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Kiran's

SSC

MATHEMATICS

CHAPTERWISE

SOLVED PAPERS

1999—till date

CHAPTERWISE COMPILATION OF PREVIOUS YEARS' SOLVED PAPERS OF EXAMS CONDUCTED BY SSC

SSC Graduate Level Exams— Combined Graduate Level Pre. Exams, CPO Sub-Inspector, Section Officer (Audit), Tax Assiatant (Income Tax & Central Excise), Section Officer (Commercial Audit), Statistical Investigators, Combined Graduate Level Tier-I, Tier-II, SAS, CISF ASI, CPO ASI & Intelligence officer, FCI, Delhi Police SI Exams etc.

SSC 10+2 Level Exams— Data Entry Operator & LDC and PA / SA Exam.

7100+ Objective Questions

SSC Combined Matric Level Exam — Combined Matric Level Pre-Exam, Multitaskin (Non-Technical) Staff, CISF Constable (GD), Constable (GD) & Riflemen (GD) and Othe Competitive Exams.

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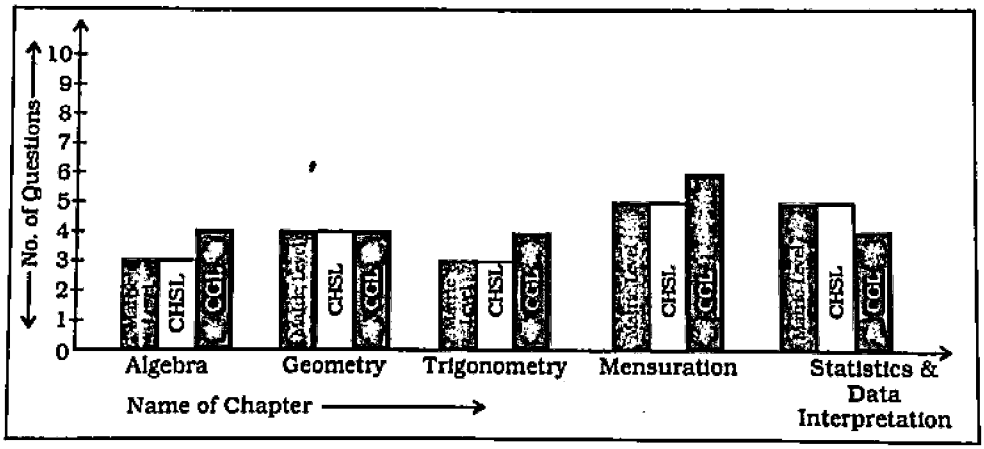
SOME NOTABLE FACTS

SSC (Staff Selection Commission)

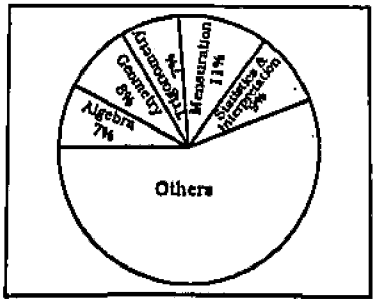
Combined Graduate Level(CGL)	Combined Higher Secondary Level (CHSL)	Matric Level
CGL Tier-I, Tier-II, Tier-III & Tier-IV, CAPFs SI & Delhi Police SI and FCI etc.	LDC & DEO and Stenographer 'C' & 'D'	Multi Tasking Staff and Constable (GD)

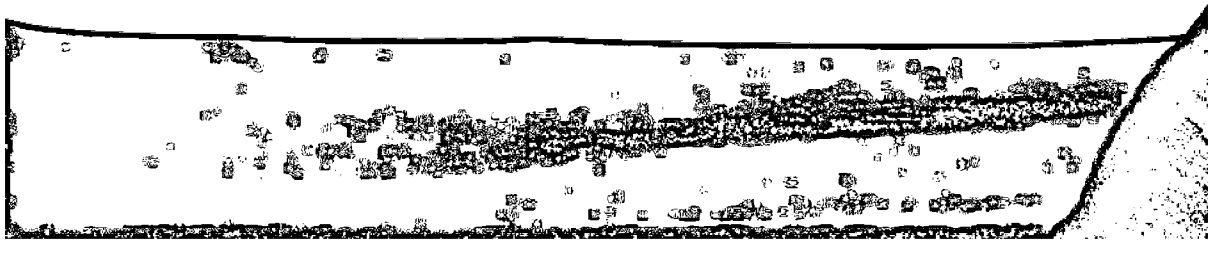
- Staff Selection Commission Conducts examination for Graduate Level, Higher Secondary Level and Matric Level on all India basis.
- Till now SSC conducted Combined Graduation level Examination used to be held in two parts i.e. Tier-I and Tier-II. But from now onwards this examination will be held in four parts i.e. Tier-I, Tier-II, Tier-III and Tier-IV.
- Earlier in SSC conducted Tier-I Exam used to have 50 questions on Mathematics out of 200 questions, while in Tier-II a candidate had to answer 100 questions. But from now onwards in Tier-I out of 100 questions, 25 questions will be on Mathematics, while a candidate has to answer 100 questions in Tier-II.
- SSC Conducts single stage examination for CHSL of 200 questions out of which Mathematics carries a weightage of 50 questions.
- Matric Level exams are conducted for Multi Tasking Staff in which out of 150, 25 questions are from Mathematics and in Constable GD exam weightage of Mathematics is 25 questions out of 100.
- The Changing nature of Mathematics questions in recent exams conducted by SSC make this subject very important and deciding factor in success or failure.

TOP 5 IMPORTANT CHAPTERS



- Combination of Algebra, Geometry, Trigonometry, Mensuration and Statistics & Data Interpretation in recent Exams (2011-2015)





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TOPICWISE DISTRIBUTION OF QUESTIONS OF SSC GRADUATE LEVEL (TIER-I, TIER-II, CPO, DPSI) EXAMS HELD DURING 2010–2015

QUANTITATIVE APTITUDE

S. No.	TOPICS	* Average number of Questions	EXAMINATIONS													
			SSC CGL Tier-I 16.05.2010 (1st Sitting)	SSC CISF 29.08.2010	SSC CPO SI 12.12.2010	SSC CGL Tier-I 26.08.2011	SSC CPO SI & ASI 28.08.2011	SSC CGL Tier-II 18.09.2012	SSC CGL Tier-I 21.04.2013	SSC CGL Tier-II 29.08.2013	SSC CGL Tier-II 21.09.2014	SSC CGL Tier-I 26.10.2014	SSC CGL Tier-II 12.04.2015	SSC CAPFs SI, CISF ASI & D.P. SI 21.06.2015	SSC CGL Tier-I 16.08.2015	SSC CGL Tier-II 25.10.2015
1.	Number System	1	4	3	2	3	2	4	2	4	1	—	4	—	2	3
2.	LCM and HCF	1	2	1	1	2	—	1	2	1	3	—	—	—	1	2
3.	Simplification	1	5	7	6	7	—	—	2	—	3	2	3	2	—	1
4.	Power, Indices and Surds	2	6	3	7	4	4	1	3	1	1	3	3	3	1	4
5.	Average	3	2	2	3	2	2	5	2	8	7	2	6	1	1	6
6.	Ratio and Proportion	3	3	4	4	3	3	5	2	5	3	1	5	3	2	7
7.	Percentage	2	2	5	4	4	2	5	2	4	5	1	3	2	1	4
8.	Profit and Loss	3	3	4	4	5	5	6	3	6	6	—	7	3	2	5
9.	Discount	2	2	2	2	3	—	4	1	4	4	4	5	1	1	4
10.	Simple Interest	1	1	3	2	1	2	1	1	1	1	1	1	—	—	2
11.	Compound Interest	1	2	1	1	2	—	3	1	3	3	—	3	1	1	3
12.	Time and Work	2	3	3	3	3	2	3	1	3	3	3	6	1	3	5
13.	Pipe and Cistern	1	—	1	1	—	1	2	1	2	2	—	1	—	—	2
14.	Time and Distance	2	3	2	2	1	1	3	1	3	2	2	2	2	3	4
15.	Boat and Stream	1	—	1	1	1	1	1	1	1	1	—	2	—	—	1
16.	Sequence and Series	1	2	2	3	—	—	1	—	2	2	—	—	—	—	—
17.	Algebra	4	3	—	—	—	5	9	5	8	10	4	8	5	8	10
18.	Trigonomentry	4	—	—	—	—	5	10	5	10	10	6	9	5	7	9
19.	Geometry	4	—	—	—	—	4	11	5	10	10	7	7	3	5	7
20.	Mensuration	6	3	—	1	5	6	15	5	15	15	5	20	8	5	16
21.	Statistics & Data Interpretation	4	3	3	3	4	5	5	5	6	5	7	5	9	7	5
22.	Miscellaneous	1	1	—	—	—	—	5	—	3	3	2	—	1	—	—
Total Number of Questions		50	50	50	50	50	50	100	50	100	100	50	100	50	50	100

* Average number of questions is based on the data available in the chart mentioned above (Considering 50 questions set)

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TOPICWISE DISTRIBUTION OF QUESTIONS SSC 10+2 DEO & LDC AND MATRIC LEVEL EXAMS HELD ON DURING 2010–2015

QUANTITATIVE APTITUDE

S. No.	TOPICS	* Average number of Questions	EXAMINATIONS													
			SSC DEO & LDC 27.11.2010	SSC DEO & LDC 20.02.2011	SSC Multi-Tasking 27.02.2011	SSC Constable (GD) 05.06.2011	SSC DEO & LDC 04.12.2011	SSC Cons. (GD) & Rifleman (GD) 22.04.2012 (1st S)	SSC DEO & LDC 11.12.2012	SSC Multitasking Staff 17.03.2013	SSC DEO & LDC 10.11.2013 (IInd Sitting)	SSC CHSL DEO & LDC 16.11.2014	SSC Constable (GD) 04.10.2015 (1st Sitting)	SSC CHSL DEO & LDC 15.11.2015 (1st Sitting)	SSC CHSL DEO & LDC 06.12.2015 (1st Sitting)	SSC CHSL DEO & LDC 20.12.2015 (1st Sitting)
1.	Number System	1	4	2	3	6	2	3	3	2	3	—	2	3	—	1
2.	LCM and HCF	1	2	—	1	2	1	1	1	1	1	—	—	—	—	1
3.	Simplification	2	5	—	7	5	6	—	—	1	—	1	1	1	2	—
4.	Power, Indices and Surds	3	6	10	6	5	7	1	1	1	3	1	—	2	1	1
5.	Average	2	2	3	2	1	3	2	2	2	2	2	3	1	3	2
6.	Ratio and Proportion	3	3	5	4	2	4	2	2	2	—	2	1	1	2	2
7.	Percentage	3	2	4	5	2	4	2	2	2	1	2	2	2	1	2
8.	Profit and Loss	3	3	3	4	3	5	2	2	3	3	2	2	3	4	3
9.	Discount	2	2	3	2	3	2	2	2	2	2	2	4	2	2	2
10.	Simple Interest	1	1	2	3	1	2	—	—	1	1	—	2	—	1	2
11.	Compound Interest	1	2	1	1	1	1	1	1	1	1	1	—	2	1	—
12.	Time and Work	2	3	2	3	2	3	2	2	2	1	1	2	2	2	2
13.	Pipe and Cistern	1	—	1	1	1	1	—	—	1	—	1	—	—	—	—
14.	Time and Distance	2	3	3	2	4	2	—	—	1	1	1	2	2	1	2
15.	Boat and Stream	1	—	—	1	—	1	1	1	—	1	—	—	—	1	—
16.	Sequence and Series	1	2	—	2	1	3	—	—	—	—	3	—	—	1	—
17.	Algebra	3	3	—	—	1	—	5	5	—	5	5	—	5	3	5
18.	Trigonomentry	3	—	—	—	—	—	5	5	—	5	5	—	4	5	5
19.	Geometry	4	—	—	—	—	—	6	6	—	6	7	—	5	6	6
20.	Mensuration	5	3	5	—	4	1	6	6	1	8	5	2	6	5	5
21.	Statistics & Data Interpretation	5	3	5	3	3	3	9	9	2	4	9	2	9	9	9
22.	Miscellaneous	1	1	1	—	—	—	5	5	—	2	—	—	—	—	—
Total Number of Questions		50	50	50	50	50	50	25	25	25	50	50	25	50	50	50

* Average number of questions is based on the data available in the chart mentioned above (Considering 50 questions set)

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	TYPE-IV : Questions based on finding the ascending & descending order of numbers etc.		SME-51
	TYPE-V : Questions based on finding the unit place of a number		SME-51
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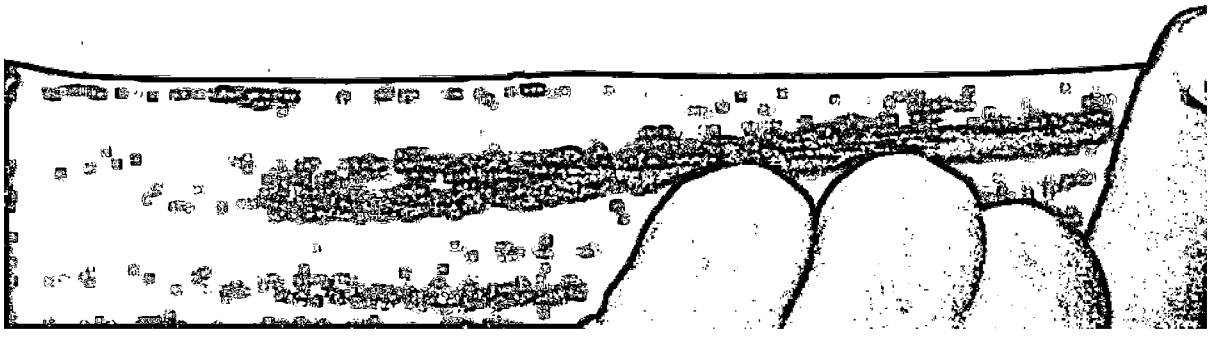
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	TYPE–VII		SME–505
	TYPE–VIII		SME–507
	TEST YOURSELF		SME–510



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13.	**Pipe and Cistern**	**81**	**SME-515-527**
	TYPE-I : Questions based on the concept of pipe and cistern		SME-515
	TYPE-II : Questions based on fractions/part of filled tank		SME-516
	TYPE-III : Questions based on taps are opened alternatively or a leak in a tank		SME-517
	TYPE-IV : Miscellaneous Questions		SME-518
	EXPLANATIONS		
	TYPE-I		SME-519
	TYPE-II		SME-521
	TYPE-III		SME-522
	TYPE-IV		SME-525
	TEST YOURSELF		SME-526
14.	**Time and Distance**	**335**	**SME-528-581**
	TYPE-I : Questions based on the basic concept of time and distance		SME-528
	TYPE-II : Questions based on Rail and Platform/Bridge		SME-530
	TYPE-III : Questions based on Rail and a man/pole/signal		SME-531
	TYPE-IV : Questions based on two Rails cross each other in opposite direction		SME-533
	TYPE-V : Questions based on a car travels with $\frac{n}{y}$ of its usual speed		SME-534
	TYPE-VI : Questions based on average speed		SME-535
	TYPE-VII : Questions based on Ratios		SME-537
	TYPE-VIII : Questions based on two train travel in same direction at different speed or thief/ constable overtake.		SME-538
	TYPE-IX : Questions based on a train (transport system)/a man changes his speed, then he arrives at its destination before/later		SME-539
	TYPE-X : Questions based on any train crosses both platform and a man/a pole at same time		SME-540
	TYPE-XI : Question based on races		SME-541
	TYPE-XII : Miscellaneous Questions		SME-542

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	EXPLANATIONS		
	TYPE-I		SME-545
	TYPE-II		SME-548
	TYPE-III		SME-550
	TYPE-IV		SME-551
	TYPE-V		SME-553
	TYPE-VI		SME-555
	TYPE-VII		SME-556
	TYPE-VIII		SME-557
	TYPE-IX		SME-559
	TYPE-X		SME-560
	TYPE-XI		SME-562
	TYPE-XII		SME-563
	TEST YOURSELF		SME-566
15.	**Boat and Stream**	**53**	**SME-582-589**
	TYPE-I : Questions based on upstream and downstream		SME-582
	TYPE-II : Questions based on a boat/a man takes 'n' times as much time in going the same distance in opposite direction		SME-583
	TYPE-III : Miscellaneous Questions		SME-584
	EXPLANATIONS		
	TYPE-I		SME-585
	TYPE-II		SME-587
	TYPE-III		SME-588
	TEST YOURSELF		SME-589
16.	**Sequence and Series**	**137**	**SME-590-603**
	TYPE-I : Questions based on finding the next number/missing number/wrong number		SME-590
	TYPE-II : Questions based on 'x^{th}' term & sum of 'n' terms		SME-592
	TYPE-III : Questions based on Simple calculation		SME-594
	TYPE-IV : Questions based on square/cube of natural/odd/even/prime numbers etc.		SME-594
	EXPLANATIONS		
	TYPE-I		SME-595
	TYPE-II		SME-597
	TYPE-III		SME-600
	TYPE-IV		SME-601
	TEST YOURSELF		SME-602

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17.	**Algebra**	**509**	**SME-604-674**
	TYPE-I : Questions based on the basic algebraic concept/calculation		SME-604
	TYPE-II : Questions based on polynomial and algebraic identity		SME-616
	TYPE-III : Questions based on graphs of linear equations		SME-625
	TYPE-IV : Questions based on ratios		SME-627
	TYPE-V : Miscellaneous Questions		SME-628
	EXPLANATIONS		
	TYPE-I		SME-630
	TYPE-II		SME-648
	TYPE-III		SME-664
	TYPE-IV		SME-668
	TYPE-V		SME-670
	TEST YOURSELF		SME-671
18.	**Trigonometry**	**395**	**SME-675-740**
	TYPE-I : Questions based on Circular Measure of angles (Radian & Degree Measure)		SME-675
	TYPE-II : Questions based on Trigonometric Ratios & Identities		SME-675
	TYPE-III : Questions based on angle of elevation		SME-692
	TYPE-IV : Questions based on angle of depression		SME-695
	TYPE-V : Miscellaneous Questions		SME-696
	EXPLANATIONS		
	TYPE-I		SME-698
	TYPE-II		SME-698
	TYPE-III		SME-724
	TYPE-IV		SME-733
	TYPE-V		SME-736
	TEST YOURSELF		SME-737
19.	**Geometry**	**416**	**SME-741-807**
	TYPE-I : Equilateral Triangles		SME-741
	TYPE-II : Isosceles Triangles		SME-742
	TYPE-III : Scalene triangles, Acute & obtuse angles triangles and others triangles		SME-743
	TYPE-IV : Right angle Triangles		SME-746
	TYPE-V : Similar Triangles		SME-748
	TYPE-VI : Rectangle		SME-749
	TYPE-VII : Square		SME-749
	TYPE-VIII : Polygon		SME-749

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	TYPE-IX : Parallelogram		SME–750
	TYPE-X : Cyclic and others Quadrilateral		SME–751
	TYPE-XI : Trapezium/Rhombus		SME–752
	TYPE-XII : Simple Circle		SME–752
	TYPE-XIII : Tangents to Circle		SME–756
	TYPE-XIV : Incentre/Circumcentre and Incircle Circumcircle		SME–758
	TYPE-XV : Miscellaneous Questions		SME–759
	EXPLANATIONS		
	TYPE-I		SME–762
	TYPE-II		SME–764
	TYPE-III		SME–766
	TYPE-IV		SME–773
	TYPE-V		SME–777
	TYPE-VI		SME–780
	TYPE-VII		SME–780
	TYPE-VIII		SME–780
	TYPE-IX		SME–782
	TYPE-X		SME–782
	TYPE-XI		SME–784
	TYPE-XII		SME–786
	TYPE-XIII		SME–792
	TYPE-XIV		SME–797
	TYPE-XV		SME–800
	TEST YOURSELF		SME–804
20.	**Mensuration**	**789**	**SME–808-926**
	TYPE-I : (2-D : Area)		SME–808
	TYPE-II : (2-D : Perimeter)		SME–822
	TYPE-III : (2-D : Percentage/Cost/Quantity)		SME–827
	TYPE-IV : (3-D : Volume)		SME–828
	TYPE-V : (3-D : Area)		SME–840
	TYPE-VI : (3-D : Percentage/Cost/Quantity)		SME–846
	TYPE-VII : Miscellaneous Questions		SME–847
	EXPLANATIONS		
	TYPE-I		SME–853
	TYPE-II		SME–880
	TYPE-III		SME–888
	TYPE-IV		SME–889
	TYPE-V		SME–907
	TYPE-VI		SME–915
	TYPE-VII		SME–917
	TEST YOURSELF		SME–923

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21.	**Statistics and Data Interpretation**	**729**	**SME–927-1002**
	TYPE–I : Pie-Chart		SME–927
	TYPE–II : Line graph		SME–940
	TYPE–III : Simple Bar Diagram		SME–943
	TYPE–IV : Horizontal and Divide Bar Diagram		SME–950
	TYPE–V : Multi Bar Diagram		SME–952
	TYPE–VI : Histogram		SME–967
	TYPE–VII : Table		SME–969
	TYPE–VIII : Miscellaneous Questions		SME–975
	EXPLANATIONS		
	TYPE–I		SME–977
	TYPE–II		SME–983
	TYPE–III		SME–985
	TYPE–IV		SME–987
	TYPE–V		SME–988
	TYPE–VI		SME–996
	TYPE–VII		SME–997
	TYPE–VIII		SME–1000
	TEST YOURSELF		SME–1001
22.	**Miscellaneous**	**46**	**SME–1003-1008**
	TYPE–I : Questions based on Logarithm		SME–1003
	TYPE–II : Questions based on Set Theory		SME–1003
	TYPE–III : Questions based on Probability		SME–1003
	TYPE–IV : Questions based on Calendar		SME–1003
	TYPE–V : Questions based on clock		SME–1003
	TYPE–VI : Questions based on Permutation & Combination		SME–1004
	TYPE–VII : Others		SME–1004
	EXPLANATIONS		
	TYPE–I		SME–1005
	TYPE–II		SME–1005
	TYPE–III		SME–1005
	TYPE–IV		SME–1005
	TYPE–V		SME–1005
	TYPE–VI		SME–1006
	TEST YOURSELF		SME–1006
			SME–1007
		7160	

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QUANTITATIVE ABILITY (APTITUDE) : AN INTRODUCTION

As we have inferred that SSC will most probably follow the pattern of questions asked in Graduate Level (FCI, CAPFs (CPO), Delhi Police), CHSL (10+2) Level, Matric Level and other competitive examinations held earlier. But the scope is enlarged. Earlier syllabus was of Arithmetic, now it is syllabus of Mathematics. New syllabus has some new topics as, Trigonometry, Geometry and Algebra. The new syllabus has been given below.

PRESCRIBED SYLLABUS

The questions will be designed to test the ability of appropriate use of numbers and number sense of the candidate. The scope of the test will be computation of **whole numbers, decimals ,fractions and relationships between numbers, Percentage, Ratio and Proportion, Square roots, Averages, Interest, Profit and Loss, Discount, Partnership Business, Mixture and Alligation, Time and distance, Time and Work, Basic Algebraic Identities of School Algebra and Elementary surds, Graphs of Linear Equations, Triangle and its various kinds of centres, Congruence and Similarity of Triangles, Circle and its Chords, Tangents, Angles subtended by chords of a circle, common tangents to two or more circles, Triangle, Quadrilaterals, Regular Polygons, Circle, Right Prism, Right Circular Cone, Right Circular Cylinder, Sphere, Hemispheres, Rectangular Parallelepiped, Regular Right Pyramid with triangular or square base, Trigonometric Ratios, Degree and Radian Measures, Standard Identities, Complementary angles, Heights and Distances, Histogram, Frequency polygon, Bar diagram and Pie chart.**

An analytical study of syllabus reveals that one will have to enlarge the dimension of study to hit the target. A tight ropeway walk may peril your prospect.

Some Important Facts

- Never read Mathematics, always use pen and paper to solve Maths.
- Study the facts and formulae of every topic. Always try to understand the root/source of the formulae.
- Give a subjective approach to your study, otherwise objective approach will serve no objective.
- Comprehend the application of formulae. A proper use makes the solution easy whereas an improper use hardens it.
- Try to give variety to your study. Solve questions of varied kind and degree.
- Go ahead from easy to harder questions. Believe in complete solution of questions.
- Practise makes a man perfect. Mathematics needs continuous practice.
- While preparing, underline the important points. This will help you during revision.
- It is perilous walking on a tight rope. So, give a wide dimension to your study.
- Most importantly, think positive, do positive.

Before we go to the section of questions asked in previous SSC Exams, we present here list of important formulae and facts, that will be helpful in your preparation.

SIMPLIFICATION :

Simplification means expressing in a simpler form. In order to simplify an expression we use the operations in the following order which is easily remembered as "BODMAS" i.e.,

(*i*) Bracket (*ii*) Of (*iii*) Division (*iv*) Multiplication (*v*) Addition (*vi*) Subtraction.'Of' means multiplication but is operated even before division.

Brackets are of four types and they are operated in the following order :

Bar or line, ( ), { } and [ ]

Thus the order of operation will be :

(—), ( ), { }, [ ], of, +, ×, +, −.

Order of + and − can be interchanged or they can be operated simultaneously too.

HCF AND LCM

1. $\text{HCF} = \dfrac{\text{HCF of Numerators}}{\text{LCM of Denominators}}$

2. $\text{LCM} = \dfrac{\text{LCM of Numerators}}{\text{HCF of Denominators}}$

3. Product of two Numbers = L.C.M. × H.C.F
   P (*x*) × Q(*x*) = L.C.M. × H.C.F.

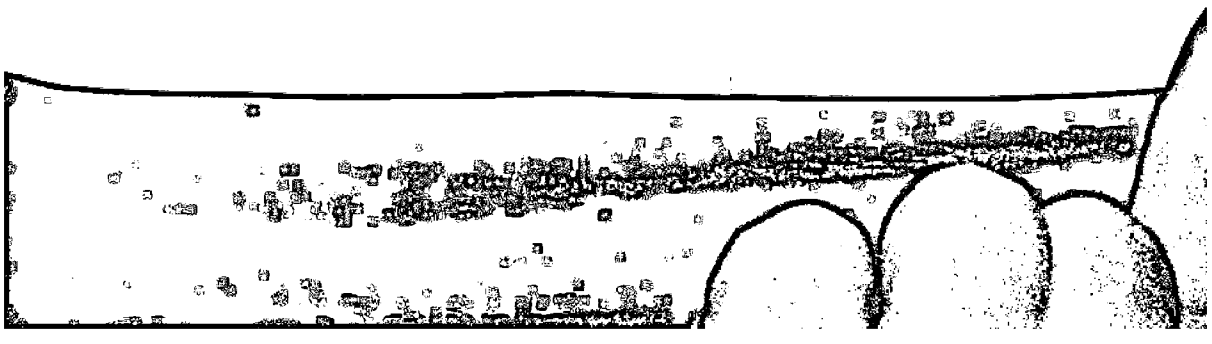
AVERAGE

1. The average of a number of quantities of the same kind is their sum divided by the number of those quantities. More briefly :

$$\text{Average} = \frac{\text{Sum of the quantities}}{\text{The number of quantities}}$$

2. Sum of the quantities = Average × The number of quantities.
3. The number of quantities

$$= \frac{\text{Sum of the quantities}}{\text{Average}}$$



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4. If a man covers a distance at x km/hr. and he again covers the same distance at y km/hr. Then his average speed $= \left(\frac{2xy}{x+y}\right)$ km/hr.

5. If a man covers three equal distances at speed of x km/hr, y km/hr and z km/hr. Then the average speed during the whole journey is $\left(\frac{3xyz}{xy+yz+zx}\right)$ km/hr.

6. Sum of 1st 'n' natural numbers $= \frac{n(n+1)}{2}$

∴ Average of first 'n' natural numbers $= \frac{n(n+1)}{2n} = \frac{(n+1)}{2}$

7. Sum of squares of first 'n' natural numbers

$$= \frac{n(n+1)(2n+1)}{6}$$

$$\boxed{\text{Average} = \frac{(n+1)(2n+1)}{6}}$$

8. Sum of cubes of first 'n' natural numbers

$$= \left[\frac{n(n+1)}{2}\right]^2$$

$$\therefore \boxed{\text{Average} = \frac{n(n+1)^2}{4}}$$

Ratio and Proportion.

1. Duplicate ratio of $a : b$ is $a^2 : b^2$
2. Triplicate ratio of $a : b$ is $a^3 : b^3$
3. Sub duplicate ratio of $a : b$ is $\sqrt{a} : \sqrt{b}$
4. Sub triplicate ratio of $a : b$ is $\sqrt[3]{a} : \sqrt[3]{b}$
5. Inverse ratio of $a : b$ is $\frac{1}{a} : \frac{1}{b}$
6. Mean proportion of two numbers a and b is $\sqrt{ab}$
7. Third proportion of two numbers a and b is $\frac{b^2}{a}$
8. Fourth proportion of three numbers a, b, c is $\frac{bc}{a}$
9. In a two dimensional geometrical figure, if the corresponding sides are in the ratio $a : b$ then their areas are in the ration $a^2 : b^2$.
10. In a three dimensional geometrical figure, if the corresponding sides are in the ratio $a : b$ then their volumes are in the ratio $a^3 : b^3$

PERCENTAGE

% Change (Increase or Decrease) :

$$\% \text{ change} = \frac{\text{Final value} - \text{Initial value}}{\text{Initial value}} \times 100$$

$$\text{or, \% change} = \left(\frac{\text{Final value}}{\text{Initial value}} - 1\right) \times 100$$

Remember, % change is always calculated with respect to the initial value. Hence, it is the initial value which is taken as reference value for finding % change.

∴ % change

$$= \frac{\text{Difference between two quantities}}{\text{Reference value}} \times 100$$

Further, change includes both, increase as well as decrease. Therefore, we follow the following sign convention :

1. If price of an article increases by x%, then reduction in consumption so that expenditure remains same

$$= \left[\frac{100 \times x}{(100+x)}\right] \%$$

2. If the price of an article decreases by x%, then increase in consumption so that expenditure remains same

$$= \left[\frac{100 \times x}{100-x}\right] \%$$

3. If the population of a town is P and the annual increase is r%, then population after t years

$$= P\left(1 + \frac{r}{100}\right)^t$$

4. If annual decrease is r%, then population in 't' years

$$= P\left(1 - \frac{r}{100}\right)^t$$

5. If first value is X% more than the second value, then the second value is

$\left[\frac{100 \times x}{100+x}\right]$ % Less than first value.

6. If first value is x% less than second value, then the second value is $\left[\frac{100 \times x}{100-x}\right]$% more than first value.

7. If a number is first increased by x% and then decreased by x% the net result is always decrease and is equal to $\left(\frac{x^2}{100}\right)$%

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8. If a number is first increased by $x\%$ and then decreased by $y\%$ the net result is $\left(x-y-\frac{xy}{100}\right)\%$ increase or decrease depending upon + ve or –ve sign
+ ve sign shows decrease.
– ve sign shows decrease.

9. If a number is successively increased by $x\%$ and $y\%$ the net increase is $\left(x+y+\frac{xy}{100}\right)\%$ (Note Questions based on change in areas of rectangle, square, circle, parallelogram with change in their sides can be solved quickly by the above tricks).
For example, if the length of a rectangle increases by x % and its breadth increases by y % than change in area $= \left(x+y+\frac{xy}{100}\right)\%$

Sign Convention : + for increase ; – for decrease

PROFIT AND LOSS

Gain = S.P. – C.P.
Loss = C.P. – S.P.

$$\% \text{ profit} = \frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100\%$$

$$\% \text{ loss} = \frac{\text{C.P.} - \text{S.P.}}{\text{C.P.}} \times 100\%$$

From these we can write direct expressions for S.P. and C.P.

$$\text{S.P.} = \left(\frac{100 + \% \text{ Profit}}{100}\right) \times \text{C.P. in case of profit}$$

$$\text{and, S.P.} = \left(\frac{100 - \% \text{ Loss}}{100}\right) \times \text{C.P. in case of loss.}$$

These can be rewritten as

$$\text{C.P.} = \left(\frac{100}{100 + \% \text{ Profit}}\right) \times \text{S.P. in case of profit}$$

$$\text{and, C.P.} = \left(\frac{100}{100 - \% \text{ Loss}}\right) \times \text{S.P. in case of loss.}$$

Discount

Discount based questions frequently asked in competitive exams.
If the price of an item is ₹ 100 and a shopkeeper allows a discount of 10% on it then the customer will

$$\text{pay} = ₹\left(100 - \frac{100 \times 10}{100}\right)$$
$$= ₹\,(100 - 10)$$
$$= ₹\,90$$

1. Discount equivalent to successive discounts of $x\%$ and $y\%$ on an article is $\left(x+y-\frac{xy}{100}\right)\%$

Ex. Successive discount equivalent to 10% and 20% will be $\left(10+20-\frac{10\times 20}{100}\right) = 30 - 2 = 28\%$

2. A single discount equivalent to successive discounts of $x\%$, $y\%$ and $z\%$ on an article will be calculated as
(i) Equivalent discount of $x\%$ and $y\%$ is

$$p\% = \left(x+y-\frac{xy}{100}\right)\%$$

(ii) Equivalent discount of $p\%$ and $z\%$ is

$$= \left(p+z-\frac{pz}{100}\right)\%$$

SIMPLE INTEREST AND COMPOUND INTEREST

$$\text{Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

When compound interest is compounded annually,

$$A = P\left[1+\frac{r}{100}\right]^t$$

TIME AND WORK

1. One day's work

$$= \frac{1}{\text{Number of days required to complete the work}}$$

2. Obviously, number of days required to complete the work

$$= \frac{1}{\text{One day's work}}$$

3. If 'M_1' men can do a 'W_1' piece of work in 'D_1' days and 'M_2' men completes 'W_2' work in 'D_2' days then we have a very important relation.

$$\boxed{M_1\, D_1\, W_2 = M_2\, D_2\, W_1}$$

If time is also included i.e.,first group finishes 'W_1' work by working 'T_1' hours daily in 'D_1' days and the second group finishes 'W_2' work by working 'T_2'hours daily in 'D_2'days then

$$\boxed{M_1\, D_1\, T_1\, W_2 = M_2\, D_2\, T_2\, W_1}$$

4. If A completes a piece of work alone in x days and B completes the same work in y days. Then they together finish the work in $\left(\frac{x.y}{x+y}\right)$ days.

5. If A and B together completes a piece of work in x days and B alone completes the same work in y days then A alone will do the work in $\left(\frac{xy}{y-x}\right)$ days.

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6. If three men A, B and C alone finishes a piece of work in x, y and z days. Then they together finish the work in $\left(\frac{xyz}{xy+yz+zx}\right)$ days.

PIPES AND CISTERNS

Theory : Pipes and Cisterns based problems are same as that of time and work.

For example :-

1. If a pipe fills a tank in x hours, then the part filled in 1 hour $= \frac{1}{x}$
2. If a pipe empty a tank in x hours, then the part of tank emptied in 1 hour $= \frac{1}{x}$
3. If a pipe (A) alone fills a tank in x hours and another pipe (B) alone fills the same tank in y hours. Then time taken to fill the tank, when both pipes are open $= \left(\frac{xy}{x+y}\right)$ hours.
4. If two pipes A and B together fill a tank in x hours and A alone fills it in y hours then time taken by 'B' to fill the tank $= \left(\frac{xy}{y-x}\right)$ hours.
5. If a pipe A alone empties the tank in x hours and another pipe 'B' alone empties it in y hours. Then time taken to empty the tank when both pipes are open $= \left(\frac{xy}{x+y}\right)$ hours.
6. If A, B and C alone fills a tank in x, y and z hours. Then the time taken to fill the tank when all three pipes are open $= \left(\frac{xyz}{xy+yz+zx}\right)$ hours.
7. If a pipe 'A' fills a tank in x hours and another pipe 'B' empties it in y hours. Then part of the tank filled in 1 hour $= \left(\frac{1}{x}-\frac{1}{y}\right)$

TIME AND DISTANCE

1. Speed $= \frac{\text{Distance}}{\text{Time}}$
2. Distance = Speed x Time
3. Time $= \frac{\text{Distance}}{\text{Speed}}$
4. When we have to change km/hr to m/sec multiply by $\frac{5}{18}$

   For example x km/hr $= \left(\frac{x \times 5}{18}\right)$ m/sec.
5. When it is required to change m/sec to km/hr multiply by $\frac{18}{5}$.

   For example, y m/sec $= \left(\frac{y \times 18}{5}\right)$ km/hr.
6. If the ratio of time taken to cover a distance is a : b then the ratio of speed will be b : a.
7. If a body covers a certain distance at x km/hr and it covers the same distance again at y km/hr then its average speed $= \left(\frac{2xy}{x+y}\right)$ km/hr.
8. There exists a inverse relation between speed and time for example
   $V_1 T_1 = V_2 T_2 = V_3 T_3$ .. and so on.
   Where V_1, V_2, V_3 are speeds and T_1, T_2, T_3 are the time taken to cover the same distance.

TRAINS

1. Time taken to cross a man or a pole $= \frac{\text{Length of Train}}{\text{Speed of Train}}$
2. Time taken to cross a platform $= \frac{\text{Length of (train + platform)}}{\text{Speed of train}}$
3. Time taken a cross a bridge $= \frac{\text{Length of (train + bridge)}}{\text{Speed of train}}$
4. When two trains moves towards each other then, Time taken to cross each other $= \frac{\text{Sum of lengths of both trains}}{\text{Sum of their speeds}}$
5. When two trains are moving in the same direction then, Time taken to cross each other $= \frac{\text{Sum of lengths of both trains}}{\text{Difference of their speeds}}$
6. When two trains are moving at speed of x km/hr and y km/hr.
   (i) Relative speed when moving towards each other $= (x + y)$ km/hr.
   (ii) Relative speed when moving in the same direction $= (x - y)$ km/hr where $x > y$.

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BOAT AND STREAM

Stream based questions are generally asked in competitive exams.

Stream means current *i.e.* the speed of water. When we say speed of boat or steamer we mean the speed of boat in still water.

Up Stream : When a boat moves against the direction of stream it is called up stream.

Down Stream : When a boat moves in the direction of stream it is called down stream.

Note : Speed of boat/steamer/ swimmer is always greater than the speed of stream/current

If the speed of a boat is x *km/hr* and the speed of stream is y *km/hr.*

Then speed of boat in upstream = $(x-y)$ *km/hr*

speed of boat in down stream = $(x+y)$ *km/hr*

$\Rightarrow$ Speed of boat = $\frac{1}{2}$(speed of boat in upstream + speed of boat in down stream)

Speed of stream = $\frac{1}{2}$ (Speed of boat in down stream – speed of boat in up stream)

ALLIGATION OR MIXTURE

$$\frac{\text{Quantity of cheaper ingredient}}{\text{Quantity of dearer ingredient}} = \frac{\left(\begin{matrix}\text{Cost Price of dearer}\\ \text{ingredient}\end{matrix}\right) - \text{Mean Price}}{\text{Mean Price} - \left(\begin{matrix}\text{Cost Price of}\\ \text{cheaper ingredient}\end{matrix}\right)}$$

MENSURATION

Triangle

1. Area = $\frac{1}{2}$ × Base × Height or,

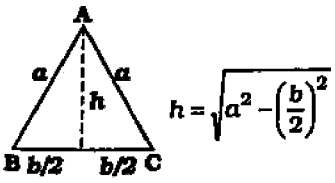
   $\sqrt{s(s-a)(s-b)(s-c)}$

   Where a, b, c are the lengths of the sides of triangle and $s = \frac{a+b+c}{2}$.

2. Area of an Equilateral triangle = $\frac{\sqrt{3}}{4} \times (\text{side})^2$

   (All sides of an equilateral triangle are equal)

3. Area of an isosceles triangle = $\frac{b}{4}\sqrt{4a^2-b^2}$



$h = \sqrt{a^2 - \left(\frac{b}{2}\right)^2}$

4. Perimeter of an equilateral triangle = 3 × side

Rectangle

1. Area = Length × Breadth
2. Perimeter = 2 (Length + Breadth)
3. Diagonal = $\sqrt{(\text{Length})^2 + (\text{Breadth})^2}$
4. Area of path (outside the rectangle) = 2 × (Length + Breadth + 2x)
   Where x = Width of the path
5. Area of the path inside of the rectangle = 2 × (Length + Breadth – 2x)

Square

1. Perimeter = 4 × side = 4 × a ; where a = side of square
2. Area = $(\text{Side})^2$
3. Diagonal = Side × $\sqrt{2}$
4. Area of path which is outside of square = 4 × (a + x)
5. Area of path which is inside of square = 4 × (a – x)

Trapezium

It is a quadrilateral whose opposite sides are parallel. Other two opposite sides are oblique.

1. Area = $\frac{1}{2}$ × Height × (Sum of parallel sides)

   Height is the distance between the two parallel sides.

2. Median = $\frac{1}{2}$ × (Sum of parallel sides)

   Median is the segment joining the midpoints of oblique sides.

Rhombus

It is parallelogram whose all sides are equal. Its diagonals bisect each other at right angle.

1. Area = $\frac{1}{2}$ × Product of diagonals
2. Side = $\sqrt{\left(\frac{D_1}{2}\right)^2 + \left(\frac{D_2}{2}\right)^2}$
3. Perimeter = 4 × Side
   Where D_1 and D_2 are diagonals

Parallelogram

1. Area of parallelogram = (Base × Height)
2. Area of parallelogram = $2\sqrt{s(s-a)(s-b)(s-d)}$

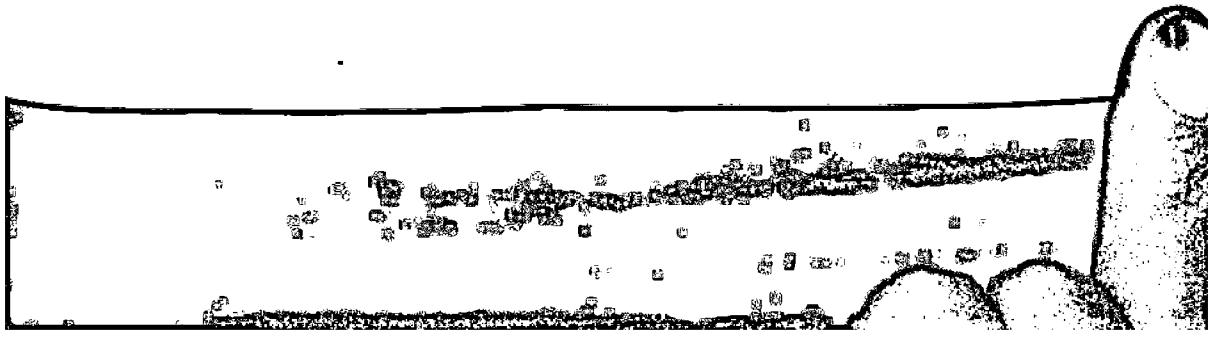
   Where $S = \frac{a+b+d}{2}$

   and a, b are adjacent sides and d is the diagonal connecting the ends of two sides.

   Some Important formulae related to carpeting a floor and paving tiles in a room.

   (1) Length of carpet = $\frac{\text{Area of floor}}{\text{width of carpet}}$

   $= \frac{\text{length} \times \text{breadth of room}}{\text{width of carpet}}$



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(2) No. of tiles Required = $\frac{\text{Area of floor}}{\text{Area of a tile}}$

(3) Largest possible tiles = H.C.F of length and breadth of a room.

(4) No. of tiles required with largest possible tiles

$$= \frac{\text{Area of floor}}{(\text{H.C.F of length and breadth of the room})^2}$$

Note : If all sides of any two dimensional figure

(i) (Rectangle, square, Parallelogram etc.) increased or decreased by x % then its perimeter also increases or decreases by x %.

(ii) If all sides of a quadrilateral increases by x % then its diagonal also increases by x %. If their is decrease in the sides by y % then perimeter is decreases by y %.

Circle

1. Diameter = 2 × Radius or $d = 2r$
2. Area $= \pi r^2$
3. Circumference $= 2\pi r = \pi d$
4. Radius $= \frac{\text{Circumference}}{2\pi} = \frac{\sqrt{\text{Area}}}{\pi}$
5. Area of sector $= \frac{\theta}{360^\circ} \times \pi r^2$
6. Length of the Arc $= \frac{\theta}{360^\circ} \times 2\pi r$
7. Area of the ring or circular path $= \pi (R + r)(R - r)$

Cuboid

1. Volume = (Length × Breadth × Height)
2. Whole Surface = 2(lb + bh + lh)
3. Diagonal = $\sqrt{l^2 + b^2 + h^2}$
4. Area of 4 walls of a room = 2 × h (l + b)

Cube

In a cube, Length = Breadth = Height

1. Volume = $(l)^3$
2. Length = $\sqrt[3]{\text{Volume}}$
3. Whole Surface = $6l^2$
4. Diagonal = $l\sqrt{3}$
5. Lateral surface area = $4l^2$

Sphere

1. Volume $= \frac{4}{3}\pi r^3$
2. Surface Area $= 4\pi r^2$

Semi-Sphere

1. Volume $= \frac{2}{3}\pi r^3$
2. Curved Surface Area $= 2\pi r^2$
3. Total Surface Area $= 3\pi r^2$

Cylinder

1. Volume $= \pi r^2 h$
2. Curved Surface Area = $2\pi rh$
3. Total Surface Area = $2\pi r (r + h)$

Where r = radius, h = height

Cone

1. Slant Height (l) $= \sqrt{r^2 + h^2}$
2. Volume $= \frac{1}{3}\pi r^2 h$
3. Curved Surface Area = πrl
4. Total Surface Area = $\pi r (l + r)$

Spherical Cell

1. Volume $= \frac{4}{3}\pi(R^3 - r^3)$
2. Total Surface Area = $4\pi (R^2 - r^2)$

Where R = Outer radius

r = Inner radius

Right Pyramid

1. Volume = $\frac{1}{3}$(Area of the Base) × Height
2. Lateral Surface Area

$= \frac{1}{2}$ (Perimeter of the Base) × Slant Height

3. Total Surface Area

= Area of the base + Lateral surface area

Some Important formulae for Solids

I. If length, breadth and height of a cuboid is increased by a%, b% and c% respectively, then its volume is increased by

$$\left[a + b + c + \frac{ab + bc + ac}{100} + \frac{abc}{(100)^2}\right]\%$$

II. If side of a cube is increased by a%, then its volume is increased by

$$\left[\left(1 + \frac{a}{100}\right)^3 - 1\right] \times 100$$

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III. If the radius or diameter of a sphere is changed by a%, then its volume changes by

$$\left[\left(1+\frac{a}{100}\right)^3-1\right]\times 100$$

Geometrical Figure	Length	Breadth	Area
Rectangle/ Parallelogram (i)	Increases by x %	Increases by y %	Increases by $\left(x+y+\frac{xy}{100}\right)\%$
(ii)	Increases by x %	decreases by y %	change in area $\left(x-y-\frac{xy}{100}\right)\%$
(iii)	decreases by x %	decreases by y %	decrease $\left(-x-y+\frac{xy}{100}\right)\%$

Square

(i) If side of square increases by x% then increase in its

$$\text{area} = \left(2x+\frac{x^2}{100}\right)\%$$

(ii) If side of a square decreases by x% then decrease in

$$\text{its area} = \left(\frac{x^2}{100}\right)\%$$

Circle

(i) If radius of a circle increases by r % then increase

$$\text{in its area} = \left(2r+\frac{r^2}{100}\right)\%$$

(ii) If radius of a circle decreases by r% then decrease

$$\text{in its area} = \left(\frac{r^2}{100}\right)\%$$

Sequence and Series

Arithmetic Progression : A series is in A.P. if the difference between any two consecutive terms in the series is same.

1. n^{th} term or last term of an A.P.
   $t_n = \quad l = a+(n-1)d$
   where a = First term,
   d = common difference
   n = number of terms.
2. Sum of n terms of an A.P.

$$S_n = \frac{n}{2}[2a+(n-1)d]$$

$$\text{or, } S_n = \frac{n}{2}[a+l] = \frac{n}{2}[a+t_n]$$

3. Three numbers in A.P are $\boxed{a-d, a, a+d}$

   Four numbers in A.P are $\boxed{a-3d, a-d, a+d, a+3d}$

   Five numbers in A.P are

   $$\boxed{a-4d, a-2d, a, a+2d, a+4d}$$

Geometric progression : A series is said to be in G.P. if the ratio of any two consecutive terms in the series is same.

1. n^{th} term of G.P $t_n = ar^{n-1}$
   where a = First terms
   r = common ratio
   n = number of terms
2. Sum of n terms of G.P.

$$s_n = \frac{a(r^n-1)}{r-1} \text{ if } r>1$$

$$s_n = \frac{a(1-r^n)}{1-r} \text{ if } r<1$$

Harmonic Progression

Three numbers a, b, c are in H.P if and only if $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P. i.e. a, b, c are in H.P if $\boxed{\frac{1}{b}-\frac{1}{a}=\frac{1}{c}-\frac{1}{b}}$

Permutation and Combination

Permutation : It is used where we have to arrange things. Out of total n things, r things (taken at a time) can be arranged as ${}^nP_r$ or $P(n,r)$

$$P(n,r) = {}^nP_r = \frac{n!}{(n-r)!} \text{ where } n \geq r$$

Combination : It is used where we have to select things. It is written as ${}^nC_r$ or $C(n,r)$

$$C(n,r) = \frac{n!}{(n-r)!r!}\ n \geq r$$

Some important results.

${}^nP_0 = 1;\ {}^nP_n = n!$

${}^nC_0 = {}^nC_n = 1\ ;\ {}^nC_r = {}^nC_{n-r} = {}^nC_1 = {}^nC_{n-1} = n.$

Ex. $${}^7P_3 = \frac{7!}{(7-3)!} = \frac{7!}{4!} = \frac{7.6.5.4!}{4!} = 210$$

$${}^5C_2 = \frac{5!}{(5-2)!2!} = \frac{5.4.3!}{3!\times 2\times 1} = 10$$

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$n!$ (is called as n factorial)

$5! = 5.4!$
$= 5.4.3!$
$= 5.4.3.2!$
$= 5.4.3.2.1!$

$\boxed{5! = 120}$

Also $\boxed{0! = 1}$

Probability

Probability means possibility. It is used to determine the chance of occurence of an even.

$$\text{Probability} = \frac{\text{No. of favourable cases}}{\text{Total Number of cases}}$$

$$\boxed{P = \frac{m}{n}}$$

Probability of Occurence of an event A is

$$P(A) = \frac{m}{n}$$

Probability of non Occurance of an event A is written as $P(\bar{A})$

$$\boxed{P(A) + P(\bar{A}) = 1}$$

Some facts regarding probability

(1) $P > 0$; (2) $0 \le P \le 1$ (3) Probability of an event is never greater than 1.

(4) Probability of failure is denoted as q. Hence we have $\boxed{p + q = 1}$

Probability based questions are generally based on

(1) Coins
(2) Die/Dice
(3) Cards

(1) Coins : In a single throw of a coin. Either Head or Tail will turn up.

Generally, Number of cases in throw of a coin is 2^n.

Where n defines the number of times a coin is thrown.

For $n = 1$ Total no. of cases $= 2^1 = 2$

For $n = 2$ Total no. of cases $= 2^2 = 4$

For $n = 3$ Total no af cases $= 2^3 = 8$

and so on.

2. Die : A die has six faces marked as (1, 2, 3, 4, 5, 6)

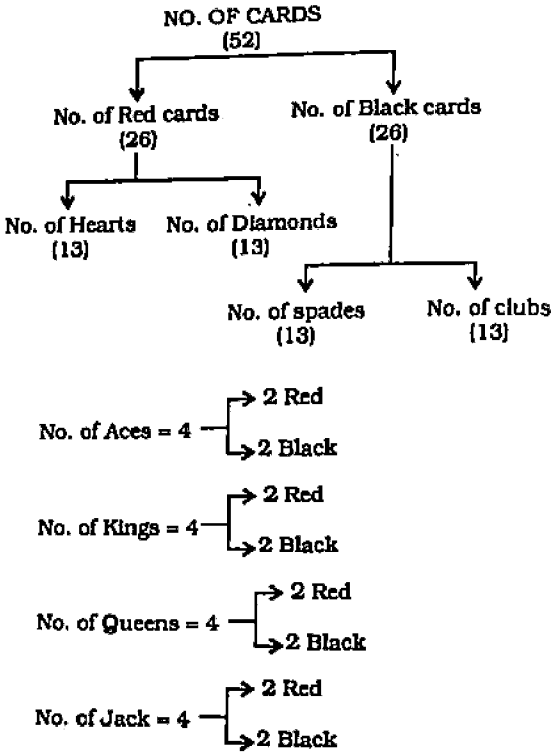
Total number of cases in a throw of die $= 6^n$.

For $n = 1$, No of cases $= 6^1 = 6$

For $n = 2$, No of cases $= 6^2 = 36$

For $n = 3$ No of cases $= 6^3 = 216$ and so on.

3. Cards : There are total 52 cards. The chart given below shows the number of cards as per their values.



ALGEBRA

Polynomials : An algebraic expression in which the variables involved have only non-negative integral powers is called a polynomial.

General Form : $p(x) = a_0 + a_1x + a_2x^2 + \ldots + a_nx^n$ is a polynomial in variable x, where $a_0, a_1, a_2, a_3 \ldots a_n$ are real numbers and n is non-negative integer.

Remainder Theorem : Let $f(x)$ be a polynomial of degree $n \ge 1$, and let a be any real number. When $f(x)$ is divided by $(x - a)$, then the remainder is $f(a)$.

Proof : Suppose that when $f(x)$ is divided by $(x - a)$, the quotient is $g(x)$ and the remainder is $r(x)$.

Then, degree $r(x)$ < degree $(x - a)$

$\Rightarrow$ degree $r(x) < 1$

$\Rightarrow$ degree $r(x) = 0$ [$\because$ degree of $(x - a) = 1$]

$\Rightarrow r(x)$ is constant, equal to r (say).

Thus, when $f(x)$ is divided by $(x - a)$, then the quotient is $g(x)$ and the remainder is r.

$\therefore f(x) = (x - a) \cdot g(x) + r$ ... (i)

Putting $x = a$ in (i), we get $r = f(a)$.

Thus, when $f(x)$ is divided by $(x - a)$, then the remainder is $f(a)$.

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Remarks

(i) If a polynomial $p(x)$ is divided by $(x+a)$, the remainder is the value of $p(x)$ at $x=-a$ i.e. $p(-a)$

$[\because x+a=0 \Rightarrow x=-a]$

(ii) If a polynomial $p(x)$ is divided by $(ax-b)$, the remainder is the value of $p(x)$ at $x=\frac{b}{a}$ i.e. $p\left(\frac{b}{a}\right)$.

$[\because ax-b=0 \Rightarrow x=\frac{b}{a}]$

(iii) If a polynomial $p(x)$ is divided by $(ax+b)$, then remainder is the value of $p(x)$ at $x=-\frac{b}{a}$ i.e. $p\left(-\frac{b}{a}\right)$

$[\because ax+b=0 \Rightarrow x=-\frac{b}{a}]$

(iv) If a polynomial $p(x)$ is divided by $b-ax$, the remainder is the value of $p(x)$ at $x=\frac{b}{a}$ i.e. $p\left(\frac{b}{a}\right)$

$[\because b-ax=0 \Rightarrow x=\frac{b}{a}]$

Factor Theorem

Let $p(x)$ be a polynomial of degree greater than or equal to 1 and a be a real number such that $p(a)=0$, then $(x-a)$ is a factor of $p(x)$.

Conversely, if $(x-a)$ is a factor of $p(x)$,

then $p(a)=0$

$\Rightarrow p(x)$, when divided by $(x-a)$ gives remainder zero.

But by Remainder theorem,

$p(x)$ when divided by $(x-a)$ gives the remainder equal to $p(a)$.

$\therefore p(a)=0$

Remarks

(i) $(x+a)$ is a factor of a polynomial iff (if and only if) $p(-a)=0$

(ii) $(ax-b)$ is a factor of a polynomial if $p\left(\frac{b}{a}\right)=0$

(iii) $(ax+b)$ is a factor of a polynomial $p(x)$ if $p\left(-\frac{b}{a}\right)=0$

(iv) $(x-a)(x-b)$ are factors of a polynomial $p(x)$ if $p(a)=0$ and $p(b)=0$

ALGEBRAIC IDENTITIES

An algebraic identity is an algebraic equation which is true for all values of the variable (s).

IMPORTANT FORMULAE

1. $(a+b)^2=a^2+2ab+b^2$
2. $(a-b)^2=a^2-2ab+b^2$
3. $(a+b)^2=(a-b)^2+4ab$
4. $(a-b)^2=(a+b)^2-4ab$
5. $a^2-b^2=(a+b)(a-b)$
6. $a^3+b^3=(a+b)(a^2-ab+b^2)$
7. $a^3-b^3=(a-b)(a^2+ab+b^2)$
8. $(a+b)^3=a^3+b^3+3ab(a+b)$
9. $(a-b)^3=a^3-b^3-3ab(a-b)$
10. $a^3+b^3=(a+b)^3-3ab(a+b)$
11. $a^3-b^3=(a-b)^3+3ab(a-b)$
12. $a^3+b^3+c^3-3abc$
    $=(a+b+c)(a^2+b^2+c^2-ab-bc-ac)$
    $=(a+b+c)\frac{1}{2}(2a^2+2b^2+2c^2-2ab-2bc-2ac)$
    $=\frac{1}{2}(a+b+c)[(a-b)^2+(b-c)^2+(c-a)^2]$
13. If $a+b+c=0$, then $a^3+b^3+c^3=3abc$
14. $(a+b+c)^3=a^3+b^3+c^3+3(b+c)(c+a)(a+b)$
15. $a^2+b^2=(a+b)^2-2ab$
16. $a^2+b^2=(a-b)^2+2ab$
17. $(a+b+c)^2=a^2+b^2+c^2+2ab+2ac+2bc$
18. $a^4+b^4+a^2b^2=(a^2-ab+b^2)(a^2+ab+b^2)$

GRAPHIC REPRESENTATION OF STRAIGHT LINES

Ordered Pair : A pair of numbers a and b listed in a specific order with a at the first place and b at the second place is called an ordered pair (a, b).

Note that $(a, b) \neq (b, a)$.

Thus, (2, 3) is one ordered pair and (3, 2) is another ordered pair.

CO-ORDINATE SYSTEM

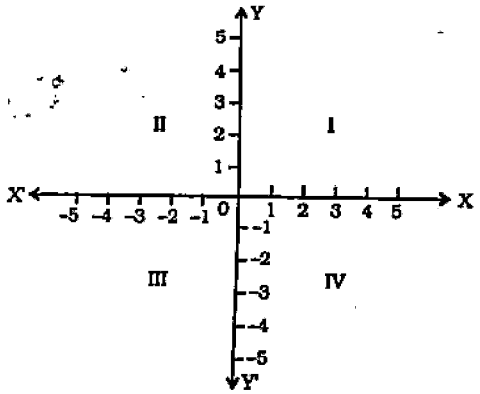
Co-ordinate Axes : The position of a point in a plane is determined with reference to two fixed mutually perpendicular lines, called the coordinate axes.

Let us draw two lines X'OX and YOY', which are perpendicular to each other and intersect at the point O.

- These lines are called the coordinate axes or the axes of reference.

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- The horizontal line X'OX is called the x-axis.
- The vertical line YOY' is called the y-axis.
- The point O is called the origin.
- The distance of a point from y-axis is called its x-co-ordinate or abscissa and the distance of the point from x-axis is called its y-co ordinate or ordinate.
- If x and y, denote respectively the abscissa and ordinate of a point P, then (x, y) are called the coordinates of the point P.
- The y-co-ordinate of every point on x-axis is zero. i.e. when a straight line intersects at x-axis, its y-co-ordinate is zero. So, the co-ordinates of any point on the x-axis are of the form $(x, 0)$.
- The x-co-ordinate of every point on y-axis is zero. So, the co-ordinates of any point on y-axis are of the form $(0, y)$.
- The co-ordinates of the origin are (0, 0).
- $y = a$ where a is constant denotes a straight line parallel to x-axis.
- $x = a$ where a is constant, denotes a straight line parallel to y-axis.
- $x = 0$ denotes y-axis.
- $y = 0$ denotes x-axis.

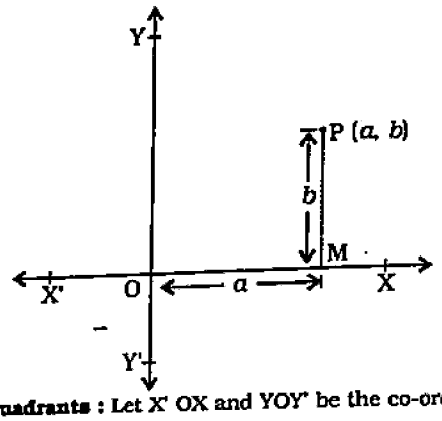


We can fix a convenient unit of length and taking the origin as zero, mark equal distances on the x-axis as well as on the y-axis.

Convention of Signs : The distances measured along OX and OY are taken as positive and those along OX' and OY' are taken as negative, as shown in the figure given above.

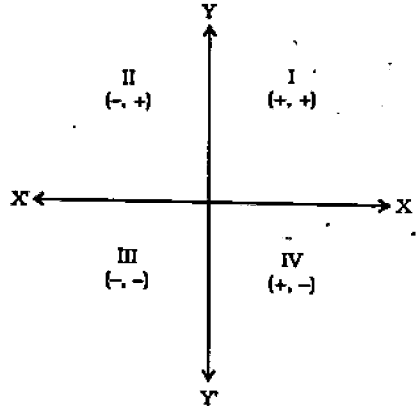
CO-ORDINATES OF A POINT IN A PLANE

Let P be a point in a plane.
Let the distance of P from the y-axis = a units.
And, the distance of P from the x-axis = b units.
Then, we say that the co-ordinates of P are (a, b).
a is called the x-co-ordinate, or abscissa of P.
b is called the y co-ordinate, or ordinate of P.



Quadrants : Let X' OX and YOY' be the co-ordinate axes.
These axes divide the plane of the paper into four regions, called quadrants. The regions XOY, YOX', X'OY' and Y'OX are respectively known as the first, second, third and fourth quadrants.
Using the convention of signs, we have the signs of the coordinates in various quadrants as given below.

Region	Quadrant	Nature of x and y	Signs of co-ordinates
XOY	I	$x > 0, y > 0$	(+, +)
YOX'	II	$x < 0, y > 0$	(–, +)
X'OY'	III	$x < 0, y < 0$	(–, –)
Y'OX	IV	$x > 0, y < 0$	(+, –)



Note : Any point lying on x-axis or y-axis does not lie in any quadrant.

Consistency and Inconsistency

- A system of a pair of linear equations in two variables is said to be consistent if it has at least one solution.
- A system of a pair of linear equations in two variables is said to be inconsistent if it has no solution.
- The system of a pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has :

(i) a unique solution (i.e. consistent) if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$. The graph of the linear equations intersect at only one point.

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(ii) no solution (i.e. inconsistent) if $\frac{a_1}{b_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

The graph of the two linear equations are parallel to each other i.e. the lines do not intersect.

(iii) an infinite number of solution if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

The graph of the linear equations are coincident.

- Homogeneous equation of the form $ax + by = 0$ is a line passing through the origin. Therefore, this system is always consistent.

TRIGONOMETRY

MEASUREMENT OF ANGLES

Systems of Measurement of Angles : There are three systems for measuring angles :

(i) Sexagesimal or English System

(ii) Centesimal or French System

(iii) Circular System

Sexagesimal System : In this system, a right angle is divided into 90 equal parts, called degrees. The symbol 1° is used to denote one degree. Thus one degree is one ninetieth part of a right angle. Each degree is divided into 60 equal parts, called minutes. The symbol 1' is used to denote one minute. And each minute is divided into 60 equal parts, called second. The symbol 1" is used to denote one second.

Thus, 1 right angle = 90 degrees (=90°)

1° = 60 minutes (=60')

1' = 60 seconds (=60")

Centesimal System : In this system, a right angle is divided into 100 equal parts, called grades; each grade is subdivided into 100 minutes and each minute into 100 seconds.

Symbols 1^g, 1' and 1" are used to denote a grade, a minute and a second respectively.

Thus,

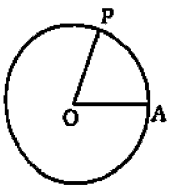
1 right angle = 100 grades (= 100^g)

1 grade = 100 minutes (= 100')

1 minute = 100 seconds (= 100")

Circular System : In this system, the unit of measurement is radian.

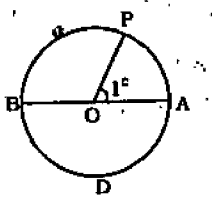
One radian, written as 1^c, is the measure of an angle subtended at the centre of a circle by an arc of length equal to the radius of the circle.



arc AP = radius r (OA)
of the circle
$\therefore \angle AOP$ = 1 radian (= 1^c)

Theorem : Radian is a constant angle.

Proof : Consider a circle with centre O and radius r.



Arc AP = radius r. $\therefore \angle AOP = 1^c$

Produce AO to meet the circle at B so that $\angle AOB$ = a straight angle = 2 right angles.

Since the angles at the centre of a circle are proportional to the arcs subtending them. Therefore,

$$\frac{\angle AOP}{\angle AOB} = \frac{arc\ AP}{arc\ APB}$$

$$\Rightarrow \frac{\angle AOP}{\angle AOB} = \frac{r}{\pi r} \Rightarrow \angle AOP = \frac{1}{\pi}\angle AOB$$

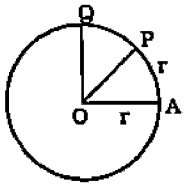
$$\Rightarrow 1^c = \frac{\text{a straight angle}}{\pi} = \frac{180^\circ}{\pi}$$

$$\therefore 1^c = \frac{180^\circ}{\pi} \qquad \Rightarrow \pi^c = 180^\circ$$

- The number of radians in an angle subtended by an arc of a circle at the centre is equal to $\frac{arc}{radius}$ i.e.

$$\theta = \frac{s}{r}$$

Proof : Consider a circle with centre O and radius r. Let $\angle AOQ = \theta^c$ and let arc AQ = s. Let P be a point on the arc AQ such that arc AP = r.



Then, $\angle AOP = 1^c$ Since angles at the centre of a circle are proportional to the arcs subtending them. Therefore,

$$\frac{\angle AOQ}{\angle AOP} = \frac{arc\ AQ}{arc\ AP}$$

$$\Rightarrow \angle AOQ = \left(\frac{arc\ AQ}{arc\ AP} \times 1\right)^c \qquad [\because \angle AOP = 1^c]$$

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$\Rightarrow \theta = \frac{s}{r}$ radians.

Remarks :

Since $180^\circ = \pi$ radians

Therefore, $1^\circ = \frac{\pi}{180}$ radians

Hence, $30^\circ = \frac{\pi}{180} \times 30 = \frac{\pi}{6}$ radians

$45^\circ = \frac{\pi}{180} \times 45 = \frac{\pi}{4}$ radians

$60^\circ = \frac{\pi}{180} \times 60 = \frac{\pi}{3}$ radians

$90^\circ = \frac{\pi}{180} \times 90 = \frac{\pi}{2}$ radians

Degree	30°	45°	60°	90°	120°	135°	150°	180°	270°	360°
Radian	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π	$\frac{3\pi}{2}$	2π

- We have,

  π radians = 180°

  $\therefore$ 1 radian $= \frac{180^\circ}{\pi} = \left(\frac{180}{22} \times 7\right)^\circ$

  $= 57^\circ\ 16'\ 22''$ (approx).
- We have,

  $180^\circ = \pi$ radians

  $\therefore 1^\circ = \frac{\pi}{180}$ radians

  $= \left(\frac{22}{7 \times 180}\right)$ radian = 0.01746 radian.

Some Useful Points

- The angle between two consecutive digits in a clock is $30^\circ \left(= \frac{\pi}{6} \text{ radians}\right)$.
- The hour hand rotates through an angle of 30° in one hour i.e. $\left(\frac{1}{2}\right)^\circ$ in one minute.
- The minute hand rotates through an angle of 6° in one minute.

TRIGONOMETRIC IDENTITIES

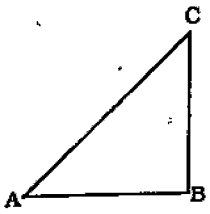
SOME BASIC FORMULAE

1. Relation between Angles, Radius and Arc length : If 's' is the length of a circle of radius r. If this arc subtends an angle θ radians at the centre of the circle

then Angle $= \frac{\text{arc}}{\text{radius}}$

$\Rightarrow s = r\theta \Rightarrow \theta = \frac{s}{r}$

2. Trigonometric Ratios : If we consider a ΔABC right angled at B then the side opposite to $\angle B$ i.e., AC is called as hypotenuse and if AB is chosen an initial line then AB is called as base and BC will be perpendicular.



So the trigonometric ratios can be represented as

$\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{BC}{AC}$

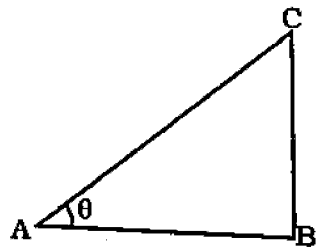
$\cos\theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{AB}{AC}$

$\tan\theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{BC}{AB}$

$\text{cosec}\,\theta = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \frac{AB}{BC} = \frac{1}{\sin\theta}$

$\sec\theta = \frac{\text{Hypotenuse}}{\text{Base}} = \frac{AC}{AB} = \frac{1}{\cos\theta}$,

$\cot\theta = \frac{\text{Base}}{\text{Perpendicular}} = \frac{AB}{BC} = \frac{\cos\theta}{\sin\theta} = \frac{1}{\tan\theta}$



Identities

(1) $\sin^2\theta + \cos^2\theta = 1$

(2) $1 + \tan^2\theta = \sec^2\theta$

(3) $1 + \cot^2\theta = \text{cosec}^2\theta$

Note : $\sin^2 A + \cos^2 B$ can not be equal to 1 because the angles are different.

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3. Values of Trigonometric ratios when $0 \le \theta \le 90°$

θ	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞ (n.d.)
$\operatorname{cosec}\theta$	∞ (n.d.)	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞ (n.d.)
$\cot\theta$	∞ (n.d.)	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

Sin θ and cos θ are called bounded functions as we know that $-1 \le \sin\theta \le 1$ and $-1 \le \cos\theta \le 1$

⇒ Values of sinθ and cosθ is always less than or equal to 1. Values of other trigonometric ratios i.e (tanθ, cosecθ, secθ and cotθ) may be greater than 1.

4. Complementary relations : Two angles are said to be complementary if their sum is 90°. i.e. A and B are complementary to each other if $\boxed{A+B=90°}$

Now

$\sin(90°-\theta) = \cos\theta$

$\cos(90°-\theta) = \sin\theta$

$\tan(90°-\theta) = \cot\theta$

$\operatorname{cosec}(90°-\theta) = \sec\theta$

$\sec(90°-\theta) = \operatorname{cosec}\theta$

$\cot(90°-\theta) = \tan\theta$

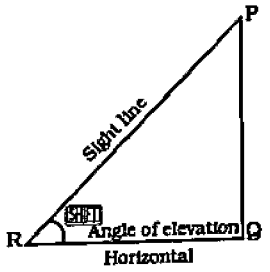
Also note that

$$\boxed{\begin{aligned}\sin\theta \times \operatorname{cosec}\theta &= 1\\ \cos\theta \times \sec\theta &= 1\\ \tan\theta \times \cot\theta &= 1\end{aligned}}$$

HEIGHTS & DISTANCES

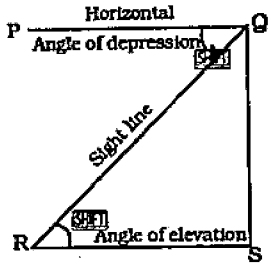
Trigonometry helps us in finding heights of objects and distances between the points without actually measuring them.

Angle of Elevation : Let PQ be a tower (pillar/shell/minar/pole) etc. standing on a level ground and the observer is standing at any point R on the level ground, is viewing at P.



The angle, which the line RP makes with the horizontal line RQ is called angle of elevation. So, ∠ PRQ is angle of elevation.

Angle of Depression : If observer is at Q and is viewing an object R on the ground, then angle between P Q and QR is the angle of depression. So, ∠ PQR is angle of depression.



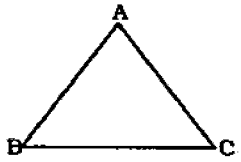
Note

- Numerically angle of elevation is equal to the angle of depression.
- The angle of elevation and the angle of depression both are measured with the horizontal.

GEOMETRY

TRIANGLES

A plane (closed) figure bounded by three line segments is called a triangle. Triangles are denoted by Δ.



A Δ ABC has :

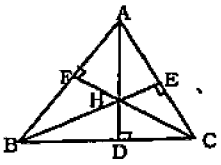
- three vertices, namely A, B and C
- three sides, AB, BC and AC.
- three angles, namely ∠A, ∠B and ∠C.

A triangle has six parts-three sides and three angles

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Some Terminologies Related to A Triangle

Altitudes : The altitude of a triangle is a line segment perpendicularly drawn from vertex to the side opposite to it. The side on which the perpendicular is being drawn is called its base.



Here AD, BE and FC are altitudes drawn on BC, AC and AB respectively.

- Altitudes of a triangle are concurrent.
- The point of intersection of all the three altitudes of a triangle is called its ortho-centre.

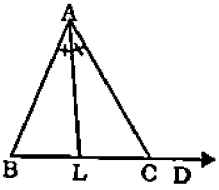
Medians : A line segment joining the mid-point of the side with the opposite vertex.

In-centre of a Triangle : The point of intersection of all the three angle bisectors of a triangle is called its in-centre.

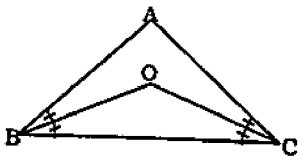
Circumcentre of a Triangle : The point of intersection of the perpendicular bisectors of the sides of a triangle is called its circumcentre

Some Useful Results on Triangles

- The sum of the angles of a triangle is 180°.
- If a side of a triangle is produced, then the exterior angle so formed is equal to the sum of the two interior opposite angles.
- An exterior angle of a triangle is greater than either of the interior opposite angles.
- The internal bisector of one base angle and the external bisector of the other is equal to one half of the vertical angle.
- The side BC of Δ ABC is produced to D. The bisector of ∠A meets BC in L. Then ∠ABC + ∠ACD = 2 ∠ALC.

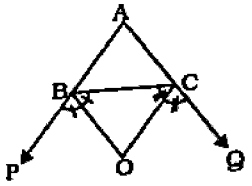


- In a Δ ABC the bisector of ∠B and ∠C intersect each other at a point O.



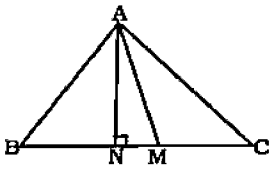
$\angle BOC = 90 + \frac{1}{2}\angle A$

- In a Δ ABC, the side AB and AC are produced to P and Q respectively. The bisectors of ∠PBC and ∠QCB intersect at a point O.



Then $\angle BOC = 90° - \frac{1}{2}\angle A$

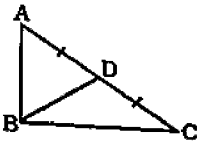
- In Δ ABC, ∠B > ∠C. If AM is the bisector of ∠BAC and AN ⊥ BC, then



$\angle MAN = \frac{1}{2}\angle B - \angle C$

- The bisectors of the base angles of a triangle can never enclose a right angle.
- If the three sides of a triangle be produced in order then the sum of all the exterior angles so formed is 360°.
- The sum of any two sides of a triangle is greater than its third side.
- The difference between any two sides of a triangle is less than its third side.
- If the bisector of the vertical angle of a triangle bisects the base, then that triangle is isosceles.
- If the altitude from one vertex of a triangle bisects the opposite side, then the triangle is isosceles.
- The perpendiculars drawn from the vertices of equal angles of an isosceles triangle to the opposite sides are equal.
- Medians of equilateral triangle are equal.
- If D is the mid-point of the hypotenuse AC of a right-angled

Δ ABC. Then $BD = \frac{1}{2}AC$



- The sum of any two sides of a triangle is greater than twice the median drawn to the third side.

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- Perimeter of a triangle is greater than the sum of its three medians.

Congruent Triangles : Two triangles are said to be congruent if both are exactly of same size i.e., all angles and sides are equal to corresponding angles and sides of other.

- Every triangle is congruent to itself $\Delta ABC \cong \Delta ABC$
- If $\Delta ABC \cong \Delta DEF$, then $DEF \cong \Delta ABC$
- If $\Delta ABC \cong \Delta DEF$ and $\Delta DEF \cong \Delta PQR$ then $\Delta ABC \cong \Delta PQR$

Sufficient Conditions For Congruence of Two Triangles

Theorem 1 : If two triangles have two sides and the included angle of the one are equal to the corresponding sides and the included angle of the other. (SAS)

Theorem 2 : If two angles and the included side of one triangle are equal to the corresponding two angles and the included side of the other triangle. (ASA)

Theorem 3 : If three sides of one triangle are respectively equal to the three sides of the other. (SSS)

Theorem 4 : If the hypotenuse and other side of one triangle are respectively equal to the hypotenuse and the corresponding side of the other triangle. (RHS)

Some other Relations in a Triangle

- Angles opposite to two equal sides of a triangle are equal.
- If two angles of a triangle are equal then the sides opposite to them are also equal.
- If two sides of a triangle are unequal the longer side has greater angle opposite to it.
- In a triangle, the greater angle has the longer side opposite to it.

Congruent Figures : The geometrical figures having the same shape and size are known as congruent figures.

Congruent figures are just like photostat copies, which are alike in every respect.

Similar Figures : Geometric figures having the same shape but different sizes are known as similar figures.

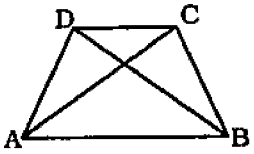
- The congruent figures are always similar but two similar figures need not be congruent. e.g., Any two circles are similar. Any two rectangles are similar.

Similar Triangles : Two triangles are said to be similar to each other if

- their corresponding sides are proportional.
- their corresponding angles are equal.

QUADRILATERALS

A plane, closed figure bounded by four line segments is called quadrilateral. There are different types of quadrilaterals so called trapezium, parallelogram, rhombus, rectangle, square.



- Sum of all the angles of a quadrilateral is 360°.
- Here ABCD is a quadrilateral. ($\angle A, \angle B$); ($\angle B, \angle C$); ($\angle C, \angle D$); ($\angle D, \angle A$) are four pairs of consecutive angles of quadrilateral ABCD.
- AC and BD are diagonals.
- (AB, BC); (BC, CD); (CD, DA) and (DA, AB) are four pairs of adjacent sides.

Various types of quadrilaterals

(A) Parallelogram : A quadrilateral in which opposite sides are equal and parallel then it is a parallelogram, written as || gm.

e.g. square, rectangle, rhombus.

Properties of Parallelogram

(a) Opposite sides are equal.

(b) Opposite angles are equal.

(c) The two diagonals bisect each other.

(d) Diagonal are equal in case of square and rectangle but not in rhombus.

Square : A parallelogram in which all sides are equal and are parallel. Here angle between the adjacent sides is 90°.

- Diagonals of square are equal.
- Diagonals bisects the angle
- Diagonals are perpendicular to each other.

Rectangle :

The parallelogram in which only opposite side are equal and parallel, angle between adjacent sides is 90°.

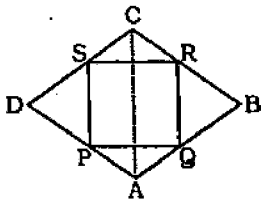
Rhombus :

A parallelogram in which all sides are equal is called a rhombus.

- Diagonals bisect each other at 90°
- Diagonals are not equal
- Sum of square of sides is equal to sum of the square of diagonal. i.e.

Some facts about parallelogram

- A diagonal of a parallelogram bisects one of the angles of the parallelogram, it also bisects the second angle, and then the two diagonals are perpendicular to each other.
- The quadrilateral formed by joining the mid-points of the consecutive sides of a rectangle is a rhombus. Here E, F, G, H are mid-points of AB, BC, CD, DA respectively then EFGH is a rhombus.



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- The quadrilateral formed by joining the mid-point of the consecutive sides of a rhombus is a rectangle. Here PQRS will be a rectangle.
- The quadrilateral formed by joining the mid-points of the sides of a square, is also a square.
- The figure formed by joining the mid-points of the pairs of consecutive sides of a quadrilateral is a parallelogram.

POLYGONS

A polygon is a closed, plane figure bounded by 'n' straight lines ($n \geq 3$). Each of the n line segment forming the polygon is called its sides.

A polygon may be a triangle, quadrilateral, pentagon etc. Polygons are classified according to the number of sides as given below :

Number of sides	Name
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon

Regular Polygon : A polygon is called a regular polygon if all its sides are equal and all angles are equal.

IMPORTANT RESULTS :

- If there is a polygon of n sides ($n \geq 3$) then we can cut it into $(n-2)$ triangles with common vertex. Then sum of the interior angles of a polygon of n sides is $(n-2) \times 180°$ or $(2n-4) \times 90°$.
- Each exterior angle of a regular polygon of n sides is $\left(\frac{360}{n}\right)°$.
- Each interior angle of a regular polygon of n sides is $\frac{(n-2)\times 180°}{n}$ or interior angle = 180° – (exterior angle)
- The sum of all the exterior angle formed by producing the sides of a convex polygon in the same order is equal to 360°.
- Number of diagonals of a polygon of n sides is $\frac{n(n-1)}{2} - n$.

CIRCLE

SOME RESULTS ON CIRCLES

Theorem 1. If two arcs of a circle are congruent then the corresponding chords are equal.

Theorem 2. The perpendicular from the centre of a circle to a chord bisects the chord.

So, here OD ⊥ AB then

AD = DB

Theorem 3. The line joining the centre to the mid point of a chord is perpendicular to the chord.

Here if AD = DB then ∠ADO = ∠ODB = 90°

Theorem 4. The perpendicular bisectors of two chords of a circle intersect at its centre.

Theorem 5. There is one and only one circle passing through three non collinear points.

- An infinite number of circles can be drawn to pass through a single point.
- An infinite number of circles can be drawn to pass through two given points.
- A unique circle can be drawn to pass through three given non collinear points.

Theorem 6. Equal chords of congruent circles are equidistant from the corresponding centres.

Theorem 7. Chords which are equidistant from the corresponding centres are equal.

Theorem 8. Equal chords of a circle are equidistant from the centre.

i.e., chords at equal distance for the centre are equal.

Theorem 9. Of any two chords of a circle, the greater chord is nearer to the centre.

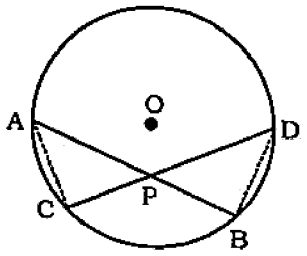
Theorem 10. The angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the circumference of circle. Here three case arises.

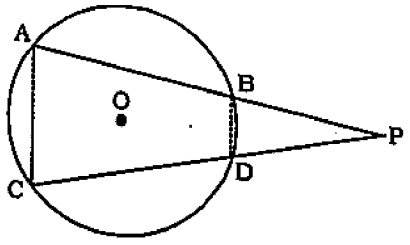
Theorem 11. The angle in a semi-circle is a right angle.

Theorem 12. Angle in the same segment of the circle are equal.

Theorem 13. If two chords AB and CD of a circle intersect inside or outside the circle when produced at a' point P.

Then, AP × PB = DP × PC





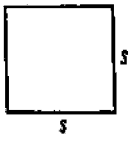
Here, you get set of questions which will familiaries you with probable question format.

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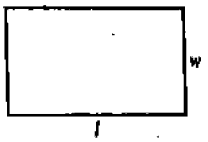
2D GEOMETRY FORMULAE

SQUARE

s = side Area: $A = s^2$ Perimeter: $P = 4s$



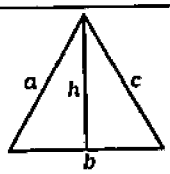
RECTANGLE



l = length, w = width
Area : $A = lw$
Perimeter : $P = 2l + 2w$

TRIANGLE

b = base, h = height

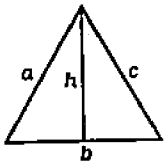


Area : $A = \frac{1}{2}bh$

Perimeter : $P = a + b + c$

EQUILATERAL TRIANGLE

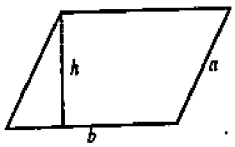
s = side



Height: $h = \frac{\sqrt{3}}{2}s$

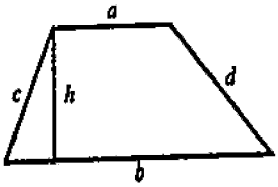
Area : $A = \frac{\sqrt{3}}{4}s^2$

PARALLELOGRAM



b = base, h = height, a = side
Area : $A = bh$
Perimeter : $P = 2a + 2b$

TRAPEZIUM

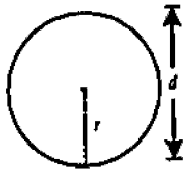


a, b = bases; h = height; c, d = sides

Area: $A = \frac{1}{2}(a + b)h$

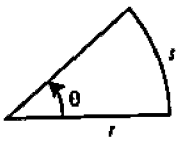
Perimeter : $P = a + b + c + d$

CIRCLE



r = radius, d = diameter
Diameter : $d = 2r$
Area: $A = \pi r^2$
Circumference : $C = 2\pi r = \pi d$

SECTOR OF CIRCLE

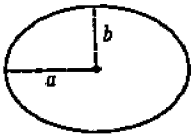


r = radius, θ = angle in radians

Area : $A = \frac{1}{2}\pi r^2$

Arc Length : $s = \theta r$

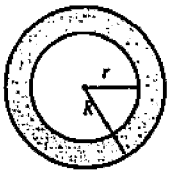
ELLIPSE



a = semimajor axis
b = semiminor axis
Area : $A = \pi ab$
Circumference :

$C = \pi\left(3(a+b) - \sqrt{(a+3b)(b+3a)}\right)$

ANNULUS



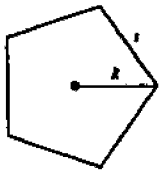
r = inner radius, R = outer radius

Average Radius : $\rho = \frac{1}{2}(r + R)$

Width : $w = R - r$
Area : $A = \pi(R^2 - r^2)$ or $A = 2\pi\rho w$

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REGULAR POLYGON



s = side length, n = number of sides

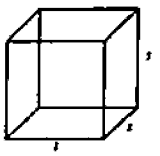
Circumradius: $R = \frac{1}{2} s \cos\left(\frac{\pi}{n}\right)$

Area : $A = \frac{1}{4} n s^2 \cot\left(\frac{\pi}{n}\right)$

or $A = \frac{1}{2} n R^2 \sin\left(\frac{2\pi}{n}\right)$

3D GEOMETRY FORMULAE

CUBE

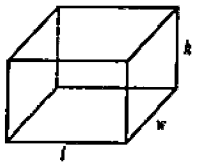


s = side

Volume: $V = s^3$

Surface Area: $S = 6s^2$

RECTANGULAR SOLID



l = length, w = width,

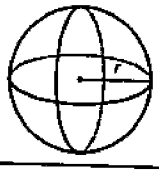
h = height

Volume : $V = lwh$

Surface Area :

$S = 2lw + 2lh + 2wh$

SPHERE

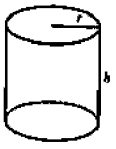


r = radius

Volume: $V = \frac{4}{3} \pi r^3$

Surface Area : $S = 4\pi r^2$

RIGHT CIRCULAR CYLINDER



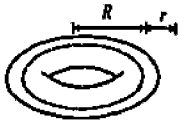
r = radius, h = height

Volume: $V = \pi r^2 h$

Surface Area:

$S = 2\pi rh + 2\pi r^2$

TORUS



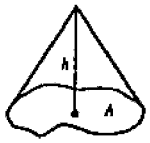
r = tube radius,

R = torus radius

Volume: $V = 2\pi^2 r^2 R$

Surface Area : $S = 4\pi^2 rR$

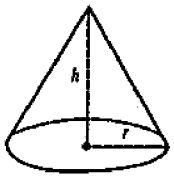
PYRAMID



A = area of base, h = height

Volume: $V = \frac{1}{3} Ah$

RIGHT CIRCULAR CONE



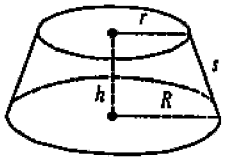
r = radius, h = height

Volume: $V = \frac{1}{3} \pi r^2 h$

Surface Area :

$S = \pi r\sqrt{r^2 + h^2} + \pi r^2$

FRUSTUM OF A CONE

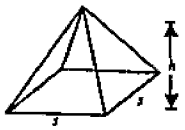


r = top radius,
R = base radius,
h = height,
s = slant height

Volume: $V = \frac{\pi}{3}\left(r^2 + rR + R^2\right)h$

Surface Area : $S = \pi s(R + r) + \pi r^2 + \pi R^2$

SQUARE PYRAMID

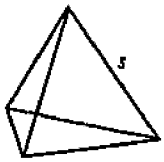


s = side, h = height

Volume : $V = \frac{1}{3} s^2 h$

Surface Area : $S = s\left(s + \sqrt{s^2 + 4h^2}\right)$

REGULAR TETRAHEDRON



s = side

Volume : $V = \frac{1}{12}\sqrt{2}s^3$

Surface Area: $S = \sqrt{3}s^2$

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1 NUMBER SYSTEM

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. Which of the following fraction is the smallest?

$\frac{7}{6}, \frac{7}{9}, \frac{4}{5}, \frac{5}{7}$

(1) $\frac{7}{6}$ (2) $\frac{7}{9}$

(3) $\frac{4}{5}$ (4) $\frac{5}{7}$

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

2. Which of the following fraction is the smallest ?

$\frac{9}{13}, \frac{17}{26}, \frac{28}{29}, \frac{33}{52}$

(1) $\frac{33}{52}$ (2) $\frac{17}{26}$

(3) $\frac{9}{13}$ (4) $\frac{28}{29}$

(SSC CGL Exam. 04.07.1999 (IInd Sitting)

3. The smallest possible three-place decimal number is :

(1) 0.012 (2) 0.123

(3) 0.111

(4) None of the above

(SSC CGL Exam. 27.02.2000 (IInd Sitting)

4. Which of the following fraction is the smallest?

$\frac{8}{15}, \frac{14}{33}, \frac{7}{13}, \frac{11}{13}$

(1) $\frac{8}{15}$ (2) $\frac{7}{13}$

(3) $\frac{11}{13}$ (4) $\frac{14}{33}$

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

5. Which of the following is the smallest fraction ?

$\frac{8}{25}, \frac{7}{23}, \frac{11}{23}, \frac{14}{53}$

(1) $\frac{8}{25}$ (2) $\frac{7}{23}$

(3) $\frac{11}{23}$ (4) $\frac{14}{53}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. Which of the following is the largest fraction ? $\frac{6}{7}, \frac{5}{6}, \frac{7}{8}, \frac{4}{5}$

(1) $\frac{6}{7}$ (2) $\frac{4}{5}$

(3) $\frac{5}{6}$ (4) $\frac{7}{8}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

7. The smallest number of five digits exactly divisible by 476 is

(1) 47600 (2) 10000

(3) 10476 (4) 10472

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

8. The least among the fractions $\frac{15}{16}, \frac{19}{20}, \frac{24}{25}, \frac{34}{35}$ is

(1) $\frac{34}{35}$ (2) $\frac{15}{16}$

(3) $\frac{19}{20}$ (4) $\frac{24}{25}$

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

9. The greatest fraction among $\frac{2}{3}, \frac{5}{6}, \frac{11}{15}$ and $\frac{7}{8}$ is

(1) $\frac{7}{8}$ (2) $\frac{11}{15}$

(3) $\frac{5}{6}$ (4) $\frac{2}{3}$

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

10. The least number among

$\frac{4}{9}, \sqrt{\frac{9}{49}}$, $0.4\dot{5}$ and $(0.8)^2$ is

(1) $\frac{4}{9}$ (2) $\sqrt{\frac{9}{49}}$

(3) $0.4\dot{5}$ (4) $(0.8)^2$

(SSC CPO S.I. Exam. 06.09.2009)

11. Which of the following number is the greatest of all ?

$0.9, 0.\overline{9}, 0.0\overline{9}, 0.\overline{09}$

(1) 0.9 (2) $0.\overline{9}$

(3) $0.0\overline{9}$ (4) $0.\overline{09}$

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

12. The greatest value among the fractions $\frac{2}{7}, \frac{1}{3}, \frac{5}{6}, \frac{3}{4}$ is :

(1) $\frac{3}{4}$ (2) $\frac{5}{6}$

(3) $\frac{1}{3}$ (4) $\frac{2}{7}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

13. The least number of five digits which has 123 as a factor is

(1) 10037 (2) 10086

(3) 10081 (4) 10063

(SSC Delhi Police SI Exam. 19.08.2012)

14. The largest among the numbers $(0.1)^2$, $\sqrt{0.0121}$, 0.12 and $\sqrt{0.0004}$ is

(1) $(0.1)^2$ (2) $\sqrt{0.0121}$

(3) 0.12 (4) $\sqrt{0.0004}$

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting

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15. The greatest among the following numbers $(3)^{\frac{1}{3}}, (2)^{\frac{1}{2}}, 1, (6)^{\frac{1}{6}}$ is :

(1) $(2)^{\frac{1}{2}}$ (2) 1

(3) $(6)^{\frac{1}{6}}$ (4) $(3)^{\frac{1}{3}}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

16. When 335 is added to 5A7, the result is 8B2. 8B2 is divisible by 3. What is the largest possible value of A ?

(1) 8 (2) 2

(3) 1 (4) 4

(SSC CGL Tier-II Exam. 29.09.2013

17. If a number is as much greater than 31 as it is less than 75, then the number is

(1) 106 (2) 44

(3) 74 (4) 53

(SSC CHSL DEO & LDC Exam. 20.10.2013)

18. The greatest number among $0.7 + \sqrt{0.16}$, $1.02 - \frac{0.6}{24}$, 1.2×0.83 and $\sqrt{1.44}$ is :

(1) $0.7 + \sqrt{0.16}$ (2) $\sqrt{1.44}$

(3) 1.2×0.83 (4) $1.02 - \frac{0.6}{24}$

(SSC CGL Prelim Exam. 06.02.2004 (Second Sitting)

9. Which is the largest of the following fractions ?

$\frac{2}{3}, \frac{3}{5}, \frac{8}{11}, \frac{11}{17}$

(1) $\frac{8}{11}$ (2) $\frac{3}{5}$

(3) $\frac{11}{17}$ (4) $\frac{2}{3}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

Sum of three fractions is $2\frac{11}{24}$. On dividing the largest fraction by the smallest fraction, $\frac{7}{6}$ is obtained which is $\frac{1}{3}$ greater than the middle fraction. The smallest fraction is

(1) $\frac{5}{8}$ (2) $\frac{3}{4}$

(3) $\frac{5}{6}$ (4) $\frac{3}{7}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

21. Arrangement of the fractions $\frac{4}{3}$, $-\frac{2}{9}, -\frac{7}{8}, \frac{5}{12}$ into ascending order is

(1) $-\frac{7}{8}, -\frac{2}{9}, \frac{5}{12}, \frac{4}{3}$

(2) $-\frac{7}{8}, -\frac{2}{9}, \frac{4}{3}, \frac{5}{12}$

(3) $-\frac{2}{9}, -\frac{7}{8}, \frac{5}{12}, \frac{4}{3}$

(4) $-\frac{2}{9}, -\frac{7}{8}, \frac{4}{3}, \frac{5}{12}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–II

1. A number when divided by 899 gives a remainder 63. If the same number is divided by 29, the remainder will be :

(1) 10 (2) 5

(3) 4 (4) 2

(SSC CGL Exam. 04.07.1999 (IInd Sitting) & SSC CGL Exam. 27.07.2008 (IInd Sitting)

2. $\frac{1}{0.04}$ is equal to :

(1) $\frac{1}{40}$ (2) $\frac{2}{5}$

(3) $\frac{5}{2}$ (4) 25

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

3. A six digit number is formed by repeating a three digit number; for example, 256, 256 or 678, 678 etc. Any number of this form is always exactly divisible by :

(1) 7 only (2) 11 only

(3) 13 only (4) 1001

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

4. The smallest number to be added to 1000, so that 45 divides the sum exactly, is :

(1) 35 (2) 80

(3) 20 (4) 10

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

5. Which of the following numbers will always divide a six-digit number of the form *xyxyxy* (where $1 \le x \le 9$, $1 \le y \le 9$)?

(1) 1010 (2) 10101

(3) 11011 (4) 11010

(SSC CHSL DEO & LDC Exam. 04.12.2011(IInd Sitting (East Zone)

6. The divisor is 25 times the quotient and 5 times the remainder. If the quotient is 16, the dividend is :

(1) 6400 (2) 6480

(3) 400 (4) 480

(SSC CGL Exam. 24.02.2002 (Ist Sitting) & SSC CGL Prel. Exam. 13.11.2005 (IInd Sitting)

7. The product of two positive numbers is 11520 and their quotient is $\frac{9}{5}$. Find the difference of two numbers.

(1) 60 (2) 64

(3) 74 (4) 70

(SSC CGL Exam. 24.02.2002 (IInd Sitting)

8. When a number is divided by 56, the remainder obtained is 29. What will be the remainder when the number is divided by 8 ?

(1) 4 (2) 5

(3) 3 (4) 7

(SSC CGL Exam. 24.02.2002 (IInd Sitting) & SSC CGL Exam. 04.02.2007 (Ist Sitting)

9. A student was asked to multiply a number by $\frac{3}{2}$ but he divided that number by $\frac{3}{2}$. His result was 10 less than the correct answer. The number was :

(1) 10 (2) 12

(3) 15 (4) 20

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

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10. A number being divided by 52 gives remainder 45. If the number is divided by 13, the remainder will be
(1) 5 (2) 6
(3) 12 (4) 7
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

11. If $\frac{3}{4}$ of the difference of $2\frac{1}{4}$ and $1\frac{2}{3}$ is subtracted from $\frac{2}{3}$ of $3\frac{1}{4}$ the result is
(1) $\frac{-48}{83}$ (2) $\frac{48}{83}$
(3) $\frac{-83}{48}$ (4) $\frac{83}{48}$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

12. A number when divided by 296 gives a remainder 75. When the same number is divided by 37, the remainder will be
(1) 1 (2) 2
(3) 8 (4) 11
(SSC CPO S.I. Exam. 12.01.2003)

13. A number when divided successively by 4 and 5 leaves remainder 1 and 4 respectively. When it is successively divided by 5 and 4 the respective remainders will be
(1) 4, 1 (2) 3, 2
(3) 2, 3 (4) 1, 2
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

14. In a division problem, the divisor is 4 times the quotient and 3 times the remainder. If remainder is 4, the dividend is
(1) 36 (2) 40
(3) 12 (4) 30
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

15. Each member of a picnic party contributed twice as many rupees as the total number of members and the total collection was ₹3042. The number of members present in the party was
(1) 2 (2) 32
(3) 40 (4) 39
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

16. How many natural numbers divisible by 7 are there between 3 and 200 ?
(1) 27 (2) 28
(3) 29 (4) 36
(SSC CPO S.I. Exam. 07.09.2003)

17. The sum of first sixty numbers from one to sixty is divisible by
(1) 13 (2) 59
(3) 60 (4) 61
(SSC CPO S.I. Exam. 07.09.2003)

18. A number when divided by 3 leaves a remainder 1. When the quotient is divided by 2, it leaves a remainder 1. What will be the remainder when the number is divided by 6?
(1) 3 (2) 4
(3) 5 (4) 2
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

19. The product of two numbers is 9375 and the quotient, when the larger one is divided by the smaller, is 15. The sum of the numbers is :
(1) 395 (2) 380
(3) 400 (4) 425
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

20. A number, when divided by 119, leaves a remainder of 19. If it is divided by 17, it will leave a remainder of :
(1) 19 (2) 10
(3) 7 (4) 2
(SSC CPO S.I. Exam. 26.05.2005) & SSC CGL Prelim Exam. 27.07.2008)

21. $(7^{19} + 2)$ is divided by 6, the remainder is :
(1) 5 (2) 3
(3) 2 (4) 1
(SSC CPO S.I. Exam. 26.05.2005)

22. When a number is divided by 357 the remainder is 39. If that number is divided by 17, the remainder will be :
(1) 0 (2) 3
(3) 5 (4) 11
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

23. A number divided by 68 gives the quotient 269 and remainder zero. If the same number is divided by 67, the remainder is :
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

24. A number when divided by 6 leaves remainder 3. When the square of the same number is divided by 6, the remainder is :
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

25. When a number is divided by 893, the remainder is 193. What will be the remainder when it is divided by 47 ?
(1) 3 (2) 5
(3) 25 (4) 33
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

26. A number divided by 13 leaves a remainder 1 and if the quotient, thus obtained, is divided by 5, we get a remainder of 3. What will be the remainder if the number is divided by 65 ?
(1) 28 (2) 16
(3) 18 (4) 40
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

27. Which of the following number is NOT divisible by 18 ?
(1) 54036 (2) 50436
(3) 34056 (4) 65043
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

28. 64329 is divided by a certain number. While dividing, the numbers, 175, 114 and 213 appear as three successive remainders. The divisor is
(1) 184 (2) 224
(3) 234 (4) 296
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

29. In a question on division, the divisor is 7 times the quotient and 3 times the remainder. If the remainder is 28, then the dividend is
(1) 588 (2) 784
(3) 823 (4) 1036
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

30. If two numbers are each divided by the same divisor, the remainders are respectively 3 and 4. If the sum of the two numbers be divided by the same divisor, the remainder is 2. The divisor is
(1) 9 (2) 7
(3) 5 (4) 3
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

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31. A number consists of two digits. If the number formed by interchanging the digits is added to the original number, the resulting number (i.e. the sum) must be divisible by
(1) 11 (2) 9
(3) 5 (4) 3
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

32. A number when divided by 5 leaves a remainder 3. What is the remainder when the square of the same number is divided by 5 ?
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

33. A number when divided by 192 gives a remainder of 54. What remainder would be obtained on dividing the same number by 16 ?
(1) 2 (2) 4
(3) 6 (4) 8
(SSC CPO S.I. Exam. 06.09.2009)

34. A number, when divided by 136, leaves remainder 36. If the same number is divided by 17, the remainder will be
(1) 9 (2) 7
(3) 3 (4) 2
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

35. Two numbers, when divided by 17, leave remainders 13 and 11 respectively. If the sum of those two numbers is divided by 17, the remainder will be
(1) 13 (2) 11
(3) 7 (4) 4
(SSC CISF ASI Exam 29.08.2010 (Paper-I)

36. A number, when divided by 221, leaves a remainder 64. What is the remainder if the same number is divided by 13 ?
(1) 0 (2) 1
(3) 11 (4) 12
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

37. When 'n' is divisible by 5 the remainder is 2. What is the remainder when n^2 is divided by 5 ?
(1) 2 (2) 3
(3) 1 (4) 4
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

38. The remainder when 3^{21} is divided by 5 is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

39. A number when divided by 49 leaves 32 as remainder. This number when divided by 7 will have the remainder as
(1) 4 (2) 3
(3) 2 (4) 5
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

40. When a number is divided by 36, the remainder is 19. What will be the remainder when the number is divided by 12 ?
(1) 7 (2) 5
(3) 3 (4) 0
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

41. $9^6 - 11$ when divided by 8 would leave a remainder of :
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

42. If 17^{200} is divided by 16, the remainder is—
(1) 17 (2) 16
(3) 1 (4) 2
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

43. When 2^{31} is divided by 5 the remainder is
(1) 4 (2) 3
(3) 2 (4) 1
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

44. A student was asked to divide a number by 6 and add 12 to the quotient. He, however, first added 12 to the number and then divided it by 6, getting 112 as the answer. The correct answer should have been
(1) 124 (2) 122
(3) 118 (4) 114
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

45. When a number is divided by 387, the remainder obtained is 48. If the same number is divided by 43, then the remainder obtained will be–
(1) 0 (2) 3
(3) 5 (4) 35
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

46. When two numbers are separately divided by 33, the remainders are 21 and 28 respectively. If the sum of the two numbers is divided by 33, the remainder will be
(1) 10 (2) 12
(3) 14 (4) 16
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

47. In a division sum, the divisor is 10 times the quotient and 5 times the remainder. If the remainder is 46, then the dividend is
(1) 4236 (2) 4306
(3) 4336 (4) 5336
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

48. When a number is divided by 24, the remainder is 16. The remainder when the same number is divided by 12 is
(1) 3 (2) 4
(3) 6 (4) 8
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

49. The expression $2^{6n} - 4^{2n}$, where n is a natural number is always divisible by
(1) 15 (2) 18
(3) 36 (4) 48
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

50. $(4^{61} + 4^{62} + 4^{63})$ is divisible by
(1) 3 (2) 11
(3) 13 (4) 17
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

51. 47 is added to the product of 71 and an unknown number. The new number is divisible by 7 giving the quotient 98. The unknown number is a multiple of
(1) 2 (2) 5
(3) 7 (4) 3
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

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52. When an integer K is divided by 3, the remainder is 1, and when K + 1 is divided by 5, the remainder is 0. Of the following, a possible value of K is
(1) 62 (2) 63
(3) 64 (4) 65
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

53. A number when divided by 91 gives a remainder 17. When the same number is divided by 13, the remainder will be :
(1) 0 (2) 4
(3) 6 (4) 3
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

54. If the sum of the two numbers is 120 and their quotient is 5, then the difference of the two numbers is–
(1) 115 (2) 100
(3) 80 (4) 72
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

55. A number when divided by 280 leaves 115 as remainder. When the same number is divided by 35, the remainder is
(1) 15 (2) 10
(3) 20 (4) 17
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

56. A certain number when divided by 175 leaves a remainder 132. When the same number is divided by 25, the remainder is :
(1) 6 (2) 7
(3) 8 (4) 9
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

57. The number of integers in between 100 and 600, which are divisible by 4 and 6 both, is
(1) 40 (2) 42
(3) 41 (4) 50
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

58. The value of λ for which the expression $x^3 + x^2 - 5x + \lambda$ will be divisible by $(x-2)$ is :
(1) 2 (2) –2
(3) –3 (4) 4
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

59. If the number formed by the last two digits of a three digit integer is an integral multiple of 6, the original integer itself will always be divisible by
(1) 6 (2) 3
(3) 2 (4) 12
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

60. Divide 37 into two parts so that 5 times one part and 11 times the other are together 227.
(1) 15, 22 (2) 20, 17
(3) 25, 12 (4) 30, 7
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

61. The greatest common divisor of $3^{3^{333}}+1$ and $3^{3^{334}}+1$ is :
(1) 2 (2) 1
(3) $3^{3^{333}}+1$ (4) 20
(SSC CGL Tier-I Exam. 21.04.2013)

62. How many numbers between 400 and 800 are divisible by 4, 5 and 6 ?
(1) 7 (2) 8
(3) 9 (4) 10
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

63. A positive integer when divided by 425 gives a remainder 45. When the same number is divided by 17, the remainder will be
(1) 11 (2) 8
(3) 9 (4) 10
(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

64. A number x when divided by 289 leaves 18 as the remainder. The same number when divided by 17 leaves y as a remainder. The value of y is
(1) 5 (2) 2
(3) 3 (4) 1
(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

65. When n is divided by 6, the remainder is 4. When $2n$ is divided by 6, the remainder is
(1) 2 (2) 0
(3) 4 (4) 1
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

66. Two numbers 11284 and 7655, when divided by a certain number of three digits, leaves the same remainder. The sum of digits of such a three-digit number is
(1) 8 (2) 9
(3) 10 (4) 11
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

67. In a division sum, the divisor is 3 times the quotient and 6 times the remainder. If the remainder is 2, then the dividend is
(1) 50 (2) 48
(3) 36 (4) 28
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

68. $2^{16}-1$ is divisible by
(1) 11 (2) 13
(3) 17 (4) 19
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

69. The smallest number that must be added to 803642 in order to obtain a multiple of 11 is
(1) 1 (2) 4
(3) 7 (4) 9
(SSC CPO S.I. Exam. 12.01.2003)

70. Which one of the following will completely divide $5^{71} + 5^{72} + 5^{73}$?
(1) 150 (2) 160
(3) 155 (4) 30
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

71. If $[n]$ denotes the greatest integer $< n$ and (n) denotes the smallest integer $> n$, where n is any real number, then
$\left(1\frac{1}{5}\right)\times\left[1\frac{1}{5}\right]-\left(1\frac{1}{5}\right)+\left[1\frac{1}{5}\right]+(1.5)$
is
(1) 1.5 (2) 2
(3) 2.5 (4) 3.5
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

72. The number which is to be added to 0.01 to get 1.1, is
(1) 1.11 (2)1.09
(3) 1 (4)0.10
(SSC Data Entry Operator Exam. 31.08.2008)

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73. $999\frac{998}{999} \times 999$ is equal to :

(1) 998999 (2) 999899

(3) 989999 (4) 999989

(SSC CHSL DEO & LDC Exam. 27.11.2010)

74. $(2^{71} + 2^{72} + 2^{73} + 2^{74})$ is divisible by

(1) 9 (2) 10

(3) 11 (4) 13

(SSC (South Zone) Investigator Exam 12.09.2010)

75. By which number should 0.022 be multiplied so that product becomes 66 ?

(1) 3000 (2) 3200

(3) 4000 (4) 3600

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

76. $(3^{25} + 3^{26} + 3^{27} + 3^{28})$ is divisible by

(1) 11 (2) 16

(3) 25 (4) 30

(SSC CPO S.I. Exam. 05.09.2004)

77. The value of

$\left(0.3\overline{467} + 0.1\overline{333}\right)$ is :

(1) 0.48 (2) $0.48\overline{01}$

(3) $0.\overline{48}$ (4) $0.4\overline{8}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

78. The value of

$\frac{3.157 \times 4126 \times 3.198}{63.972 \times 2835.121}$ is closest to

(1) 0.002 (2) 0.02

(3) 0.2 (4) 2

(SSC CPO S.I. Exam. 12.01.2003)

79. $\frac{1}{7} + \left(999\frac{692}{693}\right) \times 99$ is equal to

(1) 1 (2) 99000

(3) 99800 (4) 99900

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

80. $(49)^{15} - 1$ is exactly divisible by :

(1) 50 (2) 51

(3) 29 (4) 8

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

81. If a and b are two odd positive integers, by which of the following integers is $(a^4 - b^4)$ always divisible ?

(1) 3 (2) 6

(3) 8 (4) 12

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

82. If m and n are positive integers and $(m - n)$ is an even number, then $(m^2 - n^2)$ will be always divisible by

(1) 4 (2) 6

(3) 8 (4) 12

(SSC CGL Tier-II Exam.16.09.2012)

83. If 5432*7 is divisible by 9, then the digit in place of * is :

(1) 0 (2) 1

(3) 6 (4) 9

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

84. The least number, which must be added to 6709 to make it exactly divisible by 9, is

(1) 5 (4) 4

(3) 7 (4) 2

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

85. The total number of integers between 100 and 200, which are divisible by both 9 and 6, is :

(1) 5 (2) 6

(3) 7 (4) 8

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

86. How many 3-digit numbers, in all, are divisible by 6 ?

(1) 140 (2) 150

(3) 160 (4) 170

(SSC CPO S.I. Exam.26.05.2005 & SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

87. If 'n' be any natural number, then by which largest number $(n^3 - n)$ is always divisible ?

(1) 3 (2) 6

(3) 12 (4) 18

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

88. If n is an integer, then $(n^3 - n)$ is always divisible by :

(1) 4 (2) 5

(3) 6 (4) 7

(SSC CGL Exam.13.11.2005 (Ist Sitting) & SSC CHSL DEO & LDC Exam. 27.11.2010)

89. If the sum of the digits of any integer lying between 100 and 1000 is subtracted from the number, the result always is

(1) divisible by 6

(2) divisible by 2

(3) divisible by 9

(4) divisible by 5

(SSC CHSL DEO & LDC Exam. 20.10.2013)

90. If a number is divisible by both 11 and 13, then it must be necessarily :

(1) divisible by (11 + 13)

(2) divisible by (13 – 11)

(3) divisible by (11 × 13)

(4) 429

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

91. If * is a digit such that 5824* is divisible by 11, then * equals :

(1) 2 (2) 3

(3) 5 (4) 6

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

92. If 78*3945 is divisible by 11, where * is a digit, then * is equal to

(1) 1 (2) 0

(3) 3 (4) 5

(SSC CPO S.I. Exam. 05.09.2004)

93. If the number 4 8 3 2 7 * 8 is divisible by 11, then the missing digit (*) is

(1) 5 (2) 3

(3) 2 (4) 1

(SSC CPO S.I. Exam. 09.11.2008)

94. Both the end digits of a 99 digit number N are 2. N is divisible by 11, then all the middle digits are :

(1) 1 (2) 2

(3) 3 (4) 4

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

95. If n is a whole number greater than 1, then $n^2(n^2 - 1)$ is always divisible by :

(1) 16 (2) 12

(3) 10 (4) 8

(SSC CPO S.I. Exam. 26.05.2005)

96. A 4-digit number is formed by repeating a 2-digit number such as 2525, 3232, etc. Any number of this form is always exactly divisible by :

(1) 7 (2) 11

(3) 13

(4) Smallest 3-digit prime number

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting) & SSC CGL Tier-I Exam.16.05.2010 (IInd Sitting)

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97. What least number, of 5 digits is divisible by 41?
(1) 10045 (2) 10004
(3) 10041 (4) 41000
(SSC CPO S.I. Exam. 03.09.2006)

98. It is given that $(2^{32}+1)$ is exactly divisible by a certain number, which one of the following is also definitely divisible by the same number ?
(1) $2^{96}+1$ (2) 7×2^{33}
(3) $2^{16}-1$ (4) $2^{16}+1$
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

99. The greatest whole number, by which the expression $n^4+6n^3+11n^2+6n+24$ is divisible for every natural number n, is
(1) 6 (2) 24
(3) 12 (4) 48
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

100. How many numbers between 1000 and 5000 are exactly divisible by 225 ?
(1) 16 (2) 18
(3) 19 (4) 12
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

101. Find the largest number, which exactly divides every number of the form $(n^3-n)(n-2)$ where n is a natural number greater than 2.
(1) 6 (2) 12
(3) 24 (4) 48
(SSC CPO S.I. Exam. 09.11.2008)

102. The greatest number less than 1500, which is divisible by both 16 and 18, is
(1) 1440 (2) 1404
(3) 1386 (4) 1368
(SSC (South Zone) Investigator Exam 12.09.2010)

103. The least number, which is to be added to the greatest number of 4 digits so that the sum may be divisible by 345, is
(1) 50 (2) 6
(3) 60 (4) 5
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

104. $4^{61}+4^{62}+4^{63}+4^{64}$ is divisible by
(1) 3 (2) 10
(3) 11 (4) 13
(SSC CPO S.I. Exam. 12.01.2003)

105. The difference of a number consisting of two digits from the number formed by interchanging the digits is always divisible by
(1) 10 (2) 9
(3) 11 (4) 6
(SSC CGL Tier-I Exam. 21.04.2013 IInd Sitting)

106. Which one of the numbers is divisible by 25 ?
(1) 303310 (2) 373355
(3) 303375 (4) 22040
(SSC CGL Tier-II Exam. 29.09.2013)

107. The least number which must be added to the greatest number of 4 digits in order that the sum may be exactly divisible by 307 is
(1) 132 (2) 32
(3) 43 (4) 75
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

108. If $a=4011$ and $b=3989$ then value of $ab=?$
(1) 15999879 (2) 15899879
(3) 15989979 (4) 15998879
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

109. For any integral value of n, $3^{2n}+9n+5$ when divided by 3 will leave the remainder
(1) 1 (2) 2
(3) 0 (4) 5
(SSC CGL Tier-I Exam. 19.10.2014

110. The solution to the inequality $12x-61\le 6$ is
(1) $x\le 6$ (2) $0\le x\le 6$
(3) $-6\le x\le 6$ (4) $-6\le x\le 0$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

111. 5349 is added to 3957. Then 7062 is subtracted from the sum. The result is not divisible by
(1) 4 (2) 3
(3) 7 (4) 11
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

112. The product of all the prime numbers between 80 and 90 is
(1) 83 (2) 89
(3) 7387 (4) 598347
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

113. If n is even, (6^n-1) is divisible by
(1) 37 (2) 35
(3) 30 (4) 6
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting (TF No. 545 QP 6)

114. I have x marbles. My elder brother has 3 more than mine, while my younger brother has 3 less than mine. If the total number of marbles is 15, the number of marbles that I have is
(1) 3 (2) 5
(3) 8 (4) 7
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting (TF No. 545 QP 6)

115. Weight of a bucket when filled fully with water is 17 kg. If the weight of the bucket when half filled with water is 13.5 kg, what is the weight of empty bucket ?
(1) 12 kg (2) 8 kg
(3) 10 kg (4) 7 kg
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting (TF No. 545 QP 6)

116. In a farm there are cows and hens. If heads are counted they are 180, if legs are counted they are 420. The number of cows in the farm is
(1) 130 (2) 150
(3) 50 (4) 30
(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

117. The number which can be written in the form of $n(n+1)(n+2)$, where n is a natural number, is
(1) 7 (2) 3
(3) 5 (4) 6
(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

118. A number when divided by 2736 leaves the remainder 75. If the same number is divided by 24, then the remainder is
(1) 12 (2) 3
(3) 0 (4) 23
(SSC CGL Tier-II Exam. 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

119. The maximum value of F in the following equation
5E9 + 2F8 + 3G7 = 1114 is
where E, F, G each stands for any digit.
(1) 8 (2) 9
(3) 7 (4) 5
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 21.06.2015 IInd Sitting)

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120. The sum of four numbers is 48. When 5 and 1 are added to the first two; and 3 and 7 are subtracted from the 3rd and 4th, the numbers will be equal. The numbers are

(1) 9, 7, 15, 17 (2)4, 12, 12, 20
(3) 5, 11, 13, 19(4)6, 10, 14, 18

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

121. The least number that should be added to 2055, so that the sum is exactly divisible by 27 is

(1) 28 (2) 24
(3) 27 (4) 31

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

122. What is the Arithmetic mean of the first '*n*' natural numbers ?

(1) $\frac{n(n+1)}{2}$ (2) $\frac{n+1}{2}$

(3) $\frac{n^2(n+1)}{2}$ (4) $2(n+1)$

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

123. A number when divided by 361 gives a remainder 47. If the same number is divided by 19, the remainder obtained is

(1) 3 (2) 8
(3) 9 (4) 1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

124. The difference between the greatest and the least four digit numbers that begin with 3 and ends with 5 is

(1) 999 (2) 900
(3) 990 (4) 909

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

125. The sum of two numbers is 75 and their difference is 25. The product of the two numbers is :

(1) 1350 (2) 1250
(3) 125 (4) 1000

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6836838)

126. The difference between the greatest and least prime numbers which are less than 100 is

(1) 96 (2) 97
(3) 94 (4) 95

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692916)

TYPE–III

1. One-fourth of a tank holds 135 litres of water. What part of the tank is full if it contains 180 litres of water?

(1) $\frac{2}{5}$ (2) $\frac{2}{3}$

(3) $\frac{1}{3}$ (4) $\frac{1}{6}$

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

2. What is two-third of half of 369?

(1) 123 (2) 246

(3) $246\frac{3}{8}$ (4) $271\frac{3}{4}$

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

3. $\frac{1}{5}$ of a number exceeds $\frac{1}{7}$ of the same number by 10. The number is :

(1) 125 (2) 150
(3) 175 (4) 200

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

4. A boy was asked to find the value of $\frac{3}{8}$ of a sum of money. Instead of multiplying the sum by $\frac{3}{8}$ he divided it by $\frac{3}{8}$ and then his answer exceeded by ₹ 55. Find the correct answer ?

(1) ₹ 9 (2) ₹ 24
(3) ₹ 64 (4) ₹ 1,320

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

5. In a class, $\frac{3}{5}$ of the students are girls and rest are boys. If $\frac{2}{9}$ of the girls and $\frac{1}{4}$ of the boys are absent. What part of the total number of students are present?

(1) $\frac{23}{30}$ (2) $\frac{23}{36}$

(3) $\frac{18}{49}$ (4) $\frac{17}{25}$

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

6. An 85m long rod is divided into two parts. If one part is $\frac{2}{3}$ of the other part, then the longer part (in metres) is :

(1) 34 (2) $56\frac{2}{3}$

(3) 85 (4) 51

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

7. Fraction between $\frac{2}{5}$ and $\frac{4}{9}$ is :

(1) $\frac{3}{7}$ (2) $\frac{2}{3}$

(3) $\frac{4}{5}$ (4) $\frac{1}{2}$

(SSC CGL Exam. 04.07.1999 (IInd Sitting)

8. $\frac{2}{3}$ of three-fourth of a number is :

(1) $\frac{1}{2}$ of the number

(2) $\frac{1}{3}$ of the number

(3) $\frac{8}{9}$ of the number

(4) $\frac{17}{12}$ of the number

(SSC CGL Exam. 04.07.1999 (IInd Sitting)

9. If 3 times a number exceeds its $\frac{3}{5}$ by 60, then what is the number ?

(1) 25 (2) 35
(3) 45 (4) 60

(SSC CGL Exam. 04.07.1999 (IInd Sitting)

10. Half of 1 per cent written as a decimal is—

(1) 0.2 (2) 0.02
(3) 0.05 (4) 0.005

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

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11. A runner runs $1\frac{1}{4}$ laps of a 5 lap race. What fractional part of the race remains to be run?
(1) 15/4 (2) 4/5
(3) 5/6 (4) 2/3
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

12. The product of two fractions is $\frac{14}{15}$ and their quotient is $\frac{35}{24}$. The greater fraction is—
(1) $\frac{7}{4}$ (2) $\frac{7}{6}$
(3) $\frac{7}{3}$ (4) $\frac{4}{5}$
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

13. What fraction of $\frac{4}{7}$ must be added to itself to make the sum $1\frac{1}{14}$?
(1) $\frac{7}{8}$ (2) $\frac{1}{2}$
(3) $\frac{4}{7}$ (4) $\frac{15}{14}$
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

14. If $\frac{4}{5}$ of an estate be worth ₹ 16800, then the value of $\frac{3}{7}$ of it is—
(1) ₹ 90000 (2) ₹ 9000
(3) ₹ 72000 (4) ₹ 21000
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

15. A boy on being asked what $\frac{6}{7}$ of a certain fraction was, made the mistake of dividing the fraction by $\frac{6}{7}$ and so got an answer which exceeded the correct answer by $\frac{13}{70}$. Find the fraction–
(1) $\frac{2}{3}$ (2) $\frac{3}{5}$
(3) $\frac{4}{5}$ (4) $\frac{7}{9}$
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

16. $\frac{1}{2}$ of $\frac{3}{4}$ of a number is $2\frac{1}{2}$ of 10. What is the number?
(1) 50 (2) 60
(3) $66\frac{2}{3}$ (4) 56
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

17. If one-third of one-fourth of a number is 15, then three-tenth of the number is
(1) 35 (2) 36
(3) 45 (4) 54
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

18. Express 45 minutes as the fraction of one day.
(1) $\frac{1}{40}$ (2) $\frac{1}{32}$
(3) $\frac{1}{60}$ (4) $\frac{1}{24}$
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

19. If 1 is added to the denominator of a fraction it becomes $\frac{1}{2}$. If 1 is added to the numerator it becomes 1. The product of numerator and denominator of the fraction is
(1) 6 (2) 10
(3) 12 (4) 14
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

20. A student was asked to find $\frac{5}{16}$ of a number. By mistake he found $\frac{5}{6}$ of that number. His answer was 250 more than the correct answer. Find the given number.
(1) 300 (2) 480
(3) 450 (4) 500
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

21. A number exceeds its one-fifth by 20. The number is
(1) 100 (2) 25
(3) 20 (4) 5
(SSC CPO S.I. Exam. 12.01.2003

22. Two-third of a positive number and $\frac{25}{216}$ of its reciprocal are equal. The number is
(1) $\frac{25}{144}$ (2) $\frac{5}{12}$
(3) $\frac{144}{25}$ (4) $\frac{12}{5}$
(SSC CPO S.I. Exam. 12.01.2003

23. 0.1 and $\frac{5}{8}$ of a bamboo are in mud and water respectively and the rest of length 2.75 m is above water. What is the length of the bamboo?
(1) 10 m (2) 30 m
(3) 27.5 m (4) 20 m
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

24. A man spends $\frac{1}{3}$ of his income on food, $\frac{2}{5}$ of his income on house rent and $\frac{1}{5}$ of his income on clothes. If he still has ₹ 400 left with him, his income is
(1) ₹ 4000 (2) ₹ 5000
(3) ₹ 6000 (4) ₹ 7000
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

25. When $0.\overline{47}$ is converted as a fraction, the result is
(1) $\frac{47}{90}$ (2) $\frac{46}{90}$
(3) $\frac{46}{99}$ (4) $\frac{47}{99}$
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

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26. By how much does $\frac{6}{7/8}$ exceed $\frac{6/7}{8}$?

(1) $6\frac{1}{8}$ (2) $6\frac{3}{4}$

(3) $7\frac{3}{4}$ (4) $7\frac{5}{6}$

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003) & SSC CGL Exam. 27.07.2008 (1st Sitting)

27. If one-nineth of a certain number exceeds its one-tenth by 4, the number is

(1) 320 (2) 360

(3) 400 (4) 440

(SSC CPO S.I. Exam. 05.09.2004)

28. $0.\overline{423}$ is equivalent to the fraction :

(1) $\frac{491}{990}$ (2) $\frac{419}{990}$

(3) $\frac{49}{99}$ (4) $\frac{94}{99}$

(SSC CPO S.I. Exam. 26.05.2005)

29. Which of the following fraction is greater than $\frac{3}{4}$ but less than $\frac{5}{6}$?

(1) $\frac{2}{3}$ (2) $\frac{1}{2}$

(3) $\frac{4}{5}$ (4) $\frac{9}{10}$

(SSC CPO S.I. Exam. 26.05.2005)

30. A tin of oil was $\frac{4}{5}$ full. When 6 bottles of oil was taken out and 4 bottles of oil was poured into it, it was $\frac{3}{4}$ full. How many bottles of oil can the tin contain?

(1) 10 (2) 20

(3) 30 (4) 40

(SSC CPO S.I. Exam. 26.05.2005)

31. A candidate in an examination was asked to find $\frac{5}{14}$ of a certain number. By mistake he found $\frac{5}{4}$ of it. Thus, his answer was 25 more than the correct answer. The number was :

(1) 28 (2) 56

(3) 84 (4) 140

(SSC CPO S.I. Exam. 26.05.2005)

32. In an examination, a student was asked to find $\frac{3}{14}$ of a certain number, By mistake, he found $\frac{3}{4}$ of it. His answer was 150 more than the correct answer. The given number is :

(1) 500 (2) 280

(3) 240 (4) 180

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

33. The product of two fractions is $\frac{14}{15}$ and their quotient is $\frac{35}{24}$. The greater of the fractions is

(1) $\frac{7}{4}$ (2) $\frac{7}{6}$

(3) $\frac{7}{3}$ (4) $\frac{4}{5}$

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

34. If the difference between the reciprocal of a positive proper fraction and the fraction itself be $\frac{9}{20}$, then the fraction is

(1) $\frac{3}{5}$ (2) $\frac{3}{10}$

(3) $\frac{4}{5}$ (4) $\frac{5}{4}$

(SSC CPO S.I. Exam. 03.09.2006)

35. A boy was asked to find $\frac{3}{5}$ of a fraction. Instead, he divided the fraction by $\frac{3}{5}$ and got an answer which exceeded the correct answer by $\frac{32}{75}$. The correct answer is

(1) $\frac{3}{25}$ (2) $\frac{6}{25}$

(3) $\frac{2}{25}$ (4) $\frac{2}{15}$

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

36. The rational number between $\frac{1}{2}$ and $\frac{3}{5}$ is

(1) $\frac{2}{5}$ (2) $\frac{4}{7}$

(3) $\frac{2}{3}$ (4) $\frac{1}{3}$

(SSC CPO S.I. Exam. 09.11.2008)

37. A man read $\frac{2}{5}$ th of a book on the first day. He read $\frac{1}{3}$ rd more on second day than he read on the first day. 15 pages were left for the third day. The number of pages in the book is

(1) 100 (2) 105

(3) 225 (4) 250

(SSC CPO S.I. Exam. 6.09.2009)

38. The number 0.121212.... in the form $\frac{p}{q}$ is equal to

(1) $\frac{4}{11}$ (2) $\frac{2}{11}$

(3) $\frac{4}{33}$ (4) $\frac{2}{33}$

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

39. $0.\overline{001}$ is equal to

(1) $\frac{1}{1000}$ (2) $\frac{1}{999}$

(3) $\frac{1}{99}$ (4) $\frac{1}{9}$

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

40. $1.\overline{27}$ in the form $\frac{p}{q}$ is equal to

(1) $\frac{127}{100}$ (2) $\frac{73}{100}$

(3) $\frac{14}{11}$ (4) $\frac{11}{14}$

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

41. Find a number, one-seventh of which exceeds its eleventh part by 100.

(1) 1925 (2) 1825

(3) 1540 (4) 1340

(SSC CGL Tier-I Exam 26.06.2011 (First Sitting)

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42. The value of $\frac{1}{15}+\frac{1}{35}+\frac{1}{63}+\frac{1}{99}+\frac{1}{143}$ is

(1) $\frac{5}{39}$ (2) $\frac{4}{39}$

(3) $\frac{2}{39}$ (4) $\frac{7}{39}$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

43. The number $2.5\dot{2}$, when written as a fraction and reduced to lowest terms, the sum of the numerator and denominator is

(1) 7 (2) 29

(3) 141 (4) 349

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

44. $\frac{1}{10}$ of a rod is coloured red, $\frac{1}{20}$ orange, $\frac{1}{30}$ yellow, $\frac{1}{40}$ green, $\frac{1}{50}$ blue, $\frac{1}{60}$ black and the rest is violet. If the length of the violet portion of the rod is 12.08 metres, then the length of the rod is

(1) 16 m (2) 18 m

(3) 20 m (4) 30 m

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

45. A tree increases annually by $\frac{1}{8}$ th of its height. By how much will it increase after 2 years, if it stands today 64 cm high?

(1) 72 cm (2) 74 cm

(3) 75 cm (4) 81 cm

FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

46. A man spends $\frac{1}{4}$ th of his income on food $\frac{2}{3}$rd of it on house rent and the remaining income which is ₹ 630 on other commodities. Find his house rent.

(1) ₹ 5040 (2) ₹ 3520

(3) ₹ 4890 (4) ₹ 4458

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

47. How many $\frac{1}{6}$ of together make $41\frac{2}{3}$?

(1) 125 (2) 150

(3) 250 (4) 350

(SSC CHSL DEO Entry Operator & LDC Exam. 28.11.2010 (Ist Sitting)

48. A fraction having denominator 30 and lying between $\frac{5}{8}$ and $\frac{7}{11}$ is–

(1) $\frac{18}{30}$ (2) $\frac{19}{30}$

(3) $\frac{20}{30}$ (4) $\frac{21}{30}$

(SSC CHSL DEO Entry Operator & LDC Exam. 28.11.2010 (Ist Sitting)

49. The sum of the numerator and denominator of a positive fraction is 11. If 2 is added to both numerator and denominator, the fraction is increased by $\frac{1}{24}$. The difference of numerator and denominator of the fraction is

(1) 5 (2) 3

(3) 1 (4) 9

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

50. The denominator of a fraction is 3 more than its numerator. If the numerator is increased by 7 and the denominator is decreased by 2, we obtain 2. The sum of numerator and denominator of the fraction is

(1) 5 (2) 13

(3) 17 (4) 19

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

51. A fraction becomes $\frac{1}{3}$ when 1 is subtracted from both the numerator and the denominator. The same fraction becomes $\frac{1}{2}$ when 1 is added to both the numerator and the denominator. The sum of numerator and denominator of the fraction is

(1) 10 (2) 18

(3) 7 (4) 16

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

52. A girl was asked to multiply a number by $\frac{7}{8}$. Instead she divided the number by $\frac{7}{8}$ and got the result 15 more than the correct result. The sum of the digits of the number was :

(1) 4 (2) 8

(3) 6 (4) 11

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

53. A student was asked to multiply a given number by $\frac{8}{17}$. Instead, he divided the given number by $\frac{8}{17}$. His answer was 225 more than the correct answer. The given number was

(1) 64 (2) 289

(3) 136 (4) 225

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

54. If 1 is added to both the numerator and the denominator of a fraction, it becomes $\frac{1}{4}$. If 2 is added to both the numerator and the denominator of that fraction, it becomes $\frac{1}{3}$. The sum of numerator and denominator of the fraction is :

(1) 8 (2) 13

(3) 22 (4) 27

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

55. A number whose one-fifth part increased by 4 is equal to its one-fourth part diminished by 10, is :

(1) 260 (2) 280

(3) 240 (4) 270

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

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56. A person gives $\frac{1}{4}$ of his property to his daughter, $\frac{1}{2}$ to his sons and $\frac{1}{5}$ for charity. How much has he given away ?

(1) $\frac{1}{20}$ (2) $\frac{19}{20}$

(3) $\frac{1}{10}$ (4) $\frac{9}{10}$

(SSC CGL Tier-I Exam. 11.11.2012, Ist Sitting)

57. In an office, there are 108 tables and 132 chairs. If $\frac{1}{6}$ of the tables and $\frac{1}{4}$ of the chairs are broken. How many people can work in the office if each person requires one table and one chair?

(1) 86 (2) 90

(3) 92 (4) 99

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

58. A, B, C and D purchase a gift worth ₹ 60. A pays $\frac{1}{2}$ of what others are paying, B pays $\frac{1}{3}$ of what others are paying and C pays $\frac{1}{4}$ of what others are paying. What is the amount paid by D ?

(1) ₹ 16 (2) ₹ 13

(3) ₹ 14 (4) ₹ 15

(SSC CGL Tier-I Exam. 21.04.2013)

59. In a school $\frac{1}{10}$ of the boys are same in number as $\frac{1}{4}$ of the girls and $\frac{5}{8}$ of the girls are same in number as $\frac{1}{4}$ of the boys. The ratio of the boys to girls in that school is

(1) 2 : 1 (2) 5 : 2

(3) 4 : 3 (4) 3 : 2

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

60. A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and the denominator it becomes $\frac{5}{6}$. What is the fraction ?

(1) $\frac{7}{9}$ (2) $\frac{3}{7}$

(3) $\frac{5}{9}$ (4) $\frac{7}{10}$

(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

61. A rational number between $\frac{3}{4}$ and $\frac{3}{8}$ is

(1) $\frac{12}{7}$ (2) $\frac{7}{3}$

(3) $\frac{16}{9}$ (4) $\frac{9}{16}$

(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

62. The numerator of a fraction is 4 less than its denominator. If the numerator is decreased by 2 and the denominator is increased by 1, then the denominator becomes eight times the numerator. Find the fraction.

(1) $\frac{3}{8}$ (2) $\frac{3}{7}$

(3) $\frac{4}{8}$ (4) $\frac{2}{7}$

(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

63. In a class, there are 'z' students. Out of them 'x' are boys. What part of the class is composed of girls ?

(1) $\frac{x}{z}$ (2) $\frac{z}{x}$

(3) $1-\frac{x}{z}$ (4) $\frac{x}{z}-1$

(SSC CGL Tier-II Exam. 29.09.2013

64. Divide 50 into two parts so that the sum of their reciprocals is $\frac{1}{12}$.

(1) 35, 15 (2) 20, 30

(3) 24, 36 (4) 28, 22

(SSC CHSL DEO & LDC Exam. 20.10.2013)

65. A school group charters three identical buses and occupies $\frac{4}{5}$ of the seats. After $\frac{1}{4}$ of the passengers leave, the remaining passengers use only two of the buses. The fraction of the seats on the two buses that are now occupied is

(1) $\frac{8}{9}$ (2) $\frac{7}{10}$

(3) $\frac{7}{9}$ (4) $\frac{9}{10}$

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

66. $0.\overline{123}$ is equal to :

(1) $\frac{14}{333}$ (2) $\frac{41}{333}$

(3) $\frac{123}{1000}$ (4) $\frac{441}{333}$

(FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

67. 0.393939 ..... is equal to

(1) $\frac{39}{100}$ (2) $\frac{13}{33}$

(3) $\frac{93}{100}$ (4) $\frac{39}{990}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

68. $\frac{1}{11}$ is equal to

(1) 0.009 (2) $0.0\overline{9}$

(3) $0.\overline{09}$ (4) $0.0\overline{09}$

(SSC CPO S.I. Exam. 09.11.2008)

69. The decimal fraction $2.3\overline{49}$ is equal to

(1) 2326 /999 (2) 2326/990

(3) 2347/999 (4) 2347/990

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

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70. The value of

$\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}+\frac{1}{90}$ is

(1) $\frac{1}{10}$ (2) $\frac{3}{5}$

(3) $\frac{3}{20}$ (4) $\frac{7}{20}$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

71. $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{7}+\frac{1}{14}+\frac{1}{28}$ is equal to :

(1) 2 (2) 2.5

(3) 3 (4) 3.5

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

72. $\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}$

$+\frac{1}{90}+\frac{1}{110}+\frac{1}{132}$ is equal to:

(1) $\frac{1}{8}$ (2) $\frac{1}{7}$

(3) $\frac{1}{6}$ (4) $\frac{1}{10}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

73. Ram left $\frac{1}{3}$ of his property to his widow and $\frac{3}{5}$ of the remainder to his daughter. He gave the rest to his son who received Rs. 6,400. How much was his original property worth ?

(1) ₹ 16, 000 (2) ₹ 32, 000

(3) ₹ 24, 000 (4) ₹ 1, 600

(SSC CHSL DEO & LDC Exam. 9.11.2014)

74. A number exceeds its two fifth by 75. The number is

(1) 125 (2) 112

(3) 100 (4) 150

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

75. If the sum of two numbers, one of which is $\frac{2}{5}$ times the other, is 50, then the numbers are

(1) $\frac{115}{7}$ and $\frac{235}{7}$

(2) $\frac{150}{7}$ and $\frac{200}{7}$

(3) $\frac{240}{7}$ and $\frac{110}{7}$

(4) $\frac{250}{7}$ and $\frac{100}{7}$

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

76. If $\frac{3}{4}$ of a number is 7 more than $\frac{1}{6}$ of the number, then $\frac{5}{3}$ of the number is :

(1) 12 (2) 20

(3) 15 (4) 18

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

77. The vulgar fraction of $0.3\overline{939}$ is :

(1) $\frac{15}{33}$ (2) $\frac{11}{39}$

(3) $\frac{17}{39}$ (4) $\frac{13}{33}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

TYPE–IV

1. Arrange $\frac{4}{5},\frac{7}{8},\frac{6}{7},\frac{5}{6}$ in the ascending order :

(1) $\frac{4}{5},\frac{7}{8},\frac{6}{7},\frac{5}{6}$ (2) $\frac{5}{6},\frac{6}{7},\frac{7}{8},\frac{4}{5}$

(3) $\frac{4}{5},\frac{5}{6},\frac{6}{7},\frac{7}{8}$ (4) $\frac{7}{8},\frac{6}{7},\frac{5}{6},\frac{4}{5}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

2. Arrange the following fractions in decreasing order :

$\frac{3}{5},\frac{7}{9},\frac{11}{13}$

(1) $\frac{3}{5},\frac{7}{9},\frac{11}{13}$ (2) $\frac{7}{9},\frac{3}{5},\frac{11}{13}$

(3) $\frac{11}{13},\frac{7}{9},\frac{3}{5}$ (4) $\frac{11}{13},\frac{3}{5},\frac{7}{9}$

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. The fractions $\frac{1}{3},\frac{4}{7}$ and $\frac{2}{5}$ written in ascending order given by:

(1) $\frac{4}{7}<\frac{1}{3}<\frac{2}{5}$ (2) $\frac{2}{5}<\frac{4}{7}<\frac{1}{3}$

(3) $\frac{1}{3}<\frac{2}{5}<\frac{4}{7}$ (4) $\frac{4}{7}>\frac{1}{3}>\frac{2}{5}$

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

4. Six numbers are arranged in decreasing order. The average of the first five numbers is 30 and the average of the last five numbers is 25. The difference of the first and the last numbers is :

(1) 20 (2) 25

(3) 5 (4) 30

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

TYPE–V

1. The digit in unit's place of the product $81\times82\times83\times\ldots\times89$ is

(1) 0 (2) 2

(3) 6 (4) 8

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

2. The digit in unit's place of the product $(2153)^{167}$ is :

(1) 1 (2) 3

(3) 7 (4) 9

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

3. The digit in the unit's place of the product

$(2464)^{1793}\times(615)^{317}\times(131)^{491}$ is

(1) 0 (2) 2

(3) 3 (4) 5

(SSC CPO S.I. Exam. 05.09.2004)

4. Unit digit in $(264)^{102}+(264)^{103}$ is :

(1) 0 (2) 4

(3) 6 (4) 8

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

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5. The digit in the unit's place of $[(251)^{98} + (21)^{29} - (106)^{100} + (705)^{35} - 16^4 + 259]$ is :
(1) 1 (2) 4
(3) 5 (4) 6
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. The last digit of 3^{40} is
(1) 1 (2) 3
(3) 7 (4) 9
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

7. What will be the unit digit in the product 7^{105} ?
(1) 5 (2) 7
(3) 9 (4) 1
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

8. The unit digit in the expansion of $(2137)^{754}$ is
(1) 1 (2) 3
(3) 7 (4) 9
(SSC CPO S.I. Exam. 07.09.2003 & SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

9. One's digit of the number $(22)^{23}$ is
(1) 4 (2) 6
(3) 8 (4) 2
(SSC CPO S.I. Exam. 09.11.2008)

10. The unit digit in the product $(122)^{173}$ is
(1) 2 (2) 4
(3) 6 (4) 8
(SSC CGL Tier-I Exam 19.06.2011 (First Sitting)

11. The unit digit in the sum of $(124)^{372} + (124)^{373}$ is
(1) 5 (2) 4
(3) 2 (4) 0
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

12. The last digit of $(1001)^{2008} + 1002$ is
(1) 0 (2) 3
(2) 4 (4) 6
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

13. Find the unit digit in the product $(4387)^{245} \times (621)^{72}$.
(1) 1 (2) 2
(2) 5 (4) 7
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

14. The units digit of the expression $25^{6251} + 36^{528} + 73^{54}$ is
(1) 6 (2) 5
(3) 4 (4) 0
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

15. The unit's digit in the product $7^{71} \times 6^{65} \times 3^{65}$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

16. The digit in unit's place of the number $(1570)^2 + (1571)^2 + (1572)^2 + (1573)^2$ is :
(1) 4 (2) 1
(3) 2 (4) 3
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

17. The unit digit in $3 \times 38 \times 537 \times 1256$ is
(1) 4 (2) 2
(3) 6 (4) 8
(SSC CGL Tier-II Exam. 29.09.2013

18. In a two-digit number, the digit at the unit's place is 1 less than twice the digit at the ten's place. If the digits at unit's and ten's place are interchanged, the difference between the new and the original number is less than the original number by 20. The original number is
(1) 59 (2) 23
(3) 35 (4) 47
(SSC CHSL DEO & LDC Exam. 20.10.2013)

19. The digit in unit's place of the product $49237 \times 3995 \times 738 \times 83 \times 9$ is
(1) 0 (2) 7
(3) 5 (4) 6
(SSC CHSL DEO & LDC Exam. 16.11.2014

20. By interchanging the digits of a two digit number we get a number which is four times the original number [illegible] 24. If the unit's digit of the original number exceeds its ten's digit by 7, then original number is
(1) 29 (2) 36
(3) 58 (4) 18
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

21. There is a number consisting of two digits, the digit in the units' place is twice that in the tens' place and if 2 be subtracted from the sum of the digits, the difference is equal to $\frac{1}{6}$ th of the number. The number is
(1) 26 (2) 25
(3) 24 (4) 23
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–VI

1. The sum of three consecutive odd natural numbers is 147. Then, the middle number is :
(1) 47 (2) 48
(3) 49 (4) 51
(SSC CGL Exam. 04.07.1999 (IInd Sitting)

2. The sum of first 20 odd natural numbers is equal to :
(1) 210 (2) 300
(3) 400 (4) 420
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

3. The sum of all natural numbers from 75 to 97 is :
(1) 1598 (2) 1798
(3) 1958 (4) 1978
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

4. The sum of all natural numbers between 100 and 200, which are multiples of 3 is :
(1) 5000 (2) 4950
(3) 4980 (4) 4900
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

5. The sum of the squares of three consecutive natural numbers is 2030. Then, what is the middle number?
(1) 25 (2) 26
(3) 27 (4) 28
(SSC CGL Exam. 27.02.2000 (IInd Sitting)

6. The sum of three consecutive odd natural numbers is 87. The smallest of these numbers is :
(1) 29 (2) 31
(3) 23 (4) 27
(SSC CGL Exam. 24.02.2002 (Ist Sitting)

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7. Sum of three consecutive even integers is 54. Find the least among them.
(1) 18 (2) 15
(3) 14 (4) 16
(SSC CGL Exam. 24.02.2002 (IInd Sitting)

8. The sum of three consecutive numbers is 87. The middle number is
(1) 27 (2) 29
(3) 30 (4) 28
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

9. What is the sum of two consecutive even numbers, the difference of whose square is 84?
(1) 38 (2) 34
(3) 42 (4) 46
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. The sum of all the natural numbers from 51 to 100 is
(1) 5050 (2) 4275
(3) 4025 (4) 3775
(SSC CPO S.I. Exam. 05.09.2004)

11. The sum of all the 2-digit numbers is :
(1) 4995 (2) 4950
(3) 4945 (4) 4905
(SSC CPO S.I. Exam. 26.05.2005)

12. The sum of first 50 odd natural numbers is
(1) 1000 (2) 1250
(3) 5200 (4) 2500
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

13. The sum of all the 3-digit numbers, each of which on division by 5 leaves remainder 3, is
(1) 180 (2) 1550
(3) 6995 (4) 99090
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

14. The sum of all the 3-digit numbers is
(1) 98901 (2) 494550
(3) 8991 (4) 899
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

15. Out of six consecutive natural numbers, if the sum of first three is 27, what is the sum of the other three ?
(1) 36 (2) 35
(3) 25 (4) 24
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

16. Which one of the following is a factor of the sum of first twenty-five natural numbers ?
(1) 26 (2) 24
(3) 13 (4) 12
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

17. The sum of all even numbers between 21 and 51 is
(1) 518 (2) 540
(3) 560 (4) 596
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

18. The sum of four consecutive even numbers is 748. The smallest among them is
(1) 188 (2) 186
(3) 184 (4) 174
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

19. If the sum of five consecutive integers is S, then the largest of those integers in terms of S is
(1) $\frac{S-10}{5}$ (2) $\frac{S+4}{4}$
(3) $\frac{S+5}{4}$ (4) $\frac{S+10}{5}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

20. The sum of all those prime numbers which are not greater than17 is
(1) 59 (2) 58
(3) 41 (4) 42
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

21. The sum of the squares of 3 consecutive positive numbers is 365. The sum of the numbers is
(1) 30 (2) 33
(3) 36 (4) 45
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

22. Find three consecutive numbers such that twice the first, three times the second and four times the third together make 191.
(1) 19, 20, 21 (2) 21, 22, 23
(3) 20, 21, 22 (4) 22, 23, 24
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

23. The sum of three consecutive odd natural numbers each divisible by 3 is 72. What is the largest among them?
(1) 21 (2) 24
(3) 27 (4) 36
(SSC CGL Exam. 04.07.1999 (Ist Sitting)

24. Find the sum of all positive multiples of 3 less than 50
(1) 400 (2) 404
(3) 408 (4) 412
(SSC CGL Tier-II Exam. 21.09.2014

25. What is the arithmetic mean of first 20 odd natural numbers ?
(1) 19 (2) 17
(3) 22 (4) 20
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

26. Two positive whole numbers are such that the sum of the first number and twice the second number is 8 and their difference is 2. The numbers are :
(1) 7,5 (2) 6,4
(3) 4,2 (4) 3,5
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–VII

1. If we write 45 as sum of four numbers so that when 2 is added to first number, 2 subtracted from second number, third multiplied by 2 and fourth divided by 2, we get the same result, then the four numbers are :
(1) 1, 8, 15, 21 (2) 8, 12, 5, 20
(3) 8, 12, 10, 15 (4)2, 12, 5, 26
(SSC CGL Exam. 04.07.1999 (IInd Sitting)

2. 12345679 × 72 is equal to :
(1) 88888888 (2) 999999998
(3) 888888888 (4) 898989898
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

3. Given that 0.111 .....$=\frac{1}{9}$; 0.444 is equal to :
(1) $\frac{1}{90}$ (2) $\frac{2}{45}$
(3) $\frac{1}{99}$ (4) $\frac{4}{9}$
(SSC CGL Exam. 27.02.2000 (Ist Sitting)

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4. $8.3\dot{1}+0.\dot{6}+0.00\dot{2}$ is equal to:

(1) $8.\dot{9}\dot{1}\dot{2}$ (2) $8.9\dot{1}\dot{2}$

(3) $8.97\dot{9}$ (4) $8.9\dot{7}\dot{9}$

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

5. The value of $\left(0.\overline{63}+0.\overline{37}\right)$ is

(1) 1 (2) $\frac{100}{99}$

(3) $\frac{99}{100}$ (4) $\frac{100}{33}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

6. $\left(0.\overline{11}+0.\overline{22}\right)\times 3$ is equal to

(1) 3 (2) $1.\overline{9}$

(3) 1 (4) $0.\overline{3}$

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

7. Find the value of

$\frac{1}{5}+999\frac{494}{495}\times 99$

(1) 90000 (2) 99000

(3) 90900 (4) 99990

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. If * means adding 6 times the second number to the first number then (1 * 2) * 3 equals :

(1) 121 (2) 31

(3) 93 (4) 91

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

9. The value of $999\frac{995}{999}\times 999$ is

(1) 990809 (2) 998996

(3) 999824 (4) 998999

(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2003 (IInd Sitting)

10. $1.\overline{2}\times 0.\overline{03}=$

(1) $0.\overline{04}$ (2) $0.0\overline{36}$

(3) $1.\overline{13}$ (4) $0.\overline{037}$

(SSC CPO S.I. Exam. 06.09.2009)

11. Given that

$3.718=\frac{1}{0.2689}$; then $\frac{1}{0.0003718}$

is equal to

(1) 2689 (2) 2.689

(3) 26890 (4) 0.2689

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

12. If a and b are two distinct natural numbers, which one of the following is true ?

(1) $\sqrt{a+b}>\sqrt{a}+\sqrt{b}$

(2) $\sqrt{a+b}=\sqrt{a}+\sqrt{b}$

(3) $\sqrt{a+b}<\sqrt{a}+\sqrt{b}$

(4) $ab=1$

(SSC CPO S.I. Exam. 16.12.2007)

13. Which one of the following numbers is not a square of any natural number ?

(1) 17956 (2) 16225

(3) 63592 (4) 53361

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

14. $0.\overline{142857}+0.\overline{285714}$ is equal to

(1) 10 (2) 2

(3) $\frac{1}{2}$ (4) $\frac{1}{3}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

15. The difference of $5.\overline{76}$ and $2.\overline{3}$ is

(1) $2.\overline{54}$ (2) $3.\overline{73}$

(3) $3.\overline{46}$ (4) $3.\overline{43}$

(SSC CISF ASI Exam 29.08.2010 (Paper-1)

16. When simplified the product

$\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right)\ldots\ldots\left(1-\frac{1}{n}\right)$,

it becomes :

(1) $\frac{1}{n}$ (2) $\frac{2}{n}$

(3) $\frac{2(n-1)}{n}$ (4) $\frac{2}{n(n+1)}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

17. $2.8\overline{768}$ is equal to

(1) $2\frac{4394}{4995}$ (2) $2\frac{292}{333}$

(3) $2\frac{9}{10}$ (4) $2\frac{878}{999}$

(SSC CPO S.I. Exam. 03.09.2006)

18. Numbers 2, 4, 6, 8, 10, ..., 196, 198, 200 are multiplied together. The number of zeros at the end of the product on the right will be equal to —

(1) 21 (2) 22

(3) 24 (4) 25

(SSC Data Entry Operator Exam, 31.08.2008)

19. 7, 77, 77, 777 ÷ 77 equals

(1) 1111 (2) 101001

(3) 10101 (4) 1010101

(SSC Data Entry Operator Exam. 02.08.2009)

20. $8.3\bar{1}+0.\bar{6}+0.00\bar{2}$ is equal to

(1) $8.\overline{912}$ (2) $8.9\overline{12}$

(3) $8.97\bar{9}$ (4) $8.9\overline{79}$

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

21. The value of $0.\bar{2}+0.\bar{3}+0.\overline{32}$ is :

(1) $0.\overline{87}$ (2) $0.\overline{77}$

(3) $0.\overline{82}$ (4) $0.\overline{86}$

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

22. The value of $\left(0.\overline{63}+0.\overline{37}\right)$ is

(1) 1 (2) $\frac{100}{99}$

(3) $\frac{99}{100}$ (4) $\frac{100}{33}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

23. If $\frac{51.84}{4.32}=12$, then the value of $\frac{0.005184}{0.432}$ is

(1) 0.12 (2) 0.012

(3) 0.0012 (4) 1.2

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

24. The value of

$\left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right)\left(1+\frac{1}{4}\right)\ldots\left(1+\frac{1}{120}\right)$ is

(1) 30 (2) 40.5

(3) 60.5 (4) 121

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

25. Sum of two numbers is 40 and their product is 375. What will be the sum of their reciprocals?

(1) $\frac{8}{75}$ (2) $\frac{1}{40}$

(3) $\frac{75}{8}$ (4) $\frac{75}{4}$

(SSC CGL Exam. 04.07.1999 (Ist Sitting)

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26. The sum and product of two numbers are 12 and 35 respectively. What will be the sum of their reciprocals?

(1) $\frac{1}{3}$ (2) $\frac{1}{5}$

(3) $\frac{12}{35}$ (4) $\frac{35}{12}$

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

27. If the sum of two numbers is 3 and the sum of their squares is 12,then their product is equal to :

(1) $\frac{3}{2}$ (2) $\frac{2}{3}$

(3) $-\frac{3}{2}$ (4) $-\frac{2}{3}$

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

28. 800 chocolates were distributed among the students of a class. East student got twice as many chocolates as the number of students in the class. The number of students in the class was :

(1) 25 (2) 30

(3) 35 (4) 20

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

29. The numbers 2, 4, 6, 8 ...., 98, 100 are multiplied together. The number of zeros at the end of the product must be :

(1) 13 (2) 12

(3) 11 (4) 10

(SSC CGL Exam. 27.02.2000 (Ist Sitting)

30. How many digits in all are required to write numbers from 1 to 50?

(1) 100 (2) 92

(3) 91 (4) 50

(SSC CGL Exam. 27.02.2000 (IInd Sitting)

31. If doubling a number and adding 20 to the result gives the same answer as multiplying the number by 8 and taking away 4 from the product, the number is :

(1) 2 (2) 3

(3) 4 (4) 6

(SSC CGL Exam. 27.02.2000 (IInd Sitting)

32. A number of friends decided to go on a picnic and planned to spend ₹ 108 on eatables. Three of them however did not turn up. As a consequence each one of the remaining had to contribute ₹ 3 extra. The number of them who attended the picnic was :

(1) 15 (2) 12

(3) 9 (4) 6

(SSC CGL Exam. 27.02.2000 (IInd Sitting)

33. The numbers 1, 3, 5,7 ... 99 and128 are multiplied together. The number of zeros at the end of the product must be :

(1) 19 (2) 22

(3) 7 (4) Nil

(SSC CGL Exam. 27.02.2000 (IInd Sitting)

34. The sum of the squares of two positive numbers is 100 and difference of their squares is 28. Find the sum of the numbers :

(1) 12 (2) 13

(3) 14 (4) 15

(SSC CGL Exam. 24.02.2002 (Ist Sitting)

35. The simplified value of

$\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right)\ldots\left(1-\frac{1}{99}\right)\left(1-\frac{1}{100}\right)$

is

(1) $\frac{2}{99}$ (2) $\frac{1}{25}$

(3) $\frac{1}{50}$ (4) $\frac{1}{100}$

(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2205 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

36. The product of two numbers is 120. The sum of their squares is 289. The difference of these two numbers is

(1) 9 (2) 7

(3) 8 (4) 6

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

37. The sum and product of two numbers are 10 and 24 respectively. The sum of their reciprocals is

(1) $\frac{1}{2}$ (2) $\frac{5}{12}$

(3) $\frac{7}{12}$ (4) $\frac{12}{5}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

38. $\left(99\frac{1}{7}+99\frac{2}{7}+99\frac{3}{7}+99\frac{4}{7}+99\frac{5}{7}+99\frac{6}{7}\right)$ is equal to

(1) 603 (2) 600

(3) 598 (4) 597

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

39. 380 mangoes are distributed among some boys and girls who are 85 in number. Each boy gets four mangoes and each girl gets five. The number of boys is

(1) 15 (2) 38

(3) 40 (4) 45

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

40. The product of two positive numbers is 2500. If one number is four times the other, then the sum of the two numbers is :

(1) 25 (2) 125

(3) 225 (4) 250

(SSC CGL Exam. 24.02.2002 (IInd Sitting)

41. In a two digit number if it is known that its units digit exceeds its tens digit by 2 and that the product of the given number and the sum of its digits is equal to 144, then the number is

(1) 46 (2) 42

(3) 26 (4) 24

(SSC CPO S.I. Exam. 12.01.2003)

42. In a test, 1 mark is awarded for each correct answer and one mark is deducted for each wrong answer. If a boy answers all 20 items of the test and gets 8 marks, the number of questions answered correct by him was

(1) 16 (2) 14

(3) 12 (4) 8

(SSC CPO S.I. Exam. 12.01.2003)

43. A number of boys raised ₹ 400 for a famine relief fund, each boy giving as many 25 paise coins as there were boys. The number of boys was :

(1) 40 (2) 16

(3) 20 (4) 100

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

44. Thrice the square of a natural number decreased by four times the number is equal to 50 more than the number. The number is:

(1) 4 (2) 5

(3) 10 (4) 6

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

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45. The difference between two positive numbers is 3. If the sum of their squares is 369, then the sum of the numbers is :
(1) 81 (2) 33
(3) 27 (4) 25
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

46. A number consists of two digits such that the digit in the ten's place is less by 2 than the digit in the unit's place. Three times the number added to $\frac{6}{7}$ times the number obtained by reversing the digits equals 108. The sum of digits in the number is :
(1) 8 (2) 9
(3) 6 (4) 7
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

47. Of the three numbers, the second is twice the first and it is also thrice the third. If the average of three numbers is 44, the difference of the first number and the third number is :
(1) 24 (2) 18
(3) 12 (4) 6
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

48. A two digit number is five times the sum of its digits. If 9 is added to the number, the digits interchange their positions. The sum of digits of the number is :
(1) 11 (2) 9
(3) 7 (4) 6
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

49. How many numbers less than 1000 are multiples of both 10 and 13?
(1) 9 (2) 8
(3) 6 (4) 7
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

50. The number 1, 2, 3, 4, ..., 1000 are multiplied together. The number of zeros at the end (on the right) of the product must be :
(1) 30 (2) 200
(3) 211 (4) 249
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

51. If the difference of two numbers is 3 and the difference of their squares is 39, then the larger number is
(1) 8 (2) 9
(3) 12 (4) 13
(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & SSC CHSL DEO & LDC Exam. 04.11.2012)

52. 7 is added to a certain number; the sum is multiplied by 5; the product is divided by 9 and 3 is subtracted from the quotient. Thus if the remainder left is 12, what was the original number?
(1) 30 (2) 20
(3) 40 (4) 60
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

53. On multiplying a number by 7, all the digits in the product appear as 3's, the smallest such number is
(1) 47649 (2) 47719
(3) 47619 (4) 48619
(SSC CPO S.I. Exam. 03.09.2006)

54. A 2-digit number is 3 times the sum of its digits. If 45 is added to the number, its digits are interchanged. The sum of digits of the number is
(1) 11 (2) 9
(3) 7 (4) 5
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

55. The numbers 2272 and 875 are divided by a 3-digit number N, giving the same remainders. The sum of the digits of N is
(1) 10 (2) 11
(3) 12 (4) 13
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

56. The sum and product of two numbers are 12 and 35 respectively. The sum of their reciprocals will be
(1) $\frac{12}{35}$ (2) $\frac{1}{35}$
(3) $\frac{35}{8}$ (4) $\frac{7}{32}$
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

57. Of the three numbers, the second is twice the first and is also thrice the third. If the average of these three numbers is 44, the largest number is
(1) 24 (2) 36
(3) 72 (4) 108
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

58. The sum of the digits of a two digit number is 10. The number formed by reversing the digits is 18 less than the original number. Find the original number.
(1) 81 (2) 46
(3) 64 (4) 60
(SSC CPO S.I. Exam. 06.09.2009)

59. Five times of a positive integer is equal to 3 less than twice the square of that number. The number is
(1) 3 (2) 13
(3) 23 (4) 33
(SSC CPO S.I. Exam. 06.09.2009)

60. The product of two numbers is 24 times the difference of these two numbers. If the sum of these numbers is 14, the larger number is
(1) 9 (2) 8
(3) 7 (4) 10
(SSC CPO S.I. Exam. 06.09.2009)

61. The product of two numbers is 0.008. One of the number is $\frac{1}{5}$ of the other. The smaller number is
(1) 0.2 (2) 0.4
(3) 0.02 (4) 0.04
(SSC SAS Exam 26.06.2010 (Paper-1)

62. I multiplied a natural number by 18 and another by 21 and added the products. Which one of the following could be the sum?
(1) 2007 (2) 2008
(3) 2006 (4) 2002
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

63. If the sum of two numbers be multiplied by each number separately, the products so obtained are 247 and 114. The sum of the numbers is
(1) 19 (2) 20
(3) 21 (4) 23
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

64. If a and b are odd numbers, then which of the following is even?
(1) $a + b + ab$ (2) $a + b - 1$
(3) $a + b + 1$ (4) $a + b + 2ab$
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

65. If two numbers x and y separately divided by a number d, remainders obtained are 4375 and 2986 respectively. If the sum of the numbers i.e $(x+y)$ is divided by the same number d remainder obtained is 2361. The value of number d is
(1) 7361 (2) 5000
(3) 4000 (4) 2542
(SSC CPO S.I. Exam.09.11.2008)

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66. A farmer divides his herd of n cows among his four sons so that the first son gets one – half the herd, the second son gets one – fourth, the third son gets one – fifth and the fourth son gets 7 cows. The value of n is
(1) 80 (2) 100
(3) 140 (4) 180
(SSC CPO S.I. Exam. 09.11.2008)

67. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. A student attempted all the 200 questions and scored in all 200 marks. The number of questions, he answered correctly was
(1) 82 (2) 80
(3) 68 (4) 60
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

68. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts all 75 questions and secures 125 marks, the number of questions he attemtpts correctly is
(1) 35 (2) 40
(3) 42 (4) 46
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

69. The product of two numbers is 120 and the sum of their squares is 289. The sum of the two numbers is
(1) 23 (2)7
(3) 13 (4) 169
(SSC Data Entry Operator Exam. 31.08.2008)

70. The sum and product of two numbers are 11 and 18 respectively. The sum of their reciprocals is
(1) $\frac{2}{11}$ (2) $\frac{11}{2}$
(3) $\frac{18}{11}$ (4) $\frac{11}{18}$
(SSC Data Entry Operator Exam. 02.08.2009)

71. A man ate 100 grapes in 5 days. Each day, he ate 6 more grapes than those he ate on the earlier day. How many grapes did he eat on the first day ?
(1) 8 (2) 12
(3) 54 (4) 76
(SSC Data Entry Operator Exam. 02.08.2009)

72. Instead of multiplying a number by 0.72, a student multiplied it by 7.2. If his answer was 2592 more than the correct answer, then the original number was
(1) 400 (2) 420
(3) 500 (4) 560
(SSC Data Entry Operator Exam. 02.08.2009)

73. Of the three numbers, the sum of the first two is 55, sum of the second and third is 65 and sum of third with thrice of the first is 110. The third number is
(1) 25 (2) 30
(3) 35 (4) 28
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

74. A number consists of two digits and the digit in the ten's place exceeds that in the unit's place by 5. If 5 times the sum of the digits be subtracted from the number, the digits of the number are reversed. Then the sum of digits of the number is
(1) 11 (2) 7
(3) 9 (4) 13
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

75. In a three-digit number, the digit at the hundred's place is two times the digit at the unit's place and the sum of the digits is 18. If the digits are reversed, the number is reduced by 396. The difference of hundred's and ten's digit of the number is
(1) 1 (2) 2
(3) 3 (4) 5
(SSCCHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

76. If the digits in the unit and the ten's places of a three digit number are interchanged, a new number is formed, which is greater than the original number by 63. Suppose the digit in the unit place of the original number be x. Then, all the possible values of x are
(1) 7, 8, 9 (2) 2, 7, 9
(3) 0, 1, 2 (4) 1, 2, 8
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

77. The sum of a natural number and its square equals the product of the first three prime numbers. The number is
(1) 2 (2) 3
(3) 5 (4) 6
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

78. A man has some hens and cows. If the number of heads : number of feet = 12 : 35, find out the number of hens, if the number of heads alone is 48.
(1) 28 (2) 26
(3) 24 (4) 22
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

79. The length of a road is one kilometre. The number of plants required for plantation at a gap of 20 metres in both sides of the road is
(1) 102 (2) 100
(3) 51 (4) 50
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

80. $999\frac{98}{99} \times 99$ is equal to :
(1) 98999 (2) 99899
(3) 99989 (4) 99998
(SSC CHSL DEO Entry Operator & LDC Exam. 28.11.2010 (Ist Sitting)

81. The sum of a two digit number and the number obtained by reversing its digits is a square number. How many such numbers are there ?
(1) 5 (2) 6
(3) 7 (4) 8
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

82. The value of $99\frac{95}{99} \times 99$ is
(1) 9798 (2) 999
(3) 9898 (4) 9896
(SSC CPO S.I. Exam. 06.09.2009)

83. There are 50 boxes and 50 persons. Person 1 keeps 1 marble in every box. Person 2 keeps 2 marbles in every 2nd box, person 3 keeps 3 marbles in every third box. This process goes on till person 50 keeps 50 marbles in the 50th box. Find the total number of marbles kept in the 50th box.
(1) 43 (2) 78
(3) 6 (4) 93
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

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84. 252 m of pant cloth and 141 m of shirt cloth are available in a cloth store. To stitch one pant and one shirt, $2\frac{1}{2}$ m and $1\frac{3}{4}$ m of cloth are needed respectively. Then the approximate number of pants and shirts that can be made out of it are
(1) (80,100) (2) (100,80)
(3) (100,90) (4) (90,80)
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

85. The number 323 has
(1) three prime factors
(2) five prime factors
(3) two prime factors
(4) no prime factor
(SSC CGL Tier-I Exam. 21.04.2013 IInd Sitting)

86. The product of two positive numbers is 2500. If one number is four times the other, the sum of the two numbers is :
(1) 25 (2) 125
(3) 225 (4) 250
(SSC CGL Exam. 24.02.2002 (IInd Sitting)

87. Mohan gets 3 marks for each correct sum and loses 2 marks for each wrong sum. He attempts 30 sums and obtains 40 marks. The number of sums solved correctly is :
(1) 15 (2) 20
(3) 25 (4) 10
(SSC CGL Tier-I Exam. 21.04.2013)

88. If $a * b = a + b + \frac{a}{b}$, then the value of $12 * 4$ is :
(1) 20 (2) 21
(3) 48 (4) 19
(SSC CGL Tier-I Exam. 21.04.2013)

89. Find the maximum number of trees which can be planted, 20 metres apart, on the two sides of a straight road 1760 metres long
(1) 180 (2) 178
(3) 174 (4) 176
(SSC CGL Tier-I Exam. 21.04.2013)

90. A and B have together three times what B and C have, while A, B, C together have thirty rupees more than that of A. If B has 5 times that of C, then A has
(A) ₹ 60 (2) ₹ 65
(3) ₹ 75 (4) ₹ 45
(SSC CGL Tier-I Exam. 21.04.2013)

91. If sum of two numbers be a and their product be b, then the sum of their reciprocals is
(1) $\frac{1}{a}+\frac{1}{b}$ (2) $\frac{b}{a}$
(3) $\frac{a}{b}$ (4) $\frac{1}{ab}$
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

92. $\left(999\frac{999}{1000}\times 7\right)$ is equal to:
(1) $6993\frac{7}{1000}$ (2) $7000\frac{7}{1000}$
(3) $6633\frac{7}{1000}$ (4) $6999\frac{993}{1000}$
(SSC CPO S.I. Exam. 16.12.2007)

93. In a factory one out of every 9 is a female worker. If the number of female workers is 125, the total number of workers is
(1) 1250 (2) 1125
(3)1025 (4) 1000
(SSC Constable (GD) Exam. 12.05.2013)

94. $999\frac{1}{7}+999\frac{2}{7}+999\frac{3}{7}$
$+999\frac{4}{7}+999\frac{5}{7}+999\frac{6}{7}$
is simplified to :
(1) 5997 (2) 5979
(3) 5994 (4) 2997
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

95. 'a' divides 228 leaving a remainder 18. The biggest two-digit value of 'a' is
(1) 70 (2) 21
(3) 35 (4) 30
(SSC CHSL DEO & LDC Exam. 20.10.2013)

96. In a division sum, the divisor is 12 times the quotient and 5 times the remainder. If the remainder is 36, then the dividend is
(1) 2706 (2) 2796
(3) 2736 (4) 2826
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

97. The sum of two number is 8 and their product is 15. The sum of their reciprocals is
(1) $\frac{8}{15}$ (2) $\frac{15}{8}$
(3) 23 (4) 7
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

98. A number is doubled and 9 is added. If the resultant is trebled, it becomes 75. What is that number ?
(1) 6 (2) 3.5
(3) 8 (4) None of these
(SSC CGL Exam. 04.07.1999 (IInd Sitting)

99. If the operation '*' is defined by $a * b = a + b - ab$, then $5 * 7$ equals
(1) 12 (2) –47
(3) –23 (4) 35
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

100. A man engaged a servant on the condition that he would pay him ₹ 90 and a turban after service of one year. He served only for nine months and received the turban and an amount of ₹ 65. The price of turban is
(1) ₹ 25 (2) ₹ 18.75
(3) ₹ 10 (4) ₹ 2.50
(SSC CHSL DEO & LDC Exam. 16.11.2014

101. If a certain number of two digits is divided by the sum of its digits, the quotient is 6 and the remainder is 3. If the digits are reversed and the resulting number is divided by the sum of the digits, the quotient is 4 and the remainder is 9. The sum of the digits of the number is
(1) 6 (2) 9
(3) 12 (4) 4
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)

102. Among the following statements, the statement which is **not correct** is :
(1) Every natural number is an integer.
(2) Every natural number is a real number.
(3) Every real number is a rational number.
(4) Every integer is a rational number.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

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103. If $p = -0.12$, $q = -0.01$ and $r = -0.015$, then the correct relationship among the three is :
(1) $q > p > r$ (2) $p > r > q$
(3) $p > q > r$ (3) $p < r < q$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

104. In an exam the sum of the scores of A and B is 120, that of B and C is 130 and that of C and A is 140. Then the score of C is :
(1) 65 (2) 75
(3) 70 (4) 60
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

SHORT ANSWERS

TYPE-I

1. (4)	2. (1)	3. (4)	4. (4)
5. (4)	6. (4)	7. (4)	8. (2)
9. (1)	10. (2)	11. (2)	12. (2)
13. (2)	14. (3)	15. (4)	16. (4)
17. (4)	18. (2)	19. (1)	20. (2)
21. (1)			

TYPE-II

1. (2)	2. (4)	3. (4)	4. (1)
5. (2)	6. (2)	7. (2)	8. (2)
9. (2)	10. (2)	11. (4)	12. (1)
13. (3)	14. (2)	15. (4)	16. (2)
17. (4)	18. (2)	19. (3)	20. (4)
21. (2)	22. (3)	23. (2)	24. (4)
25. (2)	26. (4)	27. (4)	28. (3)
29. (4	30. (3)	31. (1)	32. (4)
33. (3)	34. (4	35. (3)	36. (4)
37. (4)	38. (3)	39. (1)	40. (1)
41. (*)	42. (3)	43. (2)	44. (2)
45. (3)	46. (4)	47. (4	48. (2)
49. (4)	50. (1)	51. (4)	52. (3)
53. (2)	54. (3)	55. (2)	56. (2)
57. (3)	58. (2)	59. (3)	60. (4)
61. (1)	62. (1)	63. (1)	64. (4
65. (1)	66. (4)	67. (1)	68. (3)
69. (3)	70. (3)	71. (2)	72. (2)
73. (1)	74. (2)	75. (1)	76. (4)
77. (2)	78. (3)	79. (2)	80. (4)
81. (3)	82. (1)	83. (3)	84. (1)
85. (2)	86. (2)	87. (2)	88. (3)
89. (3)	90. (3)	91. (3)	92. (4)
93. (4)	94. (4)	95. (2)	96. (4)
97. (2)	98. (1)	99. (4)	100. (2)
101. (3)	102. (1)	103. (2)	104. (2)
105. (2)	106. (3)	107. (1)	108. (1)
109. (2)	110. (1)	111. (3)	112. (3)
113. (2)	114. (2)	115. (3)	116. (4)
117. (4)	118. (2)	119. (2)	120. (4)
121. (2)	122. (2)	123. (3)	124. (3)
125. (2)	126. (4)		

TYPE-III

1. (3)	2. (1)	3. (3)	4. (2)
5. (1)	6. (4)	7. (1)	8. (1)
9. (1)	10. (4)	11. (1)	12. (2)
13. (1)	14. (2)	15. (2)	16. (3)
17. (4)	18. (2)	19. (1)	20. (2)
21. (2)	22. (2)	23. (1)	24. (3)
25. (4)	26. (2)	27. (2)	28. (2)
29. (3)	30. (4)	31. (1)	32. (2)
33. (2)	34. (3)	35. (2)	36. (2)
37. (3)	38. (3)	39. (2)	40. (3)
41. (1)	42. (1)	43. (4)	44. (1)
45. (4)	46. (1)	47. (3)	48. (2)
49. (3)	50. (2)	51. (1)	52. (4)
53. (3)	54. (1)	55. (2)	56. (2)
57. (2)	58. (2)	59. (2)	60. (1)
61. (4)	62. (2)	63. (3)	64. (2)
65. (4)	66. (2)	67. (2)	68. (3)
69. (2)	70. (3)	71. (1)	72. (3)
73. (3)	74. (1)	75. (4)	76. (2)
77. (4)			

TYPE-IV

1. (3)	2. (3)	3. (3)	4. (2)

TYPE-V

1. (1)	2. (3)	3. (1)	4. (1)
5. (2)	6. (1)	7. (2)	8. (4)
9. (3)	10. (1)	11. (4)	12. (2)
13. (4)	14. (4)	15. (4)	16. (1)
17. (4)	18. (4)	19. (1)	20. (1)
21. (3)			

TYPE-VI

1. (3)	2. (3)	3. (4)	4. (2)
5. (2)	6. (4)	7. (4)	8. (2)
9. (3)	10. (4)	11. (4)	12. (4)
13. (4)	14. (2)	15. (1)	16. (3)
17. (2)	18. (3)	19. (4)	20. (2)
21. (2)	22. (3)	23. (3)	24. (3)
25. (4)	26. (3)		

TYPE-VII

1. (2)	2. (3)	3. (4)	4. (3)
5. (2)	6. (3)	7. (2)	8. (2)
9. (2)	10. (4)	11. (1)	12. (3)
13. (3)	14. (3)	15. (4)	16. (2)
17. (2)	18. (3)	19. (4)	20. (3)
21. (1)	22. (2)	23. (2)	24. (3)
25. (1)	26. (3)	27. (3)	28. (4)
29. (3)	30. (3)	31. (3)	32. (3)
33. (3)	34. (3)	35. (3)	36. (2)
37. (2)	38. (4)	39. (4)	40. (2)
41. (4)	42. (2)	43. (1)	44. (2)
45. (3)	46. (3)	47. (3)	48. (2)
49. (4)	50. (4)	51. (1)	52. (2)
53. (3)	54. (2)	55. (1)	56. (1)
57. (3)	58. (3)	59. (1)	60. (2)
61. (4)	62. (1)	63. (1)	64. (4)
65. (2)	66. (3)	67. (2)	68. (2)
69. (1)	70. (4)	71. (1)	72. (1)
73. (3)	74. (3)	75. (2)	76. (1)
77. (3)	78. (2)	79. (1)	80. (1)
81. (4)	82. (4)	83. (4)	84. (2)
85. (3)	86. (2)	87. (2)	88. (4)
89. (2)	90. (2)	91. (3)	92. (4)
93. (2)	94. (1)	95. (1)	96. (3)
97. (1)	98. (3)	99. (3)	100. (3)
101. (3)	102. (3)	103. (4)	104. (2)

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EXPLANATIONS

TYPE-I

1. (4) $\frac{7}{6}=1.166$; $\frac{7}{9}=0.777$

$\frac{4}{5}=0.8$ and $\frac{5}{7}=0.714$

Therefore, the smallest number is $\frac{5}{7}$

2. (1) $\frac{9}{13}=\frac{9\times4}{13\times4}=\frac{36}{52}$

$\frac{17}{26}=\frac{17\times2}{26\times2}=\frac{34}{52}$

$\frac{33}{52}=\frac{33}{52}$

Among these $\frac{33}{52}$ is the smallest

Again, $\frac{28}{29}=\frac{56}{58}>\frac{36}{52}$

3. (4) The smallest possible three-place decimal number = 0.001

4. (4) $\frac{8}{15},\frac{14}{33},\frac{7}{13},\frac{11}{18}$

$\frac{8}{15}=0.533\overline{3}$

$\frac{14}{33}=0.\overline{42}$

$\frac{7}{13}=0.538$

$\frac{11}{13}=0.846$

$\therefore \frac{11}{13}>\frac{7}{13}>\frac{8}{15}>\frac{14}{33}$

5. (4) $\frac{8}{25}=0.32$, $\frac{7}{23}=0.30$

$\frac{11}{23}=0.47$, $\frac{14}{53}=0.26$

$\therefore \frac{14}{53}$ is the smallest fraction.

6. (4) The decimal equivalents of :

$\frac{6}{7}=0.857$, $\frac{5}{6}=0.833$,

$\frac{7}{8}=0.875$, $\frac{4}{5}=0.8$

Obviously, 0.875 is the greatest.

$\therefore \frac{7}{8}$ is the largest fraction.

7. (4) The smallest number of 5 digits = 10000

Now,

```
476)10000(21
   952
   ---
   480
   476
   ---
     4
```

$\therefore$ Required number = 10000 + (476 – 4)

= 10000 + 472 = 10472

8. (2) $\frac{15}{16}=0.94$; $\frac{19}{20}=0.95$

$\frac{24}{25}=0.96$; $\frac{34}{35}=0.97$

9. (1) $\frac{2}{3}=0.67$; $\frac{5}{6}=0.83$

$\frac{11}{15}=0.73$; $\frac{7}{8}=0.875$

10. (2) Decimal equivalents :

$\frac{4}{9}=0.\dot{4}$; $\sqrt{\frac{9}{49}}=\frac{3}{7}=0.43$

$0.4\dot{5}$; $(0.8)^2=0.64$

$\therefore$ Least number = 0.43

$=\sqrt{\frac{9}{49}}$

11. (2) $0.9=\frac{9}{10}$; $0.\overline{9}=\frac{9}{9}=1$,

$0.0\overline{9}=\frac{9}{90}=\frac{1}{10}$;

$0.\overline{09}=\frac{9}{99}=\frac{1}{11}$

12. (2) $\frac{2}{7}=0.286$; $\frac{1}{3}=0.33$

$\frac{5}{6}=0.833$; $\frac{3}{4}=0.75$

13. (2) The smallest number of 5 digits = 10000

Remainder on dividing 10000 by 123 = 37

$\therefore$ Required number

= 10000 + (123 – 37) = 10086

14. (3) $(0.1)^2=0.01$

$\sqrt{0.0121}=\sqrt{0.11\times0.11}=0.11$

$\sqrt{0.0004}=0.02$

$\Rightarrow 0.01<0.02<0.11<0.12$

15. (4) LCM of 3, 2 and 6 = 6

$\therefore (3)^{\frac{1}{3}}=(3^2)^{\frac{1}{6}}=(9)^{\frac{1}{6}}$

$2^{\frac{1}{2}}=\left(2^3\right)^{\frac{1}{6}}=(8)^{\frac{1}{6}}$

$(1)^{\frac{1}{6}}=1$; $(6)^{\frac{1}{6}}=(6)^{\frac{1}{6}}$

16. (4)
```
  5  A  7
  3  3  5
 ---------
  8  B  2
```

$\Rightarrow$ A $\rightarrow$ 1, 2, 3, 4, 5 &

B $\rightarrow$ 5, 6, 7, 8, 9

8B2 is exactly divisible by 3.

$\therefore$ 8 + B + 2 = multiple of 3

$\therefore$ B = 5 or 8 $\Rightarrow$ A = 1 or 4

17. (4) If the number be x, then

$x-31=75-x$

$\Rightarrow 2x=75+31=106$

$\Rightarrow x=53$

18. (2) $0.7+\sqrt{0.16}$

$=0.7+0.4=1.1$

$1.02-\frac{0.6}{24}$

$=1.02-0.025$

$=0.995$

$1.2\times0.83=0.996$

$\sqrt{1.44}=1.2$

Hence, the greatest number

$=\sqrt{1.44}$

19. (1) $\frac{2}{3}=0.66$

$\frac{3}{5}=0.6$

$\frac{8}{11}=0.73$

$\frac{11}{17}=0.65$

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20. (2) Let the three fractions be p, q and r, where $p < q < r$.

According to the question,

$$\frac{r}{p} = \frac{7}{6} \Rightarrow r = \frac{7}{6}p$$

Again, middle fraction

$$= q = \frac{7}{6} - \frac{1}{3} = \frac{7-2}{6} = \frac{5}{6}$$

$$\therefore p + q + r = 2\frac{11}{24}$$

$$\Rightarrow p + \frac{5}{6} + \frac{7}{6}p = \frac{59}{24}$$

$$\Rightarrow p + \frac{7p}{6} = \frac{59}{24} - \frac{5}{6}$$

$$\Rightarrow \frac{6p+7p}{6} = \frac{59-20}{24} = \frac{39}{24}$$

$$\Rightarrow 13p = \frac{39}{24} \times 6 = \frac{39}{4}$$

$$\Rightarrow p = \frac{39}{4 \times 13} = \frac{3}{4}$$

21. (1) Decimal equivalents of fractions :

$$\frac{4}{3} = 1.3$$

$$\frac{-2}{9} = -0.2$$

$$\frac{-7}{8} = -0.875$$

$$\frac{5}{12} = 0.42$$

$$\therefore -0.875 < -0.2 < 0.42 < 1.3$$

i.e., $\frac{-7}{8} < \frac{-2}{9} < \frac{5}{12} < \frac{4}{3}$

TYPE-II

1. (2) Required remainder = remainder got when 63 is divided by 29 = 5

2. (4) $\frac{1}{0.04} = \frac{100}{4} = 25$

3. (4) The number (x y z x y z) can be written, after giving corresponding weightage of the places at which the digits occur, as

$100000x + 10000y + 1000z + 100x + 10y + z$

$= 100100x + 10010y + 1001z$

$= 1001 (100x + 10y + z)$

Since 1001 is a factor, the number is divisible by 1001.

$7 \times 11 \times 13 = 1001$

As the number is divisible by 1001, it will also be divisible by all three namely, 7, 11 and 13 and not by only one of these because all three are factors of 1001.

So, the answer is 1001.

4. (1) $1000 = (45 \times 22) + 10$

$\therefore 45 - 10 = 35$ to be added.

So, the smallest number to be added to 1000 to make the sum exactly divisible by 45 is 35.

5. (2) Number $= xy\,xy\,xy$

$= xy \times 10000 + xy \times 100 + xy$

$= xy\,(10000 + 100 + 1)$

$= xy \times 10101$

6. (2) Quotient = 16

Divisor = $25 \times 16 = 400$

and remainder = 80

Dividend = Divisor × quotient + Remainder

$= 400 \times 16 + 80$

$= 6400 + 80 = 6480$

7. (2) Let the numbers be x and y.

$\therefore xy = 11520$

and $\frac{x}{y} = \frac{9}{5}$

$$\therefore xy \times \frac{x}{y} = 11520 \times \frac{9}{5}$$

$$\Rightarrow x^2 = 2304 \times 9$$

$$\Rightarrow x = \sqrt{2304 \times 9}$$

$\Rightarrow 48 \times 3 = 144$

From $\frac{x}{y} = \frac{9}{5}$ we have

$$y = \frac{5 \times 144}{9} = 80$$

$\therefore$ Required difference

$= 144 - 80 = 64$

8. (2) **Rule :** When the second divisor is factor of first divisor, the second remainder is obtained by dividing the first remainder by the second divisor.

Hence, on dividing 29 by 8, the remainder is 5.

9. (2) Let the given number be x. Then,

$$\left(x \times \frac{3}{2}\right) - \left(x + \frac{3}{2}\right) = 10$$

$$\Rightarrow \frac{3}{2}x - \frac{2}{3}x = 10$$

$$\Rightarrow \frac{9x - 4x}{6} = 10$$

$\Rightarrow 5x = 60 \Rightarrow x = 12$

10. (2) Here, 52 is a multiple of 13.

Hence, the required remainder is obtained on dividing 45 by 13.

Required remainder = 6.

11. (4) $\frac{13}{4} \times \frac{2}{3} - \left(\frac{9}{4} - \frac{5}{3}\right) \times \frac{3}{4}$

$$= \frac{13}{6} - \left(\frac{27-20}{12}\right) \times \frac{3}{4}$$

$$= \frac{13}{6} - \frac{7}{12} \times \frac{3}{4} = \frac{13}{6} - \frac{7}{16}$$

$$= \frac{104-21}{48} = \frac{83}{48}$$

12. (1) Let number (dividend) be X.

$\therefore X = 296 \times Q + 75$ where Q is the quotient and can have the values 1, 2, 3 etc.

$= 37 \times 8 \times Q + 37 \times 2 + 1$

$= 37\,(8Q + 2) + 1$

Thus we see that the remainder is 1.

[Remark : When the second divisor is a factor of the first divisor, the second remainder is obtained by dividing the first remainder by the second divisor. Hence, divide 75 by 37, the remainder is 1**].**

13. (3) The least number X in this case will be determined as follows:

4	X
5	Y – 1
	1 – 4

$Y = 5 \times 1 + 4 = 9$

$X = 4 \times Y + 1 = 4 \times 9 + 1 = 37$

Now,

5	37
4	7 – 2
	1 – 3

Hence, the respective remainders are 2, 3.

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14. (2) Remainder = 4
$\Rightarrow$ Divisor = 3 × 4 = 12
Again, divisor = 4 × quotient
$\Rightarrow$ 4 × quotient = 12
$\Rightarrow$ Quotient $= \frac{12}{4} = 3$
$\Rightarrow$ Dividend = 3 × 12 + 4 = 40

15. (4) Let the required number of persons be x.
According to the question,
$2x^2 = 3042$
or $x^2 = \frac{3042}{2} = 1521$
or $x = \sqrt{1521} = 39$

16. (2) Number just greater than 3 which is divisible by 7 = 7
Number just smaller than 200 which is divisible by 7 = 196
Here, $a = 7$, $a_n = 196$,
$d = 7$, $n = 8$
$\therefore a_n = a + (n-1)d$
$\Rightarrow 196 = 7 + (n-1) \times 7$
$\Rightarrow n - 1 = \frac{196-7}{7} = 27$
$\Rightarrow n = 27 + 1 = 28$
Note : We can find the answer after dividing 200 by 7. The quotient is our answer.

17. (4) Sum of first 60 numbers
$= \frac{60(60+1)}{2} = \frac{60 \times 61}{2} = 1830$
The number 1830 is divisible by 61.

18. (2) The least number (dividend) x is obtained as follows :

3	x
2	$y-1$
	$1-1$

$y = 2 \times 1 + 1 = 3$
$x = 3 \times 3 + 1 = 10$
When we divide 10 by 6, the remainder = 4

19. (3) Let the numbers be x and y and x is greater than y.
As given,
$xy = 9375$ ....(i)
Again,
$\frac{x}{y} = 15$
$\Rightarrow x = 15y$
$\therefore$ From equation (i),
$15y \times y = 9375$
$\Rightarrow y^2 = \frac{9375}{15} = 625$
$\Rightarrow y = \sqrt{625} = 25$
$\therefore x = 15y = 15 \times 25 = 375$
$\therefore x + y = 375 + 25 = 400$

20. (4) On dividing the given number by 119, let k be the quotient and 19 as remainder.
Then, number = $119k + 19$
$= 17 \times 7k + 17 \times 1 + 2$
$= 17(7k + 1) + 2$
Hence, the given number when divided by 17, gives $(7k + 1)$ as quotient and 2 as remainder.

21. (2) By the Binomial expansion we have
$(x+1)^n = x^n + {}^nC_1 x^{n-1} + {}^nC_2 x^{n-2} + \ldots\ldots + {}^nC_{n-1} x + 1$
Here, each term except the last term contains x. Obviously, each term except the last term is exactly divisible by x.
Following the same logic,
$7^{19} = (6+1)^{19}$ has each term except last term divisible by 6.
Hence, $7^{19} + 2$ when divided by 6 leaves remainder
$= 1 + 2 = 3$

22. (3) Here, 357 is exactly divisible by 17.
$\therefore$ Required remainder = Remainder obtained on dividing 39 by 17 = 5

23. (2) Number = 269 × 68
$= 269 \times (67 + 1)$
$= 269 \times 67 + 269$
Clearly, remainder is obtained on dividing 269 by 67 that is 1.

24. (4) The remainder will be same.
On dividing 9 by 6, remainder = 3
On dividing 81 by 6, remainder = 3

25. (2) Here, 893 is exactly divisible by 47.
Hence, the required remainder is obtained on dividing 193 by 47.
$\therefore$ Remainder = 5

26. (4) Let the least number be x.

13	x	Remainder
5	y	1
	1	3

$y = 5 \times 1 + 3 = 8$
$x = 13 \times 8 + 1 = 105$
On dividing 105 by 65, remainder = 40

27. (4) A number will be exactly divisible by 18 if it is divisible by 2 and 9 both. Clearly 65043 is not divisible by 2.
$\therefore$ Required number = 65043

28. (3) ×××)64329(×××
×××.....(i)
1752
××××.....(ii)
×1149
××××.....(iii)
×213

Number at (i) = 643 − 175 = 468
Number at (ii) = 1752 − 114
= 1638
Number at (iii) = 1149 − 213
= 936
Clearly, 468, 1638 and 936 are multiples of 234 and 234 > 213.
$\therefore$ Divisor = 234

29. (4) Let the quotient be Q and the remainder be R. Then
Divisor = 7 Q = 3 R
$\therefore$ Q $= \frac{3}{7}R = \frac{3}{7} \times 28 = 12$
$\therefore$ Divisor = 7 Q = 7 × 12 = 84
$\therefore$ Dividend = Divisor × Quotient + Remainder = 84 × 12 + 28 = 1008 + 28 = 1036

30. (3) Required divisor
$= 3 + 4 - 2 = 5$

31. (1) Let the number be $10x + y$
After interchanging the digits, the number obtained = $10y + x$
According to the question,
Resulting number
$= 10x + y + 10y + x$
$= 11x + 11y$
$= 11(x + y)$ which is exactly divisible by 11.

32. (4) If the quotient in the first case be x.
Then, number = $5x + 3$
On Squaring, the number
$= (5x + 3)^2$
$= 25x^2 + 30x + 9$
On dividing by 5, remainder
$= 9 - 5 = 4$

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33. (3) Here, the first divisor 192 is a multiple of second divisor 16.
∴ Required remainder
= remainder obtained by dividing 54 by 16 = 6

34. (4) If the first divisor be a multiple of the second divisor, then required remainder = remainder obtained by dividing the first remainder (36) by the second divisor (17) = 2

35. (3) First number (X) = $17x + 13$
Second number (Y) = $17y + 11$

$$\therefore \frac{X+Y}{17} = \frac{17(x+y)}{17} + \frac{13+11}{17}$$

∴ Required remainder
= Remainder obtained on dividing
11 + 13 i.e. 24 by 17 = 7

36. (4) Here, the first divisor (221) is a multiple of second divisor (13) Hence, required remainder
= remainder obtained on dividing 64 by 13 = 12

37. (4) Required remainder = Remainder obtained by dividing 2^2 by 5.
Remainder = 4

38. (3) $3^1 = 3$; $3^2 = 9$; $3^3 = 27$; $3^4 = 81$; $3^5 = 243$
i.e. unit's digit is repeated after index 4.
Remainder after dividing 21 by 4 = 1
∴ Unit's digit in the expansion of $(3)^{21} = 3$
∴ Remainder after dividing by 5 = 3

39. (1) Here, the first divisor i.e. 49 is multiple of second divisor i.e. 7.
∴ Required remainder = Remainder obtained on dividing 32 by 7 = 4

40. (1) Here, the first divisor (36) is exactly divisible by the second divisor (12).
∴ Required remainder
= Remainder obtained after 19 is divided by 12 = 7

41. (*) If $(x \pm 1)^n$ is divided by x, the remainder is $(\pm 1)^n$,
Now, $9^6 - 11 = (8 + 1)^6 - 11$
When it is divided by 8,
remainder = + 1 − 11 = − 10
When − 10 is divided by 8, remainder = − 2 i.e. − 2 + 8 = 6

42. (3) $(17)^{200} = (18 - 1)^{200}$
We know that
$(x + a)^n$
$= x^n + nx^{n-1}.a +$

$$+\frac{n(n-1)}{1\times 2}x^{n-2}a^2$$

$$+\frac{n(n-1)(n-2)}{1\times 2\times 3}x^{n-3}a^3 + \ldots + a^n$$

We see that all the terms on the R.H.S. except a^n has x as one of its factor and hence are divisible by x. So, $(x + a)^n$ is divisible by x or not will be decided by a^n.
Let x = 18, a = − 1
and n = 200
∴ $(18 - 1)^{200}$ is divisible by 18 or not will depend on $(-1)^{200}$ as all other terms in its expansion will be divisible by 18 because each of them will have 18 as one of their factors.
$(-1)^{200} = 1$ (∵ 200 is even)
1 is not divisible by 18 and is also less than 18.
∴ 1 is the remainder.

43. (2) $2^{31} = \left(2^8\right)^4 + 2 = (256)^4 \div 2$

$$= \frac{\ldots\ldots 6}{2} = \ldots\ldots 3$$

Clearly, the remainder will be 3 when divided by 5.
Illustration :
23 ÷ 5 gives remainder = 3
83 ÷ 5 gives remainder = 3

44. (2) Let the number be x.

$$\therefore \frac{x+12}{6} = 112$$

$$\Rightarrow x + 12 = 672$$

$$\Rightarrow x = 672 - 12 = 660$$

$$\therefore \text{Correct answer} = \frac{660}{6} + 12$$

= 110 + 12 = 122

45. (3) Here, 387 is a multiple of 43.
∴ Remainder obtained on dividing 48 by 43 i.e. 5 is the required remainder.

46. (4) If two numbers are separately divided by a certain divisor (d) leaving remainders r_1 and r_2, then remainder after their sum is divided by the same divisor.
$= r_1 + r_2 - d$
= 21 + 28 − 33 = 16

47. (4) Divisor = 5 × Remainder
= 5 × 46 = 230

$$\text{Quotient} = \frac{230}{10} = 23$$

∴ Dividend = Divisor × Quotient + Remainder
= 230 × 23 + 46
= 5290 + 46 = 5336

48. (2) Required remainder
= 16 − 12 = 4
(because 24 is a multiple of 12.)

49. (4) $2^{8n} - 4^{2n} = \left(2^6\right)^n - \left(4^2\right)^n$
$= 64^n - 16^n$
which is divisible by 64 − 16 = 48

50. (1) $4^{61} + 4^{62} + 4^{63}$
$= 4^{61}(1 + 4 + 4^2)$
$= 4^{61} \times 21$ which is divisible by 3.

51. (4) Let the unknown number be x.
∴ $71 \times x + 47 = 98 \times 7$
$\Rightarrow 71x = 686 - 47 = 639$

$$\Rightarrow x = \frac{639}{71} = 9 = 3 \times 3$$

52. (3) Of the given alternatives,
When 64 is divided by 3, remainder = 1
When 65 is divided by 5, remainder = 0

53. (2) Here, the first divisor (91) is a multiple of second divisor (13).
∴ Required remainder = Remainder obtained on dividing 17 by 13 = 4

54. (3) $x + y = 120$ ..... (i)

$$\frac{x}{y} = 5$$

$$\Rightarrow x = 5y$$

From, equation (i),
$5y + y = 120$
$\Rightarrow 6y = 120 \Rightarrow y = 20$
∴ $x = 120 - 20 = 100$
∴ Difference = 100 − 20 = 80

55. (2) Here, 280 is a multiple of 35.
∴ Required remainder
= Remainder obtained on dividing 115 by 35 = 10

56. (2) Here, first divisor (175) is a multiple of second divisor (25).
∴ Required remainder = Remainder obtained on dividing 132 by 25 = 7

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57. (3) We have to find such numbers which are divisible by 12 (LCM of 4 and 6).
Number of numbers divisible by 12 and lying between 1 to 600
$= \frac{600}{12} - 1 = 49$
Number of numbers divisible by 12 from 1 to 100 $= \frac{100}{12} = 8$
∴ Required answer
$= 49 - 8 = 41$

58. (2) $(x-2)$ is a factor of polynomial $P(x) = x^3 + x^2 - 5x + \lambda$.
∴ $P(2) = 0$ (i.e., on putting $x = 2$)
$\Rightarrow 2^3 + 2^2 - 5 \times 2 + \lambda = 0$
$\Rightarrow 8 + 4 - 10 + \lambda = 0$
$\Rightarrow \lambda + 2 = 0$
$\Rightarrow \lambda = -2$

59. (3) Required Number
$= 100x + 10y + z$
$\because 10y + z = 6m$
∴ Number $= 100x + 6m$, where m is a positive integer.
$= 2(50x + 3m)$

60. (4) If the first part be x, then second part $= 37 - x$.
$\therefore x \times 5 + (37 - x)\,11 = 227$
$\Rightarrow 5x + 407 - 11x = 227$
$\Rightarrow 6x = 407 - 227 = 180$
$\Rightarrow x = 30$
∴ Second part $= 7$

61. (1) $3^1 = 3$, $3^2 = 9$,
$3^3 = 27$, $3^4 = 81$
i.e. the unit's digit = odd number
∴ Hence, both numbers are divisible by 2.

62. (1) LCM of 4, 5 and 6 = 60
Quotient on dividing 800 by 60 = 13
Quotient on dividing 400 by 60 = 6
∴ Required answer = 13 − 6 = 7
Method 2 :
First number greater than 400 that is divisible by 60 = 420
Smaller number than 800 that is divisible by 60 = 780
It is an Arithmetic Progression with common difference = 60
By $t_n = a + (n-1)d$
$780 = 420 + (n-1) \times 60$
$\Rightarrow (n-1) \times 60 = 780 - 420$
$= 360$
$\Rightarrow (n-1) = 360 \div 60 = 6$
$\Rightarrow n = 6 + 1 = 7$

63. (1) The no. is of the form $(425x + 45)$ First divisor (425) is multiple of second divisor (17).
∴ Required remainder
= Remainder obtained on dividing 45 by 17 = 11

64. (4) Here, the first divisor (289) is a multiple of second divisor (17).
∴ Required remainder = Remainder obtained on dividing 18 by 17 = 1

65. (1) $n = 6q + 4$
$2n = 12q + 8$
Dividing 8 by 6 the remainder = 2

66. (4) If the remainder be x, then $(11284 - x)$ and $(7655 - x)$ are divisible by three digit number.
i.e. $(11284 - x) - (7655 - x)$
= 3629 is divisible by that number.
$3629 = 19 \times 191$
Hence, required number = 191
Sum of digits = 1 + 9 + 1 = 11

67. (1) Divisor $= 6 \times 2 = 12$
Again, Divisor = 3 × quotient
$\therefore$ Quotient $= \frac{12}{3} = 4$
Dividend $= 12 \times 4 + 2$
$= 48 + 2 = 50$

68. (3) $2^{16} - 1 = (2^8)^2 - 1$
$= (2^8+1)(2^8-1)$
$= (256 + 1)(256 - 1)$
$= 257 \times 255$ which is exactly divisible by 17.

69. (3)
$$\begin{array}{r|l} 11 & 803642(73058 \\ & \underline{77} \\ & 33 \\ & \underline{33} \\ & \times 64 \\ & \underline{55} \\ & 92 \\ & \underline{88} \\ & 4 \end{array}$$
∴ The required number
$= 11 - 4 = 7$
Method 2 :
Sum of digits at odd places = 2 + 6 + 0 = 8, sum of digits at even places = 4 + 3 + 8 = 15. For divisibility by 11, difference i.e., (15 − 8) = 0 or mutiple of 11.
∴ The required number = 7

70. (3) $5^{71} + 5^{72} + 5^{73}$
$= 5^{71}(1 + 5 + 5^2)$
$= 5^{71} \times 31$ which is exactly divisible by 155.

71. (2) $[n] < n$ (integer); $(n) > n$ (integer)
∴ Expression
$= 2 \times 1 - 2 + 1 + 2 = 2$

72. (2) Required number
$= 1.1 - 0.01 = 1.09$

73. (1) $999\,\frac{998}{999} \times 999$
$= \left(999 + \frac{998}{999}\right) \times 999$
$= 999^2 + 998$
$= (1000 - 1)^2 + 998$
$= 1000000 - 2000 + 1 + 998$
$= 998999$

74. (2) Expression
$= 2^{71}(1 + 2 + 4 + 8)$
$= 2^{71} \times 15 = 2^{71} \times 3 \times 5$
Which is exactly divisible by 10.

75. (1) Let required number be x.
$\therefore 0.022 \times x = 66$
$\Rightarrow x = \frac{66}{0.022} = 3000$

76. (4) $3^{25} + 3^{26} + 3^{27} + 3^{28}$
$= 3^{25}(1 + 3 + 3^2 + 3^3)$
$= 3^{25}(1 + 3 + 9 + 27)$
$= 3^{25} \times 40$, which is clearly divisible by 30.

77. (2) ∴ Required sum
$= 0.3\overline{467} + 0.1\overline{333} = 0.4\overline{801}$
Illustration $= \begin{array}{r|l|l} 0.34 & 67 & 67 \\ 0.13 & 33 & 33 \\ \hline 0.48 & 01 & 00 \end{array}$

78. (3) **Tricky Approach**
Taking approximate values, we have
$\frac{3 \times 4126 \times 3}{64 \times 2835} = 0.2046 \approx 0.2$

79. (2) Expression
$= \frac{1}{7} + \left(999 + \frac{692}{693}\right) \times 99$
$= \frac{1}{7} + 999 \times 99 + \frac{692}{693} \times 99$
$= \frac{1}{7} + (1000 - 1)\,99 + \frac{692}{7}$

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$= \frac{1}{7} + \frac{692}{7} + 99000 - 99$

$= \frac{693}{7} + 99000 - 99$

$= 99 + 99000 - 99 = 99000$

80. (4) $x^n - a^n$ is exactly divisible by $(x-a)$ if n is odd.
$\therefore (49)^{15} - (1)^{15}$ is exactly divisible by 49–1 = 48, that is a multiple of 8.

81. (3) $a^4 - b^4 = (a^2)^2 - (b^2)^2 = (a^2 + b^2)(a^2 - b^2) = (a^2 + b^2)(a + b)(a - b)$
Let $a = 3, b = 1$
$\therefore$ Required number
$= (3 + 1)(3 - 1) = 8$

82. (1) Let $m = n = p$ and $m - n = 2p$
$m + n = 2p$ ...
$\therefore (m - n)(m + n) = 4p^2$
$\Rightarrow m^2 - n^2 = 4p^2$

83. (3) A number is divisible by 9, if sum of its digits is divisible by 9. Let the number be x.
$\Rightarrow 5 + 4 + 3 + 2 + x + 7$
$= 21 + x$
$\therefore x = 6$

84. (1) A number is divisible by 9 if the sum of its digits is divisible by 9.
Here, 6 + 7 + 0 + 9 = 22
Now, 22 + 5 = 27, which is divisible by 9. Hence 5 must be added to 6709.

85. (2) A number is divisible by 9 and 6 both, if it is divisible by LCM of 9 and 6 i.e., 18. Hence, the numbers are 108, 126, 144, 162, 180, 198.

86. (2) First 3-digit number divisible by 6 = 102
Last such 3-digit number =996
$\therefore 996 = 102 + (n-1)6$
$\Rightarrow (n-1)6 = 996 - 102 = 894$

$\Rightarrow n - 1 = \frac{894}{6} = 149$

$\Rightarrow n = 150$

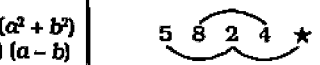
87. (2) $n^3 - n = n(n^2 - 1)$
$= n(n + 1)(n - 1)$
For $n = 2$, $n^3 - n = 6$

88. (3) $n^3 - n = n(n + 1)(n - 1)$
$n = 1$, $n^3 - n = 0$
$n = 2$, $n^3 - n = 2 \times 3 = 6$
$n = 3$, $n^3 - n = 3 \times 4 \times 2 = 24$
$n = 4$, $n^3 - n = 4 \times 5 \times 3 = 60$
60 + 6 = 10

89. (3) Number $= 100x + 10y + z$
Sum of digits $= x + y + z$
Difference $= 100x + 10y + z - x - y - z$
$= 99x + 9y = 9(11x + y)$

90. (3) divisible by (11 x 13)

91. (3) Any number is divisible by 11 when the differences of alternative digits is 0 or multiple of 0, 11 etc. Here,



$5 + 2 + \star = 7 + \star$
$8 + 4 = 12$
$\therefore \star = 12 - 7 = 5$

92. (4) A number is divisible by 11, if the difference of the sum of its digits at odd places and the sum of its digits of even places, is either 0 or a number divisible by 11.
$\therefore (5 + 9 + * + 7) - (4 + 3 + 8) = 0$ or multiple of 11
$\Rightarrow 21 + * - 15$
$\therefore * + 6 =$ a multiple of 11
$\therefore * = 5$

93. (4) A number is divisible by 11, if the difference of sum of its digits at odd places and the sum of its digits at even places is either 0 or a number divisible by 11.
Difference
$= (4 + 3 + 7 + 8) - (2 + 8 + \star)$
$= 22 - 10 - \star$
$= 12 - \star$
Clearly, $\star = 1$

94. (4) A number is divisible by 11 if the difference of the sum of digits at odd and even places be either zero or multiple of 11.
If the middle digit be 4, then 24442 or 244442 etc are divisible by 11.

95. (2) $n^2(n^2-1) = n^2(n + 1)(n - 1)$
Now, we put values $n = 2, 3.....$
When $n = 2$
$\therefore n^2(n^2 - 1) = 4 \times 3 \times 1 = 12$, which is a multiple of 12
When n = 3.
$n^2(n^2 - 1) = 9 \times 4 \times 2 = 72$,
which is also a multiple of 12. etc.

96. (4) Let the unit digit be x and ten's digit be y.
$\therefore$ Number
$= 1000y + 100x + 10y + x$
$= 1010y + 101x = 101(10y + x)$
Clearly, this number is divisible by 101, which is the smallest three-digit prime number.

97. (2) The least number of 5 digits = 10000

41)10000(243
82
180
164
160
123
37

$\therefore$ Required number
$= 10000 + (41 - 37)$
$= 10004$

98. (1) $2^{96} + 1 = (2^{32})^3 + 1^3$
$= (2^{32}+1)(2^{64} - 2^{32} + 1)$
Clearly, $2^{32}+1$ is a factor of $2^{96}+1$

99. (4) For $n = 1$
$n^4 + 6n^3 + 11n^2 + 6n + 24$
$= 1 + 6 + 11 + 6 + 24 = 48$
For $n = 2$
$n^4 + 6n^3 + 11n^2 + 6n + 24$
$= 16 + 48 + 44 + 12 + 24$
$= 144$ which is divisible by 48.
Clearly, 48 is the required number.

100. (2) When we divide 1000 by 225, quotient = 4
When we divide 5000 by 225, quotient = 22
$\therefore$ Required answer = 22 – 4 = 18

101. (3) $(n^3 - n)(n - 2)$
$= n(n - 1)(n + 1)(n - 2)$
When $n = 3$,
Number $= 3 \times 2 \times 4 = 24$

102. (1) LCM of 16 and 18 = 144
Multiple of 144 that is less than 1500 = 1440

103. (2) The largest 4-digit number = 9999

345)9999(28
690
3099
2760
339

$\therefore$ Required number = 345 – 339 = 6

104. (2) $4^{61} + 4^{62} + 4^{63} + 4^{64}$
$= 4^{61}(1 + 4 + 4^2 + 4^3)$
$= 4^{61}(1 + 4 + 16 + 64)$
$= 4^{61} \times 85$
Which is a multiple of 10.

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105. (2) Let the number be $10x + y$ where $y < x$.
Number obtained by interchanging the digits $= 10y + x$
$\therefore$ Difference $= 10x + y - 10y - x$
$= 9x - 9y = 9(x - y)$
Hence, the difference is always exactly divisible by 9.

106. (3) Check through option

$$\frac{303375}{25} = \frac{303375 \times 4}{25 \times 4}$$

$$= \frac{1213500}{100} = 12135$$

A number is divisible by 25 if the last two digits are divisible by 25 or zero.

107. (1) $307 \times 32 = 9824$
$307 \times 33 = 10131$
$\therefore$ Required number
$= 10131 - 9999 = 132$

108. (1) $a = 4011$, $b = 3989$
$\therefore ab = 4011 \times 3989$
$= (4000 + 11)(4000 - 11)$
$= (4000)^2 - (11)^2$
$= 16000000 - 121$
$= 15999879$

109. (2) Expression $= 3^{2n} + 9n + 5$
$= (3^{2n} + 9n + 3) + 2$
$= 3(3^{2n-1} + 3n + 1) + 2$
Clearly, remainder $= 2$

110. (1) $12x - 61 \le 6 \Rightarrow 12x \le 61 + 6$

$$\Rightarrow 12x < 67 \Rightarrow x \le \frac{67}{12}$$

$\Rightarrow x < 6$ (Approx.)

111. (3) Resulting number $= 3957 + 5349 - 7062 = 2244$ which is divisible by 4, 3 and 11.
$2244 \div 4 = 561$
$2244 \div 3 = 748$
$2244 \div 11 = 204$

112. (3) Prime numbers between 80 and 90.
$= 83$ and 89
$\therefore$ Required product $= 83 \times 89$
$= 7387$

113. (2) When $n = 2$,
$6^n - 1 = 6^2 - 1 = 36 - 1 = 35$
When, $n =$ an even number,
$a^n - b^n$ is always divisible by $(a^2 - b^2)$.

114. (2) Total number of marbles $= x + x + 3 + x - 3 = 3x$
$\therefore 3x = 15 \Rightarrow x = 5$

115. (3)
Bucket + full water $= 17$ kg.
Bucket + $\frac{1}{2}$ water $= 13.5$ kg.
– – –
$\frac{1}{2}$ water $= 3.5$ kg.
$\therefore$ Water $= 2 \times 3.5 = 7$ kg.
$\therefore$ Weight of empty bucket
$= 17 - 7 = 10$ kg.

116. (4) A cow and a hen each has a head.
If the total number of cows be x, then
Number of hens $= 180 - x$
A cow has four legs and a hen has two legs.
$\therefore (180 - x) \times 2 + 4x = 420$
$\Rightarrow 360 - 2x + 4x = 420$
$\Rightarrow 2x = 420 - 360 = 60$

$$\Rightarrow x = \frac{60}{2} = 30$$

117. (4) On putting $n = 1$
$n(n+1)(n+2) = 1 \times 2 \times 3 = 6$

118. (2) $2736 \div 24 = 114$
Hence, first divisor (2736) is a multiple of second divisor (24).
$\therefore$ Required remainder
= Remainder obtained on dividing 75 by 24 = 3

119. (2) 5 E9 + 2 F8 + 3 G7 = 1114
Value of 'F' will be maximum if the values of E and G are minimum.
$\therefore$ 509 + 2 F8 + 307 = 1114
$\Rightarrow$ 2 F8 = 1114 – 509 – 307 = 298
$\Rightarrow$ F = 9

120. (4) Let four numbers be a, b, c and d respectively.
$\therefore a + b + c + d = 48$ .....(i)
and,
$a + 5 = b + 1 = c - 3 = d - 7 = x$ (let)
$\therefore a = x - 5$; $b = x - 1$,
$c = x + 3$, $d = x + 7$
From equation (i),
$x - 5 + x - 1 + x + 3 + x + 7 = 48$
$\Rightarrow 4x + 4 = 48$
$\Rightarrow 4x = 48 - 4 = 44$

$$\Rightarrow x = \frac{44}{4} = 11$$

$\therefore a = x - 5 = 11 - 5 = 6$
$b = x - 1 = 11 - 1 = 10$
$c = x + 3 = 11 + 3 = 14$
$d = x + 7 = 11 + 7 = 18$

121. (2) 27) 2055 (76
189
165
162
3
$\therefore$ Required number $= 27 - 3 = 24$

122. (2) Sum of first n natural numbers

$$= \frac{n(n+1)}{2}$$

$\therefore$ Required average

$$= \frac{n(n+1)}{2 \times n} = \frac{n+1}{2}$$

123. (3) Here, the first divisor (361) is a multiple of second divisor (19).
$\therefore$ Required remainder = Remainder obtained on dividing 47 by 19 = 9

124. (3) Largest number $= 3995$
Smallest number $= 3005$
Difference $= 3995 - 3005 = 990$

125. (2) Let the numbers be x and y.
According to the question,
$x + y = 75$
$x - y = 25$
$\because (x+y)^2 - (x-y)^2 = 4xy$
$\Rightarrow 75^2 - 25^2 = 4xy$
$\Rightarrow 4xy = (75 + 25)(75 - 25)$
$\left[\because a^2 - b^2 = (a+b)(a-b)\right]$
$\Rightarrow 4xy = 100 \times 50$

$$\Rightarrow xy = \frac{100 \times 50}{4} = 1250$$

126. (4) Required difference
$= 97 - 2 = 95$

TYPE-III

1. (3) $\because$ 135 Litres $= \frac{1}{4}$th part

$$180 \text{ Litres} = \frac{1}{4} \times \frac{180}{135} = \frac{1}{3}$$

2. (1) $? = 369 \times \frac{1}{2} \times \frac{2}{3} = 123$

3. (3) Let the number be x.
$\therefore$ According to question,

$$\frac{x}{5} - \frac{x}{7} = 10 \Rightarrow \frac{7x - 5x}{35} = 10$$

$$\Rightarrow \frac{2x}{35} = 10$$

$$\Rightarrow x = \frac{10 \times 35}{2} = 175$$

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4. (2) Let the amount be ₹ x

$\therefore$ According to question,

$$\frac{8}{3}x-\frac{3}{8}x=55$$

$$\Rightarrow \frac{64x-9x}{24}=55$$

$$\Rightarrow \frac{55x}{24}=55 \text{ or, } x=₹\,24$$

5. (1) Let the total number of students in a class be x

$\therefore$ According to question,

$$\text{Number of girls} = \frac{3}{5}x$$

$$\text{and number of boys} = x-\frac{3x}{5}$$

$$=\frac{2}{5}x$$

Number of girls who are absent

$$=\frac{3}{5}\times\frac{2}{9}x=\frac{6x}{45}$$

and number of boys who are absent

$$=\frac{2}{5}\times\frac{1}{4}\times x=\frac{x}{10}$$

$\therefore$ Total number of students who are present

$$=x-\frac{6x}{45}-\frac{x}{10}$$

$$=\frac{(90-12-9)x}{90}$$

$$=\frac{69x}{90}=\frac{23x}{30}$$

Therefore, the $\frac{23}{30}$ part of the students are present in the class.

6. (4) Let the longer part be x

$\therefore$ According to question,

$$\text{Shortest part} = \frac{2x}{3}$$

$$\therefore\ x+\frac{2}{3}x=85\text{m}$$

$$\Rightarrow \frac{3x+2x}{3}=85$$

$$\Rightarrow \frac{5x}{3}=85$$

$$\therefore x=51\text{m}$$

7. (1) $\frac{2}{5}$ and $\frac{4}{9}$ = 0.40 and 0.44

Fraction between these two

$$=\frac{3}{7}=0.42$$

8. (1) $\frac{2}{3}\times\frac{3}{4}=\frac{1}{2}$

9. (1) Suppose required number is x Then,

$$3x-\frac{3x}{5}=60 \Rightarrow \frac{12x}{5}=60$$

$$\Rightarrow x=\frac{60\times5}{12}=25$$

10. (4) $\frac{1}{2}$ of 1%

$$=\frac{1}{2}\times\frac{1}{100}=\frac{0.01}{2}=0.005$$

11. (1) Remaining race

$$=5-1\frac{1}{4}\text{ laps}$$

$$=5-\frac{5}{4}\text{laps}=\frac{15}{4}\text{laps}$$

12. (2) Given

$$\frac{a}{b}\times\frac{c}{d}=\frac{14}{15} \quad \text{...(i)}$$

$$\frac{a}{b}\times\frac{d}{c}=\frac{35}{24} \quad \text{...(ii)}$$

Now multiplying both the equations

$$\frac{ac}{bd}\times\frac{ad}{bc}=\frac{14}{15}\times\frac{35}{24}$$

$$\Rightarrow \frac{a^2}{b^2}=\frac{49}{36}\Rightarrow\frac{a}{b}=\frac{7}{6}$$

$$\therefore \frac{c}{d}=\frac{\frac{14}{15}}{\frac{7}{6}}=\frac{4}{5}$$

But the greater fraction is $\frac{7}{6}$.

13. (1) Let the fraction be x.

$$\therefore \frac{4x}{7}+\frac{4}{7}=\frac{15}{14}$$

$$\Rightarrow \frac{4x}{7}=\frac{15}{14}-\frac{4}{7}=\frac{15-8}{14}=\frac{1}{2}$$

$$\Rightarrow x=\frac{1}{2}\times\frac{7}{4}=\frac{7}{8}$$

14. (2) Let the value of estate be ₹ x

According to the question

$$\frac{4}{5}\text{ of } x = 16800$$

$$\therefore x=\frac{16800\times5}{4}=₹\,21000$$

$$\therefore \frac{3}{7}\text{ of the value} = 21000\times\frac{3}{7}$$

$$=3000\times3=₹\,9000$$

15. (2) Let the fraction = x

According to the question;

$$\frac{6}{7}\text{of } x=\frac{x}{\frac{6}{7}}-\frac{13}{70}$$

$$\Rightarrow \frac{6x}{7}=\frac{7x}{6}-\frac{13}{70}$$

$$\Rightarrow \frac{7x}{6}-\frac{6x}{7}=\frac{13}{70}$$

$$\Rightarrow \frac{49x-36x}{42}=\frac{13}{70}$$

$$\Rightarrow \frac{13x}{42}=\frac{13}{70}$$

$$\therefore x=\frac{13\times42}{70\times13}=\frac{3}{5}$$

16. (3) Let the number is x.

According to the question

$$\frac{1}{2}\text{of}\frac{3}{4}\text{of } x = 2\frac{1}{2}\text{ of } 10$$

$$\Rightarrow \frac{3x}{8}=\frac{5}{2}\times10$$

$$\Rightarrow x=\frac{5\times10\times8}{3\times2}=\frac{200}{3}=66\frac{2}{3}$$

17. (4) Let the number be x.

$$\therefore \frac{x}{3\times4}=15$$

$$\Rightarrow x=15\times3\times4=180$$

Now, required number

$$=\frac{3}{10}x=\frac{3}{10}\times180=54$$

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18. (2) 1 day = 24×60 minutes

$\therefore$ Required fraction

$$= \frac{45}{24\times60} = \frac{1}{32}$$

19. (1) Let the numerator = x and denominator = y

$\therefore$ Fraction

$$= \frac{x}{y} \text{ and } \frac{x}{y+1} = \frac{1}{2}$$

$$\Rightarrow 2x = y+1 \Rightarrow x = \frac{y+1}{2}$$

$$\frac{x+1}{y} = 1 \Rightarrow x+1 = y$$

$$\Rightarrow \frac{y+1}{2} + 1 = y$$

$$\Rightarrow \frac{y+1+2}{2} = y$$

$$\Rightarrow y+3 = 2y \Rightarrow y = 3$$

$$x+1 = 3 \Rightarrow x = 2$$

$$\therefore xy = 2\times3 = 6$$

20. (2) Let the number = x

$$\therefore x\times\frac{5}{6} - x\times\frac{5}{16} = 250$$

$$\Rightarrow \frac{40x-15x}{48} = 250$$

$$\Rightarrow \frac{25x}{48} = 250$$

$$\Rightarrow x = \frac{250\times48}{25} = 480$$

21. (2) Let the number be x.

According to the question,

$$x = \frac{x}{5} + 20 \Rightarrow x - \frac{x}{5} = 20$$

$$\Rightarrow \frac{4x}{5} = 20$$

$$\Rightarrow x = \frac{20\times5}{4} = 25$$

22. (2) Let the number be x.

$$\therefore \frac{2}{3}x = \frac{25}{216x} \Rightarrow x^2 = \frac{25\times3}{2\times216}$$

$$\therefore x = \sqrt{\frac{25\times3}{2\times216}} = \sqrt{\frac{25}{144}} = \frac{5}{12}$$

23. (1) Let the length of bamboo be x metres.

$\therefore$ Length of bamboo above water

$$= x - \frac{x}{10} - \frac{5x}{8}$$

$$= \frac{40x-4x-25x}{40} = \frac{11x}{40}$$

According to the question,

$$\frac{11x}{40} = 2.75$$

$$\Rightarrow x = \frac{2.75\times40}{11} = 10 \text{ metres.}$$

24. (3) Let the man's income be ₹ x

According to the question,

$$x - \frac{x}{3} - \frac{2x}{5} - \frac{1x}{5} = 400$$

$$\text{or } x\left(1 - \frac{1}{3} - \frac{2}{5} - \frac{1}{5}\right) = 400$$

$$\text{or } x\left(\frac{15-5-6-3}{15}\right) = 400$$

$$\text{or } x\times\frac{1}{15} = 400$$

$$\text{or } x = 15\times400 = ₹\,6000$$

25. (4) $0.\overline{47} = \frac{47}{99}$

26. (2) $\frac{\frac{6}{7}}{8} = \frac{6\times8}{7} = \frac{48}{7}$

$$\frac{\frac{6}{7}}{8} = \frac{6}{7\times8} = \frac{3}{28}$$

$\therefore$ Required difference

$$= \frac{48}{7} - \frac{3}{28}$$

$$= \frac{192-3}{28} = \frac{189}{28} = \frac{27}{4} = 6\frac{3}{4}$$

27. (2) Let the number be x.

According to the question

$$\frac{x}{9} - \frac{x}{10} = 4$$

$$\Rightarrow \frac{10x-9x}{90} = 4$$

$$\Rightarrow x = 90\times4 = 360$$

28. (2) $0.4\overline{23} = \frac{423-4}{990} = \frac{419}{990}$

29. (3) Decimal equivalent of :

$$\frac{3}{4} = 0.75 \text{ and } \frac{5}{6} = 0.833$$

Now, $\frac{2}{3} = 0.66$, $\frac{1}{2} = 0.5$,

$\frac{4}{5} = 0.8$ and $\frac{9}{10} = 0.9$

Clearly, $\frac{4}{5}$ lies between $\frac{3}{4}$ and $\frac{5}{6}$.

30. (4) Let the tin contain x bottles of oil.

As given,

$$\frac{4}{5}x - 6 + 4 = \frac{3}{4}x$$

$$\Rightarrow \frac{4}{5}x - \frac{3}{4}x = 2$$

$$\Rightarrow \left(\frac{16-15}{20}\right)x = 2$$

$$\Rightarrow \frac{x}{20} = 2$$

$$\Rightarrow x = 2\times20 = 40$$

$\therefore$ The tin can contain 40 bottles.

31. (1) Let the required number be x.

As given,

$$\Rightarrow x\times\frac{5}{4} - x\times\frac{5}{14} = 25$$

$$\Rightarrow 5x\left(\frac{1}{4} - \frac{1}{14}\right) = 25$$

$$\Rightarrow 5x\left(\frac{7-2}{28}\right) = 25 \Rightarrow 5x\times\frac{5}{28} = 25$$

$$\Rightarrow x = \frac{25\times28}{5\times5} = 28$$

32. (2) Let the number be x.

Then,

$$\frac{3}{4}x - \frac{3}{14}x = 150$$

$$\Rightarrow \frac{21x-6x}{28} = 150$$

$$\Rightarrow 15x = 28\times150$$

$$\Rightarrow x = \frac{28\times150}{15} = 280$$

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33. (2) Let the fractions be x and y, where $x > y$

$\therefore xy = \frac{14}{15}$ and $\frac{x}{y} = \frac{35}{24}$

$\therefore xy \times \frac{x}{y} = \frac{14}{15} \times \frac{35}{24}$

$\Rightarrow x^2 = \frac{49}{36}$

$\Rightarrow x = \frac{7}{6}$

34. (3) The required fraction is $\frac{4}{5}$,

because $\frac{5}{4} - \frac{4}{5} = \frac{25-16}{20} = \frac{9}{20}$

35. (2) Let the fraction be x,
According to the question,

$\frac{x}{\frac{3}{5}} - x \times \frac{3}{5} = \frac{32}{75}$

$\Rightarrow \frac{5x}{3} - \frac{3x}{5} = \frac{32}{75}$

$\Rightarrow \frac{25x-9x}{15} = \frac{32}{75}$

$\Rightarrow \frac{16x}{15} = \frac{32}{75}$

$\Rightarrow x = \frac{32}{75} \times \frac{15}{16} = \frac{2}{5}$

Correct answer $= \frac{2}{5} \times \frac{3}{5} = \frac{6}{25}$

36. (2) Required number

$= \frac{3+1}{2+5} = \frac{4}{7}$ or

$\frac{1}{2} = 0.5; \frac{3}{5} = 0.6$

$\frac{4}{7} = 0.57$

Clearly, $0.5 < 0.57 < 0.6$

37. (3) Let the number of pages in the book be x.
According to the question,

$\frac{2x}{5} + \frac{2x}{5} + \frac{x}{3} \times \frac{2}{5} + 15 = x$

$\Rightarrow \frac{4x}{5} + \frac{2x}{15} + 15 = x$

$\Rightarrow \frac{12x + 2x + 225}{15} = x$

$\Rightarrow 15x = 14x + 225$

$\Rightarrow 15x - 14x = 225$

$\Rightarrow x = 225$

38. (3) $0.121212 \ldots$

$= 0.\overline{12} = \frac{12}{99} = \frac{4}{33}$

39. (2) $0.\overline{001} = \frac{1}{999}$

40. (3) $1.\overline{27} = 1\frac{27}{99} = 1\frac{3}{11} = \frac{14}{11}$

41. (1) Let the number be x.

$\therefore \frac{x}{7} - \frac{x}{11} = 100$

$\Rightarrow \frac{11x - 7x}{11 \times 7} = 100$

$\Rightarrow 4x = 77 \times 100$

$\Rightarrow x = \frac{77 \times 100}{4} = 1925$

42. (1) $\frac{1}{15} + \frac{1}{35} + \frac{1}{63} + \frac{1}{99} + \frac{1}{143}$

$= \frac{1}{3 \times 5} \times \frac{1}{5 \times 7} + \frac{1}{7 \times 9}$

$+ \frac{1}{9 \times 11} + \frac{1}{11 \times 13}$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{5} + \frac{1}{5} - \frac{1}{7} + \frac{1}{7} - \frac{1}{9} + \frac{1}{9} - \frac{1}{11} + \frac{1}{11} - \frac{1}{13}\right)$

$= \frac{1}{2}\left(\frac{1}{3} - \frac{1}{13}\right) = \frac{1}{2}\left(\frac{13-3}{39}\right) = \frac{5}{39}$

43. (4) $2.\dot{5}\dot{2} = 2\frac{52}{99} = \frac{250}{99}$

$\therefore$ Required sum
$= 250 + 99 = 349$

44. (1) Let the length of the rod be x metres. According to the question,

$x - \left(\frac{x}{10} + \frac{x}{20} + \frac{x}{30} + \frac{x}{40} + \frac{x}{50} + \frac{x}{60}\right)$

$= 12.08$

$\Rightarrow x\left[1 - \left(\frac{60+30+20+15+12+10}{600}\right)\right]$

$= 12.08$

$\Rightarrow x\left(1 - \frac{147}{600}\right) = 12.08$

$\Rightarrow x\left(\frac{600-147}{600}\right) = 12.08$

$\Rightarrow x \times \frac{453}{600} = 12.08$

$\Rightarrow x = \frac{12.08 \times 600}{453} = 16$ m.

45. (4) Height of tree after 1 year

$= 64 + 64 \times \frac{1}{8} = 72$ cm

Height of tree after 2 years

$= 72 + 72 \times \frac{1}{8}$

$= 72 + 9 = 81$ cm

46. (1) Suppose total income $= ₹ x$

$\therefore x - \frac{x}{4} - \frac{2x}{3} = 630$

$\frac{x}{12} = 630 \quad \therefore x = 7560$

$\therefore$ House rent $= \frac{2}{3} \times 7560$

$= ₹ 5040$

47. (3) Required answer

$= \frac{\frac{125}{3}}{\frac{1}{6}} = \frac{125}{3} \times 6 = 250$

48. (2) $\frac{5}{8} = 0.625$; $\frac{7}{11} = 0.636$

$\frac{20}{30} = 0.666 \ldots$; $\frac{19}{30} = 0.633 \ldots$

49. (3) Let numerator be x, then denominator $= 11 - x$.

$\therefore$ Fraction $= \frac{x}{11-x}$

Again, $\frac{x+2}{11-x+2}$

$= \frac{x}{11-x} + \frac{1}{24}$

$\Rightarrow \frac{x+2}{13-x} - \frac{x}{11-x} = \frac{1}{24}$

$\Rightarrow \frac{11x - x^2 + 22 - 2x - 13x + x^2}{(13-x)(11-x)}$

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$= \frac{1}{24}$

$\Rightarrow \frac{22-4x}{(13-x)(11-x)} = \frac{1}{24}$

$\Rightarrow 528 - 96x = 143 - 24x + x^2$

$\Rightarrow x^2 + 72x - 385 = 0$

$\Rightarrow x^2 + 77x - 5x - 385 = 0$

$\Rightarrow x(x+77) - 5(x+77) = 0$

$\Rightarrow (x-5)(x+77) = 0 \Rightarrow x = 5$

$\therefore$ Denominator $= 11 - 5 = 6$

$\therefore$ Difference $= 6 - 5 = 1$

50. (2) Let the original fraction be $\frac{x}{x+3}$.

$\therefore \frac{x+7}{x+3-2} = 2$

$\Rightarrow x + 7 = 2x + 2$

$\Rightarrow x = 7 - 2 = 5$

$\therefore$ Required sum $= x + x + 3$

$= 2x + 3 = 10 + 3 = 13$

51. (1) Let the original fraction be $\frac{x}{y}$,

$\therefore \frac{x-1}{y-1} = \frac{1}{3} \Rightarrow 3x - 3 = y - 1$

$\Rightarrow 3x - y = 2$ .....(i)

Again, $\frac{x+1}{y+1} = \frac{1}{2} \Rightarrow 2x + 2 = y + 1$

$\Rightarrow 2x - y = -1$ ....(ii)

From equation (i) – (ii)

$3x - y - 2x + y = 2 + 1$

$\Rightarrow x = 3$

From equation (i)

$3 \times 3 - y = 2 \Rightarrow y = 9 - 2 = 7$

$\Rightarrow x + y = 3 + 7 = 10$

52. (4) Let the number be x.

$\frac{x}{7} - \frac{7x}{8} = 15$

$\Rightarrow \frac{8x}{7} - \frac{7x}{8} = 15$

$\Rightarrow \frac{64x - 49x}{56} = 15$

$\Rightarrow \frac{15x}{56} = 15$

$\Rightarrow x = 56$

$\therefore$ Sum of the digit $= 5 + 6 = 11$

53. (3) Let the given number be x.

$\therefore \frac{x}{\frac{8}{17}} - \frac{8x}{17} = 225$

$\Rightarrow \frac{17x}{8} - \frac{8x}{17} = 225$

$\Rightarrow \frac{289x - 64x}{136} = 225$

$\Rightarrow \frac{225x}{136} = 225 \Rightarrow x = 136$

54. (1) Let the original fraction be $\frac{x}{y}$.

$\therefore \frac{x+1}{y+1} = \frac{1}{4}$

$\Rightarrow 4x + 4 = y + 1$

$\Rightarrow 4x - y = -3$ ...(i)

In case II,

$\frac{x+2}{y+2} = \frac{1}{3}$

$\Rightarrow 3x + 6 = y + 2$

$\Rightarrow 3x - y = -4$ ...(ii)

By (i) – (ii),

$4x - y - 3x + y = -3 + 4$

$\Rightarrow x = 1$

From (i),

$4 \times 1 - y = -3 \Rightarrow y = 7$

$\therefore x + y = 1 + 7 = 8$

55. (2) Let the number be x.

$\therefore \frac{x}{5} + 4 = \frac{x}{4} - 10$

$\Rightarrow \frac{x}{4} - \frac{x}{5} = 10 + 4 = 14$

$\Rightarrow \frac{5x - 4x}{20} = 14$

$\Rightarrow x = 20 \times 14 = 280$

56. (2) Part of the property given away

$= \frac{1}{4} + \frac{1}{2} + \frac{1}{5}$

$= \frac{5+10+4}{20} = \frac{19}{20}$

57. (2) Unbroken tables

$= \frac{5}{6} \times 108 = 90$

Unbroken chairs $= \frac{3}{4} \times 132 = 99$

Unbroken pairs $= 90$

58. (2) $A + B + C + D = 60$

$A = \frac{B+C+D}{2}$

$\Rightarrow 3A = 60 \Rightarrow A = ₹ 20$

$B = \frac{A+C+D}{3}$

$\Rightarrow 4B = 60 \Rightarrow B = ₹ 15$

$C = \frac{A+B+D}{4}$

$\Rightarrow 5C = 60 \Rightarrow B = ₹ 12$

$D = 60 - (20 + 15 + 12) = ₹ 13$

59. (2) If the number of boys be x, and that of girls be y, then

$\frac{x}{10} = \frac{y}{4} \Rightarrow \frac{x}{y} = \frac{10}{4} = \frac{5}{2} = 5 : 2$

60. (1) Solve this question by options.

Original fraction $= \frac{7}{9}$

Adding 2 to numerator and denominator, fraction $= \frac{9}{11}$

Adding 3 to numerator and denominator, fraction $= \frac{10}{12}$

$= \frac{5}{6}$, which is correct.

61. (4) $\frac{3}{4} = \frac{3 \times 4}{4 \times 4} = \frac{12}{16}$

$\frac{3}{8} = \frac{6}{16}$

$\therefore \frac{6}{16}, \frac{7}{16}, \frac{8}{16}, \frac{9}{16}, \frac{10}{16}, \frac{11}{16}, \frac{12}{16}$

$\therefore$ Required rational number

$= \frac{9}{16}$

$\frac{12}{9}, \frac{7}{3}, \frac{16}{9}$ are all greater than 1,

only $\frac{9}{16} < 1$, hence it is the obvious choice)

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62. (2) Original fraction = $\frac{x-4}{x}$

In case II,

$8(x-4-2) = x+1$

$\Rightarrow 8x-48 = x+1$

$\Rightarrow 7x = 49 \quad \Rightarrow x = 7$

$\therefore$ Original fraction

$= \frac{7-4}{7} = \frac{3}{7}$

63. (3) Boys = x

Girls = $z-x$

$\therefore$ Part of girls = $\frac{z-x}{z} = 1-\frac{x}{z}$

64. (2) First part = x,

Second part = $50-x$

$\therefore \frac{1}{x}+\frac{1}{50-x} = \frac{1}{12}$

Put values of x from the given options. Otherwise

$\Rightarrow \frac{50-x+x}{x(50-x)} = \frac{1}{12}$

$\Rightarrow x(50-x) = 600$

$\Rightarrow x^2-50x+600 = 0$

$\Rightarrow x^2-30x-20x+600 = 0$

$\Rightarrow x(x-30)-20(x-30) = 0$

$\Rightarrow (x-20)(x-30) = 0$

$\Rightarrow x = 20$ or 30

65. (4) Number of seats in each bus = 10 (let)

Total passengers = $\frac{30\times 4}{5} = 24$

$\frac{1}{4}$ of the passengers leave the bus.

Remaining passengers

$= 24 \times \frac{3}{4} = 18$

$\therefore$ Required answer

$= \frac{18}{20} = \frac{9}{10}$

66. (2) $0.\overline{123} = \frac{123}{999} = \frac{41}{333}$

67. (2) 0.393939 .....

$= 0.\dot{3}\dot{9} = \frac{39}{99} = \frac{13}{33}$

68. (3) $\frac{1}{11} = 0.0909\ldots\ldots = 0.\overline{09}$

69. (2) $2.\overline{349} = \frac{2349-23}{990}$

$= \frac{2326}{990}$

70. (3) Expression

$= \frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}+\frac{1}{90}$

$= \frac{1}{4\times 5}+\frac{1}{5\times 6}+\frac{1}{6\times 7}+$

$\frac{1}{7\times 8}+\frac{1}{8\times 9}+\frac{1}{9\times 10}$

$= \left(\frac{1}{4}-\frac{1}{5}\right)+\left(\frac{1}{5}-\frac{1}{6}\right)\ldots+\left(\frac{1}{9}-\frac{1}{10}\right)$

$= \frac{1}{4}-\frac{1}{10} = \frac{5-2}{20} = \frac{3}{20}$

71. (1) $? = 1+\frac{1}{2}+\frac{1}{4}+\frac{1}{7}+\frac{1}{14}+\frac{1}{28}$

$= \frac{28+14+7+4+2+1}{28}$

$= \frac{28+28}{28} = 2$

72. (3) Expression

$= \frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\ldots+\frac{1}{132}$

$= \frac{1}{4\times 5}+\frac{1}{5\times 6}+\frac{1}{6\times 7}+\ldots+\frac{1}{11\times 12}$

$= \frac{1}{4}-\frac{1}{5}+\frac{1}{5}-\frac{1}{6}+\frac{1}{6}-\frac{1}{7}+\ldots+\frac{1}{11}-\frac{1}{12}$

$= \frac{1}{4}-\frac{1}{12} = \frac{3-1}{12} = \frac{2}{12} = \frac{1}{6}$

73. (3) The original property with Ram = ₹ x (let)

$\therefore$ Wife's share = Rs. $\frac{x}{3}$

Remaining property

$= x-\frac{x}{3} = ₹\ \frac{2x}{3}$

Daughter's share = $\frac{2x}{3}\times\frac{3}{5}$

$= ₹\ \frac{2x}{5}$

Son's share = $\frac{2x}{3}-\frac{2x}{5}$

$= \frac{10x-6x}{15} = ₹\ \frac{4x}{15}$

$\therefore \frac{4x}{15} = 6400$

$\Rightarrow 4x = 6400\times 15$

$\Rightarrow x = \frac{6400\times 15}{4} = ₹\ 24000$

74. (1) Let the number be x.

According to the question,

$x-\frac{2x}{5} = 75$

$\Rightarrow \frac{5x-2x}{5} = 75$

$\Rightarrow \frac{3x}{5} = 75$

$\Rightarrow x = \frac{75\times 5}{3} = 125$

75. (4) First number = x (let)

$\therefore$ Second number = $\frac{2x}{5}$

$\therefore x+\frac{2x}{5} = 50$

$\Rightarrow \frac{5x+2x}{5} = 50$

$\Rightarrow 5x+2x = 50\times 5$

$\Rightarrow 7x = 250$

$\Rightarrow x = \frac{250}{7}$

$\therefore$ Second number

$= \frac{2}{5}\times\frac{250}{7} = \frac{100}{7}$

76. (2) Let the number be x.

According to the question,

$\frac{3x}{4}-\frac{x}{6} = 7$

$\Rightarrow \frac{9x-2x}{12} = 7$

$\Rightarrow 7x = 12\times 7$

$\Rightarrow x = \frac{12\times 7}{7} = 12$

$\therefore \frac{5x}{3} = \frac{5}{3}\times 12 = 20$

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77. (4) $0.3939 = 0.\overline{39}$

$= \frac{39}{99} = \frac{13}{33}$.

TYPE-IV

1. (3) Firstly, we express every fraction in decimal form.

$\frac{4}{5} = 0.8$; $\frac{7}{8} = 0.875$

$\frac{6}{7} = 0.857$

$\frac{5}{6} = 0.833 = 0.8\dot{3}$

So, $\frac{4}{5} < \frac{5}{6} < \frac{6}{7} < \frac{7}{8}$

2. (3) The decimal equivalent of

$\frac{3}{5} = 0.6, \frac{7}{9} = 0.777.....$

$\frac{11}{13} = 0.846$

Obviously, $0.846 > 0.\dot{7} > 0.6$

∴ The required decreasing order

$= \frac{11}{13}, \frac{7}{9}, \frac{3}{5}$

3. (3) $\frac{1}{3} = 0.333....$,

$\frac{4}{7} = 0.5714$, $\frac{2}{5} = 0.4$

Clearly,

$0.\overline{33} < 0.4 < 0.5714$

$\therefore \frac{1}{3} < \frac{2}{5} < \frac{4}{7}$

4. (2) Numbers are :

$a > b > c > d > e > f$

According to the question,

$a + b + c + d + e = 5 \times 30$

$= 150$ --- (i)

$b + c + d + e + f = 5 \times 25$

$= 125$ --- (ii)

By equation (i) – (ii)

$a - f = 150 - 125 = 25$

TYPE-V

1. (1) The digit in unit's place = unit's digit in the product $1 \times 2 \times 3 \times .... \times 9 = 0$.

2. (3) Unit's digit in $3^4 = 1$

So, unit digit in $3^{164} = 1$

Now, unit's digit in

$(2153)^{167}$

= unit digit in 3^{167}

= unit digit in $3^3 = 7$

3. (1) $(4)^{2m}$ gives 6 at unit digit.

$(4)^{2m+1}$ gives 4 at unit digit.

$(5)^n$ gives 5.

The same is the case with 1.

∴ Required digit = Unit's digit in the product of $4 \times 5 \times 1 = 0$

4. (1) Unit digit in $(264)^4$ i.e.

$4 \times 4 \times 4 \times 4$ is 6

∴ Unit digit in

$(264)^{100}$ is also 6.

Now, $(264)^{102} = (264)^{100} \times (264)^2$

= (Unit digit 6) × (Unit digit 6)=36

∴ Unit digit is 6

Similarly,

$(264)^{103} + (264)^{100} \times (264)^3$

Unit digit | Unit digit

6 4

Unit digit

4

Therefore, the unit digit in $(264)^{102} + (264)^{103}$ is 6 + 4 = 10 i.e. 0.

5. (2) $(251)^{98} = ...1$

$(21)^{29} = ...1$

$(106)^{100} = ...6$

$(705)^{35} = ...5$

$(16)^4 = ...6$

$259 = ...9$

∴ Required answer = 1 + 1 – 6 + 5 – 6 + 9 = 16 – 12 = 4

6. (1) $3^1 = 3$; $3^2 = 9$; $3^3 = 27$;

$3^4 = 81$; $3^5 = 343$; .....

∴ Remainder on dividing 40 by 4 = 0

∴ Unit's digit in $3^{40} = 1$

7. (2) Unit digit

$7^{[1]} \Rightarrow \boxed{7}$

$7^2 \Rightarrow 9$

$7^3 \Rightarrow 3$ 4

$7^4 \Rightarrow 1$

$7^5 \Rightarrow 7$

4) 105 (26

8

25

24

1

$7^1 \Rightarrow \boxed{7}$

8. (4) Expression = $(2137)^{754}$

Unit's digit in 2137 = 7

Now, $7^1 = 7$, $7^2 = 49$, $7^3 = 343$, $7^4 = 2401$, $7^5 = 16807$, ...

Clearly, after index 4, the unit's digit follow the same order.

Dividing index 754 by 4 we get remainder = 2

∴ Unit's digit in the expansion of $(2137)^{754}$ = Unit's digit in the expansion of $(2137)^2 = 9$

9. (3) Unit's digit in the expansion of $(22)^{23}$

= Unit's digit in the expansion of $(2)^{23}$

Now,

$2^1 = 2$

$2^2 = 4$

$2^3 = 8$

$2^4 = 16$

$2^5 = 32$

i.e. 2 repeats itself after the index 4.

On dividing 23 by 4, remainder = 3

∴ Unit's digit in $(2)^{23}$

= Unit's digit in $(2)^3 = 8$

10. (1) $2^1 = 2$; $2^2 = 4$;

$2^3 = 8$; $2^4 = 16$; $2^5 = 32$

∴ Unit digit in the product of $(122)^{173}$

= Unit digit in $(122)^1 = 2$

(1 = remainder when 173 is divided by 4).

11. (4) $4^1 = 4$; $4^2 = 16$; $4^3 = 64$; $4^4 = 256$; $4^5 = 1024$

Remainder on dividing 372 by 4 = 0

Remainder on dividing 373 by 4 = 1

∴ Required unit digit

= Unit digit of the sum of 6 + 4 = 0

12. (2) Last digit of $(1001)^{2008} + 1002$ = 1 + 2 = 3

13. (4) $7^1 = 7$; $7^2 = 49$; $7^3 = 343$; $7^4 = 2401$; $7^5 = 16807$

i.e. The unit's digit repeats itself

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after power 4.
Remainder after we divide 245 by 4 = 1
∴ Unit's digit in the product of $(4387)^{245} \times (621)^{72}$ = Unit's digit in the product of $(4387)^1 \times (621)^{72}$
$= 7 \times 1 = 7$

14. (4) Unit digit in the expansion of 25^{6251}
= Unit digit in the expansion of $5^{6251} = 5$
36^{528} = Unit digit in $6^{528} = 6$
Now, $3^1 = 3$, $3^2 = 9$, $3^3 = 27$; $3^4 = 81$, $3^5 = 243$....
$\therefore 73^{54} = 73^{52} \times 73^2$
$= 3^2 = 9$
∴ Required digit = Unit's digit of the sum 5 + 6 + 9 = 0

15. (4) $7^1 = 7$, $7^2 = 49$, $7^3 = 343$, $7^4 = 2401$
$3^1 = 3$, $3^2 = 9$, $3^3 = 27$, $3^4 = 81$
i.e. the digit at unit's place gets repeated after power 4. Unit 6 remains same for any power.
∴ Required unit's digit
= Unit's digit in the product of $7^3 \times 6 \times 3^1 = 4$

16. (1) Unit's digit in $(1570)^2 = 0$
Unit's digit in $(1571)^2 = 1$
Unit's digit in $(1572)^2 = 4$
Unit's digit in $(1573)^2 = 9$
∴ Required unit's digit
= Unit's digit (0 +1+4 + 9) = 4

17. (4)Unit's digit in 3 × 38 × 537 × 1256
= Unit's digit in 3 × 8 × 7 × 6
= 4 × 2 = 8

18. (4)Ten's digit = x
Unit's digit = $2x - 1$
∴ Original number
$= 10x + (2x - 1)$
$= 12x - 1$
New number = $10(2x - 1) + x$
$= 20x - 10 + x = 21x - 10$
$\therefore (21x - 10) - (12x + 1)$
$= 12x - 1 - 20$
$\Rightarrow 9x - 9 = 12x - 21$
$\Rightarrow 3x = 12 \Rightarrow x = 4$
⇒ Original number = $12x - 1$
$= 12 \times 4 - 1 = 47$
[check through options].

19. (1) Required unit's digit
= Unit's digit in the product of 7 × 5 × 8 × 3 × 9 = 0

20. (1) Let the two-digit number be $10x + y$ where $x < y$.
Number obtained on reversing the digits $= 10y + x$
According to the question,
$10y + x = 4(10x + y) - 24$
$\Rightarrow 40x + 4y - 10y - x = 24$
$\Rightarrow 39x - 6y = 24$
$\Rightarrow 13x - 2y = 8$ ....(i)
Again, $y - x = 7$
$\Rightarrow y = x + 7$ ....(ii)
$\therefore 13x - 2(x + 7) = 8$
$\Rightarrow 13x - 2x - 14 = 8$
$\Rightarrow 11x = 14 + 8 = 22$

$$\Rightarrow x = \frac{22}{11} = 2$$

From equation (ii),
$y - 2 = 7 \Rightarrow y = 2 + 7 = 9$
∴ Number = $10x + y = 10 \times 2 + 9 = 29$

21. (3) Ten's digit of original number = x
∴ Unit's digit = $2x$
∴ Number = $10x + 2x = 12x$
According to the question,

$$3x - 2 = \frac{1}{6} \times 12x$$

$\Rightarrow 3x - 2 = 2x$
$\Rightarrow 3x - 2x = 2$
$\Rightarrow x = 2$
∴ Number = $12x = 12 \times 2 = 2 = 24$

TYPE-VI

1. (3) $\therefore x + x + 2 + x + 4 = 147$
$\Rightarrow 3x + 6 = 147$
$\Rightarrow 3x = 147 - 6 = 141$

$$\Rightarrow x = \frac{141}{3} = 47$$

∴ Middle Number
$= x + 2 = 47 + 2 = 49$

2. (3) Series of first 20 odd natural numbers is an arithmetic progression with 1 as the first term and the common difference 2.
Sum of n terms in arithmetic progression is given by,

$$S_n = \frac{1}{2}n[2a + (n-1)d]$$

Where a : First term
d : common difference

$$\therefore S_{20} = \frac{1}{2} \times 20[(2 \times 1) + (20 - 1) \times 2]$$

$= 10[2 + 38] = 10 \times 40 = 400$
Note :Sum of first n consecutive odd numbers = n^2

3. (4) Series of all natural numbers from 75 to 97 is in A.P. whose first term,
a = 75, last term, l = 97
If number of terms be n, then
$a_n = a + (n-1)d$
$\Rightarrow 97 = 75 + (n - 1)$
$\Rightarrow n = 97 - 74 = 23$

$$S_n = \frac{n}{2}(a + l)$$

$$S_{23} = \frac{23}{2}(75 + 97)$$

$$= \frac{23}{2} \times 172 = 1978$$

4. (2) Numbers divisible by 3 and lying between 100 and 200 are : 102, 105,..... 198
Let number of terms = n
$\therefore 198 = 102 + (n-1)3$

$$\Rightarrow n - 1 = \frac{198 - 102}{3} = 32$$

$\Rightarrow n = 33$

$$\therefore S = \frac{n}{2} = (a + l)$$

$$= \frac{32}{2}(102 + 198) = 4950$$

5. (2) Let the three consecutive natural numbers be x, x + 1 and x + 2.
∴ According to question,
$x^2 + (x + 1)^2 + (x + 2)^2 = 2030$
or $x^2 + x^2 + 2x + 1 + x^2 + 4x + 4 = 2030$
or $3x^2 + 6x + 5 = 2030$
or $3x^2 + 6x - 2025 = 0$
or $x^2 + 2x - 675 = 0$
or $x^2 + 27x - 25x - 675 = 0$
$x(x + 27) - 25(x + 27) = 0$
or $(x - 25)(x + 27) = 0$
∴ x = 25 and −27
∴ Required number = x + 1
= 25 + 1 = 26

6. (4) Let the three odd consecutive natural numbers be x, x + 2 and x + 4.
∴ According to the question
x + x + 2 + x + 4 = 87
or 3x + 6 = 87
or 3x = 81 ∴ x = 27
∴ Smallest number = 27

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7. (4) Let three consecutive even integers be $2x$, $2x+2$ and $2x+4$ respectively.
$\therefore 2x + 2x + 2 + 2x + 4 = 54$
$\Rightarrow 6x + 6 = 54$
$\Rightarrow 6x = 54 - 6 = 48$
$\Rightarrow x = 8$
$\therefore$ The least even number
$= 2 \times 8 = 16$

8. (2) Let three consecutive natural numbers be x, $x+1$, $x+2$.
According to the question,
$x + x + 1 + x + 2 = 87$
$\Rightarrow 3x + 3 = 87$

$\Rightarrow 3x = 84 \Rightarrow x = \frac{84}{3} = 28$

$\therefore$ Middle number $= 28 + 1 = 29$

OR, $\frac{87}{3} = 29$

9. (3) $(x+2)^2 - x^2 = 84$
or $x^2 + 4x + 4 - x^2 = 84$
or $4x = 84 - 4 = 80$

or $x = \frac{80}{4} = 20$

$\Rightarrow x + 2 = 20 + 2 = 22$
$\therefore$ The required sum
$= 20 + 22 = 42$

10. (4) We have,
$1 + 2 + 3 \ldots\ldots + n$

$= \frac{n(n+1)}{2}$

$\therefore 51 + 52 + \ldots\ldots + 100$
$= (1 + 2 + \ldots\ldots 100) - (1 + 2 + \ldots + 50)$

$= \frac{100 \times 101}{2} - \frac{50 \times 51}{2}$

$= 5050 - 1275 = 3775$

11. (4) The two-digit numbers are : 10, 11, 12, ... 97, 98, 99
We know that,
$1 + 2 + 3 + 4 + \ldots\ldots + n$

$= \frac{n(n+1)}{2}$

$\therefore$ Required sum $= (1 + 2 + 3 + \ldots\ldots + 99) - (1 + 2 + \ldots\ldots + 9)$

$= \frac{99(99+1)}{2} - \frac{9(9+1)}{2}$

$= 4950 - 45 = 4905$

12. (4) $S = 1 + 3 + 5 + \ldots\ldots$ to 50 terms
Here, $a = 1$
$d = 3 - 1 = 2$
$n = 50$

$\therefore S = \frac{n}{2}[2a + (n-1)d]$

$= \frac{50}{2}[2 \times 1 + (50-1) \times 2]$

$= 25\,(2 + 98) = 25 \times 100$
$= 2500$

13. (4) According to the question,
First number $= a = 103$
Last number $= l = 998$
$\therefore$ If the number of such numbers be n, then,
$998 = 103 + (n-1) \times 5$
$\Rightarrow (n-1) \times 5 = 998 - 103 = 895$

$\Rightarrow n - 1 = \frac{895}{5} = 179$

$\Rightarrow n = 180$

$\therefore S = \frac{n}{2}(a + l)$

$= \frac{180}{2}(103 + 998)$

$= 90 \times 1101 = 99090$

14. (2) First 3 – digit number $= 100$
Last 3 – digit number $= 999$
Number of terms $= 900$

$\therefore S = \frac{n}{2}[a + l]$

$= \frac{900}{2}[100 + 999]$

$= 450 \times 1099 = 494550$

15. (1) $x + x + 1 + x + 2 = 27$
$3x + 3 = 27$
$3x = 24$
$x = 8$
$\therefore$ Three consecutive no's whose sum is 27 are 8, 9,10. Hence, next 3 consecutive no's having 36 as sum are 11, 12 and 13

16. (3) $\because 1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$

$\therefore 1 + 2 + 3 + \ldots + 25$

$= \frac{25(25+1)}{2} = 25 \times 13$

Hence, 13 is a factor of required sum.

17. (2) $22 + 24 + 26 + \ldots + 50$
$= 2\,[11 + 12 + 13 + \ldots + 25)$
$= 2\,[(1 + 2 + 3 + \ldots + 25) - (1 + 2 + 3 \ldots + 10)]$

$= 2\left(\frac{25 \times 26}{2} - \frac{10 \times 11}{2}\right)$

$= 2\,(325 - 55) = 2 \times 270 = 540$

Method 2 :

Tricky Approach

Sum of first n even numbers
$= n\,(n + 1)$
$\therefore$ Required sum = Sum of 25 even numbers from 1 to 50 – sum of 10 even numbers from 1 to 20
$= 25 \times 26 - 10 \times 11 = 650 - 110$
$= 540$

18. (3) $x + x + 2 + x + 4 + x + 6 = 748$
$\Rightarrow 4x + 12 = 748$
$\Rightarrow 4x = 748 - 12 = 736$

$\Rightarrow x = \frac{736}{4} = 184$

19. (4) Sum of five consecutive integers = S

$\therefore$ Third integer $= \frac{S}{5}$

$\therefore$ Largest integer $= \frac{S}{5} + 2$

$= \frac{S + 10}{5}$

20. (2) Prime numbers upto 17
$\Rightarrow 2, 3, 5, 7, 11, 13, 17$
$\therefore$ Required sum $= 2 + 3 + 5 + 7 + 11 + 13 + 17 = 58$

21. (2) $10^2 + 11^2 + 12^2$
$= 100 + 121 + 144 = 365$
$\therefore$ Required sum $= 10 + 11 + 12 = 33$

22. (3) Numbers $= x$, $x+1$ and $x+2$
$\therefore 2x + 3x + 3 + 4x + 8 = 191$
$\Rightarrow 9x = 191 - 11 = 180$
$\Rightarrow x = 20$
$\therefore$ Numbers $= 20$, 21 and 22

23. (3) Let the numbers be $3x$, $3x + 3$ and $3x + 6$
$\therefore 3x + 3x + 3 + 3x + 6 = 72$
$\Rightarrow 9x + 9 = 72$
$\Rightarrow 9x = 72 - 9 = 63$

$\Rightarrow x = \frac{63}{9} = 7$

$\therefore$ Largest number
$= 3x + 6 = 3 \times 7 + 6 = 27$

24. (3) Sum of all multiples of 3 upto 50
$= 3 + 6 + \ldots\ldots + 48$
$= 3\,(1 + 2 + 3 + \ldots + 16)$

$= \frac{3 \times 16(16+1)}{2} = 3 \times 8 \times 17$

$= 408$

$\left[\because 1 + 2 + 3 + \ldots\ldots + n = \frac{n(n+1)}{2}\right]$

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25. (4) Sum of first n odd natural numbers $= n^2 = (20)^2 = 400$

$\therefore$ Required average $= \frac{400}{20} = 20$

26. (3) Let the numbers be x and y.

According to the question,

$x + 2y = 8$ .... (i)

$x - y = 2$ ..... (ii)

By equation (i) – (ii),

$2y + y = 8 - 2$

$\Rightarrow 3y = 6 \Rightarrow y = 2$

From equation (ii),

$x - 2 = 2 \Rightarrow x = 4$

TYPE-VII

1. (2) Check through options
The numbers are : 8, 12, 5, 20

2. (3) $12345679 \times 72 = 888888888$

3. (4) Given : $0.111..... = \frac{1}{9}$

$0.444..... = 4 \times 0.111....$

$= 4 \times \frac{1}{9} = \frac{4}{9}$

4. (3) $8.3\dot{1} = 8\frac{31-3}{90}$

$= 8\frac{28}{90} = \frac{748}{90}$

$0.\dot{6} = \frac{6}{9}$

$0.00\dot{2} = \frac{2}{900}$

$\therefore 8.3\dot{1} + 0.\dot{6} + 0.00\dot{2}$

$= \frac{748}{90} + \frac{6}{9} + \frac{2}{900}$

$= \frac{7480 + 600 + 2}{900} = \frac{8082}{900}$

$= 8 = \frac{8082}{900} = 8\frac{979-97}{900}$

$= 8.97\dot{9}$

5. (2) Expression $= 0.\overline{63} + 0.\overline{37}$

$= \frac{63}{99} + \frac{37}{99} = \frac{100}{99}$

6. (3) Expression

$= \left(0.\overline{11} + 0.\overline{22}\right) \times 3$

$= \left(\frac{11}{99} + \frac{22}{99}\right) \times 3$

$= \frac{33}{99} \times 3 = \frac{99}{99} = 1$

7. (2) $\frac{1}{5} + \left(999 + \frac{494}{495}\right) \times 99$

$= \frac{1}{5} + \left(999 + 1 - \frac{1}{495}\right) \times 99$

$= \frac{1}{5} + 999 \times 99 + 99 - \frac{99}{495}$

$= \frac{1}{5} + 98901 + 99 - \frac{1}{5} = 99000$

8. (2) $(1 * 2) * 3 = (1 + 2 \times 6) * 3$
$= 13 * 3 = (13 + 3 \times 6)$
$= 13 + 18 = 31$

9. (2) The given expression

$= 999\frac{995}{999} \times 999$

$= \left(999 + \frac{995}{999}\right)999$

$= 999 \times 999 + \frac{995}{999} \times 999$

$= (1000 - 1)\,999 + 995$
$= 999000 - 999 + 995$
$= 999000 - 4 = 998996$

10. (4) Expression $= 1.\overline{2} \times 0.\overline{03}$

$= 1\frac{2}{9} \times \frac{3}{99} = \frac{11}{9} \times \frac{3}{99} = \frac{1}{27}$

$= 0.\overline{037}$

11. (1) $3.718 = \frac{1}{0.2689}$ (Given)

$\therefore \frac{1}{0.0003718} = \frac{10000}{3.718}$
$= 0.2689 \times 10000 = 2689$

12. (3) $\left(\sqrt{a+b}\right)^2 = a + b$

$\left(\sqrt{a} + \sqrt{b}\right)^2 = a + b + 2\sqrt{ab}$

Here, $a + b < a + b + 2\sqrt{ab}$

Clearly, $\sqrt{a+b} < \sqrt{a} + \sqrt{b}$

13. (3) $\sqrt{18225} = 135$,

$\sqrt{17956} = 134$

$\sqrt{63592} = 252.17$

In a perfect square number 2 never comes at the unit's place.

14. (3) $0.\overline{142857} + 0.\overline{285714}$

$= \frac{142857}{999999} + \frac{285714}{999999}$

$= \frac{142857}{285714} = \frac{1}{2}$

15. (4) $5.\overline{76} - 2.\overline{3}$

$= 5 + \frac{76}{99} - 2 - \frac{3}{9} = 3 + \frac{76-33}{99}$

$= 3 + \frac{76-33}{99} = 3 + \frac{43}{99} = 3.\overline{43}$

16. (2) $\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right).....\left(1-\frac{1}{n}\right)$

$= \frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times ..... \times \frac{n-1}{n} = \frac{2}{n}$

We observe that denominator of a term cancels with the numerator of the succeeding term

17. (2) $2.8\overline{768} = 2\frac{8768-8}{9990}$

$= 2\frac{8760}{9990} = 2\frac{292}{333}$

18. (3) When we multiply 2 and 5 (at unit place) we get a zero

$\therefore$ Number of zeros = The number of zeros in the end in the product of 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190 and 200 = 24

19. (4) $77777777 \div 77 = 1010101$

20. (3) Expression

$= 8.3\overline{1} + 0.\overline{6} + 0.00\overline{2}$

$= 8.31\overline{1}$
$+0.66\overline{6}$
$+0.00\overline{2}$
$8.97\overline{9}$

21. (1) $0.\overline{2} + 0.\overline{3} + 0.\overline{32}$

$= \frac{2}{9} + \frac{3}{9} + \frac{32}{99}$

$= \frac{22+33+32}{99} = \frac{87}{99} = 0.\overline{87}$

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22. (2) Expression = $0.\overline{63} + 0.\overline{37}$

$= \frac{63}{99} + \frac{37}{99} = \frac{100}{99}$

23. (2) $\frac{51.84}{4.32} = \frac{5184}{432} = 12$

$\therefore \frac{0.005184}{0.432} = \frac{5184}{432} \times \frac{1}{1000}$

$= \frac{12}{1000} = 0.012$

24. (3)

$\left(\frac{2+1}{2}\right)\left(\frac{3+1}{3}\right)\left(\frac{4+1}{4}\right)\ldots\left(\frac{120+1}{120}\right)$

$= \frac{3}{2} \times \frac{4}{3} \times \frac{5}{4} \times \ldots \times \frac{121}{120}$

$= \frac{121}{2} = 60.5$

25. (1) Let x and y be the two numbers. Then,

$xy = 375$ and $x + y = 40$

$\therefore$ Sum of reciprocals $= \frac{x+y}{xy}$

$= \frac{40}{375} = \frac{8}{75}$

26. (3) Let the two numbers be x and y.

$\therefore x + y = 12$ and $xy = 35$

$\frac{1}{x} + \frac{1}{y} = \frac{y+x}{xy} = \frac{12}{35}$

27. (3) Let two numbers be x and y.

$x + y = 3$

$x^2 + y^2 = 12$

$\Rightarrow (x + y)^2 = (3)^2$

$\Rightarrow x^2 + y^2 + 2xy = 9$

$\Rightarrow 12 + 2xy = 9$

$\Rightarrow 2xy = -3$

$\Rightarrow xy = -\frac{3}{2}$

28. (4) Let the number of students be n.

So, each of n students got 2n chocolates

Total no. of chocolates

$= (2n) \times n = 800$

$\Rightarrow 2n^2 = 800$

$\Rightarrow n^2 = 400 \Rightarrow n = 20$

29. (3) A product gets 0 at its end when

(i) a multiple of 5 is multiplied by an even number or

(ii) a multiple of 10 is multiplied by any number.

All the given numbers are even and do not contain any multiple of 5. So, zeros at the end of the product will come only on multiplications by multiples of 10.

Multiples of 10 that lie in the given range from 2 to 100 are 10, 20, 30, 40,50, 60, 70, 80, 90 and 100. Each of these multiples will yield one zero except 100 which will yield two zeros at the end of the product.

$\therefore$ Total no. of zeros at the product $= 9 + 2 = 11$

30. (3) Number of digits from 1 to 9 = 9

Number of digits used in writing from 10 to 50

$= 41 \times 2 = 82$

$\therefore$ Total digits $= 82 + 9 = 91$

31. (3) Let the number be x.

$\therefore$ According to question,

$2x + 20 = 8x - 4$

or $8x - 2x = 20 + 4$

or $6x = 24$

$\therefore x = 4$

32. (3) Let the original number of friends be x.

$\therefore \frac{108}{x-3} - \frac{108}{x} = 3$

$\Rightarrow 108\left(\frac{x-x+3}{x(x-3)}\right) = 3$

$\Rightarrow x(x-3) = 108$

$\Rightarrow x^2 - 3x - 108 = 0$

$\Rightarrow x^2 - 12x + 9x - 108 = 0$

$\Rightarrow (x-12) + 9(x-12) = 0$

$\Rightarrow (x-12)(x+9) = 0$

$\Rightarrow x = 12$ as $x \neq -9$

$\therefore$ The number of friends who attended the picnic

$= 12 - 3 = 9$

33. (3) In $2m \times 5n$, the number of zeros

$= n$ when $m \geq n$

$= m$ when $m < n$

Here, $128 = 2^7$

In $1 \times 3 \times 5 \times 7 \times \ldots \times 99$ multiples of 5 are 5, 15, 25, 35, 45, 55, 65, 75, 85, 95 $(= 5^{10})$

Clearly, 7 zeros will be found in the product.

34. (3) According to question

$x^2 + y^2 = 100$ ...(i)

$x^2 - y^2 = 28$ ...(ii)

Adding both the equations

$x^2 + y^2 = 100$

$x^2 - y^2 = 28$

$2x^2 = 128$

$\Rightarrow x^2 = 64 \quad \therefore x = 8$

From the equation (i)

$y^2 = 100 - 64 \quad \therefore y = 6$

So, $x + y = 8 + 6 = 14$

35. (3) $\frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} \times \ldots \times \frac{98}{99} \times \frac{99}{100}$

$= \frac{2}{100} = \frac{1}{50}$

36. (2) Let the numbers be x and y.

$xy = 120$

$x^2 + y^2 = 289$

$(x-y)^2 = x^2 + y^2 - 2xy$

$= 289 - 2 \times 120 = 289 - 240 = 49$

$\therefore x - y = 7$

37. (2) Let the numbers be x and y.

$\therefore x + y = 10$ and $xy = 24$

$\therefore \frac{x+y}{xy} = \frac{1}{y} + \frac{1}{x} = \frac{10}{24} = \frac{5}{12}$

38. (4) Expression $= 99 + \frac{1}{7} + 99 + \frac{2}{7}$

$+ 99 + \frac{3}{7} + \ldots\ldots + 99 + \frac{6}{7}$

$= (99 \times 6) + \left(\frac{1}{7} + \frac{2}{7} + \frac{3}{7} + \frac{4}{7} + \frac{5}{7} + \frac{6}{7}\right)$

$= 594 + \left(\frac{1+2+3+4+5+6}{7}\right)$

$= 594 + \frac{21}{7} = 594 + 3 = 597$

39. (4) Let number of boys $= x$

and number of girls $= 85 - x$

According to the question,

$x \times 4 + (85 - x) \times 5 = 380$

$\Rightarrow 4x + 425 - 5x = 380$

$\Rightarrow x = 45$

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40. (2) Let one of the positive numbers be x.
∴ The other will be 4x
Now, $4x \times x = 2500$
$\Rightarrow x^2 = 2500 \div 4 = 625$
$\therefore x = \sqrt{625} = 25$
∴ Sum of the two numbers
$= 5x = 5 \times 25 = 125$

41. (4) Let the ten's digit be x
∴ Unit's digit = x + 2
Therefore, the two digit number
$= 10x + x + 2$
$= 11x + 2$ ...(i)
Again,
$(11x + 2)(x + x + 2)$
$= 144$
$\Rightarrow (11x + 2)(2x + 2) = 144$
$(11x + 2)(x + 1) = 72$
$\Rightarrow 11x^2 + 2x + 11x + 2 = 72$
$\Rightarrow 11x^2 + 13x - 70 = 0$
$\Rightarrow 11x^2 - 22x + 35x - 70$
$= 0$
$\Rightarrow 11x(x - 2) + 35(x - 2) = 0$
$\Rightarrow (x - 2)(11x + 35) = 0$

$\Rightarrow x = 2, -\frac{35}{11}$

But $x = -\frac{35}{11}$

is not admissible.
∴ The number = 11x + 2
$= 11 \times 2 + 2 = 24$

42. (2) Let the number of correct answers be x
∴ The no. of incorrect answers
$= 20 - x$
According to the question,
$x - (20 - x) = 8$
$\Rightarrow x - 20 + x = 8$
$\Rightarrow 2x = 28 \Rightarrow x = 14$

43. (1) Let the number of boys = x
∴ Number of 25 paise coins= x^2
According to question,

$\frac{25}{100} \times x^2 = 400$

$\Rightarrow \frac{x^2}{4} = 400 \Rightarrow x^2 = 1600$

$\Rightarrow x = \sqrt{1600} = 40$

44. (2) Let the number be x.
According to the question,
$3 \times x^2 - 4 \times x = x + 50$
$\Rightarrow 3x^2 - 5x - 50 = 0$
$\Rightarrow 3x^2 - 15x + 10x - 50 = 0$
$\Rightarrow 3x(x - 5) + 10(x - 5) = 0$
$\Rightarrow (x - 5)(3x - 10) = 0$

$\Rightarrow x = 5$ or $\frac{-10}{3}$

But the number is natural.

$\therefore x \neq \frac{-10}{3}$

Hence, the required number = 5.

45. (3) Let the number be x and y and $x > y$.
$x - y = 3$ ...(i)
$x^2 + y^2 = 369$ ...(ii)
From equation (i)
$x - y = 3$
$\Rightarrow (x - y)^2 = 3^2$
$\Rightarrow x^2 + y^2 - 2xy = 9$
$\Rightarrow 2xy = (x^2 + y^2) - 9$
$= 369 - 9 = 360$
From equation (ii)
Now, $(x + y)^2 = x^2 + y^2 + 2xy$
$= 369 + 360 = 729$

$\therefore x + y = \sqrt{729} = 27$

∴ Required sum = 27

46. (3) Let the unit's digit be x.
∴ Ten's digit = x - 2
∴ Number = 10 (x - 2) + x
$= 10x - 20 + x = 11x - 20$
New number obtained after reversing the digits
$= 10x + x - 2 = 11x - 2$
According to the question,

$3(11x - 20) + \frac{6}{7}(11x - 2) = 108$

$\Rightarrow (11x - 20) + \frac{2}{7}(11x - 2) = 36$

$\Rightarrow 77x - 140 + 22x - 4 = 252$
$\Rightarrow 99x = 252 + 144$

$\Rightarrow x = \frac{396}{99} = 4$

∴ Number = 11x - 20
$= 11 \times 4 - 20 = 24$
∴ Sum of digits = 2 + 4 = 6

47. (3) Let the first number be x.
∴ Second number = 2x,

and third number = $\frac{2x}{3}$

Now, $x + 2x + \frac{2x}{3} = 44 \times 3$

$\Rightarrow \frac{3x + 6x + 2x}{3} = 132$

$\Rightarrow 11x = 132 \times 3$

$\Rightarrow x = \frac{132 \times 3}{11} = 36$

∴ Required difference

$= x - \frac{2x}{3} = \frac{x}{3} = \frac{36}{3} = 12$

48. (2) Let the two digit number be $10y + x$.
According to the question,
$10y + x = 5(x + y)$
$\Rightarrow 10y + x - 5x - 5y = 0$
$\Rightarrow 5y - 4x = 0$ ....(i)
And,
$10y + x + 9 = 10x + y$
$\Rightarrow 9x - 9y = 9$
$\Rightarrow x - y = 1$ ... (ii)
From equation (i),
$\Rightarrow 5y - 4(1 + y) = 0$
[From (ii)]
$\Rightarrow 5y - 4 - 4y = 0$
$\Rightarrow y = 4$
∴ From equation (ii),
$x = 4 + 1 = 5$
∴ Number = $10 \times 4 + 5 = 45$
∴ Sum of digits = 4 + 5 = 9

49. (4) The number of multiples of 130 are obtained by dividing 1000 by 130. The quotient i.e. 7 gives the result.

50. (4) Zeros are obtained if there is any zero at the end of any multiplicand and if 5 or multiple of 5 are multiplied by any even number. i.e. $(5)^n (2)^m$ has n zeros if $n < m$ or m zeros if $m < n$
Now, we obtain the index of 5 as follows :

$\text{Index} = \left[\frac{1000}{5}\right] + \left[\frac{1000}{5^2}\right]$

$+ \left[\frac{1000}{5^3}\right] + \left[\frac{1000}{5^4}\right]$

$= 200 + 40 + 8 + 1 = 249.$
Certainly, n will be less than m.
∴ Number of zeros = 249

51. (1) Let the numbers be a and b, where $a > b$
According to the question,
$a - b = 3$ ...(i)
$a^2 - b^2 = 39$
$\Rightarrow (a + b)(a - b) = 39$

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$\Rightarrow a+b=\frac{39}{a-b}=\frac{39}{3}=13$

$\Rightarrow a+b=13$ ...(ii)

Adding equations (i) and (ii)

$2a=16 \Rightarrow a=8$

52. (2) Check through options

$20 \rightarrow 20+7=27 \rightarrow 27\times 5$

$=135 \rightarrow 135+9$

$=15 \rightarrow 15-3=12$

OR, We will solve the problem from the opposite side.

Here the remainder is 12.

$12+3=15$

$15\times 9=135$

$135+5=27$

$27-7=20$

$\therefore$ The original number was 20.

53. (3) Let the smallest number be x.

$\therefore x\times 7=33333....$

$\Rightarrow x=\frac{33333....}{7}=47619$

54. (2) Let the two digit number be $=10x+y$.

According to the question,

$10x+y=3(x+y)$

$\Rightarrow 10x+y=3x+3y$

$\Rightarrow 10x+y-3x-3y=0$

$\Rightarrow 7x-2y=0$ ...(i)

and,

$10x+y+45=10y+x$

$\Rightarrow 10y+x-10x-y=45$

$\Rightarrow 9y-9x=45$

$\Rightarrow 9(y-x)=45$

$\Rightarrow y-x=5$ ...(ii)

$2\times$ (ii) + (i) we have

$2y-2x+7x-2y=10$

$\Rightarrow 5x=10 \Rightarrow x=\frac{10}{5}=2$

From equation (ii),

$y-2=5 \Rightarrow y=2+5=7$

$\therefore$ Number $=10x+y$

$=2\times 10+7=27$

$\therefore$ Sum of digits $=2+7=9$

55. (1) Let the remainder in each case be x.

Then, $(2272-x)$ and $(875-x)$ are exactly divisible by that three digit number.

Hence, their difference $[(2272-x)-(875-x)]=1397$ will also be exactly divisible by the said divisor (N).

Now, $1397=11\times 127$

Since both 11 and 127 are prime numbers, N is 127.

$\therefore$ Sum of digits $=1+2+7=10$

56. (1) Let the numbers be x and y respectively.

$\therefore x+y=12$ and $xy=35$

$\therefore \frac{1}{x}+\frac{1}{y}=\frac{x+y}{xy}=\frac{12}{35}$

57. (3) Let the third number be x.

$\therefore$ Second number $=3x$

First number $=\frac{3}{2}x$

According to the question,

$\frac{3x}{2}+3x+x=44\times 3$

$\Rightarrow \frac{3x+6x+2x}{2}=44\times 3$

$\Rightarrow 11x=88\times 3$

$\Rightarrow x=\frac{88\times 3}{11}=24$

$\therefore$ The largest number

$=3x=3\times 24=72$

58. (3) Let the two digit number be $10x+y$ where $x>y$.

Here, $x+y=10$ ...(i)

and, $10x+y-10y-x=18$

$\Rightarrow 9x-9y=18$

$\Rightarrow 9(x-y)=18$

$\Rightarrow x-y=2$ ...(ii)

Solving equations (i) and (ii),

$x=6$ and $y=4$

$\therefore$ Number $=10\times 6+4=64$

59. (1) Let the positive integer be x.

$\therefore 2x^2-5x=3$

$\Rightarrow 2x^2-5x-3=0$

$\Rightarrow 2x^2-6x+x-3=0$

$\Rightarrow 2x(x-3)+1(x-3)=0$

$\Rightarrow (x-3)(2x+1)=0$

$\therefore x=3$ and $x=-\frac{1}{2}$ is not admissible.

60. (2) Let the first number be x.

$\therefore$ Second number $=14-x$

$\therefore x(14-x)=24(x-14+x)$

$\Rightarrow x(14-x)=24(2x-14)$

$\Rightarrow 14x-x^2=48x-336$

$\Rightarrow x^2+34x-336=0$

$\Rightarrow x^2+42x-8x-336=0$

$\Rightarrow x(x+42)-8(x+42)=0$

$\Rightarrow (x+42)(x-8)=0$

$\therefore x=8$ as $x\neq -42$

$\therefore$ Second number $=14-8=6$

$\therefore$ Larger number $=8$

Note : It is preferable to solve it by oral calculation with the help of given alternatives.

61. (4) If the first number be x, then

Second number $=\frac{x}{5}$

$\therefore x\times\frac{x}{5}=0.008$

$\Rightarrow x^2=0.008\times 5=0.04$

$\therefore x=\sqrt{0.04}=0.2$

$\therefore$ Smaller number

$=\frac{0.2}{5}=0.04$

62. (1) Let the natural numbers be x and y.

$\therefore$ Required sum $=18x+21y$

$=3(6x+7y)$

Hence, the sum is divisible by 3.

$\therefore$ Required answer $=2007$

63. (1) Let the numbers be x and y.

$\therefore x(x+y)=247$

and $y(x+y)=114$

$\Rightarrow x^2+xy=247$ and $xy+y^2=114$

On adding;

$x^2+xy+xy+y^2=247+114$

$\Rightarrow x^2+2xy+y^2=361$

$\Rightarrow (x+y)^2=19^2 \Rightarrow x+y=19$

64. (4) The sum of two odd numbers is even. The same is the case with their product.

$\therefore a+b+2ab=$ Even number

65. (2) $d=4375+2986-2361$

$=5000$

66. (3) According to the question,

$\left(\frac{n}{2}+\frac{n}{4}+\frac{n}{5}\right)+7=n$

$\Rightarrow \left(\frac{10n+5n+4n}{20}\right)+7=n$

$\Rightarrow \frac{19n}{20}+7=n$

$\Rightarrow n-\frac{19n}{20}=7 \Rightarrow \frac{n}{20}=7$

$\Rightarrow n=20\times 7=140$

67. (2) If the number of correct answers be x, then

$x\times 4-1.(200-x)=200$

$\Rightarrow 4x-200+x=200$

$\Rightarrow 5x=400$

$\Rightarrow x=\frac{400}{5}=80$

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68. (2) Let the number of correct answers be x.
$\therefore x \times 4 - (75 - x) \times 1 = 125$
$\Rightarrow 4x - 75 + x = 125$
$\Rightarrow 5x = 125 + 75 = 200$
$\therefore x = \frac{200}{5} = 40$

69. (1) Let the numbers be a and b.
According to the question,
$ab = 120$ ... (i)
and $a^2 + b^2 = 289$ ... (ii)
$\therefore (a+b)^2 = a^2 + b^2 + 2ab$
$= 289 + 2 \times 120$
$= 289 + 240 = 529$
$\therefore a + b = \sqrt{529} = 23$

70. (4) Let the numbers be x and y.
According to the question,
$x + y = 11$ ....(i)
$xy = 18$ ...(ii)
Dividing equation (i) by equation (ii)
$\frac{x+y}{xy} = \frac{1}{y} + \frac{1}{x} = \frac{11}{18}$

71. (1) Let number of grapes eaten on the first day be x.
$\therefore x + x + 6 + x + 12 + x + 18 + x + 24 = 100$
$\Rightarrow 5x + 60 = 100$
$\Rightarrow 5x = 100 - 60 = 40$
$\Rightarrow x = \frac{40}{5} = 8$

72. (1) Let the original number be x.
According to the question
$7.2 \times x - 0.72 \times x = 2592$
$\Rightarrow x(7.2 - 0.72) = 2592$
$\Rightarrow x \times 6.48 = 2592$
$\Rightarrow x = \frac{2592}{6.48}$
$= \frac{2592 \times 100}{648} = 400$

73. (3) Let the numbers be x, y and z.
$\therefore x + y = 55$ ....(i)
$y + z = 65$ ....(ii)
$3x + z = 110$ ....(iii)
By equation (iii) – (ii),
$3x - y = 110 - 65 = 45$ ....(iv)
By equation (i) + (iv),
$4x = 45 + 55 = 100$
$\Rightarrow x = 25$
From equation (iii),
$75 + z = 110$
$\Rightarrow z = 110 - 75 = 35$

74. (3) Let unit's digit be x.
Ten's digit $= x + 5$
Number $= 10(x + 5) + x$
$= 11x + 50$
Again,
$11x + 50 - 5(2x + 5)$
$= 10x + x + 5$
$\Rightarrow 11x + 50 - 10x - 25 = 11x + 5$
$\Rightarrow 10x = 20 \Rightarrow x = 2$
$\therefore$ Required sum
$= 2x + 5 = 2 \times 2 + 5 = 9$

75. (2) Let the number be $100(2x) + 10y + x = 201x + 10y$ .....(i)
$\therefore 2x + y + x = 18$
$\Rightarrow 3x + y = 18$ .....(ii)
When the digits are reversed, number
$= 100(x) + 10y + 2x$
$= 102x + 10y$ .....(iii)
$\therefore 201x + 10y - 102x - 10y = 396$
$\Rightarrow 99x = 396 \Rightarrow x = 4$
$\therefore$ From equation (i)
$3 \times 4 + y = 18$
$\Rightarrow y = 18 - 12 = 6$
$\therefore$ Required difference $= 2x - y = 2 \times 4 - 6 = 2$

76. (1) Let the two digit number be $10y + x$ where $x > y$
$\therefore 10x + y - 10y - x = 63$
$\Rightarrow 9x - 9y = 63$
$\Rightarrow x - y = 7$
$\therefore x = 7, 8, 9$ and $y = 0, 1, 2$

77. (3) Let the required number be x.
$\therefore x^2 + x = 2 \times 3 \times 5$
$\Rightarrow x^2 + x - 30 = 0$
$\Rightarrow x^2 + 6x - 5x - 30 = 0$
$\Rightarrow x(x + 6) - 5(x + 6) = 0$
$\Rightarrow (x - 5)(x + 6) = 0$
$\Rightarrow x = 5$

78. (2) Number of hens $= x$
$\therefore$ Number of cows $= 48 - x$
$\therefore 2x + (48 - x) \times 4 = 35 \times 4$
$\Rightarrow 2x + 192 - 4x = 140$
$\Rightarrow 2x = 192 - 140 = 52$
$\Rightarrow x = 26$

79. (1) Length of the road = 1000 metre
Number of plants on one side of the road $= \frac{1000}{20} + 1 = 51$
$\therefore$ Total number of plants
$= 2 \times 51 = 102$

80. (1) $\left(999 + \frac{98}{99}\right) \times 99$
$= 999 \times 99 + 98$
$= (1000 - 1)\,99 + 98$
$= 99000 - 99 + 98 = 98999$

81. (4) If the number be $10x + y$ then number obtained by reversing the digits $= 10y + x$.
$\therefore 10x + y + 10y + x = 11(x + y)$
If $x + y = 11$ the possible pairs are (2, 9), (3, 8), (4, 7) and (5, 6)
$\therefore$ Required answer = 8

82. (4) Expression
$= \left(99 + \frac{95}{99}\right) \times 99$
$= 99 \times 99 + 95$
$= 99(100 - 1) + 95$
$= 9900 - 99 + 95 = 9896$

83. (4) Marbles in the 50th box will be kept by 1st, 2nd, 5th, 10th, 25th and 50th persons.
[There are the factors of 50].
$\therefore$ Number of marbles
$= 1 + 2 + 5 + 10 + 25 + 50 = 93$

84. (2) Number of pants
$= \frac{252}{2\frac{1}{2}} = \frac{252 \times 2}{5} = 100$
Number of shirts
$= \frac{141 \times 4}{7} = 80$

85. (3) $323 = 17 \times 19$

86. (2) Let one of the positive number be x.
$\therefore$ The other will be $4x$
Now, $4x \times x = 2500$
$\Rightarrow x^2 = 2500 \div 4 = 625$
$\therefore x = \sqrt{625} = 25$
$\therefore$ Sum of the two numbers
$4x + x = 5x = 5 \times 25 = 125$

87. (2) If the number of correct sums be x, then,
$x \times 3 - (30 - x) \times 2 = 40$
$\Rightarrow 3x - 60 + 2x = 40$
$\Rightarrow 5x = 60 + 40 = 100$
$\Rightarrow x = 20$

88. (4) $a * b = a + b + \frac{a}{b}$
$\therefore 12 * 4 = 12 + 4 + \frac{12}{4}$
$= 16 + 3 = 19$

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89. (2) Number of trees on each side of the road
[+1 because we would start with a tree]

$= \frac{1760}{20} + 1 = 88 + 1 = 89$

$\therefore$ Required answer
$= 89 \times 2 = 178$

90. (2) $A + B = 3(B + C)$
$A + B + C = A + 30$
$B = 5C$
$\therefore A + B = 3(B + C)$
$\Rightarrow A + 5C = 18C \Rightarrow A = 13C$
$\therefore A + B + C = A + 30$
$13C + 5C + C = 13C + 30$
$\Rightarrow 6C = 30$
$\Rightarrow C = 5$
$\Rightarrow A = 13 \times 5 = ₹ 65$

91. (3) If the numbers be x and y, then
$x + y = a$ and $xy = b$

$\therefore \frac{1}{y} + \frac{1}{x} = \frac{x+y}{xy} = \frac{a}{b}$

92. (4) $999\frac{999}{1000} \times 7$

$= \left(999 + \frac{999}{1000}\right) \times 7$

$= 6993 + \frac{6993}{1000}$

$= 6993 + 6\frac{993}{1000}$

$= 6993 + 6 + \frac{993}{1000}$

$= 6999\frac{993}{1000}$

93. (2) Total number of workers
$= 125 \times 9 = 1125$

94. (1) Expression

$= 999\frac{1}{7} + 999\frac{2}{7} + \ldots + 999\frac{6}{7}$

$= \left(999 + \frac{1}{7}\right) + \left(999 + \frac{2}{7}\right) + \ldots\ldots$

$+ \left(999 + \frac{6}{7}\right)$

$= (6 \times 999) + \left(\frac{1}{7} + \frac{2}{7} + \frac{3}{7} + \ldots + \frac{6}{7}\right)$

$= 5994 + \left(\frac{1+2+3+4+5+6}{7}\right)$

$= 5994 + \frac{21}{7} = 5994 + 3 = 5997$

95. (1) $228 = 70 \times 3 + 18$

96. (3) Divisor $= 5 \times$ remainder
$= 5 \times 36 = 180$
Again, Divisor $= 12 \times$ quotient
$\therefore 180 = 12 \times$ quotient

$\therefore$ Quotient $= \frac{180}{12} = 15$

$\therefore$ Dividend = Divisor $\times$ Quotient + Remainder
$= 180 \times 15 + 36$
$= 2700 + 36 = 2736$

97. (1) If the numbers be x and y, then
$x + y = 8$ ..... (i)
$xy = 15$ ..... (ii)
Dividing equation (i) by (ii)

$\frac{x+y}{xy} = \frac{8}{15} \Rightarrow \frac{x}{xy} + \frac{y}{xy} = \frac{8}{15}$

$\Rightarrow \frac{1}{y} + \frac{1}{x} = \frac{8}{15}$

98. (3) Suppose number is x.
$\therefore 3(2x + 9) = 75$
$\Rightarrow 6x + 27 = 75$
$\Rightarrow 6x = 48 \Rightarrow x = 8$

99. (3) $\because a * b = a + b - ab$
$\therefore 5 * 7 = 5 + 7 - 5 \times 7 = 12 - 35$
$= -23$

100. (3) 12 months' salary
$= ₹ 90 +$ turban
$\therefore$ 9 months' salary

$= (₹ 90 +$ turban$) \times \frac{9}{12}$

$= ₹ 90 \times \frac{3}{4} + \frac{3}{4}$ turban

$= ₹ \frac{135}{2} + \frac{3}{4}$ turban

$\therefore ₹ \frac{135}{2} + \frac{3}{4}$ turban

$= ₹ 65 +$ turban

$\therefore \frac{1}{4}$ turban $= \frac{135}{2} - 65 = ₹ \frac{5}{2}$

$\therefore$ Turban $\Rightarrow \frac{5}{2} \times 4 = ₹ 10$

101. (3) Let the number be $10x + y$.
Dividend = Divisor $\times$ quotient + remainder
$\therefore 10x + y = 6(x + y) + 3$
$\Rightarrow 10x + y = 6x + 6y + 3$
$\Rightarrow 10x - 6x + y - 6y = 3$
$\Rightarrow 4x - 5y = 3$ ....(i)
Again, $10y + x = 4(x + y) + 9$
$\Rightarrow 10y + x = 4x + 4y + 9$
$\Rightarrow 6y - 3x = 9$
$\Rightarrow 2y - x = 3$ ....(ii)
$\therefore$ By equation (i) + 4 $\times$ (ii),
$4x - 5y = 3$
$8y - 4x = 12$
$3y = 15$
$\Rightarrow y = 5$
From equation (ii),
$2 \times 5 - x = 3 \Rightarrow$
$x = 10 - 3 = 7$
$\therefore$ Sum of digits $= x + y = 7 + 5 = 12$

102. (3) Every rational number is a real number.

103. (4) $0.01 < 0.015 < 0.12$
$\Rightarrow -0.01 > -0.015 > -0.12$
$\Rightarrow p < r < q$

104. (2) $A + B = 120$
$B + C = 130$
$C + A = 140$
On adding,
$2(A + B + C) = 120 + 130 + 140$
$= 390$

$\Rightarrow A + B + C = \frac{390}{2} = 195$

$\therefore$ Marks obtained by C = Marks obtained by (A + B + C) − Marks obtained by (A + B)
$= 195 - 120 = 75$

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TEST YOURSELF

1. 64329 is divided by a certain number, the successive remainders being 175, 114 and 213 respectively. What are the divisor and the quotient respectively?
(1) 234 and 274 (2) 224 and 268
(3) 468 and 232 (4) 218 and 274

2. The sum of the first two of three consecutive odd numbers is 33 more than the third number. What is the second number?
(1) 35 (2) 37
(3) 39 (4) 33

3. A rational number between $\frac{1}{2}$ and $\frac{3}{5}$ is:
(1) $\frac{2}{5}$ (2) $\frac{3}{5}$
(3) $\frac{11}{20}$ (4) None of these

4. How many numbers are there between 99 and 1000 such that the digit 8, occupies the unit's place?
(1) 64 (2) 74
(3) 82 (4) None of these

5. One third of the boys and one half of the girls of a college participate in a social work project. If the number of participating students is 300 out of which 100 are boys, what is the total number of students in the college?
(1) 500 (2) 700
(3) 800 (4) None of these

6. Find the unit's digit in the product of 437, 82, 28, 45 and 47.
(1) 0 (2) 1
(3) 2 (4) 3

7. What will be the digit at unit's place in the value of $(2467)^{153}$?
(1) 9 (2) 7
(3) 3 (4) 1

8. What will be the unit's digit in the value of $(3127)^{173}$?
(1) 9 (2) 1
(3) 3 (4) 7

9. What will be the unit's digit in the product of $(2467)^{153} \times (341)^{72}$?
(1) 3 (2) 1
(3) 7 (4) 9

10. Find the number of prime factors in $30^7 \times 22^5 \times 34^{12} \times 12^5$.
(1) 70 (2) 65
(3) 29 (4) 69

11. Find the number of prime factors in the product of $25^{12} \times 10^7 \times 14^7$.
(1) 50 (2) 52
(3) 51 (4) 54

12. A certain number when successively divided by 8 and 11 leaves remainder 3 and 7 respectively. Find the remainder if the same number is divided by 88.
(1) 57 (2) 51
(3) 59 (4) 61

13. A certain number on being divided successively by 9, 11 and 13 leaves remainder 8, 9 and 8 respectively. What are the remainders when the same number be divided by reversing the order of divisors?
(1) 10, 1, 6 (2) 10, 6, 2
(3) 10, 3, 3 (4) 9, 3, 2

14. A certain number when successively divided by 3, 5 and 8 leaves remainder 1, 2, 3 respectively. Find the remainders when the same number is divided by reversing the divisors.
(1) 3, 2, 1 (2) 4, 1, 1
(3) 4, 2, 2 (4) 1, 4, 1

15. If the sum of the digits of any number, lying between 100 and 1000 is subtracted from the number, then the difference is always divisible by
(1) 7 (2) 9
(3) 11 (4) 6

16. Find the least number of five digits which is divisible by 666.
(1) 10656 (2) 10665
(3) 10566 (4) 15066

17. Find the nearest number to 56586 which is exactly divisible by 552.
(1) 58686 (2) 56856
(3) 58656 (4) 85656

18. Find the number nearest to 77685 which is exactly divisible by 720.
(1) 78680 (2) 77700
(3) 77760 (4) 78960

19. Find the number nearest to 12199 which is exactly divisible by the product of the first four prime numbers.
(1) 12229 (2) 122208
(3) 12280 (4) 12180

20. Find the greatest number of 4 digits and the least number of 5 digits which when divided by 789 leave a remainder 5 in each case.
(1) 9473, 10262 (2) 9573, 10362
(3) 9673, 10462 (4) 9676, 10465

SHORT ANSWERS

1. (1)	2. (2)	3. (3)	4. (4)
5. (2)	6. (1)	7. (2)	8. (4)
9. (3)	10. (1)	11. (2)	12. (3)
13. (1)	14. (2)	15. (2)	16. (1)
17. (2)	18. (3)	19. (4)	20. (1)

EXPLANATIONS

1. (1) $\times\times\times$) 64329 ($\times\times\times$
$\frac{\times\times\times}{175}$
Here, 643 – 175 = 468
∴ Divisor = 468 or 234

234) 64329(274
$\frac{468}{1752}$
$\frac{1638}{1149}$
$\frac{936}{213}$
Divisor = 234
Quotient = 274

2. (2) $x + x + 2 = x + 4 + 33$
$\Rightarrow x + 2 = 37$

3. (3) Required number
$= \frac{\frac{1}{2}+\frac{3}{5}}{2} = \frac{5+6}{20} = \frac{11}{20}$

4. (4) Such numbers between 99 and 200 = 10
Total numbers = 90

5. (2) Total number of students = 100 × 3 + 400 = 700

6. (1) The unit's digits in 437, 82, 28, 45 and 47 are 7, 2, 8, 5 and 7 respectively.
The product of 7, 2, 8, 5 and 7 = 7 × 2 × 8 × 5 × 7 = 3920
Since the unit's digit in 3920 is 0, hence, the unit digit of 437 × 82 × 28 × 45 × 47 will also be zero.

7. (2) The given number = $(2467)^{153}$
Here, the unit's digit in 2467 is 7 that repeats itself after 4 times

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Now, we divide index by 4.

$$4\overline{)153}\,(38$$
$$\underline{12}$$
$$33$$
$$\underline{32}$$
$$1$$

Here the remainder is 1.
The unit's digit in the value of $(2467)^{153}$ will be same as $(7)^1 = 7$

8. (4) Here the unit's digit of 3127 is 7 and the index is 173
So, if we divide 173 by 4, the remainder is 1.
∴ The required unit's digit $= (7)^1 = 7$

9. (3) The unit's digit in $(2467)^{153}$ = The unit's digit in $(7)^{153}$ = The unit's digit in $(7)^1 = 7$
and the unit's digit in $(341)^{72} = 1$
Because for any index to 1, the value of unit's digit will be 1.
∴ The unit's digit in the product of $(2467)^{153} \times (341)^{72} = 7 \times 1 = 7$

10. (1) We break each base number into prime factors.
Now, $30^7 = (2\times3\times5)^7 = 2^7\times3^7\times5^7$
$22^5 = (2\times11)^5 = 2^5\times11^5$
$34^{12} = (2\times17)^{12} = 2^{12}\times17^{12}$
$12^5 = (3\times2\times2)^5 = 3^5\times2^5\times2^5$
∴ $30^7\times2^2\times34^{12}\times12^5 = 2^7\times3^7\times5^7\times2^5\times11^5\times2^{12}\times17^{12}\times3^5\times2^5\times2^5$
$= 2^{7+5+12+5+5}\times3^{7+5}\times5^7\times11^5\times17^{12}$
$= 2^{34}\times3^{12}\times5^7\times11^5\times17^{12}$
∴ The required number of prime factors
$= 34 + 12 + 7 + 5 + 12 = 70$

11. (2) We break each base number into prime factors.
Now, 25^{12}
$= (5\times5)^{12} = 5^{12}\times5^{12}$
$10^7 = (2\times5)^7 = 2^7\times5^7$
and, $14^7 = (2\times7)^7 = 2^7\times7^7$
∴ $25^{12}\times10^7\times14^7 = 5^{12}\times5^{12}\times2^7\times5^7\times2^7\times7^7$
$= 5^{12+12+7}\times2^{7+7}\times7^7 = 5^{31}\times2^{14}\times7^7$
∴ Number of prime factors = 31 + 14 + 7 = 52

12. (3) It is to be noted that $88 = 8\times11$
Here, $d_1 = 8$, $d_2 = 11$, $r_1 = 3$, $r_2 = 7$.
Where d_1, d_2 are divisors and r_1 and r_2 are respective remainders.
∴ Required remainder $= d_1r_2 + r_1$
$= 8\times7 + 3 = 56 + 3 = 59$

13. (1) We proceed to find the number that is least as mentioned below.

9	z	
11	y	– 8
13	x	– 9
	1	– 8

$x = 13\times1 + 8 = 21$
$y = 11x + 9 = 11\times21 + 9 = 231 + 9 = 240$
$z = 9y + 8 = 9\times240 = 8 = 2160 + 8 = 2168$.
Now, divide 2168 by 13, 11 and 9.

13	2168	
11	166	– 10
9	15	– 1
	1	– 6

Hence, the remainders are 10, 1 and 6 respectively.
Remark : To determine the least number, we have taken the last quotient as 1.

14. (2) This problem can be solved by determining true or complete remainder and dividing it by reversing the order of divisors.
True remainder $= d_1d_2r_3 + d_1r_2 + r_1$
Here, $d_1 = 3$, $d_2 = 5$, $r_1 = 1$, $r_2 = 2$, $r_3 = 3$
∴ **True** remainder $= 3\times5\times3 + 3\times2 + 1 = 45 + 6 + 1 = 52$
Now, we divide 52 by 8, 5 and 3

8	52	
5	6	– 4
3	1	– 1
	0	1

Hence, the remainders are 4, 1 and 1.

15. (2) Any number between 100 and 1000 may be written as $100m + 10n + K$ where $0 < m < 9$, $0 < n < 9$ and $0 < K < 9$.
∴ $(100m + 10n + K) - (m + n + K)$
$= 99m + 9n$
$= 9(11m + n) =$ multiple of 9.
Hence divisible by 9.

16. (1) The least number of five digits = 10000
Now, we divide 10000 by 666

$$666\overline{)10000}\,(15$$
$$\underline{666}$$
$$3340$$
$$\underline{3330}$$
$$10$$

Here, we have 10 as remainder, Therefore, the least number to be added to the least number of 5 digits, i.e., 10000 to get the least number of 5 digits which is exactly divisible by 666 is 666–10 or 656.
Hence, the required number = 10000 + 656 = 10656.

17. (2) We divide 56586 by 552

$$552\overline{)56586}\,(102$$
$$\underline{552}$$
$$1386$$
$$\underline{1104}$$
$$282$$

∴ $R = 282$
$D = 552$
∴ $D - R = 552 - 282 = 270$
Here, $(D - R) < R$
So, we get the required number by adding $(D - R)$ to the dividend. Therefore, the number nearest to 56586 that is exactly divisible by 552 is
56586 + 270 = 56856

18. (3) We divide 77685 by 720

$$720\overline{)77685}\,(107$$
$$\underline{720}$$
$$5685$$
$$\underline{5040}$$
$$645$$

Here, $D - R = 720 - 645 = 75 < R$
∴ The required number
= 77685 + 75 = 77760

19. (4) As we know, the first four prime numbers are 2, 3, 5, 7
Their product $= 2\times3\times5\times7 = 210$
Now, we divide 12199 by 210

$$210\overline{)12199}\,(58$$
$$\underline{1050}$$
$$1699$$
$$\underline{1680}$$
$$19$$

Here, $D - R = 210 - 19 = 191$
So, $(D - R) > R$.
Hence, the required number
$= 12199 - R = 12199 - 19$
$= 12180$

20. (1) The greatest number of 4 digits = 9999
Now, we divide 9999 by 789

$$789\overline{)9999}\,(12$$
$$\underline{789}$$
$$2109$$
$$\underline{1578}$$
$$531$$

Thus, when 9999 – 531 = 9468 is divided by 789, no remainder is left.
The required greatest number of 4 digits = 9468 + 5 = 9473
The least number of 5 digits = 10000

$$789\overline{)10000}\,(12$$
$$\underline{789}$$
$$2110$$
$$\underline{1578}$$
$$532$$

Remainder = 532
∴ The least number of 5 digits exactly divisible by 789
= 10000 + (789 – 532)
= 10000 + 257 = 10257
∴ The required number
= 10257 + 5 = 10262
Remark : If 532 is subtracted from 10000 the number obtained 9468 is exactly divisible by 789 but in that case, the number will not be of 5 digits but of 4 digits.

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2 LCM AND HCF

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. The LCM of two numbers is 864 and their HCF is 144. If one of the number is 288, the other number is :
(1) 576 (2) 1296
(3) 432 (4) 144
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. LCM of two numbers is 225 and their HCF is 5. If one number is 25, the other number will be:
(1) 5 (2) 25
(3) 45 (4) 225
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The L.C.M. of two numbers is 1820 and their H.C.F. is 26. If one number is 130 then the other number is :
(1) 70 (2) 1690
(3) 364 (4) 1264
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The LCM of two numbers is 1920 and their HCF is 16. If one of the number is 128, find the other number.
(1) 204 (2) 240
(3) 260 (4) 320
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. The HCF of two numbers 12906 and 14818 is 478. Their LCM is
(1) 400086 (2) 200043
(3) 600129 (4) 800172
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. The H.C.F. and L.C.M. of two 2-digit numbers are 16 and 480 respectively. The numbers are :
(1) 40, 48 (2) 60, 72
(3) 64, 80 (4) 80, 96
(SSC CPO S.I. Exam. 26.05.2005)

7. The HCF of two numbers is 16 and their LCM is 160. If one of the number is 32, then the other number is
(1) 48 (2) 80
(3) 96 (4) 112
(SSC CPO Sub Inspector Exam. 12.01.2003

8. The product of two numbers is 4107. If the H.C.F. of the numbers is 37, the greater number is
(1) 185 (2) 111
(3) 107 (4) 101
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting) & SSC CGL Exam. 27.07.08 (Second Sitting)

9. The HCF of two numbers is 15 and their LCM is 300. If one of the number is 60, the other is :
(1) 50 (2) 75
(3) 65 (4) 100
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

10. The HCF and LCM of two numbers are 12 and 924 respectively. Then the number of such pairs is
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGLTier-1 Exam 26.06.2011 (Second Sitting)

11. The LCM of two numbers is 30 and their HCF is 5. One of the number is 10. The other is
(1) 20 (2) 25
(3) 15 (4) 5
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

12. The product of two numbers is 1280 and their H.C.F. is 8. The L.C.M. of the number will be :
(1) 160 (2) 150
(3) 120 (4) 140
(SSC CPO SI Exam. 16.12.2007)

13. The H.C.F. and L.C.M. of two numbers are 8 and 48 respectively. If one of the number is 24, then the other number is
(1) 48 (2) 36
(3) 24 (4) 16
(SSC CGLTier-I Exam. 16.05.2010 (First Sitting)

14. The H.C.F and L.C.M of two numbers are 12 and 336 respectively. If one of the number is 84, the other is
(1) 36 (2) 48
(3) 72 (4) 96
(SSC CGLTier-I Exam. 16.05.2010 (Second Sitting)

15. The product of two numbers is 216. If the HCF is 6, then their LCM is
(1) 72 (2) 60
(3) 48 (4) 36
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

16. The HCF and LCM of two numbers are 18 and 378 respectively. If one of the number is 54, then the other number is
(1) 126 (2) 144
(3) 198 (4) 238
(SSC (South Zone) Investigator Exam 12.09.2010)

17. The HCF and product of two numbers are 15 and 6300 respectively. The number of possible pairs of the numbers is
(1) 4 (2) 3
(3) 2 (4) 1
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

18. The HCF of two numbers is 15 and their LCM is 225. If one of the number is 75, then the other number is :
(1) 105 (2) 90
(3) 60 (4) 45
(SSC CHSL DEO & LDC Exam. 27.11.2010)

19. The LCM of two numbers is 520 and their HCF is 4. If one of the number is 52, then the other number is
(1) 40 (2) 42
(3) 50 (4) 52
(SSC CISF Constable (GD) Exam. 05.06.2011)

20. The H.C.F. of two numbers is 96 and their L.C.M. is 1296. If one of the number is 864, the other is
(1) 132 (2) 135
(3) 140 (4) 144
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

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21. The LCM of two numbers is 4 times their HCF. The sum of LCM and HCF is 125. If one of the number is 100, then the other number is
(1) 5 (2) 25
(3) 100. (4) 125
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

22. Product of two co-prime numbers is 117. Then their L.C.M. is
(1) 117 (2) 9
(3) 13 (4) 39
(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

23. The product of two numbers is 2160 and their HCF is 12. Number of such possible pairs is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

24. LCM of two numbers is 2079 and their HCF is 27. If one of the number is 189, the other number is
(1) 297 (2) 584
(3) 189 (4) 216
(SSC (10+2) Level Data Entry Operator & LDC Exam. 10.11.2013, IInd Sitting)

25. The product of two numbers is 2028 and their HCF is 13. The number of such pairs is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CPO S.I. Exam. 12.01.2003 & SSC CGL Tier-I Exam. 19.06.11 (First Sitting)

26. The HCF and LCM of two numbers are 13 and 455 respectively. If one of the number lies between 75 and 125, then, that number is :
(1) 78 (2) 91
(3) 104 (4) 117
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

27. The H.C.F. of two numbers is 8. Which one of the following can never be their L.C.M.?
(1) 24 (2) 48
(3) 56 (4) 60
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

28. The HCF of two numbers is 23 and the other two factors of their LCM are 13 and 14. The larger of the two numbers is :
(1) 276 (2) 299
(3) 345 (4) 322
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

29. The L.C.M. of three different numbers is 120. Which of the following cannot be their H.C.F.?
(1) 8 (2) 12
(3) 24 (4) 35
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

30. The H.C.F. and L.C.M. of two numbers are 44 and 264 respectively. If the first number is divided by 2, the quotient is 44. The other number is
(1) 147 (2) 528
(3) 132 (4) 264
(SSC CHSL DEO & LDC Exam. 9.11.2014)

TYPE–II

1. The least number which when divided by 4, 6, 8, 12 and 16 leaves a remainder of 2 in each case is :
(1) 46 (2) 48
(3) 50 (4) 56
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The least number, which when divided by 12, 15, 20 or 54 leaves a remainder of 4 in each case, is :
(1) 450 (2) 454
(3) 540 (4) 544
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Find the greatest number of five digits which when divided by 3, 5, 8, 12 have 2 as remainder :
(1) 99999 (2) 99958
(3) 99960 (4) 99962
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The least multiple of 13, which on dividing by 4, 5, 6, 7 and 8 leaves remainder 2 in each case is:
(1) 2520 (2) 842
(3) 2522 (4) 840
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone, SSC CGL Prelim Exam. 24.02.2002 (Second Sitting) & SSC CGL Prelim Exam. 13.11.2005)

5. A, B, C start running at the same time and at the same point in the same direction in a circular stadium. A completes a round in 252 seconds, B in 308 seconds and C in 198 seconds. After what time will they meet again at the starting point ?
(1) 26 minutes 18 seconds
(2) 42 minutes 36 seconds
(3) 45 minutes
(4) 46 minutes 12 seconds
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

6. Find the largest number of four digits such that on dividing by 15, 18, 21 and 24 the remainders are 11, 14, 17 and 20 respectively.
(1) 6557 (2) 7556
(3) 5675 (4) 7664
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

7. The least perfect square, which is divisible by each of 21, 36 and 66 is
(1) 214344 (2) 214434
(3) 213444 (4) 231444
(SSC CPO S.I. Exam. 12.01.2003)

8. The least number, which when divided by 4, 5 and 6 leaves remainder 1, 2 and 3 respectively, is
(1) 57 (2) 59
(3) 61 (4) 63
(SSC CPO S.I. Exam. 12.01.2003)

9. Let the least number of six digits which when divided by 4, 6, 10, 15 leaves in each case same remainder 2 be N. The sum of digits in N is :
(1) 3 (2) 5
(3) 4 (4) 6
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

10. Which is the least number which when doubled will be exactly divisible by 12, 18, 21 and 30?
(1) 2520 (2) 1260
(3) 630 (4) 196
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

11. The smallest square number divisible by 10, 16 and 24 is
(1) 900 (2) 1600
(3) 2500 (4) 3600
(SSC CPO S.I. Exam. 07.09.2003)

12. If the students of a class can be grouped exactly into 6 or 8 or 10, then the minimum number of students in the class must be
(1) 60 (2) 120
(3) 180 (4) 240
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

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13. The least number which when divided by 4, 6, 8 and 9 leave zero remainder in each case and when divided by 13 leaves a remainder of 7 is :
(1) 144 (2) 72
(3) 36 (4) 85
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

14. The smallest number, which when divided by 12 and 16 leaves remainder 5 and 9 respectively, is :
(1) 55 (2) 41
(3) 39 (4) 29
(SSC CPO S.I. Exam. 26.05.2005)

15. A number which when divided by 10 leaves a remainder of 9, when divided by 9 leaves a remainder of 8, and when divided by 8 leaves a remainder of 7, is :
(1) 1539 (2) 539
(3) 359 (4) 1359
(SSC CPO S.I. Exam. 26.05.2005)

16. What is the smallest number which leaves remainder 3 when divided by any of the numbers 5, 6 or 8 but leaves no remainder when it is divided by 9 ?
(1) 123 (2) 603
(3) 723 (4) 243
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

17. The least number which when divided by 16, 18, 20 and 25 leaves 4 as remainder in each case but when divided by 7 leaves no remainder is
(1) 17004 (2) 18000
(3) 18002 (4) 18004
(SSC CGL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

18. What is the least number which when divided by the numbers 3, 5, 6, 8, 10 and 12 leaves in each case a remainder 2 but when divided by 13 leaves no remainder ?
(1) 312 (2) 962
(3) 1562 (4) 1586
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

19. The least multiple of 7, which leaves the remainder 4, when divided by any of 6, 9, 15 and 18, is
(1) 76 (2) 94
(3) 184 (4) 364
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

20. The largest number of five digits which, when divided by 16, 24, 30, or 36 leaves the same remainder 10 in each case, is :
(1) 99279 (2) 99370
(3) 99269 (4) 99350
(SSC CPO S.I. Exam. 16.12.2007)

21. The smallest number, which when divided by 5, 10, 12 and 15, leaves remainder 2 in each case; but when divided by 7 leaves no remainder, is
(1) 189 (2) 182
(3) 175 (3) 91
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

22. What least number must be subtracted from 1936 so that the resulting number when divided by 9, 10 and 15 will leave in each case the same remainder 7 ?
(1) 37 (2) 36
(3) 39 (4) 30
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

23. The least number, which when divided by 18, 27 and 36 separately leaves remainders 5, 14, and 23 respectively, is
(1) 95 (2) 113
(3) 149 (4) 77
(SSC CPO S.I. Exam. 09.11.2008)

24. The least number which when divided by 5, 6, 7 and 8 leaves a remainder 3, but when divided by 9 leaves no remainder is
(1) 1677 (2) 1683
(3) 2523 (4) 3363
(SSC CPO S.I. Exam. 06.09.2009) & SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

25. The greatest number of four digits which when divided by 12, 16 and 24 leave remainders 2, 6 and 14 respectively is
(1) 9974 (2) 9970
(3) 9807 (4) 9998
(SSC CPO S.I. Exam. 06.09.2009)

26. When a number is divided by 15, 20 or 35, each time the remainder is 8. Then the smallest number is
(1) 428 (2) 427
(3) 328 (4) 338
(SSC CPO S.I. Exam. 06.09.2009)

27. The smallest number, which, when divided by 12 or 10 or 8, leaves remainder 6 in each case, is
(1) 246 (2) 186
(3) 126 (4) 66
(SSC (South Zone) Investigator Exam. 12.09.2010)

28. The traffic lights at three different road crossings change after 24 seconds, 36 seconds and 54 seconds respectively. If they all change simultaneously at 10 : 15 : 00 AM, then at what time will they again change simultaneously?
(1) 10 : 16 : 54 AM
(2) 10 : 18 : 36 AM
(3) 10 : 17 : 02 AM
(4) 10 : 22 : 12 AM
(SSC CGLTier-1 Exam. 26.06.2011 (First Sitting)

29. From a point on a circular track 5 km long A, B and C started running in the same direction at the same time with speed of $2\frac{1}{2}$ km per hour, 3 km per hour and 2 km per hour respectively. Then on the starting point all three will meet again after
(1) 30 hours (2) 6 hours
(3) 10 hours (4) 15 hours
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

30. Four runners started running simultaneously from a point on a circular track. They took 200 seconds, 300 seconds, 360 seconds and 450 seconds to complete one round. After how much time do they meet at the starting point for the first time ?
(1) 1800 seconds
(2) 3600 seconds
(3) 2400 seconds
(4) 4800 seconds
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

31. Four bells ring at intervals of 4, 6, 8 and 14 seconds. They start ringing simultaneously at 12.00 O'clock. At what time will they again ring simultaneously ?
(1) 12 hrs. 2 min. 48 sec.
(2) 12 hrs. 3 min.
(3) 12 hrs. 3 min. 20 sec.
(4) 12 hrs. 3 min. 44 sec.
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

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32. 4 bells ring at intervals of 30 minutes, 1 hour, $1\frac{1}{2}$ hour and 1 hour 45 minutes respectively. All the bells ring simultaneously at 12 noon. They will again ring simultaneously at :
(1) 12 mid night (2) 3 a.m.
(3) 6 a.m. (4) 9 a.m.
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

33. Four bells ring at the intervals of 5, 6, 8 and 9 seconds. All the bells ring simulataneously at some time. They will again ring simultaneously after
(1) 6 minutes (2) 12 minutes
(3) 18 minutes (4) 24 minutes
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

34. Three bells ring simultaneously at 11a.m. They ring at regular intervals of 20 minutes, 30 minutes, 40 minutes respectively. The time when all the three ring together next is
(1) 2 p.m. (2) 1 p.m.
(3) 1.15 p.m. (4) 1.30 p.m.
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

35. The greatest number of four digits which when divided by 3, 5, 7, 9 leave remainders 1, 3, 5, 7 respectively is :
(1) 9763 (2) 9764
(3) 9766 (4) 9765
(SSC CGL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

36. Five bells begin to toll together and toll respectively at intervals of 6, 7, 8, 9 and 12 seconds. After how many seconds will they toll together again ?
(1) 72 Sec. (2) 612 Sec.
(3) 504 Sec. (4) 318 Sec.
(SSC Constable (GD) Exam. 12.05.2013)

37. L.C.M. of $\frac{2}{3}, \frac{4}{9}, \frac{5}{6}$ is
(1) $\frac{8}{27}$ (2) $\frac{20}{3}$
(3) $\frac{10}{3}$ (4) $\frac{20}{27}$
(SSCCGL DEO & LDC Exam. 20.10.2013)

38. The number nearest to 10000, which is exactly divisible by each of 3, 4, 5, 6, 7 and 8, is :
(1) 9240 (2) 10080
(3) 9996 (4) 10000
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

39. The largest 4-digit number exactly divisible by each of 12, 15, 18 and 27 is
(1) 9690 (2) 9720
(3) 9930 (4) 9960
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

40. The least number, which is a perfect square and is divisible by each of the numbers 16, 20 and 24, is
(1) 1600 (2) 3600
(3) 6400 (4) 14400
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

41. The number nearest to 43582 divisible by each of 25, 50 and 75 is :
(1) 43500 (2) 43650
(3) 43600 (4) 43550
(SSC CPO S.I. Exam. 16.12.2007)

42. The smallest number, which when increased by 5 is divisible by each of 24,32, 36 and 564, is
(1) 869 (2) 859
(3) 4320 (4) 427
(SSC CPO S.I. Exam. 09.11.2008)

43. The greatest number, which when subtracted from 5834, gives a number exactly divisible by each of 20, 28, 32 and 35, is
(1) 1120 (2) 4714
(3) 5200 (4) 5600
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

44. The smallest perfect square divisible by each of 6, 12 and 18 is
(1) 196 (2) 144
(3) 108 (4) 36
(SSC (South Zone) Investigator Exam. 12.09.2010)

45. The greatest 4-digit number exactly divisible by 10, 15, 20 is
(1) 9990 (2) 9960
(3) 9980 (4) 9995
(SSC Graduate Level Tier-II Exam. 29.09.2013

46. Find the least number which when divided separately by 15, 20, 36 and 48 leaves 3 as remainder in each case.
(1) 183 (2) 243
(3) 483 (4) 723
(SSC CGL Tier-II Exam. 21.09.2014

47. Three men step off together from the same spot. Their steps measure 63 cm, 70 cm and 77 cm respectively. The minimum distance each should cover so that all can cover the distance in complete steps is
(1) 9630 cm (2) 9360 cm
(3) 6930 cm (4) 6950 cm
(SSC CGL Tier-II Exam. 21.09.2014

TYPE–III

1. The maximum number of students among whom 1001 pens and 910 pencils can be distributed in such a way that each student gets same number of pens and same number of pencils, is :
(1) 91 (2) 910
(3) 1001 (4) 1911
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The greatest number, which when divide 989 and 1327 leave remainders 5 and 7 respectively, is :
(1) 8 (2) 16
(3) 24 (4) 32
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. H.C.F of $\frac{2}{3}, \frac{4}{5}$ and $\frac{6}{7}$ is
(1) $\frac{48}{105}$ (2) $\frac{2}{105}$
(3) $\frac{1}{105}$ (4) $\frac{24}{105}$
(SSC Graduate Level Tier-II Exam. 16.09.2012)

4. Let N be the greatest number that will divide 1305, 4665 and 6905 leaving the same remainder in each case. Then, sum of the digits in N is :
(1) 4 (2) 5
(3) 6 (4) 8
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

5. What is the greatest number that will divide 307 and 330 leaving remainders 3 and 7 respectively ?
(1) 19 (2) 16
(3) 17 (4) 23
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

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6. Which greatest number will divide 3026 and 5053 leaving remainders 11 and 13 respectively?
(1) 18 (2) 30
(3) 45 (4) 60
(SSC CPO S.I. Exam. 03.09.2006)

7. The greatest number, by which 1657 and 2037 are divided to give remainders 6 and 5 respectively, is
(1) 127 (2) 133
(3) 235 (4) 305
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

8. The largest number, which divides 25, 73 and 97 to leave the same remainder in each case, is
(1) 24 (2) 23
(3) 21 (4) 6
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. What is the greatest number which will divide 110 and 128 leaving a remainder 2 in each case ?
(1) 8 (2) 18
(3) 28 (4) 38
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

10. A milkman has 75 litres milk in one can and 45 litres in another. The maximum capacity of container which can measure milk of either container exact number of times is :
(1) 1 litre (2) 5 litres
(3) 15 litres (4) 25 litres
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

11. What is the least number of square tiles required to pave the floor of a room 15 m 17 cm long and 9 m 2 cm broad?
(1) 840 (2) 841
(3) 820 (4) 814
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

12. Three sets of English, Mathematics and Science books containing 336, 240, 96 books respectively have to be stacked in such a way that all the books are stored subject-wise and the height of each stack is the same. Total number of stacks will be
(1) 14 (2) 21
(3) 22 (4) 48
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

13. A farmer has 945 cows and 2475 sheep. He farms them into flocks, keeping cows and sheep separate and having the same number of animals in each flock. If these flocks are as large as possible, then the maximum number of animals in each flock and total number of flocks required for the purpose are respectively
(1) 15 and 228 (2) 9 and 380
(3) 45 and 76 (4) 46 and 75
(SSC (10+2) Level Data Entry Operator & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

14. A milk vendor has 21 litres of cow milk, 42 litres of toned milk and 63 litres of double toned milk. If he wants to pack them in cans so that each can contains same litres of milk and does not want to mix any two kinds of milk in a can, then the least number of cans required is
(1) 3 (2) 6
(3) 9 (4) 12
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

15. The greatest number that divides 411, 684, 821 and leaves 3, 4 and 5 as remainders, respectively, is
(1) 254 (2) 146
(3) 136 (4) 204
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

16. Find the greatest number which will exactly divide 200 and 320.
(1) 10 (2) 20
(3) 16 (4) 40
(SSC CGL Tier-II Exam. 21.09.2014

17. 84 Maths books, 90 Physics books and 120 Chemistry books have to be stacked topicwise. How many books will be there in each stack so that each stack will have the same height too ?
(1) 12 (2) 18
(3) 6 (4) 21
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

18. The greatest number that will divide 729 and 901 leaving remainders 9 and 5 respectively, is
(1) 15 (2) 16
(3) 19 (4) 20
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

19. Three tankers contain 403 litres, 434 litres, 465 litres of diesel respectively. Then the maximum capacity of a container that can measure the diesel of the three containers exact number of times is
(1) 31 litres (2) 62 litres
(3) 41 litres (4) 84 litres
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

20. There are 24 peaches, 36 apricots and 60 bananas and they have to be arranged in several rows in such a way that every row contains the same number of fruits of only one type. What is the minimum number of rows required for this to happen ?
(1) 12 (2) 9
(3) 10 (4) 6
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

21. The greatest number by which 2300 and 3500 are divided leaving the remainders of 32 and 56 respectively, is
(1) 136 (2) 168
(3) 42 (4) 84
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 21.06.2015 IInd Sitting)

TYPE–IV

1. The LCM and the HCF of the numbers 28 and 42 are in the ratio :
(1) 6 : 1 (2) 2 : 3
(3) 3 : 2 (4) 7 : 2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. If the ratio of two numbers is 2 : 3 and their L.C.M. is 54, then the sum of the two numbers is
(1) 5 (2) 15
(3) 45 (4) 270
(SSC CPO S.I. Exam. 07.09.2003)

3. The ratio of two numbers is 4 : 5 and their L.C.M. is 120. The numbers are
(1) 30, 40 (2) 40, 32
(3) 24, 30 (4) 36, 20
(SSC CPO S.I. Exam. 07.09.2003)

4. Three numbers are in the ratio 2 : 3 : 4 and their H.C.F. is 12. The L.C.M. of the numbers is
(1) 144 (2) 192
(3) 96 (4) 72
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

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5. Two numbers are in the ratio 3 : 4. If their LCM is 240, the smaller of the two number is
(1) 100 (2) 80
(3) 60 (4) 50
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

6. Two numbers are in the ratio 3 : 4. Their L.C.M. is 84. The greater number is
(1) 21 (2) 24
(3) 28 (4) 84
(SSC CGLTier-I Exam. 16.05.2010 (First Sitting)

7. Two numbers are in the ratio 3 : 4. If their HCF is 4, then their LCM is
(1) 48 (2) 42
(3) 36 (4) 24
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting) & SSC (South Zone) Investigator Exam. 12.09.2010 & SSC MTS Exam. 10.03.2013)

8. The ratio of the sum to the LCM of two natural numbers is 7 : 12. If their HCF is 4, then the smaller number is :
(1) 20 (2) 16
(3) 12 (4) 8
(SSC CGL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

9. Two numbers are in the ratio 3 : 4. The product of their H.C.F. and L.C.M. is 2028. The sum of the numbers is
(1) 68 (2) 72
(3) 86 (4) 91
(SSC DEO Exam. 02.09.2009)

10. The LCM of two numbers is 48. The numbers are in the ratio 2 : 3. The sum of the numbers is
(1) 28 (2) 32
(3) 40 (4) 64
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

11. The ratio of two numbers is 4 : 5 and their H.C.F. is 8. Then their L.C.M. is
(1) 130 (2) 140
(3) 150 (4) 160
(SSC CGL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

12. The ratio of two numbers is 3 : 4 and their HCF is 5. Their LCM is :
(1) 10 (2) 60
(3) 15 (4) 12
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

13. Three numbers are in the ratio 1 : 2 : 3 and their HCF is 12. The numbers are
(1) 12, 24, 36 (2) 5, 10, 15
(3) 4, 8, 12 (4) 10, 20, 30
(SSC CGL Tier-I Exam. 19.10.2014 (1st Sitting)

14. If $x : y$ be the ratio of two whole numbers and z be their HCF, then the LCM of those two numbers is
(1) yz (2) $\frac{xz}{y}$
(3) $\frac{xy}{z}$ (4) xyz
(SSC CHSL DEO & LDC Exam. 16.11.2014

15. The H.C.F. and L.C.M. of two numbers are 21 and 84 respectively. If the ratio the two numbers is 1 : 4, then the larger of the two numbers is
(1) 12 (2) 108
(3) 48 (4) 84
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099[illegible]

TYPE–V

1. The product of the LCM and HCF of two numbers is 24. The difference of the two numbers is 2. Find the numbers ?
(1) 8 and 6 (2) 8 and 10
(3) 2 and 4 (4) 6 and 4
[SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The LCM of two numbers is 495 and their HCF is 5. If the sum of the numbers is 100, then their difference is :
(1) 10 (2) 46
(3) 70 (4) 90
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Two numbers, both greater than 29, have HCF 29 and LCM 4147. The sum of the numbers is :
(1) 966 (2) 696
(3) 669 (4) 666
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting), & SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. The sum of the H.C.F. and L.C.M of two numbers is 680 and the L.C.M. is 84 times the H.C.F. If one of the number is 56, the other is :
(1) 84 (2) 12
(3) 8 (4) 96
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

5. The sum of two numbers is 84 and their HCF is 12. Total number of such pairs of number is
(1) 2 (2) 3
(3) 4 (4) 5
(SSC HSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

6. The sum of a pair of positive integer is 336 and their H.C.F. is 21. The number of such possible pairs is
(1) 2 (2) 3
(3) 4 (4) 5
(SSC CGL DEO & LDC Exam. 04.12.2011 (1st Sitting (North Zone)

7. The sum of two numbers is 45. Their difference is $\frac{1}{9}$ of their sum. Their L.C.M. is
(1) 200 (2) 250
(3) 100 (4) 150
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

8. The H.C.F. of two numbers, each having three digits , is 17 and their L.C.M. is 714. The sum of the numbers will be :
(1) 289 (2) 391
(3) 221 (4) 731
(SSC CPO S.I. Exam. 16.12.2007)

9. The product of the LCM and the HCF of two numbers is 24. If the difference of the numbers is 2, then the greater of the number is
(1) 3 (2) 4
(3) 6 (4) 8
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. The sum of two numbers is 216 and their HCF is 27. How many pairs of such numbers are there?
(1) 1 (2) 2
(3) 3 (4) 0
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

11. The LCM of two numbers is 12 times their HCF. The sum of the HCF and the LCM is 403. If one of the number is 93, then the other number is
(1) 124 (2) 128
(3) 134 (4) 138
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

12. Sum of two numbers is 384. H.C.F. of the numbers is 48. The difference of the numbers is
(1) 100 (2) 192
(3) 288 (4) 336
(SSC CPO S.I. Exam. 06.09.2009)

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13. The sum of two numbers is 36 and their H.C.F and L.C.M. are 3 and 105 respectively. The sum of the reciprocals of two numbers is

(1) $\frac{2}{35}$ (2) $\frac{3}{25}$

(3) $\frac{4}{35}$ (4) $\frac{2}{25}$

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting) & SSC HSL DEO & LDC Exam. 28.11.2010)

14. L.C.M. of two numbers is 120 and their H.C.F. is 10. Which of the following can be the sum of those two numbers ?

(1) 140 (2) 80
(3) 60 (4) 70

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

15. Three numbers which are co-prime to one another are such that the product of the first two is 551 and that of the last two is 1073. The sum of the three numbers is :

(1) 75 (2) 81
(3) 85 (4) 89

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

16. The sum of two numbers is 36 and their H.C.F. is 4. How many pairs of such numbers are possible ?

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

17. If the HCF and LCM of two consecutive (positive) even numbers be 2 and 84 respectively, then the sum of the numbers is

(1) 30 (2) 26
(3) 14 (4) 34

(SSC CGL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

18. The LCM of two positive integers is twice the larger number. The difference of the smaller number and the GCD of the two numbers is 4. The smaller number is :

(1) 12 (2) 6
(3) 8 (4) 10

(SSC CGL DEO & LDC Exam. 21.10.2012, IInd Sitting)

19. The L.C.M. of two numbers is 20 times their H.C.F. The sum of H.C.F. and L.C.M. is 2520. If one of the number is 480, the other number is :

(1) 400 (2) 480
(3) 520 (4) 600

(SSC CPO S.I. Exam. 26.05.2005)

20. The LCM of two numbers is 44 times of their HCF. The sum of the LCM and HCF is 1125. If one number is 25, then the other number is

(1) 1100 (2) 975
(3) 900 (4) 800

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

21. If A and B are the H.C.F. and L.C.M. respectively of two algebraic expressions x and y, and $A + B = x + y$, then the value of $A^3 + B^3$ is

(1) $x^3 - y^3$ (2) x^3
(3) y^3 (4) $x^3 + y^3$

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

22. HCF and LCM of two numbers are 7 and 140 respectively. If the numbers are between 20 and 45, the sum of the numbers is :

(1) 70 (2) 77
(3) 63 (4) 56

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

23. The number between 3000 and 4000 which is exactly divisible by 30, 36 and 80 is

(1) 3625 (2) 3250
(3) 3500 (4) 3600

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

24. Let x be the least number, which when divided by 5, 6, 7 and 8 leaves a remainder 3 in each case but when divided by 9 leaves no remainder. The sum of digits of x is

(1) 21 (2) 22
(3) 18 (4) 24

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

25. The greatest four digit number which is exactly divisible by each one of the numbers 12, 18, 21 and 28 is

(1) 9828 (2) 9288
(3) 9882 (4) 9928

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

26. A number x is divisible by 7. When this number is divided by 8, 12 and 16. It leaves a remainder 3 in each case. The least value of x is:

(1) 148 (2) 149
(3) 150 (4) 147

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

27. Let x be the smallest number, which when added to 2000 makes the resulting number divisible by 12, 16, 18 and 21. The sum of the digits of x is

(1) 7 (2) 5
(3) 6 (4) 4

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

28. The smallest five digit number which is divisible by 12,18 and 21 is :

(1) 10224 (2) 30256
(3) 10080 (4) 50321

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

29. A number between 1000 and 2000 which when divided by 30, 36 and 80 gives a remainder 11 in each case is

(1) 1451 (2) 1641
(3) 1712 (4) 1523

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

30. The number between 4000 and 5000 that is divisible by each of 12, 18, 21 and 32 is

(1) 4023 (2) 4032
(3) 4302 (4) 4[illegible]03

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–VI

1. The LCM of two multiples of 12 is 1056. If one of the number is 132, the other number is

(1) 12 (2) 72
(3) 96 (4) 132

(SSC CPO S.I. Exam. 06.09.2009)

2. The least number to be subtracted from 36798 to get a number which is exactly divisible by 78 is

(1) 18 (2) 60
(3) 38 (4) 68

(SSC CPO S.I. Exam. 06.09.2009)

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3. Find the least multiple of 23, which when divided by 18, 21 and 24 leaves the remainder 7, 10 and 13 respectively.
(1) 3013 (2) 3024
(3) 3002 (4) 3036
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The greatest number, that divides 122 and 243 leaving respectively 2 and 3 as remainders, is
(1) 12 (2) 24
(3) 30 (4) 120
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. If $P = 2^3.3^{10}.5$; $Q = 2^5.3.7$, then HCF of P and Q is :
(1) 2.3.5.7 (2) 3.2^3
(3) $2^3.3^7$ (4) $2^3.3^{10}.5.7$
(SSC CGL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

6. A fraction becomes $\frac{1}{6}$ when 4 is subtracted from its numerator and 1 is added to its denominator. If 2 and 1 are respectively added to its numerator and the denominator, it becomes $\frac{1}{3}$. Then, the LCM of the numerator and denominator of the said fraction, must be
(1) 14 (2) 350
(3) 5 (4) 70
(SSC CGL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

7. The HCF (GCD) of a, b is 12, a, b are positive integers and $a > b > 12$. The smallest values of (a, b) are respectively
(1) 12, 24 (2) 24, 12
(3) 24, 36 (4) 36, 24
(SSC CGL Tier-I Exam. 11.11.2012, 1st Sitting)

8. The number of pair of positive integers whose sum is 99 and HCF is 9 is
(1) 2 (2) 3
(3) 4 (4) 5
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 01.11.2015, IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (3)	2. (3)	3. (3)	4. (2)
5. (1)	6. (4)	7. (2)	8. (2)
9. (2)	10. (3)	11. (3)	12. (1)
13. (4)	14. (2)	15. (4)	16. (1)
17. (3)	18. (4)	19. (1)	20. (4)
21. (2)	22. (1)	23. (2)	24. (1)
25. (2)	26. (2)	27. (4)	28. (4)
29. (4)	30. (3)		

TYPE-II

1. (3)	2. (4)	3. (4)	4. (3)
5. (4)	6. (2)	7. (3)	8. (1)
9. (2)	10. (3)	11. (4)	12. (2)
13. (2)	14. (2)	15. (3)	16. (4)
17. (4)	18. (2)	19. (4)	20. (2)
21. (2)	22. (3)	23. (1)	24. (2)
25. (1)	26. (1)	27. (3)	28. (2)
29. (3)	30. (1)	31. (1)	32. (4)
33. (1)	34. (2)	35. (1)	36. (3)
37. (2)	38. (2)	39. (2)	40. (2)
41. (2)	42. (2)	43. (2)	44. (4)
45. (2)	46. (4)	47. (3)	

TYPE-III

1. (1)	2. (3)	3. (2)	4. (1)
5. (1)	6. (3)	7. (1)	8. (1)
9. (2)	10. (3)	11. (4)	12. (1)
13. (3)	14. (2)	15. (3)	16. (4)
17. (3)	18. (2)	19. (1)	20. (3)
21. (4)			

TYPE-IV

1. (1)	2. (3)	3. (3)	4. (1)
5. (3)	6. (3)	7. (1)	8. (3)
9. (4)	10. (3)	11. (4)	12. (2)
13. (1)	14. (4)	15. (4)	

TYPE-V

1. (4)	2. (1)	3. (2)	4. (4)
5. (2)	6. (3)	7. (3)	8. (3)
9. (3)	10. (2)	11. (1)	12. (3)
13. (3)	14. (4)	15. (3)	16. (3)
17. (2)	18. (3)	19. (4)	20. (1)
21. (4)	22. (3)	23. (4)	24. (3)
25. (1)	26. (4)	27. (1)	28. (3)
29. (1)	30. (2)		

TYPE-VI

1. (3)	2. (2)	3. (1)	4. (4)
5. (2)	6. (4)	7. (4)	8. (4)

EXPLANATIONS

TYPE-I

1. (3) Required number
$= \frac{\text{HCF} \times \text{LCM}}{\text{First number}}$
$= \frac{864 \times 144}{288} = 432$

2. (3) LCM × HCF = 1st Number× 2nd Number
$\Rightarrow 225 \times 5 = 25 \times x$
$\therefore x = \frac{225 \times 5}{25} = 45$

3. (3) Given that
L.C.M. of two numbers = 1820
H.C.F. of those numbers = 26
One of the number is 130
∴ Another number
$= \frac{1820 \times 26}{130} = 364$

4. (2) We have,
First number × second number = LCM × HCF
∴ Second number
$= \frac{1920 \times 16}{128} = 240$

5. (1) Product of two numbers = HCF × LCM
$\Rightarrow 12906 \times 14818 = \text{LCM} \times 478$
$\Rightarrow \text{LCM} = \frac{12906 \times 14818}{478}$
$= 400086$

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6. (4) H.C.F. of the two 2-digit numbers = 16
Hence, the numbers can be expressed as $16x$ and $16y$, where x and y are prime to each other.
Now,
First number × second number = H.C.F. × L.C.M.
$\Rightarrow 16x \times 16y = 16 \times 480$
$\Rightarrow xy = \frac{16 \times 480}{16 \times 16} = 30$
The possible pairs of x and y, satisfying the condition $xy = 30$ are : (3, 10), (5, 6), (1, 30), (2, 15)
Since the numbers are of 2-digits each.
Hence, admissible pair is (5, 6)
$\therefore$ Numbers are : $16 \times 5 = 80$ and $16 \times 6 = 96$

7. (2) We know that,
First number × Second number = LCM × HCF
$\Rightarrow$ Second number
$= \frac{16 \times 160}{32} = 80$

8. (2)
$\text{LCM} = \frac{\text{Product of two numbers}}{\text{HCF}}$
$= \frac{4107}{37} = 111$
Obviously, numbers are 111 and 37 which satisfy the given condition.
Hence, the greater number = 111

9. (2) First number × Second number = HCF × LCM
$\therefore$ Second number
$= \frac{15 \times 300}{60} = 75$

10. (3) Let the numbers be $12x$ and $12y$ where x and y are prime to each other.
$\therefore$ LCM = $12xy$
$\therefore 12xy = 924$
$\Rightarrow xy = 77$
$\therefore$ Possible pairs = (1,77) and (7,11)

11. (3) First number × second number = LCM × HCF
Let the second number be x.
$\therefore 10x = 30 \times 5$
$\Rightarrow x = \frac{30 \times 5}{10} = 15$

12. (1) HCF × LCM = Product of two numbers
$\Rightarrow 8 \times \text{LCM} = 1280$
$\Rightarrow \text{LCM} = \frac{1280}{8} = 160$

13. (4) First number × second number = HCF × LCM
$\Rightarrow 24 \times \text{second number} = 8 \times 48$
$\therefore$ Second number $= \frac{8 \times 48}{24} = 16$

14. (2) First number × second number = HCF × LCM
$\Rightarrow 84 \times$ second number
$= 12 \times 336$
$\therefore$ Second number
$= \frac{12 \times 336}{84} = 48$

15. (4) Let the numbers be $6x$ and $6y$ where x and y are prime to each other.
$\therefore 6x \times 6y = 216$
$\Rightarrow xy = \frac{216}{6 \times 6} = 6$
$\therefore$ LCM = $6xy = 6 \times 6 = 36$

16. (1) Second number
$= \frac{\text{HCF} \times \text{LCM}}{\text{First number}}$
$= \frac{18 \times 378}{54} = 126$

17. (3) Let the number be $15x$ and $15y$, where x and y are co-prime.
$\therefore 15x \times 15y = 6300$
$\Rightarrow xy = \frac{6300}{15 \times 15} = 28$
So, two pairs are
(7, 4) and (14, 2)

18. (4) First number × Second number = HCF × LCM
$\Rightarrow 75 \times$ Second number
$= 15 \times 225$
$\therefore$ Second number
$= \frac{15 \times 225}{75} = 45$

19. (1) First number × second number = HCF × LCM
$\Rightarrow 52 \times$ second number
$= 4 \times 520$
$\Rightarrow$ Second number
$= \frac{4 \times 520}{52} = 40$

20. (4) First number × Second number = HCF × LCM
$\Rightarrow 864 \times$ Second number
$= 96 \times 1296 \Rightarrow$ Second number
$= \frac{96 \times 1296}{864} = 144$

21. (2) Let LCM be L and HCF be H, then
$L = 4H$
$\therefore H + 4H = 125$
$\Rightarrow 5H = 125$
$\Rightarrow H = \frac{125}{5} = 25$
$\therefore L = 4 \times 25 = 100$
$\therefore$ Second number
$= \frac{L \times H}{\text{First number}}$
$= \frac{100 \times 25}{100} = 25$

22. (1) HCF of two-prime numbers = 1
$\therefore$ Product of numbers = their LCM = 117
$117 = 13 \times 9$ where 13 & 9 are co-prime. L.C.M (13,9) = 117.

23. (2) HCF = 12
Numbers = $12x$ and $12y$
where x and y are prime to each other.
$\therefore 12x \times 12y = 2160$
$\Rightarrow xy = \frac{2160}{12 \times 12}$
$= 15 = 3 \times 5, 1 \times 15$
Possible pairs = (36, 60) and (12, 180)

24. (1) Second number
$= \frac{\text{H.C.F.} \times \text{L.C.M.}}{\text{First Number}}$
$= \frac{27 \times 2079}{189} = 297$

25. (2) Here, HCF = 13
Let the numbers be 13x and 13y where x and y are Prime to each other.
Now, $13x \times 13y = 2028$
$\Rightarrow xy = \frac{2028}{13 \times 13} = 12$
The possible pairs are : (1, 12), (3, 4), (2, 6)
But the 2 and 6 are not co-prime.
$\therefore$ The required no. of pairs = 2

26. (2) HCF = 13
Let the numbers be 13x and 13y. Where x and y are co-prime.
$\therefore$ LCM $= 13xy$
$\therefore 13xy = 455$
$\therefore xy = \frac{455}{13} = 35 = 5 \times 7$
$\therefore$ Numbers are $13 \times 5 = 65$ and $13 \times 7 = 91$

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27. (4) HCF of two numbers is 8. This means 8 is a factor common to both the numbers. LCM is common multiple for the two numbers, it is divisible by the two numbers. So, the required answer = 60

28. (4) Let the numbers be $23x$ and $23y$ where x and y are co-prime.
$\therefore$ LCM = $23xy$
As given,
$23xy = 23 \times 13 \times 14$
$\therefore x = 13,\ y = 14$
$\therefore$ The larger number = $23y$
$= 23 \times 14 = 322$

29. (4) LCM = $2 \times 2 \times 2 \times 3 \times 5$
Hence, HCF = 4, 8, 12 or 24
According to question
30 cannot be H.C.F. of 120.

30. (3) First number = $2 \times 44 = 88$
$\therefore$ First number $\times$ Second number
= H.C.F. $\times$ L.C.M.
$\Rightarrow$ 88 $\times$ Second numebr
$= 44 \times 264$
$\Rightarrow$ Second number

$$= \frac{44 \times 264}{88} = 132$$

TYPE-II

1. (3) L.C.M. of 4, 6, 8, 12 and 16 = 48
$\therefore$ Required number
$= 48 + 2 = 50$

2. (4) LCM of 15, 12, 20, 54 = 540
Then number = 540 + 4 = 544
[4 being remainder]

3. (4) The greatest number of five digits is 99999.
LCM of 3, 5, 8 and 12

2	3, 5, 8, 12
2	3, 5, 4, 6
3	3, 5, 2, 3
	1, 5, 2, 1

$\therefore$ LCM = $2 \times 2 \times 3 \times 5 \times 2 = 120$
After dividing 99999 by 120, we get 39 as remainder
99999 – 39 = 99960
= (833 $\times$ 120)
99960 is the greatest five digit number divisible by the given divisors.
In order to get 2 as remainder in each case we will simply add 2 to 99960.
$\therefore$ Greatest number
= 99960 + 2 = 99962

4. (3) LCM of 4, 5, 6, 7 and 8

= 2	4, 5, 6, 7, 8
2	2, 5, 3, 7, 4
	1, 5, 3, 7, 2

$= 2 \times 2 \times 2 \times 3 \times 5 \times 7 = 840$.
let required number be 840 K + 2 which is multiple of 13.
Least value of K for which (840 K + 2) is divisible by 13 is K = 3
$\therefore$ Required number
$= 840 \times 3 + 2$
$= 2520 + 2 = 2522$

5. (4) Required time = LCM of 252, 308 and 198 seconds

2	252, 308 198
2	126, 154, 99
7	63, 77, 99
9	9, 11, 99
11	1, 11, 11
	1, 1, 1

$\therefore$ LCM = $2 \times 2 \times 7 \times 9 \times 11$
= 2772 seconds
= 46 minutes 12 seconds

6. (2) $15 = 3 \times 5$
$18 = 3^2 \times 2$
$21 = 3 \times 7$
$24 = 2^3 \times 3$
LCM = $8 \times 9 \times 5 \times 7 = 2520$
The largest number of four digits = 9999

2520)9999(3
7560
2439

Required number
= 9999 – 2439 – 4 = 7556
(Because 15 – 11 = 4
18 – 14 = 4
21 – 17 = 4
24 – 20 = 4)

7. (3) LCM of 21, 36 and 66
$\therefore$ LCM = $3 \times 2 \times 7 \times 6 \times 11$
$= 3 \times 3 \times 2 \times 2 \times 7 \times 11$
$\therefore$ Required number
$= 3^2 \times 2^2 \times 7^2 \times 11^2$
= 213444

8. (1) Here 4 – 1 = 3, 5 – 2 = 3, 6 – 3 = 3
$\therefore$ The required number
= LCM of (4, 5, 6) – 3
= 60 – 3 = 57

9. (2) LCM of 4, 6, 10, 15 = 60
Least number of 6 digits = 100000
The least number of 6 digits which is exactly divisible by 60 = 100000 + (60 – 40)
= 100020
$\therefore$ Required number (N)
= 100020 + 2 = 100022
Hence, the sum of digits = 1 + 0 + 0 + 0 + 2 + 2 = 5

10. (3) The LCM of 12, 18, 21, 30

2	12, 18, 21, 30
3	6, 9, 21, 15
	2, 3, 7, 5

$\therefore$ LCM = $2 \times 3 \times 2 \times 3 \times 7 \times 5$
= 1260
$\therefore$ The required number

$$= \frac{1260}{2} = 630$$

11. (4) We find LCM of = 10, 16, 24

2	10, 16, 24
2	5, 8, 12
2	5, 4, 6
2	5, 2, 3,
3	5, 1, 3
5	5, 1, 1
	1, 1, 1

$\therefore$ LCM = $2^2 \times 2^2 \times 3 \times 5$
$\therefore$ Required number
$= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$
= 3600

12. (2) Required number of students = LCM of 6, 8, 10 = 120

13. (2) LCM of 4, 6, 8, 9

2	4,6,8,9
2	2,3,4,9
3	1,3,2,9
	1,1,2,3

$\therefore$ LCM = $2 \times 2 \times 3 \times 2 \times 3 = 72$
$\therefore$ Required number = 72, because it is exactly divisible by 4, 6, 8 and 9 and it leaves remainder 7 when divided by 13.

14. (2) Here, 12 – 5 = 7,
16 – 9 = 7
$\therefore$ Required number
= (L.C.M. of 12 and 16) – 7
= 48 – 7 = 41

15. (3) Here, Divisor – remainder = 1
e.g., 10 – 9 = 1, 9 – 8 = 1,
8 – 7 = 1
$\therefore$ Required number
= (L.C.M. of 10, 9, 8) –1
= 360 – 1 = 359

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16. (4) We find LCM of 5, 6 and 8
$5 = 5$
$6 = 3 \times 2$
$8 = 2^3$
$= 2^3 \times 3 \times 5 = 8 \times 15 = 120$
Required number = 120K + 3
∴ when K = 2, $120 \times 2 + 3 = 243$ required no.
It is completely divisible by 9

17. (4) LCM of 16, 18, 20 and 25 = 3600
∴ Required number = 3600K + 4 which is exactly divisible by 7 for certain value of K.
When K = 5,
number = 3600 × 5 + 4
= 18004 which is exactly divisible by 7.

18. (2) LCM of 3, 5, 6, 8, 10 and 12 = 120
∴ Required number
= 120x + 2, which is exactly divisible by 13.
120x + 2 = 13 × 9x + 3x + 2
Clearly 3x + 2 should be divisible by 13.
For x=8, 3x + 2 is divisible by 13.
∴ Required number
= 120x + 2 = 120 × 8 + 2
= 960 + 2 = 962

19. (4) LCM of 6, 9, 15 and 18

= 2	6,	9,	15,	18
3	3,	9,	15,	9
3	1,	3,	5,	3
	1,	1,	5,	1

∴ LCM = 2 × 3 × 3 × 5 = 90
∴ Required number = 90k + 4, which must be a multiple of 7 for some value of k.
For k = 4,
Number = 90 × 4 + 4 = 364, which is exactly divisible by 7.

20. (2) We will find the LCM of 16, 24, 30 and 36.

2	16,	24,	30,	36
2	8,	12,	15,	18
2	4,	6,	15,	9
3	2,	3,	15,	9
	2,	1,	5,	3

∴ LCM = 2 × 2 × 2 × 3 × 2 × 5 × 3 = 720
The largest number of five digits = 99999
On dividing 99999 by 720, the remainder = 639
∴ The largest five-digit number divisible by 720
= 99999 − 639 = 99360
∴ Required number = 99360 + 10 = 99370

21. (2) LCM of 5, 10, 12, 15

2	5,	10,	12,	15
3	5,	5,	6,	15
= 5	5,	5,	2,	5
	1,	1,	2,	1

∴ LCM = 2 × 3 × 5 × 2 = 60
∴ Number = 60k + 2
Now, the required number should be divisible by 7.
Now, 60k + 2 = 7 × 8k + 4k + 2
If we put k = 3, (4k + 2) is equal to 14 which is exactly divisible by 7.
∴ Required number = 60 × 3 + 2 = 182

22. (3) LCM of 9, 10 and 15 = 90
⇒ The multiple of 90 are also divisible by 9, 10 or 15.
∴ 21 × 90 = 1890 will be divisible by them.
∴ Now, 1897 will be the number that will give remainder 7.
1936 − 1897
Required number
= 1936 − 1897 = 39

23. (1) The difference between the divisor and the corresponding remainder is same in each case ie. 18 − 5 = 13, 27 − 14 = 13, 36 − 23 = 13
∴ Required number
= (LCM of 18, 27, and 36) − 13
= 108 − 13 = 95

24. (2) The LCM of 5, 6, 7 and 8 = 840
∴ Required number = 840 k + 3 which is exactly divisible by 9 for some value of k.
Now, 840 k + 3 = 93 × 9 k + (3k + 3)
When k = 2, 3k + 3 = 9, which is divisible by 9.
∴ Required number
= 840 × 2 + 3 = 1683

25. (1) Here, 12 − 2 = 10; 16 − 6 = 10; 24 − 14 = 10
Now, LCM of 12, 16 and 24 = 48
∴ The greatest 4-digit number exactly divisible by 48 = 9984
∴ Required number
= 9984 − 10 = 9974

26. (1) LCM of 15, 20 and 35 = 420
∴ Required least number
= 420 + 8 = 428

27. (3) The smallest number divisible by 12 or 10 or 8
= LCM of 12, 10 and 8 = 120
⇒ Required number = 120 + 6
= 126

28. (2) LCM of 24, 36 and 54 seconds
= 216 seconds
= 3 minutes 36 seconds
∴ Required time = 10 : 15 : 00 + 3 minutes 36 seconds
= 10 : 18 : 36 a.m.

29. (3) A makes one complete round of the circular track in $\frac{5}{\frac{5}{2}}$ = 2 hours.
B in $\frac{5}{3}$ hours and C in $\frac{5}{2}$ hours.
That is after 2 hours A is at the starting point, B after $\frac{5}{3}$ hours and C after $\frac{5}{2}$ hours.
Hence the required time
= LCM of 2, $\frac{5}{3}$ and $\frac{5}{2}$ hours
$= \frac{\text{LCM of } 2, 5, 5}{\text{HCF of } 3, 2}$
$= \frac{10}{1}$ = 10 hours.

30. (1) Required time = LCM of 200, 300, 360 and 450 seconds
= 1800 seconds

31. (1) LCM of 4, 6, 8, 14
= 168 seconds
= 2 minutes 48 seconds
They ring again at 12 + 2 min. 48 sec.
= 12 hrs. 2 min. 48 sec.

32. (4) $1\frac{1}{2}$ hours = 90 minutes
1 hour and 45 minutes
= 105 minutes
1 hour = 60 minutes
∴ LCM of 30 minutes, 60 minutes, 90 minutes and 105 minutes

3	30,	60,	90,	105
5	10,	20,	30,	35
2	2,	4,	6,	7
	1,	2,	3,	7

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$\therefore$ LCM = $3 \times 5 \times 2 \times 2 \times 3 \times 7$
= 1260 minutes

1260 minutes = $\frac{1260}{60}$ = 21 hours

$\therefore$ The bell will again ring simultaneously after 21 hours.
$\therefore$ Time will be
= 12 noon + 21 hours
= 9 a.m.

33. (1) The LCM of 5, 6, 8 and 9
= 360 seconds = 6 minutes

34. (2) LCM of 20, 30 and 40 minutes = 120 minutes
Hence, the bells will toll together again after 2 hours i.e. at 1 p.m.

35. (1) The difference between divisor and the corresponding remainder is equal.
LCM of 3, 5, 7 and 9 = 315
Largest 4-digit number = 9999

315)9999(31
945
549
315
234

$\therefore$ Number divisible by 315
= 9999 – 234 = 9765
Required number
= 9765 – 2 = 9763

36. (3) Required time = LCM of 6, 7, 8, 9 and 12 seconds
= 504 seconds

37. (2) LCM = $\frac{\text{LCM of 2, 4, 5}}{\text{HCF of 3, 9, 6}}$

= $\frac{20}{3}$

38. (2) LCM of 3, 4, 5, 6, 7, 8 = 840

840)10000(11
840
1600
840
760

Since, the remainder 760 is more than half of the divisor 840.
$\therefore$ The nearest number
= 10000 + (840 – 760) = 10080

39. (2) The largest number of 4-digits is 9999. L.C.M. of divisors

2	12,	15,	18,	27
3	6,	15,	9,	27
3	2,	5,	3,	9
	2,	5,	1,	3

LCM = $2 \times 2 \times 3 \times 3 \times 3 \times 5$
= 540

Divide 9999 by 540, now we get 279 as remainder.
9999 – 279 = 9720
Hence, 9720 is the largest 4-digit number exactly divisible by each of 12, 15, 18 and 27.

40. (2) The smallest number divisible by 16, 20 and 24
= LCM of 16, 20 and 24

2	16,	20,	24
2	8,	10,	12
2	4,	5,	6
	2,	5,	3

$\therefore$ LCM = $2 \times 2 \times 2 \times 2 \times 5 \times 3$
= $2^2 \times 2^2 \times 5 \times 3$
$\therefore$ Required complete square number = $2^2 \times 2^2 \times 5^2 \times 3^2$ = 3600

41. (2) LCM of 25, 50 and 75 = 150
On dividing 43582 by 150, remainder = 82

150) 43582(290
300
1358
1350
82

$\therefore$ Required number
= 43582 + (150 – 82) = 43650

42. (2) Required number = (LCM of 24, 32, 36 and 54) – 5
Now,

2	24,	32,	36,	54
2	12,	16,	18,	27
2	6,	8,	9,	27
3	3,	4,	9,	27
3	1,	4,	3,	9
	1,	4,	1,	3

LCM = $2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 4$
= 864
$\therefore$ Required number = 864 – 5
= 859

43. (2)

2	20,	28,	32,	35
2	10,	14,	16,	35
5	5,	7,	8,	35
7	1,	7,	8,	7
	1,	1,	8,	1

$\therefore$ LCM = $2 \times 2 \times 5 \times 7 \times 8$
= 1120
$\therefore$ Required number
= 5834 – 1120 = 4714

44. (4) The LCM of 6, 12 and 18
= 36 = 6^2

45. (2) LCM of 10, 15 and 20 = 60
Largest 4-digit number = 9999

$\therefore$ 60)9999(166
60
399
360
399
360
39

$\therefore$ Required number
= 9999 – 39 = 9960

46. (4) Required number = (LCM of 15, 20, 36 and 48) + 3

2	15,	20,	36,	48
2	15,	10,	18,	24
3	15,	5,	9,	12
5	5,	5,	3,	4
	1,	1,	3,	4

$\therefore$ LCM = $2 \times 2 \times 3 \times 5 \times 3 \times 4$
= 720
$\therefore$ Required number
= 720 + 3 = 723

47. (3) Required distance = LCM of 63, 70 and 77 cm.
= 6930 cm.

Illustration :

7	63,	70,	77
	9,	10,	11

$\therefore$ LCM = $7 \times 9 \times 10 \times 11$
= 6930

TYPE-III

1. (1) Maximum number of students
= The greatest common divisor
= HCF of 1001 and 910 = 91

2. (3) Required number
= HCF of (989 – 5) and (1327 – 7)
= HCF of 984 and 1320 = 24
$\therefore$ HCF = 24

3. (2) HCF of $\frac{2}{3}, \frac{4}{5}$ and $\frac{6}{7}$

= $\frac{\text{HCF of 2, 4 and 6}}{\text{LCM of 3, 5 and 7}}$

= $\frac{2}{105}$

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4. (1) The greatest number N = HCF of (1305 – x), (4665 – x) and (6905 – x), where x is the remainder
= HCF of (4665 – 1305), (6905–4665) and
(6905 – 1305)
= HCF of 3360, 2240 and 5600

```
2240)3360(1
      2240
      1120)2240(2
            2240
```

Again,

```
1120)5600(5
      5600
```

∴ N = 1120
Sum of digits
= 1 + 1 + 2 + 0 = 4

5. (1) The number will be HCF of 307 – 3 = 304 and
330 – 7 = 323.

```
304)323(1
    304
     19)304(16
         19
        114
        114
          ×
```

∴ Required number = 19

6. (3) 3026 –11 = 3015 and
5053 –13 = 5040
Required number = HCF of 3015 and 5040

```
3015)5040(1
     3015
     2025)3015(1
          2025
           990)2025(2
               1980
                45)990(22
                  90
                  90
                   ×
```

∴ Required number = 45

7. (1) We have to find HCF of
(1657 – 6 = 1651) and
(2037 – 5 = 2032)
1651 = 13 × 127
2032 = 16 × 127
∴ HCF = 127
So, required number will be 127.

8. (1) Let x be the remainder.
Then, (25 – x), (73 – x), and (97 – x) Will be exactly divisible by the required number.
∴ Required number
= HCF of (73 –x) – (25 –x),
(97 –x) – (73 –x)
and (97 –x) – (25 –x)
= HCF of (73 –25), (97 –73), and
(97 –25) = HCF of 48, 24 and
72 = 24

9. (2) Required number
= HCF of (110 – 2) and (128 – 2)
= HCF of 108 and 126 = 18

10. (3) Required maximum capacity of container
= HCF of 75 l and 45 l
Now, 75 = 5 × 5 × 3
45 = 5 × 3 × 3
∴ HCF = 15 litres

11. (4) Length of the floor
= 15 m 17 cm = 1517 cm
Breadth of the floor
= 9m 2 cm = 902 cm.
Area of the floor
= 1517 × 902 cm^2
The number of square tiles will be least, when the size of each tile is maximum.
∴ Size of each tile = HCF of 1517 and 902 = 41
∴ Required number of tiles

$$= \frac{1517 \times 902}{41 \times 41} = 814$$

12. (1) Number of books in each stack = HCF of 336, 240, 96 = 48

```
240) 336 (1
     240
      96) 240 (2
          192
           48) 96(2
               96
                ×
```

```
48) 96 (2
    96
     ×
```

∴Total number of stacks

$$= \frac{336}{48} + \frac{240}{48} + \frac{96}{48}$$

=7 + 5 + 2 = 14

13. (3) First of all we find the HCF of 945 and 2475. HCF = 45
Illustration :

```
945)2475(2
    1890
     585)945(1
         585
          360)585(1
              360
               225)360(1
                   225
                    135)225(1
                        135
                         90)135(1
                             90
                              45)90(2
                                 90
                                  x
```

∴ Maximum number of animals in each flock = 45
Required total number of flocks

$$= \frac{945}{45} + \frac{2475}{45} = 21 + 55 = 76$$

14. (2) Maximum quantity in each can = HCF of 21, 42 and 63 litres
= 21 litres
Required least number of cans

$$= \frac{21}{21} + \frac{42}{21} + \frac{63}{21}$$

= 1 + 2 + 3 = 6

15. (3) Required number = HCF of 411 – 3 = 408; 684 – 4 = 680 and 821 – 5 = 816
HCF of 408 and 816 = 408
HCF of 408 and 680

```
408)  680 (1
      408
       272)408(1
           272
            136) 272(2
                 272
                  ×
```

∴ Required number = 136

16. (4) Required number = HCF of 200 and 320 = 40
Illustration :

```
200) 320 (1
     200
      120) 200 (1
           120
            80) 120 (1
                80
                 40) 80 (2
                    80
                     ×
```

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17. (3) As the height of each stack is same, the required number of books in each stack
= HCF of 84, 90 and 120
$84 = 2 \times 2 \times 3 \times 7$
$90 = 2 \times 3 \times 3 \times 5$
$120 = 2 \times 2 \times 2 \times 3 \times 5$
$\therefore$ HCF $= 2 \times 3 = 6$

18. (2) Required number
= HCF of (729 – 9)
= 720 and (901 – 5)
= 896

720) 896 (1
720
176) 720 (4
704
16) 176 (11
16
16
x

H.C.F = 16

19. (1) Greatest capacity of measuring vessel
= HCF of 403 litres, 434 litres and 465 litres
= 31 litres

Illustration :

HCF of 403 and 434

403) 434 (1
403
31) 403 (13
31
93
93
x

HCF of 31 and 465

31) 465 (15
31
155
155
x

$\Rightarrow$ 31 litres

0. (3) Minimum number of rows = Maximum number of fruits in each row
$\therefore$ HCF of 24, 36 and 60 = 12
$\therefore$ Minimum number of rows

$$= \frac{24}{12} + \frac{36}{12} + \frac{60}{12}$$

$= 2 + 3 + 5 = 10$

21. (4) Required number
= HCF of 2300 – 32 = 2268 and 3500 – 56 = 3444

2268) 3444 (1
2268
1176) 2268 (1
1176
1092) 1176 (1
1092
84) 1092 (13
84
252
252
x

$\therefore$ HCF = 84

TYPE-IV

1. (1) L.C.M. of 28 and 42

2	28, 42
2	14, 21
7	7, 21
	1, 3

$= 2 \times 2 \times 7 \times 3 = 84$
H.C. F. of 28 and 42

28) 42 (1
28
14) 28 (2
28
00

$\therefore$ H.C. F = 14

$$\text{Required ratio} = \frac{84}{14} = 6:1$$

2. (3) Let the two numbers are 2x and 3x respectively.
According to question,
LCM = 54
$x(3 \times 2) = 54$
$\Rightarrow x = 9$
Numbers = $2x = 2 \times 9 = 18$
and, $3x = 3 \times 9 = 27$
Sum of the two numbers
= 18 + 27 = 45

3. (3) Suppose the numbers are 4x and 5x respectively
According to question
$x \times 4 \times 5 = 120$
$\Rightarrow x = 6$
$\therefore$ Required numbers
$= 4 \times 6 = 24$
and $= 5 \times 6 = 30$

4. (1) Let the numbers be $2x$, $3x$ and $4x$ respectively.
$\therefore$ HCF $= x = 12$
$\therefore$ Numbers are : $2 \times 12 = 24$
$3 \times 12 = 36$, $4 \times 12 = 48$
LCM of 24, 36, 48
$= 2 \times 2 \times 2 \times 3 \times 3 \times 2 = 144$

5. (3) Let the number be $3x$ and $4x$.
Their LCM $= 12x$
According to the question,
$12x = 240$

$$\Rightarrow x = \frac{240}{12} = 20$$

$\therefore$ Smaller number $= 3x = 3 \times 20$
$= 60$

6. (3) Let the numbers be $3x$ and $4x$.
$\therefore$ Their LCM $= 12x$
$\therefore 12x = 84$

$$\Rightarrow x = \frac{84}{12} = 7$$

$\therefore$ Larger number
$= 4x = 4 \times 7 = 28$

7. (1) Numbers $= 3x$ and $4x$
HCF $= x = 4$
$\therefore$ LCM $= 12x = 12 \times 4 = 48$

8. (3) Let the numbers be $4x$ and $4y$ where x and y are prime to each other.
LCM $= 4xy$

$$\therefore \frac{(4x + 4y)}{4xy} = \frac{7}{12}$$

$\Rightarrow 12(x + y) = 7xy$
$\Rightarrow x = 3,\ y = 4$
$\therefore$ Smaller number
$= 4 \times 3 = 12$

9. (4) Let the numbers be $3x$ and $4x$
respectively
First number x second number
= HCF x LCM
$\Rightarrow 3x \times 4x = 2028$

$$\Rightarrow x^2 = \frac{2028}{3 \times 4} = 169$$

$\therefore x = \sqrt{169} = 13$
$\therefore$ Sum of the numbers
$= 3x + 4x = 7x = 7 \times 13 = 91$

10. (3) If the numbers be $2x$ and $3x$, then LCM $= 6x$
$\therefore 6x = 48 \Rightarrow x = 8$
$\therefore$ Required sum $= 2x + 3x = 5x$
$= 5 \times 8 = 40$

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11. (4) Let the numbers be $4x$ and $5x$.
$\therefore$ H.C.F. $= x = 8$
$\therefore$ Numbers = 32 and 40
$\therefore$ Their LCM = 160

12. (2) If the numbers be $3x$ and $4x$, then
HCF $= x = 5$
$\therefore$ Numbers = 15 and 20
$\therefore$ LCM = 60

13. (1) Numbers = x, $2x$ and $3x$ (let)
Their H.C.F. $= x = 12$
$\therefore$ Numbers = 12, 24 and 36

14. (4) Product of two numbers
= HCF × LCM
$\Rightarrow$ Numbers = zx and zy
$\therefore zx \times zy = z \times$ LCM
$\Rightarrow$ LCM = xyz

15. (4) HCF of numbers = 21
$\therefore$ Numbers = $21x$ and $21y$
Where x and y are prime to each other.
Ratio of numbers = 1 : 4
$\therefore$ Larger number = $21 \times 4 = 84$

TYPE-V

1. (4) Let the numbers be x and $(x + 2)$.
$\therefore$ Product of numbers
= HCF × LCM
$\Rightarrow x(x+2) = 24$
$\Rightarrow x^2 + 2x - 24 = 0$
$\Rightarrow x^2 + 6x - 4x - 24 = 0$
$\Rightarrow x(x+6) - 4(x+6) = 0$
$\Rightarrow (x-4)(x+6) = 0$
$\Rightarrow x = 4$, as $x \neq -6 = 0$
$\therefore$ Numbers are 4 and 6.

2. (1) Suppose 1st number is x then, 2nd number
$= 100 - x$
$\therefore$ LCM × HCF = 1st number × 2nd number
$\Rightarrow 495 \times 5 = x \times (100 - x)$
$\Rightarrow 495 \times 5 = 100x - x^2$
$\Rightarrow x^2 - 55x - 45x - 2475 = 0$
$\Rightarrow (x - 45)(x - 55) = 0$
$\Rightarrow x = 45$ or $x = 55$
Then, difference $= 55 - 45 = 10$

3. (2) Let the number be 29x and 29y respectively
where x and y are prime to each other.
$\therefore$ LCM of 29x and 29y = 29xy
Now, 29xy = 4147
$\therefore xy = \frac{4147}{29} = 143$
Thus xy = 11 × 13
$\therefore$ Numbers are 29 × 11
= 319 and 29 × 13 = 377
$\therefore$ Required sum
= 377 + 319 = 696

4. (4) Let HCF be h and LCM be l.
Then, $l = 84h$ and $l + h = 680$
$\Rightarrow 84h + h = 680$
$\Rightarrow h = \frac{680}{85} = 8$
$\therefore l = 680 - 8 = 672$
$\therefore$ Other number
$= \frac{672 \times 8}{56} = 96$

5. (2) HCF = 12
$\therefore$ Numbers = $12x$ and $12y$ where x and y are prime to each other.
$\therefore 12x + 12y = 84$
$\Rightarrow 12(x + y) = 84$
$\Rightarrow x + y = \frac{84}{12} = 7$
$\therefore$ Possible pairs of numbers satisfying this condition
= (1,6), (2,5) and (3,4). Hence three pairs are of required numbers.

6. (3) Let the numbers be $21x$ and $21y$ where x and y are prime to each other.
$\therefore 21x + 21y = 336$
$\Rightarrow 21(x + y) = 336$
$\Rightarrow x + y = \frac{336}{21} = 16$
$\therefore$ Possible pairs
= (1, 15), (5, 11), (7, 9), (3, 13)

7. (3) Let the number be x and y.
According to the question,
$\therefore x + y = 45$ ..... (i)
Again, $x - y = \frac{1}{9}(x + y)$
or $x - y = \frac{1}{9} \times 45$
or $x - y = 5$ ..... (ii)
By (i) + (ii) we have,
$x + y = 45$
$x - y = 5$
$2x = 50$
or, $x = 25$
$\therefore y = 45 - 25 = 20$.
Now, LCM of 25 and 20 = 100.

8. (3) Let the numbers be $17x$ and $17y$ where x and y are co-prime.
LCM of $17x$ and $17y = 17xy$
According to the question,
$17xy = 714$
$\Rightarrow xy = \frac{714}{17} = 42 = 6 \times 7$
$\Rightarrow x = 6$ and $y = 7$
or, $x = 7$ and $y = 6$.
$\therefore$ First number $= 17x$
$= 17 \times 6 = 102$
Second number $= 17y$
$= 17 \times 7 = 119$
$\therefore$ Sum of the numbers
$= 102 + 119 = 221$

9. (3) Let the larger number be x.
$\therefore$ Smaller number $= x - 2$
$\therefore$ First number × Second number = HCF × LCM
$\Rightarrow x(x-2) = 24$
$\Rightarrow x^2 - 2x - 24 = 0$
$\Rightarrow x^2 - 6x + 4x - 24 = 0$
$\Rightarrow x(x-6) + 4(x-6) = 0$
$\Rightarrow (x-6)(x+4) = 0$
$\Rightarrow x = 6$ because $x \neq -4$

10. (2) HCF of two numbers = 27
$\therefore$ Let the numbers be $27x$ and $27y$ where x and y are prime to each other.
According to the question,
$27x + 27y = 216$
$\Rightarrow 27(x + y) = 216$
$\Rightarrow x + y = \frac{216}{27} = 8$
$\therefore$ Possible pairs of x and y = (1, 7) and (3, 5)
$\therefore$ Numbers =(27, 189) and (81, 135)

11. (1) Let the HCF of numbers = H
$\therefore$ Their LCM = 12H
According to the question,
$12H + H = 403$
$\Rightarrow 13H = 403$
$\Rightarrow H = \frac{403}{13} = 31$
$\Rightarrow$ LCM = 12 × 31

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Now,
First number × second number = HCF × LCM
= 93 × Second Number
= 31 × 31 × 12

$$\text{Second number} = \frac{31\times31\times12}{93}$$

$$= 124$$

12. (3) Let the numbers be $48x$ and $48y$ where x and y are co-primes.
$\therefore\ 48x + 48y = 384$
$\Rightarrow\ 48\ (x + y) = 384$

$$\Rightarrow\ x + y = \frac{384}{48} = 8 \quad \text{..... (i)}$$

Possible and acceptable pairs of x and y satisfying this condition are : (1, 7) and (3, 5).
$\therefore$ Numbers are : $48 \times 1 = 48$ and $48 \times 7 = 336$
and $48 \times 3 = 144$ and $48 \times 5 = 240$
$\therefore$ Required difference
$= 336 - 48 = 288$

13. (3) Let the numbers be $3x$ and $3y$.
$\therefore\ 3x + 3y = 36$
$\Rightarrow\ x + y = 12$ ... (i)
and $3xy = 105$ ... (ii)
Dividing equation (i) by (ii), we have

$$\frac{x}{3xy} + \frac{y}{3xy} = \frac{12}{105}$$

$$\Rightarrow \frac{1}{3y} + \frac{1}{3x} = \frac{4}{35}$$

14. (4) Let the numbers be $10x$ and $10y$ where x and y are prime to each other.
$\therefore$ LCM $= 10xy$
$\Rightarrow 10xy = 120$
$\Rightarrow xy = 12$
Possible pairs = (3, 4) or (1, 12)
$\therefore$ Sum of the numbers $= 30 + 40 = 70$

15. (3) Let the numbers be x, y and z which are prime to one another.
Now, $xy = 551$
$yz = 1073$
$\therefore\ y$ = HCF of 551 and 1073
$\therefore\ y = 29$

$$\therefore\ x = \frac{551}{29} = 19$$

$$\text{and } z = \frac{1073}{29} = 37$$

$\therefore$ Sum $= 19 + 29 + 37 = 85$

16. (3) HCF of two numbers = 4.
Hence, the numbers can be given by $4x$ and $4y$ where x and y are co-prime. Then,
$4x + 4y = 36 \Rightarrow 4\ (x + y) = 36$
$\Rightarrow x + y = 9$
Possible pairs satisfying this condition are : (1, 8), (4, 5), (2, 7)

17. (2) Let the numbers be $2x$ and $2y$ where x and y are prime to each other.
$\therefore$ LCM $= 2xy$
$\Rightarrow 2xy = 84$
$\Rightarrow xy = 42 = 6 \times 7$
$\therefore$ Numbers are 12 and 14.
Hence Sum $= 12 + 14 = 26$

18. (3) Let the numbers be xH and yH where H is the HCF and yH $> x$H.
$\therefore$ LCM $= xy$H
$\therefore\ xy$H $= 2y$H $\Rightarrow x = 2$
Again, xH $-$ H $= 4$
$\Rightarrow 2$H $-$ H $= 4 \Rightarrow$ H $= 4$
$\therefore$ Smaller number $= x$H $= 8$

19. (4) Let the H.C.F. be H.
$\therefore$ L.C.M. $= 20$H
Then, H + 20H = 2520
$\Rightarrow 21$ H = 2520

$$\Rightarrow \text{H} = \frac{2520}{21} = 120$$

$\therefore$ L.C.M. $= 20\text{H} = 20\times120 = 2400$
As,
First number × Second number = L.C.M. × H.C.F.
$\Rightarrow$ 480 × Second number = 2400 × 120
$\Rightarrow$ Second number

$$= \frac{2400\times120}{480} = 600$$

20. (1) If the HCF = H, then
LCM $= 44$ H
$\therefore\ 44$ H + H $= 1125$
$\Rightarrow 45$ H $= 1125$

$$\therefore\ \text{H} = \frac{1125}{45} = 25$$

$\therefore$ LCM $= 44 \times 25 = 1100$
Now
First number × Second number = LCM × HCF
$\Rightarrow 25 \times$ Second number $= 1100 \times 25$
$\therefore$ Second number

$$= \frac{1100\times25}{25} = 1100$$

21. (4) Let no. are x and y and HCF = A, LCM = B
Using Rule, we have
$xy = AB$
$\Rightarrow x + y = A + B$ (given) ...(i)
$(x-y)^2 = (x + y)^2 - 4xy$
or, $(x-y)^2 = (A + B)^2 - 4AB$
or, $(x-y)^2 = (A - B)^2$
or, $(x-y) = A - B$ ...(ii)
Using (i) and (ii), we get
$x = A$ and $y = B$
$\therefore A^3 + B^3 = x^3 + y^3$

22. (3) Let the numbers be $7x$ and $7y$ where x and y are co-prime.
Now, LCM of $7x$ and $7y = 7xy$
$\therefore\ 7xy = 140$

$$\Rightarrow\ xy = \frac{140}{7} = 20$$

Now, required values of x and y whose product is 50 and are co-prime, will be 4 and 5.
$\therefore$ Numbers are 28 and 35 which lie between 20 and 45.
$\therefore$ Required sum $= 28 + 35 = 63$.

23. (4) Firstly, we find the LCM of 30, 36 and 80.

2	30, 36, 80
2	15, 18, 40
3	15, 9, 20
5	5, 3, 20
	1, 3, 4

$\therefore$ LCM $= 2 \times 2 \times 3 \times 5 \times 3 \times 4$
$= 720$
$\therefore$ Required number = Multiple of $720 = 720 \times 5 = 3600$;
because $3000 < 3600 < 4000$

24. (3) LCM of 5, 6, 7 and 8 = 840

2	5, 6, 7, 8
	5, 3, 7, 4

$\therefore$ LCM $= 2 \times 5 \times 3 \times 7 \times 4 = 840$
$\therefore$ Required number $= 840x + 3$ which is divisible by 9 for a certain least value of x.
Now,
$840x + 3 = 93x \times 9 + 3x + 3$
$3x + 3$, is divisible by 9 for $x = 2$
$\therefore$ Required number $= 840 \times 2 + 3$
$= 1680 + 3 = 1683$
$\therefore$ Sum of digits $= 1 + 6 + 8 + 3 = 18$

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25. (1)

2	12,	18,	21,	28
2	6,	9,	21,	14
3	3,	9,	21,	7
7	1,	3,	7,	7
	1,	3,	1,	1

$\therefore$ LCM = $2 \times 2 \times 3 \times 3 \times 7 = 252$
The largest 4-digit number = 9999

252) 9999 (39
756
2439
2268
171

$\therefore$ Required number = 9999 – 171 = 9828

26. (4) LCM of 8, 12 and 16 = 48
$\therefore$ Required number = $48a + 3$ which is divisible by 7.
$\therefore x = 48a + 3$
$= (7 \times 6a) + (6a + 3)$ which is divisible by 7.
i.e. $6a + 3$ is divisible by 7.
When $a = 3$, $6a + 3 = 18 + 3$
$= 21$ which is divisible by 7.
$\therefore x = 48 \times 3 + 3 = 144 + 3 = 147$

27. (1)

2	12,	16,	18,	21
2	6,	8,	9,	21
3	3,	4,	9,	21
	1,	4,	3,	7

$\therefore$ LCM = $2 \times 2 \times 3 \times 4 \times 3 \times 7 = 1008$
Multiple of 1008 = 2016
$\therefore$ Required number = 2016 – 2000 = 16 = x
$\therefore$ Sum of digits of $x = 1 + 6 = 7$

28. (3)

2	12,	18,	21
3	6,	9,	21
	2,	3,	7

$\therefore$ LCM of 12, 18 and 21
$= 2 \times 3 \times 2 \times 3 \times 7 = 252$
Of the options,
$10080 \div 252 = 40$

29. (1) We find LCM of 30, 36 and 80.

2	30,	36,	80
2	15,	18,	40
3	15,	9,	20
5	5,	3,	20
	1,	3,	4

$\therefore$ LCM = $2 \times 2 \times 3 \times 3 \times 4 \times 5 = 720$
$\therefore$ Required number = $2 \times 720 + 11$
$= 1440 + 11 = 1451$

30. (2)

2	12,	18,	21,	32
2	6,	9,	21,	16
3	3,	9,	21,	8
	1,	3,	7,	8

$\therefore$ LCM = $2 \times 2 \times 3 \times 3 \times 7 \times 8 = 2016$
$\therefore$ Required number = $2016 \times 2 = 4032$

TYPE-VI

1. (3) Let the numbers be $12x$ and $12y$.
$\therefore$ Their LCM = $12xy$ when x and y are prime to each other.

$$\therefore y = \frac{1056}{132} = 8 \quad [\because 12x = 132]$$

$\therefore$ Other number = $12y$
$= 12 \times 8 = 96$

2. (2) When 36798 is divided by 78, remainder = 60
$\therefore$ The least number to be subtracted = 60

3. (1) LCM of 18, 21 and 24

2	18,	21,	24
3	9,	21,	12
	3,	7,	4

LCM = $2 \times 3 \times 3 \times 7 \times 4 = 504$
Now compare the divisors with their respective remainders. We observe that in all the cases the remainder is just 11 less than their respective divisor. So the number can be given by 504 K – 11. Where K is a positive integer
Since $23 \times 21 = 483$
We can write 504 K – 11
$= (483 + 21)$ K – 11
$= 483$ K + (21K – 11)
483 K is multiple of 23, since 483 is divisible by 23.
So, for (504K – 11) to be multiple of 23, the remainder (21K – 11) must be divisible by 23.
Put the value of K = 1, 2, 3, 4, 5, 6, ... and so on successively. We find that the minimum value of K for which (21K – 11) is divisible by 23. is 6, $(21 \times 6 - 11) = 115$ which is divisible by 23.
Therefore, the required least number
= $504 \times 6 - 11 = 3013$

4. (4) Clearly, 122 – 2 = 120 and 243 – 3 = 240 are exactly divisible by the required number.
$\therefore$ Required number = HCF of 120 and 240 = 120

5. (2) $P = 2^3 \times 3^{10} \times 5$
$Q = 2^5 \times 3 \times 7$
HCF = $2^3 \times 3$

6. (4) Let the original fraction be $\frac{x}{y}$.

$$\therefore \frac{x-4}{y+1} = \frac{1}{6}$$

$\Rightarrow 6x - 24 = y + 1$
$\Rightarrow 6x - y = 25$ .....(i)
Again,

$$\frac{x+2}{y+1} = \frac{1}{3}$$

$\Rightarrow 3x + 6 = y + 1$
$\Rightarrow 3x - y = -5$ .....(ii)
By equation (i) – (ii),
$6x - y - 3x + y = 25 + 5$
$\Rightarrow 3x = 30 \Rightarrow x = 10$
From equation (i),
$60 - y = 25 \Rightarrow y = 35$
LCM of 10 and 35 = 70

7. (4) HCF of a and b = 12
$\therefore$ Numbers = $12x$ and $12y$ where x and y are prime to each other.
$\because a > b > 12$
$\therefore a = 36$; $b = 24$

8. (4) Let the numbers be $9x$ and $9y$ where x and y are prime to each other.
According to the question,
$9x + 9y = 99$
$\Rightarrow 9(x + y) = 99$
$\Rightarrow x + y = 11$
Possible pairs = (1, 10) (2, 9), (3, 8), (4, 7), (5, 6)

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TEST YOURSELF

1. The sum of two numbers is 1215 and their HCF is 81. How many such pairs of numbers can be formed?
(1) 3 (2) 4
(3) 6 (4) None of these

2. Three plots having an area of 132, 204 and 228 square metres respectively are to be subdivided into equal vegetable beds. If the breadth of a bed is 3 metres, find the maximum length that a bed can have.
(1) 14 metres (2) 4 metres
(3) 24 metres (4) 6 metres

3. Three plots having an area of 165, 195 and 285 square metres respectively are to be sub-divided into equalised flower beds. If the breadth of a bed is 3 metres, what will the maximum length of a bed?
(1) 5.5 metres (2) 6 metres
(3) 5 metres (4) 6.5 metres

4. A room is 26 metres long and 10 metres broad. Its floor is to be paved by square tiles. What will be the least number of tiles required to cover the floor completely?
(1) 50 (2) 55
(3) 60 (4) 65

5. Find the least number of square tiles by which the floor of a room of dimensions 16.58 × 8.32 m can be covered completely?
(1) 348644 (2) 344864
(3) 384644 (4) None of these

6. A wine seller had three types of wine, 403 litres of 1st kind, 434 litres of 2nd kind and 465 litres of 3rd kind. Find the least possible number of casks of equal size in which different types of wine can be filled without mixing.
(1) 46 (2) 44
(3) 42 (4) 48

7. Find the greatest number which will divide 478 and 719 leaving remainders 2 and 5 respectively.
(1) 242 (2) 240
(3) 236 (4) 238

8. Find the greatest number which will divide 42, 49 and 56 and leave remainders 6, 7 and 8 respectively.
(1) 6 (2) 8
(3) 12 (4) 24

9. Find the greatest number which divides 99, 123 and 183 leaving the same remainder in each case.
(1) 11 (2) 12
(3) 13 (4) 14

10. On dividing the numbers 7654, 8506 and 9997 by a certain largest number, in each case the remainder is the same. Find the number and the remainder.
(1) 213 and 199
(2) 223 and 189
(3) 233 and 179
(4) None of these

11. The numbers 2270, 3739 and 6677 on being divided by a certain number of three digits, leave the same remainder. Find the number and the remainder respectively.
(1) 123, 20 (2) 113, 10
(3) 116, 20 (4) 118, 15

12. On being divided by a three digit number, the numbers 95336 and 91545 leave the same remainder. Find the number and the remainder.
(1) 234 and 109
(2) 233 and 105
(3) 223 and 115
(4) None of these

13. The numbers 11284 and 7655 when divided by a number of three digit, leave the same remainder. Find the number of three digits.
(1) 292 (2) 219
(3) 119 (4) 191

14. What is the greatest number that will divide 2930 and 3246 that will leave 7 as remainder in each case.
(1) 79 (2) 89
(3) 69 (4) 97

15. In finding the HCF of two numbers by division method, the last divisor is 49 and the quotients are 17, 3, 2. Find the two numbers.
(1) 243 and 4929
(2) 343 and 5929
(3) 334 and 5992
(4) None of these

16. In finding the HCF of two numbers by division method, the last divisor is 18 and quotients are 2, 7 and 3. Find the numbers.
(1) 639 and 846
(2) 369 and 864
(3) 396 and 846
(4) None of these

17. Find the HCF of 513, 1134 and 1215.
(1) 27 (2) 9
(3) 18 (4) 54

SHORT ANSWERS

1. (2)	**2.** (2)	**3.** (3)	**4.** (4)
5. (2)	**6.** (3)	**7.** (4)	**8.** (1)
9. (3)	**10.** (1)	**11.** (2)	**12.** (3)
13. (4)	**14.** (1)	**15.** (2)	**16.** (3)
17. (1)			

EXPLANATIONS

1. (2) Let the numbers be $81x$ and $81y$ where x and y are co-prime.

$\therefore 81x + 81y = 1215$

$\Rightarrow x + y = \frac{1215}{81} = 15$

Possible pairs
= (1, 14), (2, 13), (4, 11), (7, 8)

2. (2) The maximum area a bed can have will be the greatest divisor of three plots.

Now, HCF of 132, 204 and 228 = ?

HCF of 132 and 204

```
132)204(1
  132
  ---
 72)132(1
   72
   --
  60)72(1
    60
    --
   12)60(5
     60
     --
      x
```

The HCF of 132 and 204 = 12
The required HCF = HCF of 12 and 228.

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12) 228 (19
12
108
108
x

Hence, the greatest area of the equalised bed = 12 sq.metres
∴ Maximum length of the bed

$= \frac{\text{Area}}{\text{Breadth}} = \frac{12}{3} = 4$ metres

3. (3) Maximum area of a bed = HCF of 165, 195 and 285.

165) 195 (1
165
30) 165 (5
150
15) 30 (2
30
x

15) 285 (19
15
135
135
x

∴ HCF = Maximum area = 15 sq. metres
Breadth = 3 metres

∴ Length $= \frac{15}{3}$ = 5 metres

4. (4) For the least number of tiles, each tile must be of maximum area.
Side of the largest tile = HCF of 26m and 10m
= HCF of 2 × 13m and 2 × 5 m = 2 metres
∴ Area of a tile = 2 × 2 = 4 sq. metres
∴ The least number of tiles

$\frac{\text{Area of the floor}}{\text{Area of a tile}} = \frac{26 \times 10}{2 \times 2} = 65$

5. (2) We require the least number of square tiles, hence each tile must be of maximum dimensions.
Hence, the maximum dimensions of a tile
= HCF of 16.58 m and 8.32 m
Now, 16.58 m= 16.58 × 100 cm = 1658 cm
8.32 m = 8.32 ×100 cm = 832 cm

832) 1658 (1
832
826) 832 (1
826
6) 826 (137
6
22
18
46
42
4) 6 (1
4
2) 4 (2
4
x

Hence, the side of a square tile = 2 cm
∴ Required number of tiles

$= \frac{\text{Area of floor}}{\text{Area of a square tile}}$

$= \frac{1658 \times 832}{2 \times 2} = 344864$

6. (3) For the least possible number of casks of equal size, the size of each cask must be of the greatest capacity. Hence, the capacity of the cask will be equal to the HCF of 403*l*, 434*l* and 465*l*.
Now, HCF of 403 and 434.

403) 434 (1
403
31) 403 (13
31
93
93
x

Required HCF= HCF of 31 and 465

31) 465 (15
31
155
155
x

∴ Required HCF = 31 litres = Capacity of a cask.
So, required number of casks

$= \frac{403}{31} + \frac{434}{31} + \frac{465}{31}$

= 13 + 14 + 15 = 42

7. (4) We can understand the problem in better way in this form, i.e., (478 – 2) = 476 and (719 – 5) = 714 will be completely divisible by that number to be found. For this to happen we take the HCF Of 476 and 714.

476) 714 (1
476
238) 476 (2
476
x

∴ Required number = HCF of 476 and 714 = 238

8. (1) Take the HCF of (42 – 6) = 36, (49 – 7) = 42 and (56 – 8) = 48

36) 42 (1
36
6) 36 (6
36
x

And, HCF of 6 and 48 is also 6.
So, the required greatest number will be 6.

9. (3) Let *x* be the remainder. Then (99 – *x*), (123 – *x*) and (183 – *x*) will be exactly divisible by the required number. As discussed under division method of HCF, any number which divides the given number, also divides their difference. In other words, HCF of given numbers is same as the HCF of their difference.
∴ Required number
= HCF of (123 – *x*) – (99 – *x*), (183– *x*) – (123 – *x*) and (183 – *x*) – (99 – *x*)
= HCF of (123 – 99), (183 – 123) and (183 – 99)
= HCF of 24, 60 and 84
Now, 24 = 2 × 2 × 2 × 3
60 = 2 × 2 × 3 × 5
84 = 2 × 2 × 3 × 7
∴ Required HCF = 2 × 2 × 3 = 12
∴ Required number = 13

10. (1) Let the remainder be *x*.
Then (7654 – *x*), (8506 – *x*) and (9997 – *x*) are exactly divisible by that number.
Hence the required number
= HCF of (7654 – *x*),(8506 – *x*) and (9997 – *x*)
= HCF of (8506 – *x*) – (7654 – *x*), (9997 – *x*) – (8506 – *x*) and (9997 – *x*) – (7654 – *x*) = HCF of 852, 1491 and 2343

852) 1491 (1
852
639) 852 (1
639
213) 639 (3
639
x

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Now, HCF of 213 and 2343

213) 2343 (11
213
213
213
x

Hence required number = 213
Required remainder = 7654 ÷ 213

213) 7654 (35
639
1264
1065
199

Hence required remainder = 199

11. (2) As done in the previous question, the greatest common divisor
= HCF of (3739 – 2270), (6677 – 3739) and (6677 – 2270)
= HCF of 1469, 2938 and 4407
Now, 1469 = 1469 × 1
2938 = 1469 × 2
4407 = 1469 × 3
∴HCF = 1469
Now, 1469 = 113 × 13
Since, (2270 – *R*), (3739 – *R*) and (6677 – *R*), where *R* is the remainder, are exactly divisible by 1469, hence these are also exactly divisible by its factors 13 and 113. The three digit number is 113. Now the above mentioned numbers can be written as
2270 = (113 × 20) + 10
3739 = (113 × 33) + 10
6677 = (113 × 59) + 10
Hence, the required number is 113 and the remainder is 10.

12. (3) Let the remainder in each case be *x*.
Then, the numbers (95336 – *x*) and (91545 – *x*) will be exactly divisible by that three digit number.
As discussed earlier, the difference of the two numbers, i.e., [(95336 – *x*) – (91545 – *x*)] or, 3791 is exactly divisible by the three digit number. In other words, that three digit number will be a factor of 3791.
Now, 3791= 17 × 223
Since, the factors of 3791 have only 223 as three digit factor.
So, Required number = 223
Now, we divide 95336 by 223 to get remainder.

223) 95336 (427
892
613
446
1676
1561
Remainder → 115

13. (4) Let the remainder in each case be *x*.
Then, (11284 – *x*) and (7655 – *x*) are exactly divisible by that three digit number.
Hence, their difference is [(11284 – *x*) – (7655 – *x*] = 3629 will also be exactly divisible by that three digit number. In other words that divisor will be a factor of 3629.
Now, 3629 = 19 ×191
Since both 19 and 191 are prime numbers, the three digit number is 191.
Hence, the required number = 191

14. (1) Obviously, the greatest number will divide completely the numbers (2930 – 7) and (3246 – 7), i.e., 2923 and 3239.
Hence, the greatest number will be the HCF of 2923 and 3239.

2923) 3239 (1
2923
316) 2923 (9
2844
79) 316 (4
316
x

∴HCF = 79
Hence, the required number = 79

15. (2) Here, the last divisor = 49 and quotient = 2
or, Symbolically the process of finding the HCF by division method can be shown in this way.

a) *b* (17
17*a*
c) *a* (3
3*c*
49) *c* (2
c
x

the dividend (c) = 49 × 2 = 98
Now, divisor = 98,
quotient = 3
and remainder = 49
∴ Dividend (*a*) = 98 × 3 + 49 = 294 + 49 = 343
Again, divisor = 343,
quotient = 17
and remainder = 98
∴ Dividend (*b*) = 343 × 17 + 98 = 5831+ 98 = 5929
Thus, two numbers are 343 and 5929.
Short-cut method :

	a	*b*	*c*	49
Remainders →		17	3	2

Let two numbers are *a* and *b*.
c = 2 × 49 = 98
b = 3*c* + 49 = 3 × 98 + 49 = 343
a = 17*b*+*c* = 17×343 + 98 = 5929

16. (3) Last divisor = 18 and quotient = 3
∴ Dividend = 18 × 3 = 54
Now, divisor = 54, quotient = 7 and remainder = 18
∴ Dividend = 7 × 54 + 18 = 378 + 18 = 396
Now, divisor = 396, quotient = 2 and remainder = 54
∴ Dividend = 2 × 396 + 54 = 792 + 54 = 846
Hence, the required numbers are 396 and 846.

17. (1) At first, we find out the HCF of 1134 and 1215

1134)1215(1
1134
81)1134(14
81
324
324
x

∴ HCF of 1134 and 1215 is 81.
∴ Required HCF = HCF of 513 and 81.

81)513(6
486
27)81(3
81
x

∴ HCF of given numbers = 27 □□□

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3 SIMPLIFICATION

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. Simplify : $1+\cfrac{1}{1+\cfrac{2}{2+\cfrac{3}{1+\cfrac{4}{5}}}}$

(1) $1\frac{11}{17}$ (2) $1\frac{5}{7}$

(3) $1\frac{6}{17}$ (4) $1\frac{21}{17}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. Simplify : $1+\cfrac{2}{1+\cfrac{3}{1+\cfrac{4}{5}}}$

(1) $\frac{7}{4}$ (2) $\frac{4}{7}$

(3) $\frac{7}{5}$ (4) $\frac{3}{7}$

(SSC CGLPrelim Exam. 04.07.1999 (First Sitting)

3. The value of

$\cfrac{1}{3+\cfrac{1}{2-\cfrac{1}{\frac{7}{9}}}}+\frac{17}{22}$ is :

(1) $\frac{12}{22}$ (2) $\frac{22}{5}$

(3) $\frac{5}{22}$ (4) 1

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. If $x=1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{2}}}}$

then, the value of $2x+\frac{7}{4}$ is :

(1) 3 (2) 4

(3) 5 (4) 6

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. Simplify :

$\frac{19}{43}+\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{1+\frac{1}{4}}}}$

(1) 1 (2) $\frac{19}{43}$

(3) $\frac{43}{19}$ (4) $\frac{38}{43}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. The simplification of $\cfrac{5}{3+\cfrac{3}{1-\frac{2}{3}}}$

gives

(1) 5 (2) $\frac{5}{3}$

(3) $\frac{5}{12}$ (4) $\frac{3}{5}$

(SSC CPO S.I. Exam. 2.01.2003)

7. If $2=x+\cfrac{1}{1+\cfrac{1}{3+\frac{1}{4}}}$, then the value of x is :

(1) $\frac{18}{17}$ (2) $\frac{21}{17}$

(3) $\frac{13}{17}$ (4) $\frac{12}{17}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. Find the value of

$\cfrac{2}{1+\cfrac{1}{1-\frac{1}{2}}}\times\cfrac{3}{\frac{5}{6}\text{of}\,\frac{3}{2}+1\frac{1}{4}}$

(1) 6 (2) 8

(3) 4 (4) 2

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. Simplify :

$1+\cfrac{4}{2+\cfrac{3}{5-\frac{1}{2}}}-\frac{1}{2}(10+2)$

(1) 1 (2) 0

(3) $-\frac{15}{2}$ (4) $-\frac{1}{2}$

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10.

$\left[\left(1+\cfrac{1}{10+\frac{1}{10}}\right)\times\left(1+\cfrac{1}{10+\frac{1}{10}}\right)-\left(1-\cfrac{1}{10+\frac{1}{10}}\right)\times\left(1-\cfrac{1}{10+\frac{1}{10}}\right)\right]+\left[\left(1+\cfrac{1}{10+\frac{1}{10}}\right)+\left(1-\cfrac{1}{10+\frac{1}{10}}\right)\right]$

simplifies to

(1) $\frac{100}{101}$ (2) $\frac{90}{101}$

(3) $\frac{20}{101}$ (4) $\frac{101}{100}$

(SSC CPO S.I. Exam. 07.09.2003)

11. $\cfrac{5\frac{9}{14}}{5+\cfrac{3}{3+\cfrac{1}{\frac{3}{5}}}}$ is equal to

(1) 1 (2) 1.5

(3) 2 (4) 2.5

(SSC CGL Prelim Exam. 08.02.200 (First Sitting

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12. $\dfrac{2}{2+\dfrac{2}{3+\dfrac{2}{3+\frac{2}{3}}}} \times 0.39$ is simplified to

(1) $\frac{1}{3}$ (2) 2

(3) 6 (4) None of these

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

13. $1+\dfrac{1}{1+\frac{1}{2}}$ is equal to

(1) 3 (2) $\frac{3}{2}$

(3) $\frac{2}{3}$ (4) $\frac{5}{3}$

(SSC CPO S.I. Exam. 05.09.2004)

14. $\frac{13}{48}$ is equal to

(1) $\dfrac{1}{3+\dfrac{1}{1+\frac{1}{16}}}$

(2) $\dfrac{1}{2+\dfrac{1}{1+\frac{1}{8}}}$

(3) $\dfrac{1}{3+\dfrac{1}{1+\dfrac{1}{1+\frac{1}{8}}}}$

(4) $\dfrac{1}{3+\dfrac{1}{1+\dfrac{1}{2+\frac{1}{4}}}}$

(SSC CPO S.I. Exam. 03.09.2006)

15. The value of $1+\dfrac{1}{1+\dfrac{1}{1+\dfrac{1}{1+\frac{2}{3}}}}$ is

(1) $\frac{21}{13}$ (2) $\frac{17}{3}$

(3) $\frac{34}{21}$ (4) $\frac{8}{5}$

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

16. The value of $\dfrac{2\frac{1}{3}-1\frac{2}{11}}{3+\dfrac{1}{3+\dfrac{1}{3+\frac{1}{3}}}}$ is

(1) $\frac{38}{109}$ (2) $\frac{109}{38}$

(3) 1 (4) $\frac{116}{109}$

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

17. The value of $3+\dfrac{3}{3+\dfrac{1}{3+\frac{1}{3}}}$ is

(1) $\frac{40}{11}$ (2) $\frac{43}{11}$

(3) $\frac{46}{11}$ (4) $\frac{41}{11}$

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

18. $1+\dfrac{1}{1+\frac{1}{5}} = ?$

(1) $\frac{11}{6}$ (2) $\frac{13}{6}$

(3) $\frac{15}{6}$

(4) None of the above

(SSC CISF Constable (GD) Exam. 05.06.2011)

19. $\dfrac{4\frac{2}{7}-\frac{1}{2}}{3\frac{1}{2}+1\frac{1}{7}}+\dfrac{1}{2+\dfrac{1}{2+\dfrac{1}{5-\frac{1}{5}}}}$

is equal to

(1) 1 (2) $\frac{1}{2}$

(3) 2 (4) $\frac{1}{3}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

20. If $\left[4-\dfrac{5}{1+\dfrac{1}{3+\dfrac{1}{2+\frac{1}{4}}}}\right]^{15}$

part of a journey takes 10 minutes, then to complete $\frac{3}{5}$ th of that journey, it will take

(1) 40 minutes (2) 45 minutes

(3) 48 minutes (4) 36 minutes

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

21. $\sqrt{\dfrac{4\frac{1}{7}-2\frac{1}{4}}{3\frac{1}{2}+1\frac{1}{7}}+\dfrac{2}{2+\dfrac{1}{2+\dfrac{1}{5-\frac{1}{5}}}}}$

is equal to

(1) 1 (2) 4

(3) 3 (4) 2

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

22. The value of $1+\dfrac{1}{1+\dfrac{2}{3+\frac{4}{5}}}$ is :

(1) $\frac{12}{29}$ (2) $\frac{8}{19}$

(3) $\frac{48}{29}$ (4) $\frac{2}{19}$

(SSC CAFFs SI & CISF ASI Exam. 23.06.2013)

23. The value of $1-\dfrac{a}{1-\dfrac{1}{1+\frac{a}{1-a}}}$ is

(1) a (2) 1 – a

(3) 1 (4) 0

(SSC CGL Tier-I Exam. 26.10.2014)

24. On simplification, the expression

$\dfrac{4\frac{1}{7}-2\frac{1}{7}}{3\frac{1}{2}+1\frac{1}{7}}+\dfrac{1}{2+\dfrac{1}{2+\dfrac{1}{5-\frac{1}{5}}}}$

is equal to

(1) $\frac{28}{65}$ (2) $\frac{24}{53}$

(3) $\frac{56}{53}$ (4) $\frac{14}{65}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

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25. The simplified value of :

$$\left\{\left(1+\frac{1}{10+\frac{1}{10}}\right)\left(1+\frac{1}{10+\frac{1}{10}}\right)-\left(1-\frac{1}{10+\frac{1}{10}}\right)\left(1-\frac{1}{10+\frac{1}{10}}\right)\right\}\div\left\{\left(1+\frac{1}{10+\frac{1}{10}}\right)\left(1-\frac{1}{10+\frac{1}{10}}\right)\right\}$$

(1) $\frac{20}{101}$ (2) $\frac{100}{101}$

(3) 2 (4) $\frac{90}{101}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

26. The value of

$$4-\frac{1}{1+\frac{1}{3+\frac{1}{2+\frac{1}{4}}}}$$ is

(1) $\frac{1}{8}$ (2) $\frac{1}{64}$

(3) $\frac{1}{16}$ (4) $\frac{1}{32}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–II

1. Evaluate : $\frac{9|3-5|-5|4|+10}{-3(5)-2\times4+2}$

(1) $\frac{9}{10}$ (2) $-\frac{8}{17}$

(3) $-\frac{16}{19}$ (4) $\frac{4}{7}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. 5-[4-{3-(3-3-6)}] is equal to :

(1) 10 (2) 6

(3) 4 (4) 0

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. Evaluate :

$$\frac{-(4-6)^2-3(-2)+|-6|}{18-9+3\times5}$$

(1) $\frac{3}{8}$ (2) $\frac{4}{7}$

(3) $\frac{8}{3}$ (4) $\frac{7}{4}$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. Simplify : $\frac{\frac{5}{3}\times\frac{7}{5}\text{ of }\frac{17}{5}-\frac{1}{3}}{\frac{2}{9}\times\frac{5}{7}\text{ of }\frac{28}{5}-\frac{2}{3}}$

(1) $\frac{1}{2}$ (2) 4

(3) 2 (4) $\frac{1}{4}$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

5. 1– [5 – {2 + (– 5 + 6 – 2) 2}] is equal to :

(1) –4 (2) 2

(3) 0 (4) –2

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

6. On simplification 3034 – (1002 ÷ 20.04) is equal to

(1) 3029 (2) 2984

(3) 2993 (4) 2543

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

7. When simplified, the expression

$(100)^{\frac{1}{2}}\times(0.001)^{\frac{1}{3}}-(0.0016)^{\frac{1}{4}}\times3^0+\left(\frac{5}{4}\right)^{-1}$ is equal to:

(1) 1.6 (2) 0.8

(3) 1.0 (4) 0

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

8. When $\left(\frac{1}{2}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}\right)$ is divided by $\left(\frac{2}{5}-\frac{5}{9}+\frac{3}{5}-\frac{7}{18}\right)$, the result is :

(1) $5\frac{1}{10}$ (2) $2\frac{1}{18}$

(3) $3\frac{1}{6}$ (4) $3\frac{3}{10}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

9. Simplify :

$$8\frac{1}{2}-\left[3\frac{1}{4}+\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

(1) $4\frac{1}{2}$ (2) $4\frac{1}{6}$

(3) $9\frac{1}{2}$ (4) $\frac{2}{9}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

10. If $\frac{50}{*}=\frac{*}{12\frac{1}{2}}$, then the value of * is :

(1) $\frac{25}{2}$ (2) $\frac{4}{25}$

(3) 4 (4) 25

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

11. The value of 0.008 × 0.01 × 0.072 ÷ (0.12 × 0.0004) is :

(1) 1.2 (2) 0.12

(3) 0.012 (4) 1.02

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

12. The value of

$$\frac{2}{3}\times\frac{3}{\frac{5}{6}+\frac{2}{3}\text{ of }1\frac{1}{4}}$$ is :

(1) 2 (2) 1

(3) $\frac{1}{2}$ (4) $\frac{2}{3}$

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

13. Find the sum of the following :

$$\frac{1}{9}+\frac{1}{6}+\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}$$

(1) $\frac{1}{2}$ (2) 0

(3) $\frac{1}{9}$ (4) $\frac{1}{2520}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

14. The value of 25 – 5 [2 + 3 {2 – 2 (5 – 3) + 5) – 10] ÷ 4 is :

(1) 5 (2) 23.25

(3) 23.75 (4) 25

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

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15. Find the value of * in the following

$$1\frac{2}{3}+\frac{2}{7}\times\frac{*}{7}=1\frac{1}{4}\times\frac{2}{3}+\frac{1}{6}$$

(1) $\frac{1}{6}$ (2) 0.6

(3) 0.006 (4) 6

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

16. $9-1\frac{2}{9}$ of $3\frac{3}{11}+5\frac{1}{7}$ of $\frac{7}{9}$ is equal to :

(1) 8 (2) 9

(3) $8\frac{32}{81}$ (4) $\frac{3}{4}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

17. The value of

$$\frac{5}{1\frac{7}{8}\text{ of }1\frac{1}{3}}\times\frac{2\frac{1}{10}}{3\frac{1}{2}}\text{ of }1\frac{1}{4}$$

(1) $1\frac{1}{2}$ (2) 0.05

(3) 1 (4) 2

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

18. $\frac{9}{20}-\left[\frac{1}{5}+\left\{\frac{1}{4}+\left(\frac{5}{6}-\overline{\frac{1}{3}+\frac{1}{2}}\right)\right\}\right]$ is equal to

(1) 0 (2) 1

(3) $\frac{9}{20}$ (4) $\frac{9}{10}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

19. $\frac{0.8\overline{3}+7.5}{2.3\overline{21}-0.098}$ is equal to

(1) 0.6 (2) 0.1

(3) 0.06 (4) 0.05

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

20. For what value of *, statement

$\left[\frac{(*)}{21}\times\frac{(*)}{189}\right]=1$ is correct ?

(1) 3969 (2) 147

(3) 63 (4) 21

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

21. If $\frac{1120}{\sqrt{P}}=80$, then P is equal to

(1) 14 (2) 140

(3) 196 (4) 225

(SSC CPO S.I. Exam. 12.01.2003

22. $\frac{3\frac{1}{4}-\frac{4}{5}\text{ of }\frac{5}{6}}{4\frac{1}{3}+\frac{1}{5}-\left(\frac{3}{10}+21\frac{1}{5}\right)}-\left(1\frac{2}{3}\text{ of }1\frac{1}{2}\right)$

is equal to

(1) 9 (2) $11\frac{1}{2}$

(3) 13 (4) $15\frac{1}{2}$

(SSC CPO S.I. Exam. 12.01.2003

23. Simplify

$$\left[3\frac{1}{4}+\left\{1\frac{1}{4}-\frac{1}{2}\left(2\frac{1}{2}-\overline{\frac{1}{4}-\frac{1}{6}}\right)\right\}\right]+\left(\frac{1}{2}\text{of}4\frac{1}{3}\right)$$

(1) 18 (2) 36

(3) 39 (4) 78

(SSC CPO S.I. Exam. 12.01.2003

24. The value of

$$\frac{0.1\times0.1\times0.1+0.2\times0.2\times0.2+0.3\times0.3\times0.3-3\times0.1\times0.2\times0.3}{0.1\times0.1+0.2\times0.2+0.3\times0.3-0.1\times0.2-0.2\times0.3-0.3\times0.1}$$

is

(1) 0.006 (2) 0.6

(3) 0 (4) 0.2

(SSC CPO S.I. Exam. 12.01.2003

25. $\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}+\frac{1}{90}+\frac{1}{110}=?$

(1) $\sqrt{2}\frac{2}{27}$ (2) $\frac{1}{9}$

(3) $\frac{5}{27}$ (4) $\frac{6}{55}$

(SSC CPO S.I. Exam. 12.01.2003

26. If $I=\frac{3}{4}+\frac{5}{6}$, $II=3+[(4+5)+6]$, $III=[3\div(4\div5)]+6$, $IV=3+4(5+6)$ then

(1) I and II are equal

(2) I and IV are equal

(3) I and III are equal

(4) All are equal

(SSC CPO S.I. Exam. 12.01.2003

27. The value of $1+[1+1+\{1+1+(1+1+2)\}]$ is

(1) 1 (2) $\frac{5}{8}$

(3) 2 (4) $\frac{1}{2}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

28. The simplified value of

$$\frac{\frac{1}{3}+\frac{1}{3}\times\frac{1}{3}}{\frac{1}{3}+\frac{1}{3}\text{ of }\frac{1}{3}}-\frac{1}{9}\text{ is}$$

(1) 0 (2) 1

(3) $\frac{1}{3}$ (4) $\frac{1}{9}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

29. Simplify :

$$\frac{2\frac{3}{4}}{1\frac{5}{6}}+\frac{7}{8}\times\left(\frac{1}{3}+\frac{1}{4}\right)+\frac{5}{7}+\frac{3}{4}\text{of}\frac{3}{7}$$

(1) $\frac{56}{77}$ (2) $\frac{49}{80}$

(3) $\frac{2}{3}$ (4) $3\frac{2}{9}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

30. The simplification of $3.\overline{36}-2.\overline{05}+1.\overline{33}$ equals :

(1) 2.60 (2) $2.\overline{61}$

(3) 2.64 (4) $2.\overline{64}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

31. The value of

$$\frac{0.9\times0.9\times0.9+0.2\times0.2\times0.2+0.3\times0.3\times0.3-3\times0.9\times0.2\times0.3}{0.9\times0.9+0.2\times0.2+0.3\times0.3-0.9\times0.2-0.2\times0.3-0.3\times0.9}$$

is

(1) 1.4 (2) 0.054

(3) 0.8 (4) 1.0

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

32. Simplify :

$$(0.\overline{1})^2\left\{1-9\,(0.1\overline{6})^2\right\}$$

(1) $-\frac{1}{162}$ (2) $\frac{1}{108}$

(3) $\frac{7696}{10^6}$ (4) $\frac{1}{109}$

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

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33. Simplify :

$$\frac{1+\frac{1}{2}}{1-\frac{1}{2}}+\frac{4}{7}\left(\frac{2}{5}+\frac{3}{10}\right) \text{ of } \frac{\frac{1}{2}+\frac{1}{3}}{\frac{1}{2}-\frac{1}{3}}$$

(1) $\frac{2}{3}$ (2) $37\frac{1}{2}$

(3) $\frac{3}{2}$ (4) $18\frac{3}{8}$

(SSC CGL Prelim Exam. 11.05.2003) (Second Sitting)

34. Simplify :

$[0.9 - \{2.3 - 3.2 - (7.1 - 5.4 - 3.5)\}]$

(1) 0.18 (2) 1.8

(3) 0 (4) 2.6

(SSC CGL Prelim Exam. 11.05.2003) (Second Sitting)

35. $(32)^3 + (79)^3 - (111)^3 + 3 \times 32 \times 79 \times 111$ is equal to

(1) 10000 (2) 0

(3) 30007 (4) 1

(SSC CPO S.I. Exam. 07.09.2003)

36. $\left(\frac{5}{2}+\frac{3}{2}\right)\left(\frac{25}{4}-\frac{15}{4}+\frac{9}{4}\right)$ is equal to

(1) 38 (2) 19

(3) 37 (4) 36

(SSC CPO S.I. Exam. 07.09.2003)

37. $(0.2 \times 0.2 + 0.01)\ (0.1 \times 0.1 + 0.02)^{-1}$ is equal to

(1) $\frac{5}{3}$ (2) $\frac{41}{12}$

(3) $\frac{41}{4}$ (4) $\frac{9}{5}$

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

38. $\frac{1}{2}+\left\{4\frac{3}{4}-\left(3\frac{1}{6}-2\frac{1}{3}\right)\right\}$ is equal to

(1) $3\frac{2}{3}$ (2) $1\frac{1}{4}$

(3) $4\frac{5}{12}$ (4) $1\frac{2}{3}$

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

39. The simplification of $\frac{1}{8}+\frac{1}{8^2}+\frac{1}{8^3}+\frac{1}{8^4}+\frac{1}{8^5}$ upto three-places of decimals yields

(1) 0.143 (2) 0.163

(3) 0.215 (4) 0.715

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

40. $8.7-\left[7.6-\left\{6.5-\left(5.4-\overline{4.3-2}\right)\right\}\right]$ is simplified to :

(1) 2.5 (2) 3.5

(3) 4.5 (4) 5.5

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

41. The simplified value of $[(0.111)^3 + (0.222)^3 - (0.333)^3 + (0.333)^2\ (0.222)]^3$ is :

(1) 0.999 (2) 0

(3) 0.888 (4) 0.111

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

42. $\frac{1\frac{1}{4}+1\frac{1}{2}}{\left(\frac{1}{15}+1-\frac{9}{10}\right)}$ is equal to :

(1) 3 (2) 6

(3) $\frac{2}{5}$ (4) 5

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

43. $\frac{-\frac{1}{2}-\frac{2}{3}+\frac{4}{5}-\frac{1}{3}+\frac{1}{5}+\frac{3}{4}}{\frac{1}{2}+\frac{2}{3}-\frac{4}{3}+\frac{1}{3}-\frac{1}{5}-\frac{4}{5}}$ is simplified to

(1) $-\frac{10}{3}$ (2) $-\frac{3}{10}$

(3) 1 (4) – 2

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

44. The simplification of $\left(0.\overline{63}+0.\overline{37}+0.\overline{80}\right)$ yields the result

(1) $1.\overline{80}$ (2) $1.\overline{81}$

(3) $1.\overline{79}$ (4) 1.80

(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

45. $\frac{(4.53-3.07)^2}{(3.07-2.15)(2.15-4.53)}+\frac{(3.07-2.15)^2}{(2.15-4.53)(4.53-3.07)}+\frac{(2.15-4.53)^2}{(4.53-3.07)(3.07-2.15)}$ is simplified to

(1) 0 (2) 1

(3) 2 (4) 3

(SSC CPO S.I. Exam. 05.09.2004)

46. $\frac{17}{15}\times\frac{17}{15}+\frac{2}{15}\times\frac{2}{15}-\frac{17}{15}\times\frac{4}{15}$ is equal to

(1) 0 (2) 1

(3) 10 (4) 11

(SSC CPO S.I. Exam. 05.09.2004)

47. $\left(4\frac{11}{15}+\frac{15}{71}\right)^2-\left(4\frac{11}{15}-\frac{15}{71}\right)^2$ is equal to :

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CPO S.I. Exam. 26.05.2005)

48. The value of $\frac{0.1\times0.1\times0.1+0.02\times0.02\times0.02}{0.2\times0.2\times0.2+0.04\times0.04\times0.04}$ is :

(1) 0.0125 (2) 0.125

(3) 0.25 (4) 0.5

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

49. If * represents a number, then the value of * in $5\frac{3}{*}\times3\frac{1}{2}=19$ is :

(1) 7 (2) 4

(3) 6 (4) 2

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

50. $\left(\sqrt{2}+\frac{1}{\sqrt{2}}\right)^2$ is equal to :

(1) $2\frac{1}{2}$ (2) $3\frac{1}{2}$

(3) $4\frac{1}{2}$ (4) $5\frac{1}{2}$

(SSC CGL Prelim Exam. 13.11.2005 (1st Sitting) & (SSC CISF ASI Exam. 29.08.2010)

51. The value of $(0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.02 - 1$ is :

(1) 1.98 (2) 1.09

(3) 1 (4) 0

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

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52. $\{71 \times 29 + 27 \times 15 + 8 \times 4\}$ equals
(1) 3450 (2) 3458
(3) 2496 (4) None of these
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

53. $(0.05 \times 5 - 0.005 \times 5)$ equals
(1) 2.250 (2) 0.225
(3) 0.0225 (4) 0.275
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

54. The value of
$$\sqrt[3]{\frac{0.2\times0.2\times0.2+0.04\times0.04\times0.04}{0.4\times0.4\times0.4+0.08\times0.08\times0.08}}$$
is
(1) 0.5 (2) 0.25
(3) 0.75 (4) 0.125
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

55. $(256)^{0.16} \times (16)^{0.16}$ is equal to
(1) 4 (2) 16
(3) 64 (4) 256.25
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

56.
$$\left(\frac{1}{3.5}+\frac{1}{5.7}+\frac{1}{7.9}+\frac{1}{9.11}+\frac{1}{11.13}+\frac{1}{13.15}\right)$$
is equal to
(1) $\frac{2}{45}$ (2) $\frac{4}{45}$
(3) $\frac{7}{45}$ (4) $\frac{2}{15}$
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

57. $(53 \times 87 + 159 \times 21 + 106 \times 25)$ is equal to
(1) 16000 (2) 1060
(3) 10600 (4) 60100
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

58. The value of $\frac{0.125+0.027}{0.25-0.15+0.09}$ is
(1) 0.2 (2) 0.25
(3) 0.3 (4) 0.8
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & (SSC CGL Tier-I Exam. 16.05.2010 (Ist Sitting)

59. $\frac{8(3.75)^3+1}{(7.5)^2-6.5}$ is equal to
(1) 2.75 (2) $\frac{9}{5}$
(3) 4.75 (4) 8.5
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

60. The value of
$$\frac{(2.697-0.498)^2+(2.697+0.498)^2}{2.697\times2.697+0.498\times0.498}$$ is
(1) 4 (2) 2
(3) 2.199 (4) 3.195
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

61. The least fraction to be subtracted from the expression
$$\frac{3\frac{1}{4}-\frac{4}{5}\text{ of }\frac{5}{6}}{4\frac{1}{3}+\frac{1}{5}-\left(\frac{3}{10}+21\frac{1}{5}\right)}$$
to make it an integer.
(1) $\frac{1}{2}$ (2) $\frac{5}{6}$
(3) $\frac{1}{4}$ (4) $\frac{3}{10}$
(SSC CPO S.I. Exam. 06.09.2009)

62. If $\sqrt[3]{0.014\times0.14x} = 0.014 \times 0.14\sqrt[3]{y}$, find the value of $\frac{x}{y}$.
(1) 0.000196 (2) 0.00196
(3) 0.0196 (4) 0.196
(SSC CPO S.I. Exam. 06.09.2009)

63. $\frac{4.41\times0.16}{2.1\times1.6\times0.21}$ is simplified to
(1) 1 (2) 0.1
(3) 0.01 (4) 10
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

64. $(0.1 \times 0.01 \times 0.001 \times 10^7)$ is equal to
(1) 100 (2) $\frac{1}{10}$
(3) $\frac{1}{100}$ (4) 10
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

65. $\frac{3.25\times3.20-3.20\times3.05}{0.064}$ is equal to :
(1) 1 (2) $\frac{1}{2}$
(3) $\frac{1}{10}$ (4) 10
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

66. $\left\{\frac{(0.1)^2-(0.01)^2}{0.0001}+1\right\}$ is equal to
(1) 1010 (2) 110
(3) 101 (4) 100
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

67. $(0.5 \times 5 + 0.25 \times 0.5 + 0.5 \times 4 + 0.5 \times 0.75)$ is equal to
(1) 5 (2) 10
(3) 15 (4) 20
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

68. $\frac{(5+5+5+5)+5}{3+3+3+3+3}$ is equal to
(1) 1 (2) $\frac{3}{10}$
(3) $\frac{4}{9}$ (4) $\frac{2}{5}$
(SSC (South Zone) Investigator Exam. 12.09.2010)

69.
$$\frac{(100-1)(100-2)(100-3)\ldots(100-200)}{100\times99\times98\times\ldots\times3\times2\times1}$$
is equal to
(1) $\frac{100}{99\times98\times97\times\ldots\times3\times2\times1}$
(2) $-\frac{1}{99\times98\times97\times\ldots\times3\times2\times1}$
(3) 0
(4) $-\frac{2}{99\times98\times97\times\ldots\times3\times2\times1}$
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

70. $(0.9 \times 0.9 \times 0.9 + 0.1 \times 0.1 \times 0.1)$ is equal to
(1) 0.73 (2) 0.82
(3) 0.91 (4) 1.00
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

71. Simplify:
$$\frac{0.0347\times0.0347\times0.0347+(0.9653)^3}{(0.0347)^2-(0.347)(0.09653)+(0.9653)^3}$$
(1) 0.9306 (2) 1.0009
(3) 1.0050 (4) 1
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)



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72. The value of $\frac{(3.2)^3-0.008}{(3.2)^2+0.64+0.04}$ is

(1) 0 (2) 2.994
(3) 3.208 (4) 3

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

73. Simplify:

$$\frac{\frac{1}{3}+\frac{1}{4}\left[\frac{2}{5}-\frac{1}{2}\right]}{1\frac{2}{3}\text{ of }\frac{3}{4}-\frac{3}{4}\text{ of }\frac{4}{5}}$$

(1) $\frac{37}{78}$ (2) $\frac{37}{13}$

(3) $\frac{74}{78}$ (4) $\frac{74}{13}$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

74. $\frac{0.04}{0.03}$ of $\frac{\left(3\frac{1}{3}-2\frac{1}{2}\right)+\frac{1}{2}\text{ of }1\frac{1}{4}}{\frac{1}{3}+\frac{1}{5}\text{ of }\frac{1}{9}}$

(1) 1 (2) 5

(3) $\frac{1}{5}$ (4) $\frac{1}{2}$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

75. $\frac{0.3555\times0.5555\times2.025}{0.225\times1.7775\times0.2222}$ is equal to :

(1) 5.4 (2) 4.58
(3) 4.5 (4) 5.45

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

76. $100\times10-100+2000\div100=?$

(1) 29 (2) 920
(3) 980 (4) 1000

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

77. If $\frac{547.527}{0.0082}=x$, then the value of $\frac{547527}{82}$ is

(1) $10x$ (2) $100x$

(3) $\frac{x}{100}$ (4) $\frac{x}{10}$

(SSC CHSL DEO & LDC Exam. 04.11.2012 Ist Sitting)

78. $\frac{1}{1+2^{a-b}}+\frac{1}{1+2^{b-a}}$ is

(1) $a-b$ (2) $b-a$
(3) 1 (4) 0

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

79. The value of

$$3\frac{1}{2}-\left[2\frac{1}{4}+\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

is

(1) $\frac{1}{2}$ (2) $2\frac{1}{2}$

(3) $3\frac{1}{2}$ (4) $9\frac{1}{2}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

80. $3\frac{3}{5}\times3\frac{3}{5}+2\times3\frac{3}{5}\times\frac{2}{5}+\frac{2}{5}\times\frac{2}{5}=?$

(1) 15 (2) 16
(3) 17 (4) 18

(SSC Constable (GD) Exam. 12.05.2013)

81. Find the sum of

$$\left(1-\frac{1}{n+1}\right)+\left(1-\frac{2}{n+1}\right)+\left(1-\frac{3}{n+1}\right)+.....\left(1-\frac{n}{n+1}\right)$$

(1) n (2) $\frac{1}{2}n$

(3) $(n+1)$ (4) $\frac{1}{2}(n+1)$

(SSC Graduate Level Tier-II Exam. 29.09.2013

82. The value of

$$5\frac{1}{3}+1\frac{2}{9}\times\frac{1}{4}\left(10+\frac{3}{1-\frac{1}{5}}\right)\text{ is}$$

(1) 15 (2) $\frac{67}{25}$

(3) $\frac{128}{11}$ (4) $\frac{128}{99}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

83. If $x\,[-2\,\{-4\,(-a)\}]+5\,[-2\,\{-2\,(-a)\}]=4a$, then $x=$

(1) -2 (2) -3
(3) -4 (4) -5

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

84. The value of

$$3+\left[(8-5)+\left\{(4-2)+\left(2+\frac{8}{13}\right)\right\}\right]\text{ is}$$

(1) $\frac{15}{17}$ (2) $\frac{13}{17}$

(3) $\frac{15}{19}$ (4) $\frac{13}{19}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

85. If '+' means '÷', '×' means '−', '÷' means '×' and '−' means '+', what will be the value of the following expression ?

$9+3+4-8\times2=?$

(1) $6\frac{1}{4}$ (2) $6\frac{3}{4}$

(3) $-1\frac{3}{4}$ (4) 18

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

86. The simplified value of

$\frac{4}{15}$ of $\frac{5}{8}\times6+15-10$ is

(1) 6 (2) 3
(3) 5 (4) 4

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 21.06.2015 IInd Sitting)

TYPE–III

1. Assume that

$\sqrt{13}=3.605$ (approximately)

$\sqrt{130}=11.40$ (approximately)

Find the value of :

$\sqrt{1.3}+\sqrt{1300}+\sqrt{0.013}$

(1) 36.164 (2) 36.304
(3) 37.304 (4) 37.164

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. On simplification of

$$\frac{(2.644)^2-(2.356)^2}{0.288}$$

we get :

(1) 1 (2) 4
(3) 5 (4) 6

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

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3. Simplification of

$$\frac{(3.4567)^2-(3.4533)^2}{0.0034}$$

yields the result :

(1) 6.91 (2) 7
(3) 6.81 (4) 7.1

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. The value of $\frac{(0.03)^2-(0.01)^2}{0.03-0.01}$ is:

(1) 0.02 (2) 0.004
(3) 0.4 (4) 0.04

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

5. $\left(\sqrt{72}-\sqrt{18}\right)+\sqrt{12}$ is equal to:

(1) $\sqrt{6}$ (2) $\sqrt{3}/2$
(3) $\sqrt{2}/3$ (4) $\sqrt{6}/2$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. The value of $\frac{\sqrt{80}-\sqrt{112}}{\sqrt{45}-\sqrt{63}}$ is :

(1) $\frac{3}{4}$ (2) $1\frac{3}{4}$
(3) $1\frac{1}{3}$ (4) $1\frac{7}{9}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

7. The value of

$$\sqrt{\frac{(0.1)^2+(0.01)^2+(0.009)^2}{(0.01)^2+(0.001)^2+(0.0009)^2}}$$

is :

(1) 10^2 (2) 10
(3) 0.1 (4) 0.01

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

8. The value of

$$\sqrt{\frac{(0.03)^2+(0.21)^2+(0.065)^2}{(0.003)^2+(0.021)^2+(0.0065)^2}}$$

is :

(1) 0.1 (2) 10
(3) 10^2 (4) 10^3

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

9. The sum of

$\sqrt{0.01}+\sqrt{0.81}+\sqrt{1.21}+\sqrt{0.0009}$ is :

(1) 2.1 (2) 2.13
(3) 2.03 (4) 2.11

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

10. The value of

$$\sqrt{\frac{(6.1)^2+(61.1)^2+(611.1)^2}{(0.61)^2+(6.11)^2+(61.11)^2}}$$ is

(1) 0.1 (2) 1.1
(3) 10 (4) 100

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

11. Simplify

$$\sqrt{\left[(12.1)^2-(8.1)^2\right]+\left[(0.25)^2+(0.25)(19.95)\right]}$$

(1) 1 (2) 2
(3) 3 (4) 4

(SSC CPO S.I. Exam. 12.01.2003

12. The value of

$$\frac{0.051\times0.051\times0.051+0.041\times0.041\times0.041}{0.051\times0.051-0.051\times0.041+0.041\times0.041}$$

is :

(1) 0.92 (2) 0.092
(3) 0.0092 (4) 0.00092

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

13. The value of

$$\sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+\sqrt{49}}}}}$$ is

(1) 3 (2) 9
(3) 7 (4) 5

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

14. The value of $\frac{(75.8)^2-(55.8)^2}{20}$ is

(1) 20 (2) 40
(3) 121.6 (4) 131.6

(SSC CPO S.I. Exam. 07.09.2003)

15. $\sqrt{\frac{0.25}{0.0009}}\times\sqrt{\frac{0.09}{0.36}}$ is equal to :

(1) $\frac{5}{6}$ (2) $7\frac{1}{6}$
(3) $7\frac{1}{3}$ (4) $8\frac{1}{3}$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

16. $\frac{(3.63)^2-(2.37)^2}{3.63+2.37}$ is simplified to

(1) 6 (2) 1.36
(3) 2.26 (4) 1.26

(SSC CPO S.I. Exam. 03.09.2006)

17. $\sqrt{\frac{0.081\times0.484}{0.0064\times6.25}}$ is equal to

(1) 9 (2) 0.9
(3) 99 (4) 0.99

(SSC CPO S.I. Exam. 09.11.2008)

18. The simplified value of

$\sqrt{900}+\sqrt{0.09}-\sqrt{0.000009}$ is

(1) 30.27 (2) 30.297
(3) 30.097 (4) 30.197

(SSC CPO S.I. Exam. 06.09.2009)

19. $\sqrt{\frac{0.009\times0.036\times0.016\times0.08}{0.002\times0.0008\times0.0002}}$

is equal to

(1) 34 (2) 36
(3) 38 (4) 39

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

20. $\sqrt{1\frac{1}{4}\times\frac{64}{125}\times1.44}$ is equal to

(1) $1\frac{1}{25}$ (2) $\frac{24}{25}$
(3) $\frac{23}{25}$ (4) $\frac{21}{25}$

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. $\left[2\sqrt{54}-6\sqrt{\frac{2}{3}}-\sqrt{96}\right]$ is equal to

(1) 0 (2) 1
(3) 2 (4) $\sqrt{6}$

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

22. $\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}}$ is equal to

(1) $\frac{2}{\sqrt{6}}$ (2) $2\sqrt{6}$
(3) $4\sqrt{6}$ (4) 2

(SSC CPO Sub-Inspector Exam. 12.12.2010 (Paper-I)

23. The value of $\frac{4-\sqrt{0.04}}{4+\sqrt{0.4}}$ is close to

(1) 0.4 (2) 0.8
(3) 1.0 (4) 1.4

(SSC CPO S.I. Exam. 12.01.2003)

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24. The value of

$$\left(3+\sqrt{8}\right)+\frac{1}{3-\sqrt{8}}-\left(6+4\sqrt{2}\right) \text{ is}$$

(1) 8 (2) 1

(3) $\sqrt{2}$ (4) 0

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

25. What is the square root of 0.09?

(1) 0.3 (2) 0.03

(3) 0.003 (4) 3.0

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

26. The square root of :

$$\frac{(0.75)^3}{1-0.75}+\left[0.75+(0.75)^2+1\right]$$

is :

(1) 4 (2) 3

(3) 2 (4) 1

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting

27. The square root of (272^2-128^2) is :

(1) 256 (2) 200

(3) 240 (4) 144

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

28. The value of $\sqrt{0.000441}$ is equal to :

(1) 0.21 (2) 0.0021

(3) 0.021 (4) 0.00021

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

29. The value of $\frac{\sqrt{0.441}}{\sqrt{0.625}}$ is equal to :

(1) 0.048 (2) 0.84

(3) 0.48 (4) 0.084

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

30. The square root of

$$\frac{0.342\times0.684}{0.000342\times0.000171} \text{ is :}$$

(1) 250 (2) 2500

(3) 2000 (4) 4000

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

31. $\sqrt{0.00060516}$ is equal to

(1) 0.0246 (2) 0.00246

(3) 0.246 (4) 0.000246

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

32. The Square root of

$$\frac{9.5\times0.085}{0.017\times0.019} \text{ is}$$

(1) 0.5 (2) 5

(3) 50 (4) 500

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & SSC MTS Exam. 17.03.2013 (IInd Sitting)

33. Find the value of

$$\sqrt{248+\sqrt{52+\sqrt{144}}}$$

(1) –16 (2) ±16

(3) 16 (4) 16.2

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & SSC CGL Exam. 08.02.2004 (IInd Sitting)

34. If $(102)^2 = 10404$ then, the value of

$$\sqrt{104.04}+\sqrt{1.0404}+\sqrt{0.010404}$$

is equal to

(1) 0.306 (2) 0.0306

(3) 11.122 (4) 11.322

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

35. $\sqrt{0.00004761}$ equals

(1) 0.069 (2) 0.0069

(3) 0.00069 (4) 0.0609

(SSC CPO S.I. Exam. 12.01.2003

36. If $\sqrt{2}=1.414$, the square root of $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ is nearest to

(1) 0.172 (2) 0.414

(3) 0.586 (4) 1.414

(SSC CPO S.I. Exam. 12.01.2003

37. $\sqrt{\frac{0.00001225}{0.00005392}}$ is equal to :

(1) $\frac{25}{77}$ (2) $\frac{35}{73}$

(3) $\frac{35}{77}$ (4) $\frac{25}{73}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

38. The square root of $0.\overline{4}$ is :

(1) $0.\overline{8}$ (2) $0.\overline{6}$

(3) $0.\overline{7}$ (4) $0.\overline{9}$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

39. The square root of

$$\frac{\left(3\frac{1}{4}\right)^4-\left(4\frac{1}{3}\right)^4}{\left(3\frac{1}{4}\right)^2-\left(4\frac{1}{3}\right)^2} \text{ is :}$$

(1) $7\frac{1}{12}$ (2) $5\frac{5}{12}$

(3) $1\frac{1}{12}$ (4) $1\frac{7}{12}$

(SSC CPO S.I. Exam. 26.05.2005)

40. The positive square root of $[0.6 \times 0.6 \times 0.6 + 0.4 \times 0.4 \times 0.4 + 3 \times 0.6 \times 0.4]$ is equal to

(1) 2.1736 (2) 1

(3) 0.21736 (4) 0.072

(SSC SAS Exam. 26.06.2010 (Paper-1)

41. $\sqrt{\frac{0.49}{0.25}}+\sqrt{\frac{0.81}{0.36}}$ is equal to :

(1) $7\frac{9}{10}$ (2) $2\frac{9}{10}$

(3) $\frac{9}{10}$ (4) $9\frac{9}{10}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

42. If $\sqrt{x}+\sqrt{441}=0.02$, then value of x is :

(1) 1.64 (2) 2.64

(3) 1.764 (4) 0.1764

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

43. Find the value of

$$\sqrt{4+\sqrt{44+\sqrt{10000}}}$$

(1) 12 (2) 8

(3) 4 (4) –4

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

44. Given that

$\sqrt{574.6} = 23.97$

$\sqrt{5746} = 75.8$

then $\sqrt{0.00005746}$ equals

(1) 0.002397 (2) 0.0002397

(3) 0.007580 (4) 0.00758

(SSC CPO S.I. Exam. 12.01.2003

45.

$$\sqrt{(0.798)^2+0.404\times0.798+(0.202)^2} +1 = 2 ?$$

(1) 0 (2) 2

(3) 1.596 (4) 0.404

(SSC CGL Prelim Exam. 11.05.200 (First Sitting

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46. The value of $\sqrt{11.981+7\sqrt{1.2996}}$ is closest to
(1) 5.1 (2) 4.9
(3) 4.5 (4) 4.1
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

47. The value of $\sqrt{32}-\sqrt{128}+\sqrt{50}$ correct to 3 places of decimal is :
(1) 1.732 (2) 1.141
(3) 1.414 (4) 1.441
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

48. The square root of $\left(7+3\sqrt{5}\right)\left(7-3\sqrt{5}\right)$ is :
(1) 4 (2) $\sqrt{5}$
(3) $3\sqrt{5}$ (4) 2
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

49. The value of $\sqrt{400}+\sqrt{0.0400}+\sqrt{0.000004}$ is
(1) 0.222 (2) 20.22
(3) 20.202 (4) 2.022
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

50. If $\sqrt{3}$ = 1.7321, the value of $\sqrt{192}-\frac{1}{2}\sqrt{48}-\sqrt{75}$, correct to 3 places of decimal, is
(1) 8.661 (2) 4.331
(3) 1.7321 (4) –1.732
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

51. $\sqrt{\frac{48.4}{0.289}}$ is equal to
(1) $129\frac{7}{17}$ (2) $1\frac{5}{17}$
(3) $12\frac{16}{17}$ (4) $12\frac{1}{17}$
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

52. The sum of the squares of 3 consecutive positive numbers is 365. The sum of the numbers is
(1) 30 (2) 33
(3) 36 (4) 45
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

53. If $\sqrt{4096}$ = 64, then the value of $\sqrt{40.96}+\sqrt{0.4096}+\sqrt{0.004096}+\sqrt{0.00004096}$ up to two places of decimals is :
(1) 7.09 (2) 7.10
(3) 7.11 (4) 7.12
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & FCI Assistant Grade III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

54. Given that $\sqrt{13}$ = 3.6 and $\sqrt{130}$ = 11.4, then the value of $\sqrt{1.3}+\sqrt{1300}+\sqrt{0.013}$ is equal to
(1) 36.164 (2) 37.254
(3) 36.254 (4) 37.154
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

55. The simplified value of $\sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+\sqrt{49}}}}}$ is
(1) 3 (2) 2
(3) 4 (4) 6
(SSC CPO S.I. Exam. 06.09.2009)

56. $\sqrt{110\frac{1}{4}}$ is equal to
(1) 12.0 (2) 11.5
(3) 11.0 (4) 10.5
(SSC CPO Sub-Inspector Exam 12.12.2010 (Paper-I)

57. $\sqrt{8+\sqrt{57+\sqrt{38+\sqrt{108+\sqrt{169}}}}}$ =?
(1) 4 (2) 6
(3) 8 (4) 10
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

58. If $(10.15)^2$ = 103.0225, then the value of $\sqrt{1.030225}+\sqrt{10302.25}$ is
(1) 1025·15 (2) 103·515
(3) 102·515 (4) 102·0515
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

59. The number of digits in the square root of 625686734489 is
(1) 4 (2) 5
(3) 6 (4) 7
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

60. If the square root of 841 is 29, then 0.00000841 is equal to :
(1) 0.029 (2) 0.0029
(3) 0.00029 (4) 0.29
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting) & Tier-1 Exam,16.05.2010 (First Sitting)

61. The square root of $\frac{0.324\times0.081\times4.624}{1.5625\times0.0289\times72.9\times64}$ is
(1) 24 (2) 2.4
(3) 0.024 (4) 1.2
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

62. The simplified value of $\sqrt{0.25\times2.25}$ is
(1) 0.075 (2) 0.705
(3) 0.750 (4) 7.500
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

63. $\sqrt{64}-\sqrt{36}$ is equal to
(1) –2 (2) 2
(3) 0 (4) 1
(SSC CISF Constable (GD) Exam,

64. If $\sqrt{18225}$ = 135, then the value of $\sqrt{18225}+\sqrt{182.25}+\sqrt{1.8225}+\sqrt{0.018225}$ is
(1) 14.9985 (2) 149.985
(3) 1499.85 (4) 1.49985
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

65. The square root of $21\frac{51}{169}$ is
(1) $5\frac{8}{13}$ (2) $4\frac{8}{13}$
(3) $4\frac{3}{13}$ (4) $5\frac{5}{13}$
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

66. If $(1101)^2$ = 1212201, find the value of $\sqrt{121.2201}$.
(1) 110.1 (2) 11.01
(3) 1.101 (4) 11.001
(SSC CGL Tier-I Exam. 11.11.2012 (Ist Sitting)

67. The value of $\sqrt{\frac{0.064\times0.256\times15.625}{0.025\times0.625\times4.096}}$ is
(1) 2 (2) 2.4
(3) 0.24 (4) 4.2
(SSC Delhi Police Sub-Inspector (SI) Exam. 19.08.2012)

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68. The value of
$\sqrt{19.36}+\sqrt{0.1936}+\sqrt{0.001936}+\sqrt{0.00001936}$ is :
(1) 4.8484 (2) 4.8694
(3) 4.8884 (4) 4.8234
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

69. The number of pairs of natural numbers, the difference of whose squares is 45 will be
(1) 2 (2) 3
(3) 6 (4) 5
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

70. What is the value of $\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}}$?
(1) $2\sqrt{6}$ (2) $4\sqrt{6}$
(3) 2 (4) 4
(SSC Multi-Tasking Staff Exam. 10.03.2013)

71. Simplify :
$\sqrt{3\frac{33}{64}}+\sqrt{9\frac{1}{7}}\times 2\sqrt{3\frac{1}{9}}$
(1) $\frac{45}{256}$ (2) $1\frac{17}{28}$
(3) $4\frac{3}{8}$ (4) $2\frac{3}{16}$
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

72. The simplified value of $\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$ is
(1) 3 (2) 2
(3) 6 (4) 4
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

73. Number of digits in the square root of 62478078 is:
(1) 4 (2) 5
(3) 6 (4) 3
(SSC CGL Tier-I Exam. 21.04.2013, Ist Sitting)

74. If $\left(n^r-tn+\frac{1}{4}\right)$ be a perfect square, then the values of t are:
(1) ± 2 (2) 1, 2
(3) 2,3 (4) ± 1
(SSC CGL Tier-I Exam. 21.04.2013, Ist Sitting)

75. The square root of $33-4\sqrt{35}$ is :
(1) $\pm\left(2\sqrt{7}+\sqrt{5}\right)$
(2) $\pm\left(\sqrt{7}+2\sqrt{5}\right)$
(3) $\pm\left(\sqrt{7}-2\sqrt{5}\right)$
(4) $\pm\left(2\sqrt{7}-\sqrt{5}\right)$
(SSC CGL Tier-I Exam. 21.04.2013)

76. Find the value of
$\sqrt{156.25}+\sqrt{0.0081}-\sqrt{0.0361}$
(1) 13.4 (2) 15.4
(3) 12.4 (4) 17.4
(SSC Constable (GD) Exam. 12.05.2013)

77. The fourth root of 24010000 is
(1) 7 (2) 49
(3) 490 (4) 70
(SSC CGL Tier-I Exam. 19.05.2013)

78. The digit at the unit's place in the square-root of 15876 is :
(1) 8 (2) 6
(3) 4 (4) 2
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

79. The digit at unit's place of the number $(1570)^2+(1571)^2+(1572)^2+(1573)^2$ is :
(1) 4 (2) 1
(3) 2 (4) 3
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

80. The smallest 4-digit number, which is a perfect square, is
(1) 1009 (2) 1016
(3) 1024 (4) 1025
(SSC CPO Sub-Inspector Exam. 05.09.2004 & SAS Exam. 26.06.2010)

81. The smallest number added to 680621 to make the sum a perfect square is :
(1) 4 (2) 5
(3) 6 (4) 8
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

82. The smallest positive integer, when multiplied by 392, the product is a perfect square, is
(1) 6 (2) 5
(3) 3 (4) 2
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

83. Which smallest number must be added to 2203 so that we get a perfect square ?
(1) 1 (2) 3
(3) 6 (4) 8
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

84. The number of perfect square numbers between 50 and 1000 is
(1) 21 (2) 22
(3) 23 (4) 24
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

85. The smallest number which should be added to the number 8958 so that the result is a perfect square is
(1) 69 (2) 67
(3) 77 (4) 79
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

86. The largest number of five digits, which is a perfect square is
(1) 99999 (2) 99976
(3) 99856 (4) 99764
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

87. How many perfect squares lie between 120 and 300 ?
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

88. The smallest number that must be subtracted from 1000 to make the resulting number a perfect square is
(1) 37 (2) 38
(3) 39 (4) 40
(SSC Data Entry Operator Exam. 02.08.2009)

89. The least integer which should be added to 1000 so as to make it a perfect square is
(1) 10 (2) 18
(3) 24 (4) 89
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

90. The greatest 4 digit number which is a perfect square, is
(1) 9999 (2) 9909
(3) 9801 (4) 9081
(SSC CGL Tier-I Exam. 19.05.2013)

91. What number must be added to the expression $16a^2-12a$ to make it a perfect square ?
(1) $\frac{9}{4}$ (2) $\frac{11}{2}$
(3) $\frac{13}{2}$ (4) 16
(SSC CGL Tier-I Exam. 19.05.2013)

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92. If the number p is 5 more than q and the sum of the squares of p and q is 55, then the product of p and q is
(1) 10 (2) –10
(3) 15 (4) –15
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

93. The square root of a positive number less than 100 lies between :
(1) 0 and 1000
(2) 0 and 10
(3) –10 and 10
(4) –100 and 100
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

94. If the sum of two numbers is 22 and the sum of their squares is 404, then the product of the numbers is :
(1) 40 (2) 44
(3) 80 (4) 88
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

95. One-third of the square root of which number is 0.0001?
(1) 0.0009 (2) 0.000001
(3) 0.00009 (4) None of the above
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

96. Three fifth of the square of a certain number is 126.15. What is the number?
(1) 210.25 (2) 75.69
(3) 14.5 (4) 145
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting) & SSC CGL Prelim Exam. 13.11.2005)

97. How many positive integers less than 1000 are multiples of 11 whose square roots are whole numbers.
(1) 2 (2) 4
(3) 8 (4) 11
(SSC CPO S.I. Exam. 07.09.2003)

98. The number, whose square is equal to the difference of the squares of 75.15 and 60.12, is
(1) 46.09 (2) 48.09
(3) 45.09 (4) 47.09
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

99. The sum of the squares of two numbers is 386. If one of the number is 5, the other will be :
(1) 18 (2) 19
(3) 15 (4) 20
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

100. The number, whose square is equal to the difference between the squares of 975 and 585, is :
(1) 780 (2) 390
(3) 1560 (4) 130
(SSC CPO S.I. Exam. 28.05.2005)

101. If the sum and difference of two numbers are 20 and 8 respectively, then the difference of their squares is :
(1) 12 (2) 28
(3) 80 (4) 160
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

102. The sum of the squares of two positive integers is 100 and the difference of their squares is 28. The sum of the numbers is :
(1) 12 (2) 13
(3) 14 (4) 15
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

103. If x is a perfect square integer such that $7 < (2x - 3) < 17$, then the value of x is :
(1) 25 (2) 16
(3) 9 (4) 4
(SSC CHSL DEO & LDC Exam. 27.11.2010)

104. If the product of four consecutive natural numbers increased by a natural number p, is a perfect square; then the value of p is
(1) 8 (2) 4
(3) 2 (4) 1
(SSC CPO S.I. Exam. 03.09.2006)

105. Given that $\sqrt{24}$ is approximately equal to 4.898. $\sqrt{\frac{8}{3}}$ is nearly equal to
(1) 0.544 (2) 1.333
(3) 1.633 (4) 2.666
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

106. There are some boys and girls in a room. The square of the number of the girls is less than the square of the number of boys by 28. If there were two more girls, the number of boys would have been the same as that of the girls. The total number of the boys and girls in the room are
(1) 56 (2) 14
(3) 10 (4) 7
(SSC CPO S.I. Exam. 16.12.2007)

107. If the sum of the squares of three consecutive natural numbers is 110, then the smallest of these natural numbers is :
(1) 8 (2) 6
(3) 7 (4) 5
(SSC CPO S.I. Exam. 16.12.2007)

108. The product of two whole numbers is 37. The square root of the difference of the numbers is
(1) 8 (2) 7.5
(3) 6 (4) 4.5
(SSC CPO S.I. Exam. 16.12.2007)

109. The number, whose square is equal to the difference of the squares of the numbers 68 and 32, is
(1) 36 (2) 48
(3) 60 (4) 64
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

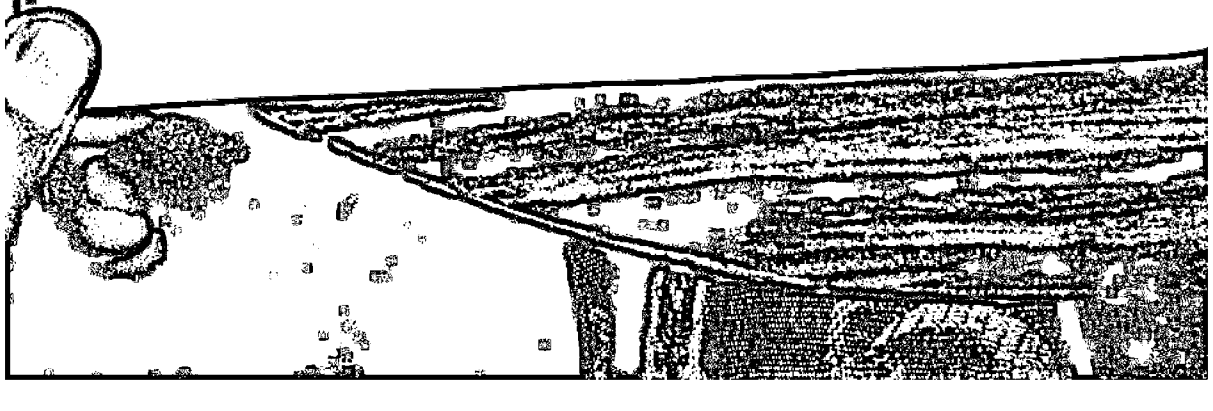
110. The sum of a positive integer and its square is 2450. The positive integer is
(1) 45 (2) 48
(3) 49 (4) 50
(SSC (South Zone) Investigator Exam 12.09.2010)

111. The product of two numbers is 45 and their difference is 4. The sum of squares of the two numbers is
(1) 135 (2) 240
(3) 73 (4) 106
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

112. 1008 divided by which single digit number gives a perfect square?
(1) 9 (2) 4
(3) 8 (4) 7
(SSC CGL Exam. 27.02.2000 (1st Sitting)

113. The least number that must be subtracted from 63520 to make the result a perfect square is :
(1) 16 (2) 20
(3) 24 (4) 30
(SSC CGL Exam. 24.02.2002 (IInd Sitting)

114. What is the least number which should be subtracted from 0.000326, to have perfect square ?
(1) 0.000004 (2) 0.000002
(3) 0.04 (4) 0.02
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)



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115. By which smallest number should 5808 be multiplied so that it becomes a perfect square?
(1) 2 (2) 7
(3) 11 (4) 3
(SSC CGL Exam. 04.07.1999 (1st Sitting)

116. By which smallest number should 20184 be multiplied so that it becomes a perfect square ?
(1) 2 (2) 3
(3) 5 (4) 6
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

117. The least number which must be added to 1728 to make it a perfect square is _____.
(1) 36 (2) 32
(3) 38 (4) 30
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

118. If a = 64 and b = 289, then the value of

$$\left(\sqrt{\sqrt{a}+\sqrt{b}}-\sqrt{\sqrt{b}-\sqrt{a}}\right)^{\frac{1}{2}}$$ is

(1) $2^{\frac{1}{2}}$ (2) 2
(3) 4 (4) -2
(SSC CGL Tier-II Exam. 21.09.2014

119. $\sqrt{64009}$ is equal to
(1) 352 (2) 523
(3) 253 (4) 532
(SSC CGL Tier-II Exam. 21.09.2014

120. A tourist spends daily as many rupees as the number of days of his total tour. If his total expenses were ₹ 361, then how many days did his tour last ?
(1) 17 days (2) 19 days
(3) 21 days (4) 31 days

121. The value of $\sqrt{10^{-6}\times 0.25}$ is
(1) 0.0025 (2) 0.0005
(3) 0.25 (4) 0.50
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

122. The simplified value of

$$\frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}}-\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}+\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$$ is

(1) $\sqrt{2}$ (2) $\frac{1}{\sqrt{2}}$
(3) $\sqrt{3}-\sqrt{2}$ (4) 0
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

123. The value of $\frac{4-\sqrt{0.04}}{4+\sqrt{0.4}}$ is close to
(1) 0.4 (2) 0.8
(3) 1.0 (4) 1.4
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

124. If $\sqrt{0.05\times 0.5\times a}=0.5\times 0.05\times\sqrt{b}$, then $\frac{a}{b}$ is equal to
(1) 0.0025 (2) 0.025
(3) 0.25 (4) 0.00025
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

125. A teacher wants to arrange his students in an equal number of rows and columns. If there are 1369 students, the number of students in the last row are
(1) 37 (2) 33
(3) 63 (4) 47
(SSC CHSL DEO & LDC Exam. 9.11.2014)

126. Which of the following is true?
(1) $\sqrt{5}+\sqrt{3}>\sqrt{6}+\sqrt{2}$
(2) $\sqrt{5}+\sqrt{3}<\sqrt{6}+\sqrt{2}$
(3) $\sqrt{5}+\sqrt{3}=\sqrt{6}+\sqrt{2}$
(4) $(\sqrt{5}+\sqrt{3})(\sqrt{6}+\sqrt{2})=1$
(SSC CHSL DEO & LDC Exam. 9.11.2014)

127. The least number by which 20184 must be multiplied so as to make the product a perfect square is
(1) 2 (2) 3
(3) 5 (4) 6
(SSC CHSL DEO Exam. 16.11.2014 (1st Sitting)

128. 1008 divided by which single digit number gives a perfect square ?
(1) 9 (2) 4
(3) 8 (4) 7
(SSC Constable (GD) Exam, 04.10.2015, 1st Sitting)

129. The sum of two numbers is 37 and the difference of their squares is 185. then the difference between the two numbers is :
(1) 10 (2) 4
(3) 5 (4) 3
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (1st Sitting) TF No. 6636838)

130. A General of Army wants to form a square from 36562 armies. After arrangement, he found some armies left. How many armies were left ?
(1) 81 (2) 36
(3) 97 (4) 65
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

131. The square root of $\frac{2+\sqrt{3}}{2}$ is
(1) $\pm\frac{1}{\sqrt{2}}(\sqrt{3}+1)$
(2) $\pm\frac{1}{2}(\sqrt{3}-2)$
(3) None of these
(4) $\pm\frac{1}{2}(\sqrt{3}-1)$
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

132. The value of $(11111)^2$ is
(1) 12344321 (2) 121212121
(3) 123454321 (4) 11344311
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

133. The smallest whole number that is to be multiplied with 59535 to make a perfect square number is x. The sum of digits of x is
(1) 9 (2) 5
(3) 7 (4) 6
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (1st Sitting) TF No. 8037731)

134. The digit in the unit place in the square root of 66049 is
(1) 3 (2) 7
(3) 8 (4) 2
(SSC CGL Tier-I Re-Exam, 30.08.2015)

135. The value of $\sqrt{0.000441}$ is equal to
(1) 0.21 (2) 0.00021
(3) 0.0021 (4) 0.021
(SSC Constable (GD) Exam, 04.10.2015, 1st Sitting)

136. The sum of the perfect squares between 120 and 300 is
(1) 1400 (2) 1296
(3) 1024 (4) 1204
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

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137. The least number that should be subtracted from the number 32146 to make it a perfect square is :
(1) 305 (2) 105
(3) 205 (4) 405
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

138. If 5416 * 6 is a perfect square, then the digit at '*' is :
(1) 9 (2) 4
(3) 6 (4) 5
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

139. A number of boys raised Rs. 12,544 for a famine fund, each boy has given as many rupees as there were boys. The number of boys was :
(1) 102 (2) 112
(3) 122 (4) 132
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441156)

TYPE–IV

1. The sum of the cubes of the numbers 22, –15 and –7 is equal to
(1) 6930 (2) 9630
(3) 3 (4) 0
(SSC CPO S.I. Exam. 05.09.2004)

2. $\frac{\sqrt[3]{8}}{\sqrt{16}} + \sqrt{\frac{100}{49}} \times \sqrt[3]{125}$ is equal to :
(1) 7 (2) $1\frac{3}{4}$
(3) $\frac{7}{100}$ (4) $\frac{4}{7}$
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. $\sqrt[3]{\frac{72.9}{0.4096}}$ is equal to :
(1) 0.5625 (2) 5.625
(3) 182 (4) 13.6
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. $(5.5)^3 - (4.5)^3$ is equal to :
(1) 1 (2) 75
(3) 74.25 (4) 75.25
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

5. The value of $\sqrt[3]{\frac{7}{875}}$ is equal to
(1) $\frac{1}{3}$ (2) $\frac{1}{15}$
(3) $\frac{1}{4}$ (4) $\frac{1}{5}$
(SSC CPO S.I. Exam. 07.09.2003)

6. $\sqrt[3]{\frac{19}{513}}$ is equal to
(1) $\frac{1}{9}$ (2) $\frac{1}{3}$
(3) $\frac{1}{\sqrt{27}}$ (4) $\frac{1}{\sqrt{3}}$
(SSC CPO S.I. Exam. 05.09.2004)

7. $\sqrt[3]{(333)^3+(333)^3+(334)^3-3\times333\times333\times334}$ is equal to
(1) 12 (2) 11
(3) 10 (4) 15
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

8. If cube root of 175616 is 56, then the value of $\sqrt[3]{175.616} + \sqrt[3]{0.175616} + \sqrt[3]{0.000175616}$ is equal to :
(1) 0.168 (2) 62.16
(3) 6.216 (4) 6.116
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

9. $\sqrt[3]{0.000064}$ is equal to
(1) 0.0002 (2) 0.002
(3) 0.02 (4) 0.2
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

10. $\sqrt[3]{15612 + \sqrt{154 + \sqrt{225}}}$ is equal to
(1) 15 (2) 25
(3) 75 (4) 125
(SSC (South Zone) Investigator Exam 12.09.2010)

11. $\sqrt[3]{0.000125}$ is equal to
(1) 0.5 (2) 0.15
(3) 0.05 (4) 0.005
(SSC (South Zone) Investigator Exam 12.09.2010)

12. The sum of the squares of 2 numbers is 146 and the square root of one of them is $\sqrt{5}$. The cube of the other number is
(1) 1111 (2) 1221
(3) 1331 (4) 1441
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

13. $\left(\sqrt[3]{1000} + \sqrt[3]{0.009} - \sqrt[3]{0.125}\right)$ is equal to
(1) 9.7 (2) 9.97
(3) 9.99 (4) 9.9997
(SSC CPO S.I. Exam 12.12.2010 (Paper-1)

14. $\sqrt[3]{1 - \frac{127}{343}}$ is equal to
(1) $\frac{5}{9}$ (2) $1 - \frac{1}{7}$
(3) $\frac{4}{7}$ (4) $1 - \frac{2}{7}$
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

15. If $\sqrt[3]{3^n} = 27$, then the value of n is :
(1) 9 (2) 6
(3) 1 (4) 3
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

16. The value of $\sqrt{\sqrt[3]{0.000729}}$ is
(1) 0.9 (2) 0.3
(3) 0.03 (4) 0.09
(SSC Multi-Tasking Staff Exam, 10.03.2013, Ist Sitting : Patna)

17. The value of $\left(\sqrt{4^3 + 15^2}\right)^3$ is :
(1) 4913 (2) 4313
(3) 4193 (4) 3943
(SSC Multi-Tasking Staff Exam. 10.03.2013)

18. $\sqrt[3]{4\frac{12}{125}}$ is equal to
(1) 1.4 (2) 1.6
(3) 1.8 (4) 2.4
(SSC CPO Sub Inspector Exam. 06.09.2009) & SSC CPO S.I. Exam. 12.12.2010 (Paper-I) & SSC MTS Exam. 17.03.2013 (Ist Sitting)

19. By which smallest number 1323 must be multiplied, so that it becomes a perfect cube?
(1) 2 (2) 3
(3) 5 (4) 7
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

20. Sum of digits of the smallest number by which 1440 be multiplied so that it becomes a perfect cube, is
(1) 4 (2) 6
(3) 7 (4) 8
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

21. The sum of the digits of the smallest number which, when multiplied by 1800, gives a perfect cube, is :
(1) 2 (2) 3
(3) 6 (4) 8
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

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22. Which smallest number must be added to 710 so that the sum is a perfect cube ?
(1) 29 (2) 19
(3) 11 (4) 21
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

23. The least number, by which 1944 must be multiplied so as to make the result a perfect cube, is
(1) 2 (2) 3
(3) 6 (4) 13
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

24. The smallest natural number, by which 3000 must be divided to make the quotient a perfect cube, is :
(1) 3 (2) 4
(3) 5 (4) 6
(SSC CPO S.I. Exam. 16.12.2007)

25. The smallest positive integer n, for which $864n$ is a perfect cube, is :
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CPO S.I. Exam. 16.12.2007)

26. By what least number should 675 be multiplied so as to obtain a perfect cube number ?
(1) 3 (2) 5
(3) 24 (4) 40
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

27. The least number, that must be added to 1720 so as to obtain a perfect cube, is
(1) 7 (2) 8
(3) 11 (4) 13
(SSC SAS Exam 26.06.2010 (Paper-1)

28. By what least number should 4320 be multiplied so as to obtain a number which is a perfect cube ?
(1) 40 (2) 50
(3) 60 (4) 80
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

29. Which of the following is a perfect square as well as a cube?
343, 125, 81, or 64
(1) 81 (2) 125
(3) 343 (4) 64
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

30. The square of a natural number subtracted from its cube is 48. The number is
(1) 8
(3) 5 (4) 4
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

31. The least possible value of A for which $90 \times A$ is a perfect cube is
(1) 200 (2) 300
(3) 500 (4) 600
(SSC CPO S.I. Exam. 12.01.2003

32. If the square root of x is the cube root of y, then the relation between x and y is
(1) $x^3 = y^2$ (2) $x^2 = y^3$
(3) $x = y$ (4) $x^6 = y^5$
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

33. If $x = \sqrt{3} + \sqrt{2}$ then the value of $x^3 - \frac{1}{x^3}$ is
(1) $10\sqrt{2}$ (2) $14\sqrt{2}$
(3) $22\sqrt{2}$ (4) $8\sqrt{2}$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

34. The value of $(1001)^3$ is
(1) 1003003001
(2) 100303001
(3) 100300301
(4) 103003001
(SSC CGL Tier-I Exam. 26.10.2014)

35. What is the smallest number by which 625 must be divided so that the quotient is a perfect cube ?
(1) 25 (2) 5
(3) 2 (4) 3
(SSC CGL Tier-II Exam. 21.09.2014)

36. The sum of the cubes of two numbers is 793. The sum of the numbers is 13. Then the difference of the two numbers is
(1) 7 (2) 6
(3) 5 (4) 8
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

37. The smallest number by which 243000 be divided so that the quotient is a perfect cube is
(1) 3 (2) 27
(3) 9 (4) 1
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

38. When simplified, the product
$\left(2 - \frac{1}{3}\right)\left(2 - \frac{3}{5}\right)\left(2 - \frac{5}{7}\right) \ldots \left(2 - \frac{997}{999}\right)$
equals
(1) $\frac{5}{999}$ (2) $\frac{5}{3}$
(3) $\frac{1001}{999}$ (4) $\frac{1001}{3}$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

39. If the cube root of 79507 is 43, then the value of
$\sqrt[3]{79.507} + \sqrt[3]{0.079507} + \sqrt[3]{0.000079507}$
is
(1) 0.4773 (2) 477.3
(3) 47.73 (4) 4.773
(SSC CGL Tier-I Exam, 09.09.2015 (IInd Sitting) TF No. 4239378)

TYPE–V

1. The simplified value of $\frac{(0.0539 - 0.002) \times 0.4 + 0.56 \times 0.07}{0.04 \times 0.25}$ = ?
(1) 59.96 (2) 0.5996
(3) 5.996 (4) 599.6
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

SHORT ANSWERS

TYPE-I

1. (1)	2. (1)	3. (4)	4. (3)
5. (1)	6. (3)	7. (2)	8. (4)
9. (2)	10. (3)	11. (1)	12. (4)
13. (4)	14. (4)	15. (3)	16. (1)
17. (2)	18. (1)	19. (3)	20. (3)
21. (1)	22. (3)	23. (4)	24. (3)
25. (*)	26. (1)		

TYPE-II

1. (3)	2. (1)	3. (3)	4. (3)
5. (1)	6. (2)	7. (1)	8. (1)
9. (2)	10. (4)	11. (2)	12. (1)
13. (1)	14. (3)	15. (4)	16. (1)
17. (1)	18. (1)	19. (4)	20. (3)
21. (3)	22. (3)	23. (2)	24. (2)

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25. (4)	26. (2)	27. (2)	28. (1)
29. (4)	30. (4)	31. (1)	32. (2)
33. (3)	34. (3)	35. (2)	36. (2)
37. (1)	38. (3)	39. (1)	40. (3)
41. (2)	42. (4)	43. (2)	44. (2)
45. (4)	46. (2)	47. (4)	48. (2)
49. (1)	50. (3)	51. (4)	52. (3)
53. (2)	54. (1)	55. (1)	56. (4)
57. (3)	58. (4)	59. (4)	60. (2)
61. (1)	62. (2)	63. (1)	64. (4)
65. (4)	66. (4)	67. (1)	68. (4)
69. (3)	70. (1)	71. (4)	72. (4)
73. (1)	74. (2)	75. (3)	76. (2)
77. (4)	78. (3)	79. (1)	80. (2)
81. (2)	82. (1)	83. (2)	84. (*)
85. (4)	86. (1)		

TYPE-III

1. (3)	2. (3)	3. (1)	4. (4)
5. (4)	6. (3)	7. (2)	8. (2)
9. (2)	10. (3)	11. (4)	12. (2)
13. (1)	14. (4)	15. (4)	16. (4)
17. (4)	18. (2)	19. (2)	20. (2)
21. (1)	22. (4)	23. (2)	24. (4)
25. (1)	26. (3)	27. (3)	28. (3)
29. (2)	30. (3)	31. (1)	32. (3)
33. (2)	34. (4)	35. (2)	36. (1)
37. (2)	38. (2)	39. (2)	40. (2)
41. (2)	42. (4)	43. (3)	44. (4)
45. (2)	46. (3)	47. (3)	48. (4)
49. (3)	50. (3)	51. (3)	52. (2)
53. (3)	54. (2)	55. (1)	56. (4)
57. (1)	58. (3)	59. (3)	60. (2)
61. (3)	62. (3)	63. (2)	64. (2)
65. (2)	66. (2)	67. (1)	68. (3)
69. (2)	70. (3)	71. (4)	72. (2)
73. (1)	74. (4)	75. (4)	76. (3)
77. (4)	78. (2)	79. (1)	80. (3)
81. (1)	82. (4)	83. (3)	84. (4)
85. (2)	86. (3)	87. (3)	88. (3)
89. (3)	90. (3)	91. (1)	92. (3)
93. (3)	94. (1)	95. (4)	96. (3)

97. (1)	98. (3)	99. (2)	100. (1)
101. (4)	102. (3)	103. (3)	104. (4)
105. (3)	106. (2)	107. (4)	108. (3)
109. (3)	110. (3)	111. (4)	112. (4)
113. (1)	114. (2)	115. (4)	116. (4)
117. (1)	118. (1)	119. (3)	120. (2)
121. (2)	122. (4)	123. (2)	124. (2)
125. (1)	126. (1)	127. (4)	128. (4)
129. (3)	130. (1)	131. (3)	132. (3)
133. (4)	134. (2)	135. (4)	136. (1)
137. (2)	138. (1)	139. (2)	

TYPE-IV

1. (1)	2. (2)	3. (2)	4. (4)
5. (4)	6. (2)	7. (3)	8. (3)
9. (4)	10. (2)	11. (3)	12. (3)
13. (1)	14. (2)	15. (1)	16. (2)
17. (1)	18. (2)	19. (4)	20. (2)
21. (3)	22. (2)	23. (2)	24. (1)
25. (2)	26. (2)	27. (2)	28. (2)
29. (4)	30. (4)	31. (2)	32. (1)
33. (3)	34. (1)	35. (2)	36. (3)
37. (3)	38. (4)	39. (4)	

TYPE-V

1. (3)			

EXPLANATIONS

TYPE-I

1. (1)

$$? = 1+\cfrac{1}{1+\cfrac{2}{2+\cfrac{3}{1+\cfrac{4}{5}}}}$$

$$= 1+\cfrac{1}{1+\cfrac{2}{2+\cfrac{3\times5}{5+4}}} = 1+\cfrac{1}{1+\cfrac{2}{2+\cfrac{5}{3}}}$$

$$= 1+\cfrac{1}{1+\cfrac{2\times3}{6+5}} = 1+\frac{1\times11}{11+6}$$

$$= 1+\frac{11}{17} = 1\frac{11}{17}$$

2. (1) $? = 1+\cfrac{2}{1+\cfrac{3\times5}{9}} = 1+\cfrac{2}{1+\cfrac{5}{3}}$

$$= 1+\frac{2\times3}{8} = \frac{7}{4}$$

3. (4) $\cfrac{1}{3+\cfrac{1}{2-\cfrac{1}{\cfrac{7}{9}}}}+\frac{17}{22}$

$$= \cfrac{1}{3+\cfrac{1}{2-\cfrac{9}{7}}}+\frac{17}{22}$$

$$= \cfrac{1}{3+\cfrac{1}{\cfrac{14-9}{7}}}+\frac{17}{22}$$

$$= \cfrac{1}{3+\cfrac{1}{\cfrac{5}{7}}}+\frac{17}{22} = \cfrac{1}{3+\cfrac{7}{5}}+\frac{17}{22}$$

$$= \cfrac{1}{\cfrac{15+7}{5}}+\frac{17}{22}$$

$$= \frac{5}{22}+\frac{17}{2} = \frac{22}{22} = 1$$

4. (3) $x = 1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{1}{2}}}}$

$$= 1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\frac{3}{2}}}} = 1+\cfrac{1}{1+\cfrac{1}{1+\frac{2}{3}}}$$

$$= 1+\cfrac{1}{1+\cfrac{1}{\frac{5}{3}}} = 1+\frac{1}{1+\frac{3}{5}}$$

$$= 1+\frac{1}{\frac{8}{5}} = 1+\frac{5}{8} = \frac{13}{8}$$

$$\therefore 2x+\frac{7}{4} = 2\times\frac{13}{8}+\frac{7}{4}$$

$$= \frac{13+7}{4} = \frac{20}{4} = 5$$

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5. (1) $\frac{19}{43}+\frac{1}{2+\frac{1}{3+\frac{1}{1+\frac{1}{4}}}}$

$\frac{19}{43}\quad\frac{1}{2+\frac{1}{3+\frac{4}{5}}}$

$=\frac{19}{43}+\frac{1}{2+\frac{5}{19}}=\frac{19}{43}+\frac{19}{43}$

$=\frac{19}{43}\times\frac{43}{19}=1$

6. (3) $\frac{5}{3+\frac{3}{\frac{3-2}{3}}}=\frac{5}{3+\frac{3}{\frac{1}{3}}}$

$\frac{5}{3+3\times3}=\frac{5}{3+9}=\frac{5}{12}$

7. (2) $2=x+\frac{1}{1+\frac{1}{3+\frac{1}{4}}}$

$\Rightarrow 2=x+\frac{1}{1+\frac{1}{\frac{12+1}{4}}}$

$\Rightarrow 2=x+\frac{1}{1+\frac{4}{13}}$

$\Rightarrow 2=x+\frac{1}{\frac{13+4}{13}}$

$\Rightarrow 2=x+\frac{1}{\frac{17}{13}}$

$\Rightarrow 2=x+\frac{13}{17}\Rightarrow x=2-\frac{13}{17}$

$=\frac{34-13}{17}=\frac{21}{17}$

8. (4) $\frac{2}{1+\frac{1}{\frac{1}{2}}}\times\frac{3}{\left(\frac{5}{6}\times\frac{3}{2}\right)+\frac{5}{4}}$

$=\frac{2}{1+2}\times\frac{3}{\frac{5}{4}+\frac{5}{4}}$

$=\frac{2}{3}\times\frac{3}{\frac{5}{4}\times\frac{4}{5}}=\frac{2}{3}\times3=2$

9. (2) $1+\frac{\cdot}{2+\frac{3}{\frac{10-1}{2}}}-\frac{\cdot}{2}\times5$

$=1+\frac{4}{2+\frac{6}{9}}-\frac{5}{2}=1+\frac{4}{2+\frac{2}{3}}-\frac{5}{2}$

$=1+\frac{4}{\frac{8}{3}}-\frac{5}{2}=1+\frac{4\times3}{8}-\frac{5}{2}$

$=1+\frac{3}{2}-\frac{5}{2}=\frac{2+3-5}{2}=0$

10. (3) Suppose that

$1+\frac{1}{10+\frac{1}{10}}=\frac{111}{101}=a$

and, $1-\frac{1}{10+\frac{1}{10}}=\frac{91}{101}=b$

$\therefore\ \frac{a^2-b^2}{(a+b)}=\frac{(a+b)(a-b)}{(a+b)}$

$=(a-b)$

$=\frac{111}{101}-\frac{91}{101}=\frac{20}{101}$

11. (1) $\frac{\frac{79}{14}}{5+\frac{3}{3+\frac{5}{3}}}$

$=\frac{\frac{79}{14}}{5+\frac{3}{\frac{9+5}{3}}}$

$=\frac{\frac{79}{14}}{5+\frac{9}{14}}=\frac{\frac{79}{14}}{\frac{70+9}{14}}$

$=\frac{79}{14}\times\frac{14}{79}=1$

12. (4) $\frac{2}{2+\frac{2}{3+\frac{2}{\frac{11}{3}}}\times0.39}$

$\frac{2}{2+\frac{2}{3+\frac{6}{11}}\times0.39}$

$=\frac{2}{2+\frac{2}{\frac{33+6}{11}}\times0.39}$

$=\frac{2}{2+\frac{11\times2}{39}\times0.39}$

$=\frac{2}{2+\frac{11\times2}{39}\times\frac{39}{100}}$

$=\frac{2}{2+\frac{11}{50}}=\frac{2}{\frac{100+11}{50}}$

$=\frac{100}{111}$

13. (4) Expression $=1+\frac{1}{1+\frac{1}{2}}$

$=1+\frac{1}{\frac{2+1}{2}}=1+\frac{2}{3}=\frac{3+2}{3}=\frac{5}{3}$

14. (4) Check through options

$\frac{1}{3+\frac{1}{1+\frac{1}{2+\frac{1}{4}}}}$

$=\frac{1}{3+\frac{1}{1+\frac{1}{\frac{8+1}{4}}}}=\frac{1}{3+\frac{1}{1+\frac{4}{9}}}$

$=\frac{1}{3+\frac{1}{\frac{9+4}{9}}}=\frac{1}{3+\frac{9}{13}}=\frac{1}{\frac{39+9}{13}}=\frac{13}{48}$

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15. (3) Expression

$$= 1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\cfrac{3+2}{3}}}}}$$

$$= 1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\frac{3}{5}}}}$$

$$= 1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{\cfrac{5+3}{5}}}}$$

$$= 1+\cfrac{1}{1+\cfrac{1}{1+\frac{5}{8}}}$$

$$= 1+\cfrac{1}{1+\cfrac{1}{\cfrac{8+5}{8}}}$$

$$= 1+\frac{1}{1+\frac{8}{13}} = 1+\frac{1}{\frac{13+8}{13}}$$

$$= 1+\frac{13}{21} = \frac{21+13}{21} = \frac{34}{21}$$

16. (1) Expression

$$= \frac{\frac{7}{3}-\frac{13}{11}}{3+\cfrac{1}{3+\cfrac{1}{\cfrac{9+1}{3}}}} = \frac{\frac{77-39}{33}}{3+\frac{1}{3+\frac{3}{10}}}$$

$$= \frac{\frac{38}{33}}{3+\cfrac{1}{\cfrac{30+3}{10}}} = \frac{\frac{38}{33}}{3+\frac{10}{33}}$$

$$= \frac{\frac{38}{33}}{\frac{99+10}{33}} = \frac{38}{33}\times\frac{33}{109} = \frac{38}{109}$$

17. (2) Expression $= 3+\cfrac{3}{3+\cfrac{1}{\cfrac{9+1}{3}}}$

$$= 3+\frac{3}{3+\frac{3}{10}} = 3+\frac{3}{\frac{30+3}{10}}$$

$$= 3+\frac{30}{33} = 3+\frac{10}{11} = \frac{33+10}{11} = \frac{43}{11}$$

18. (1) Expression $= 1+\cfrac{1}{1+\frac{1}{5}}$

$$= 1+\frac{1}{\frac{5+1}{5}} = 1+\frac{5}{6} = \frac{6+5}{6} = \frac{11}{6}$$

19. (3) First part $= \dfrac{\frac{30}{7}-\frac{1}{2}}{\frac{2}{7}+\frac{8}{7}}$

$$= \frac{\frac{60-7}{14}}{\frac{49+16}{14}} = \frac{53}{14}\times\frac{14}{65} = \frac{53}{65}$$

Second part $= \cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{\frac{25-1}{5}}}}$

$$= \frac{1}{2+\frac{1}{2+\frac{5}{24}}} = \frac{1}{2+\frac{1}{\frac{48+5}{24}}}$$

$$= \frac{1}{2+\frac{24}{53}} = \frac{1}{\frac{106+24}{53}}$$

$$= \frac{53}{130}$$

$\therefore$ Expression

$$= \frac{53}{65}+\frac{53}{130} = \frac{53}{65}\times\frac{130}{53} = 2$$

20. (3)

$$4-\cfrac{5}{1+\cfrac{1}{3+\cfrac{1}{\frac{9}{4}}}} = 4-\cfrac{5}{1+\cfrac{1}{3+\frac{4}{9}}}$$

$$= 4-\cfrac{5}{1+\cfrac{1}{\frac{27+4}{9}}} = 4-\frac{5}{1+\frac{9}{31}}$$

$$= 4-\frac{5}{\frac{40}{31}} = 4-\frac{5\times31}{40}$$

$$= 4-\frac{31}{8} = \frac{32-31}{8} = \frac{1}{8}$$

$\because$ Time taken in completing $\frac{1}{8}$ part = 10 minutes

$\therefore$ Time taken in completing $\frac{3}{5}$ part

$$= 10\times8\times\frac{3}{5}$$

= 48 minutes

21. (1) $\dfrac{4\frac{1}{7}-2\frac{1}{4}}{3\frac{1}{2}+1\frac{1}{7}} = \dfrac{\frac{29}{7}-\frac{9}{4}}{\frac{7}{2}+\frac{8}{7}}$

$$= \frac{\frac{116-63}{28}}{\frac{49+16}{14}} = \frac{53}{28}\times\frac{14}{65} = \frac{53}{130}$$

Again,

$$\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{\frac{25-1}{5}}}} = \cfrac{1}{2+\cfrac{1}{2+\frac{5}{24}}}$$

$$= \cfrac{1}{2+\cfrac{1}{\frac{48+5}{24}}} = \frac{1}{2+\frac{24}{53}}$$

$$= \frac{1}{\frac{106+24}{53}} = \frac{53}{130}$$

$\therefore$ Expression $= \sqrt{\frac{53}{130}+\frac{53}{130}} = 1$

22. (3) $1+\cfrac{1}{1+\cfrac{2}{\cfrac{15+4}{5}}}$

$$= 1+\cfrac{1}{1+\cfrac{2\times5}{19}} = 1+\frac{1}{\frac{19+10}{19}}$$

$$= 1+\frac{19}{29} = \frac{29+19}{29} = \frac{48}{29}$$

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23. (4) Expression $= 1-\dfrac{a}{1-\dfrac{1}{1+\dfrac{a}{1-a}}}$

$= 1-\dfrac{a}{1-\dfrac{1}{\dfrac{1-a+a}{1-a}}}$

$= 1-\dfrac{a}{1-\dfrac{1}{\dfrac{1}{1-a}}}$

$= 1-\dfrac{a}{1-(1-a)} = 1-\dfrac{a}{1-1+a}$

$= 1-1 = 0$

24. (3) First part $= \dfrac{4\frac{1}{7}-2\frac{1}{7}}{3\frac{1}{2}+1\frac{1}{7}}$

$= \dfrac{\frac{29}{7}-\frac{15}{7}}{\frac{7}{2}+\frac{8}{7}} = \dfrac{\frac{14}{7}}{\frac{49+16}{14}}$

$= \dfrac{2}{\frac{65}{14}} = \dfrac{2\times14}{65} = \dfrac{28}{65}$

Second part $= \dfrac{1}{2+\dfrac{1}{2+\dfrac{1}{\frac{25-1}{5}}}}$

$= \dfrac{1}{2+\dfrac{1}{2+\frac{5}{24}}} = \dfrac{1}{2+\dfrac{1}{\frac{48+5}{24}}}$

$= \dfrac{1}{2+\frac{24}{53}} = \dfrac{1}{\frac{106+24}{53}} = \dfrac{53}{130}$

$\therefore$ Expression $= \dfrac{28}{65}+\dfrac{53}{130}$

$= \dfrac{28}{65}\times\dfrac{130}{53} = \dfrac{56}{53}$

25. (*) Let, $a = 1+\dfrac{1}{10+\frac{1}{10}}$

$= 1+\dfrac{1}{\frac{100+1}{10}} = 1+\dfrac{10}{101}$

$= \dfrac{101+10}{101} = \dfrac{111}{101}$

Again,

$b = 1-\dfrac{1}{10+\frac{1}{10}} = 1-\dfrac{1}{\frac{100+1}{10}}$

$= 1-\dfrac{10}{101}$

$= \dfrac{101-10}{101} = \dfrac{91}{101}$

$\therefore$ Expression

$= (a^2-b^2)+ab$

$= \{(a+b)(a-b)\}+ab$

$= \left(\dfrac{111}{101}+\dfrac{91}{101}\right)\left(\dfrac{111}{101}-\dfrac{91}{101}\right)$

$+\left(\dfrac{111}{101}\times\dfrac{91}{101}\right)$

$= \dfrac{202}{101}\times\dfrac{20}{101}\times\dfrac{101\times101}{111\times91}$

$= \dfrac{4040}{10101}$

26. (1) Expression

$= 4-\dfrac{5}{1+\dfrac{1}{3+\dfrac{1}{\frac{8+1}{4}}}}$

$= 4-\dfrac{5}{1+\dfrac{1}{3+\frac{4}{9}}} = 4-\dfrac{5}{1+\dfrac{1}{\frac{27+4}{9}}}$

$= 4-\dfrac{5}{1+\frac{9}{31}} = 4-\dfrac{5}{\frac{31+9}{31}}$

$= 4-\dfrac{5\times31}{40} = \dfrac{160-155}{40}$

$= \dfrac{5}{40} = \dfrac{1}{8}$

TYPE-II

1. (3) $? = \dfrac{9|3-5|-5|4|+10}{-3(5)-2\times4+2}$

$= \dfrac{9\times2-5\times4+10}{-15-8+2}$

$= \dfrac{18-2}{-19} = -\dfrac{16}{19}$

2. (1) $? = 5-[4-\{3-(3-3-6)\}]$

$= 5-[4-\{3-(-6)\}]$

$= 5-[4-[3+6]]$

$= 5-[4-9]$

$= 5+5 = 10$

3. (3) $? = \dfrac{-(-2)^2+6+6}{18-15}$

$= \dfrac{-4+12}{3} = \dfrac{8}{3}$

4. (3) $\dfrac{\frac{5}{3}\times\frac{7}{51}\text{ of }\frac{17}{5}-\frac{1}{3}}{\frac{2}{9}\times\frac{5}{7}\text{ of }\frac{28}{5}-\frac{2}{3}}$

$= \dfrac{\frac{5}{3}\times\frac{7}{15}-\frac{1}{3}}{\frac{2}{9}\times4-\frac{2}{3}}$

$= \dfrac{\frac{7}{9}-\frac{1}{3}}{\frac{8}{9}-\frac{2}{3}} = \dfrac{4}{9}\times\dfrac{9}{2} = 2$

5. (1) $? = 1-[5-\{2+(-1)2\}]$

$= 1-[5-[2-2]]$

$= 1-[5-0]$

$= 1-5 = -4$

6. (2) $3034-(1002\div20.04)$

$= 3034-\dfrac{1002}{20.04}$

$= 3034-\dfrac{1002}{2004}\times100$

$= 3034-50 = 2984$

7. (1)

$(100)^{\frac{1}{2}}\times(0.001)^{\frac{1}{3}}-(0.0016)^{\frac{1}{4}}\times3^0+\left(\dfrac{5}{4}\right)^{-1}$

$= 10\times0.1-0.2\times1+\dfrac{4}{5}$

$= 1-0.2+0.8 = 1.6$

8. (1) $? = \left(\dfrac{1}{2}-\dfrac{1}{4}+\dfrac{1}{5}-\dfrac{1}{6}\right)$

$+\left(\dfrac{2}{5}-\dfrac{5}{9}+\dfrac{3}{5}-\dfrac{7}{18}\right)$

$= \left(\dfrac{30-15+12-10}{60}\right)$

$+\left(\dfrac{36-50+54-35}{90}\right)$

$= \left(\dfrac{17}{60}\right)+\left(\dfrac{5}{90}\right) = \dfrac{17}{60}\times18$

$= \dfrac{51}{10} = 5\dfrac{1}{10}$

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9. (2)

$$3\frac{1}{2}-\left[3\frac{1}{4}+\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

$$=\frac{17}{2}-\left[\frac{13}{4}+\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{3}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

$$=\frac{17}{2}-\left[\frac{13}{4}+\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{9-2-1}{6}\right)\right\}\right]$$

$$=\frac{17}{2}-\left[\frac{13}{4}+\left\{\frac{5}{4}-\frac{1}{2}\times\frac{6}{6}\right\}\right]$$

$$=\frac{17}{2}-\left[\frac{13}{4}+\left\{\frac{5}{4}-\frac{1}{2}\right\}\right]$$

$$=\frac{17}{2}-\left[\frac{13}{4}+\left\{\frac{5-2}{4}\right\}\right]$$

$$=\frac{17}{2}-\left[\frac{13}{4}+\frac{3}{4}\right]$$

$$=\frac{17}{2}-\left[\frac{13}{4}\times\frac{4}{3}\right]=\frac{17}{2}-\frac{13}{3}$$

$$=\frac{51-26}{6}=\frac{25}{6}=4\frac{1}{6}$$

10. (4) Let the value of * be x.

$$\therefore \frac{50}{x}=\frac{x}{12\frac{1}{2}}$$

$$\Rightarrow \frac{50}{x}=\frac{2x}{25}$$

$$\Rightarrow 2x^2=50\times 25$$

$$\Rightarrow x^2=25\times 25$$

$$\therefore x=25$$

11. (2) $0.008\times 0.01\times 0.072+(0.12\times 0.0004)$

$$=0.008\times 0.01\times 0.072+(0.000048)$$

$$=0.008\times 0.01\times\frac{0.072}{0.000048}$$

$$=\frac{0.00000576}{0.000048}=0.12$$

2. (1) $\frac{2}{3}\times\frac{3}{\frac{5}{6}+\frac{2}{3}\text{ of }1\frac{1}{4}}$

$$=\frac{2}{3}\times\frac{3}{\frac{5}{6}+\frac{2}{3}\text{ of }\frac{5}{4}}$$

$$=\frac{2}{3}\times\frac{3}{\frac{5}{6}+\frac{10}{12}}$$

$$=\frac{2}{3}\times\frac{3}{\frac{5}{6}\times\frac{12}{10}}=\frac{2}{3}\times\frac{3}{1}=2$$

13. (1)

$$\frac{1}{9}+\frac{1}{6}+\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+\frac{1}{42}+\frac{1}{56}+\frac{1}{72}$$

$$=\frac{1}{9}+\frac{1}{2\times 3}+\frac{1}{3\times 4}+\frac{1}{4\times 5}$$

$$+\frac{1}{5\times 6}+\ldots\frac{1}{8\times 9}$$

$$=\frac{1}{9}+\frac{1}{2}-\frac{1}{3}+\frac{1}{3}-\frac{1}{4}+\ldots+\frac{1}{8}-\frac{1}{9}=\frac{1}{2}$$

14. (3) Expression

$$=25-5\,[2+3\,\{2-2(5-3)+5\}-10]+4$$

$$=25-5\,[2+3\,(2-2\times 2+5)-10]+4$$

$$=25-5\,[2+9-10]+4$$

$$=25-5+4=25-\frac{5}{4}$$

$$=\frac{100-5}{4}=\frac{95}{4}=23.75$$

15. (4) We have

$$\frac{5}{3}+\frac{2}{7}\times\frac{*}{7}=\frac{5}{4}\times\frac{2}{3}\times 6$$

$$\Rightarrow\frac{5}{3}\times\frac{7}{2}\times\frac{*}{7}=\frac{5\times 2\times 6}{4\times 3}$$

$$\therefore *=\frac{5\times 2\times 6\times 3\times 2\times 7}{5\times 7\times 4\times 3}=6$$

16. (1) Expression

$$=9-\frac{11}{9}\text{ of }\frac{36}{11}+\frac{36}{7}\text{of }\frac{7}{9}$$

$$=9-\frac{11}{9}\times\frac{36}{11}+\frac{36}{7}\times\frac{7}{9}$$

$$=9-4+4$$

$$=9-4\times\frac{1}{4}=9-1=8$$

17. (1) $\frac{5}{\frac{15}{8}\times\frac{4}{3}}\times\frac{\frac{21}{10}}{\frac{7}{2}}of\frac{5}{4}$

$$=5\times\frac{2}{5}\times\frac{21}{10}\times\frac{2}{7}\times\frac{5}{4}$$

$$=\frac{3}{2}=1\frac{1}{2}$$

18. (1) $\frac{9}{20}-\left[\frac{1}{5}+\left\{\frac{1}{4}+\left(\frac{5}{6}-\overline{\frac{1}{3}+\frac{1}{2}}\right)\right\}\right]$

$$=\frac{9}{20}-\left[\frac{1}{5}+\left\{\frac{1}{4}+\left(\frac{5}{6}-\frac{5}{6}\right)\right\}\right]$$

$$=\frac{9}{20}-\left[\frac{1}{5}+\frac{1}{4}\right]=\frac{9}{20}-\frac{9}{20}=0$$

19. (4) $\frac{0.8\bar{3}+7.5}{2.321-0.098}=\frac{\frac{83-8}{90}+7.5}{2\frac{321-3}{990}-\frac{98}{990}}$

$$=\frac{\frac{75}{90}+7.5}{2\frac{318}{990}-\frac{98}{990}}=\frac{\frac{75}{90}+7.5}{2\frac{220}{990}}$$

$$=\frac{7.5}{90\times 7.5}\times\frac{990}{2200}=\frac{1}{20}=0.05$$

20. (3) Let '*' be H

$$\left[\frac{(H)}{21}\times\frac{(H)}{189}\right]=1$$

$$\Rightarrow (H)^2=21\times 189$$

$$\Rightarrow H=\sqrt{21\times 189}=63$$

21. (3) $80\times\sqrt{P}=1120$

$$\Rightarrow\sqrt{P}=\frac{1120}{80}=14$$

$$\Rightarrow P=(14)^2=196$$

22. (3) $\frac{\frac{13}{4}-\frac{5}{6}\times\frac{4}{5}}{\frac{13}{3}+\frac{1}{5}-\left(\frac{3}{10}+\frac{106}{5}\right)}-\left(\frac{3}{2}\times\frac{5}{3}\right)$

$$=\frac{\frac{13}{4}-\frac{2}{3}}{\frac{13\times 5}{3}-\left(\frac{3+212}{10}\right)}-\frac{5}{2}$$

$$=\frac{\frac{39-8}{12}}{\frac{65}{3}-\frac{215}{10}}-\frac{5}{2}=\frac{\frac{31}{12}}{\frac{650-645}{30}}-\frac{5}{2}$$

$$=\frac{31}{12}\times\frac{30}{5}-\frac{5}{2}$$

$$=\frac{31}{2}-\frac{5}{2}=\frac{31-5}{2}=\frac{26}{2}=13$$

23. (2)

$$\left[\frac{13}{4}+\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{5}{2}-\frac{3-2}{12}\right)\right\}\right]+\frac{13}{6}$$

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$$=\left[\frac{13}{4}+\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{5}{2}-\frac{1}{12}\right)\right\}\right]+\frac{13}{6}$$

$$=\left[\frac{13}{4}+\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{30-1}{12}\right)\right\}\right]+\frac{13}{6}$$

$$=\left[\frac{13}{4}+\left\{\frac{5}{4}-\frac{1}{2}\times\frac{29}{12}\right\}\right]+\frac{13}{6}$$

$$=\left[\frac{13}{4}+\left\{\frac{30-29}{24}\right\}\right]+\frac{13}{6}$$

$$=\left[\frac{13}{4}+\frac{1}{24}\right]+\frac{13}{6}$$

$$=\left[\frac{13}{4}\times 24\right]+\frac{13}{6}$$

$$=13\times 6\times\frac{6}{13}=36$$

24. (2) Let 0.1 = a, 0.2 = b and 0.3 = c

Then, we have,

$$\frac{a\times a\times a+b\times b\times b+c\times c\times c-3abc}{a\times a+b\times b+c\times c-ab-bc-ac}$$

$$=\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-bc-ac}$$

$$=a+b+c$$

$$=0.1+0.2+0.3=0.6$$

25. (4)

$$\frac{1}{5\times 6}+\frac{1}{6\times 7}+\frac{1}{7\times 8}+\frac{1}{8\times 9}+\frac{1}{9\times 10}+\frac{1}{10\times 11}$$

$$=\frac{1}{5}-\frac{1}{6}+\frac{1}{6}-\frac{1}{7}+\frac{1}{7}-\frac{1}{8}+\frac{1}{8}-\frac{1}{9}+\frac{1}{9}-\frac{1}{10}+\frac{1}{10}-\frac{1}{11}$$

$$=\frac{1}{5}-\frac{1}{11}=\frac{11-5}{55}=\frac{6}{55}$$

26. (2) I. $=\frac{3}{4}\times\frac{6}{5}=\frac{9}{10}$

II. $=3+\left[\frac{4}{5}\times\frac{1}{6}\right]=3+\frac{2}{15}=\frac{45}{2}$

III. $=\left[3+\frac{4}{5}\right]+6=\frac{15}{4}+6=\frac{5}{8}$

IV. $=3+4\times\frac{5}{6}=3+\frac{10}{3}=\frac{9}{10}$

Obviously, (I) and (IV) are equal

27. (2)

$$=1+\left[1+1+\left\{1+1+(1+1+2)\right\}\right]$$

$$=1+\left[1+1+\left\{1+1+\left(1+\frac{1}{2}\right)\right\}\right]$$

$$=1+\left[1+1+\left\{1+1+\frac{3}{2}\right\}\right]$$

$$=1+\left[1+1+\left\{1+\frac{2}{3}\right\}\right]=1+\left[1+1+\frac{5}{3}\right]$$

$$=1+\left[1+\frac{3}{5}\right]=1+\frac{8}{5}=\frac{5}{8}$$

28. (1) The given expression

$$=\frac{\frac{1}{3}\times 3\times\frac{1}{3}}{\frac{1}{3}+\left(\frac{1}{3}\times\frac{1}{3}\right)}-\frac{1}{9}$$

$$=\frac{\frac{1}{3}}{\frac{1}{3}+\frac{1}{9}}-\frac{1}{9}=\frac{\frac{1}{3}}{\frac{1}{3}\times 9}-\frac{1}{9}$$

$$=\frac{1}{3}-\frac{1}{9}=\frac{1}{9}-\frac{1}{9}=0$$

29. (4) The given expression

$$=\frac{\frac{11}{4}}{\frac{11}{6}}+\frac{7}{8}\left(\frac{4+3}{12}\right)+\frac{5}{7}+\frac{3}{4}\text{ of }\frac{3}{7}$$

$$=\left(\frac{11}{4}\times\frac{6}{11}\right)+\frac{7}{8}\times\frac{7}{12}+\frac{5}{7}+\left(\frac{3}{4}\times\frac{3}{7}\right)$$

$$=\frac{3}{2}+\frac{7}{8}\times\frac{7}{12}+\frac{5}{7}+\frac{9}{28}$$

$$=\frac{3}{2}\times\frac{8}{7}\times\frac{7}{12}+\frac{5}{7}\times\frac{28}{9}$$

$$=1+\frac{20}{9}=\frac{9+20}{9}=\frac{29}{9}=3\frac{2}{9}$$

30. (4) $3.\overline{36}-2.\overline{05}+1.\overline{33}$

$$=3\frac{36}{99}-2\frac{05}{99}+1\frac{33}{99}$$

$$=3+\frac{36}{99}-2-\frac{5}{99}+1+\frac{33}{99}$$

$$=(3-2+1)+\left(\frac{36}{99}-\frac{5}{99}+\frac{33}{99}\right)$$

$$=2+\left(\frac{36-5+33}{99}\right)$$

$$=2+\frac{64}{99}=2\frac{64}{99}=2.\overline{64}$$

31. (1) Let 0.9 = x, 0.2 = y and 0.3 = z

Then, the given expression

$$=\frac{x\times x\times x+y\times y\times y+z\times z\times z-3x\times y\times z}{x\times x+y\times y+z\times z-x\times y-y\times z-z\times x}$$

$$=\frac{x^3+y^3+z^3-3xyz}{x^2+y^2+z^2-xy-yz-zx}$$

$$=\frac{(x+y+z)(x^2+y^2+z^2-xy-yz-zx)}{x^2+y^2+z^2-xy-yz-zx}$$

$$=x+y+z$$

$$=0.9+0.2+0.3=1.4$$

32. (2) $\left(\frac{1}{9}\right)^2\left\{1-9\left(\frac{16-1}{90}\right)^2\right\}$

$$=\frac{1}{81}\left\{1-\frac{9\times 15\times 15}{90\times 90}\right\}$$

$$=\frac{1}{81}\times\left\{1-\frac{1}{4}\right\}$$

$$=\frac{1}{81}\times\frac{3}{4}=\frac{1}{108}$$

33. (3) $\frac{\frac{3}{2}}{\frac{1}{2}}+\frac{4}{7}\left(\frac{4+3}{10}\right)\text{ of }\frac{\frac{3+2}{6}}{\frac{3-2}{6}}$

$$=3+\frac{4}{7}\left(\frac{7}{10}\right)\text{ of }\left(\frac{5}{6}\times 6\right)$$

$$=3+\left(\frac{4}{7}\times\frac{7}{10}\times 5\right)=3+2=\frac{3}{2}$$

34. (3) $[0.9-\{2.3-3.2-(7.1-8.9)\}]$

$$=[0.9-\{2.3-3.2+1.8\}]$$

$$=[0.9-0.9]=0$$

35. (2) Let, 32 = a

79 = b, −111 = c

When (a + b + c) = 0

then $a^3+b^3+c^3-3abc=0$

Here, a+ b+c = 32+79−111 = 0

$\therefore (32)^3+(79)^3-(111)^3+3\times 32\times 79\times 111=0$

36. (2) $\left(\frac{5}{2}+\frac{3}{2}\right)\left(\frac{25}{4}-\frac{15}{4}+\frac{9}{4}\right)$

$$=4\times\frac{19}{4}=19$$

37. (1) Expression $=\frac{(0.04+0.01)}{(0.01+0.02)}$

$$=\frac{0.05}{0.03}=\frac{5}{3}$$

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38. (3) Expression

$$= \frac{1}{2}+\left\{\frac{19}{4}-\left(\frac{19}{6}-\frac{7}{3}\right)\right\}$$

$$= \frac{1}{2}+\left\{\frac{19}{4}-\left(\frac{19-14}{6}\right)\right\}$$

$$= \frac{1}{2}+\left\{\frac{19}{4}-\frac{5}{6}\right\}$$

$$= \frac{1}{2}+\frac{19}{4}-\frac{5}{6}$$

$$= \frac{6+57-10}{12} = \frac{53}{12} = 4\frac{5}{12}$$

39. (1) Expression = 0.125 + 0.015625 + 0.001953125 + 0.00024414 + 0.000030517
= 0.1428 ≈ 0.143

40. (3) Expression
$= 8.7 - [7.6 - \{6.5 - (5.4 - \overline{4.3-2})\}]$
$= 8.7 - [7.6 - \{6.5 - (5.4 - 2.3)\}]$
$= 8.7 - [7.6 - \{6.5 - 3.1\}]$
$= 8.7 - [7.6 - 3.4]$
$= 8.7 - 4.2 = 4.5$

41. (2) If $a + b + c = 0$, then
$a^3 + b^3 + c^3 = 3abc$
Here, $0.111 + 0.222 + (-0.333) = 0$
$\therefore (0.111)^3 + (0.222)^3 + (-0.333)^3$
$= -3 \times 0.111 \times 0.222 \times 0.333$
$= -(0.333)^2 \times 0.222$
∴ Expression
$= [-(0.333)^2 \times 0.222 + (0.333)^2 \times 0.222]^3 = 0$

42. (4) Expression

$$= \frac{\frac{5}{4}+\frac{3}{2}}{\left(\frac{2+30-27}{30}\right)}$$

$$= \frac{\frac{5}{4}\times\frac{2}{3}}{\frac{5}{30}} = \frac{5}{6}\times\frac{30}{5} = 5$$

43. (2) Expression

$$= \frac{\frac{-30-40+48-20+12+45}{60}}{\frac{30+40-80+20-12-48}{60}}$$

$$= \frac{105-90}{90-140} = -\frac{15}{50} = -\frac{3}{10}$$

44. (2) Expression
$= 0.\overline{63}+0.\overline{37}+0.\overline{80}$

$$= \frac{63}{99}+\frac{37}{99}+\frac{80}{99}$$

$$= \frac{63+37+80}{99} = \frac{180}{99}$$

$$= 1\frac{81}{99} = 1.\overline{81}$$

45. (4) Let $(4.53 - 3.07) = a$
$(3.07 - 2.15) = b$ and
$(2.15 - 4.53) = c \therefore a + b + c = 0$
∴ Expression

$$= \frac{a^2}{bc}+\frac{b^2}{ac}+\frac{c^2}{ab}$$

$$= \frac{a^3+b^3+c^3}{abc} = \frac{3abc}{abc} = 3$$

[If $a + b + c = 0$, $a^3 + b^3 + c^3 = 3abc$]

46. (2) Expression

$$= \frac{17}{15}\times\frac{17}{15}+\frac{2}{15}\times\frac{2}{15}-2\times\frac{17}{15}\times\frac{2}{15}$$

$$= \left(\frac{17}{15}-\frac{2}{15}\right)^2$$

$$= \left(\frac{17-2}{15}\right)^2 = \left(\frac{15}{15}\right)^2 = 1$$

47. (4) Let $4\frac{11}{15} = a$ and $\frac{15}{71} = b$.
∴ Expression
$= (a + b)^2 - (a - b)^2$
$= (a^2 + b^2 + 2ab) - (a^2 + b^2 - 2ab) = 4ab$

$$= 4\times4\frac{11}{15}\times\frac{15}{71} = 4\times\frac{71}{15}\times\frac{15}{71} = 4$$

48. (2) Let $0.1 = a \Rightarrow 0.2 = 2a$
and $0.02 = b \Rightarrow 0.04 = 2b$
∴ Expression

$$= \frac{a^3+b^3}{8a^3+8b^3}$$

$$= \frac{a^3+b^3}{8(a^3+b^3)} = \frac{1}{8} = 0.125$$

49. (1) $5\frac{3}{*}\times\frac{7}{2} = 19$

$$\Rightarrow 5\frac{3}{*} = \frac{19\times2}{7}$$

$$\Rightarrow 5\frac{3}{*} = \frac{38}{7} = 5\frac{3}{7}$$

$\Rightarrow * = 7$

50. (3) $\left(\sqrt{2}+\frac{1}{\sqrt{2}}\right)^2$

$$= 2 + \frac{1}{2} + 2\times\sqrt{2}\times\frac{1}{\sqrt{2}} = 4\frac{1}{2}$$

51. (4) Expression
$= (0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.02 - 1$
$= (0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.02\ (0.98+0.02) - 1$
$= (0.98 + 0.02)^3 - 1 = 1 - 1 = 0$

52. (3) Expression
$= 71 \times 29 + 27 \times 15 + 8 \times 4$
$= 2059 + 405 + 32 = 2496$

53. (2) Expression
$= 0.05 \times 5 - 0.005 \times 5$
$= 0.25 - 0.025 = 0.225$

54. (1) Let $0.2 = a$ and $0.04 = b$
$\Rightarrow 0.4 = 2a$ and $0.08 = 2b$
∴ Expression

$$= \sqrt[3]{\frac{a\times a\times a+b\times b\times b}{2a\times2a\times2a+2b\times2b\times2b}}$$

$$= \sqrt[3]{\frac{a^3+b^3}{8(a^3+b^3)}} = \sqrt[3]{\frac{1}{8}} = \frac{1}{2} = 0.5$$

55. (1) Expression
$= (256)^{0.16} \times (16)^{0.18}$
$= (2^8)^{0.16} \times (2^4)^{0.18}$
$= (2)^{8\times0.18} \times (2)^{4\times0.18}$
$= (2)^{1.28} \times (2)^{0.72} = (2)^{1.28+0.72}$
$= (2)^2 = 4$

56. (4) Expression

$$\left(\frac{1}{3.5}+\frac{1}{5.7}+\frac{1}{7.9}+\frac{1}{9.11}+\frac{1}{11.13}+\frac{1}{13.15}\right)$$

$$= \frac{1}{2}\left(\frac{2}{3.5}+\frac{2}{5.7}+\frac{2}{7.9}+\frac{2}{9.11}+\frac{2}{11.13}+\frac{2}{13.15}\right)$$

$$= \frac{1}{2}\left(\frac{1}{3}-\frac{1}{5}+\frac{1}{5}-\frac{1}{7}+\frac{1}{7}-\frac{1}{9}+\frac{1}{9}-\frac{1}{11}+\frac{1}{11}-\frac{1}{13}+\frac{1}{13}-\frac{1}{15}\right)$$

$$= \frac{1}{2}\left(\frac{1}{3}-\frac{1}{15}\right) = \frac{1}{2}\left(\frac{5-1}{15}\right)$$

$$= \frac{1}{2}\times\frac{4}{15} = \frac{2}{15}$$

57. (3) Expression
$= (53 \times 87 + 159 \times 21 + 106 \times 25)$
$= 53\ (87 + 3 \times 21 + 2 \times 25)$
$= 53\ (87 + 63 + 50)$
$= 53 \times 200 = 10600$

58. (4) Expression

$$= \frac{(0.5)^3+(0.3)^3}{(0.5)^2-0.5\times0.3+(0.3)^2}$$

Let $0.5 = a$, and $0.3 = b$

$$\therefore \text{Expression} = \frac{a^3+b^3}{a^2-ab+b^2}$$

$$= \frac{(a+b)(a^2-ab+b^2)}{a^2-ab+b^2}$$

$= a + b = 0.5 + 0.3 = 0.8$

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59. (4) Expression $= \dfrac{8(3.75)^3+1}{(7.5)^2-6.5}$

$= \dfrac{(2\times3.75)^3+1}{(7.5)^2-7.5\times1+1^2}$

$= \dfrac{(7.5)^3+1}{(7.5)^2-7.5\times1+1^2}$

$\left[a^3+b^3=(a+b)(a^2-ab+b^2)\right]$

$= 7.5 + 1 = 8.5$

60. (2) Let 2.697 = a and 0.498 = b

$\therefore$ Expression

$= \dfrac{(a-b)^2+(a+b)^2}{a^2+b^2}$

$= \dfrac{2(a^2+b^2)}{a^2+b^2} = 2$

61. (1) Expression

$= \dfrac{\frac{13}{4}-\frac{4}{5}\times\frac{5}{6}}{\frac{13}{3}\times5-\left(\frac{3}{10}+\frac{106}{5}\right)}$

$= \dfrac{\frac{13}{4}-\frac{2}{3}}{\frac{65}{3}-\frac{3}{10}-\frac{106}{5}}$

$= \dfrac{\frac{39-8}{12}}{\frac{650-9-636}{30}}$

$= \dfrac{31}{12}\times\dfrac{30}{5} = \dfrac{31}{2} = 15\dfrac{1}{2}$

$\therefore$ Required answer

$= 15\dfrac{1}{2} - 15 = \dfrac{1}{2}$

62. (2) $\sqrt[3]{0.014\times0.14x}$

$= 0.014\times0.14\ \sqrt[3]{y}$

On squaring both sides,

$0.014 \times 0.14x$

$= (0.014)^2 \times (0.14)^2 xy$

$\therefore \dfrac{x}{y} = 0.014\times0.14 = 0.00196$

63. (1)

$\dfrac{4.41\times0.16}{2.1\times1.6\times0.21} = \dfrac{441\times16}{21\times16\times21} = 1$

64. (4) $0.1 \times 0.01 \times 0.001 \times 10^7$

$= 10^{-6} \times 10^7 = 10$

65. (4) Expression

$= \dfrac{3.20(3.25-3.05)}{0.064}$

$= \dfrac{3.20\times0.20}{0.064} = 10$

66. (4) $\dfrac{0.01-0.0001}{0.0001}+1 = \dfrac{0.0099}{0.0001}+1$

$= 99 + 1 = 100$

67. (1) Expression

$= 0.5\ (5 + 0.25 + 4 + 0.75)$

$= 0.5 \times 10 = 5$

68. (4) Expression

$= \dfrac{20+5}{9+3+3} = \dfrac{4}{10} = \dfrac{2}{5}$

69. (3) Expression

$= \dfrac{(100-1)(100-2)(100-3)\ldots}{(100-100)\ldots(100-200)}$

$= 0$ [$\because 100 - 100 = 0$]

70. (1) $(0.9)^3 + (0.1)^3$

$= 0.729 + 0.001 = 0.73$

71. (4) Let $0.0347 = a$

and $0.9653 = b$

$\therefore$ Expression $= \dfrac{a^3+b^3}{a^2-ab+b^2}$

$= \dfrac{(a+b)(a^2-ab+b^2)}{a^2-ab+b^2} = a+b$

$= 0.0347 + 0.9653 = 1$

72. (4) Expression

$= \dfrac{(3.2)^3-(0.2)^3}{(3.2)^2+3.2\times0.2+(0.2)^2}$

Let $3.2 = a$ and $0.2 = b$

$\therefore$ Expression $= \dfrac{a^3-b^3}{a^2+ab+b^2}$

$= \dfrac{(a-b)(a^2+ab+b^2)}{a^2+ab+b^2} = a-b$

$= 3.2 - 0.2 = 3$

73. (1) Expression

$= \dfrac{\frac{1}{3}+\frac{1}{4}\left[\frac{4-5}{10}\right]}{\frac{3}{4}\times\frac{5}{3}-\frac{4}{5}\times\frac{3}{4}}$

$= \dfrac{\frac{1}{3}-\frac{1}{4}\times\frac{1}{10}}{\frac{5}{4}-\frac{3}{5}} = \dfrac{\frac{1}{3}-\frac{1}{40}}{\frac{5}{4}-\frac{3}{5}}$

$= \dfrac{\frac{40-3}{120}}{\frac{25-12}{20}} = \dfrac{37}{120}\times\dfrac{20}{13} = \dfrac{37}{78}$

74. (2) Expression

$= \dfrac{0.04}{0.03}\times\dfrac{\left(\frac{10}{3}-\frac{5}{2}\right)+\frac{5}{4}\times\frac{1}{2}}{\frac{1}{3}+\frac{1}{9}\times\frac{1}{5}}$

$= \dfrac{4}{3}\times\dfrac{\left(\frac{20-15}{6}\right)+\frac{5}{8}}{\frac{1}{3}+\frac{1}{45}}$

$= \dfrac{4}{3}\times\dfrac{\frac{5}{6}\times\frac{8}{5}}{\frac{15+1}{45}} = \dfrac{4}{3}\times\dfrac{45}{16}\times\dfrac{4}{3} = 5$

75. (3) Expression

$= \dfrac{0.3555\times0.5555\times2.025}{0.225\times1.7775\times0.2222}$

$= \dfrac{3555\times5555\times2025}{225\times17775\times2222} = 4.5$

76. (2) $100 \times 10 - 100 + 2000 \div 100$

$= 100 \times 10 - 100 + 20$

$= 100\ (10 - 1) + 20$

$= 100 \times 9 + 20$

$= 900 + 20 = 920$

77. (4) $\dfrac{547.527}{0.0082} = x$

$\Rightarrow \dfrac{5475270}{82} = x$

$\Rightarrow \dfrac{547527}{82} = \dfrac{x}{10}$

78. (3) $\dfrac{1}{1+2^{a-b}}+\dfrac{1}{1+2^{b-a}}$

$= \dfrac{1}{1+\frac{2^a}{2^b}}+\dfrac{1}{1+\frac{2^b}{2^a}}$

$= \dfrac{2^b}{2^b+2^a}+\dfrac{2^a}{2^a+2^b} = \dfrac{2^b+2^a}{2^b+2^a} = 1$

79. (1) Expression

$= \dfrac{7}{2}-\left[\dfrac{9}{4}+\left\{\dfrac{5}{4}-\dfrac{1}{2}\left(\dfrac{3}{2}-\dfrac{1}{3}-\dfrac{1}{6}\right)\right\}\right]$

$= \dfrac{7}{2}-\left[\dfrac{9}{4}+\left\{\dfrac{5}{4}-\dfrac{1}{2}\left(\dfrac{9-2-1}{6}\right)\right\}\right]$

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$= \frac{7}{2} - \left[\frac{9}{4} + \left\{\frac{5}{4} - \frac{1}{2}\right\}\right]$

$= \frac{7}{2} - \left[\frac{9}{4} + \left\{\frac{5-2}{4}\right\}\right]$

$= \frac{7}{2} - \left[\frac{9}{4} + \frac{3}{4}\right]$

$= \frac{7}{2} - \frac{9}{4} \times \frac{4}{3}$

$= \frac{7}{2} - 3 = \frac{7-6}{2} = \frac{1}{2}$

80. (2) Let $3\frac{3}{5} = a$ and $\frac{2}{5} = b$, then

Expression $= a^2 + 2ab + b^2$

$= (a + b)^2$

$= \left(3\frac{3}{5} + \frac{2}{5}\right)^2 = (4)^2 = 16$

81. (2)

$\left(1 - \frac{1}{n+1}\right) + \left(1 - \frac{2}{n+1}\right) + \left(1 - \frac{3}{n+1}\right) + \ldots\ldots \left(1 - \frac{n}{n+1}\right)$

$= n - \left(\frac{1}{n+1} + \frac{2}{n+1} + \frac{3}{n+1} + \ldots + \frac{n}{n+1}\right)$

$= n - \frac{1+2+3+\ldots\ldots+n}{n+1}$

$= n - \frac{n(n+1)}{2(n+1)} = n - \frac{n}{2} = \frac{n}{2} = \frac{1}{2}n$

82. (1) Expression

$= \frac{16}{3} + \frac{11}{9} \times \frac{1}{4}\left(10 + \frac{3}{\frac{5-1}{5}}\right)$

$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4}\left(10 + \frac{15}{4}\right)$

$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4}\left(\frac{40+15}{4}\right)$

$= \frac{16}{3} \times \frac{9}{11} \times \frac{1}{4} \times \frac{55}{4} = 15$

83. (2) $x[-2\{-4(-a)\}] + 5[-2\{-2(-a)\}] = 4a$

$\Rightarrow x \times (-8a) + 5 \times (-4a) = 4a$

$\Rightarrow x \times (-2) + 5 \times (-1) = 1$

$\Rightarrow 2x + 5 = -1$

$\Rightarrow 2x = -5 - 1 = -6$

$\Rightarrow x = \frac{-6}{2} = -3$

84. (*) Expression

$= 3 \div \left[(8-5) + \left\{(4-2) + \left(2 + \frac{8}{13}\right)\right\}\right]$

$= 3 \div \left[3 + \left\{2 + \frac{26+8}{13}\right\}\right]$

$= 3 \div \left[3 + \left\{2 + \frac{34}{13}\right\}\right]$

$= 3 \div \left[3 + \left\{\frac{26+34}{13}\right\}\right]$

$= 3 \div \left[3 + \frac{60}{13}\right]$

$= 3 \div \left[\frac{3 \times 13}{60}\right]$

$= 3 \div \frac{13}{20} = 3 \times \frac{20}{13} = \frac{60}{13}$

85. (4) ? = 9 + 3 + 4 – 8 × 2

After respective substitutions,

? = 9 ÷ 3 × 4 + 8 – 2

$= \frac{9}{3} \times 4 + 8 - 2$

= 20 – 2 = 18

86. (1) Expression

$= \frac{4}{15}$ of $\frac{5}{8} \times 6 + 15 - 10$

= 1 + 15 – 10 = 16 – 10 = 6

TYPE-III

1. (3) $\sqrt{13} + \sqrt{1300} + \sqrt{0.013}$

$= \sqrt{\frac{130}{100}} + 10\sqrt{13} + \sqrt{\frac{130}{10000}}$

$= \frac{1}{10}\sqrt{130} + 10\sqrt{13} + \frac{1}{100}\sqrt{130}$

$= \frac{11.40}{10} + 3.605 \times 10 + \frac{11.40}{100}$

= 1.140 + 36.05 + 0.1140

= 37.304

2. (3) $? = \frac{(2.644)^2 - (2.356)^2}{0.288}$

$= \frac{(2.644 - 2.356)(2.644 + 2.356)}{0.288}$

$= \frac{0.288 \times 5}{0.288} = 5$

3. (1)

$? = \frac{(3.4567 + 3.4533)(3.4567 - 3.4533)}{0.0034}$

$= \frac{6.9100 \times 0.0034}{0.0034} = 6.91$

4. (4) $\frac{(0.03)^2 - (0.01)^2}{0.03 - 0.01}$

[Using $a^2 - b^2 = (a + b)(a - b)$]

$= \frac{(0.03 + 0.01)(0.03 - 0.01)}{0.03 - 0.01}$

= 0.03 + 0.01 = 0.04

5. (4) $\left(\sqrt{72} - \sqrt{18}\right) \div \sqrt{12}$

$= \frac{\sqrt{72} - \sqrt{18}}{\sqrt{12}}$

$= \frac{6\sqrt{2} - 3\sqrt{2}}{2\sqrt{3}} = \frac{3\sqrt{2}}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{6}}{2}$

6. (3) $\frac{\sqrt{80} - \sqrt{112}}{\sqrt{45} - \sqrt{63}}$

$= \frac{\sqrt{16 \times 5} - \sqrt{16 \times 7}}{\sqrt{9 \times 5} - \sqrt{9 \times 7}}$

$= \frac{4\sqrt{5} - 4\sqrt{7}}{3\sqrt{5} - 3\sqrt{7}} = \frac{4\left(\sqrt{5} - \sqrt{7}\right)}{3\left(\sqrt{5} - \sqrt{7}\right)}$

$= \frac{4}{3} = 1\frac{1}{3}$

7. (2)

$\sqrt{\frac{(0.1)^2 + (0.01)^2 + (0.009)^2}{(0.01)^2 + (0.001)^2 + (0.0009)^2}}$

$= \sqrt{\frac{0.01 + 0.0001 + 0.000081}{0.0001 + 0.000001 + 0.00000081}}$

$= \sqrt{\frac{0.010181}{0.00010181}} = \sqrt{100} = 10$

8. (2) Let $0.03 = x \Rightarrow 0.003 = \frac{x}{10}$

$0.21 = y \Rightarrow 0.021 = \frac{y}{10}$

and $0.065 = z \Rightarrow 0.0065 = \frac{z}{10}$

∴ Expression

$= \sqrt{\frac{x^2 + y^2 + z^2}{\left(\frac{x}{10}\right)^2 + \left(\frac{y}{10}\right)^2 + \left(\frac{z}{10}\right)^2}}$

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$$= \sqrt{100\frac{(x^2+y^2+z^2)}{(x^2+y^2+z^2)}}$$

$= \sqrt{100} = 10$

9. (2)

$\sqrt{0.01} + \sqrt{0.81} + \sqrt{1.21} + \sqrt{0.0009}$

$= 0.1 + 0.9 + 1.1 + 0.03$

$= 2.13$

10. (3) $\sqrt{\frac{(6.1)^2+(61.1)^2+(611.1)^2}{(0.61)^2+(6.11)^2+(61.11)^2}}$

$$= \sqrt{\frac{(10\times0.61)^2+(10\times6.11)^2+(10\times61.11)^2}{(0.61)^2+(6.11)^2+(61.11)^2}}$$

$= \sqrt{100} = 10$

11. (4) $\sqrt{\frac{20.2\times4}{0.25\times20.2}} = \sqrt{\frac{4}{0.25}}$

$= \sqrt{\frac{400}{25}} = \sqrt{16} = 4$

12. (2) Let $0.051 = x$ and $0.041 = y$

$\therefore$ The given expression

$$= \frac{x^3+y^3}{x^2-xy+y^2}$$

$$= \frac{(x+y)(x^2-xy+y^2)}{x^2-xy+y^2}$$

$= x + y = 0.051 + 0.041$

$= 0.092$

13. (1) $\sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+7}}}}$

$= \sqrt{5+\sqrt{11+\sqrt{19+6}}}$

$= \sqrt{5+\sqrt{11+\sqrt{25}}}$

$= \sqrt{5+\sqrt{11+5}} = \sqrt{5+4}$

$= \sqrt{9} = 3$

14. (4) $\frac{(75\cdot8)^2-(55\cdot8)^2}{20}$

$$= \frac{(75\cdot8-55\cdot8)(75\cdot8+55\cdot8)}{20}$$

$$= \frac{20\times131\cdot6}{20} = 131\cdot6$$

15. (4) Expression

$$= \sqrt{\frac{(0.25\times0.09)}{0.0009\times0.36}}$$

$$= \sqrt{\frac{\frac{25}{100}\times\frac{9}{100}}{\frac{9}{10000}\times\frac{36}{100}}}$$

$$= \sqrt{\frac{25\times9\times1000000}{9\times36\times10000}}$$

$$= \frac{5\times10}{6} = \frac{25}{3} = 8\frac{1}{3}$$

16. (4) Let $3.63 = a$ and $2.37 = b$

$\therefore$ Expression $= \frac{a^2-b^2}{a+b}$

$$= \frac{(a-b)(a+b)}{a+b}$$

$= a - b = 3.63 - 2.37 = 1.26$

17. (4) Expression

$$= \sqrt{\frac{0.081\times0.484}{0.0064\times6.25}}$$

$$= \sqrt{\frac{81\times484}{64\times625}} = \frac{9\times22}{8\times25} = 0.99$$

18. (2) Expression

$= \sqrt{900} + \sqrt{0.09} - \sqrt{0.000009}$

$= 30 + 0.3 - 0.003$

$= 30.297$

19. (2) Expression

$$= \sqrt{\frac{0.009\times0.036\times0.016\times0.08}{0.002\times0.0008\times0.0002}}$$

$$= \sqrt{\frac{9\times36\times16\times8}{2\times8\times2}}$$

$= 3 \times 2 \times 3 \times 2 = 36$

20. (2) Expression

$$= \sqrt{\frac{5}{4}\times\frac{64}{125}\times1.44}$$

$$= \sqrt{\frac{16}{25}\times\frac{144}{100}} = \frac{4}{5}\times\frac{12}{10} = \frac{24}{25}$$

21. (1) Expression

$= 2\sqrt{54} - 6\sqrt{\frac{2}{3}} - \sqrt{96}$

$= 2\sqrt{9\times6} - \sqrt{\frac{2\times6\times6}{3}} - \sqrt{16\times6}$

$= 2\times3\sqrt{6} - 2\sqrt{6} - 4\sqrt{6} = 0$

22. (4) $\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}} = \frac{2\sqrt{6}+6\sqrt{6}}{4\sqrt{6}}$

$= \frac{8\sqrt{6}}{4\sqrt{6}} = 2$

23. (2) $\frac{4-\sqrt{0.04}}{4+\sqrt{0.4}} = \frac{4-0.2}{4+\sqrt{0.4}}$

$= \frac{3.8}{4+0.632} = \frac{3.8}{4.632} = 0.8$

$= (a + b) = 0.08 + 0.02 = 0.1$

24. (4) $\frac{1}{3-\sqrt{8}} = \frac{3+\sqrt{8}}{(3-\sqrt{8})(3+\sqrt{8})}$

(Rationalising the denominator)

$= \frac{3+\sqrt{8}}{9-8} = 3 + \sqrt{8}$

$\therefore$ Expression

$= 3 + \sqrt{8} + 3 + \sqrt{8} - 6 - 4\sqrt{2}$

$= 6 + 2\sqrt{8} - 6 - 4\sqrt{2} = 2\sqrt{8} - 4\sqrt{2}$

$= 2\times2\sqrt{2} - 4\sqrt{2} = 0$

25. (1) $\sqrt{0.09} = \sqrt{0.3\times0.3} = 0.3$

26. (3) Expression

$$= \frac{(0.75)^3+(1-0.75)[(0.75)^2+0.75\times1+1^2]}{1-0.075}$$

$$= \frac{(0.75)^3+1^3-(0.75)^3}{0.25}$$

$$= \frac{1}{0.25} = \frac{100}{25} = 4$$

$\therefore$ Required square root

$= \sqrt{4} = 2$

27. (3) $? = \sqrt{(272^2-128^2)}$

$= \sqrt{(272+128)(272-128)}$

$= \sqrt{400\times144} = 20\times12 = 240$

28. (3) $\sqrt{0.000441}$

$= \sqrt{0.021\times0.021}$

$= 0.021$

29. (2) Expression $= \frac{\sqrt{0.441}}{\sqrt{0.625}}$

$$= \sqrt{\frac{0.441}{0.625}} = \sqrt{\frac{441}{625}}$$

$$= \frac{21}{25} = 0.84$$

30. (3) $\sqrt{\frac{0.342\times0.684}{0.000342\times0.000171}}$

$$= \sqrt{\frac{342\times684\times10^6}{342\times171}}$$

$= \sqrt{4\times10^6} = 2\times10^3 = 200$

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31. (1) $\sqrt{0.00060516} = 0.0246$

32. (3) $= \sqrt{\frac{9.5\times0.085}{0.017\times0.019}} = \sqrt{2500}$

$= 50$

33. (2) $\sqrt{248+\sqrt{52+\sqrt{144}}}$

$= \sqrt{248+\sqrt{52+12}}$

$= \sqrt{248+\sqrt{64}} = \sqrt{248+8}$

$\sqrt{256} = \pm16$

34. (4) $\because (102)^2 = 10404$

$\Rightarrow \sqrt{10404} = 102$

$\sqrt{104.04}+\sqrt{1.0404}+\sqrt{0.010404}$
$= 10.2 + 1.02 + 0.102$
$= 11.322$

35. (2) $\sqrt{0.00004761} = \sqrt{\frac{4761}{10^8}}$

$= \sqrt{\frac{3\times3\times23\times23}{10^4\times10^4}}$

$= \frac{69}{10^4} = 0.0069$

36. (1) $\sqrt{2} = 1.414$ (Given)
Now,

$\frac{\sqrt{2}-1}{\sqrt{2}+1} = \frac{(\sqrt{2}-1)(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)}$

$= \frac{(\sqrt{2}-1)^2}{2-1} = (\sqrt{2}-1)^2$

$= 2 + 1 - 2\sqrt{2}$
$= 3 - 2\sqrt{2}$
$= 3 - 2\times1.44$
$= 3 - 2.828$
$= 0.172$

37. (2) $\sqrt{\frac{0.00001225}{0.00005329}}$

$= \sqrt{\frac{\frac{1225}{10^8}}{\frac{5329}{10^8}}} = \sqrt{\frac{1225}{5329}} = \frac{35}{73}$

38. (2) $0.\overline{4} = \frac{4}{9}$

$\therefore \sqrt{\frac{4}{9}} = \frac{2}{3} = \frac{2\times3}{3\times3} = \frac{6}{9} = 0.\overline{6}$

39. (2) Given expression

$= \frac{\left(3\frac{1}{4}\right)^4 - \left(4\frac{1}{3}\right)^4}{\left(3\frac{1}{4}\right)^2 - \left(4\frac{1}{3}\right)^2}$

$= \frac{\left[\left(3\frac{1}{4}\right)^2 + \left(4\frac{1}{3}\right)^2\right]\left[\left(3\frac{1}{4}\right)^2 - \left(4\frac{1}{3}\right)^2\right]}{\left(3\frac{1}{4}\right)^2 - \left(4\frac{1}{3}\right)^2}$

$\left[\because a^2-b^2 = (a+b)(a-b)\right]$

$= \left(3\frac{1}{4}\right)^2 + \left(4\frac{1}{3}\right)^2 = \left(\frac{13}{4}\right)^2 + \left(\frac{13}{3}\right)^2$

$= \frac{169}{16} + \frac{169}{9} = 169\left(\frac{1}{16}+\frac{1}{9}\right)$

$= 169\left(\frac{9+16}{144}\right) = \frac{169\times25}{144}$

$\therefore$ Required answer

$= \sqrt{\frac{169\times25}{144}} = \frac{13\times5}{12} = \frac{65}{12} = 5\frac{5}{12}$

40. (2) Expression $= 0.6\times0.6\times0.6 + 0.4\times0.4\times0.4 + 3\times0.6\times0.4(0.6+0.4) = (0.6+0.4)^3 = 1$
$\therefore$ Required square root $= 1$

41. (2) $\sqrt{\frac{0.49}{0.25}} + \sqrt{\frac{0.81}{0.36}}$

$= \frac{0.7}{0.5} + \frac{0.9}{0.6} = \frac{42+45}{30} = \frac{87}{30}$

$= \frac{29}{10} = 2\frac{9}{10}$

42. (4) $\sqrt{x} + \sqrt{441} = 0.02$

$\Rightarrow \sqrt{x} = 0.02\times21$

$\Rightarrow x = 0.1764$

43. (3) $? = \sqrt{4+\sqrt{44+100}}$

$= \sqrt{4+\sqrt{144}} = \sqrt{4+12} = 4$

44. (4) $\sqrt{0.00005746} = \sqrt{5746\times10^{-8}}$
$= 75.8\times10^{-4} = 0.00758$

45. (2)

$\sqrt{(0.798)^2 + 0.404\times0.798 + (0.202)^2} + 1$

$= \sqrt{(0.798)^2 + 2\times0.798\times0.202 + (0.202)^2} + 1$

$= \sqrt{(0.798+0.202)^2} + 1$

$= \sqrt{(1.000)^2} + 1 = 1 + 1 = 2$

46. (3) $\sqrt{11.981+7\sqrt{1.2996}}$

$= \sqrt{11.981+7\times1.14}$

$= \sqrt{11.981+7.98}$

$= \sqrt{19.961}$

$= 4.467 \approx 4.5$

47. (3) Expression

$= 4\sqrt{2} - 8\sqrt{2} + 5\sqrt{2}$

$= \sqrt{2}(4-8+5) = \sqrt{2}$

$= 1.414$

48. (4)

$(7+3\sqrt{5})(7-3\sqrt{5}) = (7)^2 - (3\sqrt{5})^2$

$= 49 - 45 = 4$

$\therefore$ Required square root

$= \sqrt{4} = 2$

49. (3) Expression

$= \sqrt{400} + \sqrt{0.0400} + \sqrt{0.000004}$

$= 20 + 0.2 + 0.002$

$= 20.202$

50. (3) Expression

$= \sqrt{192} - \frac{1}{2}\sqrt{48} - \sqrt{75}$

$= \sqrt{64\times3} - \frac{1}{2}\sqrt{16\times3} - \sqrt{25\times3}$

$= 8\sqrt{3} - \frac{1}{2}\times4\sqrt{3} - 5\sqrt{3}$

$= 8\sqrt{3} - 2\sqrt{3} - 5\sqrt{3}$

$= \sqrt{3} = 1.7321$

51. (3) $\sqrt{\frac{48.4}{0.289}} = \sqrt{\frac{484}{2.89}}$

$= \frac{22}{1.7} = \frac{220}{17} = 12\frac{16}{17}$

52. (2) $10^2 + 11^2 + 12^2$
$= 100 + 121 + 144 = 365$
$\therefore$ Required sum $= 10+11+12 = 33$

53. (3) $\sqrt{4096} = 64$

$\therefore \sqrt{40.96} = 6.4$ and

$\sqrt{0.4096} = 0.64$ etc.

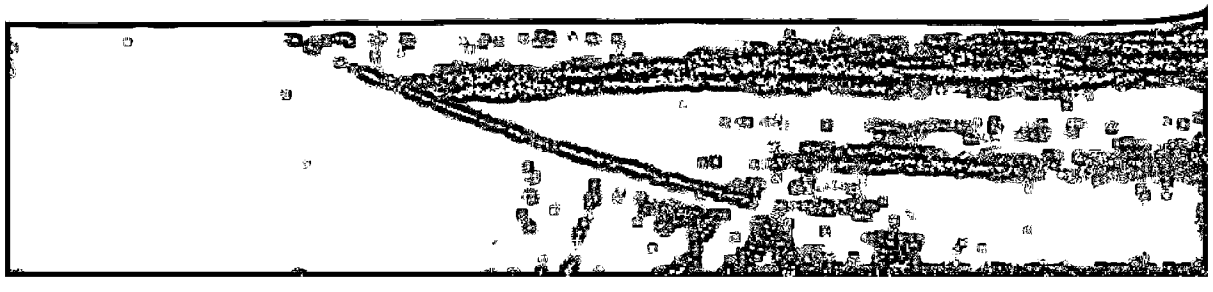
$\therefore$ Expression
$= 6.4 + 0.64 + 0.064 + 0.0064$
$= 7.1104$

54. (2) $\sqrt{13} = 3.6$ and $\sqrt{130} = 11.4$

$\therefore \sqrt{1.3} + \sqrt{1300} + \sqrt{0.013}$

$= \sqrt{\frac{130}{100}} + \sqrt{13\times100} + \sqrt{\frac{130}{10000}}$

$= \frac{11.4}{10} + 3.6\times10 + \frac{11.4}{100}$
$= 1.14 + 36 + 0.114$
$= 37.254$



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55. (1) Expression

$= \sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+7}}}}$

$= \sqrt{5+\sqrt{11+\sqrt{19+6}}}$

$= \sqrt{5+\sqrt{11+5}}$

$= \sqrt{5+4} = \sqrt{9} = 3$

56. (4) $\sqrt{110\frac{1}{4}} = \sqrt{\frac{441}{4}} = \sqrt{\frac{21\times21}{2\times2}}$

$= \frac{21}{2} = 10\frac{1}{2} = 10.5$

57. (1) Expression

$= \sqrt{8+\sqrt{57+\sqrt{38+\sqrt{108+\sqrt{169}}}}}$

$= \sqrt{8+\sqrt{57+\sqrt{38+\sqrt{108+13}}}}$

$= \sqrt{8+\sqrt{57+\sqrt{38+\sqrt{121}}}}$

$= \sqrt{8+\sqrt{57+\sqrt{38+11}}}$

$= \sqrt{8+\sqrt{57+\sqrt{49}}}$

$= \sqrt{8+\sqrt{57+7}} = \sqrt{8+\sqrt{64}}$

$= \sqrt{8+8} = \sqrt{16} = 4$

58. (3) $(10.15)^2 = 103.0225$

$\Rightarrow (1.015)^2 = 1.030225$

and $(101.5)^2 = 10302.25$

$\therefore \sqrt{1.030225} + \sqrt{10302.25}$

$= \sqrt{(1.015)^2} + \sqrt{(101.5)^2}$

$= 1.015 + 101.5$

$= 102.515$

59. (3) The number of digits in 625686734489 is 12.

$\therefore$ Number of digits in its square root = 6

i.e., $\sqrt{625686734489} = 791003.625$.

60. (2) $\sqrt{841} = 29$

$\frac{\sqrt{841}}{10000} = \frac{29}{10000}$

$\Rightarrow \frac{\sqrt{841}}{100000000} = \frac{29}{10000}$

$\therefore \sqrt{0.00000841} = 0.0029$

61. (3) Expression

$= \sqrt{\frac{0.324\times0.081\times4.624}{1.5625\times0.0289\times72.9\times64}}$

$= \sqrt{\frac{324\times81\times4624}{15625\times289\times729\times64}}$

$= \frac{18\times9\times68}{125\times17\times27\times8} = 0.024$

62. (3) $\sqrt{0.25\times2.25} = 0.5 \times 1.5$

$= 0.75$

63. (2) $\sqrt{64} - \sqrt{36} = 8 - 6 = 2$

64. (2) $\sqrt{18225} = 135$

$\therefore \sqrt{182.25} = 13.5$;

$\sqrt{1.8225} = 1.35$;

$\sqrt{0.018225} = 0.135$

$\therefore$ Expression

$= 135 + 13.5 + 1.35 + 0.135$

$= 149.985$

65. (2) $21\frac{51}{169} = \frac{21\times169+51}{169}$

$= \frac{3600}{169}$

$\therefore \sqrt{21\frac{51}{169}} = \sqrt{\frac{3600}{169}} = \frac{60}{13} = 4\frac{8}{13}$

66. (2) $(1101)^2 = 1212201$

$\Rightarrow 1101 = \sqrt{1212201}$

$= \sqrt{121.2201}$

$\sqrt{\frac{1212201}{10000}} = \frac{1101}{100} = 11.01$

67. (1) Expression

$= \sqrt{\frac{0.064\times0.256\times15.625}{0.025\times0.625\times4.096}}$

$= \sqrt{\frac{64\times256\times15625}{25\times625\times4096}}$

$= \frac{8\times16\times125}{5\times25\times64} = 2$

68. (3)

$\sqrt{19.36} + \sqrt{0.1936} + \sqrt{0.001936}$

$+ \sqrt{0.00001936}$

$= 4.4 + 0.44 + 0.044 + 0.0044$

$= 4.8884$

69. (2) Let the numbers be x and y where $x > y$

$\therefore x^2 - y^2 = 45$

$\Rightarrow (x+y)(x-y) = 45$

Now, $45 = 5 \times 9$

$= 15 \times 3 = 45 \times 1$

$\therefore$ Number of pairs = 3

70. (3) Expression $= \frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}}$

$= \frac{2\sqrt{6}+6\sqrt{6}}{4\sqrt{6}} = \frac{8\sqrt{6}}{4\sqrt{6}} = 2$

71. (4) Expression

$= \sqrt{3\frac{33}{64}} + \sqrt{9\frac{1}{7}} \times 2\sqrt{3\frac{1}{9}}$

$= \sqrt{\frac{225}{64}} + \sqrt{\frac{64}{7}} \times 2\sqrt{\frac{28}{9}}$

$= \sqrt{\frac{225}{64}\times\frac{7}{64}\times\frac{28}{9}} \times 2$

$= \frac{5\times7}{8\times4} \times 2 = \frac{35}{16} = 2\frac{3}{16}$

72. (2) Expression

$= \frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$

$= \frac{4\sqrt{2}+4\sqrt{3}}{2\sqrt{2}+2\sqrt{3}} = \frac{4(\sqrt{2}+\sqrt{3})}{2(\sqrt{2}+\sqrt{3})} = 2$

73. (1) Number of digits in 62478078 = 8

$\therefore$ Number of digits in its square root = 4

$\Rightarrow \sqrt{62478078} = 7904$

$\Rightarrow \sqrt{62473216} = 7904$

74. (4) For $n^r - tn + \frac{1}{4}$ to be a perfect square,

$r = 2$ and $t = \pm1$

$\left[n^2 - n + \frac{1}{4} = n^2 - 2.n.\frac{1}{2} + \frac{1}{4}\right.$

$\left. = \left(n - \frac{1}{2}\right)^2\right]$

$n^2 + n + \frac{1}{4} = n^2 + 2.n.\frac{1}{2} + \frac{1}{4}$

$= \left(n + \frac{1}{2}\right)^2$

75. (4) $33 - 4\sqrt{35}$

$= 33 - 2 \times 2\sqrt{5\times7}$

$= 33 - 2 \times 2\sqrt{7} \times \sqrt{5}$

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$= 28 + 5 - 2 \times 2\sqrt{7} \times \sqrt{5}$

$= \left(2\sqrt{7}\right)^2 + \left(\sqrt{5}\right)^2 - 2 \times 2\sqrt{7} \times \sqrt{5}$

$= \left(2\sqrt{7} - \sqrt{5}\right)^2$

$\therefore \sqrt{33 - 4\sqrt{35}}$

$= \sqrt{\left(2\sqrt{7} - \sqrt{5}\right)^2}$

$= \pm\left(2\sqrt{7} - \sqrt{5}\right)$

76. (3) Expression

$= \sqrt{156.25} + \sqrt{0.0081} - \sqrt{0.0361}$

$= 12.5 + 0.09 - 0.19 = 12.4$

77. (4) $\sqrt{24010000} = 4900$

Again, $\sqrt{4900} = 70$

$\therefore \sqrt[4]{24010000} = 70$

78. (2) $\sqrt{15876} = 126$

The digit at the unit's place is 6.

1	1 58 76	126
1	1	
22	58	
2	44	
246	1476	
6	1476	
252	×	

79. (1) Unit's digit in $(1570)^2 = 0$
Unit's digit in $(1571)^2 = 1$
Unit's digit in $(1572)^2 = 4$
Unit's digit in $(1573)^2 = 9$
$\therefore$ Required unit's digit
= Unit's digit in $(0 + 1 + 4 + 9) = 4$

80. (3) The smallest 4-digit number = 1000
The smallest 4 digit perfect square number = $2^{10} = 1024$

81. (1)

8	68 06 21	824
8	64	
162	406	
2	324	
1644	8221	
	6576	
	1645	

$\therefore (824)^2 < 680621 < (825)^2$
$\therefore$ Required number
$= [(825)^2 - 680621] = 4$

82. (4) $392 = 2 \times 2 \times 2 \times 7 \times 7$
$= 2^2 \times 7^2 \times 2$
Clearly, when 392 is multiplied by 2, the product is a perfect square.

83. (3) $47 \times 47 = 2209$
Clearly, 6 should be added to 2203 to get a perfect square.

84. (4) Perfect square numbers between 50 and 1000 start from 64 to 961 i.e., $(8)^2$ to $(31)^2$
$\therefore$ The required number
$= (31 - 8) + 1 = 24$

85. (2)

9	89 58	94
9	81	
184	× 858	
4	736	
188	122	

Now, $95 \times 95 = 9025$
$\therefore$ Required number
$= 9025 - 8958 = 67$

86. (3) Largest 5-digit number = 99999
Now,

3	9 9 9 9 9	316
3	9	
61	× 99	
1	62	
626	3799	
6	3756	
632	× 43	

$\therefore$ Required number
$= 99999 - 43 = 99856$

87. (3) $11^2 = 121$, $12^2 = 144$,
$13^2 = 169$, $14^2 = 196$
$15^2 = 225$, $16^2 = 256$,
$17^2 = 289$
So, total perfect squares = 7

88. (3) $31^2 = 961$
$32^2 = 1024$
$\therefore$ Required number
$= 1000 - 961 = 39$

89. (3) $(31)^2 < 1000 < 32^2$
$32 \times 32 = 1024$
$\therefore$ Required number
$= 1024 - 1000 = 24$

90. (3) $99 \times 99 = 9801$

91. (1) $a^2 - 2ab + b^2 = (a - b)^2$
$\therefore 16a^2 - 12a$

$= (4a)^2 - 2 \times 4a \times \frac{3}{2}$

Hence, on adding $\left(\frac{3}{2}\right)^2 = \frac{9}{4}$, expression will be a perfect square.

92. (3) $p = q + 5$
$\Rightarrow p - q = 5$
$p^2 + q^2 = 55$
$\therefore (p - q)^2 + 2pq = 55$
$\Rightarrow 25 + 2pq = 55$
$\Rightarrow 2pq = 30$
$\Rightarrow pq = 15$

93. (3) Since the numbers between -10 and 10 will be single digit and the numbers below 100 will be either one digit or two digit. We know that the square root of one or two digit number is always single digit number. Therefore, required answer is option (3).

94. (1) Let the two numbers be A and B.
Then, $A + B = 22$
and $A^2 + B^2 = 404$
We know that
$(A + B)^2 = A^2 + B^2 + 2AB$
or $(22)^2 = 404 + 2AB$
or $484 = 404 + 2AB$
or $2AB = 80$
or $AB = 40$
$\therefore$ The product of the two numbers = 40

95. (4) According to question,

$\frac{1}{3} \times \sqrt{x} = 0.001$

$\Rightarrow \sqrt{x} = 0.003 \Rightarrow x = 0.000009$

96. (3) Let the number be x
According to the question

$\frac{3}{5}$ of $x^2 = 126.15$

$\Rightarrow x^2 = \frac{126.15 \times 5}{3}$

$\Rightarrow x^2 = 210.25$

$\therefore x = \sqrt{210.25} = 14.5$

97. (1) Multiples of 11 whose square root are whole number
First = $11 \times 11 = 121$
Second = $11 \times 11 \times 4 = 484$

98. (3) Let the number be x. Then,
$x^2 = (75.15)^2 - (60.12)^2$
$= (75.15 + 60.12)(75.15 - 60.12)$
$= 135.27 \times 15.03$
$= 2033.1081$

$\Rightarrow x = \sqrt{2033.1081}$
$= 45.09$

99. (2) Let the required number be x. Then,
$x^2 + 5^2 = 386$
$\Rightarrow x^2 = 386 - 25$
$\Rightarrow x^2 = 361$

$\Rightarrow x = \sqrt{361} = 19$

100. (1) Let the required number be x.
As per given information,
$x^2 = (975)^2 - (585)^2$
$\Rightarrow x^2 = (975 + 585)(975 - 585)$
$\Rightarrow x^2 = 1560 \times 390$

$\Rightarrow x = \sqrt{1560 \times 390}$

$= \sqrt{13 \times 12 \times 3 \times 13 \times 10 \times 10}$
$= 780$

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101. (4) Let $x + y = 20$ and $x - y = 8$

$\therefore (x+y)(x-y) = 20 \times 8$

$\Rightarrow x^2 - y^2 = 160$

102. (3) Let the numbers be x and y. Then,

$x^2 + y^2 = 100$ ...(i)

$x^2 - y^2 = 28$ ...(ii)

On adding,

$2x^2 = 128$

$\Rightarrow x^2 = 64 \Rightarrow x = 8$

From equation (i),

$64 + y^2 = 100$

$\Rightarrow y^2 = 36 \Rightarrow y = 6$

$\therefore$ Required sum $= 8 + 6 = 14$

103. (3) Check through options

When $x = 9$,

$2x - 3 = 2 \times 9 - 3 = 15 < 17$

104. (4) $1 \times 2 \times 3 \times 4 = 24$

$\Rightarrow 24 + 1 = 25 = 5^2$;

$2 \times 3 \times 4 \times 5 = 120$

$\Rightarrow 120 + 1 = 121 = 11^2$

$\therefore P = 1$

105. (3) Expression

$$= \sqrt{\frac{8}{3}} = \sqrt{\frac{8\times3}{3\times3}} = \frac{\sqrt{24}}{3}$$

$$= \frac{4.898}{3} = 1.6326 = 1.633$$

106. (2) Let the number of boys and girls in the room be x and y respectively.

According to the question,

$x^2 = y^2 + 28$

$\Rightarrow x^2 - y^2 = 28$ .....(i)

and $x = y + 2$

$\Rightarrow x - y = 2$ .....(ii)

On dividing equation (i) by equation (ii), we have

$$\frac{x^2 - y^2}{x-y} = \frac{28}{2}$$

$$\Rightarrow \frac{(x+y)(x-y)}{x-y} = 14$$

$\Rightarrow x + y = 14$

$\therefore$ Total number of boys and girls $= 14$

107. (4) From the given alternatives,

$5^2 + 6^2 + 7^2 = 110$

$\therefore$ The smallest number $= 5$

108. (3) 37 is a prime number.

$\therefore 37 = 1 \times 37$

$\therefore$ Required answer

$= \sqrt{37 - 1} = \sqrt{36} = 6$

109. (3) According to the question,

$= 68^2 - 32^2 = (68 + 32)(68 - 32)$

$= 100 \times 36$

$= 3600 = (60)^2$

110. (3) $x^2 + x = 2450$

$\Rightarrow x(x+1) = 2450 = 49 \times 50$

$\therefore x = 49$

111. (4) Let the numbers be x and y and $x > y$.

$\therefore xy = 45$

and $x - y = 4$

$\therefore x^2 + y^2 = (x-y)^2 + 2xy$

$= (4)^2 + 2 \times 45 = 16 + 90$

$= 106$

112. (4) $1008 = 4 \times 4 \times 3 \times 3 \times 7$

$$\therefore \frac{1008}{7} = (4\times3)^2 = (12)^2$$

113. (1) Obviously, 16 must be subtracted to make the result a perfect square.

i.e. $63520 - 16 = \sqrt{63504} = 252$

114. (2) The given number has 6 decimal places.

Now,

1	326	18
1	1	
28	226	
8	224	
36	2	

i.e. $326 - 2 = 324$ Which is a perfect square of 18.

Therefore, 0.000002 should be subtracted from 0.000326 to make it a perfect square of 0.018.

115. (4) $5808 = 2 \times 2 \times 2 \times 2 \times 3 \times 11 \times 11 = 2^4 \times 2^2 \times 11^2 \times 3$

Therefore, when 5808 is multiplied by 3, then it will be perfect square number.

116. (4)

2	20184
2	10092
2	5046
3	2523
29	841
	29

$\therefore 20184 = 2 \times 2 \times 2 \times 3 \times 29 \times 29 \times = 2^2 \times 29^2 \times 2 \times 3$.

$\therefore$ Required number $= 2 \times 3 = 6$

117. (1) $41 \times 41 = 1681$

$42 \times 42 = 1764$

$\therefore$ Required answer

$= 1764 - 1728 = 36$

118. (1) $a = 64$ and $b = 289$

$\therefore \sqrt{a} = \sqrt{64} = 8$ and

$\sqrt{b} = \sqrt{289} = 17$

$$\therefore \left(\sqrt{\sqrt{a}+\sqrt{b}} - \sqrt{\sqrt{b}-\sqrt{a}}\right)^{\frac{1}{2}}$$

$$= \left(\sqrt{8+17} - \sqrt{17-8}\right)^{\frac{1}{2}}$$

$$= \left(\sqrt{25} - \sqrt{9}\right)^{\frac{1}{2}}$$

$$= (5-3)^{\frac{1}{2}} = (2)^{\frac{1}{2}}$$

119. (3)

2	6 40 09 | 253
2	4
45	240
5	225
503	1509
3	1509
506	×

$\therefore \sqrt{64009} = 253$

120. (2) Let the number of days of tour be x.

$\therefore$ Total expenditure $= x^2$

$\therefore x^2 = 361 \Rightarrow x = \sqrt{361} = 19$

121. (2) Expression $= \sqrt{10^{-6} \times 0.25}$

$$= \sqrt{\frac{0.25}{10^6}} = \sqrt{\frac{25}{10^6 \times 10^2}}$$

$$= \sqrt{\frac{25}{10^8}} = \frac{5}{10^4} = 0.0005$$

122. (4) $\dfrac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}}$

$$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{(\sqrt{6}+\sqrt{3})(\sqrt{6}-\sqrt{3})}$$

$$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{6-3}$$

$$= \sqrt{2}\left(\sqrt{6}-\sqrt{3}\right) = \sqrt{12} - \sqrt{6}$$

$= 2\sqrt{3} - \sqrt{6}$

$\dfrac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}$

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$= \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(\sqrt{6}+\sqrt{2})(\sqrt{6}-\sqrt{2})}$

$= \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{6-2}$

$= \sqrt{3}\left(\sqrt{6}-\sqrt{2}\right) = \sqrt{18} - \sqrt{6}$

$= 3\sqrt{2} - \sqrt{6}$

$\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$

$= \frac{\sqrt{6}(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$

$= \frac{\sqrt{18}-\sqrt{12}}{3-2}$

$= 3\sqrt{2} - 2\sqrt{3}$

∴ Expression

$= 2\sqrt{3} - \sqrt{6} - \left(3\sqrt{2}-\sqrt{6}\right) + 3\sqrt{2} - 2\sqrt{3}$

$= 2\sqrt{3} - \sqrt{6} - 3\sqrt{2} + \sqrt{6} + 3\sqrt{2} - 2\sqrt{3} = 0$

123. (2) Expression $= \frac{4-\sqrt{0.04}}{4+\sqrt{0.4}}$

$= \frac{4-0.2}{4+0.6}$

$= \frac{3.8}{4.6} = \frac{38}{46} = \frac{19}{23}$

$= 0.83 \approx 0.8$

124. (2) $\sqrt{0.05 \times 0.5 \times a}$

$= 0.5 \times 0.05 \times \sqrt{b}$

On squaring both sides,

$0.05 \times 0.5 \times a = 0.5 \times 0.5 \times 0.05 \times 0.05 \times b$

$\Rightarrow a = 0.5 \times 0.05b$

$\Rightarrow \frac{a}{b} = 0.5 \times 0.05 = 0.025$

125. (1) Number of students in the last row $= \sqrt{1369} = 37$

Illustration :

3	13 69 | 37
3	9
67	469
7	469
74	x

126. (1) $\sqrt{5} = 2.24$

$\sqrt{3} = 1.73$

$\sqrt{6} = 2.45$

$\sqrt{2} = 1.41$

$\therefore \sqrt{5} + \sqrt{3} = 2.24 + 1.73$

$= 3.97$

$\sqrt{6} + \sqrt{2} = 2.45 + 1.41 = 3.86$

Clearly, $3.97 > 3.86$

127. (4)

2	20184
2	10092
2	5046
3	2523
29	841
	29

$\therefore 20184 = 2 \times 2 \times 2 \times 3 \times 29 \times 29$

$= 2^2 \times 29^2 \times 2 \times 3$

∴ For making it a perfect square, 20184 should be multiplied by $2 \times 3 = 6$

$20184 \times 6 = 121104$;

$\sqrt{121104} = 348$

128. (4)

2	1008
2	504
2	252
2	126
3	63
3	21
	7

$\therefore 1008$

$= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7$

$= 2^2 \times 2^2 \times 3^2 \times 7$

∴ Required answer = 7

129. (3) Let the numbers be x and y where $x > y$.

According to the question,

$x + y = 37$

and

$x^2 - y^2 = 185$

$\Rightarrow (x+y)(x-y) = 185$

$\Rightarrow 37(x-y) = 185$

$\Rightarrow x - y = \frac{185}{37} = 5$

130. (1)

1	36562 | 191
1	1
29	265
9	261
381	462
1	381
	81

∴ Number of armies left = 81

131. (3) $\frac{2+\sqrt{3}}{2} = \frac{2(2+\sqrt{3})}{4}$

$= \frac{4+2\sqrt{3}}{4} = \frac{3+1+2\sqrt{3}}{4}$

$= \frac{\left(\sqrt{3}\right)^2 + (1)^2 + 2 \times \sqrt{3} \times 1}{4}$

$= \left(\frac{\sqrt{3}+1}{2}\right)^2$

$\therefore \sqrt{\frac{2+\sqrt{3}}{2}} = \pm \frac{\sqrt{3}+1}{2}$

132. (3) $11^2 = 121$

$111^2 = 12321$

$1111^2 = 1234321$

$11111^2 = 123454321$

133. (4)

5	59535
3	11907
3	3969
3	1323
3	441
3	147
7	49
	7

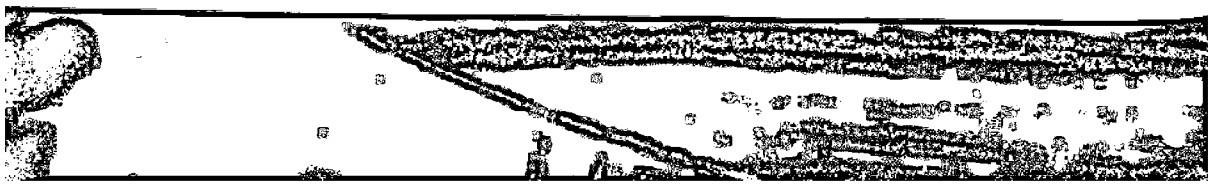
$\therefore 59535 = 3 \times 3 \times 3 \times 3 \times 7^2 \times 3 \times 5$

$= 3^2 \times 3^2 \times 7^2 \times 3 \times 5$

∴ According to the question,

$x = 3 \times 5 = 15$

∴ Sum of digits $= 1 + 5 = 6$



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134. (2)

2	$\overline{6}\ \overline{60}\ \overline{49}$ | 257
2	4
45	260
5	225
507	3549
7	3549
514	×

$\therefore \sqrt{66049} = 257$

$\therefore$ Unit place digit = 7

135. (4) $\sqrt{0.000441} = \sqrt{\frac{441}{1000000}}$

$= \frac{21}{1000} = 0.021$

136. (1) Required sum = 121 + 144 + 169 + 196 + 225 + 256 + 289 = 1400

137. (2) $\sqrt{32146} > 179$

$179 \times 179 = 32041$

$\therefore$ Required answer

$= 32146 - 32041 = 105$

138. (1)

7	$\overline{54}\ \overline{16}\ \overline{*6}$ | 736
7	49
143	516
3	429
1466	87*6

$\because 1466 \times 6 = 8796$

$\therefore * = 9$

139. (2) Number of boys = $\sqrt{12544}$

= 112

Illustration :

1	$\overline{12}\overline{54}\overline{44}$ | 112
1	1
21	× 25
1	21
222	444
2	444
224	×

TYPE-IV

1. (1) Here, 22 – 15 – 7 = 0

We know that

$a^3 + b^3 + c^3 = 3abc$,

If $a + b + c = 0$

$\therefore (22)^3 + (-15)^3 + (-7)^3$

$= 3 \times 22 \times (-15) (-7) = 6930$

2. (2) On simplification,

Expression $= \frac{2}{4} \times \frac{7}{10} \times 5$

$= \frac{7}{4} = 1\frac{3}{4}$

3. (2) $\sqrt[3]{\frac{72.9}{0.4096}} = \sqrt[3]{\frac{729000}{4096}}$

$= \sqrt[3]{\frac{(90)^3}{(16)^3}} = \frac{90}{16} = \frac{45}{8} = 5.625$

4. (4) $(5.5)^3 - (4.5)^3$

$= (5.5 - 4.5)^3 + 3 \times 5.5 \times 4.5 (5.5 - 4.5)$

$= (1)^3 + 74.25 (1)$

$= 1 + 74.25 = 75.25$

5. (4) $\sqrt[3]{\frac{7}{875}} = \left(\frac{7}{875}\right)^{\frac{1}{3}}$

$= \left(\frac{1}{125}\right)^{\frac{1}{3}} = \frac{1}{5}$

6. (2) $\sqrt[3]{\frac{19}{513}} = \sqrt[3]{\frac{1}{27}} = \frac{1}{3}$

7. (3) We know that

$a^3 + b^3 + c^3 - 3abc$

$= (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

$= \frac{1}{2}(a+b+c)[(a-b)^2 + (b-c)^2 + (c-a)^2]$

$\therefore \sqrt[3]{(333)^3 + (333)^3 + (334)^3 - 3 \times 333 \times 333 \times 334}$

$= \sqrt[3]{\frac{1}{2}(333+333+334)[(333-333)^2 + (333-334)^2 + (334-333)^2]}$

$= \sqrt[3]{\frac{1}{2} \times 1000 \times 2} = \sqrt[3]{1000}$

$= \sqrt[3]{10 \times 10 \times 10} = 10$

8. (3) Here, $\sqrt[3]{175616} = 56$

$\therefore \sqrt[3]{175.616} = 5.6$

$\sqrt[3]{0.175616} = 0.56$

and $\sqrt[3]{0.000175616} = 0.056$

$\therefore$ Required sum

$= 56. + 0.56 + 0.056 = 6.216$

9. (4) $\sqrt[3]{\sqrt{0.000064}} = \sqrt[3]{0.008}$

$= \sqrt[3]{0.2 \times 0.2 \times 0.2}$

$= 0.2$

10. (2) Expression

$= \sqrt[3]{15612 + \sqrt{154 + \sqrt{225}}}$

$= \sqrt[3]{15612 + \sqrt{154 + 15}}$

$= \sqrt[3]{15612 + 13}$

$= \sqrt[3]{15625} = 25$

11. (3)

$\sqrt[3]{0.000125} = \sqrt[3]{0.05 \times 0.05 \times 0.05}$

$= 0.05$

12. (3) First number $= (\sqrt{5})^2 = 5$

Let the second number be x.

$\therefore x^2 + 5^2 = 146$

$\Rightarrow x^2 = 146 - 25 = 121$

$\Rightarrow x = \sqrt{121} = 11$

$\therefore$ Cube of 11 = 1331

13. (1) $\sqrt[3]{1000} + \sqrt[3]{0.008} - \sqrt[3]{0.125}$

$= 10 + 0.2 - 0.5 = 9.7$

14. (2) Expression

$= \sqrt[3]{1 - \frac{127}{343}} = \sqrt[3]{\frac{343 - 127}{343}}$

$= \sqrt[3]{\frac{216}{343}} = \sqrt[3]{\frac{(6)^3}{(7)^3}} = \frac{6}{7} = 1 - \frac{1}{7}$

15. (1) $\sqrt[3]{3^n} = 27$

$\Rightarrow (3)^{\frac{n}{3}} = 3^3$

$\Rightarrow \frac{n}{3} = 3 \Rightarrow n = 3 \times 3 = 9$

16. (2) Expression

$= \sqrt{\sqrt[3]{0.000729}}$

$= \sqrt{\sqrt[3]{0.09 \times 0.09 \times 0.09}}$

$= \sqrt{0.09} = \sqrt{0.3 \times 0.3}$

$= 0.3$

17. (1) Expression $= \left(\sqrt{4^3 + 15^2}\right)^3$

$= \left(\sqrt{64 + 225}\right)^3 = \left(\sqrt{289}\right)^3$

$= (17)^3 = 4913$

18. (2) Expression $= \sqrt[3]{4\frac{12}{125}}$

$= \sqrt[3]{\frac{512}{125}} = \sqrt[3]{\frac{8 \times 8 \times 8}{5 \times 5 \times 5}} = \frac{8}{5} = 1.6$

19. (4) $1323 = 3 \times 3 \times 3 \times 7 \times 7$

$\therefore$ It must be multiplied by 7.

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20. (2) $1440 = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2^3 \times 2^2 \times 3^2 \times 5$
To make 1440 a perfect cube, it must be multiplied by $2 \times 3 \times 5 \times 5 = 150$.
$\therefore$ The required sum $= 1+5+0 = 6$

21. (3) $1800 = 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 = 2^3 \times 3^2 \times 5^2$
To make 1800 a perfect cube, it must be multiplied by 15 (least number).
$\therefore$ Required sum $= 1 + 5 = 6$

22. (2) Clearly, $\sqrt[3]{729} = 9$
$\therefore$ 19 should be added to 710 to get a perfect cube.

23. (2)

2	1944
2	972
2	486
3	243
3	81
3	27
3	9
	3

$\therefore 1944 = 2\times2\times2\times3\times3\times3\times3\times3$
$= 2^3 \times 3^3 \times 3^2$
Clearly; 1944 should be multiplied by 3 to make the result a perfect cube.

24. (1) $3000 = 3 \times 1000 = 3 \times 10^3$
Clearly, when we divide 3000 by natural number 3, the quotient is 1000 which is a perfect cube.

25. (2)

2	864
2	432
2	216
2	108
2	54
3	27
3	9
	3

$\therefore 864 = 2^3 \times 3^3 \times 2^2$
For $864n$ to be a perfect cube, $n = 2$

26. (2) $675 = 5 \times 5 \times 3 \times 3 \times 3$
$\therefore$ Required number $= 5$

27. (2) $12 \times 12 \times 12 = 1728$
$\therefore$ Required number
$= 1728 - 1720 = 8$

28. (2) $4320 = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 5$
$= 2^3 \times 3^3 \times 2^2 \times 5$
$\therefore$ Required number $= 2\times5\times5 = 50$

29. (4) $343 = 7 \times 7 \times 7$
$125 = 5 \times 5 \times 5$
$81 = 3 \times 3 \times 3 \times 3$
$64 = 8 \times 8 = 4 \times 4 \times 4$
We see that 343 and 125 are only perfect cubes of 7 and 5 respectively. 81 is only a perfect square of 9. 64 is a perfect square of 8 as well as a perfect cube of 4.

30. (4) Let number be x
$\therefore$ According to question,
$x^3 - x^2 = 48 \quad \therefore x = 4$

31. (2) The number $= 90 \times A$
$= 3 \times 3 \times 2 \times 5 \times A$
The least value of A for which the given number is a perfect cube
$= 3 \times 2^2 \times 5^2$
$= 3 \times 4 \times 25 = 300$

32. (1) $\sqrt{x} = \sqrt[3]{y}$

$\Rightarrow x^{\frac{1}{2}} = y^{\frac{1}{3}}$

$\Rightarrow (x^{\frac{1}{2}})^6 = (y^{\frac{1}{3}})^6$

$\Rightarrow x^3 = y^2$

33. (3) $x = \sqrt{3} + \sqrt{2}$

$$\therefore \frac{1}{x} = \frac{1}{\sqrt{3}+\sqrt{2}} = \frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$$

$$= \frac{\sqrt{3}-\sqrt{2}}{3-2} = \sqrt{3}-\sqrt{2}$$

$$\therefore x - \frac{1}{x} = \sqrt{3}+\sqrt{2}-\sqrt{3}+\sqrt{2}$$

$$= 2\sqrt{2}$$

$$\therefore x^3 - \frac{1}{x^3} = \left(x-\frac{1}{x}\right)^3 + 3\left(x-\frac{1}{x}\right)$$

$$= \left(2\sqrt{2}\right)^3 + 3\times2\sqrt{2}$$

$$= 16\sqrt{2} + 6\sqrt{2} = 22\sqrt{2}$$

34. (1) **Look at the pattern :**
$1001 \times 1001 = 1002001$
$1001\times1001\times1001 = 1003003001$

35. (2)

5	625
5	125
5	25
	5

$\therefore 625 = 5 \times 5 \times 5 \times 5 = 5^3 \times 5$
For the smallest cube number, 625 should be divided 5,
$625 \div 5 = 125 = 5^3$

36. (3) Let the numbers be a and b where $a > b$.
According to the question,
$a^3 + b^3 = 793$
and $a + b = 13$
$\therefore (a+b)^3 = a^3 + b^3 + 3ab(a+b)$
$\Rightarrow (13)^3 = 793 + 3ab \times 13$
$\Rightarrow 2197 = 793 + 39ab$
$\Rightarrow 39ab = 2197 - 793 = 1404$

$$\Rightarrow ab = \frac{1404}{39} = 36$$

$\therefore (a+b)^2 = (a+b)^2 - 4ab$
$= (13)^2 - 4 \times 36$
$= 169 - 144 = 25$

$\Rightarrow a - b = \sqrt{25} = 5$

37. (3) $243000 = 243 \times 1000$
$= 3\times3\times3\times3\times3\times10\times10\times10$
$= 3^3 \times 3^2 \times 10^3$
$\therefore$ Required number $= 3^2 = 9$

38. (4) Expression

$$= \left(2-\frac{1}{3}\right)\left(2-\frac{3}{5}\right)\left(2-\frac{5}{7}\right)\ldots\left(2-\frac{997}{999}\right)$$

$$= \left(\frac{6-1}{3}\right)\left(\frac{10-3}{5}\right)\left(\frac{14-5}{7}\right)\ldots\left(\frac{1998-997}{999}\right)$$

$$= \frac{5}{3}\times\frac{7}{5}\times\frac{9}{7}\times\ldots\times\frac{1001}{999}$$

$$= \frac{1001}{3}$$

39. (4) $\sqrt[3]{79507} = 43$
$\therefore \sqrt[3]{79.507} + \sqrt[3]{0.079507} + \sqrt[3]{0.000079507}$
$= 4.3 + 0.43 + 0.043$
$= 4.773$

TYPE-V

1. (3) $? =$

$$\frac{(0.0539 - 0.002)\times0.4 + 0.56\times0.07}{0.04\times0.25}$$

$$= \frac{0.0519\times0.4 + 0.0392}{0.01}$$

$$= \frac{0.02076 + 0.0392}{0.01}$$

$$= \frac{0.05996}{0.01} = 5.996$$

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TEST YOURSELF

1. Simplify:

$$\frac{3.5\times1.5}{0.025+0.125\times7.5}\times\frac{1}{3+\frac{1}{1+\frac{1}{2}}}$$

(1) 0.9 (2) 0.95
(3) 0.095 (4) 0.082

2. Simplify:

$$\frac{3}{4+\frac{5}{6+\frac{7}{8}}}-\frac{3}{5}+\frac{1}{2}\text{ of }1\frac{1}{5}+1\frac{3}{26}$$

(1) $\frac{3}{4}$ (2) $\frac{1}{2}$
(3) $\frac{3}{5}$ (4) $\frac{3}{7}$

3. Simplify:

$$999\frac{998}{999}\times999+999$$

(1) 999997 (2) 999998
(3) 99998 (4) 999994

4. Simplify

$$2+\frac{3}{17}\text{ of }\left(2\frac{3}{4}+3\frac{5}{8}\right)+\frac{2}{5}+2\frac{1}{5}+\frac{2}{9}$$

(1) $\frac{9}{17}$ (2) $\frac{7}{11}$
(3) $\frac{13}{11}$ (4) $\frac{24}{11}$

5. Simplify:

$$120+3\,of\,5+\left[7\times2\left\{10+5\left(24-10\times2+\overline{7+3\times10+5}\right)\right\}\right]$$

(1) 120.03 (2) 116.04
(3) 118 (4) 125

6. $\frac{2.5\times3+7.5+2.5-0.5\text{ of }3}{47+12+1.5-6\text{ of }2\times3}=?$

(1) $\frac{3}{17}$ (2) $\frac{9}{19}$
(3) $\frac{4}{11}$ (4) $\frac{3}{11}$

7. Simplify:

$$\frac{17}{7+\frac{3}{4-2\frac{3}{4}}}\times\frac{2021}{2193}+\left(1\frac{37}{48}-\frac{15}{16}\right)$$

$$+\frac{3}{4}\,of\,\frac{3\frac{1}{2}}{2\frac{1}{2}}$$

(1) $2\frac{1}{8}$ (2) $4\frac{1}{8}$
(3) $3\frac{1}{8}$ (4) $3\frac{1}{7}$

8. $\frac{1\frac{7}{9}\text{ of }\frac{27}{64}}{\frac{11}{12}\times9\frac{9}{11}}+\frac{4\frac{4}{7}\text{ of }\frac{21}{160}}{2\frac{5}{6}+2\frac{2}{15}}=?$

(1) $\frac{425}{2344}$ (2) $\frac{425}{2434}$
(3) $\frac{421}{2443}$ (4) $\frac{425}{2304}$

9. Simplify:

$$\frac{8\frac{3}{5}+7\frac{3}{4}+5\frac{2}{3}-4\frac{1}{2}}{13-11\frac{9}{10}+10\frac{7}{9}-9\frac{17}{20}}\,of\,\frac{2}{11}\,of\,365$$

(1) $573\frac{3}{11}$ (2) $571\frac{7}{11}$
(3) $572\frac{3}{11}$ (4) $575\frac{4}{11}$

10. Simplify:

$$\frac{1}{8}of\left(\frac{1}{10}-\frac{1}{11}\right)+\frac{\frac{1}{7}-\frac{1}{9}+\left(\frac{4}{9}+\frac{4}{11}\right)}{\frac{1}{7}+\frac{1}{9}+\left(\frac{4}{9}-\frac{4}{11}\right)}\times\frac{\frac{1}{3}+\frac{1}{7}+\left(\frac{1}{7}-\frac{1}{9}\right)}{\left(\frac{1}{3}+\frac{1}{7}\right)+\frac{1}{7}-\frac{1}{9}}$$

(1) $\frac{85}{176}$ (2) $\frac{83}{176}$
(3) 83 (4) 86

11. Simplify

$$\frac{2\frac{4}{9}+3\frac{2}{3}\text{ of }\frac{2}{5}\times\frac{3}{5}+1\frac{1}{9}}{1\frac{1}{9}\times\frac{3}{4}\text{ of }1\frac{2}{5}+\frac{21}{38}-\frac{1}{3}}-\frac{5\frac{1}{2}-\frac{3}{4}}{2\frac{1}{5}\times1\frac{9}{11}}$$

(1) 1 (2) 0
(3) 2 (4) 3

12. Simplify:

$$\frac{\frac{5}{6}+\frac{7}{8}\,of\,\frac{4}{5}+\frac{3}{4}\,of\,\frac{9}{10}}{8\frac{1}{3}-\left(\frac{4}{1-\frac{7}{8}}\,of\,2\frac{1}{4}\right)+\frac{7}{9}\,of\,12\,of\,6\frac{1}{2}+5\frac{1}{9}}$$

(1) $24\frac{1}{4}$ (2) $24\frac{3}{4}$
(3) $22\frac{1}{2}$ (4) $23\frac{1}{3}$

13. Simplify:

$$\frac{\frac{2}{3}+\frac{3}{4}\text{of}\frac{5}{6}}{\frac{2}{3}+\frac{3}{4}\times\frac{5}{6}}+\frac{2+2\times2}{2+2\times2}+\frac{\frac{1}{2}+\frac{1}{2}\text{of}\frac{1}{2}}{\frac{1}{2}+\frac{1}{2}\text{of}\frac{1}{2}}$$

(1) 2 (2) 2.5
(3) 4 (4) 4.5

14. Simplify:

$$\frac{5+5\times5}{5\times5+5}\times\frac{\frac{1}{5}+\frac{1}{5}\,of\,\frac{1}{5}}{\frac{1}{5}\,of\,\frac{1}{5}+\frac{1}{5}}\times\left(5-\frac{1}{5}\right)\times\frac{1}{\frac{46}{5}-\frac{3}{1-\frac{2}{3}}}$$

(1) 400 (2) 500
(3) 600 (4) 300

15. Simplify $1+\frac{1}{1+\frac{1}{1+\frac{1}{9}}}$

(1) $1\frac{9}{19}$ (2) $1\frac{10}{19}$
(3) $2\frac{9}{19}$ (4) $3\frac{9}{19}$

16. Compute the following:

$$7+\frac{2}{5+\frac{3}{4+\frac{2}{3+\frac{1}{4}}}}$$

(1) $3\frac{40}{113}$ (2) $6\frac{40}{113}$
(3) $7\frac{40}{113}$ (4) $5\frac{40}{113}$

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17. Simplify :

$$7\frac{1}{2}-\left[2\frac{1}{4}+\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

(1) $4\frac{1}{2}$ (2) $3\frac{1}{2}$

(3) $4\frac{1}{3}$ (4) $\frac{1}{3}$

18. Simplify :

$$3+\left[(8-5)+\left\{(4-2)+\left(2+\frac{8}{13}\right)\right\}\right]=?$$

(1) $\frac{17}{13}$ (2) $\frac{13}{17}$

(3) $\frac{15}{17}$ (4) $\frac{17}{15}$

19. Simplify

$$5\frac{1}{2}-\left[2\frac{1}{3}+\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{2}{3}-\overline{\frac{1}{6}-\frac{1}{8}}\right)\right\}\right]$$

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$

(3) $\frac{1}{6}$ (4) $\frac{2}{3}$

SHORT ANSWERS

1. (2)	2. (1)	3. (2)	4. (4)
5. (1)	6. (2)	7. (3)	8. (4)
9. (1)	10. (1)	11. (2)	12. (2)
13. (2)	14. (3)	15. (2)	16. (3)
17. (1)	18. (2)	19. (3)	

EXPLANATIONS

1. (2) Expression =

$$\frac{3.5\times1.5}{0.025\times\frac{1}{0.125}\times7.5}\times\frac{1}{3+\frac{1}{1+\frac{1}{2}}}$$

$$=\frac{3.5\times1.5\times125}{25\times7.5}\times\frac{1}{3+\frac{1}{\frac{3}{2}}}$$

$$=3.5\times\frac{1}{3+\frac{2}{3}}=3.5\times\frac{1}{\frac{9+2}{3}}$$

$$=\frac{3.5\times3}{11}=\frac{10.5}{11}=0.95$$

2. (1) $\frac{3}{4+\frac{5}{6+\frac{7}{8}}}=\frac{3}{4+\frac{5}{\frac{48+7}{8}}}$

$$=\frac{3}{4+\frac{5\times8}{55}}$$

$$=\frac{3}{4+\frac{8}{11}}$$

$$=\frac{3}{\frac{44+8}{11}}=\frac{3\times11}{52}=\frac{33}{52}$$

$\therefore$ Expression $=\frac{33}{52}-\frac{3}{5}+\frac{1}{2}$

of $1\frac{1}{5}+1\frac{3}{26}$

$$=\frac{33}{52}-\frac{3}{5}+\frac{1}{2}\times\frac{6}{5}+\frac{29}{26}$$

$$=\frac{33}{52}-\frac{3}{5}\times\frac{5}{3}+\frac{29}{26}$$

$$=\frac{33}{52}-1+\frac{29}{26}$$

$$=\frac{33-52+58}{52}=\frac{39}{52}=\frac{3}{4}$$

3. (2) $\left(999+\frac{998}{999}\right)999+999$

$= (999)^2 + 998 + 999$

$= (1000 - 1)^2 + 998 + 999$

$= 1000000 + 1 - 2000 + 998 + 999$

$= 999998$

4. (4) The given expression

$$=2+\frac{3}{17}\text{ of }\left(\frac{11}{4}+\frac{29}{8}\right)+\frac{2}{5}+\frac{11}{5}+\frac{2}{9}$$

$$=2+\frac{3}{17}\text{ of }\left(\frac{22+29}{8}\right)+\frac{2}{5}+\frac{11}{5}+\frac{2}{9}$$

$$=2+\frac{3}{17}\text{ of }\frac{51}{8}+\frac{2}{5}+\frac{11}{5}+\frac{2}{9}$$

$$=2+\frac{3}{17}\times\frac{51}{8}+\frac{2}{5}+\frac{11}{5}+\frac{2}{9}$$

$$=2+\frac{9}{8}+\frac{2}{5}+\frac{11}{5}+\frac{2}{9}$$

$$=2\times\frac{8}{9}+\frac{2}{5}\times\frac{5}{11}+\frac{2}{9}$$

$$=\frac{16}{9}+\frac{2}{11}+\frac{2}{9}=\frac{176+18+22}{99}$$

$$=\frac{216}{99}=\frac{24}{11}$$

5. (1) The given expression

$120+3\text{ of }5+$

$\left[7\times2\left\{10+5\left(24-10\times2+\overline{7+3\times10+5}\right)\right\}\right]$

$=120+3\text{ of }5+$

$\left[7\times2\left\{10+5\left(24-10\times2+\overline{7+3\times2}\right)\right\}\right]$

$=120+3\text{ of }5+$

$\left[7\times2\left\{10+5\left(24-10\times2+\overline{7+6}\right)\right\}\right]$

$=120+3\text{ of }5+$

$\left[7\times2\left\{10+5\left(24-10\times2+13\right)\right\}\right]$

$=120+3\text{ of }5+$

$\left[7\times2\left\{10+5\left(24-20+13\right)\right\}\right]$

$=120+3\text{ of }5+\left[7\times2\left\{10+5\times17\right\}\right]$

$=120+3\text{ of }5+\left[7\times2\left\{10\times\frac{1}{5}\times17\right\}\right]$

$=120+3\text{ of }5+\left[7\times2\left\{2\times17\right\}\right]$

$=120+3\text{ of }5+\left[7\times2\times34\right]$

$= 120 + 3 \times 5 + 476 = 120 + 15 + 476$

$=120+\frac{15}{476}=120\frac{15}{476}$

$= 120.03$

6. (2) The given expression

$$=\frac{2.5\times3+7.5\div2.5-0.5\text{of}3}{47+12+1.5-6\text{of}2\times3}$$

$$=\frac{2.5\times3+7.5\times\frac{1}{2.5}-0.5\times3}{47+12\times\frac{1}{1.5}-6\times2\times3}$$

$$=\frac{7.5+3-1.5}{47+8-36}=\frac{9}{19}$$

7. (3)

$$\frac{17}{7+\frac{3}{4-\frac{11}{4}}}\times\frac{2021}{2193}+\left(\frac{85}{48}-\frac{15}{16}\right)+\frac{3}{4}\text{ of }\frac{3\frac{3}{2}}{\frac{5}{2}}$$

$$=\frac{17}{7+\frac{3}{\frac{16-11}{4}}}\times\frac{47}{51}+\left(\frac{85}{48}-\frac{15}{16}\right)+\frac{3}{4}\text{ of }\frac{3\frac{3}{4}}{\frac{5}{2}}$$

$$=\frac{17}{7+\frac{12}{5}}\times\frac{47}{51}+\left(\frac{85-45}{48}\right)$$

$$+\frac{3}{4}\times\frac{15}{4}\times\frac{2}{5}$$

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$$=\frac{17}{\frac{35+12}{5}}\times\frac{47}{51}+\frac{40}{48}+\frac{9}{8}$$

$$=\frac{17\times5}{47}\times\frac{47}{51}\times\frac{48}{40}+\frac{9}{8}$$

$$=2+1\frac{1}{8}=3\frac{1}{8}$$

8. (4) $\dfrac{\frac{16}{9}\text{ of }\frac{27}{64}}{\frac{11}{12}\times\frac{108}{11}}+\dfrac{\frac{32}{7}\text{ of }\frac{21}{160}}{\frac{17}{6}+\frac{32}{15}}$

$$=\frac{\frac{16}{9}\times\frac{27}{64}}{\frac{11}{12}\times\frac{108}{11}}+\frac{\frac{32}{7}\times\frac{21}{160}}{\frac{17}{6}\times\frac{15}{32}}$$

$$=\frac{\frac{3}{4}}{\frac{9}{1}}+\frac{\frac{3}{5}}{\frac{17\times5}{32\times2}}$$

$$=\frac{3}{4}\times\frac{1}{9}+\frac{3\times2\times32}{17\times5\times5}$$

$$=\frac{1}{4}\times\frac{1}{3}\times\frac{17\times5\times5}{3\times2\times32}=\frac{425}{2304}$$

9. (1)

$$\frac{\frac{43}{5}+\frac{31}{4}+\frac{17}{3}-\frac{9}{2}}{13-\frac{119}{10}+\frac{97}{9}-\frac{197}{20}}\text{ of }\frac{2}{11}\text{ of }365$$

$$=\frac{\frac{516+465+340-270}{60}}{\frac{2340-2142+1940-1773}{180}}\text{ of }\frac{2}{11}\times365$$

$$=\frac{\frac{1321-270}{60}}{\frac{4280-3915}{180}}\text{ of }\frac{2\times365}{11}$$

$$=\frac{\frac{1051}{60}}{\frac{365}{180}}\text{ of }\frac{2\times365}{11}$$

$$=\frac{1051}{60}\times\frac{180}{365}\times\frac{2\times365}{11}$$

$$=\frac{1051\times3\times2}{11}$$

$$=\frac{6306}{11}=573\frac{3}{11}$$

10. (1) $\dfrac{\frac{1}{8}\text{ of }\left(\frac{11-10}{110}\right)+\frac{\frac{1}{7}-\frac{1}{9}+\left(\frac{44+36}{99}\right)}{\frac{1}{7}+\frac{1}{9}+\left(\frac{44-36}{99}\right)}\times\frac{\frac{1}{3}+\frac{1}{7}+\left(\frac{9-7}{63}\right)}{\left(\frac{7+3}{21}\right)+\frac{1}{7}-\frac{1}{9}}}{}$

$$=\frac{1}{8}\text{of }\frac{1}{110}+\frac{\frac{1}{7}-\frac{1}{9}\times\frac{99}{80}}{\frac{1}{7}+\frac{1}{9}\times\frac{99}{8}}\times\frac{\frac{1}{3}+\frac{1}{7}\times\frac{63}{2}}{\frac{10}{21}\times\frac{7}{1}-\frac{1}{9}}$$

$$=\frac{1}{8}\text{ of }\frac{1}{110}+\frac{\frac{1}{7}-\frac{11}{80}}{\frac{1}{7}+\frac{11}{8}}\times\frac{\frac{1}{3}+\frac{9}{2}}{\frac{10}{3}-\frac{1}{9}}$$

$$=\frac{1}{8}\times\frac{1}{110}+\frac{\frac{80-77}{560}}{\frac{8177}{56}}\times\frac{\frac{2127}{6}}{\frac{30-1}{9}}$$

$$=\frac{1}{8}\times\frac{1}{110}\times\frac{850}{3}\times\frac{9}{6}=\frac{85}{176}$$

11. (2)

$$\frac{2\frac{4}{9}+3\frac{2}{3}\text{of}\frac{2}{5}\times\frac{3}{5}+1\frac{1}{9}}{1\frac{1}{9}\times\frac{3}{4}\text{of}1\frac{2}{5}+\frac{21}{38}-\frac{1}{3}}-\frac{5\frac{1}{2}-\frac{3}{4}}{2\frac{1}{5}\times1\frac{9}{11}}$$

$$=\frac{\frac{22}{9}+\frac{11}{3}\text{of}\frac{2}{5}\times\frac{3}{5}+\frac{10}{9}}{\frac{10}{9}\times\frac{3}{4}\text{of}\frac{7}{5}+\frac{21}{38}-\frac{1}{3}}-\frac{\frac{11}{2}-\frac{3}{4}}{\frac{11}{5}\times\frac{20}{11}}$$

$$=\frac{\frac{22}{9}+\frac{22}{15}\times\frac{3}{5}+\frac{10}{9}}{\frac{10}{9}\times\frac{21}{20}+\frac{21}{38}-\frac{1}{3}}-\frac{22-3}{4}$$

$$=\frac{\left(\frac{22}{9}\times\frac{15}{22}\right)\times\frac{3}{5}+\frac{10}{9}}{\frac{10}{9}\times\left(\frac{21}{20}\times\frac{38}{21}\right)-\frac{1}{3}}-\frac{19}{4}$$

$$=\frac{\frac{5}{3}\times\frac{3}{5}+\frac{10}{9}}{\frac{10}{9}\times\frac{19}{10}-\frac{1}{3}}-\frac{19}{4}\times\frac{1}{4}$$

$$=\frac{1+\frac{10}{9}}{\frac{19}{9}-\frac{1}{3}}-\frac{19}{16}=\frac{\frac{9+10}{9}}{\frac{19-3}{9}}-\frac{19}{16}$$

$$=\frac{\frac{19}{9}}{\frac{16}{9}}-\frac{19}{16}=\frac{19}{16}-\frac{19}{16}=0$$

12. (2)

$$\frac{\frac{5}{6}+\left(\frac{7}{8}\times\frac{4}{5}\right)+\left(\frac{3}{4}\times\frac{9}{10}\right)}{\frac{25}{3}-\left(\frac{4}{\frac{8-7}{8}}\text{ of }\frac{9}{4}\right)+\left(\frac{7}{9}\times12\right)}\text{ of }\frac{13}{2}+\frac{46}{9}$$

$$=\frac{\frac{5}{6}+\frac{7}{10}+\frac{27}{40}}{\frac{25}{3}-32\times\frac{9}{4}+\frac{28}{3}}\text{of }\frac{13}{2}+\frac{46}{9}$$

$$=\frac{\frac{5}{6}+\frac{7}{10}\times\frac{40}{27}}{\frac{25}{3}-32\times\frac{9}{4}\times\frac{3}{28}}\text{of }\frac{13}{2}+\frac{46}{9}$$

$$=\frac{\frac{5}{6}+\frac{28}{27}}{\frac{25}{3}-\frac{54}{7}}\text{of }\frac{13}{2}+\frac{46}{9}$$

$$=\frac{45+56}{\frac{54}{175-162}}\text{of }\frac{13}{2}+\frac{46}{9}$$

$$=\frac{101}{54}\times\frac{21}{13}\times\frac{13}{2}+\frac{46}{9}$$

$$=\frac{707}{36}+\frac{46}{9}=\frac{707+184}{36}$$

$$8\frac{91}{36}=24\frac{27}{36}=24\frac{3}{4}$$

13. (2) The given expression

$$\frac{\frac{2}{3}+\frac{3}{4}\text{of}\frac{5}{6}}{\frac{2}{3}+\frac{3}{4}\times\frac{5}{6}}+\frac{2+2\times2}{2+2\times2}+\frac{\frac{1}{2}+\frac{1}{2}\text{of}\frac{1}{2}}{\frac{1}{2}+\frac{1}{2}\text{of}\frac{1}{2}}$$

$$=\frac{\frac{2}{3}+\left(\frac{3}{4}\times\frac{5}{6}\right)}{\left(\frac{2}{3}\times\frac{4}{3}\right)\times\frac{5}{6}}+\frac{2+4}{\left(2\times\frac{1}{2}\right)\times2}+\frac{\frac{1}{2}+\left(\frac{1}{2}\times\frac{1}{2}\right)}{\frac{1}{2}+\frac{1}{2}\times\frac{1}{2}}$$

$$=\frac{\frac{2}{3}+\frac{5}{8}}{\frac{8}{9}\times\frac{5}{6}}+\frac{6}{2}+\frac{\frac{1}{2}+\frac{1}{4}}{\frac{1}{2}+\frac{1}{4}}$$

$$=\frac{\frac{2}{3}\times\frac{8}{5}}{\frac{20}{27}}+3+\frac{\frac{1}{2}\times4}{\frac{2+1}{4}}$$

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$$=\frac{16}{15}\times\frac{27}{20}+3+\frac{2}{\frac{3}{4}}$$

$$=\frac{36}{25}+3+\left(2\times\frac{4}{3}\right)$$

$$=\frac{36}{25}+3+\frac{8}{3}=\frac{36}{25}+3\times\frac{3}{8}$$

$$=\frac{288+225}{200}=\frac{513}{200}=2\frac{113}{200}=2.5$$

14. (3) The given expression

$$=\frac{5+25}{25+5}\times\frac{\frac{1}{5}+\left(\frac{1}{5}\times\frac{1}{5}\right)}{\left(\frac{1}{5}\times\frac{1}{5}\right)+\frac{1}{5}}\times\left(\frac{25-1}{5}\right)\times\frac{1}{\frac{46}{5}-\frac{3}{\frac{3-2}{3}}}$$

$$=\frac{30}{30}\times\frac{\frac{1}{5}+\frac{1}{25}}{\frac{1}{25}+\frac{1}{5}}\times\frac{24}{5}\times\frac{1}{\frac{46}{5}-\frac{3}{\frac{1}{3}}}$$

$$=\frac{\frac{1}{5}\times25}{\frac{1}{25}\times5}\times\frac{24}{5}\times\frac{1}{\frac{46}{5}-9}$$

$$=\frac{5}{\frac{1}{5}}\times\frac{24}{5}\times\frac{1}{\frac{46-45}{5}}$$

$$=5\times5\times\frac{24}{5}\times\frac{5}{1}=600$$

15. (2) It is a continued fraction. In such problems, we should start from the bottom and work upwards.
The given expression

$$=1+\frac{1}{1+\frac{1}{1+\frac{1}{9}}}=1+\frac{1}{1+\frac{1}{\frac{9+1}{9}}}$$

$$=1+\frac{1}{1+\frac{1}{\frac{10}{9}}}=1+\frac{1}{1+1\times\frac{9}{10}}$$

$$=1+\frac{1}{1+\frac{9}{10}}=1+\frac{1}{\frac{10+9}{10}}$$

$$=1+\frac{10}{19}=\frac{19+10}{19}=\frac{29}{19}=1\frac{10}{19}$$

16. (3) $7+\cfrac{2}{5+\cfrac{3}{4+\cfrac{2}{3+\frac{1}{4}}}}$

$$=7+\cfrac{2}{5+\cfrac{3}{4+\cfrac{2}{\frac{12+1}{4}}}}$$

$$=7+\cfrac{2}{5+\cfrac{3}{4+\frac{2\times4}{13}}}$$

$$=7+\cfrac{2}{5+\cfrac{3}{4+\frac{8}{13}}}$$

$$=7+\cfrac{2}{5+\frac{3}{\frac{52+8}{13}}}$$

$$=7+\frac{2}{5+3\times\frac{13}{60}}$$

$$=7+\frac{2}{5+\frac{13}{20}}=7+\frac{2}{\frac{100+13}{20}}$$

$$=7+\frac{2\times20}{113}$$

$$=7+\frac{40}{113}=7\frac{40}{113}$$

17. (1) The given expression

$$=7\frac{1}{2}-\left[2\frac{1}{4}+\left\{1\frac{1}{4}-\frac{1}{2}\left(1\frac{1}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

$$=\frac{15}{2}-\left[\frac{9}{4}+\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{3}{2}-\frac{1}{3}-\frac{1}{6}\right)\right\}\right]$$

$$=\frac{15}{2}-\left[\frac{9}{4}+\left\{\frac{5}{4}-\frac{1}{2}\left(\frac{9-2-1}{6}\right)\right\}\right]$$

$$=\frac{15}{2}-\left[\frac{9}{4}+\left\{\frac{5}{4}-\frac{1}{2}\times1\right\}\right]$$

$$=\frac{15}{2}-\left[\frac{9}{4}+\left\{\frac{5-2}{4}\right\}\right]$$

$$=\frac{15}{2}-\left[\frac{9}{4}+\frac{3}{4}\right]$$

$$=\frac{15}{2}-\left[\frac{9}{4}\times\frac{4}{3}\right]$$

$$=\frac{15}{2}-3=\frac{15-6}{2}=\frac{9}{2}=4\frac{1}{2}$$

18. (2) The given expression

$$=3+\left[(8-5)+\left\{(4-2)+\left(2+\frac{8}{13}\right)\right\}\right]$$

$$=3+\left[3+\left\{2+\left(\frac{26+8}{13}\right)\right\}\right]$$

$$=3+\left[3+\left\{2+\frac{34}{13}\right\}\right]$$

$$=3+\left[3+\left\{2\times\frac{13}{34}\right\}\right]$$

$$=3+\left[\frac{3\times34}{26}\right]=\frac{3\times26}{3\times34}=\frac{13}{17}$$

19. (3) The given expression

$$=5\frac{1}{2}-\left[2\frac{1}{3}+\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{2}{3}-\overline{\frac{1}{6}-\frac{1}{8}}\right)\right\}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}+\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{2}{3}-\overline{\frac{1}{6}-\frac{1}{8}}\right)\right\}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}+\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{2}{3}-\frac{4-3}{24}\right)\right\}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}+\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{2}{3}-\frac{1}{24}\right)\right\}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}+\left\{\frac{3}{4}-\frac{1}{2}\left(\frac{16-1}{24}\right)\right\}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}+\left\{\frac{3}{4}-\frac{1}{2}\times\frac{15}{24}\right\}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}+\left\{\frac{3}{4}-\frac{15}{48}\right\}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}+\left\{\frac{36-15}{48}\right\}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}+\frac{21}{48}\right]$$

$$=\frac{11}{2}-\left[\frac{7}{3}\times\frac{48}{21}\right]$$

$$=\frac{11}{2}-\frac{16}{3}=\frac{33-32}{6}=\frac{1}{6}$$

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4 POWER, INDICES AND SURDS

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. By how much does $\sqrt{12}+\sqrt{18}$ exceed $\sqrt{3}+\sqrt{2}$?

(1) $2(\sqrt{3}-\sqrt{2})$ (2) $2(\sqrt{3}+\sqrt{2})$

(3) $\sqrt{3}+2\sqrt{2}$ (4) $\sqrt{2}-4\sqrt{3}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The value of

$$\sqrt{5+2\sqrt{6}}-\frac{1}{\sqrt{5+2\sqrt{6}}}$$ is :

(1) $2\sqrt{2}$ (2) $2\sqrt{3}$

(3) $1+\sqrt{5}$ (4) $\sqrt{5}-1$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. The value of $\sqrt{2^4}+\sqrt[3]{64}+\sqrt[4]{2^8}$ is :

(1) 12 (2) 16

(3) 18 (4) 24

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

4. $2\sqrt[3]{32}-3\sqrt[3]{4}+\sqrt[3]{500}$ is equal to :

(1) $4\sqrt[3]{6}$ (2) $3\sqrt{24}$

(3) $6\sqrt[3]{4}$ (4) 916

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

5. $(\sqrt{8}-\sqrt{4}-\sqrt{2})$ equals :

(1) $2-\sqrt{2}$ (2) $\sqrt{2}-2$

(3) 2 (4) –2

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. $8^{2/3}$ is equal to :

(1) $5\frac{1}{2}$ (2) $21\frac{1}{3}$

(3) 4 (4) $3\frac{1}{3}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

7. The simplified form of $(16^{1/4}+16^{-1/4})$ is :

(1) 0 (2) $\frac{4097}{64}$

(3) 1 (4) $\frac{16}{4097}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

8. $16^{3/4}$ is equal to :

(1) $4\sqrt{2}$ (2) 8

(3) $2\sqrt{2}$ (4) 16

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

9. $(0.01024)^{1/5}$ is equal to :

(1) 4.0 (2) 0.04

(3) 0.4 (4) 0.00004

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

10. $(16^{0.16}\times 2^{0.36})$ is equal to

(1) 2 (2) 16

(3) 32 (4) 64

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

11. The value of $(256)^{0.16}\times(16)^{0.18}$ is :

(1) 4 (2) – 4

(3) 16 (4) 256

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

12. The value of

$$\frac{(243)^{0.13}\times(243)^{0.07}}{(7)^{0.25}\times(49)^{0.075}\times(343)^{0.2}}$$

(1) $\frac{3}{7}$ (2) $\frac{7}{3}$

(3) $1\frac{3}{7}$ (4) $2\frac{2}{7}$

(SSC CPO S.I. Exam. 12.01.2003

13. The value of :

$$\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$$ is

(1) 1 (2) 2

(3) 3 (4) 8

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

14. $\sqrt{\sqrt[3]{0.004096}}$ is equal to

(1) 4 (2) 0.4

(3) 0.04 (4) 0.004

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

15. The approximate value of

$$\frac{3\sqrt{12}}{2\sqrt{28}}+\frac{2\sqrt{21}}{\sqrt{98}}$$ is

(1) 1.0727 (2) 1.0606

(3) 1.6026 (4) 1.6007

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

16. The value of

$2+\sqrt{0.09}-\sqrt[3]{0.008}-75\%$ of 2.80 is :

(1) 0 (2) 0.01

(3) –1 (4) 0.001

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

17. The value of

$$(\sqrt[3]{3.5}+\sqrt[3]{2.5})\left\{(\sqrt[3]{3.5})^2-\sqrt[3]{8.75}+(\sqrt[3]{2.5})^2\right\}$$

is :

(1) 5.375 (2) 1

(3) 6 (4) 5

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

18. The value of

$(3+2\sqrt{2})^{-3}+(3-2\sqrt{2})^{-3}$ is

(1) 189 (2) 180

(3) 108 (4) 198

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

19. $\frac{\sqrt{5}}{\sqrt{3}+\sqrt{2}}-\frac{3\sqrt{3}}{\sqrt{5}+\sqrt{2}}+\frac{2\sqrt{2}}{\sqrt{5}+\sqrt{3}}$ is equal to :

(1) 0 (2) $2\sqrt{15}$

(3) $2\sqrt{10}$ (4) $2\sqrt{6}$

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting

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20. When $(4+\sqrt{7})$ is presented in the form of perfect square it will be equal to

(1) $(2+\sqrt{7})^2$ (2) $\left(\frac{\sqrt{7}}{2}+\frac{1}{2}\right)^2$

(3) $\left\{\frac{1}{\sqrt{2}}(\sqrt{7}+1)\right\}^2$ (4) $\left(\sqrt{3}+\sqrt{4}\right)^2$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

21. The value of

$$\frac{1}{\sqrt{3.25}+\sqrt{2.25}}+\frac{1}{\sqrt{4.25}+\sqrt{3.25}}+\frac{1}{\sqrt{5.25}+\sqrt{4.25}}+\frac{1}{\sqrt{6.25}+\sqrt{5.25}}$$ is

(1) 1.00 (2) 1.25
(3) 1.50 (4) 2.25

(SSC CPO S.I. Exam. 05.09.2004)

22. The simplified form of

$$\frac{2}{\sqrt{7}+\sqrt{5}}+\frac{7}{\sqrt{12}-\sqrt{5}}-\frac{5}{\sqrt{12}-\sqrt{7}}$$

is :

(1) 5 (2) 2
(3) 1 (4) 0

(SSC CPO S.I. Exam. 26.05.2005)

23. $\left(\frac{1}{2}\right)^{\frac{1}{2}}$ is equal to

(1) $\frac{1}{\sqrt{2}}$ (2) $2\sqrt{2}$

(3) $-\sqrt{2}$ (4) $\sqrt{2}$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005 & SSC HSL DEO & LDC Exam. 28.11.2010)

24. $\frac{1}{\sqrt{3}+\sqrt{4}}+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}+\frac{1}{\sqrt{7}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{9}}$ is equal to

(1) $\sqrt{3}$ (2) $3\sqrt{3}$

(3) $3-\sqrt{3}$ (4) $5-\sqrt{3}$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

25. $(16)^{0.16}\times(16)^{0.04}\times(2)^{0.2}$ is equal to :

(1) 1 (2) 2
(3) 4 (4) 16

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

26. $\frac{12}{3+\sqrt{5}+2\sqrt{2}}$ is equal to

(1) $1-\sqrt{5}+\sqrt{2}+\sqrt{10}$

(2) $1+\sqrt{5}+\sqrt{2}-\sqrt{10}$

(3) $1+\sqrt{5}-\sqrt{2}+\sqrt{10}$

(4) $1-\sqrt{5}-\sqrt{2}+\sqrt{10}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

27. $\left(3+\frac{1}{\sqrt{3}}+\frac{1}{3+\sqrt{3}}+\frac{1}{\sqrt{3}-3}\right)$ is equal to

(1) 1 (2) 3
(3) $3+\sqrt{3}$ (4) $3-\sqrt{3}$

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & SSC CGL Tier-I Exam. 19.06.2011 (IInd Sitting) & SSC (10+2) DEO & LDC Exam. 20.10.2013)

28. $\sqrt{8-2\sqrt{15}}$ is equal to :

(1) $\sqrt{5}+\sqrt{3}$ (2) $5-\sqrt{3}$

(3) $\sqrt{5}-\sqrt{3}$ (4) $3-\sqrt{5}$

(SSC CPO S.I. Exam. 16.12.2007)

29. $(0.04)^{-(1.5)}$ is equal to

(1) 25 (2) 125
(3) 60 (4) 5

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

30. The value of

$\sqrt[3]{1372}\times\sqrt[3]{1458}+\sqrt[3]{343}$ is

(1) 18 (2) 15
(3) 13 (4) 12

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

31. $\left(\frac{2}{\sqrt{5}+\sqrt{3}}-\frac{3}{\sqrt{6}-\sqrt{3}}+\frac{1}{\sqrt{6}+\sqrt{5}}\right)$ is equal to

(1) $2\sqrt{6}$ (2) $2\sqrt{5}$

(3) $2\sqrt{3}$ (4) 0

(SSC CPO S.I. Exam. 09.11.2008)

32. $\frac{1}{3-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-2}=$

(1) 5 (2) 4
(3) 3 (4) 2

(SSC CPO S.I.Exam. 06.09.2009) & SSC MTS (Non-Tech.) Exam. 20.02.2011)

33. $\frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}$ is equal to

(1) $5+2\sqrt{6}$ (2) $\frac{3+2\sqrt{6}}{2}$

(3) $5-2\sqrt{3}$ (4) $5+2\sqrt{3}$

(SSC CISF ASI Exam 29.08.2010 (Paper-1)

34. The value of

$\frac{2+\sqrt{3}}{2-\sqrt{3}}+\frac{2-\sqrt{3}}{2+\sqrt{3}}+\frac{\sqrt{3}+1}{\sqrt{3}-1}$ is

(1) $16+\sqrt{3}$ (2) $4-\sqrt{3}$

(3) $2-\sqrt{3}$ (4) $2+\sqrt{3}$

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

35. The square root of $14+6\sqrt{5}$ is

(1) $2+\sqrt{5}$ (2) $3+\sqrt{5}$

(3) $5+\sqrt{3}$ (4) $3+2\sqrt{5}$

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

36. The value of

$\frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}}-\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}+\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$ is

(1) 4 (2) 0

(3) $\sqrt{2}$ (4) $3\sqrt{6}$

(SSC CGL Prelim Exam. 11.05.2003 (IInd Sitting) & SSC CPO S.I. 16.12.2007 & SSC CGL 27.07.2008 (Ist Sitting) & SSC CGL Tier-I Exam. 26.06.2011 (Ist Sitting) & SSC CGL Tier-II Exam. 29.09.2013)

37. Simplify : $\left(\frac{\frac{3}{2+\sqrt{3}}-\frac{2}{2-\sqrt{3}}}{2-5\sqrt{3}}\right)$

(1) $\frac{1}{2}-5\sqrt{3}$ (2) $2-5\sqrt{3}$

(3) 1 (4) 0

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

38. $(64)^{-\frac{2}{3}}\times\left(\frac{1}{4}\right)^{-2}$ is equal to :

(1) 1 (2) 2

(3) $\frac{1}{2}$ (4) $\frac{1}{16}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

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39. $\left(\frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}}+\frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}\right)$ simplifies to :

(1) $\sqrt{5}+\sqrt{6}$ (2) $2\sqrt{5}+\sqrt{6}$

(3) $\sqrt{5}-\sqrt{6}$ (4) $2\sqrt{5}-3\sqrt{6}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

40. $\left(\frac{2+\sqrt{3}}{2-\sqrt{3}}+\frac{2-\sqrt{3}}{2+\sqrt{3}}+\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$ simplifies to :

(1) $2-\sqrt{3}$ (2) $2+\sqrt{3}$

(3) $16-\sqrt{3}$ (4) $40-\sqrt{3}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

41. $\left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right)^2+\left(\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)^2$ is equal to :

(1) 64 (2) 62

(3) 66 (4) 68

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

42. The value of $\sqrt{\frac{(\sqrt{12}-\sqrt{8})(\sqrt{3}+\sqrt{2})}{5+\sqrt{24}}}$ is :

(1) $\sqrt{6}-\sqrt{2}$ (2) $\sqrt{6}+\sqrt{2}$

(3) $\sqrt{6}-2$ (4) $2-\sqrt{6}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

43. Simplify :

$$\left[64^{\frac{2}{3}}\times 2^{-2}+8^0\right]^{\frac{1}{2}}$$

(1) 0 (2) 1

(3) 2 (4) $\frac{1}{2}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

44. The value of

$$\frac{1}{\sqrt{(12-\sqrt{140})}}-\frac{1}{\sqrt{(8-\sqrt{60})}}-\frac{2}{\sqrt{10+\sqrt{84}}}$$

is :

(1) 0 (2) 1

(3) 2 (4) 3

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & SSC CGL Exam. 13.11.2005 (IInd Sitting)

45. The value of

$$\sqrt{11+2\sqrt{30}}-\frac{1}{\sqrt{11+2\sqrt{30}}}$$ is

(1) $2\sqrt{5}$ (2) $2\sqrt{6}$

(3) $1+\sqrt{6}$ (4) $1+\sqrt{5}$

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

46. The value of $(243)^{0.16}\times(243)^{0.04}$ is equal to :

(1) 0.16 (2) 3

(3) $\frac{1}{3}$ (4) 0.04

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

47. $\frac{3^0+3^{-1}}{3^{-1}-3^0}$ is simplified to

(1) –2 (2) –1

(3) 1 (4) 2

(SSC CPO S.I. Exam. 05.09.2004)

48. Simplify

$$\frac{1}{\sqrt{100}-\sqrt{99}}-\frac{1}{\sqrt{99}-\sqrt{98}}+\frac{1}{\sqrt{98}-\sqrt{97}}-\frac{1}{\sqrt{97}-\sqrt{96}}+\ldots.+\frac{1}{\sqrt{2}-\sqrt{1}}$$

(1) 0 (2) 9

(3) 10 (4) 11

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

49. $\left[\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}+\frac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}\right]$ in simplified form equals to :

(1) 1 (2) $\sqrt{2}$

(3) $\frac{1}{\sqrt{2}}$ (4) 0

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

50. $\left[\sqrt[3]{2}\times\sqrt{2}\times\sqrt[3]{3}\times\sqrt{3}\right]$ is equal to

(1) 6^5 (2) $6^{5/6}$

(3) 6

(4) None of these

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

51. The value of $(256)^{0.16}\times(256)^{0.09}$ is :

(1) 256.25 (2) 64

(3) 16 (4) 4

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

52. $\left[8-\left(\frac{4^{\frac{9}{4}}\sqrt{2\cdot2^2}}{2\sqrt{2^{-2}}}\right)^{\frac{1}{2}}\right]$ is equal to

(1) 32 (2) 8

(3) 1 (4) 0

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

53. $\frac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}}-\frac{2\sqrt{6}}{\sqrt{3}+1}+\frac{2\sqrt{3}}{\sqrt{6}+2}$ is equal to

(1) 3 (2) 2

(3) 0 (4) $\sqrt{3}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

54. $(4)^{0.5}\times(0.5)^4$ is equal to :

(1) 1 (2) 4

(3) $\frac{1}{8}$ (4) $\frac{1}{32}$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

55. $\left[\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}-\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}\right]$ simplifies to

(1) $2\sqrt{6}$ (2) $4\sqrt{6}$

(3) $2\sqrt{3}$ (4) $3\sqrt{2}$

(SSC CGL Prelim Exam. 27.07.2006 (First Sitting)

56. The value of $\sqrt{40+\sqrt{9\sqrt{81}}}$ is

(1) $\sqrt{111}$ (2) 9

(3) 7 (4) 11

(SSC CHSL DEO & LDC Exam. 20.10.2013)

57. $\frac{1}{\sqrt{9}-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-\sqrt{4}}$ is equal to

(1) 5 (2) 1

(3) 3 (4) 0

(SSC CGL Prelim Exam. 27.07.2006 (Second Sitting)

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56. Simplified form of $\left[\left(\sqrt[3]{x^{-3/5}}\right)^{-5/3}\right]^{5}$ is

(1) x^5 (2) x^{-5}

(3) x (4) $\frac{1}{x}$

(SSC CGL Tier-I Exam. 16.06.2010 (Second Sitting)

59. $\left[\frac{\sqrt{3}+1}{\sqrt{3}-1}+\frac{\sqrt{2}+1}{\sqrt{2}-1}+\frac{\sqrt{3}-1}{\sqrt{3}+1}+\frac{\sqrt{2}-1}{\sqrt{2}+1}\right]$ is simplified to

(1) 10 (2) 12

(3) 14 (4) 18

(SSC (South Zone) Investigator Exam. 12.09.2010)

60. $\frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{12}-\sqrt{32}+\sqrt{50}}$ is equal to

(1) 3 (2) $\sqrt{3}$

(3) $3\sqrt{2}$ (4) $2\sqrt{3}$

(SSC (South Zone) Investigator Exam. 12.09.2010)

61. $\left(\frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}}+\frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}\right)$ simplifies to

(1) $\sqrt{5}+\sqrt{6}$ (2) $2\sqrt{5}+\sqrt{6}$

(3) $\sqrt{5}-\sqrt{6}$ (4) $2\sqrt{5}-3\sqrt{6}$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

62. When simplified equal to $(256)^{-\left(4^{-\frac{3}{2}}\right)}$ is

(1) 8 (2) $\frac{1}{8}$

(3) 2 (4) $\frac{1}{2}$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

63. $\left\{(-2)^{(-2)}\right\}^{(-2)}$ is equal to :

(1) 16 (2) 8

(3) –8 (4) –1

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

64. $\left(\sqrt{2}+\sqrt{7-2\sqrt{10}}\right)$ is equal to

(1) $\sqrt{2}$ (2) $\sqrt{7}$

(3) $\sqrt{5}$ (4) $2\sqrt{5}$

(SSC Data Entry Operator Exam. 31.08.2008)

65. $(256)^{0.16} \times (4)^{0.36}$ is equal to

(1) 64 (2) 16

(3) 256.25 (4) 4

(SSC Data Entry Operator Exam. 02.08.2009)

66. By how much does $5\sqrt{7}-2\sqrt{5}$ exceed $3\sqrt{7}-4\sqrt{5}$?

(1) $5\left(\sqrt{7}+\sqrt{5}\right)$ (2) $\sqrt{7}+\sqrt{5}$

(3) $2\left(\sqrt{7}+\sqrt{5}\right)$ (4) $7\left(\sqrt{2}+\sqrt{5}\right)$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

67. $\frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}}+\frac{\sqrt{7}+\sqrt{5}}{\sqrt{7}-\sqrt{5}}$ is equal to :

(1) 12 (2) $6\sqrt{35}$

(3) 6 (4) $2\sqrt{35}$

(SSC HSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

68. $\left(\frac{2}{\sqrt{6}+2}+\frac{1}{\sqrt{7}+\sqrt{6}}+\frac{1}{\sqrt{8}-\sqrt{7}}+2-2\sqrt{2}\right)$ is equal to

(1) 0 (2) $2\sqrt{2}$

(3) $\sqrt{6}$ (4) $2\sqrt{7}$

(SSC HSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

69. By how much does $\left(\sqrt{12}+\sqrt{18}\right)$ exceed $\left(2\sqrt{3}+2\sqrt{2}\right)$?

(1) 2 (2) $\sqrt{3}$

(3) $\sqrt{2}$ (4) 3

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

70. The value of $\frac{1}{\sqrt{2}+1}+\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{\sqrt{4}+\sqrt{3}}+....+\frac{1}{\sqrt{100}+\sqrt{99}}$ is

(1) 1 (2) 9

(3) $\sqrt{99}$ (4) $\sqrt{99}-1$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

71. $\left[\left\{\left(-\frac{1}{2}\right)^2\right\}^{-2}\right]^{-1}$ is equal to :

(1) $\frac{1}{16}$ (2) 16

(3) $-\frac{1}{16}$ (4) –16

(SSC HSL DEO & LDC Exam. 27.11.2010)

72. $2\sqrt[3]{40}-4\sqrt[3]{320}+3\sqrt[3]{625}-3\sqrt[3]{5}$ is equal to

(1) $-2\sqrt[3]{340}$ (2) 0

(3) $\sqrt[3]{340}$ (4) $\sqrt[3]{660}$

(SSC CGL Tier-II Exam.16.09.2012)

73. The value of $\sqrt[3]{0.000125}$ is

(1) 0.005 (2) 0.05

(3) 0.5 (4) 0.0005

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

74. $\frac{0.3555\times0.5555\times2.025}{0.225\times1.7775\times0.2222}$ is equal to

(1) 5.4 (2) 4.58

(3) 4.5 (4) 5.45

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

75. The simplification of $\frac{0.06\times0.06\times0.06-0.05\times0.05\times0.05}{0.06\times0.06+0.06\times0.05+0.05\times0.05}$ gives :

(1) 0.01 (2) 0.001

(3) 0.1 (4) 0.02

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

76. Simplify :

$\frac{0.05\times0.05\times0.05-0.04\times0.04\times0.04}{0.05\times0.05+0.002+0.04\times0.04}$

(1) 1 (2) 0.1

(3) 0.01 (4) 0.001

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

77. If $\frac{\left(x-\sqrt{24}\right)\left(\sqrt{75}+\sqrt{50}\right)}{\sqrt{75}-\sqrt{50}}=1$, then the value of x is

(1) $\sqrt{5}$ (2) 5

(3) $2\sqrt{5}$ (4) $3\sqrt{5}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

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78. Evaluate

$$\sqrt{20}+\sqrt{12}+\sqrt[3]{729}-\frac{4}{\sqrt{5}-\sqrt{3}}-\sqrt{81}$$

(1) $\sqrt{2}$ (2) $\sqrt{3}$

(3) 0 (4) $2\sqrt{2}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

79. Let

$$a=\frac{1}{2-\sqrt{3}}+\frac{1}{3-\sqrt{8}}+\frac{1}{4-\sqrt{15}}.$$

Then we have

(1) $a < 18$ but $a \neq 9$

(2) $a > 18$

(3) $a = 18$

(4) $a = 9$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

80. If a, b are rationals and

$$a\sqrt{2}+b\sqrt{3} = \sqrt{98} + \sqrt{108}-\sqrt{48}-\sqrt{72}$$

then the values of a, b are respectively

(1) 1, 2 (2) 1, 3

(3) 2, 1 (4) 2, 3

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

81. Let $\sqrt[3]{a}=\sqrt[3]{26}+\sqrt[3]{7}+\sqrt[3]{63}$.

Then

(1) $a < 729$ but $a > 216$

(2) $a < 216$

(3) $a > 729$

(4) $a = 729$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

82. The value of

$$\frac{\sqrt{72}\times\sqrt{363}\times\sqrt{175}}{\sqrt{32}\times\sqrt{147}\times\sqrt{252}}$$ is

(1) $\frac{55}{42}$ (2) $\frac{45}{56}$

(3) $\frac{45}{28}$ (4) $\frac{55}{28}$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

83. Simplify :

$$\frac{5.32\times56+5.32\times44}{(7.66)^2-(2.34)^2}$$

(1) 7.2 (2) 8.5

(3) 10 (4) 12

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC SO Commercial Audit Exam. 16.11.2003)

84. $2+\frac{6}{\sqrt{3}}+\frac{1}{2+\sqrt{3}}+\frac{1}{\sqrt{3}-2}$

equals to

(1) $+\left(2\sqrt{3}\right)$ (2) $-\left(2+\sqrt{3}\right)$

(3) 1 (4) 2

(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

85. If $\frac{4+3\sqrt{3}}{\sqrt{7+4\sqrt{3}}}=A+\sqrt{B}$, then B − A is

(1) −13 (2) $2\sqrt{13}$

(3) 13 (4) $3\sqrt{3}-\sqrt{7}$

(SSC CGL Tier-I Exam. 21.04.2013 IInd Sitting)

86. Find the simplest value of $2\sqrt{50}+\sqrt{18}-\sqrt{72}$ (given $\sqrt{2}$ = 1.414).

(1) 4.242 (2) 9.898

(3) 10.312 (4) 8.484

(SSC CGL Tier-I Exam. 19.05.2013 Ist Sitting)

87. (6.5 × 6.5 − 45.5 + 3.5 × 3.5) is equal to :

(1) 10 (2) 9

(3) 7 (4) 6

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

88. (7.5 × 7.5 + 37.5 + 2.5 × 2.5) is equal to :

(1) 100 (2) 80

(3) 60 (4) 30

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

89. Simplify :

$$\frac{(1.5)^3+(4.7)^3+(3.8)^3-3\times1.5\times4.7\times3.8}{(1.5)^2+(4.7)^2+(3.8)^2-1.5\times4.7-4.7\times3.8-3.8\times1.5}$$

(1) 0 (2) 1

(3) 10 (4) 30

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

90. Simplify :

$$\frac{(6.25)^{\frac{1}{2}}\times(0.0144)^{\frac{1}{2}}+1}{(0.027)^{\frac{1}{3}}\times(81)^{\frac{1}{4}}}$$

(1) 0.14 (2) 1.4

(3) 1 (4) $1.\overline{4}$

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005)

91. Simplify :

$$\frac{0.41\times0.41\times0.41+0.69\times0.69\times0.69}{0.41\times0.41-0.41\times0.69+0.69+0.69}$$

(1) 0.28 (2) 1.1

(3) 11 (4) 2.8

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

92. $\frac{10.3\times10.3\times10.3+1}{10.3\times10.3-10.3+1}$ is equal to :

(1) 9.3 (2) 10.3

(3) 11.3 (4) 12.3

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

93. $\frac{1.49\times14.9-0.51\times5.1}{14.9-5.1}$ is equal to :

(1) 0.20 (2) 20.00

(3) 2.00 (4) 22.00

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

94. $(0.04)^{-1.5}$ on simplification gives :

(1) 25 (2) 125

(3) 250 (4) 625

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

95. $\frac{(0.96)^3-(0.1)^3}{(0.96)^2+0.096+(0.1)^2}$ is simplified to :

(1) 1.06 (2) 0.95

(3) 0.86 (4) 0.97

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting

96. The value of $\frac{64-0.008}{16+0.8+0.04}$ is :

(1) 2 (2) 3.8

(3) 0.6 (4) 4.2

(SSC CGL Prelim Exam. 08.02.200 (First Sitting

97. The value of

$$\frac{0.796\times0.796-0.204\times0.204}{0.796-0.204}$$ is

(1) 0.408 (2) 0.59

(3) 0.592 (4) 1

(SSC CPO S.I. Exam. 26.05.200

98. $\frac{(2.3)^3+0.027}{(2.3)^2-0.69+0.09}$ is equal t

(1) 2.60 (2) 2.00

(3) 2.33 (4) 2.80

(SSC CPO S.I. Exam. 26.05.200

99. The value of

$$\frac{5.71\times5.71\times5.71-2.79\times2.79\times2.79}{5.71\times5.71+5.71\times2.79+2.79\times2.79}$$

in simplified form is :

(1) 8.5 (2) 8.6
(3) 2.82 (4) 2.92

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

100. The value of

$$\frac{(1.5)^3+(4.7)^3+(3.8)^3-3\times1.5\times4.7\times3.8}{(1.5)^2+(4.7)^2+(3.8)^2-1.5\times4.7-4.7\times3.8-3.8\times1.5}$$ is :

(1) 0 (2) 1
(3) 10 (4) 30

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

101.

$$\left[\frac{(0.73)^3+(0.27)^3}{(0.73)^2+(0.27)^2-(0.73)\times(0.27)}\right]$$

simplifies to

(1) 1 (2) 0.4087
(3) 0.73 (4) 0.27

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

102. $0.75 \times 7.5 - 2 \times 7.5 \times 0.25 + 0.25 \times 2.5$ is equal to

(1) 250 2) 2500
(3) 2.5 (4) 25

(SSC CPO S.I. Exam. 03.09.2006)

103. $\left(\frac{1}{14}+\frac{1}{4.7}+\frac{1}{7.10}+\frac{1}{10.13}+\frac{1}{13.16}\right)$ is equal to

(1) $\frac{1}{3}$ (2) $\frac{5}{16}$
(3) $\frac{3}{8}$ (4) $\frac{41}{7280}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

104. $\frac{137\times137+133\times133+18221}{137\times137\times137-133\times133\times133}$ is equal to

(1) 4 (2) 270
(3) $\frac{1}{4}$ (4) $\frac{1}{270}$

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (SSC CGL Prelim Exam. 27.07.2006) & (SSC DEO Exam. 31.06.2006)

105.

$$\left(\frac{2.75\times2.75\times2.75-2.25\times2.25\times2.25}{2.75\times2.75+2.75\times2.25+2.25\times2.25}\right)$$

is equal to :

(1) – 5 (2) 0.5
(3) –0.5 (4) 5

(SSC CPO S.I. Exam. 16.12.2007)

106.

$$\frac{(5624)^3+(4376)^3}{5624\times5624-(5624\times4376)+4376\times4376}$$

is equal to

(1) 10 (2) 1.248
(3) 20.44 (4) 1

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

107. The value of

$$\left[\frac{(0.337+0.126)^2-(0.337-0.126)^2}{0.337\times0.126}\right]$$

is

(1) 4 (2) 0.211
(2) 0.463 (4) 0.4246

(SSC CPO S.I. Exam. 06.09.2009)

108. $\frac{256\times256-144\times144}{112}$ is equal to

(1) 420 (2) 400
(3) 360 (4) 320

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

109. $[8.7 \times 8.7 + 2 \times 8.7 \times 1.3 + 1.3 \times 1.3]$ is equal to

(1) 1.69 (2) 10
(3) 75.69 (4) 100

(SSC (South Zone) Investigator Exam. 12.09.2010)

110. $\frac{(3.06)^3-(1.98)^3}{(3.06)^2+3.06\times1.98+(1.98)^2}$

is equal to

(1) 1.08 (2) 5.04
(3) 2.16 (4) 1.92

(SSC (South Zone) Investigator Exam. 12.09.2010)

111. $\frac{3.25\times3.25+1.75\times1.75-2\times3.25\times1.75}{3.25\times3.25-1.75\times1.75}$ is simplified to

(1) 0.5 (2) 0.4
(3) 0.3 (4) 0.2

(SSC CPO Sub-Inspector Exam. 12.12.2010 (Paper-I)

112. $\frac{(0.05)^2+(0.41)^2+(0.073)^2}{(0.005)^2+(0.041)^2+(0.0073)^2}$ is

(1) 10 (2) 100
(3) 1000 (4) None of these

(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

113. $\frac{2.3\times2.3\times2.3-1}{2.3\times2.3+2.3+1}$ is equal to

(1) 1.3 (2) 3.3
(3) 0.3 (4) 2.2

(SSC CPO S.I. Exam. 07.09.2003)

114. Find the value of :

$(0.98)^3+(0.02)^3+3\times0.98\times0.02-1$

(1) 1.98 (2) 1.09
(3) 1 (4) 0

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

115.

$$\frac{0.08\times0.08\times0.08+0.02\times0.02\times0.02}{0.08\times0.08-0.0016+0.02\times0.02}$$ is simplified to :

(1) 0.001 (2) 0.1
(3) 0.0016 (4) 0.016

(SSC CHSL DEO & LDC Exam. 27.11.2010)

116. The value of $0.65 \times 0.65 + 0.35 \times 0.35 + 0.70 \times 0.65$ is

(1) 1.75 (2) 1.00
(3) 1.65 (4) 1.55

(SSC Constable (GD) Exam. 12.05.2013 1st Sitting)

117. $(2.4 \times 10^3) \div (8 \times 10^{-2})$ equals

(1) 3×10^5 (2) 3×10^4
(3) 3×10^{-5} (4) 30

(SSC CPO S.I. Exam. 12.01.2003)

118. $[3 - 4(3 - 4)^{-1}]^{-1}$ is equal to :

(1) 7 (2) –7
(3) $\frac{1}{7}$ (4) $-\frac{1}{7}$

(SSC CPO S.I.Exam. 26.05.2005)

119. $\frac{(998)^2-(997)^2-45}{(98)^2-(97)^2}$ equals

(1) 1995 (2) 195
(3) 95 (4) 10

(SSC CGL Prelim Exam. 27.07.2006 (First Sitting)

120. Evaluate : $\frac{\sqrt{24}+\sqrt{6}}{\sqrt{24}-\sqrt{6}}$.

(1) 2 (2) 3
(3) 4 (4) 5

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 EPO)

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121. $55^3 + 17^3 - 72^3 + 201960$ is equal to

(1) –1 (2) 0
(3) 1 (4) 17

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

122. What is the value of

$$\frac{2.75\times2.75\times2.75-2.25\times2.25\times2.25}{2.75\times2.75+2.75\times2.25+2.25\times2.25}$$ is

(1) 3 (2) $\frac{3}{2}$

(3) 1 (4) $\frac{1}{2}$

(SSC CGL Tier-I Exam. 26.10.2014)

123. The value of $\frac{(243)^{\frac{n}{5}}\times3^{2n+1}}{9^n\times3^{n-1}}$ is

(1) 3 (2) 9
(3) 6 (4) 12

(SSC CGL Tier-I Exam. 26.10.2014

124. The simplified value of

$(\sqrt{3}+1)(10+\sqrt{12})(\sqrt{12}-2)(5-\sqrt{3})$ is

(1) 16 (2) 88
(3) 176 (4) 132

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

125. The simplified value of $(0.2)^3 \times 200 \div 2000$ of $(0.2)^2$ is

(1) $\frac{1}{100}$ (2) $\frac{1}{50}$

(3) $\frac{1}{10}$ (4) 1

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

126. The simplified value of

$$\left(\sqrt{6}+\sqrt{10}-\sqrt{21}-\sqrt{35}\right)\left(\sqrt{6}-\sqrt{10}+\sqrt{21}-\sqrt{35}\right)$$ is

(1) 13 (2) 12
(3) 11 (4) 10

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

127. The value of

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}+\frac{1}{\sqrt{7}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{9}}$$ is

(1) 2 (2) 0
(3) 4 (4) 1

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

128. The value of

$$\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-2}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{3-\sqrt{8}}$$ is

(1) 7 (2) 0
(3) 1 (4) 5

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

129. If $2+x\sqrt{3}=\frac{1}{2+\sqrt{3}}$, then the simplest vlaue of x is

(1) – 1 (2) 1
(3) – 2 (4) 2

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

130. The value of :

$$\sqrt{\frac{0.324\times0.081\times4.624}{1.5625\times0.0289\times72.9\times64}}$$ is

(1) 2.4 (2) 24
(3) 0.024 (4) 0.24

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

131. If $\frac{\sqrt{7}-1}{\sqrt{7}+1}-\frac{\sqrt{7}+1}{\sqrt{7}-1}=a+\sqrt{7}\,b$, then the values of a and b are respectively

(1) $\sqrt{7}$, –1 (2) $\sqrt{7}$, 1

(3) 0, $-\frac{2}{3}$ (4) $-\frac{2}{3}$, 0

(SSC CGL Tier-I Re-Exam, 30.06.2015)

132. The value of

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\ldots\ldots+\frac{1}{\sqrt{8}+\sqrt{9}}$$ is

(1) 1 (2) 0
(3) 2 (4) $\sqrt{2}$

(SSC CGL Tier-I Re-Exam, 30.06.2015)

133. If $\frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}}=\sqrt{3}$, then $a : b$ is equal to

(1) 2 : $\sqrt{3}$ (2) $\sqrt{3}$: 4

(3) $\sqrt{3}$: 2 (4) 4 : $\sqrt{3}$

(SSC CGL Tier-I Re-Exam, 30.06.2015)

134. The value of

$$\frac{(75.8)^2-(35.8)^2}{40}$$ is

(1) 121.6 (2) 40
(3) 160 (4) 111.6

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

135. The value of

$$\frac{(0.67\times0.67\times0.67)-(0.33\times0.33\times0.33)}{(0.67\times0.67)-(0.67\times0.33)-(0.33\times0.33)}$$ is

(1) 11 (2) 1.1
(3) 3.4 (4) 0.34

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099665)

136. The value of $\frac{1}{1+\sqrt{2}+\sqrt{3}}+\frac{1}{1-\sqrt{2}+\sqrt{3}}$ is :

(1) $\sqrt{2}$ (2) $\sqrt{3}$

(3) 1 (4) $4\left(\sqrt{3}+\sqrt{2}\right)$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375233)

137. If $a=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and $b=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, then the value of $\frac{a^2}{b}+\frac{b^2}{a}$ is :

(1) 1030 (2) 1025
(3) 970 (4) 930

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

138. If $1^3+2^3+\ldots\ldots+10^3=3025$, then the value of $2^3+4^3+\ldots\ldots+20^3$ is :

(1) 7590 (2) 5060
(3) 24200 (4) 12100

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

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TYPE–II

1. Which one of the following is the least?

$\sqrt{3}, \sqrt[3]{2}, \sqrt{2}$ and $\sqrt[3]{4}$

(1) $\sqrt{2}$ (2) $\sqrt[3]{4}$

(3) $\sqrt{3}$ (4) $\sqrt[3]{2}$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. Which of the following is the biggest ?

$\sqrt[3]{4}, \sqrt[4]{6}, \sqrt[6]{15}$, and $\sqrt[12]{245}$,

(1) $\sqrt[3]{4}$ (2) $\sqrt[4]{6}$

(3) $\sqrt[6]{15}$ (4) $\sqrt[12]{245}$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Which of the following number is the least?

$(0.5)^2, \sqrt{0.49}, \sqrt[3]{0.008}$, 0.23

(1) $(0.5)^2$ (2) $\sqrt{0.49}$

(3) $\sqrt[3]{0.008}$ (4) 0.23

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. Arrange the following in descending order : $\sqrt[3]{4}$. $\sqrt{2}$. $\sqrt[6]{3}$. $\sqrt[4]{5}$

(1) $\sqrt[3]{4} > \sqrt[4]{5} > \sqrt{2} > \sqrt[6]{3}$

(2) $\sqrt[4]{5} > \sqrt[3]{4} > \sqrt[6]{3} > \sqrt{2}$

(3) $\sqrt{2} > \sqrt[6]{3} > \sqrt[3]{4} > \sqrt[4]{5}$

(4) $\sqrt[6]{3} > \sqrt[4]{5} > \sqrt[3]{4} > \sqrt{2}$

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

5. The greatest of the numbers $(2.89)^{0.5}$, $2-(0.5)^2$,

$1+\dfrac{0.5}{1-\dfrac{1}{2}}$, $\sqrt{3}$ is :

(1) $(2.89)^{0.5}$ (2) $2-(0.5)^2$

(3) $1+\dfrac{0.5}{1-\dfrac{1}{2}}$ (4) $\sqrt{3}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

6. Among $\sqrt{2}, \sqrt[3]{3}, \sqrt[4]{5}, \sqrt[3]{2}$ which one is the greatest ?

(1) $\sqrt[4]{5}$ (2) $\sqrt{2}$

(3) $\sqrt[3]{3}$ (4) $\sqrt[3]{2}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

7. The ascending order of $(2.89)^{0.5}$, $2-(0.5)^2$, $\sqrt{3}$ and $\sqrt[3]{0.008}$ is

(1) $2-(0.5)^2$, $\sqrt{3}$, $\sqrt[3]{0.008}$, $(2.89)^{0.5}$

(2) $\sqrt[3]{0.008}$, $(2.89)^{0.5}$, $\sqrt{3}$, $2-(0.5)^2$

(3) $\sqrt[3]{0.008}$, $\sqrt{3}$, $(2.89)^{0.5}$, $2-(0.5)^2$

(4) $\sqrt{3}$, $\sqrt[3]{0.008}$, $2-(0.5)^2$, $(2.89)^{0.5}$

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. The greatest one of $\sqrt{2}$, $\sqrt[3]{3}$, $\sqrt[6]{6}$, $\sqrt[4]{5}$ is

(1) $\sqrt{2}$ (2) $\sqrt[3]{3}$

(3) $\sqrt[6]{6}$ (4) $\sqrt[4]{5}$

(SSC CPO S.I. Exam. 07.09.2003)

9. The smallest of $\sqrt{8}+\sqrt{5}$, $\sqrt{7}+\sqrt{6}$, $\sqrt{10}+\sqrt{3}$ and $\sqrt{11}+\sqrt{2}$ is :

(1) $\sqrt{8}+\sqrt{5}$ (2) $\sqrt{7}+\sqrt{6}$

(3) $\sqrt{10}+\sqrt{3}$ (4) $\sqrt{11}+\sqrt{2}$

(SSC CPO S.I. Exam. 26.05.2005)

10. Which of the following is the largest number ?

$\sqrt{2}, \sqrt[3]{3}, \sqrt[4]{4}, \sqrt[6]{6}$

(1) $\sqrt{2}$ (2) $\sqrt[3]{3}$

(3) $\sqrt[4]{4}$ (4) $\sqrt[6]{6}$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005) & SSC CGL Prelim Exam. 27.07.2006 (1st Sitting)

11. Which is the greatest among $(\sqrt{19}-\sqrt{17})$, $(\sqrt{13}-\sqrt{11})$, $(\sqrt{7}-\sqrt{5})$ and $(\sqrt{5}-\sqrt{3})$?

(1) $\sqrt{19}-\sqrt{17}$ (2) $\sqrt{13}-\sqrt{11}$

(3) $\sqrt{7}-\sqrt{5}$ (4) $\sqrt{5}-\sqrt{3}$

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

12. The greatest number among $\sqrt[3]{2}$, $\sqrt{3}$, $\sqrt[3]{5}$ and 1.5 is :

(1) $\sqrt[3]{2}$ (2) $\sqrt[3]{5}$

(3) $\sqrt{3}$ (4) 1.5

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

13. The greatest of $\sqrt{2}$, $\sqrt[6]{3}$, $\sqrt[3]{4}$, $\sqrt[4]{5}$ is

(1) $\sqrt{2}$ (2) $\sqrt[6]{3}$

(3) $\sqrt[3]{4}$ (4) $\sqrt[4]{5}$

(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & SSC (10+2) DEO & LDC Exam. 11.12.2011 (East Zone)

14. The greatest one of $\sqrt{4}$, $\sqrt[3]{4}$, $\sqrt[4]{6}$ and $\sqrt[6]{8}$ is

(1) $\sqrt{3}$ (2) $\sqrt[3]{4}$

(3) $\sqrt[4]{6}$ (4) $\sqrt[6]{8}$

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

15. The greatest among $\sqrt{7}-\sqrt{5}$, $\sqrt{5}-\sqrt{3}$, $\sqrt{9}-\sqrt{7}$, $\sqrt{11}-\sqrt{9}$ is

(1) $\sqrt{7}-\sqrt{5}$ (2) $\sqrt{5}-\sqrt{3}$

(3) $\sqrt{9}-\sqrt{7}$ (4) $\sqrt{11}-\sqrt{9}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

16. Greatest among the numbers $\sqrt[3]{9}$, $\sqrt{3}$, $\sqrt[4]{16}$, $\sqrt[6]{80}$ is

(1) $\sqrt[3]{9}$ (2) $\sqrt{3}$

(3) $\sqrt[4]{16}$ (4) $\sqrt[6]{80}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

17. The least one of $2\sqrt{3}$, $2\sqrt[4]{5}$, $\sqrt{8}$ and $3\sqrt{2}$ is

(1) $2\sqrt{3}$ (2) $2\sqrt[4]{5}$

(3) $\sqrt{8}$ (4) $3\sqrt{2}$

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

18. Out of the numbers 0.3, 0.03, 0.9, 0.09 the number that is nearest to the value of $\sqrt{0.9}$ is

(1) 0.3 (2) 0.03

(3) 0.9 (4) 0.09

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

19. The greatest number among 2^{60}, 3^{48}, 4^{36} and 5^{24} is

(1) 2^{60} (2) 3^{48}

(3) 4^{36} (4) 5^{24}

(SSC SAS Exam 26.06.2010 (Paper-1)

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20. The greatest among the numbers $\sqrt{2}, \sqrt[3]{3}, \sqrt[4]{5}, \sqrt[6]{6}$ is

(1) $\sqrt{2}$ (2) $\sqrt[3]{3}$

(3) $\sqrt[6]{6}$ (4) $\sqrt[4]{5}$

(SSC (South Zone) Investigator Exam 12.09.2010)

21. The smallest among $\sqrt[6]{12}$, $\sqrt[3]{4}$, $\sqrt[4]{5}$, $\sqrt{3}$ is

(1) $\sqrt[6]{12}$ (2) $\sqrt[3]{4}$

(3) $\sqrt{3}$ (4) $\sqrt[4]{5}$

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I) & SSC (10+2) Data Entry Operator & LDC Exam 11.12.2011 (Delhi Zone)

22. The largest among the numbers $0.9, (0.9)^2, \sqrt{0.9}, 0.\overline{9}$ is :

(1) 0.9 (2) $(0.9)^2$

(3) $\sqrt{0.9}$ (4) $0.\overline{9}$

(SSC CHSL DEO & LDC Exam. 27.11.2010)

23. Among the numbers $\sqrt{2}$, $\sqrt[3]{9}$, $\sqrt[4]{16}$, $\sqrt[5]{32}$, the greatest one is

(1) $\sqrt{2}$ (2) $\sqrt[3]{9}$

(3) $\sqrt[4]{16}$ (4) $\sqrt[5]{32}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

24. The greatest among the numbers $\sqrt[4]{3}, \sqrt[3]{4}, \sqrt[10]{12}$, 1 is

(1) 1 (2) $\sqrt[3]{4}$

(3) $\sqrt[4]{3}$ (4) $\sqrt[10]{12}$

(SSC CHSL DEO & LDC Exam. 04.12.2011(IInd Sitting (North Zone)

25. The greatest among the numbers $3\sqrt{2}, 3\sqrt{7}, 6\sqrt{5}, 2\sqrt{20}$ is

(1) $3\sqrt{2}$ (2) $3\sqrt{7}$

(3) $6\sqrt{5}$ (4) $2\sqrt{20}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

26. The greatest among the numbers $\sqrt{0.09}, \sqrt[3]{0.064}$, 0·5 and $\frac{3}{5}$ is

(1) $\sqrt{0.09}$ (2) $\sqrt[3]{0.064}$

(3) 0·5 (4) $\frac{3}{5}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

27. The largest number among $\sqrt{2}, \sqrt[3]{3}, \sqrt[4]{4}$ is

(1) $\sqrt{2}$ (2) $\sqrt[3]{3}$

(3) $\sqrt[4]{4}$ (4)All are equal

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

28. The greatest of the following numbers

0.16, $\sqrt{0.16}$, $(0.16)^2$, 0.04 is

(1) 0.16 (2) $\sqrt{0.16}$

(3) 0.04 (4) $(0.16)^2$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

29. The smallest among the numbers $2^{250}, 3^{150}, 5^{100}$ and 4^{200}

(1) 4^{200} (2) 5^{100}

(3) 3^{150} (4) 2^{250}

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

30. The greatest of the numbers $\sqrt[3]{8}$, $\sqrt[4]{13}$, $\sqrt[5]{16}$, $\sqrt[10]{41}$ is:

(1) $\sqrt[4]{13}$ (2) $\sqrt[5]{16}$

(3) $\sqrt[10]{41}$ (4) $\sqrt[3]{8}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

31. Which is greater $\sqrt[3]{2}$ or $\sqrt{3}$?

(1) Cannot be compared

(2) $\sqrt[3]{2}$

(3) $\sqrt{3}$

(4) Equal

(SSC CHSL DEO & LDC Exam. 20.10.2013)

32. Arranging the following in descending order, we get $\sqrt[3]{4}, \sqrt{2}, \sqrt[6]{3}, \sqrt[4]{5}$

(1) $\sqrt[3]{4} > \sqrt[4]{5} > \sqrt{2} > \sqrt[6]{3}$

(2) $\sqrt[4]{5} > \sqrt[3]{4} > \sqrt[6]{3} > \sqrt{2}$

(3) $\sqrt{2} > \sqrt[6]{3} > \sqrt[3]{4} > \sqrt[4]{5}$

(4) $\sqrt[6]{3} > \sqrt[4]{5} > \sqrt[3]{4} > \sqrt{2}$

(SSC CGL Tier-I Exam. 19.10.2014

33. The greatest number among the following is

$\frac{4}{9}$, $\sqrt{\frac{9}{49}}$, $0.\dot{4}\dot{7}$, $(0.7)^2$

(1) $\frac{4}{9}$ (2) $\sqrt{\frac{9}{49}}$

(3) $0.\dot{4}\dot{7}$ (4) $(0.7)^2$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting (TF No. 333 LO 2)

34. The greatest number among 3^{50}, 4^{40}, 5^{30} and 6^{20} is

(1) 3^{50} (2) 4^{40}

(3) 5^{30} (4) 6^{20}

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–III

1. Given $\sqrt{2} = 1.414$. The value of $\sqrt{8} + 2\sqrt{32} - 3\sqrt{128} + 4\sqrt{50}$ is

(1) 8.484 (2) 8.526

(3) 8.426 (4) 8.876

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

2. If $\sqrt{15} = 3.88$, then what is the value of $\sqrt{\frac{5}{3}}$

(1) $1.29\overline{3}$ (2) 1.2934

(3) 1.29 (4) 1.295

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. If $\sqrt{3} = 1.732$, then what is the value of $\frac{4+3\sqrt{3}}{\sqrt{7}+4\sqrt{3}}$ upto three places of decimal ?

(1) 0.023 (2) 0.464

(3) 2.464 (4) 3.023

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

4. Given that $\sqrt{3} = 1.732$, the value of $\frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{12}-\sqrt{32}+\sqrt{50}}$ is

(1) 4.899 (2) 2.551

(3) 1.414 (4) 1.732

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

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5. Given that $\sqrt{5} = 2.236$ and $\sqrt{3} = 1.732$; the value of $\frac{1}{\sqrt{5}+\sqrt{3}}$ is
(1) 0.504 (2) 0.252
(3) 0.362 (4) 0.372
(SSC CPO S.I. Exam. 16.12.2007)

6. Given that $\sqrt{5} = 2.24$, then the value of $\frac{3\sqrt{5}}{2\sqrt{5}-0.48}$ is
(1) 0.168 (2) 1.68
(3) 16.8 (4) 168
(SSC CPO S.I. Exam. 09.11.2008)

7. Given that $\sqrt{2} = 1.414$; the value of $\frac{1}{\sqrt{2}+1}$ is
(1) 0.414 (2) 2.414
(3) 3.414 (4) 5.414
(SSC CPO S.I. Exam. 09.11.2008)

8. Evaluate:
$16\sqrt{\frac{3}{4}} - 9\sqrt{\frac{4}{3}}$ if $\sqrt{12} = 3.46$
(1) 3.46 (2) 10.38
(3) 13.84 (4) 24.22
(SSC CPO S.I. Exam. 06.09.2009)

9. If $\sqrt{2} = 1.4142$, find the value of
$2\sqrt{2} + \sqrt{2} + \frac{1}{2+\sqrt{2}} + \frac{1}{\sqrt{2}-2}$
(1) 1.4144 (2) 2.8284
(3) 28.284 (4) 2.4142
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

10. If $\sqrt{3} = 1.732$, is given, then the value of $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ is
(1) 11.732 (2) 13.928
(3) 12.928 (4) 13.925
(SSC Data Entry Operator Exam. 31.08.2008)

11. If $\sqrt{2} = 1.4142...$ is given, then the value of $\frac{7}{(3+\sqrt{2})}$ correct upto two decimal places is
(1) 1.59 (2) 1.60
(3) 2.58 (4) 2.57
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

12. If $\sqrt{5329} = 73$, then the value of $\sqrt{5329} + \sqrt{53.29} + \sqrt{0.5329} + \sqrt{0.005329} + \sqrt{0.00005329}$ is
(1) 81. 1003 (2) 81. 0113
(3) 81. 1103 (4) 81. 1013
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

13. If $\sqrt{33} = 5.745$, then the value of $\sqrt{\frac{3}{11}}$ is approximately
(1) 1 (2) 0.5223
(3) 6.32 (4) 2.035
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

14. If $\sqrt{7} = 2.646$, then the value of $\frac{1}{\sqrt{28}}$ up to three places of decimal is:
(1) 0.183 (2) 0.185
(3) 0.187 (4) 0.189
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

TYPE–IV

1. The rationalising factor of $3\sqrt{3}$ is
(1) $\frac{1}{3}$ (2) 3
(3) -3 (4) $\sqrt{3}$
(SSC CPO S.I. Exam. 07.09.2003)

2. A rationalising factor of $(\sqrt[3]{9} - \sqrt[3]{3} + 1)$ is
(1) $\sqrt[3]{3} - 1$ (2) $\sqrt[3]{3} + 1$
(3) $\sqrt[3]{9} + 1$ (4) $\sqrt[3]{9} - 1$
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. The total number of prime factors in $4^{10} \times 7^3 \times 16^2 \times 11 \times 10^2$ is
(1) 34 (2) 35
(3) 36 (4) 37
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

4. The number of prime factors in $6^{333} \times 7^{222} \times 8^{111}$
(1) 1221 (2) 1222
(3) 1111 (4) 1211
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

5. The square root of $\left(\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}\right)$ is
(1) $\sqrt{3}+\sqrt{2}$ (2) $\sqrt{3}-\sqrt{2}$
(3) $\sqrt{2}\pm\sqrt{3}$ (4) $\sqrt{2}-\sqrt{3}$
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

6. If $x = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ and $y = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ then $(x+y)$ equals:
(1) 8 (2) 16
(3) $2\sqrt{15}$ (4) $2(\sqrt{5}+\sqrt{3})$
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

7. If x, y are rational numbers and $\frac{5+\sqrt{11}}{3-2\sqrt{11}} = x + y\sqrt{11}$.
The values of x and y are
(1) $x = \frac{-14}{17}, y = \frac{-13}{26}$
(2) $x = \frac{4}{13}, y = \frac{11}{17}$
(3) $x = \frac{-27}{25}, y = \frac{-11}{37}$
(4) $x = \frac{-37}{35}, y = \frac{-13}{35}$
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

TYPE–V

1. Simplify: $\left[\sqrt[3]{6\sqrt{5^9}}\right]^4 \left[\sqrt[3]{6\sqrt{5^9}}\right]^4$
(1) 5^2 (2) 5^4
(3) 5^8 (4) 5^{12}
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If $27^{2x-1} = (243)^3$ then the value of x is:
(1) 3 (2) 6
(3) 7 (4) 9
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

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3. If $3^{x+4} = 27^{2x+1}$, the value of x is :
(1) 7 (2) 3
(3) –2 (4) 1
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. $(36)^{\frac{1}{6}}$ is equal to :
(1) 1 (2) 6
(3) $\sqrt{6}$ (4) $\sqrt[3]{6}$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

5. $\left(\frac{8}{125}\right)^{-\frac{4}{3}}$ simplifies to :
(1) $\frac{625}{16}$ (2) $\frac{625}{8}$
(3) $\frac{625}{32}$ (4) $\frac{16}{625}$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. If $(125)^{2/3} \times (625)^{-1/4} = 5^x$ the value of x is
(1) 3 (2) 2
(3) 0 (4) 1
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

7. If $(2000)^{10} = 1{\cdot}024 \times 10^k$, then the value of k is
(1) 33 (2) 30
(3) 34 (4) 31
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I) (Middle Zone)

8. If $0.42 \times 100^k = 42$, then the value of k is
(1) 4 (2) 2
(3) 1 (4) 3
(SSC CISF Constable (GD) Exam. 05.06.2011)

9. If $3^{x+y} = 81$ and $81^{x-y} = 3$, then the value of x is
(1) 42 (2) $\frac{15}{8}$
(3) $\frac{17}{8}$ (4) 39
(SSC Data Entry Operator Exam. 02.08.2009)

10. If $2^x = 3^y = 6^{-z}$ then $\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$ is equal to
(1) 0 (2) 1
(3) $\frac{3}{2}$ (4) $-\frac{1}{2}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

11. If $a = 7 - 4\sqrt{3}$, the value of $a^{\frac{1}{2}} + a^{-\frac{1}{2}}$ is
(1) $3\sqrt{3}$ (2) 4
(3) 7 (4) $2\sqrt{3}$
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

12. If $\left(\frac{3}{4}\right)^3\left(\frac{4}{3}\right)^{-7} = \left(\frac{3}{4}\right)^{2x}$, then x is :
(1) –2 (2) 2
(3) 5 (4) $2\frac{1}{2}$
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

13. What is the product of the roots of the equation $x^2 - \sqrt{3} = 0$?
(1) $+\sqrt{3}$ (2) $\sqrt{3}\,i$
(3) $-\sqrt{3}\,i$ (4) $-\sqrt{3}$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

14. If $2^{x-1} + 2^{x+1} = 320$, then the value of x is
(1) 6 (2) 8
(3) 5 (4) 7
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

15. $4^{61} + 4^{62} + 4^{63} + 4^{64}$ is divisible by
(1) 17 (2) 3
(3) 11 (4) 13
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

16. If $5\sqrt{5} \times 5^3 + 5^{-\frac{3}{2}} = 5^{a+2}$, then the value of a is
(1) 4 (2) 5
(3) 6 (4) 8
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

17. The value of $\left(3+2\sqrt{2}\right)^{-3} + \left(3-2\sqrt{2}\right)^{-3}$ is
(1) 198 (2) 180
(3) 108 (4) 189
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

18. Solve for x :
$3^x - 3^{x-1} = 486$.
(1) 7 (2) 9
(3) 5 (4) 6
(SSC CGL Tier-I Exam. 26.10.2014)

19. A tap is dripping at a constant rate into a container. The level (L cm) of the water in the container is given by the equation $L = 2 - 2^t$, where t is time taken in hours. Then the level of water in the container at the start is
(1) 0 cm (2) 1 cm
(3) 2 cm (4) 4 cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

20. Arranging the following in ascending order
3^{34}, 2^{51}, 7^{17} we get
(1) $3^{34} > 2^{51} > 7^{17}$
(2) $7^{17} > 2^{51} > 3^{34}$
(3) $3^{34} > 7^{17} > 2^{51}$
(4) $2^{51} > 3^{34} > 7^{17}$
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

21. If $3^{2x-y} = 3^{x+y} = \sqrt{27}$, then the value of 3^{x-y} will be
(1) 3 (2) $\frac{1}{\sqrt{3}}$
(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{27}}$
(SSC CAPFs SI, CISF ASI & Delh Police SI Exam, 21.06.201 (Ist Sitting) TF No. 8037731

22. The value of $[(0.87)^2+(0.13)^2 \cdot (0.87) \times (0.26)]^{2013}$ is.
(1) 0 (2) 2013
(3) 1 (4) –1
(SSC CAPFs SI, CISF ASI & Dell Police SI Exam, 21.06.201 IInd Sittin

23. The mean of 1^3, 2^3, 3^3, 4^3, 5^3, 6^3, 7^3 is
(1) 20 (2) 112
(3) 56 (4) 28
(SSC CGL Tie Re-Exam, 30.08.201

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24. The unit digit in the product $(2467)^{153} \times (341)^{72}$ is

(1) 7 (2) 3
(3) 9 (4) 1

(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099665)

25. The exponential form of $\sqrt{\sqrt{2} \times \sqrt{3}}$ is :

(1) 6 (2) $6^{\frac{1}{2}}$
(3) $6^{\frac{1}{2}}$ (4) $6^{\frac{1}{4}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (1st Sitting) TF No. 6636838)

26. The quotient when 10^{100} is divided by 5^{75} is :

(1) $2^{25} \times 10^{75}$ (2) 10^{25}
(3) 2^{75} (4) $2^{75} \times 10^{25}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

TYPE–VI

1. $\sqrt{1+\sqrt{1+\sqrt{1+\ldots\ldots}}}$

(1) equals 1
(2) lies between 0 and 1
(3) lies between 1 and 2
(4) is greater than 2

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

2. $\sqrt{2+\sqrt{2+\sqrt{2+\ldots\ldots}}}$ is equal to

(1) $\sqrt{2}$ (2) $2\sqrt{2}$
(3) 2 (4) 3

(SSC CPO S.I. Exam. 12.01.2003

3. $\sqrt{12+\sqrt{12+\sqrt{12+\ldots.}}}$ is equal to

(1) 3 (2) 4
(3) 6 (4) 2

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

4. $\sqrt{6+\sqrt{6+\sqrt{6+\ldots.}}}$ is equal to

(1) 3 (2) 4
(3) 5 (4) 6

(SSC SAS Exam 26.06.2010 (Paper-1) & SSC CGL Tier-I Exam 26.06.2010 (1st Sitting) & SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting)

5. $\sqrt{3\sqrt{3\sqrt{3\ldots.}}}$ is equal to

(1) $\sqrt{3}$ (2) 3
(3) $2\sqrt{3}$ (4) $3\sqrt{3}$

(SSC HSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

6. Find the value of $\sqrt{30+\sqrt{30+\sqrt{30+\ldots..}}}$

(1) 5 (2) $3\sqrt{10}$
(3) 6 (4) 7

(SSC Graduate Level Tier-II Exam. 29.09.2013

7. The value of $\sqrt{2\sqrt[3]{4\sqrt{2\sqrt[3]{4\sqrt{2\sqrt[3]{4}\ldots\ldots}}}}}$ is

(1) 2 (2) 2^2
(3) 2^3 (4) 2^5

(SSC Graduate Level Tier-II Exam. 29.09.2013

8. If $m = \sqrt{5+\sqrt{5+\sqrt{5+\ldots\ldots}}}$ and $n = \sqrt{5-\sqrt{5-\sqrt{5-\ldots\ldots}}}$, then among the following the relation between m and n holds is

(1) $m-n+1=0$
(2) $m+n-1=0$
(3) $m+n+1=0$
(4) $m-n-1=0$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

9. The value of $\sqrt{72+\sqrt{72+\sqrt{72+\ldots..}}}$ is

(1) 9 (2) 8
(3) 18 (4) 12

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

10. $\dfrac{\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+\sqrt{225}}}}}}{\sqrt[3]{8}} = ?$

(1) 4 (2) 2
(3) 8 (4) $\frac{1}{2}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (1st Sitting) TF No. 5037731)

11. The value of the expression $\sqrt{6+\sqrt{6+\sqrt{6+\ldots+\text{upto }\infty}}}$ is

(1) 5 (2) 3
(3) 2 (4) 30

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (1st Sitting) TF No. 9692918)

TYPE–VII

1. Which of the following is closest to $\sqrt{3}$?

(1) $\frac{9}{5}$ (2) 1.75
(3) $\frac{173}{100}$ (4) 1.69

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

2. If $a = \frac{\sqrt{3}}{2}$, then the value of $\sqrt{1+a}+\sqrt{1-a}$ is

(1) $\sqrt{3}$ (2) $\frac{\sqrt{3}}{2}$
(3) $2+\sqrt{3}$ (4) $2-\sqrt{3}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. If $a=\frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b=\frac{\sqrt{5}-1}{\sqrt{5}+1}$, the value of $\left(\frac{a^2+ab+b^2}{a^2-ab+b^2}\right)$ is

(1) $\frac{3}{4}$ (2) $\frac{4}{3}$
(3) $\frac{3}{5}$ (4) $\frac{5}{3}$

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

4. If $x = 1+\sqrt{2}+\sqrt{3}$, then the value of $\left(x+\frac{1}{x-1}\right)$ is

(1) $1+2\sqrt{3}$ (2) $2+\sqrt{3}$
(3) $3+\sqrt{2}$ (4) $2\sqrt{3}-1$

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

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5. If $x+\frac{1}{x}=-2$ then the value of $x^{2n+1}+\frac{1}{x^{2n+1}}$ where n is a positive integer, is
(1) 0 (2) 2
(3) −2 (4) −5
(SSC CPO S.I. Exam. 09.11.2008)

6. If m and n $(n>1)$ are whole numbers such that $m^n=121$, the value of $(m-1)^{n+1}$ is
(1) 1 (2) 10
(3) 121 (4) 1000
(SSC CPO S.I. Exam. 09.11.2008)

7. The number, which when multiplied with $(\sqrt{3}+\sqrt{2})$ gives $(\sqrt{12}+\sqrt{18})$, is
(1) $3\sqrt{2}-2\sqrt{3}$ (2) $3\sqrt{2}+2\sqrt{3}$
(3) $\sqrt{6}$ (4) $2\sqrt{3}-3\sqrt{2}$
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

8. If the product of first fifty positive consecutive integers be divisible by 7^n, where n is an integer, then the largest possible value of n is
(1) 7 (2) 8
(3) 10 (4) 5
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

9. If $9\sqrt{x}=\sqrt{12}+\sqrt{147}$, then x = ?
(1) 5 (2) 3
(3) 2 (4) 4
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

10. A man is born in the year 1896 A.D. If in the year x^2 A.D. his age is $x-4$, the value of x is
(1) 40 (2) 44
(3) 36 (4) 42
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

11. Choose the incorrect relation(s) from the following:
(i) $\sqrt{6}+\sqrt{2}=\sqrt{5}+\sqrt{3}$
(ii) $\sqrt{6}+\sqrt{2}<\sqrt{5}+\sqrt{3}$
(iii) $\sqrt{6}+\sqrt{2}>\sqrt{5}+\sqrt{3}$
(1) (ii) and (iii) (2) (i)
(3) (ii) (4) (i) and (iii)
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

12. If $x=\frac{1}{\sqrt{2}+1}$ then $(x+1)$ equals to
(1) 2 (2) $\sqrt{2}$
(3) $\sqrt{2}+1$ (4) $\sqrt{2}-1$
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3190210)

SHORT ANSWERS

TYPE-I

1. (3)	2. (1)	3. (1)	4. (3)
5. (2)	6. (3)	7. (2)	8. (2)
9. (3)	10. (1)	11. (1)	12. (1)
13. (2)	14. (2)	15. (2)	16. (1)
17. (3)	18. (4)	19. (1)	20. (3)
21. (1)	22. (4)	23. (4)	24. (3)
25. (2)	26. (2)	27. (2)	28. (3)
29. (2)	30. (1)	31. (1)	32. (1)
33. (1)	34. (1)	35. (2)	36. (2)
37. (3)	38. (1)	39. (3)	40. (3)
41. (2)	42. (3)	43. (3)	44. (1)
45. (1)	46. (2)	47. (1)	48. (4)
49. (3)	50. (2)	51. (4)	52. (4)
53. (3)	54. (3)	55. (2)	56. (3)
57. (1)	58. (3)	59. (1)	60. (2)
61. (3)	62. (4)	63. (1)	64. (3)
65. (4)	66. (3)	67. (1)	68. (4)
69. (3)	70. (2)	71. (1)	72. (2)
73. (2)	74. (3)	75. (1)	76. (3)
77. (2)	78. (3)	79. (1)	80. (1)
81. (1)	82. (4)	83. (3)	84. (4)
85. (3)	86. (2)	87. (2)	88. (1)
89. (3)	90. (4)	91. (2)	92. (3)
93. (3)	94. (2)	95. (3)	96. (2)
97. (4)	98. (1)	99. (4)	100. (3)
101. (1)	102. (3)	103. (2)	104. (3)
105. (2)	106. (1)	107. (1)	108. (2)
109. (4)	110. (1)	111. (3)	112. (2)
113. (1)	114. (4)	115. (2)	116. (2)
117. (2)	118. (3)	119. (4)	120. (2)
121. (2)	122. (4)	123. (2)	124. (3)
125. (2)	126. (4)	127. (1)	128. (4)
129. (1)	130. (3)	131. (3)	132. (3)
133. (4)	134. (4)	135. (4)	136. (3)
137. (3)	138. (3)		

TYPE-II

1. (4)	2. (1)	3. (3)	4. (1)
5. (3)	6. (1)	7. (2)	8. (2)
9. (4)	10. (2)	11. (4)	12. (3)
13. (3)	14. (1)	15. (2)	16. (1)
17. (3)	18. (3)	19. (2)	20. (4)
21. (4)	22. (4)	23. (2)	24. (2)
25. (3)	26. (4)	27. (2)	28. (2)
29. (2)	30. (4)	31. (3)	32. (1)
33. (4)	34. (2)		

TYPE-III

1. (1)	2. (1)	3. (3)	4. (4)
5. (2)	6. (2)	7. (1)	8. (1)
9. (2)	10. (2)	11. (1)	12. (3)
13. (2)	14. (4)		

TYPE-IV

1. (4)	2. (2)	3. (3)	4. (1)
5. (1)	6. (1)	7. (4)	

TYPE-V

1. (2)	2. (1)	3. (4)	4. (4)
5. (1)	6. (4)	7. (1)	8. (3)
9. (3)	10. (1)	11. (2)	12. (3)
13. (4)	14. (4)	15. (1)	16. (1)
17. (1)	18. (4)	19. (2)	20. (1)
21. (3)	22. (3)	23. (2)	24. (1)
25. (4)	26. (4)		

TYPE-VI

1. (3)	2. (3)	3. (2)	4. (1)
5. (2)	6. (3)	7. (1)	8. (4)
9. (1)	10. (2)	11. (2)	

TYPE-VII

1. (3)	2. (1)	3. (2)	4. (1)
5. (3)	6. (4)	7. (3)	8. (2)
9. (2)	10. (2)	11. (4)	12. (2)

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EXPLANATIONS

TYPE-I

1. (3) $\left(\sqrt{12}+\sqrt{18}\right)-\left(\sqrt{3}+\sqrt{2}\right)$

$=\left(2\sqrt{3}-\sqrt{3}\right)+\left(3\sqrt{2}-\sqrt{2}\right)$

$=\sqrt{3}+2\sqrt{2}$

2. (1) $\sqrt{5+2\sqrt{6}}$

$=\sqrt{3+2+2\times\sqrt{3}\times\sqrt{2}}$

$=\sqrt{\left(\sqrt{3}+\sqrt{2}\right)^2}=\sqrt{3}+\sqrt{2}$

$\therefore \dfrac{1}{\sqrt{5+2\sqrt{6}}}=\sqrt{3}-\sqrt{2}$

Hence, Expression

$=\sqrt{3}+\sqrt{2}-\sqrt{3}+\sqrt{2}=2\sqrt{2}$

3. (1) $?=\sqrt{2^4}+\sqrt[3]{64}+\sqrt[4]{2^8}$

$=2^{4\times\frac{1}{2}}+4^{3\times\frac{1}{3}}+2^{8\times\frac{1}{4}}$

$=2^2+4+2^2$

$=4+4+4=12$

4. (3) Expression

$=2\sqrt[3]{8\times4}-3\sqrt[3]{4}+\sqrt[3]{125\times4}$

$=2\times2\sqrt[3]{4}-3\sqrt[3]{4}+5\sqrt[3]{4}$

$=6\sqrt[3]{4}$

5. (2) $?=\left(\sqrt{8}-\sqrt{4}-\sqrt{2}\right)$

$=\left(2\sqrt{2}-2-\sqrt{2}\right)$

$=\sqrt{2}-2$

6. (3) $8^{\frac{2}{3}}=\left(2^3\right)^{\frac{2}{3}}$

$=2^{3\times\frac{2}{3}}=2^2=4$

7. (2) $\left(16^{\frac{3}{2}}+16^{\frac{-3}{2}}\right)$

$=\left(4^3\right)^{\frac{3}{2}}+\dfrac{1}{(16)^{\frac{3}{2}}}$

$=4^{2\times\frac{3}{2}}+\dfrac{1}{4^{2\times\frac{3}{2}}}=4^3+\dfrac{1}{4^3}$

$=64+\dfrac{1}{64}=\dfrac{4096+1}{64}=\dfrac{4097}{64}$

8. (2) $(16)^{\frac{3}{4}}=\left(4^2\right)^{\frac{3}{4}}$

$=4^{2\times\frac{3}{4}}=4^{\frac{3}{2}}=2^{2\times\frac{3}{2}}=2^3=8$

9. (3) $(0.01024)^{\frac{1}{5}}$

$=\left[(0.4)^5\right]^{1/5}=0.4^{5\times1/5}=0.4$

10. (1) $\left(16^{0.16}\times2^{0.36}\right)$

$=\left(16^{\frac{16}{100}}\times2^{\frac{36}{100}}\right)$

$=\left(2^{4\times\frac{16}{100}}\times2^{\frac{36}{100}}\right)$

$=\left(2^{\frac{64}{100}+\frac{36}{100}}\right)=\left(2^{\frac{100}{100}}\right)$

$=2$

11. (1) Expression

$=(256)^{0.16}\times(16)^{0.18}$

$=(4)^{4\times0.16}\times(4)^{2\times0.18}$

$=(4)^{0.64}\times(4)^{0.36}$

$=(4)^{0.64+0.36}=(4)^1=4$

12. (1) Expression

$=\dfrac{(243)^{0.13+0.07}}{(7)^{0.25}\times(7\times7)^{0.075}\times(7\times7\times7)^{0.2}}$

$=\dfrac{\left(3^5\right)^{0.2}}{(7)^{0.25}\times(7)^{0.075\times2}\times(7)^{3\times02}}$

$=\dfrac{(3)^{5\times0.2}}{(7)^{0.25+0.15+0.6}}=\dfrac{3}{7}$

13. (2) $\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{4+3+2\times2\times\sqrt{3}}}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{(2)^2+\left(\sqrt{3}\right)^2+2\times2\times\sqrt{3}}}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{\left(2+\sqrt{3}\right)^2}}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+8\left(2+\sqrt{3}\right)}}$

$=\sqrt{-\sqrt{3}+\sqrt{3+16+8\sqrt{3}}}$

$=\sqrt{-\sqrt{3}+\sqrt{\left(\sqrt{3}\right)^2+(4)^2+2\times4\times\sqrt{3}}}$

$=\sqrt{-\sqrt{3}+\sqrt{\left(4+\sqrt{3}\right)^2}}$

$=\sqrt{-\sqrt{3}+4+\sqrt{3}}=\sqrt{4}=2$

14. (2) $\left(\sqrt[3]{0.004096}\right)^{\frac{1}{2}}$

$=(0.004096)^{\frac{1}{3}\times\frac{1}{2}}$

$=\left(\dfrac{4096}{1000000}\right)^{\frac{1}{6}}=\left\{\left(\dfrac{4}{10}\right)^6\right\}^{\frac{1}{6}}$

$=\left(\dfrac{4}{10}\right)^{6\times\frac{1}{6}}=\dfrac{4}{10}=0.4$

15. (2) Expression

$=\dfrac{3\times\sqrt{12}}{2\times\sqrt{28}}\times\dfrac{\sqrt{98}}{2\times\sqrt{21}}$

$=\dfrac{3\times2\times\sqrt{3}}{2\times2\times\sqrt{7}}\times\dfrac{7\times\sqrt{2}}{2\times\sqrt{3}\times\sqrt{7}}$

$=\dfrac{3\sqrt{2}}{4}=\dfrac{3\times1.414}{4}=1.0605$

$=1.0606$

16. (1) Expression

$=2+\sqrt{0.09}-\sqrt[3]{(0.2)^3}-75\%\ of\ 2.80$

$=2+0.3-0.2-\dfrac{75}{100}\times2.80$

$=2.3-0.2-2.1$

$=2.3-2.3=0$

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17. (3) Let $\sqrt[3]{3.5} = a$ and $\sqrt[3]{2.5} = b$

∴ Expression

$= (a+b)(a^2 - ab + b^2)$

$= a^3 + b^3$

$= (\sqrt[3]{3.5})^3 + (\sqrt[3]{2.5})^3$

$= 3.5 + 2.5 = 6$

18. (4) We know that

$a^3 + b^3$

$= (a+b)^3 - 3ab(a+b)$

Now,

$(3+2\sqrt{2})^{-3} + (3-2\sqrt{2})^{-3}$

$= \frac{1}{(3+2\sqrt{2})^3} + \frac{1}{(3-2\sqrt{2})^3}$

$= \frac{(3-2\sqrt{2})^3 + (3+2\sqrt{2})^3}{(3+2\sqrt{2})^3 \times (3-2\sqrt{2})^3}$

$= \frac{(3-2\sqrt{2}+3+2\sqrt{2})^3 - 3(3-2\sqrt{2})(3+2\sqrt{2})(3-2\sqrt{2}+3+2\sqrt{2})}{[(3+2\sqrt{2})(3-2\sqrt{2})]^3}$

$= \frac{(6)^3 - 3(9-8)(6)}{1}$

$= 216 - 18 = 198$

19. (1)

$\frac{\sqrt{5}}{\sqrt{3}+\sqrt{2}} = \frac{\sqrt{5}(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$

$= \frac{\sqrt{15}-\sqrt{10}}{3-2} = \sqrt{15}-\sqrt{10}$

$\frac{3\sqrt{3}}{\sqrt{5}+\sqrt{2}} = \frac{3\sqrt{3}}{\sqrt{5}+\sqrt{2}} \times \frac{\sqrt{5}-\sqrt{2}}{\sqrt{5}-\sqrt{2}}$

$= \frac{3\sqrt{3}(\sqrt{5}-\sqrt{2})}{5-2} = \sqrt{15}-\sqrt{6}$

$\frac{2\sqrt{2}}{\sqrt{5}+\sqrt{3}} = \frac{2\sqrt{2}(\sqrt{5}-\sqrt{3})}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})}$

$= \frac{2\sqrt{2}(\sqrt{5}-\sqrt{3})}{5-3} = \sqrt{10}-\sqrt{6}$

∴ Expression

$= (\sqrt{15}-\sqrt{10}) - (\sqrt{15}-\sqrt{6}) + (\sqrt{10}-\sqrt{6})$

$= \sqrt{15} - \sqrt{10} - \sqrt{15} + \sqrt{6} + \sqrt{10} - \sqrt{6}$

$= 0$

20. (3) $4 + \sqrt{7} = \frac{8+2\sqrt{7}}{2}$

$= \frac{7+1+2\times\sqrt{7}\times 1}{2}$

$= \frac{(\sqrt{7})^2 + (1)^2 + 2\times\sqrt{7}\times 1}{2}$

$= \frac{(\sqrt{7}+1)^2}{(\sqrt{2})^2} = \left\{\frac{1}{\sqrt{2}}(\sqrt{7}+1)\right\}^2$

21. (1) $\frac{1}{\sqrt{3.25}+\sqrt{2.25}}$

$= \frac{1}{(\sqrt{3.25}+\sqrt{2.25})} \times \frac{\sqrt{3.25}-\sqrt{2.25}}{\sqrt{3.25}-\sqrt{2.25}}$

$= \frac{\sqrt{3.25}-\sqrt{2.25}}{3.25-2.25} = \sqrt{3.25}-\sqrt{2.25}$

Similarly,

$\frac{1}{\sqrt{4.25}+\sqrt{3.25}} = \sqrt{4.25}-\sqrt{3.25}$

$\frac{1}{\sqrt{5.25}+\sqrt{4.25}} = \sqrt{5.25}-\sqrt{4.25}$

$\frac{1}{\sqrt{6.25}+\sqrt{5.25}} = \sqrt{6.25}-\sqrt{5.25}$

∴ Expression

$= \sqrt{3.25} - \sqrt{2.25} + \sqrt{4.25} - \sqrt{3.25} + \sqrt{5.25} - \sqrt{4.25} + \sqrt{6.25} - \sqrt{5.25}$

$= \sqrt{6.25} - \sqrt{2.25} = 2.5 - 1.5 = 1$

22. (4) First term $= \frac{2}{\sqrt{7}+\sqrt{5}}$

$= \frac{2\times(\sqrt{7}-\sqrt{5})}{(\sqrt{7}+\sqrt{5})(\sqrt{7}-\sqrt{5})}$

$= \frac{2(\sqrt{7}-\sqrt{5})}{7-5} = \sqrt{7}-\sqrt{5}$

Second term $= \frac{7}{\sqrt{12}-\sqrt{5}}$

$= \frac{7(\sqrt{12}+\sqrt{5})}{(\sqrt{12}-\sqrt{5})(\sqrt{12}+\sqrt{5})}$

$= \frac{7(\sqrt{12}+\sqrt{5})}{12-5}$

$= \frac{7(\sqrt{12}+\sqrt{5})}{7} = \sqrt{12}+\sqrt{5}$

Third term $= \frac{5}{\sqrt{12}-\sqrt{7}}$

$= \frac{5(\sqrt{12}+\sqrt{7})}{(\sqrt{12}-\sqrt{7})(\sqrt{12}+\sqrt{7})}$

$= \frac{5(\sqrt{12}+\sqrt{7})}{12-7} = \sqrt{12}+\sqrt{7}$

∴ Expression

$= (\sqrt{7}-\sqrt{5}) + (\sqrt{12}+\sqrt{5}) - (\sqrt{12}+\sqrt{7})$

$= \sqrt{7} - \sqrt{5} + \sqrt{12} + \sqrt{5} - \sqrt{12} - \sqrt{7} = 0$

23. (4) $\left(\frac{1}{2}\right)^{-\frac{1}{2}} = (2)^{\frac{1}{2}} = \sqrt{2}$

24. (3) $\frac{1}{\sqrt{3}+\sqrt{4}}$

$= \frac{1}{\sqrt{3}+\sqrt{4}} \times \frac{\sqrt{4}-\sqrt{3}}{\sqrt{4}-\sqrt{3}}$

$= \frac{\sqrt{4}-\sqrt{3}}{4-3} = \sqrt{4}-\sqrt{3}$

Similarly,

$\frac{1}{\sqrt{4}+\sqrt{5}} = \sqrt{5}-\sqrt{4}$... so on

∴ Expression

$= \sqrt{4} - \sqrt{3} + \sqrt{5} - \sqrt{4} + \sqrt{6} - \sqrt{5} + \sqrt{7} - \sqrt{6} + \sqrt{8} - \sqrt{7} + \sqrt{9} - \sqrt{8}$

$= \sqrt{9} - \sqrt{3} = 3 - \sqrt{3}$

25. (2) $(16)^{0.16} \times (16)^{0.04} \times (2)^{0.2}$

$= (2^4)^{0.16} \times (2^4)^{0.04} \times (2)^{0.2}$

$= 2^{0.64} \times 2^{0.16} \times 2^{0.2}$

$= (2)^{0.64+0.16+0.2} = 2$

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26. (2) Expression

$$=\frac{12}{3+\sqrt{5}+2\sqrt{2}}$$

$$=\frac{12(3+\sqrt{5}-2\sqrt{2})}{\left[(3+\sqrt{5})+2\sqrt{2}\right]\left[(3+\sqrt{5})-2\sqrt{2}\right]}$$

[Rationalising the denominator]

$$=\frac{12(3+\sqrt{5}-2\sqrt{2})}{(3+\sqrt{5})^2-(2\sqrt{2})^2}$$

$$=\frac{12(3+\sqrt{5}-2\sqrt{2})}{9+5+6\sqrt{5}-8}$$

$$=\frac{12(3+\sqrt{5}-2\sqrt{2})}{6\sqrt{5}+6}$$

$$=\frac{2(3+\sqrt{5}-2\sqrt{2})}{\sqrt{5}+1}$$

$$=\frac{2(3+\sqrt{5}-2\sqrt{2})(\sqrt{5}-1)}{(\sqrt{5}+1)(\sqrt{5}-1)}$$

$$=\frac{2(3\sqrt{5}+5-2\sqrt{10}-3-\sqrt{5}+2\sqrt{2})}{5-1}$$

$$=\frac{2\left(2\sqrt{5}+2\sqrt{2}-2\sqrt{10}+2\right)}{4}$$

$$=\frac{2\times2(\sqrt{5}+\sqrt{2}-\sqrt{10}+1)}{4}$$

$$=1+\sqrt{5}+\sqrt{2}-\sqrt{10}$$

27. (2) Expression

$$=3+\frac{1}{\sqrt{3}}+\frac{1}{3+\sqrt{3}}+\frac{1}{\sqrt{3}-3}$$

$$=3+\frac{1}{\sqrt{3}}+\frac{1}{3+\sqrt{3}}-\frac{1}{3-\sqrt{3}}$$

$$=3+\frac{1}{\sqrt{3}}+\left(\frac{3-\sqrt{3}-3-\sqrt{3}}{(3+\sqrt{3})(3-\sqrt{3})}\right)$$

$$=3+\frac{1}{\sqrt{3}}+\frac{-2\sqrt{3}}{9-3}=3+\frac{1}{\sqrt{3}}-\frac{\sqrt{3}}{3}$$

$$=3+\frac{1}{\sqrt{3}}-\frac{1}{\sqrt{3}}=3$$

28. (3) Expression $=\sqrt{8-2\sqrt{15}}$

$$=\sqrt{5+3-2\sqrt{5}\times\sqrt{3}}$$

$$=\sqrt{\left(\sqrt{5}\right)^2+\left(\sqrt{3}\right)^2-2\sqrt{5}\times\sqrt{3}}$$

$$=\sqrt{\left(\sqrt{5}-\sqrt{3}\right)^2}=\sqrt{5}-\sqrt{3}$$

29. (2) Expression $=(0.04)^{-1.5}$

$$=\frac{1}{(0.04)^{1.5}}=\frac{1}{(0.04)^{\frac{3}{2}}}$$

$$=\frac{1}{(0.04\times0.04\times0.04)^{\frac{1}{2}}}$$

$$=\frac{1}{\sqrt{0.0000064}}$$

$$=\frac{1}{0.008}=\frac{1000}{8}=125$$

30. (1) Expression

$$=\frac{\sqrt[3]{1372}\times\sqrt[3]{1458}}{\sqrt[3]{343}}$$

$$=\sqrt[3]{\frac{1372\times1458}{343}}$$

$$=\sqrt[3]{5832}$$

$$=\sqrt[3]{18\times18\times18}=18$$

31. (1)

$$\frac{2}{\sqrt{5}+\sqrt{3}}=\frac{2(\sqrt{5}-\sqrt{3})}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})}$$

[Rationalising the denominator]

$$=\frac{2(\sqrt{5}-\sqrt{3})}{5-3}=\sqrt{5}-\sqrt{3}$$

Similarly,

$$\frac{3}{\sqrt{6}-\sqrt{3}}=\frac{3(\sqrt{6}+\sqrt{3})}{6-3}=\sqrt{6}+\sqrt{3}$$

$$\frac{1}{\sqrt{6}+\sqrt{5}}=\frac{\sqrt{6}-\sqrt{5}}{6-5}=\sqrt{6}-\sqrt{5}$$

$\therefore$ Expression

$$=\sqrt{5}-\sqrt{3}+\sqrt{6}+\sqrt{3}+\sqrt{6}-\sqrt{5}$$

$$=2\sqrt{6}$$

32. (1) Here,

$$\frac{1}{3-\sqrt{8}}=\frac{(3+\sqrt{8})}{(3-\sqrt{8})(3+\sqrt{8})}$$

$$=\frac{3+\sqrt{8}}{9-8}=3+\sqrt{8}$$

$$\frac{1}{\sqrt{8}-\sqrt{7}}=\frac{\sqrt{8}+\sqrt{7}}{(\sqrt{8}-\sqrt{7})(\sqrt{8}+\sqrt{7})}$$

$=\sqrt{8}+\sqrt{7}$ AND.... so on

Expression

$$=(3+\sqrt{8})-(\sqrt{8}+\sqrt{7})+(\sqrt{7}+\sqrt{6})-(\sqrt{6}+\sqrt{5})+(\sqrt{5}+2)$$

$$=3+\sqrt{8}-\sqrt{8}-\sqrt{7}+\sqrt{7}+\sqrt{6}-\sqrt{6}-\sqrt{5}+\sqrt{5}+2$$

$$=3+2=5$$

33. (1) Expression $=\frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}$

Rationalising the denominator,

$$=\frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}\times\frac{3\sqrt{2}+2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$$

$$=\frac{(3\sqrt{2}+2\sqrt{3})^2}{(3\sqrt{2})^2-(2\sqrt{3})^2}$$

$$=\frac{18+12+2\times3\sqrt{2}\times2\sqrt{3}}{18-12}$$

$$=\frac{30+12\sqrt{6}}{6}$$

$$=\frac{6(5+2\sqrt{6})}{6}=5+2\sqrt{6}$$

34. (1) Expression

$$=\left(\frac{2+\sqrt{3}}{2-\sqrt{3}}+\frac{2-\sqrt{3}}{2+\sqrt{3}}\right)+\frac{\sqrt{3}+1}{\sqrt{3}-1}\times\frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$=\left[\frac{(2+\sqrt{3})^2+(2-\sqrt{3})^2}{(2-\sqrt{3})(2+\sqrt{3})}\right]+\frac{(\sqrt{3}+1)^2}{3-1}$$

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$= \frac{2(4+3)}{4-3} + \frac{3+1+2\sqrt{3}}{2}$

$\left[\because (a+b)^2 + (a-b)^2 = 2(a^2+b^2)\right]$

$= 14 + 2 + \sqrt{3} = 16 + \sqrt{3}$

35. (2) $14 + 6\sqrt{5} = 14 + 2 \times 3 \times \sqrt{5}$

$= 9 + 5 + 2 \times 3 \times \sqrt{5}$

$= (3)^2 + (\sqrt{5})^2 + 2 \times 3 \times \sqrt{5}$

$= (3 + \sqrt{5})^2$

$\therefore \sqrt{14 + 6\sqrt{5}} = \sqrt{(3+\sqrt{5})^2}$

$= 3 + \sqrt{5}$

36. (2) Expression

$= \frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}} - \frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}} + \frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$

$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{(\sqrt{6}+\sqrt{3})(\sqrt{6}-\sqrt{3})} - \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(\sqrt{6}+\sqrt{2})(\sqrt{6}-\sqrt{2})} + \frac{\sqrt{6}}{(\sqrt{3}+\sqrt{2})} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{6-3} - \frac{4\sqrt{3}(\sqrt{6}-\sqrt{2})}{(6-2)} + \frac{\sqrt{6}(\sqrt{3}-\sqrt{2})}{3-2}$

$= \sqrt{2}(\sqrt{6}-\sqrt{3}) - \sqrt{3}(\sqrt{6}-\sqrt{2}) + \sqrt{6}(\sqrt{3}-\sqrt{2})$

$= \sqrt{12} - \sqrt{6} - \sqrt{18} + \sqrt{6} + \sqrt{18} - \sqrt{12}$

$= 0$

37. (3) Expression

$= \frac{3(2-\sqrt{3}) - 2(2+\sqrt{3})}{\frac{(2+\sqrt{3})(2-\sqrt{3})}{2-\sqrt{3}}}$

$= \frac{6 - 3\sqrt{3} - 4 - 2\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})(2-5\sqrt{3})}$

$= \frac{2-5\sqrt{3}}{2-5\sqrt{3}} = 1$

38. (1) $(64)^{\frac{-2}{3}} \times \left(\frac{1}{4}\right)^{-2}$

$= \frac{1}{(64)^{\frac{2}{3}}} \times (4)^2$

$= \frac{1}{(4)^{3\times\frac{2}{3}}} \times 4^2 \qquad = \frac{1}{4^2} \times 4^2 = 1$

39. (3) $\frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}} + \frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}$

$= \frac{(1+\sqrt{2})(\sqrt{5}-\sqrt{3}) + (1-\sqrt{2})(\sqrt{5}+\sqrt{3})}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})}$

$= \frac{\sqrt{5} - \sqrt{3} + \sqrt{10} - \sqrt{6} + \sqrt{5} + \sqrt{3} - \sqrt{10} - \sqrt{6}}{(\sqrt{5})^2 - (\sqrt{3})^2}$

[Using $(a+b)(a-b) = a^2 - b^2$]

$= \frac{2\sqrt{5} - 2\sqrt{6}}{5-3} = \frac{2(\sqrt{5}-\sqrt{6})}{2}$

$= \sqrt{5} - \sqrt{6}$

40. (3) Given expression

$= \left(\frac{2+\sqrt{3}}{2-\sqrt{3}} + \frac{2-\sqrt{3}}{2+\sqrt{3}} + \frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$

$= \left[\frac{(2+\sqrt{3})^2 + (2-\sqrt{3})^2}{(2-\sqrt{3})(2+\sqrt{3})} + \frac{(\sqrt{3}-1)}{(\sqrt{3}+1)} \times \frac{(\sqrt{3}-1)}{(\sqrt{3}-1)}\right]$

$= \left[\frac{4+3+4\sqrt{3}+4+3-4\sqrt{3}}{(2)^2 - (\sqrt{3})^2} + \frac{(\sqrt{3}-1)^2}{(\sqrt{3})^2 - (1)^2}\right]$

$= \left[\frac{14}{4-3} + \frac{3+1-2\sqrt{3}}{3-1}\right]$

$= \left[14 + \frac{2(2-\sqrt{3})}{2}\right] = 16 - \sqrt{3}$

41. (2) Given expression :

$\left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right)^2 + \left(\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)^2$

Now,

$\left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right)^2 = \frac{(\sqrt{5}+\sqrt{3})^2}{(\sqrt{5}-\sqrt{3})^2}$

$= \frac{(\sqrt{5})^2 + (\sqrt{3})^2 + 2\sqrt{5} \times \sqrt{3}}{(\sqrt{5})^2 + (\sqrt{3})^2 - 2\sqrt{5} \times \sqrt{3}}$

$= \frac{5+3+2\sqrt{15}}{5+3-2\sqrt{15}}$

$= \frac{8+2\sqrt{15}}{8-2\sqrt{15}} = \frac{4+\sqrt{15}}{4-\sqrt{15}}$

Similarly,

$\left(\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)^2 = \frac{4-\sqrt{15}}{4+\sqrt{15}}$

Therefore, given expression

$= \frac{4+\sqrt{15}}{4-\sqrt{15}} + \frac{4-\sqrt{15}}{4+\sqrt{15}}$

$= \frac{16+15+8\sqrt{15}+16+15-8\sqrt{15}}{16-15}$

$= 62$

42. (3) $\sqrt{\frac{(\sqrt{12}-\sqrt{8})(\sqrt{8}+\sqrt{2})}{5+\sqrt{24}}}$

$= \sqrt{\frac{\sqrt{36} - \sqrt{24} + \sqrt{24} - \sqrt{16}}{5+\sqrt{24}}}$

$= \sqrt{\frac{6-4}{5+\sqrt{24}}} = \sqrt{\frac{2}{5+\sqrt{24}}}$

$= \sqrt{\frac{2}{5+\sqrt{6\times4}}} = \sqrt{\frac{2}{5+2\sqrt{6}}}$

$= \sqrt{\frac{2}{5+2\sqrt{6}} \times \frac{5-2\sqrt{6}}{5-2\sqrt{6}}}$

$= \sqrt{\frac{2(5-2\sqrt{6})}{25-24}} = \sqrt{2(5-2\sqrt{6})}$

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$= \sqrt{2(3+2+2\sqrt{6})}$

$= \sqrt{2\left[(\sqrt{3})^2+(\sqrt{2})^2-2\sqrt{3}\sqrt{2}\right]}$

$= \sqrt{2(\sqrt{3}-\sqrt{2})^2} = \sqrt{2}(\sqrt{3}-\sqrt{2})$

$= \sqrt{6}-2$

43. (3) $\left[64^{\frac{2}{3}}\times 2^{-2}+8^{\circ}\right]^{\frac{1}{2}}$

$= \left[\left(64^{\frac{1}{3}}\right)^2\times\frac{1}{2^2}+1\right]^{\frac{1}{2}}$

$= \left[\left(\sqrt[3]{64}\right)^2\times\frac{1}{4}\right]^{\frac{1}{2}} = \left[(4)^2\times\frac{1}{4}\right]^{\frac{1}{2}}$

$= [4]^{\frac{1}{2}} = \sqrt{4} = 2$

44. (1) Expression

$= \frac{1}{\sqrt{12-\sqrt{140}}} - \frac{1}{\sqrt{8-\sqrt{60}}} - \frac{2}{\sqrt{10+\sqrt{84}}}$

$= \frac{1}{\sqrt{12-\sqrt{4\times35}}} - \frac{1}{\sqrt{8-\sqrt{4\times15}}} - \frac{2}{\sqrt{10+\sqrt{4\times21}}}$

$= \frac{1}{\sqrt{12-2\times\sqrt{7}\times\sqrt{5}}} - \frac{1}{\sqrt{8-2\times\sqrt{5}\times\sqrt{3}}} - \frac{2}{\sqrt{10+2\times\sqrt{7}\times\sqrt{3}}}$

$= \frac{1}{\sqrt{(\sqrt{7})^2+(\sqrt{5})^2-2\times\sqrt{7}\times\sqrt{5}}} - \frac{1}{\sqrt{(\sqrt{5})^2+(\sqrt{3})^2-2\times\sqrt{5}\times\sqrt{3}}} - \frac{2}{\sqrt{(\sqrt{7})^2+(\sqrt{3})^2-2\times\sqrt{7}\times\sqrt{3}}}$

$= \frac{1}{\sqrt{(\sqrt{7}-\sqrt{5})^2}} - \frac{1}{\sqrt{(\sqrt{5}-\sqrt{3})^2}} - \frac{2}{\sqrt{(\sqrt{7}+\sqrt{3})^2}}$

$= \frac{1}{\sqrt{7}-\sqrt{5}} - \frac{1}{\sqrt{5}-\sqrt{3}} - \frac{2}{\sqrt{7}+\sqrt{3}}$

$= \frac{\sqrt{7}+\sqrt{5}}{(\sqrt{7})^2-(\sqrt{5})^2} - \frac{\sqrt{5}+\sqrt{3}}{(\sqrt{5})^2-(\sqrt{3})^2} - \frac{2(\sqrt{7}-\sqrt{3})}{(\sqrt{7})^2-(\sqrt{3})^2}$

[Rationalizing each term by respective conjugates]

$= \frac{\sqrt{7}+\sqrt{5}}{2} - \frac{\sqrt{5}+\sqrt{3}}{2} - \frac{2(\sqrt{7}-\sqrt{3})}{4}$

$= \frac{\sqrt{7}+\sqrt{5}-\sqrt{5}-\sqrt{3}-\sqrt{7}+\sqrt{3}}{2} = 0$

45. (1) $\sqrt{11+2\sqrt{30}}$

$= \sqrt{5+6+2\times\sqrt{5}\times\sqrt{6}}$

$= \sqrt{\left(\sqrt{5}+\sqrt{6}\right)^2} = \sqrt{6}+\sqrt{5}$

$\therefore \frac{1}{\sqrt{11+2\sqrt{30}}} = \sqrt{6}-\sqrt{5}$

$\therefore$ Expression

$= \sqrt{6}+\sqrt{5}-\sqrt{6}+\sqrt{5} = 2\sqrt{5}$

46. (2) $(243)^{0.16}\times(243)^{0.04}$

$= (243)^{0.16+0.04}$

$= (243)^{0.2} = (243)^{1/5}$

$= (3^5)^{1/5} = 3$

47. (1) Expression $= \frac{3^{\circ}+3^{-1}}{3^{-1}-3^{\circ}}$

$= \frac{1+\frac{1}{3}}{\frac{1}{3}-1} = \frac{\frac{3+1}{3}}{\frac{1-3}{3}} = \frac{4}{3}\times\frac{-3}{2} = -2$

48. (4) $\frac{1}{\sqrt{100}-\sqrt{99}}$

$= \frac{\sqrt{100}+\sqrt{99}}{(\sqrt{100}-\sqrt{99})(\sqrt{100}+\sqrt{99})}$

$= \sqrt{100}+\sqrt{99}$

Similarly, $\frac{1}{\sqrt{99}-\sqrt{98}}$

$= \sqrt{99}+\sqrt{98}$ ... and so on

$\therefore$ Expression

$= \sqrt{100}+\sqrt{99}-\sqrt{99}-\sqrt{98}+\sqrt{98}+\sqrt{97}....+\sqrt{2}+1$

$= \sqrt{100}+1 = 10+1 = 11$

49. (3) $\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}$

$= \left[\frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{\sqrt{2}+\sqrt{3}+\sqrt{5}}\right]\times\frac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}}$

$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2+3+2\sqrt{6}-5}$

$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2\sqrt{6}}$

Similarly, $\frac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}$

$= \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{\left[(\sqrt{2}-\sqrt{3})-\sqrt{5}\right]\left[(\sqrt{2}-\sqrt{3})+\sqrt{5}\right]}$

$= \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{-2\sqrt{6}}$

$\therefore$ Expression

$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}}{2\sqrt{6}} - \frac{\sqrt{2}-\sqrt{3}+\sqrt{5}}{2\sqrt{6}}$

$= \frac{\sqrt{2}+\sqrt{3}+\sqrt{5}-\sqrt{2}+\sqrt{3}-\sqrt{5}}{2\sqrt{6}}$

$= \frac{\sqrt{3}}{\sqrt{6}} = \frac{1}{\sqrt{2}}$

50. (2) Expression

$= \sqrt[3]{2}\times\sqrt{2}\times\sqrt[3]{3}\times 3$

$= 2^{\frac{1}{3}}\times 2^{\frac{1}{2}}\times 3^{\frac{1}{3}}\times 3^{\frac{1}{2}}$

$= 2^{\frac{5}{6}}\times 3^{\frac{5}{6}} = (6)^{\frac{5}{6}}$

51. (4) $(256)^{16/100}\times(256)^{9/100}$

$= (256)^{25/100} = (256)^{1/4} = \left(4^4\right)^{\frac{1}{4}}$

$= (4)^{4\times\frac{1}{4}} = 4$

52. (4) Expression

$= \left[8-\left(\frac{\frac{9}{4^4}\sqrt{2\times 2^2}}{2\sqrt{2^{-2}}}\right)^{\frac{1}{2}}\right]$

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$$= \left[8-\left(\frac{(2)^{2\times\frac{9}{4}}\times 2^{\frac{3}{2}}}{2\times(2^{-2})^{\frac{1}{2}}}\right)^{\frac{1}{2}}\right]$$

$$= \left[8-\left(\frac{2^{\frac{9}{2}}\times 2^{\frac{3}{2}}}{2^{1}\times 2^{-1}}\right)^{\frac{1}{2}}\right]$$

$$= \left[8-\left(\frac{2^{\frac{9}{2}+\frac{3}{2}}}{2^{1-1}}\right)^{\frac{1}{2}}\right]$$

$$= \left[8-\left(2^{6}\right)^{\frac{1}{2}}\right] = \left(8-2^{3}\right) = 8-8 = 0$$

53. (3) Expression

$$= \frac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}} - \frac{2\sqrt{6}}{\sqrt{3}+1} + \frac{2\sqrt{3}}{\sqrt{6}+2}$$

Now,

$$\frac{3\sqrt{2}}{\sqrt{6}+\sqrt{3}} = \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{(\sqrt{6}+\sqrt{3})(\sqrt{6}-\sqrt{3})}$$

$$= \frac{3\sqrt{2}(\sqrt{6}-\sqrt{3})}{6-3} = \sqrt{2}(\sqrt{6}-\sqrt{3})$$

$$= \sqrt{12}-\sqrt{6} = 2\sqrt{3}-\sqrt{6}$$

$$= \frac{2\sqrt{6}}{\sqrt{3}+1} = \frac{2\sqrt{6}(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}-1)}$$

$$= \sqrt{6}(\sqrt{3}-1) = \sqrt{18}-\sqrt{6}$$

$$= 3\sqrt{2}-\sqrt{6}$$

$$= \frac{2\sqrt{3}}{\sqrt{6}+2} = \frac{2\sqrt{3}\,(\sqrt{6}-2)}{(\sqrt{6}+2)\,(\sqrt{6}-2)}$$

$$= \frac{2\sqrt{3}\,(\sqrt{6}-2)}{6-4} = \sqrt{3}(\sqrt{6}-2)$$

$$= \sqrt{3}\times\sqrt{6}-2\sqrt{3} = 3\sqrt{2}-2\sqrt{3}$$

$\therefore$ Expression

$$= (2\sqrt{3}-\sqrt{6})-(3\sqrt{2}-\sqrt{6})$$

$$+(3\sqrt{2}-2\sqrt{3})$$

$$= 2\sqrt{3}-\sqrt{6}-3\sqrt{2}+\sqrt{6}$$

$$+3\sqrt{2}-2\sqrt{3} = 0$$

54. (3) $(4)^{0.5}\times(0.5)^4$

$$= \left(2^{2}\right)^{1/2}\times\left(\frac{5}{10}\right)^{4} = 2\times\left(\frac{1}{2}\right)^{4}$$

$$= \frac{2}{2\times2\times2\times2} = \frac{1}{2\times2\times2} = \frac{1}{8}$$

55. (2) Expression

$$= \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} - \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{\left(\sqrt{3}+\sqrt{2}\right)^{2}-\left(\sqrt{3}-\sqrt{2}\right)^{2}}{\left(\sqrt{3}+\sqrt{2}\right)\left(\sqrt{3}-\sqrt{2}\right)}$$

$$= \frac{3+2+2\sqrt{6}-3-2+2\sqrt{6}}{\left(\sqrt{3}\right)^{2}-\left(\sqrt{2}\right)^{2}}$$

$$= \frac{4\sqrt{6}}{3-2} = 4\sqrt{6}$$

56. (3) $\sqrt{40+\sqrt{9\sqrt{81}}}$

$$= \sqrt{40+\sqrt{9\times9}}$$

$$= \sqrt{40+9} = \sqrt{49} = 7$$

57. (1)

$$\frac{1}{\sqrt{9}-\sqrt{8}} = \frac{1}{\sqrt{9}-\sqrt{8}}\times\frac{\sqrt{9}+\sqrt{8}}{\sqrt{9}+\sqrt{8}} = \frac{\sqrt{9}+\sqrt{8}}{9-8}$$

$$= \sqrt{9}+\sqrt{8}$$

Similarly, $\frac{1}{\sqrt{8}-\sqrt{7}} = \sqrt{8}+\sqrt{7}$

... and so on

Expression =

$$\left(\sqrt{9}+\sqrt{8}\right)-\left(\sqrt{8}+\sqrt{7}\right)+\left(\sqrt{7}+\sqrt{6}\right)-$$

$$\left(\sqrt{6}+\sqrt{5}\right)+\left(\sqrt{5}+\sqrt{4}\right)$$

$$= \sqrt{9}+\sqrt{8}-\sqrt{8}-\sqrt{7}+\sqrt{7}+\sqrt{6}-\sqrt{6}$$

$$-\sqrt{5}+\sqrt{5}+\sqrt{4}$$

$$= \sqrt{9}+\sqrt{4} = 3+2 = 5$$

58. (3) $\left[\left(\sqrt[5]{x^{-3/5}}\right)^{\frac{-5}{3}}\right]^{5}$

$$= \left(x^{-\frac{3}{5}}\right)^{\frac{1}{5}\times\frac{-5}{3}\times5}$$

$$= x^{-\frac{3}{5}\times\frac{-5}{3}} = x$$

59. (1)

$$\frac{\sqrt{3}+1}{\sqrt{3}-1} = \frac{\sqrt{3}+1}{\sqrt{3}-1}\times\frac{\sqrt{3}+1}{\sqrt{3}-1} = \frac{\left(\sqrt{3}+1\right)^{2}}{3-1}$$

$$= \frac{3+1+2\sqrt{3}}{2} = 2+\sqrt{3}$$

$$\therefore \frac{\sqrt{3}-1}{\sqrt{3}+1} = 2-\sqrt{3}$$

$$\frac{\sqrt{2}+1}{\sqrt{2}-1} = \frac{\left(\sqrt{2}+1\right)^{2}}{(\sqrt{2}-1)(\sqrt{2}+1)}$$

$$= \frac{2+1+2\sqrt{2}}{2-1} = 3+2\sqrt{2}$$

$$\therefore \frac{\sqrt{2}-1}{\sqrt{2}+1} = 3-2\sqrt{2}$$

$\therefore$ Expression $= 2+\sqrt{3}+3+$

$2\sqrt{2}+2-\sqrt{3}+3-2\sqrt{2}$

$= 10$

60. (2) Expression

$$= \frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{2\times2\times3}} -$$

$$\sqrt{2\times2\times2\times2\times2}+\sqrt{5\times5\times2}$$

$$= \frac{3+\sqrt{6}}{5\sqrt{3}-4\sqrt{3}-4\sqrt{2}+5\sqrt{2}}$$

$$= \frac{3+\sqrt{6}}{\sqrt{3}+\sqrt{2}}$$

$$= \frac{\sqrt{3}\left(\sqrt{3}+\sqrt{2}\right)}{\sqrt{3}+\sqrt{2}} = \sqrt{3}$$

61. (3) Expression

$$= \frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}} + \frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}$$

$$= \frac{(1+\sqrt{2})(\sqrt{5}-\sqrt{3})+(\sqrt{5}+\sqrt{3})(1-\sqrt{2})}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})}$$

$$= \frac{\sqrt{5}+\sqrt{10}-\sqrt{3}-\sqrt{6}+\sqrt{5}}{+\sqrt{3}-\sqrt{10}-\sqrt{6}}$$

$$= \frac{2\sqrt{5}-2\sqrt{6}}{2} = \frac{2\left(\sqrt{5}-\sqrt{6}\right)}{2}$$

$$= \sqrt{5}-\sqrt{6}$$

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62. (4)

$$(256)^{-\left(4^{-\frac{3}{2}}\right)} = (256)^{-\left(\frac{1}{4^{3/2}}\right)}$$

$$= (256)^{-\frac{1}{8}} = \frac{1}{(256)^{\frac{1}{8}}} = \frac{1}{(2^8)^{\frac{1}{8}}} = \frac{1}{2}$$

63. (1) $\left\{(-2)^{(-2)}\right\}^{(-2)} = \frac{1}{\left\{(-2)^{(-2)}\right\}^2}$

$$= \frac{1}{(-2)^{-4}} = (-2)^4 = 16$$

64. (3) Expression

$$= \sqrt{2} + \sqrt{7 - 2\sqrt{10}}$$

$$= \sqrt{2} + \sqrt{7 - 2 \times \sqrt{5} \times \sqrt{2}}$$

$$= \sqrt{2} + \sqrt{\left(\sqrt{5}\right)^2 + \left(\sqrt{2}\right)^2 - 2 \times \sqrt{5} \times \sqrt{2}}$$

$$= \sqrt{2} + \sqrt{\left(\sqrt{5} - \sqrt{2}\right)^2}$$

$$= \sqrt{2} + \sqrt{5} - \sqrt{2} = \sqrt{5}$$

65. (4) $(256)^{0.16} \times (4)^{0.36}$

$= (4^4)^{0.16} \times 4^{0.36} = 4^{0.64} \times 4^{0.36}$

$= (4)^{0.64 + 0.36} = 4$

66. (3) $? = 5\sqrt{7} - 2\sqrt{5} - 3\sqrt{7} + 4\sqrt{5}$

$$= 2\sqrt{7} + 2\sqrt{5} = 2\left(\sqrt{7} + \sqrt{5}\right)$$

67. (1) $\frac{\sqrt{7} - \sqrt{5}}{\sqrt{7} + \sqrt{5}} + \frac{\sqrt{7} + \sqrt{5}}{\sqrt{7} - \sqrt{5}}$

$$= \frac{\left(\sqrt{7} - \sqrt{5}\right)^2 + \left(\sqrt{7} + \sqrt{5}\right)^2}{\left(\sqrt{7} + \sqrt{5}\right)\left(\sqrt{7} - \sqrt{5}\right)}$$

$$= \frac{2\left[\left(\sqrt{7}\right)^2 + \left(\sqrt{5}\right)^2\right]}{\left(\sqrt{7}\right)^2 - \left(\sqrt{5}\right)^2}$$

$$= \frac{2(7+5)}{7-5} = 12$$

68. (4) $\frac{2}{\sqrt{6}+2} = \frac{2}{\sqrt{6}+2} \times \frac{\sqrt{6}-2}{\sqrt{6}-2}$

$$= \frac{2\left(\sqrt{6}-2\right)}{6-4} = \sqrt{6} - 2$$

Similarly, $\frac{1}{\sqrt{7}+\sqrt{6}} = \sqrt{7} - \sqrt{6}$

and $\frac{1}{\sqrt{8}-\sqrt{7}} = \frac{\sqrt{8}+\sqrt{7}}{\left(\sqrt{8}-\sqrt{7}\right)\left(\sqrt{8}+\sqrt{7}\right)}$

$$= \frac{\sqrt{8}+\sqrt{7}}{8-7} = \sqrt{8} + \sqrt{7}$$

$$= 2\sqrt{2} + \sqrt{7}$$

$\therefore$ Expression $= \sqrt{6} - 2 + \sqrt{7} - \sqrt{6} +$

$2\sqrt{2} + \sqrt{7} + 2 - 2\sqrt{2} = 2\sqrt{7}$

69. (3) $\sqrt{12} + \sqrt{18}$

$$= \sqrt{3 \times 2 \times 2} + \sqrt{2 \times 3 \times 3}$$

$$= 2\sqrt{3} + 3\sqrt{2}$$

$\therefore$ Required difference

$$= 2\sqrt{3} + 3\sqrt{2} - 2\sqrt{3} - 2\sqrt{2} = \sqrt{2}$$

70. (2) $\frac{1}{\sqrt{2}+1} = \frac{1}{\sqrt{2}+1} \times \frac{\sqrt{2}-1}{\sqrt{2}-1}$

$$= \frac{\sqrt{2}-1}{2-1} = \sqrt{2} - 1$$

$\therefore$ Expression

$= \sqrt{2} - 1 + \sqrt{3} - \sqrt{2} + \sqrt{4} - \sqrt{3} + \ldots\ldots$

$+ \sqrt{99} - \sqrt{98} + \sqrt{100} - \sqrt{99}$

$= \sqrt{100} - 1 = 10 - 1 = 9$

71. (1) $\left\{\left(\frac{-1}{2}\right)^2\right\}^{-2\times(-1)} = \left(\frac{-1}{2}\right)^{2\times 2}$

$$= \left(-\frac{1}{2}\right)^4 = \frac{1}{16}$$

72. (2) $2.\sqrt[3]{40} = 2.\sqrt[3]{2\times2\times2\times5}$

$= 4\sqrt[3]{5}$

$4.\sqrt[3]{320}$

$= 4.\sqrt[3]{2\times2\times2\times2\times2\times2\times5}$

$= 16.\sqrt[3]{5}$

$3.\sqrt[3]{625}$

$= 3.\sqrt[3]{5\times5\times5\times5} = 15.\sqrt[3]{5}$

$\therefore$ Expression $= 4.\sqrt[3]{5} - 16\sqrt[3]{5}$

$+ 15.\sqrt[3]{5} - 3.\sqrt[3]{5}$

$= 19.\sqrt[3]{5} - 19.\sqrt[3]{5} = 0$

73. (2) $\sqrt[3]{0.000125}$

$= \sqrt[3]{0.05 \times 0.05 \times 0.05} = 0.05$

74. (3) Expression

$$= \frac{0.3555 \times 0.5555 \times 2.025}{0.225 \times 1.7775 \times 0.2222}$$

$$= \frac{3555 \times 5555 \times 2025}{225 \times 17775 \times 2222} = 4.5$$

75. (1)

$$? = \frac{0.06\times0.06\times0.06 - 0.05\times0.05\times0.05}{0.06\times0.06 + 0.06\times0.05 + 0.05\times0.05}$$

We know that

$$\frac{a^3 - b^3}{a^2 + ab + b^2} = a - b$$

$[\because a^3 - b^3 = (a-b)(a^2 + ab + b^2)]$

$\therefore$ Required answer

$= 0.06 - 0.05 = 0.01$

76. (3) Using the formula

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

$$? = \frac{0.05\times0.05\times0.05 - 0.04\times0.04\times0.04}{0.05\times0.05 + 0.002 + 0.04\times0.04}$$

$$= \frac{(0.05)^3 - (0.04)^3}{(0.05)^2 + 0.05\times0.04 + (0.04)^2}$$

$$= 0.05 - 0.04 = 0.01$$

77. (2) $\frac{\left(x - \sqrt{24}\right)\left(\sqrt{75} + \sqrt{50}\right)}{\sqrt{75} - \sqrt{50}} = 1$

$$\Rightarrow \frac{\left(x - 2\sqrt{6}\right)\left(5\sqrt{3} + 5\sqrt{2}\right)}{5\sqrt{3} - 5\sqrt{2}} = 1$$

$$\Rightarrow \frac{\left(x - 2\sqrt{6}\right)\left(\sqrt{3} + \sqrt{2}\right)}{\sqrt{3} - \sqrt{2}} = 1$$

Now, $x - 2\sqrt{6} = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$

$$= \frac{\left(\sqrt{3} - \sqrt{2}\right)^2}{\left(\sqrt{3} + \sqrt{2}\right)\left(\sqrt{3} - \sqrt{2}\right)}$$

$$= 3 + 2 - 2\sqrt{6}$$

$\Rightarrow x - 2\sqrt{6} = 5 - 2\sqrt{6} \Rightarrow x = 5$

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78. (3) $\sqrt{20}+\sqrt{12}+\sqrt[3]{729}-\frac{4}{\sqrt{5}-\sqrt{3}}-\sqrt{81}$

$=2\sqrt{5}+2\sqrt{3}+9-\frac{4}{(\sqrt{5}-\sqrt{3})}\times\frac{(\sqrt{5}+\sqrt{3})}{(\sqrt{5}+\sqrt{3})}-9$

$=2\sqrt{5}+2\sqrt{3}+9-\frac{4(\sqrt{5}+\sqrt{3})}{5-3}-9$

$=2\sqrt{5}+2\sqrt{3}+9-2\sqrt{5}-2\sqrt{3}-9$

$=0$

79. (1) $a=\frac{1}{2-\sqrt{3}}+\frac{1}{3-\sqrt{8}}+\frac{1}{4-\sqrt{15}}$

$=\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}+\frac{1}{3-\sqrt{8}}\times\frac{3+\sqrt{8}}{3+\sqrt{8}}+\frac{1}{4-\sqrt{15}}\times\frac{4+\sqrt{15}}{4+\sqrt{15}}$

$=\frac{2+\sqrt{3}}{4-3}+\frac{3+\sqrt{8}}{9-8}+\frac{4+\sqrt{15}}{16-15}$

$=2+\sqrt{3}+3+2\sqrt{2}+4+\sqrt{15}$

$=9+\sqrt{3}+2\sqrt{2}+\sqrt{15}$

$=9<9+\sqrt{3}+2\sqrt{2}+\sqrt{15}<18$

[Illustration: $\sqrt{3}=1.7$

$\sqrt{2}=1.4$

$\sqrt{15}=3.9$

$=9+1.7+2.8+3.9=17.4<18$]

80. (1) $a\sqrt{2}+b\sqrt{3}$

$=\sqrt{98}+\sqrt{108}-\sqrt{48}-\sqrt{72}$

$\Rightarrow a\sqrt{2}+b\sqrt{3}$

$=\sqrt{7\times7\times2}+\sqrt{2\times2\times3\times3\times3}-\sqrt{2\times2\times2\times2\times3}-\sqrt{2\times2\times2\times3\times3}$

$\Rightarrow a\sqrt{2}+b\sqrt{3}$

$=7\sqrt{2}+6\sqrt{3}-4\sqrt{3}-6\sqrt{2}$

$=\sqrt{2}+2\sqrt{3}$

$\therefore a=1, b=2$

81. (1) $\sqrt[3]{a}=\sqrt[3]{26}+\sqrt[3]{7}+\sqrt[3]{63}$

$\Rightarrow\sqrt[3]{a}<\sqrt[3]{27}+\sqrt[3]{8}+\sqrt[3]{64}$

$\Rightarrow\sqrt[3]{a}<3+2+4$

$\Rightarrow\sqrt[3]{a}<9$

$\Rightarrow a<9^3=729$

82. (4) $\frac{\sqrt{72}\times\sqrt{363}\times\sqrt{175}}{\sqrt{32}\times\sqrt{147}\times\sqrt{252}}$

$=\frac{\sqrt{2\times2\times2\times3\times3}\times\sqrt{3\times11\times11}\times\sqrt{5\times5\times7}}{\sqrt{2\times2\times2\times2\times2}\times\sqrt{7\times7\times3}\times\sqrt{2\times2\times3\times3\times7}}$

$=\frac{6\sqrt{2}\times11\sqrt{3}\times5\sqrt{7}}{4\sqrt{2}\times7\sqrt{3}\times6\sqrt{7}}$

$=\frac{6\times11\times5}{4\times7\times6}=\frac{55}{28}$

83. (3) Expression

$=\frac{5.32\,(56+44)}{(7.66+2.34)\,(7.66-2.34)}$

$=\frac{532}{10\times5.32}=10$

84. (4) Expression

$=2+\frac{6}{\sqrt{3}}+\frac{1}{2+\sqrt{3}}+\frac{1}{\sqrt{3}-2}$

$=2+\frac{6}{\sqrt{3}}+\frac{1}{2+\sqrt{3}}-\frac{1}{2-\sqrt{3}}$

$=2+2\sqrt{3}+\left(\frac{2-\sqrt{3}-2-\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})}\right)$

$=2+2\sqrt{3}-2\sqrt{3}=2$

85. (3) $\sqrt{7+4\sqrt{3}}=\sqrt{7+2\times2\times\sqrt{3}}$

$=\sqrt{4+3+2\times2\times\sqrt{3}}$

$=\sqrt{(2+\sqrt{3})^2}=2+\sqrt{3}$

$\therefore\frac{4+3\sqrt{3}}{2+\sqrt{3}}=A+\sqrt{B}$

$\Rightarrow\frac{(4+3\sqrt{3})(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}=A+\sqrt{B}$

$\Rightarrow\frac{8-4\sqrt{3}+6\sqrt{3}-9}{4-3}=A+\sqrt{B}$

$\Rightarrow2\sqrt{3}-1=A+\sqrt{B}$

$\Rightarrow A=-1$ and $\sqrt{B}=2\sqrt{3}$

$\Rightarrow B=2\sqrt{3}\times2\sqrt{3}=12$

$\therefore B-A=12+1=13$

86. (2) Expression

$=2\sqrt{50}+\sqrt{18}-\sqrt{72}$

$=2\sqrt{2\times5\times5}+\sqrt{3\times3\times2}-\sqrt{2\times2\times2\times3\times3}$

$=10\sqrt{2}+3\sqrt{2}-6\sqrt{2}$

$=(10\times1.414)+(3\times1.414)-(6\times1.414)=7\times1.414=9.898$

87. (2) $(6.5\times6.5-45.5+3.5\times3.5)$

$=[(6.5)^2-2\times6.5\times3.5+(3.5)^2]$

$=(6.5-3.5)^2=(3)^2=9$

88. (1) $?=(7.5\times7.5+37.5+2.5\times2.5)$

$=[(7.5)^2+2\times7.5\times2.5+(2.5)^2]$

$=[7.5+2.5]^2=(10)^2=100$

89. (3)

$\frac{(1.5)^3+(4.7)^3+(3.8)^3-3\times1.5\times4.7\times3.8}{(1.5)^2+(4.7)^2+(3.8)^2-1.5\times4.7-4.7\times3.8-3.8\times1.5}$

$=\frac{(1.5+4.7+3.8)\left\{1.5^2+4.7^2+3.8^2-1.5\times4.7-4.7\times3.8-3.8\times1.5\right\}}{(1.5)^2+(4.7)^2+(3.8)^2-1.5\times4.7-4.7\times3.8-3.8\times1.5}$

$=1.5+4.7+3.8=10$

90. (4) $\frac{(6.25)^{\frac{1}{2}}\times(0.0144)^{\frac{1}{2}}+1}{(0.027)^{\frac{1}{3}}\times(81)^{\frac{1}{4}}}$

$=\frac{2.5\times0.12+1}{0.3\times3}=\frac{0.3+1}{0.9}=\frac{1.3}{0.9}$

$=1.4444=1.\overline{4}$

91. (2) Let $0.41=x$ and $0.69=y$

$\therefore$ Expression $=\frac{(x^3+y^3)}{(x^2-xy+y^2)}$

$=\frac{(x+y)(x^2-xy+y^2)}{(x^2-xy+y^2)}$

$=x+y=0.41+0.69=1.10$

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92. (3) Expression

$$=\frac{10.3\times10.3\times10.3+1\times1\times1}{10.3\times10.3-10.3\times1+1\times1}$$

Let $10.3 = a$ and $1 = b$,

Then,

$$\text{Expression}=\frac{a^3+b^3}{a^2-ab+b^2}$$

$$=\frac{(a+b)(a^2-ab+b^2)}{a^2-ab+b^2}$$

$= a + b = 10.3 + 1 = 11.3$

93. (3) Let, $1.49 = a$ and $0.51 = b$

$$\therefore \frac{a^2-b^2}{a-b}$$

$$=\frac{(a+b)(a-b)}{(a-b)}=a+b$$

$\therefore 1.49 + 0.51 = 2$

94. (2) $(0.04)^{-1.5}=\frac{1}{(0.04)^{1.5}}$

$$=\frac{1}{\left[(0.2)^2\right]^{\frac{3}{2}}}=\frac{1}{(0.2)^{2\times\frac{3}{2}}}=\frac{1}{(0.2)^3}$$

$$=\frac{1}{0.008}=\frac{1000}{8}=125$$

95. (3) Let $0.96 = a$ and $0.1 = b$,

$\therefore$ Expression

$$=\frac{a^3-b^3}{a^2+ab+b^2}=\frac{(a-b)(a^2+ab+b^2)}{a^2+ab+b^2}$$

$= a - b = 0.96 - 0.1 = 0.86$

96. (2) Expression

$$=\frac{(4)^3-(0.2)^3}{(4)^2+4\times0.2+(0.2)^2}$$

Let $4 = a$, $0.2 = b$

$\therefore$ Expression

$$=\frac{a^3-b^3}{a^2+ab+b^2}$$

$$=\frac{(a-b)(a^2+ab+b^2)}{a^2+ab+b^2}$$

$= a - b = 4 - 0.2 = 3.8$

97. (4) Let $0.796 = a$ and $0.204 = b$

$$\therefore \text{Expression}=\frac{a\times a-b\times b}{a-b}$$

$$=\frac{a^2-b^2}{a-b}=\frac{(a+b)(a-b)}{a-b}$$

$= a + b = 0.796 + 0.204 = 1$

98. (1) Expression

$$=\frac{(2.3)^3+(0.3)^3}{(2.3)^2-2.3\times0.3+0.3\times0.3}$$

Let $2.3 = a$ and $0.3 = b$

$$\therefore \text{Expression}=\frac{a^3+b^3}{a^2-ab+b^2}$$

$= a + b$

$= 2.3 + 0.3 = 2.6$

99. (4) Let $5.71 = a$ and $2.79 = b$

$\therefore$ Expression

$$=\frac{a^3-b^3}{a^2+ab+b^2}$$

$$=\frac{(a-b)(a^2+ab+b^2)}{a^2+ab+b^2}$$

$= a - b = 5.71 - 2.79 = 2.92$

100. (3) Let $1.5 = a$, $4.7 = b$, $3.8 = c$

$\therefore$ Expression

$$=\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-bc-ca}$$

$= a + b + c$

$= 1.5 + 4.7 + 3.8 = 10$

101. (1) Let $0.73 = a$ and $0.27 = b$

$\therefore$ Expression

$$=\frac{a^3+b^3}{a^2+b^2-ab}$$

$$=\frac{(a+b)(a^2+b^2-ab)}{a^2+b^2-ab}$$

$= a + b = 0.73 + 0.27 = 1$

102. (3) Expression

$= 0.75 \times 7.5 - 2 \times 7.5 \times 0.25 + 0.25 \times 2.5$

$= 0.75 \times 0.75 \times 10 - 2 \times 0.75 \times 0.25 \times 10 + 0.25 \times 0.25 \times 10$

$=10\left[(0.75)^2-2\times0.75\times0.25+(0.25)^2\right]$

$=10(0.75-0.25)^2 = 10 \times 0.25 = 2.5$

103. (2) Expression

$$=\frac{1}{1\times4}+\frac{1}{4\times7}+\frac{1}{7\times10}+\frac{1}{10\times13}+\frac{1}{13\times16}$$

$$=\frac{1}{3}\left[\left(\frac{3}{1\times4}\right)+\left(\frac{3}{4\times7}\right)+\left(\frac{3}{7\times10}\right)+\left(\frac{3}{10\times13}\right)+\left(\frac{3}{13\times16}\right)\right]$$

$$=\frac{1}{3}\left[\left(1-\frac{1}{4}\right)+\left(\frac{1}{4}-\frac{1}{7}\right)+\left(\frac{1}{7}-\frac{1}{10}\right)+\left(\frac{1}{10}-\frac{1}{13}\right)+\left(\frac{1}{13}-\frac{1}{16}\right)\right]$$

$$=\frac{1}{3}\left(1-\frac{1}{4}+\frac{1}{4}-\frac{1}{7}+\frac{1}{7}-\frac{1}{10}+\frac{1}{10}-\frac{1}{13}+\frac{1}{13}-\frac{1}{16}\right)$$

$$=\frac{1}{3}\left(1-\frac{1}{16}\right)=\frac{1}{3}\left(\frac{16-1}{16}\right)$$

$$=\frac{1}{3}\times\frac{15}{16}=\frac{5}{16}$$

104. (3) Expression

$$=\frac{137\times137+133\times133+137\times133}{137\times137\times137-133\times133\times133}$$

$[\because 137\times133=18221]$

Let $137 = a$ and $133 = b$

$$\therefore \text{Expression}=\frac{a^2+b^2+ab}{a^3-b^3}$$

$$=\frac{a^2+b^2+ab}{(a-b)(a^2+b^2+ab)}$$

$$=\frac{1}{a-b}=\frac{1}{137-133}=\frac{1}{4}$$

105. (2) Let $2.75 = a$ and $2.25 = b$

$$\therefore \text{Expression}=\frac{a^3-b^3}{a^2+ab+b^2}$$

$$=\frac{(a-b)(a^2+ab+b^2)}{a^2+ab+b^2}$$

$= a - b = 2.75 - 2.25 = 0.5$

106. (1) Let $5.624 = a$ and $4.376 = b$

$$\therefore \text{Given expression}=\frac{a^3+b^3}{a^2-ab+b^2}$$

$$=\frac{(a+b)(a^2-ab+b^2)}{a^2-ab+b^2}$$

$= a + b = 5.624 + 4.376 = 10$

107. (1) Let $0.337 = a$ and $0.126 = b$.

$\therefore$ Expression

$$=\frac{(a+b)^2-(a-b)^2}{ab}=\frac{4ab}{ab}=4$$

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108. (2) Tricky approach

If $256 = a$ and $144 = b$, then

Expression $= \dfrac{a^2 - b^2}{a - b}$

$[a - b = 256 - 144 = 112]$

$= \dfrac{(a+b)(a-b)}{(a-b)} = a + b$

$= 256 + 144 = 400$

109. (4) Expression

$= (8.7 + 1.3)^2$

$[a^2 + 2ab + b^2 = (a + b)^2]$

$= 10^2 = 100$

110. (1) Let $3.06 = a$ and $1.98 = b$

$\therefore$ Expression

$= \dfrac{a^3 - b^3}{a^2 + ab + b^2}$

$= \dfrac{(a-b)(a^2+ab+b^2)}{a^2+ab+b^2}$

$= a - b = 3.06 - 1.98 = 1.08$

111. (3) If $3.25 = a$ and $1.75 = b$ then,

Expression $= \dfrac{a^2 + b^2 - 2ab}{a^2 - b^2}$

$= \dfrac{(a-b)^2}{(a+b)(a-b)} = \dfrac{a-b}{a+b}$

$= \dfrac{3.25 - 1.75}{3.25 + 1.75} = \dfrac{1.5}{5} = 0.3$

112. (2) Let $0.05 = a \therefore 0.005 = \dfrac{a}{10}$

$0.41 = b \therefore 0.041 = \dfrac{b}{10}$

and $0.073 = c \therefore 0.0073 = \dfrac{c}{10}$

$\therefore$ Expression

$= \dfrac{a^2 + b^2 + c^2}{\left(\frac{a}{10}\right)^2 + \left(\frac{b}{10}\right)^2 + \left(\frac{c}{10}\right)^2}$

$= \dfrac{a^2 + b^2 + c^2}{\frac{1}{100}(a^2 + b^2 + c^2)} = 100$

113. (1) If $2.3 = a$ and $1 = b$,

Expression $= \dfrac{a^3 - b^3}{a^2 + ab + b^2}$

$= a - b = 2.3 - 1 = 1.3$

114. (4)

$(0.98)^3 + (0.02)^3 + 3 \times 0.98 \times 0.2 - 1$

$= 0.941192 + 0.000008 + 0.0588 - 1$

$= 1 - 1 = 0$

115. (2) If $0.08 = a$ and $0.02 = b$ then

Expression $= \dfrac{a^3 + b^3}{a^2 - ab + b^2}$

$= \dfrac{(a+b)(a^2 - ab + b^2)}{a^2 - ab + b^2} = a + b$

$= 0.08 + 0.02 = 0.1$

116. (2) Expression $= 0.65 \times 0.65 + 0.35 \times 0.35 + 2 \times 0.35 \times 0.65$

$= (0.65 + 0.35)^2 = (1)^2 = 1$

$[\because a^2 + b^2 + 2ab = (a + b)^2]$

117. (2) $\dfrac{2.4 \times 10^3}{8 \times 10^{-2}} = \dfrac{24 \times 10^3}{8 \times 10 \times 10^{-2}}$

$= \dfrac{24 \times 10^3 \times 10}{8} = 3 \times 10^4$

118. (3) Given expression

$= [3 - 4\{3 - 4\}^{-1}]^{-1}$

$= [3 - 4\{-1\}^{-1}]^{-1}$

$= \left[3 - \dfrac{4}{-1}\right]^{-1} = (3 + 4)^{-1}$

$= (7)^{-1} = \dfrac{1}{7}$

119. (4) Expression

$= \dfrac{\left[(998)^2 - (997)^2\right] - 45}{(98)^2 - (97)^2}$

$= \dfrac{(998 + 997)(998 - 997) - 45}{(98 + 97)(98 - 97)}$

$= \dfrac{1995 - 45}{195} = \dfrac{1950}{195} = 10$

120. (2) Expression $= \dfrac{\sqrt{24} + \sqrt{6}}{\sqrt{24} - \sqrt{6}}$

$= \dfrac{\sqrt{2 \times 2 \times 6} + \sqrt{6}}{\sqrt{2 \times 2 \times 6} - \sqrt{6}} = \dfrac{2\sqrt{6} + \sqrt{6}}{2\sqrt{6} - \sqrt{6}}$

$= \dfrac{\sqrt{6}(2+1)}{\sqrt{6}(2-1)} = 3$

121. (2) $a = 55$, $b = 17$, $c = -72$

$a + b + c = 55 + 17 - 72 = 0$

$\therefore a^3 + b^3 + c^3 - 3abc = 0$

122. (4) Let $2.75 = a$ and $2.25 = b$

$\therefore$ Expression $= \dfrac{a^3 - b^3}{a^2 + ab + b^2}$

$= \dfrac{(a-b)(a^2+ab+b^2)}{a^2+ab+b^2}$

$= a - b = 2.75 - 2.25$

$= 0.50 = \dfrac{1}{2}$

123. (2) Expression

$= \dfrac{(243)^{\frac{n}{5}} \times 3^{2n+1}}{9^n \times 3^{n-1}}$

$= \dfrac{(3^5)^{\frac{n}{5}} \times 3^{2n+1}}{(3^2)^n \times 3^{n-1}} = \dfrac{(3)^{5 \times \frac{n}{5}} \times 3^{2n+1}}{3^{2n} \times 3^{n-1}}$

$= \dfrac{3^n \times 3^{2n+1}}{3^{2n} \times 3^{n-1}} = \dfrac{3^{3n+1}}{3^{3n-1}}$

$= 3^{3n+1-3n+1} = 3^2 = 9$

$[a^m \times a^n = a^{m+n}; a^m \div a^n = a^{m-n}; (a^m)^n = a^{mn}]$

124. (3) Expression $= (\sqrt{3} + 1)(10 + \sqrt{12})(\sqrt{12} - 2)(5 - \sqrt{3})$

$= (\sqrt{3} + 1)(10 + 2\sqrt{3})(2\sqrt{3} - 2)(5 - \sqrt{3})$

$= (\sqrt{3} + 1) \times 2(5 + \sqrt{3}) \times 2(\sqrt{3} - 1)(5 - \sqrt{3})$

$= 4(\sqrt{3} + 1)(\sqrt{3} - 1)(5 + \sqrt{3})(5 - \sqrt{3})$

$= 4(3 - 1)(25 - 3)$

$[(a + b)(a - b) = a^2 - b^2]$

$= 4 \times 2 \times 22 = 176$

125. (2) Expression

$= (0.2)^3 \times 200 \div 2000$ of $(0.2)^2$

$= (0.2)^3 \times 200 \div (2000 \times 0.2 \times 0.2)$

$= \dfrac{0.2 \times 0.2 \times 0.2 \times 200}{2000 \times 0.2 \times 0.2}$

$= \dfrac{2 \times 2 \times 2 \times 200}{2000 \times 2 \times 2 \times 10}$

$= \dfrac{2}{100} = \dfrac{1}{50}$

126. (4) $\left(\sqrt{6} + \sqrt{10} - \sqrt{21} - \sqrt{35}\right)$

$\left(\sqrt{6} - \sqrt{10} + \sqrt{21} - \sqrt{35}\right)$

$= \left\{\left(\sqrt{6} - \sqrt{35}\right) + \left(\sqrt{10} - \sqrt{21}\right)\right\}$

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$\{(\sqrt{6}-\sqrt{35})-(\sqrt{10}-\sqrt{21})\}$

$=(\sqrt{6}-\sqrt{35})^2-(\sqrt{10}-\sqrt{21})^2$

$=(6+35-2\sqrt{210})$

$-(10+21-2\sqrt{210})$

$=41-2\sqrt{210}-31+2\sqrt{210}$

$=41-31=10$

127. (1) $\frac{1}{\sqrt{2}+1}=\frac{\sqrt{2}-1}{(\sqrt{2}+1)(\sqrt{2}-1)}$

$=\frac{\sqrt{2}-1}{2-1}=\sqrt{2}-1$

Similarly, $\frac{1}{\sqrt{3}+\sqrt{2}}$

$=\frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$

$=\frac{\sqrt{3}-\sqrt{2}}{3-2}$

$=\sqrt{3}-\sqrt{2}$

∴ Expression $=\sqrt{2}-1+\sqrt{3}-\sqrt{2}+\sqrt{4}-\sqrt{3}+\sqrt{5}-\sqrt{4}+\sqrt{6}-\sqrt{5}+\sqrt{7}-\sqrt{6}+\sqrt{8}-\sqrt{7}+\sqrt{9}-\sqrt{8}$

$=\sqrt{9}-1$

$=3-1=2$

128. (4) $\frac{1}{\sqrt{7}-\sqrt{6}}$

$=\frac{\sqrt{7}+\sqrt{6}}{(\sqrt{7}-\sqrt{6})(\sqrt{7}+\sqrt{6})}$

(rationalising the denominator)

$=\frac{\sqrt{7}+\sqrt{6}}{7-6}=\sqrt{7}+\sqrt{6}$

Similarly,

$\frac{1}{\sqrt{6}-\sqrt{5}}=\sqrt{6}+\sqrt{5}$;

$\frac{1}{\sqrt{5}-2}=\sqrt{5}+2$

$\frac{1}{\sqrt{8}-\sqrt{7}}=\sqrt{8}+\sqrt{7}$,

$\frac{1}{3-\sqrt{8}}=3+\sqrt{8}$

∴ Expression

$=(\sqrt{7}+\sqrt{6})-(\sqrt{6}+\sqrt{5})+(\sqrt{5}+2)-(\sqrt{8}+\sqrt{7})+(3+\sqrt{8})$

$=\sqrt{7}+\sqrt{6}-\sqrt{6}-\sqrt{5}+\sqrt{5}+2-\sqrt{8}-\sqrt{7}+3+\sqrt{8}=2+3=5$

129. (1) $2+x\sqrt{3}$

$=\frac{1}{2+\sqrt{3}}\times\frac{2-\sqrt{3}}{2-\sqrt{3}}$

(On rationalising the denominator)

$\Rightarrow 2+x\sqrt{3}=2-\sqrt{3}$

$\Rightarrow x\sqrt{3}=-\sqrt{3}\Rightarrow x=-1$

130. (3) Expression

$=\sqrt{\frac{0.324\times0.081\times4.624}{1.5625\times0.0289\times72.9\times64}}$

$=\sqrt{\frac{324\times81\times4624}{15625\times289\times729\times64}}$

$=\frac{18\times9\times68}{125\times17\times27\times8}=0.024$

131. (3) $\frac{\sqrt{7}-1}{\sqrt{7}+1}-\frac{\sqrt{7}+1}{\sqrt{7}-1}=a+\sqrt{7}\,b$

$\Rightarrow\frac{(\sqrt{7}-1)^2-(\sqrt{7}+1)^2}{(\sqrt{7}+1)(\sqrt{7}-1)}=a+\sqrt{7}\,b$

$\Rightarrow\frac{-4\times\sqrt{7}\times1}{7-1}=a+\sqrt{7}\,b$

$[\because (a-b)^2-(a+b)^2=-4ab]$

$\Rightarrow\frac{-4\sqrt{7}}{6}=a+\sqrt{7}\,b$

$\Rightarrow 0-\frac{2}{3}\sqrt{7}=a+\sqrt{7}\,b$

$\Rightarrow a=0,\ b=-\frac{2}{3}$

132. (3) $\frac{1}{\sqrt{2}+1}=\frac{(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)}$

(Rationalising the denominator)

$=\frac{\sqrt{2}-1}{2-1}=\sqrt{2}-1$

Similarly,

$\frac{1}{\sqrt{2}+\sqrt{3}}=\sqrt{3}-\sqrt{2}$;

$\frac{1}{\sqrt{4}+\sqrt{3}}=\sqrt{4}-\sqrt{3}$.....;

$\frac{1}{\sqrt{8}+\sqrt{9}}=\sqrt{9}-\sqrt{8}$

∴ Expression

$=\sqrt{2}-1+\sqrt{3}-\sqrt{2}+\sqrt{4}-\sqrt{3}+\sqrt{5}-\sqrt{4}+\sqrt{6}-\sqrt{5}+\sqrt{7}-\sqrt{6}+\sqrt{8}-\sqrt{7}+\sqrt{9}-\sqrt{8}=\sqrt{9}-1=3-1=2$

133. (4) $\frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}}=\frac{\sqrt{3}}{1}$

By componendo and dividendo,

$\frac{\sqrt{a+2b}+\sqrt{a-2b}+\sqrt{a+2b}-\sqrt{a-2b}}{\sqrt{a+2b}+\sqrt{a-2b}-\sqrt{a+2b}+\sqrt{a-2b}}$

$=\frac{\sqrt{3}+1}{\sqrt{3}-1}$

$\Rightarrow\frac{\sqrt{a+2b}}{\sqrt{a-2b}}=\frac{\sqrt{3}+1}{\sqrt{3}-1}$

On squaring,

$\frac{a+2b}{a-2b}=\frac{3+1+2\sqrt{3}}{3+1-2\sqrt{3}}=\frac{4+2\sqrt{3}}{4-2\sqrt{3}}$

$\Rightarrow\frac{a+2b}{a-2b}=\frac{2+\sqrt{3}}{2-\sqrt{3}}$

By componendo and dividendo,

$\frac{a+2b+a-2b}{a+2b-a+2b}=\frac{2+\sqrt{3}+2-\sqrt{3}}{2+\sqrt{3}+2+\sqrt{3}}$

$\Rightarrow\frac{2a}{4b}=\frac{4}{2\sqrt{3}}\Rightarrow\frac{a}{2b}=\frac{2}{\sqrt{3}}$

$\Rightarrow\frac{a}{b}=\frac{4}{\sqrt{3}}=4:\sqrt{3}$

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134. (4) Expression

$$= \frac{(75.8)^2 - (35.8)^2}{40}$$

$$= \frac{(75.8 + 35.8)(75.8 - 35.8)}{40}$$

$$= \frac{111.6 \times 40}{40} = 111.6$$

135. (4) Let, $0.67 = a$ and $0.33 = b$

$$\therefore \text{ Expression} = \frac{a^3 - b^3}{(a^2 + ab + b^2)}$$

$$= \frac{(a-b)(a^2 + ab + b^2)}{a^2 + ab + b^2}$$

$$= a - b = 0.67 - 0.33 = 0.34$$

136. (3) Expression

$$= \frac{1}{(1+\sqrt{3}) + \sqrt{2}} + \frac{1}{(1+\sqrt{3}) - \sqrt{2}}$$

$$= \frac{1 + \sqrt{3} - \sqrt{2} + 1 + \sqrt{3} + \sqrt{2}}{(1+\sqrt{3}+\sqrt{2})(1+\sqrt{3}-\sqrt{2})}$$

$$= \frac{2 + 2\sqrt{3}}{(1+\sqrt{3})^2 - (\sqrt{2})^2}$$

$$= \frac{2(1+\sqrt{3})}{1 + 3 + 2\sqrt{3} - 2}$$

$$= \frac{2(1+\sqrt{3})}{2(1+\sqrt{3})} = 1$$

137. (3) $a = \dfrac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$

$$= \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}} \times \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} - \sqrt{2}}$$

(Rationalising the denominator)

$$= \frac{(\sqrt{3} - \sqrt{2})^2}{(\sqrt{3})^2 - (\sqrt{2})^2}$$

$$= \frac{3 + 2 - 2 \times \sqrt{3} \times \sqrt{2}}{3 - 2}$$

$$= 5 - 2\sqrt{6}$$

$$\therefore b = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}} = 5 + 2\sqrt{6}$$

$$\therefore a + b = 5 - 2\sqrt{6} + 5 + 2\sqrt{6} = 10 \text{ and}$$

$$ab = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}} \times \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}} = 1$$

$$\therefore \frac{a^2}{b} + \frac{b^2}{a} = \frac{a^3 + b^3}{ab}$$

$$= a^3 + b^3 = (a+b)^3 - 3ab(a+b)$$
$$= (10)^3 - 3 \times 10 = 1000 - 30$$
$$= 970$$

138. (3) $1^3 + 2^3 + \ldots\ldots + 10^3 = 3025$

$$\therefore 2^3 + 4^3 + \ldots\ldots + 20^3$$
$$= 2^3 (1 + 2^3 + \ldots\ldots + 10^3)$$
$$= 8 \times 3025 = 24200$$

TYPE-II

1. (4) $\sqrt{3}, \sqrt[3]{2}, \sqrt{2}$ and $\sqrt[3]{4}$

LCM of 2 and 3 = 6

$$\therefore \sqrt{3} = (3)^{\frac{1}{2}} = 3^{\frac{3}{6}} = (3^3)^{\frac{1}{6}} = \sqrt[6]{27}$$

$$\sqrt[3]{2} = \sqrt[6]{2^2} = \sqrt[6]{4}$$

$$\sqrt{2} = \sqrt[6]{2^3} = \sqrt[6]{8}$$

$$\sqrt[3]{4} = \sqrt[6]{4^2} = \sqrt[6]{16}$$

2. (1) $\sqrt[3]{4} = \sqrt[12]{256}$, $\sqrt[4]{6} = \sqrt[12]{216}$,

$\sqrt[5]{15} = \sqrt[12]{225}$, $\sqrt[12]{245}$

3. (3) $(0.5)^2 = 0.25$

$\sqrt{0.49} = 0.7$

$\sqrt[3]{0.008} = 0.2$

$0.23 = 0.23$

$\therefore \sqrt{0.49} > (0.5)^2 > 0.23 > \sqrt[3]{0.008}$

4. (1) $\sqrt[3]{4}, \sqrt{2}, \sqrt[6]{3}, \sqrt[4]{5}$

L.C.M. of 3, 2, 6, 4, = 12

$$\sqrt[3]{4} = (4)^{\frac{1}{3}} = (4)^{\frac{4}{12}}$$

$$= \left(4^4\right)^{\frac{1}{12}} = (256)^{\frac{1}{12}}$$

$$\sqrt{2} = (2)^{\frac{1}{2}} = (2)^{\frac{6}{12}}$$

$$= \left(2^6\right)^{\frac{1}{12}} = (64)^{\frac{1}{12}}$$

$$\sqrt[6]{3} = (3)^{\frac{1}{6}} = (3)^{\frac{2}{12}} = \left(3^2\right)^{\frac{1}{12}}$$

$$= (9)^{\frac{1}{12}}$$

$$\sqrt[4]{5} = (5)^{\frac{1}{4}} = (5)^{\frac{3}{12}} = \left(5^3\right)^{\frac{1}{12}}$$

$$= (125)^{\frac{1}{12}}$$

$$\therefore (256)^{\frac{1}{12}} > (125)^{\frac{1}{12}} > (64)^{\frac{1}{12}} > (9)^{\frac{1}{12}}$$

or, $\sqrt[3]{4} > \sqrt[4]{5} > \sqrt{2} > \sqrt[6]{3}$

5. (3) $(2.89)^{0.5} = (2.89)^{\frac{5}{10}}$

$$= \sqrt{2.89} = 1.7$$
$$= 2 - (0.5)^2 = 2 - 0.25 = 1.75$$

$$1 + \frac{0.5}{1 - \frac{1}{2}} = 1 + \frac{0.5}{\frac{1}{2}}$$

$$= 1 + \frac{0.5}{0.5} = 1 + 1 = 2$$

$\sqrt{3} = 1.732$

6. (1) LCM of 2, 3, 4, 3 = 12

Thus $\sqrt{2} = \left(2^6\right)^{\frac{1}{12}} = \sqrt[12]{64}$

$\sqrt[3]{3} = \left(3^4\right)^{\frac{1}{12}} = \sqrt[12]{81}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

$\sqrt[3]{2} = \sqrt[12]{2^4} = \sqrt[12]{16}$

Obviously, $\sqrt[4]{5}$ is the greatest

$= 0.05$

7. (2) $(2.89)^{0.5} = (2.89)^{\frac{1}{2}} = 1.7$,

$2 - (0.5)^2 = 2 - 0.25 = 1.75$,

$\sqrt{3} = 1.732$

and $\sqrt[3]{0.008}$

$$= \sqrt[3]{0.2 \times 0.2 \times 0.2} = 0.2$$

Obviously,

$0.2 < 1.7 < 1.732 < 1.75$

$\therefore \sqrt[3]{0.008} < (2.89)^{0.5} < \sqrt{3} < 2 - (0.5)^2$

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8. (2) $\sqrt{2}, \sqrt[3]{3}, \sqrt[6]{6}, \sqrt[5]{5}$

LCM of 2, 3, 6 & 5 = 30

$2^{\frac{1}{2}} = 2^{\frac{15}{30}} = \sqrt[30]{2^{15}} = 32768$

$3^{\frac{1}{3}} = 3^{\frac{10}{30}} = \sqrt[30]{3^{10}} = 59049$

$6^{\frac{1}{6}} = 6^{\frac{5}{30}} = \sqrt[30]{6^5} = 7776$

$5^{\frac{1}{5}} = 5^{\frac{6}{30}} = \sqrt[30]{5^6} = 15625$

Therefore, $\sqrt[3]{3}$ is the greatest.

9. (4) Here, $\left(\sqrt{8}+\sqrt{5}\right)^2$

$= \left(\sqrt{8}\right)^2 + \left(\sqrt{5}\right)^2 + 2\times\sqrt{8}\times\sqrt{5}$

$= 8 + 5 + 2 \times \sqrt{8\times5}$

$= 13 + 2\sqrt{40}$

Similarly,

$\left(\sqrt{7}+\sqrt{6}\right)^2 = 7 + 6 + 2 \times \sqrt{7\times6}$

$= 13 + 2\sqrt{42}$.

$\left(\sqrt{10}+\sqrt{3}\right)^2$

$= 10 + 3 + 2 \times \sqrt{10\times3}$

$= 13 + 2\sqrt{30}$.

Similarly, $\left(\sqrt{11}+\sqrt{2}\right)^2$

$= 11 + 2 + 2\sqrt{11\times2}$

$= 13 + 2\sqrt{22}$

Clearly, $13 + 2\sqrt{22}$ is the smallest among these.

$\therefore \sqrt{11}+\sqrt{2}$ is the smallest.

10. (2) LCM of 2, 3, 4 and 6 = 12

$\therefore \sqrt{2} = (2)^{\frac{1}{2}} = (2)^{\frac{6}{12}}$

$= \left(2^6\right)^{\frac{1}{12}} = \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[3]{3} = \sqrt[12]{3^4} = \sqrt[12]{81}$

$\sqrt[4]{4} = \sqrt[12]{4^3} = \sqrt[12]{64}$

$\sqrt[6]{6} = \sqrt[12]{6^2} = \sqrt[12]{36}$

11. (4) $\sqrt{19}-\sqrt{17}$

$= \frac{\left(\sqrt{19}-\sqrt{17}\right)\times\left(\sqrt{19}\times\sqrt{17}\right)}{\sqrt{19}+\sqrt{17}}$

$= \frac{19-17}{\sqrt{19}+\sqrt{17}} = \frac{2}{\sqrt{19}+\sqrt{17}}$

Similarly, $\sqrt{13}-\sqrt{11}$

$= \frac{2}{\sqrt{13}+\sqrt{11}}$.

$\sqrt{7}-\sqrt{5} = \frac{2}{\sqrt{7}+\sqrt{5}}$

$\sqrt{5}-\sqrt{3} = \frac{2}{\sqrt{5}+\sqrt{3}}$

Clearly, $\sqrt{5}-\sqrt{3}$ is the greatest.

(Smaller the denominator, greater the no.)

12. (3) LCM of 3 and 2 = 6.

$\therefore \sqrt[3]{2} = \sqrt[6]{2^2} = \sqrt[6]{4}$;

$\sqrt{3} = \sqrt[6]{27}; \sqrt[3]{5} = \sqrt[6]{25}$

$1.5 = \sqrt{2.25} = \sqrt[6]{(2.25)^3}$

13. (3) LCM of 2, 6, 3, 4 = 12

$\therefore \sqrt{2} = \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[6]{3} = \sqrt[12]{3^2} = \sqrt[12]{9}$

$\sqrt[3]{4} = \sqrt[12]{4^4} = \sqrt[12]{256}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

Clearly,

$\sqrt[12]{9} < \sqrt[12]{64} < \sqrt[12]{125} < \sqrt[12]{256}$

$\therefore \sqrt[6]{3} < \sqrt{2} < \sqrt[4]{5} < \sqrt[3]{4}$

14. (1)

$\sqrt{3} = (3)^{\frac{1}{2}\times\frac{6}{6}} = \left(3^6\right)^{\frac{1}{12}} = (729)^{\frac{1}{12}}$

$\sqrt[3]{4} = (4)^{\frac{1}{3}\times\frac{4}{4}} = \left(4^4\right)^{\frac{1}{12}} = (256)^{\frac{1}{12}}$

$\sqrt[4]{6} = (6)^{\frac{1}{4}\times\frac{3}{3}} = \left(6^3\right)^{\frac{1}{12}} = (216)^{\frac{1}{12}}$

$\sqrt[6]{8} = (8)^{\frac{1}{6}\times\frac{2}{2}} = \left(8^2\right)^{\frac{1}{12}} = (64)^{\frac{1}{12}}$

Now, it is clear that $\sqrt{3}$ is the greatest.

15. (2) $\frac{1}{\sqrt{7}-\sqrt{5}}$

$= \frac{\sqrt{7}+\sqrt{5}}{(\sqrt{7}-\sqrt{5})(\sqrt{7}+\sqrt{5})}$

$= \frac{\sqrt{7}+\sqrt{5}}{7-5} = \frac{\sqrt{7}+\sqrt{5}}{2}$.

$\frac{1}{\sqrt{5}-\sqrt{3}} = \frac{\sqrt{5}+\sqrt{3}}{(\sqrt{5}-\sqrt{3})(\sqrt{5}+\sqrt{3})}$

$= \frac{\sqrt{5}+\sqrt{3}}{5-3} = \frac{\sqrt{5}+\sqrt{3}}{2}$

Similarly,

$\frac{1}{\sqrt{9}-\sqrt{7}} = \frac{\sqrt{9}+\sqrt{7}}{2}$

$\frac{1}{\sqrt{11}-\sqrt{9}} = \frac{\sqrt{11}+\sqrt{9}}{2}$

Clearly, $\frac{\sqrt{5}+\sqrt{3}}{2}$ is the smallest.

$\therefore \frac{1}{\sqrt{5}-\sqrt{3}}$ is the smallest.

$\therefore \sqrt{5}-\sqrt{3}$ is the greatest.

16. (1) The orders of the given surds are 3, 2, 4 and 6.

Their LCM = 12

Now we convert each surd into a surd of order 12.

$\sqrt[3]{9} = (9)^{\frac{1}{3}} = (9)^{\frac{4}{12}} = (9^4)^{\frac{1}{12}}$

$= \sqrt[12]{6561}$

Similarly,

$\sqrt{3} = \sqrt[12]{3^6} = \sqrt[12]{729}$

$\sqrt[4]{16} = \sqrt[12]{16^3} = \sqrt[12]{4096}$

$\sqrt[6]{80} = \sqrt[12]{80^2} = \sqrt[12]{6400}$

Clearly,

$\sqrt[12]{729} < \sqrt[12]{4096} < \sqrt[12]{6400} < \sqrt[12]{6561}$

$\therefore \sqrt[3]{9}$ is the greatest number.

17. (3) The orders of the surds are 2, 4, 2 and 2. Their LCM = 4

We convert each surd into a surd of order 4.

$2\sqrt{3} = \sqrt{4\times3} = \sqrt{12} = \sqrt[4]{(12)^2} = \sqrt[4]{144}$

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$2\sqrt[4]{5} = \sqrt[4]{2^4 \times 5} = \sqrt[4]{80}$

$3\sqrt{2} = \sqrt{18} = \sqrt[4]{(18)^2} = \sqrt[4]{324}$

$\sqrt{8} = \sqrt[4]{64}$

Hence, the least number $= \sqrt{8}$

18. (3)

9 |	$0.\overline{90}\ \overline{00}$ | 0.94
9 |	81
184 |	900
4 |	736
188 |	164

$\therefore \sqrt{0.9} = 0.94 \approx 0.9$

19. (2) $2^{60} = (2^5)^{12} = (32)^{12}$

$5^{24} = (5^2)^{12} = (25)^{12}$

$\therefore\ 2^{60} > 5^{24}$

$3^{48} = (3^4)^{12} = (81)^{12}$

$\therefore\ 3^{48} > 2^{60}$

$4^{36} = (4^3)^{12} = (64)^{12}$

$\therefore\ 3^{48}$ is the largest number.

20. (4) LCM of orders 2,3,4, 6 = 12

$\therefore (2)^{\frac{1}{2}} = 2^{\frac{6}{12}} = \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[3]{3} = \sqrt[12]{3^4} = \sqrt[12]{81}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

$\sqrt[6]{6} = \sqrt[12]{6^2} = \sqrt[12]{36}$

The greatest number $= \sqrt[4]{5}$

21. (4) LCM of indices of surds = LCM of 6, 3, 4 and 2 = 12

$\therefore \sqrt[6]{12} = \sqrt[12]{12^2} = \sqrt[12]{144}$

$\sqrt[3]{4} = \sqrt[12]{4^4} = \sqrt[12]{256}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

$\sqrt{3} = \sqrt[12]{3^6} = \sqrt[12]{729}$

$\therefore$ The smallest surd $= \sqrt[4]{5}$

22. (4) $(0.9)^2 = 0.81$:

$\sqrt{0.9} = 0.95$

$0.\overline{9} = \frac{9}{9} = 1$

23. (2) $(16)^{\frac{1}{4}} = (2^4)^{\frac{1}{4}} = 2$

$\sqrt[5]{32} = (32)^{\frac{1}{5}} = (2^5)^{\frac{1}{5}} = 2$

$\sqrt[3]{9} > 2, \sqrt{2} < 2$

24. (2) LCM of indices of surds = 20

$\therefore\ \sqrt[4]{3} = \sqrt[20]{3^5} = \sqrt[20]{243}$

$\sqrt[5]{4} = \sqrt[20]{4^4} = \sqrt[20]{256}$

$\sqrt[10]{12} = \sqrt[20]{144}$

25. (3) $3\sqrt{2} = 3 \times 1.4 = 4.2$

$3\sqrt{7} = 3 \times 2.6 = 7.8$

$6\sqrt{5} = 6 \times 2.2 = 13.2$

$2\sqrt{20} = 2 \times 4.5 = 9$

26. (4) $\sqrt{0.09} = 0.3$; $\sqrt[3]{0.064}$ = 0.4; 0.5;

$\frac{3}{5} = 0.6$

Clearly, $\sqrt{0.09} < \sqrt[3]{0.064} < 0.5 < \frac{3}{5}$

27. (2) LCM of power of surds = 12

$\therefore\ \sqrt{2} = (2)^{\frac{1}{2}} = (2^6)^{\frac{1}{12}}$

$= \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[3]{3} = \sqrt[12]{3^4} = \sqrt[12]{81}$

$\sqrt[4]{4} = \sqrt[12]{4^3} = \sqrt[12]{64}$

$\because$ Since 81 is the largest, hence, $\sqrt[3]{3}$ is the largest number.

28. (2) $\sqrt{0.16} = 0.4$; $(0.16)^2$ = 0.0256

Clearly,

$0.0256 < 0.04 < 0.16 < \sqrt{0.16}$

29. (2) $2^{250} = (2^5)^{50} = (32)^{50}$

$3^{150} = (3^3)^{50} = (27)^{50}$

$5^{100} = (5^2)^{50} = (25)^{50}$

$4^{200} = (4^4)^{50} = (256)^{50}$

$\therefore$ The smallest number $= (5)^{100}$

30. (4) LCM of 2, 4, 5 and 10 = 20

$\therefore \sqrt[2]{8} = \sqrt[20]{8^{10}}$; $\sqrt[4]{13} = \sqrt[20]{13^5}$

$\sqrt[5]{16} = \sqrt[20]{16^4}$; $\sqrt[10]{41} = \sqrt[20]{41^2}$

Clearly, $\sqrt[2]{8}$ is the largest.

31. (3) $\sqrt[3]{2} = 2^{\frac{1}{3}} = 2^{\frac{2}{6}} = \sqrt[6]{4}$

$\sqrt{3} = 3^{\frac{1}{2}} = 3^{\frac{3}{6}} = \sqrt[6]{27}$

32. (1) LCM of indices = LCM of 3, 6, 4 and 2 = 12

$\therefore \sqrt[3]{4} = (4)^{\frac{1}{3}} = (4)^{\frac{1}{12}} = \sqrt[12]{4^4}$

$= \sqrt[12]{256}$

$\sqrt{2} = (2)^{\frac{1}{2}} = \sqrt[12]{2^6} = \sqrt[12]{64}$

$\sqrt[6]{3} = \sqrt[12]{3^2} = \sqrt[12]{9}$

$\sqrt[4]{5} = \sqrt[12]{5^3} = \sqrt[12]{125}$

Clearly, $\sqrt[3]{4} > \sqrt[4]{5} > \sqrt{2} > \sqrt[6]{3}$

33. (4) Decimal equivalents of fractions :

$\frac{4}{9} = 0.44$; $\sqrt{\frac{9}{49}} = \frac{3}{7} = 0.43$;

$(0.7)^2 = 0.49$

34. (2) $3^{50} = (3^5)^{10} = (243)^{10}$

$4^{40} = (4^4)^{10} = (256)^{10}$

$5^{30} = (5^3)^{10} = (125)^{10}$

$6^{20} = (6^2)^{10} = (36)^{10}$

$\therefore$ Largest number $= 4^{40}$

TYPE-III

1. (1) $\sqrt{8} + 2\sqrt{32} - 3\sqrt{128} + 4\sqrt{50}$

$= 2\sqrt{2} + 8\sqrt{2} - 3 \times 8\sqrt{2} + 4 \times 5\sqrt{2}$

$= 2\sqrt{2} + 8\sqrt{2} - 24\sqrt{2} + 20\sqrt{2}$

$= (2 + 8 - 24 + 20)\sqrt{2}$

$= 6\sqrt{2} = 6 \times 1.414 = 8.484$

2. (1) $\sqrt{15} = 3.88$ (Given)

Now, $\sqrt{\frac{5}{3}} = \sqrt{\frac{5 \times 3}{3 \times 3}} = \frac{\sqrt{15}}{3}$

$= \frac{3.88}{3} = 1.29\overline{3}$

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3. (3)

$$\frac{4+3\sqrt{3}}{\sqrt{7+4\sqrt{3}}}=\frac{4+3\sqrt{3}}{\sqrt{4+3+2\times2\times\sqrt{3}}}$$

$$=\frac{4+3\sqrt{3}}{\sqrt{(2+\sqrt{3})^2}}=\frac{4+3\sqrt{3}}{2+\sqrt{3}}$$

$$=\frac{(4+3\sqrt{3})(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}$$

$$=8-4\sqrt{3}+6\sqrt{3}-9$$

$$=2\sqrt{3}-1=2\times1.732-1$$

$$=3.464-1=2.464$$

4. (4) Expression

$$=\frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{12}-\sqrt{32}+\sqrt{50}}$$

$$=\frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{2\times2\times3}-\sqrt{2\times2\times2\times2\times2}+\sqrt{2\times5\times5}}$$

$$=\frac{3+\sqrt{6}}{5\sqrt{3}-4\sqrt{3}-4\sqrt{2}+5\sqrt{2}}$$

$$=\frac{3+\sqrt{6}}{\sqrt{3}+\sqrt{2}}=\frac{(3+\sqrt{6})(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$$

[On rationalising the denominator]

$$=\frac{3\sqrt{3}+\sqrt{18}-3\sqrt{2}-\sqrt{12}}{3-2}$$

$$=3\sqrt{3}+3\sqrt{2}-3\sqrt{2}-2\sqrt{3}$$

$$=\sqrt{3}=1.732$$

5. (2) Expression $=\frac{1}{\sqrt{5}+\sqrt{3}}$

$$=\frac{1}{\sqrt{5}+\sqrt{3}}\times\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

(Rationalising the denominator)

$$=\frac{\sqrt{5}-\sqrt{3}}{5-3}=\frac{2.236-1.732}{2}$$

$$=\frac{0.504}{2}=0.252$$

6. (2) Expression

$$=\frac{3\sqrt{5}}{2\sqrt{5}-0.48}$$

$$=\frac{3\times2.24}{2\times2.24-0.48}=\frac{6.72}{4.48-0.48}$$

$$=\frac{6.72}{4}=1.68$$

7. (1) Expression

$$=\frac{1}{\sqrt{2}+1}=\frac{\sqrt{2}-1}{(\sqrt{2}+1)(\sqrt{2}-1)}$$

$$=\frac{\sqrt{2}-1}{2-1}=\sqrt{2}-1$$

$$=1.414-1=0.414$$

8. (1) Expression

$$=16\sqrt{\frac{3\times4}{4\times4}}-9\sqrt{\frac{4\times3}{3\times3}}$$

$$=\frac{16\sqrt{12}}{4}-\frac{9\sqrt{12}}{3}$$

$$=4\sqrt{12}-3\sqrt{12}$$

$$=\sqrt{12}=3.46$$

9. (2) Expression

$$=2\sqrt{2}+\sqrt{2}+\frac{1}{2+\sqrt{2}}+\frac{1}{\sqrt{2}-2}$$

$$=2\sqrt{2}+\sqrt{2}+\left(\frac{1}{2+\sqrt{2}}-\frac{1}{2-\sqrt{2}}\right)$$

$$=2\sqrt{2}+\sqrt{2}+\left(\frac{2-\sqrt{2}-2-\sqrt{2}}{(2+\sqrt{2})(2-\sqrt{2})}\right)$$

$$=2\sqrt{2}+\sqrt{2}+\frac{-2\sqrt{2}}{4-2}$$

$$=2\sqrt{2}+\sqrt{2}-\sqrt{2}=2\sqrt{2}$$

$$=2\times1.4142=2.8284$$

10. (2) Expression

$$=\frac{2+\sqrt{3}}{2-\sqrt{3}}=\frac{(2+\sqrt{3})(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})}$$

[On rationalising the denominator]

$$=\frac{(2+\sqrt{3})^2}{4-3}=(2+\sqrt{3})^2$$

$$=2^2+(\sqrt{3})^2+2\times2\times\sqrt{3}$$

$$=4+3+4\sqrt{3}$$

$$=7+4\times1.732=7+6.928$$

$$=13.928$$

11. (1) $\frac{7}{3+\sqrt{2}}=\frac{7(3-\sqrt{2})}{(3+\sqrt{2})(3-\sqrt{2})}$

[Rationalising the denominator]

$$=\frac{7(3-\sqrt{2})}{9-2}\quad[(a+b)(a-b)=a^2-b^2]$$

$$=3-\sqrt{2}$$

$$=3-1.4142=1.5858$$

$$=1.59$$ (correct to two decimal places)

12. (3) $\sqrt{5329}=73$

$$\therefore\sqrt{5329}+\sqrt{53.29}+\sqrt{0.5329}+\sqrt{0.005329}+\sqrt{0.00005329}$$

$$=73+7.3+0.73+0.073+0.0073$$

$$=81.1103$$

13. (2) $\sqrt{33}=5.745$ (Given)

$$\therefore\sqrt{\frac{3}{11}}=\sqrt{\frac{3\times11}{11\times11}}=\frac{\sqrt{33}}{11}$$

$$=\frac{5.745}{11}$$

$$=0.5223$$

14. (4) $\frac{1}{\sqrt{28}}=\frac{1}{2\sqrt{7}}$

$$=\frac{\sqrt{7}}{2\sqrt{7}\times\sqrt{7}}=\frac{\sqrt{7}}{14}$$

$$=\frac{2.646}{14}=0.189$$

TYPE-IV

1. (4) $3\sqrt{3}\times\sqrt{3}=3\times3=9$

$\therefore$ Required rationalising factor is $\sqrt{3}$.

2. (2) $\sqrt[3]{9}-\sqrt[3]{3}+1=(3)^{\frac{2}{3}}-(3)^{\frac{1}{3}}+(1)^{\frac{2}{3}}$

$$\therefore(\sqrt[3]{3}+1)(\sqrt[3]{9}-\sqrt[3]{3}+1)=(3^{\frac{1}{3}})^3+1$$

$$=3+1=4$$

$[\because a^3+b^3=(a+b)(a^2-ab+b^2)]$

$\therefore$ Rationalising factor $=\sqrt[3]{3}+1$

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3. (3) $4^{10} \times 7^3 \times 16^2 \times 11 \times 10^2$
$= (2^2)^{10} \times (7)^3 \times (2^4)^2 \times 11 \times (2 \times 5)^2$
$= 2^{20} \times 7^3 \times 2^8 \times 11 \times 2^2 \times 5^2$
$= (2)^{20+8+2} \times 5^2 \times 7^3 \times 11^1$
$= (2)^{30} \times 5^2 \times 7^3 \times 11^1$
$\therefore$ Total number of prime factors
$= 30 + 2 + 3 + 1 = 36$

4. (1) $(6)^{333} \times (7)^{222} \times (8)^{111}$
$\therefore (2 \times 3)^{333} \times (7)^{222} \times (2^3)^{111}$
$\therefore 2^{333} \times 3^{333} \times 7^{222} \times 2^{333}$
$\therefore 2^{666} \times 3^{333} \times 7^{222}$
$\therefore$ Number of prime factors
$= 666 + 333 + 222 = 1221$

5. (1) Expression $= \dfrac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

Rationalising the denominator,

$$= \frac{(\sqrt{3}+\sqrt{2})(\sqrt{3}+\sqrt{2})}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})}$$

$$= \frac{(\sqrt{3}+\sqrt{2})^2}{3-2} = (\sqrt{3}+\sqrt{2})^2$$

$$\therefore \sqrt{\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}} = \sqrt{(\sqrt{3}+\sqrt{2})^2}$$

$$= \sqrt{3}+\sqrt{2}$$

6. (1) $x = \dfrac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$

$$= \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} \times \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$$

$$= \frac{(\sqrt{5}+\sqrt{3})^2}{5-3} = \frac{5+3+2\sqrt{15}}{2}$$

$$= \frac{8+2\sqrt{15}}{2} = 4+\sqrt{15}$$

$$\therefore y = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} = 4-\sqrt{15}$$

$\therefore x + y$
$= 4 + \sqrt{15} + 4 - \sqrt{15} = 8$

7. (4) Expression $= \dfrac{5+\sqrt{11}}{3-2\sqrt{11}}$

$$= \frac{(5+\sqrt{11})(3+2\sqrt{11})}{(3-2\sqrt{11})(3+2\sqrt{11})}$$

(On rationalising the denominator)

$$= \frac{15+22+10\sqrt{11}+3\sqrt{11}}{9-4\times11}$$

$$= \frac{37+13\sqrt{11}}{-35}$$

$$\therefore x + y\sqrt{11} = \frac{-37}{35} - \frac{13}{35}\sqrt{11}$$

$$\therefore x = \frac{-37}{35},$$

$$y = -\frac{13}{35}$$

TYPE-V

1. (2) $\left[\sqrt[3]{\sqrt[6]{5^9}}\right]^4 \left[\sqrt[6]{\sqrt[3]{5^9}}\right]^4$

$$= \left[5^{9\times\frac{1}{6}\times\frac{1}{3}}\right]^4 \left[5^{9\times\frac{1}{6}\times\frac{1}{3}}\right]^4$$

$$= \left[5^{\frac{1}{2}\times4}\right]\left[5^{\frac{1}{2}\times4}\right] = 5^2 \times 5^2 = 5^4$$

2. (1) $27^{2x-1} = (243)^3$
$\Rightarrow (3^3)^{2x-1} = (3^5)^3$
$\Rightarrow (3)^{3(2x-1)} = (3)^{5\times3}$
$\Rightarrow 3(2x-1) = 5 \times 3$
or $2x - 1 = 5$ $\therefore x = 3$

3. (4) $3^{x+8} = 3^{3(2x+1)}$
$\Rightarrow x + 8 = 6x + 3$
$\Rightarrow 5x = 5$
$\therefore x = 1$

4. (4) $(36)^{\frac{1}{6}} = \left(6^2\right)^{\frac{1}{6}}$

$$= (6)^{\frac{2}{6}} = (6)^{\frac{1}{3}} = \sqrt[3]{6}$$

5. (1) $\left(\dfrac{8}{125}\right)^{-\frac{4}{3}} = \left(\dfrac{2^3}{5^3}\right)^{-\frac{4}{3}}$

$$= \left[\left(\frac{2}{5}\right)^3\right]^{-\frac{4}{3}} = \left(\frac{2}{5}\right)^{-\frac{4}{3}\times3}$$

$$= \left(\frac{5}{2}\right)^4 = \frac{625}{16}$$

6. (4) $(125)^{2/3} \times (625)^{-1/4} = 5^x$

$$\Rightarrow 5^{3\times\frac{2}{3}} \times 5^{4\times-\frac{1}{4}} = 5^x$$
$$\Rightarrow 5^2 \times 5^{-1} = 5^x$$
$$\Rightarrow 5^1 = 5^x \Rightarrow x = 1$$

7. (1) $(2000)^{10} = 1.024 \times 10^k$

$$\Rightarrow (2\times10^3)^{10} = \frac{1024}{1000}\times10^k$$
$$\Rightarrow 2^{10} \times 10^{30} = 1024 \times 10^{k-3}$$
$$\Rightarrow 2^{10} \times 10^{30} = 2^{10} \times 10^{k-3}$$
$$\Rightarrow 30 = k - 3 \Rightarrow k = 33$$

8. (3) $0.42 \times 100^k = 42$

$$\Rightarrow \frac{42}{100}\times100^k = 42$$
$$\Rightarrow 100^k = \frac{42\times100}{42} = 100^1$$
$$\Rightarrow k = 1$$

9. (3) $3^{x+y} = 81$
$\Rightarrow 3^{x+y} = 3^4$
$\Rightarrow x + y = 4$ ...(i)
and $81^{x-y} = 3$
$\Rightarrow (3^4)^{x-y} = 3$
$\Rightarrow 3^{4x-4y} = 3^1 \Rightarrow 4x - 4y = 1$ ...(ii)
By equation (i) $\times$ 4 + (ii) we have,

$$\begin{array}{r} 4x + 4y = 16 \\ 4x - 4y = 1 \\ \hline 8x \quad\quad = 17 \end{array} \Rightarrow x = \frac{17}{8}$$

10. (1) $2^x = 3^y = 6^{-z} = k$

$$\Rightarrow 2 = k^{\frac{1}{x}}; 3 = k^{\frac{1}{y}}; 6 = k^{-\frac{1}{z}}$$

$\because 2 \times 3 = 6$

$$\Rightarrow k^{\frac{1}{x}} \times k^{\frac{1}{y}} = k^{-\frac{1}{z}}$$

$$\Rightarrow k^{\frac{1}{x}+\frac{1}{y}} = k^{-\frac{1}{z}}$$

$$\Rightarrow \frac{1}{x}+\frac{1}{y} = -\frac{1}{z} \Rightarrow \frac{1}{x}+\frac{1}{y}+\frac{1}{z} = 0$$

11. (2) $a = 7 - 4\sqrt{3}$

$$\therefore \frac{1}{a} = \frac{1}{7-4\sqrt{3}}$$

$$= \frac{1}{7-4\sqrt{3}} \times \frac{7+4\sqrt{3}}{7+4\sqrt{3}}$$

$$= 7 + 4\sqrt{3}$$

$$\therefore \left(\sqrt{a} + \frac{1}{\sqrt{a}}\right)^2 = a + \frac{1}{a} + 2$$

$$= 7 - 4\sqrt{3} + 7 + 4\sqrt{3} + 2 = 16$$

$$\Rightarrow \sqrt{a} + \frac{1}{\sqrt{a}} = 4$$

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12. (3) $\left(\frac{3}{4}\right)^3 \times \left(\frac{4}{3}\right)^{-7} = \left(\frac{3}{4}\right)^{2x}$

$\Rightarrow \left(\frac{3}{4}\right)^3 \times \left(\frac{3}{4}\right)^7 = \left(\frac{3}{4}\right)^{2x}$

$\Rightarrow \left(\frac{3}{4}\right)^{10} = \left(\frac{3}{4}\right)^{2x}$

$\Rightarrow 2x = 10 \Rightarrow x = 5$

13. (4) $x^2 - \sqrt{3} = 0$

$\Rightarrow x^2 - (3)^{\frac{1}{2}} = 0$

$\Rightarrow x^2 - \left(3^{\frac{1}{4}}\right)^2 = 0$

$\Rightarrow \left(x + 3^{\frac{1}{4}}\right)\left(x - 3^{\frac{1}{4}}\right) = 0$

$\therefore x = 3^{\frac{1}{4}}$ or $-3^{\frac{1}{4}}$

$\therefore$ Product of roots

$= 3^{\frac{1}{4}} \times -3^{\frac{1}{4}} = -\sqrt{3}$

Note : Product of the roots of $ax^2 + bx + c = 0$ is $\frac{c}{a}$

$\therefore$ Product of the roots of $x^2 - b.0 - \sqrt{3} = 0$ is $-\sqrt{3}$

14. (4) $2^{x-1} + 2^{x+1} = 320$

$\Rightarrow 2^{x-1}\left(1 + 2^2\right) = 320$

$\Rightarrow 2^{x-1} \times 5 = 320$

$\Rightarrow 2^{x-1} = \frac{320}{5} = 64 \Rightarrow 2^{x-1} = 2^6$

$\Rightarrow x - 1 = 6 \Rightarrow x = 7$

15. (1) $4^{61} + 4^{62} + 4^{63} + 4^{64}$

$= 4^{61}(1 + 4 + 4^2 + 4^3)$

$= 4^{61}(1 + 4 + 16 + 64)$

$= 4^{61} \times 85$ which is divisible by 17.

16. (1) $5\sqrt{5} \times 5^3 + 5^{\frac{3}{2}} = 5^{a+2}$

$\Rightarrow 5 \times 5^{\frac{1}{2}} \times 5^3 + 5^{\frac{3}{2}} = 5^{a+2}$

$\Rightarrow 5^{1+\frac{1}{2}+3+\frac{3}{2}} = 5^{a+2}$

$\Rightarrow 5^6 = 5^{a+2} \Rightarrow a + 2 = 6$

$\Rightarrow a = 6 - 2 = 4$

$[a^m \times a^n = a^{m+n}]$

$[a^m \div a^n = a^{m-n}]$

17. (1) $(3 + 2\sqrt{2})(3 - 2\sqrt{2})$

$= (3)^2 - (2\sqrt{2})^2 = 9 - 8 = 1$

$\therefore 3 + 2\sqrt{2} = \frac{1}{3 - 2\sqrt{2}}$

$(x + y)^3 + (x - y)^3 = x^3 + y^3 + 3x^2 y + 3xy^2 + x^3 - y^3 - 3x^2 y + 3xy^2$

$= 2x^3 + 6xy^2$

$\therefore (3 + 2\sqrt{2})^{-3} + (3 - 2\sqrt{2})^{-3}$

$= \left(\frac{1}{3 + 2\sqrt{2}}\right)^3 + \left(\frac{1}{3 - 2\sqrt{2}}\right)^3$

$= (3 - 2\sqrt{2})^3 + (3 + 2\sqrt{2})^3$

$= 2 \times (3)^3 + 6 \times 3 \times (2\sqrt{2})^2$

$= 2 \times 27 + 18 \times 8$

$= 54 + 144 = 198$

18. (4) $3^x - 3^{x-1} = 486$

$\Rightarrow 3^{x-1}(3 - 1) = 486$

$\Rightarrow 3^{x-1} \times 2 = 486$

$\Rightarrow 3^{x-1} = \frac{486}{2} = 243$

$\Rightarrow 3^{x-1} = 3^5 \Rightarrow x - 1 = 5$

$\Rightarrow x = 5 + 1 = 6$

19. (2) $L = 2 - 2^t$

At the start, $t = 0$

$\therefore L = 2 - 2^0 = 2 - 1 = 1$ cm

20. (1) $3^{34} = (3^2)^{17} = 9^{17}$

$2^{51} = (2^3)^{17} = 8^{17}$

$7^{17} = 7^{17}$

Clearly, $9^{17} > 8^{17} > 7^{17}$

i.e., $3^{34} > 2^{51} > 7^{17}$

21. (3) $3^{2x-y} = 3^{x+y} = \sqrt{27} = (3)^{\frac{3}{2}}$

$\Rightarrow 2x - y = \frac{3}{2}$

$\Rightarrow 4x - 2y = 3$ ....(i)

and, $3^{x+y} = (3)^{\frac{3}{2}}$

$\Rightarrow x + y = \frac{3}{2}$

$\Rightarrow 2x + 2y = 3$ ....(ii)

From equations (i) and (ii)

$4x - 2y + 2x + 2y = 3 + 3$

$\Rightarrow 6x = 6 \Rightarrow x = 1$

From equation (i),

$4 - 2y = 3$

$\Rightarrow 2y = 1 \Rightarrow y = \frac{1}{2}$

$\therefore 3^{x-y} = 3^{1-\frac{1}{2}} = \sqrt{3}$

22. (3) Expression

$= [(0.87)^2 + (0.13)^2 + 0.87 \times 0.26]^{2013}$

$= (0.87 + 0.13)^{2013} = 1^{2013} = 1$

$[\because (a + b)^2 = a^2 + b^2 + 2ab]$

23. (2) Sum of the cubes of first n natural numbers

$= \left(\frac{n(n+1)}{2}\right)^2$

Their average $= \frac{n(n+1)^2}{4}$

$\therefore$ Required average when $n = 7$,

$= \frac{7(7+1)^2}{4} = \frac{7 \times 8 \times 8}{4} = 112$

24. (1) $7^1 = 7$, $7^2 = 49$, $7^3 = 343$, $7^4 = 2401$, $7^5 = 16807$

i.e. after index 4, the unit's digit is repeated.

$\therefore$ On dividing 153 by 4, remainder = 1

$\therefore$ Unit's digit in the expansion of $(2467)^{153} = 7^1 = 7$ and unit's digit in the expansion of $(341)^{72} = 1$

$\therefore$ Required unit's digit

$= 7 \times 1 = 7$

25. (4) Expression $= \sqrt{\sqrt{2} \times \sqrt{3}}$

$= \left(\sqrt{2} \times \sqrt{3}\right)^{\frac{1}{2}} = \left(2^{\frac{1}{2}} \times 3^{\frac{1}{2}}\right)^{\frac{1}{2}}$

$= (6)^{\frac{1}{2} \times \frac{1}{2}} = (6)^{\frac{1}{4}}$

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26. (4) Expression $= \frac{(10)^{100}}{(5)^{75}}$

$= \frac{(2\times5)^{100}}{(5)^{75}}$

$= \frac{(2)^{100}\times(5)^{100}}{(5)^{75}}$

$= 2^{100}\times5^{25}$

$= 2^{25}\times5^{25}\times2^{75}$

$= (10)^{25}\times2^{75}$

TYPE-VI

1. (3) Let $x=\sqrt{1+\sqrt{1+\sqrt{1+\ldots}}}$

On squaring both sides

$x^2=1+\sqrt{1+\sqrt{1+\sqrt{1+\ldots}}}$

$\Rightarrow x^2=1+x$

$\Rightarrow x^2-x-1=0$

$\Rightarrow x=\frac{+1\pm\sqrt{1+4}}{2}=\frac{+1\pm\sqrt{5}}{2}$

But sum of + ve numbers can't be negative.

$\therefore x=\frac{1+\sqrt{5}}{2}=\frac{1+2.236}{2}$

$=\frac{3.236}{2}=1.618$

Thus $1<1.618<2$

2. (3) Let $x=\sqrt{2+\sqrt{2+\sqrt{2+}}}\ldots\ldots$

$\therefore x^2=2+\sqrt{2+\sqrt{2+}}\ldots.$

$\Rightarrow x^2=2+x$

$\Rightarrow x^2-x-2=0$

$\Rightarrow x^2-2x+x-2=0$

$\Rightarrow x(x-2)+1(x-2)=0$

$\Rightarrow (x-2)(x+1)=0$

$\Rightarrow x=2$ or -1

But sum of positive numbers can't be negative.

$\therefore x=2$

3. (2) Let $x=\sqrt{12+\sqrt{12+\sqrt{12+}}}\ldots.$

On squaring both sides,

$x^2=12+\sqrt{12+\sqrt{12+\sqrt{12+}}}\ldots.$

$\Rightarrow x^2=12+x$

$\Rightarrow x^2-x-12=0$

$\Rightarrow x^2-4x+3x-12=0$

$\Rightarrow x(x-4)+3(x-4)=0$

$\Rightarrow (x-4)(x+3)=0$

$\Rightarrow x=4,-3$

$\because$ The given expression is positive.

$\therefore x=4$

4. (1) Let $x=\sqrt{6+\sqrt{6+\sqrt{6+}}}\ldots.$

Squaring on both sides,

$x^2=6+\sqrt{6+\sqrt{6+}}\ldots.$

$\Rightarrow x^2=6+x$

$\Rightarrow x^2-x-6=0$

$\Rightarrow x^2-3x+2x-6=0$

$\Rightarrow x(x-3)+2(x-3)=0$

$\Rightarrow (x+2)(x-3)=0$

$\therefore x=3$ because $x\neq-2$

5. (2) Let $x=\sqrt{3\sqrt{3\sqrt{3}}}\ldots.$

Squaring both sides,

$x^2=3\sqrt{3\sqrt{3\sqrt{3}}}\ldots.=3x$

$\Rightarrow x^2-3x=0$

$\Rightarrow x(x-3)=0$

$\therefore x=3$ because $x\neq0$

6. (3) Let $x=\sqrt{30+\sqrt{30+\sqrt{30+}}}\ldots.$

On squaring both sides,

$x^2=30+\sqrt{30+\sqrt{30+\sqrt{30+}}}\ldots.$

$\Rightarrow x^2=30+x$

$\Rightarrow x^2-x-30=0$

$\Rightarrow x^2-6x+5x-30=0$

$\Rightarrow x(x-6)+5(x-6)=0$

$\Rightarrow (x-6)(x+5)=0$

$\Rightarrow x=6$ because $x\neq-5$

7. (1) $x=\sqrt{2\sqrt[3]{4\sqrt{2\sqrt[3]{4}}}}\ldots\ldots\ldots\ldots$

On squaring

$x^2=2\sqrt[3]{4\sqrt{2\sqrt[3]{4}}}\ldots\ldots$

On cubing,

$x^6=8\times4x$

$\Rightarrow x^5=32=2^5\Rightarrow x=2$

8. (4) $m=\sqrt{5+\sqrt{5+\sqrt{5+}}}\ldots\ldots\ldots$

On squaring both sides,

$m^2=5+m\Rightarrow m^2-m=5$ ....(i)

Again,

$n=\sqrt{5-\sqrt{5-\sqrt{5}}}\ldots\ldots\ldots$

On squaring both sides,

$n^2=5-n$

$\Rightarrow n^2+n=5$ .....(ii)

$\therefore m^2-m=n^2+n$

$\Rightarrow (m^2-n^2)=m+n$

$\Rightarrow (m+n)(m-n)-(m+n)=0$

$\Rightarrow (m+n)(m-n-1)=0$

9. (1) $x=\sqrt{72+\sqrt{72+\sqrt{72+}}}\ldots\ldots$

On squaring both sides,

$x^2=72+\sqrt{72+\sqrt{72+\sqrt{72+}}}\ldots\ldots$

$\Rightarrow x^2=72+x$

$\Rightarrow x^2-x-72=0$

$\Rightarrow x^2-9x+8x-72=0$

$\Rightarrow x(x-9)+8(x-9)=0$

$\Rightarrow (x+8)(x-9)=0$

$\Rightarrow x=9$ because $x\neq-8$

10. (2)

$?=\frac{\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+15}}}}}{\sqrt[3]{2\times2\times2}}$

$=\frac{\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{169}}}}}{2}$

$=\frac{\sqrt{10+\sqrt{25+\sqrt{108+13}}}}{2}$

$=\frac{\sqrt{10+\sqrt{25+\sqrt{121}}}}{2}$

$=\frac{\sqrt{10+\sqrt{25+11}}}{2}$

$=\frac{\sqrt{10+\sqrt{36}}}{2}=\frac{\sqrt{10+6}}{2}$

$=\frac{\sqrt{16}}{2}=\frac{4}{2}=2$

11. (2) Let, $x=\sqrt{6+\sqrt{6+\sqrt{6+}}}\ldots\infty$

On squaring,

$x^2=6+\sqrt{6+\sqrt{6+\sqrt{6+}}}\ldots\infty$

$\Rightarrow x^2=6+x$

$\Rightarrow x^2-x-6=0$

$\Rightarrow x^2-3x+2x-6=0$

$\Rightarrow x(x-3)+2(x-3)=0$

$\Rightarrow (x+2)(x-3)=0$

$\Rightarrow x=3$ because $x\neq-2$

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TYPE-VII

1. (3) $\sqrt{3} = 1.732$

$\therefore \frac{173}{100} = 1.73 \approx 1.732$

2. (1) $a = \frac{\sqrt{3}}{2}$

$\therefore \sqrt{1+a} + \sqrt{1-a}$

$= \sqrt{1+\frac{\sqrt{3}}{2}} + \sqrt{1-\frac{\sqrt{3}}{2}}$

$= \frac{\sqrt{2+\sqrt{3}}}{\sqrt{2}} + \frac{\sqrt{2-\sqrt{3}}}{\sqrt{2}}$

$= \frac{\sqrt{4+2\sqrt{3}}}{\sqrt{2}\times\sqrt{2}} + \frac{\sqrt{4-2\sqrt{3}}}{\sqrt{2}\times\sqrt{2}}$

$= \frac{\sqrt{(\sqrt{3}+1)^2}}{2} + \frac{\sqrt{(\sqrt{3}-1)^2}}{2}$

$= \frac{\sqrt{3}+1}{2} + \frac{\sqrt{3}-1}{2}$

$= \frac{\sqrt{3}+1+\sqrt{3}-1}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}$

3. (2) It is given that

$a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$

Now, $a + b = \frac{\sqrt{5}+1}{\sqrt{5}-1} + \frac{\sqrt{5}-1}{\sqrt{5}+1}$

$= \frac{(\sqrt{5}+1)^2 + (\sqrt{5}-1)^2}{(\sqrt{5}-1)(\sqrt{5}+1)}$

$= \frac{2\left[(\sqrt{5})^2 + (1)^2\right]}{(\sqrt{5})^2 - (1)^2}$

$[\because (a+b)^2 + (a-b)^2 = 2(a^2+b^2)]$

$= \frac{2(5+1)}{5-1} = \frac{2\times 6}{4} = 3$

and $a.b = \frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}-1}{\sqrt{5}+1} = 1$

Expression $= \frac{a^2+ab+b^2}{a^2-ab+b^2}$

$= \frac{(a+b)^2-ab}{(a+b)^2-3ab} = \frac{(3)^2-1}{(3)^2-3\times 1}$

$= \frac{9-1}{9-3} = \frac{8}{6} = \frac{4}{3}$

4. (1) $x = 1 + \sqrt{2} + \sqrt{3}$ (Given)

$\therefore x + \frac{1}{x} = 1 + \sqrt{2} + \sqrt{3} + \frac{1}{\sqrt{2}+\sqrt{3}}$

$= 1 + \sqrt{2} + \sqrt{3} + \frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$

$= 1 + \sqrt{2} + \sqrt{3} + \frac{\sqrt{3}-\sqrt{2}}{(3-2)}$

$= 1 + \sqrt{2} + \sqrt{3} + \sqrt{3} - \sqrt{2}$

$= 1 + 2\sqrt{3}$

5. (3) $x + \frac{1}{x} = -2$ ...(i)

$\therefore \left(x - \frac{1}{x}\right)^2 = \left(x + \frac{1}{x}\right)^2 - 4$

$= (-2)^2 - 4 = 0$

$\Rightarrow x - \frac{1}{x} = 0$ ...(ii)

Solving equations (i) and (ii), we have

$\therefore x = -1$

$\therefore x^{2n+1} + \frac{1}{x^{2n+1}}$

$= (-1)^{2n+1} + \frac{1}{(-1)^{2n+1}}$

$= -1 - 1 = -2$

6. (4) $m^n = 121 = (11)^2$

$\Rightarrow m = 11, n = 2$

$\therefore (m-1)^{n+1} = (11-1)^{2+1}$

$= 10^3$

$= 1000$

7. (3) Required number

$= \frac{\sqrt{12}+\sqrt{18}}{\sqrt{3}+\sqrt{2}}$

$= \frac{\sqrt{2\times 2\times 3} + \sqrt{3\times 3\times 2}}{\sqrt{3}+\sqrt{2}}$

$= \frac{2\sqrt{3}+3\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

(Rationalising the denominator)

$= \frac{2\sqrt{3}\times\sqrt{3} + 3\sqrt{2}\times\sqrt{3} - 2\sqrt{3}\times\sqrt{2} - 3\sqrt{2}\times\sqrt{2}}{3-2}$

$= 6 + 3\sqrt{6} - 2\sqrt{6} - 6 = \sqrt{6}$

8. (2) All multiples of 7 upto 50

$\Rightarrow$ 7, 14, 21, 28, 35, 42 and 49

$\Rightarrow 7, 2\times 7, 3\times 7, 4\times 7, 5\times 7, 6\times 7$ and 7×7

$\therefore 7^n = 7^8 \Rightarrow n = 8$

9. (2) $9\sqrt{x} = \sqrt{12} + \sqrt{147}$

$\Rightarrow 9\sqrt{x} = 2\sqrt{3} + 7\sqrt{3}$

$= \sqrt{3}(2+7)$

$\Rightarrow 9\sqrt{x} = 9\sqrt{3} \Rightarrow x = 3$

10. (2) $43^2 < \sqrt{1896} < 44^2$

$\therefore 44 \times 44 = 1936$

$\therefore x = 44$

11. (4) $\left(\sqrt{6}+\sqrt{2}\right)^2$

$= 6 + 2 + 2\sqrt{12}$

$= 8 + 2\sqrt{12}$

$\left(\sqrt{5}+\sqrt{3}\right)^2 = 5 + 3 + 2\sqrt{15}$

$= 8 + 2\sqrt{15}$

Clearly, $\sqrt{15} > \sqrt{12}$

Hence, $\sqrt{6} + \sqrt{2} < \sqrt{5} + \sqrt{3}$

12. (2) $x = \frac{1}{\sqrt{2}+1}$

$= \frac{1}{\sqrt{2}+1} \times \frac{\sqrt{2}-1}{\sqrt{2}-1} = \frac{\sqrt{2}-1}{2-1}$

$= \sqrt{2} - 1$

$\therefore x + 1 = \sqrt{2} - 1 + 1$

$= \sqrt{2}$

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TEST YOURSELF

1. If $x = 1-\sqrt{2}$, find the value of $\left(x-\frac{1}{x}\right)^3$.

(1) 12 (2) 16
(3) 6 (4) 8

2. If $a = 7-4\sqrt{3}$, find the value of $\sqrt{a}+\frac{1}{\sqrt{a}}$.

(1) –6 (2) 6
(3) 4 (4) –4

3. If both a and b are rational numbers, find the values of a and b in the following equation :

$$\frac{\sqrt{3}-1}{\sqrt{3}+1} = a+b\sqrt{3}$$

(1) $a = 2,\ b = -1$
(2) $a = -2,\ b = 1$
(3) $a = -3,\ b = 1$
(4) $a = 3,\ b = -1$

4. Find the value of a and b in the following equaton.

$$\frac{5+\sqrt{3}}{7-4\sqrt{3}} = 47a+\sqrt{3}b$$

(1) $a = -27,\ b = 47$
(2) $a = -47,\ b = -27$
(3) $a = 47,\ b = 27$
(4) $a = 27,\ b = 47$

5. Simplify the following equation :

$$\frac{4+\sqrt{5}}{4-\sqrt{5}}+\frac{4-\sqrt{5}}{4+\sqrt{5}}$$

(1) $\frac{42}{11}$ (2) $\frac{-42}{11}$

(3) $\frac{-43}{22}$ (4) 11

6. $\frac{\sqrt{5}-2}{\sqrt{5}+2}+\frac{\sqrt{5}+2}{\sqrt{5}-2} = ?$

(1) $8\sqrt{5}$ (2) $-8\sqrt{5}$
(3) $8\sqrt{3}$ (4) $-8\sqrt{2}$

7. $\frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}+\frac{\sqrt{12}}{\sqrt{3}-\sqrt{2}} = ?$

(1) 11 (2) –11
(3) 12 (4) –12

8. $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{80}+\sqrt{48}-\sqrt{45}-\sqrt{27}} = ?$

(1) –2 (2) 2
(3) –1 (4) 1

9. Simplify :

$$\frac{6}{2\sqrt{3}-\sqrt{6}}+\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}-\frac{4\sqrt{3}}{\sqrt{6}-\sqrt{2}}$$

(1) 2 (2) –1
(3) 0 (4) 1

10. Simplify :

$$\frac{4\sqrt{18}}{\sqrt{12}}-\frac{8\sqrt{75}}{\sqrt{32}}+\frac{9\sqrt{2}}{\sqrt{3}}$$

(1) 0 (2) –1
(3) 1 (4) 2

11. If

$$\frac{7+\sqrt{5}}{7-\sqrt{5}}-\frac{7-\sqrt{5}}{7+\sqrt{5}} = a+7\sqrt{5}b,$$

determine the rational number.

(1) $a = -2,\ b = \frac{2}{11}$

(2) $a = 0,\ b = \frac{1}{11}$

(3) $a = -1,\ b = \frac{1}{11}$

(4) $a = -2,\ b = -11$

12. $2\times\frac{16\times2^{n+1}-4\times2^n}{16\times2^{n+2}-2\times2^{n+2}} = ?$

(1) 1 (2) $\frac{1}{3}$

(3) 2 (4) $\frac{1}{2}$

13. Evaluate :

$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}$$
$$+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}$$
$$+\frac{1}{\sqrt{7}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{9}}$$

(1) 4 (2) 0
(3) 2 (4) –2

14. Given

$\sqrt{2} = 1.4142$, find correct to three places of decimal the value of

$$\frac{4}{3\sqrt{3}-2\sqrt{2}}+\frac{3}{3\sqrt{3}+2\sqrt{2}}.$$

(1) 2.063 (2) 2.036
(3) 2.306 (4) 2.36

15. Evaluate

$$\frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$$

it being given that

$\sqrt{5} = 2.236$ and $\sqrt{10} = 3.162$.

(1) 5.938 (2) 5.398
(3) 5.893 (4) 5.839

16. If $x = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and

$y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ find the value of $x^3 + y^3$

(1) 807 (2) 907
(3) 970 (4) 870

17. If $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y = \frac{\sqrt{3}-1}{\sqrt{3}+1}$ find the value of $x^2 + xy - y^2$.

(1) $8\sqrt{2}+1$ (2) $8\sqrt{3}+1$

(3) $7\sqrt{3}+1$ (4) $8\sqrt{3}+2$

18. If $x = \frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}}$, ther find the value of $bx^2 - ax + b$

(1) 2 (2) 1
(3) 0 (4) 6

19. If $a = \frac{1}{3+2\sqrt{2}}$,

$b = \frac{1}{3-2\sqrt{2}}$ then $a^2b + ab^2 =$

(1) –5 (2) 5
(3) –6 (4) 6

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20. If $x=\sqrt{\frac{5+2\sqrt{6}}{5-2\sqrt{6}}}$ find the value of $x^2(x-10)^2$.

(1) 1 (2) −1
(3) 2 (4) −2

21. If $x=5-\sqrt{24}$, find the value of

$$\left(x^3+\frac{1}{x^3}\right)-10\left(x^2+\frac{1}{x^2}\right)+4\left(x+\frac{1}{x}\right)-30$$

(1) 1 (2) 0
(3) −1 (4) 2

22. a, b, c, p are rational numbers where p is a not a perfect cube.

If $a+bp^{\frac{1}{3}}+cp^{\frac{2}{3}}=0$, which of the following relations is correct ?

(1) $a=b=c=2$
(2) $a\neq b=c$
(3) $a=b=c=0$
(4) $a\neq b\neq c\neq 0$

23. Simplify: $\sqrt{3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}}}$

(1) $3^{15/16}$ (2) $3^{33/32}$
(3) $3^{21/32}$ (4) $3^{31/32}$

24. If $\sqrt{\sqrt[3]{0.000001\times x}}=0.5$ then find the value of x.

(1) 15625 (2) 15.625
(3) 16625 (4) 16.625

25. If $x=\sqrt{5+\sqrt{5+\sqrt{5+\ldots\infty}}}$ and $y=\sqrt{5-\sqrt{5-\sqrt{5-\ldots,\infty}}}$, then find the value of x.

(1) $-y$
(2) $y+1$
(3) $-y$ or $y+1$
(4) None of these

26. If $x=\frac{1}{2-\sqrt{3}}$ find the value of x^3-2x^2-7x+5.

(1) 2 (2) 8
(3) 4 (4) 3

27. Find the square root of $5+2\sqrt{6}$.

(1) $\sqrt{3}+\sqrt{2}$ (2) $\sqrt{3}+2$
(3) $2+\sqrt{3}$ (4) $\sqrt{3}-\sqrt{2}$

28. Find the positive square root of $14\sqrt{5}-30$.

(1) $\sqrt{5}(3-\sqrt{5})$
(2) $\sqrt[4]{5}(3-\sqrt{5})$
(3) $\sqrt{3}+2\sqrt{5}$
(4) $\sqrt{3}-2\sqrt{5}$

29. Evaluate: $\frac{2(\sqrt{2}+\sqrt{6})}{3\sqrt{2}+\sqrt{3}}$

(1) 21 (2) $-\frac{4}{3}$
(3) $\frac{4}{3}$ (4) $\frac{1}{3}$

30. Simplify: $\sqrt{\left(\frac{6+2\sqrt{3}}{33-19\sqrt{3}}\right)}$

(1) $5-2\sqrt{3}$ (2) $5+2\sqrt{3}$
(3) $5-3\sqrt{3}$ (4) $5+3\sqrt{3}$

31. Find the value of

$$\frac{\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}}{\sqrt{\sqrt{5}+1}}-\sqrt{3-2\sqrt{2}}$$

(1) 1 (2) −1
(3) 2 (4) −2

32. Simplify:

$$\frac{4\sqrt{3}}{2-\sqrt{2}}-\frac{30}{4\sqrt{3}-\sqrt{18}}-\frac{\sqrt{18}}{3-2\sqrt{3}}$$

(1) $2\sqrt{6}$ (2) $4\sqrt{6}$
(3) $3\sqrt{6}$ (4) $-4\sqrt{6}$

33. Show that

$$\frac{1}{\sqrt{11-2\sqrt{30}}}-\frac{3}{\sqrt{7-2\sqrt{10}}}-\frac{4}{\sqrt{8+4\sqrt{3}}}=0$$

(1) −2 (2) 2
(3) 0 (4) −1

34. Simplify: $\frac{\sqrt{4-\sqrt{7}}}{\sqrt{8+3\sqrt{7}-2\sqrt{2}}}$

(1) 1 (2) 2
(3) −2 (4) 3

35. Find the value of

$$\left(28+10\sqrt{3}\right)^{\frac{1}{2}}-\left(7-4\sqrt{3}\right)^{-\frac{1}{2}}.$$

(1) −3 (2) 3
(3) 2 (4) 4

36. Evaluate

$$(28-10\sqrt{3})^{\frac{1}{2}}-(7+4\sqrt{3})^{-\frac{1}{2}}+\frac{\sqrt{7}}{\sqrt{16+6\sqrt{7}}-\sqrt{16-6\sqrt{7}}}$$

(1) $4\frac{1}{2}$ (2) $2\frac{1}{2}$
(3) $3\frac{1}{2}$ (4) 3

37. Evaluate:

$$\frac{26-15\sqrt{3}}{\left[5\sqrt{2}-\sqrt{38+5\sqrt{3}}\right]^2}+\frac{\sqrt{10}+\sqrt{18}}{\sqrt{8}+\sqrt{(\sqrt{3}-\sqrt{5})}}$$

(1) $4\frac{1}{2}$ (2) $2\frac{1}{4}$
(3) $3\frac{1}{2}$ (4) $2\frac{1}{3}$

38. Simplify:

$$\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$$

(1) 2 (2) −2
(3) 3 (4) −3

39. Simplify:

$$\left(\frac{81}{16}\right)^{-\frac{3}{4}}\times\left\{\left(\frac{25}{9}\right)^{-\frac{3}{2}}+\left(\frac{5}{2}\right)^{-3}\right\}$$

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(1) 1 (2) 2
(3) 0 (4) 4

40. Simplify :

$$\left(\frac{1}{4}\right)^{-2}-3(8)^{\frac{2}{3}}(4)^0+\left(\frac{9}{16}\right)^{\frac{-1}{2}}$$

(1) $4\frac{1}{3}$ (2) $5\frac{1}{3}$

(3) $2\frac{1}{3}$ (4) $6\frac{1}{3}$

41. $\dfrac{(25)^{\frac{3}{2}}\times(243)^{\frac{3}{5}}}{(16)^{\frac{5}{4}}\times(8)^{\frac{4}{3}}}=?$

(1) $\frac{512}{3375}$ (2) $\frac{512}{3275}$

(3) $\frac{3375}{512}$ (4) $\frac{3475}{512}$

42. $\dfrac{16\times2^{n+1}-4\times2^n}{16\times2^{n+2}-2\times2^{n+2}}=?$

(1) $\frac{4}{5}$ (2) $\frac{3}{4}$

(3) $\frac{2}{3}$ (4) $\frac{1}{2}$

43. Simplify :

$$\frac{\left(x^{a+b}\right)^2\left(x^{b+c}\right)^2\left(x^{c+a}\right)^2}{\left(x^a x^b x^c\right)^4}$$

(1) $2x$ (2) 0
(3) 1 (4) $a+b+c$

44. If $25^{x-1}=5^{2x-1}-100$, find the value of x.

(1) 4 (2) 2
(3) 1 (4) 0

45. If $\dfrac{9^n\times3^2\times\left(3^{\frac{-n}{2}}\right)^{-2}-(27)^n}{3^{3m}\times2^3}=\frac{1}{27}$, then $m-n=?$

(1) 2 (2) 0
(3) 1 (4) 4

46. $\dfrac{a^{-1}}{a^{-1}+b^{-1}}+\dfrac{a^{-1}}{a^{-1}-b^{-1}}=?$

(1) $\frac{b^2}{b^2-a^2}$ (2) $\frac{b^2}{b^2+a^2}$

(3) $\frac{2b^2}{b^2+a^2}$ (4) $\frac{2b^2}{b^2-a^2}$

47. Assuming that x is a positive real number and a, b, c are rational numbers, then

$$\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ac}}=?$$

(1) 1 (2) 2
(3) 0 (4) 4

48. $\left(\dfrac{x^a}{x^b}\right)^{a+b}\left(\dfrac{x^b}{x^c}\right)^{b+c}\left(\dfrac{x^c}{x^a}\right)^{c+a}=?$

(1) $\frac{1}{2}$ (2) 2
(3) 0 (4) 1

49. $\left(\dfrac{x^a}{x^b}\right)^{a^2+ab+b^2}\left(\dfrac{x^b}{x^c}\right)^{b^2+bc+c^2}\left(\dfrac{x^c}{x^a}\right)^{c^2+ca+a^2}=?$

(1) 3 (2) 2
(3) 1 (4) 0

50. If x, y, z are positive real numbers, then

$$\sqrt{x^{-1}y}.\sqrt{y^{-1}z}.\sqrt{z^{-1}x}=?$$

(1) 1 (2) 0
(3) –1 (4) –2

51. Find the simplest value of

$$\frac{4\sqrt{3}}{2-\sqrt{2}}-\frac{30}{4\sqrt{3}-3\sqrt{2}}-\frac{3\sqrt{2}}{3-2\sqrt{3}}.$$

(1) $4\sqrt{2}$ (2) $4\sqrt{3}$

(3) $4\sqrt{6}$ (4) $5\sqrt{6}$

52. Find the value of n, if

$(10^{12}+25)^2-(10^{12}-25)^2=10^n$

(1) 12 (2) 13
(3) 14 (4) 15

53. Find the value of

$$\frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$$

if $\sqrt{5}=2.236$ and $\sqrt{10}=3.162$.

(1) 5.498 (2) 5.398
(3) 6.398 (4) 3.498

54. $\left(28-10\sqrt{3}\right)^m-\left(7+4\sqrt{3}\right)^{-m}$ is equal to

(1) 4 (2) 5
(3) 3 (4) 4.3

SHORT ANSWERS

1. (4)	2. (3)	3. (1)	4. (3)
5. (1)	6. (2)	7. (1)	8. (4)
9. (3)	10. (1)	11. (2)	12. (1)
13. (3)	14. (1)	15. (2)	16. (3)
17. (2)	18. (3)	19. (4)	20. (1)
21. (2)	22. (3)	23. (4)	24. (1)
25. (3)	26. (4)	27. (1)	28. (2)
29. (3)	30. (4)	31. (1)	32. (2)
33. (3)	34. (1)	35. (2)	36. (3)
37. (4)	38. (1)	39. (1)	40.(2)
41. (3)	42. (4)	43. (3)	44. (2)
45. (3)	46. (4)	47. (1)	48. (4)
49. (3)	50. (1)	51. (3)	52. (3)
53. (2)	54. (3)		

EXPLANATIONS

1. (4) Here, $x=1-\sqrt{2}$

$$\therefore \frac{1}{x}=\frac{1}{1-\sqrt{2}}$$

$$=\frac{1}{1-\sqrt{2}}\times\frac{1+\sqrt{2}}{1+\sqrt{2}}$$

$$=\frac{1+\sqrt{2}}{1-2}=-\left(1+\sqrt{2}\right)$$

$$\therefore x-\frac{1}{x}=\left(1-\sqrt{2}\right)-\left\{-\left(1+\sqrt{2}\right)\right\}$$

$$=1-\sqrt{2}+1+\sqrt{2}=2$$



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$$\therefore \left(x-\frac{1}{x}\right)^3 = 2^3 = 8$$

2. (3) We have $a = 7-4\sqrt{3}$

$$\therefore \frac{1}{a} = \frac{1}{7-4\sqrt{3}} \times \frac{7+4\sqrt{3}}{7+4\sqrt{3}}$$

$$= \frac{7+4\sqrt{3}}{(7)^2-\left(4\sqrt{3}\right)^2} = \frac{7+4\sqrt{3}}{49-48}$$

$$= 7+4\sqrt{3}$$

$$\text{Now, } \left(\sqrt{a}+\frac{1}{\sqrt{a}}\right)^2 = a+\frac{1}{a}+2$$

$$= 7-4\sqrt{3}+7+4\sqrt{3}+2 = 16$$

$$\therefore \sqrt{a}+\frac{1}{\sqrt{a}} = 4$$

3. (1) Multiplying the numerator and denominator by the conjugate of $\sqrt{3}+1$, we have

$$\frac{\sqrt{3}-1}{\sqrt{3}+1}$$

$$\frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{\left(\sqrt{3}-1\right)^2}{\left(\sqrt{3}\right)^2-(1)^2}$$

$$= \frac{\left(\sqrt{3}\right)^2+1-2\sqrt{3}}{3-1}$$

$$= \frac{4-2\sqrt{3}}{2} = 2-\sqrt{3}$$

$$\therefore \frac{\sqrt{3}-1}{\sqrt{3}+1} = a+b\sqrt{3}$$

$$\Rightarrow 2-\sqrt{3} = a+b\sqrt{3}$$

$$\Rightarrow a+b\sqrt{3} = 2+(-1)\sqrt{3}$$

On equating rational and irrational parts

$a = 2$ and $b = -1$

4. (3) Multiplying the numerator and denominator by the conjugate of $7-4\sqrt{3}$, we have

$$\frac{5+\sqrt{3}}{7-4\sqrt{3}}$$

$$= \frac{5+\sqrt{3}}{7-4\sqrt{3}} \times \frac{7+4\sqrt{3}}{7+4\sqrt{3}}$$

$$= \frac{35+5\times4\sqrt{3}+7\times\sqrt{3}+\sqrt{3}\times4\sqrt{3}}{7^2-\left(4\sqrt{3}\right)^2}$$

$$= \frac{35+20\sqrt{3}+7\sqrt{3}+4\left(\sqrt{3}\right)^2}{49-16\left(\sqrt{3}\right)^2}$$

$$= \frac{35+27\sqrt{3}+12}{49-48} = 47+27\sqrt{3}$$

$$\therefore \frac{5+\sqrt{3}}{7-4\sqrt{3}} = a+b\sqrt{3}$$

$$\Rightarrow 47+27\sqrt{3} = a+b\sqrt{3}$$

On equating rational and irrational parts.

$a = 47$ and $b = 27$

5. (1) Rationalising the denominator of each term, we have

$$\frac{4+\sqrt{5}}{4-\sqrt{5}}+\frac{4-\sqrt{5}}{4+\sqrt{5}}$$

$$= \frac{4+\sqrt{5}}{4-\sqrt{5}} \times \frac{4+\sqrt{5}}{4+\sqrt{5}} + \frac{4-\sqrt{5}}{4+\sqrt{5}} \times \frac{4-\sqrt{5}}{4-\sqrt{5}}$$

$$= \frac{\left(4+\sqrt{5}\right)^2}{\left(4-\sqrt{5}\right)\left(4+\sqrt{5}\right)} + \frac{\left(4-\sqrt{5}\right)^2}{\left(4+\sqrt{5}\right)\left(4-\sqrt{5}\right)}$$

$$= \frac{\left(4+\sqrt{5}\right)^2}{16-5} + \frac{\left(4-\sqrt{5}\right)^2}{16-5}$$

$$= \frac{\left(4+\sqrt{5}\right)^2+\left(4-\sqrt{5}\right)^2}{11}$$

$$= \frac{2\left[(4)^2+\left(\sqrt{5}\right)^2\right]}{11}$$

$[\because (a+b)^2+(a-b)^2 = 2(a^2+b^2)]$

$$= \frac{2(16+5)}{11} = \frac{42}{11}$$

6. (2) $\dfrac{\sqrt{5}-2}{\sqrt{5}+2} - \dfrac{\sqrt{5}+2}{\sqrt{5}-2}$

$$= \frac{\sqrt{5}-2}{\sqrt{5}+2} \times \frac{\sqrt{5}-2}{\sqrt{5}-2} - \frac{\sqrt{5}+2}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2}$$

$$= \frac{\left(\sqrt{5}-2\right)^2}{\left(\sqrt{5}+2\right)\left(\sqrt{5}-2\right)} - \frac{\left(\sqrt{5}+2\right)^2}{\left(\sqrt{5}-2\right)\left(\sqrt{5}+2\right)}$$

$$= \frac{\left(\sqrt{5}\right)^2+2^2-2\times2\times\sqrt{5}}{\left(\sqrt{5}\right)^2-2^2} - \frac{\left(\sqrt{5}\right)^2+2^2+2\times2\times\sqrt{5}}{\left(\sqrt{5}\right)^2-2^2}$$

$$= \frac{5+4-4\sqrt{5}}{5-4} - \frac{5+4+4\sqrt{5}}{5-4}$$

$$= \left(9-4\sqrt{5}\right)-\left(9+4\sqrt{5}\right)$$

$$= 9-4\sqrt{5}-9-4\sqrt{5} = -8\sqrt{5}$$

7. (1) 1st term $= \dfrac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$

Rationalising the denominator, we have

$$\frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}}$$

$$= \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}} \times \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}-2\sqrt{3}}$$

$$= \frac{\left(3\sqrt{2}-2\sqrt{3}\right)^2}{\left(3\sqrt{2}\right)^2-\left(2\sqrt{3}\right)^2}$$

$$= \frac{\left(3\sqrt{2}\right)^2+\left(2\sqrt{3}\right)^2-2\times3\sqrt{2}\times2\sqrt{3}}{18-12}$$

$$= \frac{18+12-12\sqrt{6}}{6} = \frac{30-12\sqrt{6}}{6}$$

$$= \frac{6\left(5-2\sqrt{6}\right)}{6} = 5-2\sqrt{6}$$

2nd term

$$= \frac{\sqrt{12}}{\sqrt{3}-\sqrt{2}} = \frac{\sqrt{4\times3}}{\sqrt{3}-\sqrt{2}} = \frac{2\sqrt{3}}{\sqrt{3}-\sqrt{2}}$$

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$= \frac{2\sqrt{3}}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

[Rationalising the denominator]

$= \frac{2\sqrt{3}(\sqrt{3}+\sqrt{2})}{(\sqrt{3})^2-(\sqrt{2})^2}$

$= \frac{6+2\sqrt{6}}{3-2} = 6+2\sqrt{6}$

$\therefore \frac{3\sqrt{2}-2\sqrt{3}}{3\sqrt{2}+2\sqrt{3}} + \frac{\sqrt{12}}{\sqrt{3}-\sqrt{2}}$

$= 5-2\sqrt{6}+6+2\sqrt{6} = 11$

8. (4) $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{80}+\sqrt{48}-\sqrt{45}-\sqrt{27}}$

$\therefore \frac{\sqrt{5}+\sqrt{3}}{\sqrt{16\times5}+\sqrt{16\times3}-\sqrt{9\times5}-\sqrt{9\times3}}$

$= \frac{\sqrt{5}+\sqrt{3}}{4\sqrt{5}+4\sqrt{3}-3\sqrt{5}-3\sqrt{3}}$

$= \frac{\sqrt{5}+\sqrt{3}}{(4-3)\sqrt{5}+(4-3)\sqrt{3}}$

$= \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}} = 1$

9. (3) Rationalising the denominator of each term, we have

1st term

$= \frac{6}{2\sqrt{3}-\sqrt{6}} \times \frac{2\sqrt{3}+\sqrt{6}}{2\sqrt{3}+\sqrt{6}}$

$= \frac{6(2\sqrt{3}+\sqrt{6})}{(2\sqrt{3})^2-(\sqrt{6})^2}$

$= \frac{6(2\sqrt{3}+\sqrt{6})}{12-6}$

$= \frac{6(2\sqrt{3}+\sqrt{6})}{6} = 2\sqrt{3}+\sqrt{6}$

2nd term

$= \frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$= \frac{\sqrt{18}-\sqrt{12}}{(\sqrt{3})^2-(\sqrt{2})^2}$

$= \frac{\sqrt{9\times2}-\sqrt{4\times3}}{3-2} = 3\sqrt{2}-2\sqrt{3}$

3rd term

$= \frac{4\sqrt{3}}{\sqrt{6}-\sqrt{2}} \times \frac{\sqrt{6}+\sqrt{2}}{\sqrt{6}+\sqrt{2}}$

$= \frac{4\sqrt{18}+4\sqrt{6}}{(\sqrt{6})^2-(\sqrt{2})^2}$

$= \frac{4(\sqrt{9\times2}+\sqrt{6})}{6-2} = 3\sqrt{2}+\sqrt{6}$

$\therefore$ Given expression =

$2\sqrt{3}+\sqrt{6}+3\sqrt{2}-2\sqrt{3}-3\sqrt{2}-\sqrt{6}$

$= 0$

10. (1) $\frac{4\sqrt{18}}{\sqrt{12}} - \frac{8\sqrt{75}}{\sqrt{32}} + \frac{9\sqrt{2}}{\sqrt{3}}$

$= \frac{4\sqrt{9\times2}}{\sqrt{4\times3}} - \frac{8\sqrt{25\times3}}{\sqrt{16\times2}} + \frac{9\sqrt{2}}{\sqrt{3}}$

$= \frac{12\sqrt{2}}{2\sqrt{3}} - \frac{40\sqrt{3}}{4\sqrt{2}} + \frac{9\sqrt{2}}{\sqrt{3}}$

$= \frac{6\sqrt{2}}{\sqrt{3}} - \frac{10\sqrt{3}}{\sqrt{2}} + \frac{9\sqrt{2}}{\sqrt{3}}$

Now rationalising the denominator of each term, we have

$= \frac{6\sqrt{2}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} - \frac{10\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} + \frac{9\sqrt{2}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{6\sqrt{6}}{3} - \frac{10\sqrt{6}}{2} + \frac{9\sqrt{6}}{3}$

$= 2\sqrt{6}-5\sqrt{6}+3\sqrt{6} = 0$

11. (2) Rationalising the denominator of each term, we get

L.H.S. $= \frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}}$

$= \frac{7+\sqrt{5}}{7-\sqrt{5}} \times \frac{7+\sqrt{5}}{7+\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} \times \frac{7-\sqrt{5}}{7-\sqrt{5}}$

$= \frac{(7+\sqrt{5})^2}{7^2-(\sqrt{5})^2} - \frac{(7-\sqrt{5})^2}{7^2-(\sqrt{5})^2}$

$= \frac{7^2+(\sqrt{5})^2+2\times7\times\sqrt{5}}{49-5}$

$- \frac{7^2+(\sqrt{5})^2-2\times7\times\sqrt{5}}{49-5}$

$= \frac{49+5+14\sqrt{5}}{44} - \frac{49+5-14\sqrt{5}}{44}$

$= \frac{54+14\sqrt{5}-54+14\sqrt{5}}{44}$

$= \frac{28\sqrt{5}}{44} = \frac{7\sqrt{5}}{11}$

Now $\frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}}$

$= a+7\sqrt{5}\,b$

$\Rightarrow \frac{7\sqrt{5}}{11} = a+7\sqrt{5}\,b$

$\Rightarrow 0+7\sqrt{5}.\frac{1}{11} = a+7\sqrt{5}\,b$

$\Rightarrow a = 0$ and $b = \frac{1}{11}$

12. (1) $\frac{16\times2^{n+1}-4\times2^n}{16\times2^{n+2}-2\times2^{n+2}}$

$= \frac{2^4\times2^{n+1}-2^2\times2^n}{2^4\times2^{n+2}-2\times2^{n+2}}$

$= \frac{2^{n+5}-2^{n+2}}{2^{n+6}-2^{n+3}}$

$= \frac{2^{n+5}-2^{n+2}}{2(2^{n+5}-2^{n+2})} = \frac{1}{2}$

$\therefore$ Expression $= 2 \times \frac{1}{2} =$

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13. (3) Rationalising the denominator of each term, the given expression becomes

$$= \frac{1-\sqrt{2}}{1-2} + \frac{\sqrt{2}-\sqrt{3}}{2-3} + \frac{\sqrt{3}-\sqrt{4}}{3-4}$$
$$+ \frac{\sqrt{4}-\sqrt{5}}{4-5} + \ldots + \frac{\sqrt{8}-\sqrt{9}}{8-9}$$
$$= -1+\sqrt{2}-\sqrt{2}+\sqrt{3}-\sqrt{3}+\sqrt{4}$$
$$-\sqrt{4}+\sqrt{5}-\sqrt{5}+\sqrt{6}-\sqrt{6}$$
$$+\sqrt{7}-\sqrt{7}+\sqrt{8}-\sqrt{8}+\sqrt{9}$$
$$= -1+\sqrt{9} = -1+3 = 2$$

14. (1) Rationalising the denominator of each term, we have

$$= \frac{4}{3\sqrt{3}-2\sqrt{2}} \times \frac{3\sqrt{3}+2\sqrt{2}}{3\sqrt{3}+2\sqrt{2}}$$
$$+ \frac{3}{3\sqrt{3}+2\sqrt{2}} \times \frac{3\sqrt{3}-2\sqrt{2}}{3\sqrt{3}-2\sqrt{2}}$$
$$= \frac{4\left(3\sqrt{3}+2\sqrt{2}\right)}{\left(3\sqrt{3}\right)^2-\left(2\sqrt{2}\right)^2} + \frac{3\left(3\sqrt{3}-2\sqrt{2}\right)}{\left(3\sqrt{3}\right)^2-\left(2\sqrt{2}\right)^2}$$
$$= \frac{12\sqrt{3}+8\sqrt{2}+9\sqrt{3}-6\sqrt{2}}{27-8}$$
$$= \frac{(12+9)\sqrt{3}+(8-6)\sqrt{2}}{19}$$
$$= \frac{21}{19}\sqrt{3}+\frac{2}{19}\sqrt{2}$$
$$= \frac{21}{19}\times 1.7321 + \frac{2}{19}\times 1.4142$$
$$= \frac{1}{19}(21\times 1.7321 + 2\times 1.4142)$$
$$= \frac{1}{19}(36.3741 + 2.8284)$$
$$= \frac{39.2025}{19} = 2.0632 = 2.063$$

Method 2 :

$$\frac{4}{3\sqrt{3}-2\sqrt{2}} + \frac{3}{3\sqrt{3}+2\sqrt{2}}$$
$$= \frac{4\left(3\sqrt{3}+2\sqrt{2}\right)+3\left(3\sqrt{3}-2\sqrt{2}\right)}{\left(3\sqrt{3}-2\sqrt{2}\right)\left(3\sqrt{3}+2\sqrt{2}\right)}$$
$$= \frac{12\sqrt{3}+8\sqrt{2}+9\sqrt{3}-6\sqrt{2}}{\left(3\sqrt{3}\right)^2-\left(2\sqrt{2}\right)^2}$$
$$= \frac{21\sqrt{3}+2\sqrt{2}}{27-8}$$
$$= \frac{21}{19}\sqrt{3}+\frac{2}{19}\sqrt{2}$$
$$= \frac{21}{19}\times 1.7321 + \frac{2}{19}\times 1.4142$$
$$= \frac{1}{19}(21\times 1.7321 + 2\times 1.4142)$$
$$= \frac{1}{19}(36.3741 + 2.8284)$$
$$= \frac{39.2028}{19} = 2.0632 = 2.063$$

15. (2) We have

$$\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}$$
$$= \sqrt{10}+\sqrt{2^2\times 5}+\sqrt{2^2\times 10}$$
$$-\sqrt{5}-\sqrt{2^4\times 5}$$
$$= \sqrt{10}+2\sqrt{5}+2\sqrt{10}-\sqrt{5}-4\sqrt{5}$$
$$= (1+2)\sqrt{10}+(2-1-4)\sqrt{5}$$
$$= 3\sqrt{10}-3\sqrt{5} = 3\left(\sqrt{10}-\sqrt{5}\right)$$
$$\therefore \frac{15}{\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}}$$
$$= \frac{15}{3\left(\sqrt{10}-\sqrt{5}\right)} = \frac{15}{\sqrt{10}-\sqrt{5}}$$
$$= \frac{5\left(\sqrt{10}+\sqrt{5}\right)}{\left(\sqrt{10}-\sqrt{5}\right)\left(\sqrt{10}+\sqrt{5}\right)}$$
$$= \frac{5\left(\sqrt{10}+\sqrt{5}\right)}{10-5}$$
$$= \sqrt{10}+\sqrt{5} = 3.162 + 2.236 = 5.398$$

16. (3) Rationalising the denominators, we have

$$x = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$
$$= \frac{\left(\sqrt{3}-\sqrt{2}\right)^2}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$$
$$= \frac{3+2-2\sqrt{3}\times\sqrt{2}}{3-2} = 5-2\sqrt{6}$$

and, $y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$$= \frac{\left(\sqrt{3}+\sqrt{2}\right)^2}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$$
$$= \frac{3+2+2\sqrt{3}\times\sqrt{2}}{3-2} = 5+2\sqrt{6}$$
$$\therefore x+y$$
$$= 5-2\sqrt{6}+5+2\sqrt{6} = 10$$

and, $xy = \left(5-2\sqrt{6}\right)\left(5+2\sqrt{6}\right)$

$$= 5^2-\left(2\sqrt{6}\right)^2 = 25-24 = 1$$

$x^3 + y^3 = (x + y)^3 - 3xy\,(x + y)$
$= 10^3 - 3 \times 10 = 1000 - 30 = 970$

17. (2) We have

$$x = \frac{\sqrt{3}+1}{\sqrt{3}-1} = \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$
$$= \frac{\left(\sqrt{3}+1\right)^2}{\left(\sqrt{3}\right)^2-(1)^2} = \frac{3+1+2\sqrt{3}}{3-1}$$
$$= \frac{4+2\sqrt{3}}{2} = 2+\sqrt{3}$$

Similarly, $y = 2-\sqrt{3}$

$$\therefore x+y = 2+\sqrt{3}+2-\sqrt{3} = 4$$
$$x-y$$
$$= \left(2+\sqrt{3}\right)-\left(2-\sqrt{3}\right) = 2\sqrt{3}$$

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$xy = (2+\sqrt{3})(2-\sqrt{3})$

$= 4-3 = 1$

Hence, x^2+xy-y^2

$= x^2-y^2+xy$

$= (x+y)(x-y)+xy$

$= 4\times 2\sqrt{3}+1 = 8\sqrt{3}+1$

18. (3) We have

$$x = \frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}-\sqrt{a-2b}} \times \frac{\sqrt{a+2b}+\sqrt{a-2b}}{\sqrt{a+2b}+\sqrt{a-2b}}$$

$$= \frac{\left(\sqrt{a+2b}+\sqrt{a-2b}\right)^2}{\left(\sqrt{a+2b}\right)^2-\left(\sqrt{a-2b}\right)^2}$$

$$= \frac{a+2b+a-2b+2\sqrt{a+2b}\sqrt{a-2b}}{(a+2b)-(a-2b)}$$

$$= \frac{2a+2\sqrt{a^2-4b^2}}{4b}$$

$$\therefore x = \frac{a+\sqrt{a^2-4b^2}}{2b}$$

$$\Rightarrow 2bx = a+\sqrt{a^2-4b^2}$$

$$\Rightarrow 2bx-a = \sqrt{a^2-4b^2}$$

$$\Rightarrow (2bx-a)^2 = \left(\sqrt{a^2-4b^2}\right)^2$$

[On squaring both sides]

$\Rightarrow 4b^2x^2 + a^2 - 4abx = a^2 - 4b^2$

$\Rightarrow 4b^2x^2 - 4abx + 4b^2 = 0$

$\Rightarrow 4b(bx^2 - ax + b) = 0$

$\Rightarrow bx^2 - ax + b = 0$

19. (4) $a = \frac{1}{3+2\sqrt{2}}$

$$= \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$$

$$= \frac{3-2\sqrt{2}}{(3)^2-\left(2\sqrt{2}\right)^2}$$

$$= \frac{3-2\sqrt{2}}{9-8} = 3-2\sqrt{2}$$

$$b = \frac{1}{3-2\sqrt{2}} \times \frac{3+2\sqrt{2}}{3+2\sqrt{2}}$$

$$= \frac{3+2\sqrt{2}}{(3)^2-\left(2\sqrt{2}\right)^2}$$

$$= \frac{3+2\sqrt{2}}{9-8} = 3+2\sqrt{2}$$

Now, $a^2b + ab^2 = ab(a+b)$

$\therefore a+b$

$= 3-2\sqrt{2}+3+2\sqrt{2} = 6$

and, $ab = (3-2\sqrt{2})(3+2\sqrt{2})$

$= 9 - 8 = 1$

Hence, $a^2b + ab^2 = ab(a+b)$

$= 1 \times 6 = 6$

20. (1) $x = \sqrt{\frac{5+2\sqrt{6}}{5-2\sqrt{6}}}$

On rationalising, we have

$$x = \sqrt{\frac{5+2\sqrt{6}}{5-2\sqrt{6}} \times \frac{5+2\sqrt{6}}{5+2\sqrt{6}}}$$

$$= \sqrt{\frac{\left(5+2\sqrt{6}\right)^2}{(5)^2-\left(2\sqrt{6}\right)^2}}$$

$$= \sqrt{\frac{\left(5+2\sqrt{6}\right)^2}{25-24}} = 5+2\sqrt{6}$$

$\therefore x^2(x-10)^2$

$= (5+2\sqrt{6})^2(5+2\sqrt{6}-10)^2$

$= (5+2\sqrt{6})^2(2\sqrt{6}-5)^2$

$= (25+24+20\sqrt{6})(24+25-20\sqrt{6})$

$= (49+20\sqrt{6})(49-20\sqrt{6})$

$= (49)^2-(20\sqrt{6})^2$

$= 2401 - 2400 = 1$

21. (2) Here, $x = 5-\sqrt{24}$

$$\therefore \frac{1}{x} = \frac{1}{5-\sqrt{24}}$$

$$= \frac{1}{5-\sqrt{24}} \times \frac{5+\sqrt{24}}{5+\sqrt{24}}$$

$$= \frac{5+\sqrt{24}}{25-24} = 5+\sqrt{24}$$

$$\therefore x^3+\frac{1}{x^3}$$

$$= \left(x+\frac{1}{x}\right)^3 - 3\left(x+\frac{1}{x}\right)$$

$$= \left(5-\sqrt{24}+5+\sqrt{24}\right)^3$$

$$-3\left(5-\sqrt{24}+5+\sqrt{24}\right)$$

$= 10^3 - 3 \times 10$

$= 1000 - 30 = 970$

$$x^2+\frac{1}{x^2} = \left(x+\frac{1}{x}\right)^2 - 2$$

$$= \left(5-\sqrt{24}+5+\sqrt{24}\right)^2 - 2$$

$= 100 - 2 = 98$

$$x+\frac{1}{x}$$

$= 5-\sqrt{24}+5+\sqrt{24} = 10$

$\therefore$ The given expression

$= 970 - 10 \times 98 + 4 \times 10 - 30$

$= 970 - 980 + 40 - 30 = 0$

22. (3) $a + bp^{\frac{1}{3}} + cp^{\frac{2}{3}} = 0$ --(i)

On multiplying both sides by $p^{\frac{1}{3}}$,

$ap^{\frac{1}{3}} + bp^{\frac{2}{3}} + cp = 0$ --(ii)

Equation (i) $\times b$ – (ii) $\times c$,

$$\left(ab + b^2p^{\frac{1}{3}} + bcp^{\frac{2}{3}}\right) -$$

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$$\left(acp^{\frac{1}{3}} + bcp^{\frac{2}{3}} + c^2p\right) = 0$$

$\Rightarrow \left(b^2 - ac\right)p^{\frac{1}{3}} + ab - c^2p = 0$

$\Rightarrow b^2 - ac = 0$ and $ab - c^2p = 0$

$\Rightarrow b^2 = ac$ and $ab = c^2p$

$\Rightarrow b^2 = ac$ and $a^2b^2 = c^4p^2$

$\Rightarrow a^2(ac) = c^4p^2$

$\Rightarrow a^3c - p^2c^4 = 0$

$\Rightarrow (a^3 - p^2c^3)c = 0$

$\Rightarrow a^3 - p^2c^3 = 0$ or $c = 0$

$a^3 - p^2c^3 = 0$

$p^2 = \frac{a^3}{c^3} \Rightarrow \left(p^2\right)^{\frac{1}{3}} = \frac{a}{c}$

$\Rightarrow \left(p^{\frac{1}{3}}\right)^{\frac{1}{2}} = \frac{a}{c}$, which is impossible as $(p)^{\frac{1}{3}}$ is irrational.

$\therefore c = 0$

Putting $c = 0$ in

$b = 0$

$\therefore a + bp^{\frac{1}{3}} + cp$

$\Rightarrow a = 0$

$\therefore a = b = c = 0$

23. (4) Let $x = \sqrt{3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}}}$

On squaring both sides, we have,

$\Rightarrow x^2 = 3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}}$

On squaring again,

$\Rightarrow x^4 = 3^2 \times 3\sqrt{3\sqrt{3\sqrt{3}}}$

On squaring again,

$\Rightarrow x^8 = 3^4 \times 3^2 \times 3\sqrt{3\sqrt{3}}$

On squaring again, $\Rightarrow x^{16}$

$= 3^8 \times 3^4 \times 3^2 \times 3\sqrt{3}$

On squaring again

$\Rightarrow x^{32} = 3^{16} \times 3^8 \times 3^4 \times 3^2 \times 3$

$x^{32} = 3^{16+8+4+2+1}$

$\Rightarrow x^{32} = 3^{31}$

$\Rightarrow x = \left(3^{31}\right)^{\frac{1}{32}} = 3^{\frac{31}{32}}$

24. (1) The given expression

$\sqrt{\sqrt[3]{0.000001 \times x}} = 0.5$

$\Rightarrow \left(\sqrt[3]{0.000001 \times x}\right)^{\frac{1}{2}} = 0.5$

$\Rightarrow (0.000001 \times x)^{\frac{1}{2} \times \frac{1}{3}} = 0.5$

$\Rightarrow (0.000001 \times x)^{\frac{1}{6}} = 0.5$

$\Rightarrow \left(10^{-6} \times x\right)^{\frac{1}{6}} = 0.5$

$\Rightarrow 10^{-1} \times x^{\frac{1}{6}} = 0.5$

$\Rightarrow x^{\frac{1}{6}} = \frac{0.5}{0.1} = 5$

$\Rightarrow x = 5^6 = 15625$

25. (3) Here,

$x = \sqrt{5 + \sqrt{5 + \sqrt{5 + \ldots\ldots}}}\infty$

On squaring we have $x^2 = 5 + x$ ....(i)

and, $y = \sqrt{5 - \sqrt{5 - \sqrt{5 - \ldots\ldots}}}\infty$

$\therefore y^2 = 5 - y$ ...(ii)

From equations (i) and (ii)

$x^2 - x = y^2 + y$

$\Rightarrow x^2 - y^2 = x + y$

$\Rightarrow (x + y)(x - y) = (x + y)$

$\Rightarrow (x + y)(x - y) - (x + y) = 0$

$\Rightarrow (x + y)(x - y - 1) = 0$

Thus, either $x + y = 0$ or, $(x - y - 1) = 0$

or, $x = -y$ or, $x = y + 1$

26. (4) We have

$x = \frac{1}{2 - \sqrt{3}}$

$= \frac{1}{2 - \sqrt{3}} \times \frac{2 + \sqrt{3}}{2 + \sqrt{3}}$

$= \frac{2 + \sqrt{3}}{2^2 - \left(\sqrt{3}\right)^2}$

$= \frac{2 + \sqrt{3}}{4 - 3} = 2 + \sqrt{3}$

Now, $x = 2 + \sqrt{3}$

$\Rightarrow x - 2 = \sqrt{3}$

$\Rightarrow (x - 2)^2 = \left(\sqrt{3}\right)^2$

$\Rightarrow x^2 - 4x + 4 = 3$

$\Rightarrow x^2 - 4x + 1 = 0$ ....(i)

Now,

$x^2 - 4x + 1 \;)\; x^3 - 2x^2 - 7x + 5 \;(x + 2$

$x^3 - 4x + x$

$- \quad + \quad -$

$2x^2 - 8x + 5$

$2x^2 - 8x + 2$

$- \quad + \quad -$

3

$\therefore x^3 - 2x^2 - 7x + 5 = (x + 2)(x^2 - 4x + 1) + 3$

$= (x + 2) \times 0 + 3 = 3$

27. (1) $5 + 2\sqrt{6} = 3 + 2 + 2\sqrt{3}\sqrt{2}$

$= \left(\sqrt{3}\right)^2 + \left(\sqrt{2}\right)^2 + 2 \times \sqrt{3} \times \sqrt{2}$

$= \left(\sqrt{3} + \sqrt{2}\right)^2$

$\therefore \sqrt{5 + 2\sqrt{6}}$

$= \sqrt{\left(\sqrt{3} + \sqrt{2}\right)^2} = \sqrt{3} + \sqrt{2}$

Note : Express the given number in the form of

$x + y + 2\sqrt{xy}$

$= \left(\sqrt{x}\right)^2 + \left(\sqrt{y}\right)^2 + 2\sqrt{x} \times \sqrt{y}$

$= \left(\sqrt{x} + \sqrt{y}\right)^2$

28. (2) $14\sqrt{5} - 30$

$= \sqrt{5}\left(14 - 6\sqrt{5}\right)$

$= \sqrt{5}\left(14 - 2 \times 3 \times \sqrt{5}\right)$

$= \sqrt{5}\left(9 + 5 - 2 \times \sqrt{9} \times \sqrt{5}\right)$

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$= \sqrt{5}\left[(\sqrt{9})^2 + (\sqrt{5})^2 - 2\sqrt{9}\sqrt{5}\right]$

$= \sqrt{5}(3-\sqrt{5})^2$

$\therefore \sqrt{14\sqrt{5}-30}$

$= \sqrt{\sqrt{5}(3-\sqrt{5})^2} = \sqrt[4]{5}(3-\sqrt{5})$

29. (3) Let the required value be x, i.e.,

$$x = \frac{2(\sqrt{2}+\sqrt{6})}{3\sqrt{2+\sqrt{3}}} \text{ then,}$$

$$x^2 = \left[\frac{2(\sqrt{2}+\sqrt{6})}{3\sqrt{2+\sqrt{3}}}\right]^2$$

$$x^2 = \frac{4(\sqrt{2}+\sqrt{6})^2}{\left(3\sqrt{2+\sqrt{3}}\right)^2}$$

$$\Rightarrow x^2 = \frac{4(\sqrt{2}+\sqrt{6})^2}{9(2+\sqrt{3})}$$

$$x^2 = \frac{4(2+6+2\times\sqrt{2}\times\sqrt{6})}{9(2+\sqrt{3})}$$

$$\Rightarrow x^2 = \frac{4(8+2\sqrt{12})}{9(2+\sqrt{3})}$$

$$x^2 = \frac{4\left(8+2\sqrt{2^2\times 3}\right)}{9(2+\sqrt{3})}$$

$$\Rightarrow x^2 = \frac{4(8+4\sqrt{3})}{9(2+\sqrt{3})}$$

$$x^2 = \frac{16(2+\sqrt{3})}{9(2+\sqrt{3})} = \frac{16}{9}$$

$$\Rightarrow x = \frac{4}{3}$$

30. (4) $\sqrt{\left(\frac{6+2\sqrt{3}}{33-19\sqrt{3}}\right)}$

$$= \sqrt{\frac{\sqrt{3}(2\sqrt{3}+2)}{\sqrt{3}(11\sqrt{3}-19)}}$$

$$= \sqrt{\frac{2(\sqrt{3}+1)(11\sqrt{3}+19)}{(11\sqrt{3}-19)(11\sqrt{3}+19)}}$$

$$= \sqrt{\frac{2(33+19\sqrt{3}+11\sqrt{3}+19)}{(11\sqrt{3})^2-(19)^2}}$$

$$= \sqrt{\frac{2(52+30\sqrt{3})}{363-361}}$$

$= \sqrt{52+30\sqrt{3}}$

$= \sqrt{52+2\times 15\times\sqrt{3}}$

$= \sqrt{52+2\times\sqrt{225}\times\sqrt{3}}$

$= \sqrt{52+2\times\sqrt{225\times 3}}$

$= \sqrt{52+2\times\sqrt{25\times 9\times 3}}$

$= \sqrt{25+27+2\times\sqrt{25}\times\sqrt{27}}$

$= \sqrt{\left(\sqrt{25}+\sqrt{27}\right)^2}$

$= \sqrt{25}+\sqrt{27} = 5+3\sqrt{3}$

31. (1) It will be convenient to solve this problem part-wise.

Let, $x = \frac{\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}}{\sqrt{\sqrt{5}+1}}$

Then,

$$x^2 = \left[\frac{\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}}{\sqrt{\sqrt{5}+1}}\right]^2$$

$$= \frac{\left[\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}\right]^2}{\left[\sqrt{\sqrt{5}+1}\right]^2}$$

$$= \frac{\sqrt{5}+2+\sqrt{5}-2+2\sqrt{\sqrt{5}+2}\sqrt{\sqrt{5}-2}}{\sqrt{5}+1}$$

$$= \frac{2\sqrt{5}+2\sqrt{(\sqrt{5})^2-(2)^2}}{\sqrt{5}+1}$$

$$= \frac{2\sqrt{5}+2\sqrt{5-4}}{\sqrt{5}+1}$$

$$= \frac{2\sqrt{5}+2}{\sqrt{5}+1} = \frac{2(\sqrt{5}+1)}{\sqrt{5}+1} = 2$$

$x^2 = 2$

$\therefore x = \sqrt{2}$

Also,

$\sqrt{3-2\sqrt{2}}$

$= \sqrt{2+1-2\times\sqrt{2}\times 1}$

$= \sqrt{(\sqrt{2})^2+(1)^2-2\times\sqrt{2}\times 1}$

$= \sqrt{(\sqrt{2}-1)^2} = \sqrt{2}-1$

Hence,

$$\frac{\sqrt{\sqrt{5}+2}+\sqrt{\sqrt{5}-2}}{\sqrt{\sqrt{5}+1}} - \sqrt{3-2\sqrt{2}}$$

$= \sqrt{2}-(\sqrt{2}-1) = 1$

32. (2)

$$\frac{4\sqrt{3}}{2-\sqrt{2}} - \frac{30}{4\sqrt{3}-\sqrt{18}} - \frac{\sqrt{18}}{3-2\sqrt{3}}$$

On rationalising the denominators of each term, we get

$$= \frac{4\sqrt{3}(2+\sqrt{2})}{(2-\sqrt{2})(2+\sqrt{2})}$$

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$$-\frac{30\left(4\sqrt{3}+\sqrt{18}\right)}{\left(4\sqrt{3}-\sqrt{18}\right)\left(4\sqrt{3}+\sqrt{18}\right)}$$

$$-\frac{\sqrt{18}\left(3+2\sqrt{3}\right)}{\left(3-2\sqrt{3}\right)\left(3+2\sqrt{3}\right)}$$

$$=\frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{(2)^2-\left(\sqrt{2}\right)^2}-\frac{30\left(4\sqrt{3}+\sqrt{18}\right)}{\left(4\sqrt{3}\right)^2-\left(\sqrt{18}\right)^2}$$

$$-\frac{\sqrt{18}\left(3+2\sqrt{3}\right)}{(3)^2-\left(2\sqrt{3}\right)^2}$$

$[\because (a+b)(a-b)=a^2-b^2]$

$$=\frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{4-2}$$

$$-\frac{30\left(4\sqrt{3}+\sqrt{18}\right)}{48-18}-\frac{\sqrt{18}\left(3+2\sqrt{3}\right)}{9-12}$$

$$=\frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{2}-\frac{30\left(4\sqrt{3}+\sqrt{9\times2}\right)}{30}$$

$$-\frac{\sqrt{9\times2}\left(3+2\sqrt{3}\right)}{-3}$$

$$=2\sqrt{3}\left(2+\sqrt{2}\right)-\left(4\sqrt{3}+3\sqrt{2}\right)$$

$$-\frac{3\sqrt{2}\left(3+2\sqrt{3}\right)}{-3}$$

$$=\frac{4\sqrt{3}\left(2+\sqrt{2}\right)}{2}-\frac{30\left(4\sqrt{3}+\sqrt{9\times2}\right)}{30}$$

$$-\frac{\sqrt{9\times2}\left(3+2\sqrt{3}\right)}{-3}$$

$$=2\sqrt{3}\left(2+\sqrt{2}\right)-\left(4\sqrt{3}+3\sqrt{2}\right)$$

$$-\frac{3\sqrt{2}\left(3+2\sqrt{3}\right)}{-3}$$

$$=4\sqrt{3}+2\sqrt{6}-4\sqrt{3}-3\sqrt{2}+3\sqrt{2}+2\sqrt{6}$$

$$=2\sqrt{6}+2\sqrt{6}=4\sqrt{6}$$

33. (3) The given expression consists of three parts. Now, we solve each part separately.

Part I $=\dfrac{1}{\sqrt{11-2\sqrt{30}}}$

or $\sqrt{\dfrac{1}{\left(11-2\sqrt{30}\right)}}$

On rationalising the denominator by its conjugate we have expression

$$=\sqrt{\frac{1\times\left(11+2\sqrt{30}\right)}{\left(11-2\sqrt{30}\right)\left(11+2\sqrt{30}\right)}}$$

$$=\sqrt{\frac{11+2\sqrt{30}}{(11)^2-\left(2\sqrt{30}\right)^2}}$$

$[\because (a+b)(a-b)=a^2-b^2]$

$$=\sqrt{\frac{11+2\sqrt{30}}{121-120}}$$

$$=\sqrt{11+2\sqrt{30}}$$

$$=\sqrt{11+2\times\sqrt{6}\times\sqrt{5}}$$

$$=\sqrt{6+5+2\times\sqrt{6}\times\sqrt{5}}$$

$$=\sqrt{\left(\sqrt{6}\right)^2+\left(\sqrt{5}\right)^2+2\times\sqrt{6}\times\sqrt{5}}$$

$$=\sqrt{\left(\sqrt{6}+\sqrt{5}\right)^2}=\sqrt{6}+\sqrt{5}$$

$[\because a^2+b^2+2ab=(a+b)^2]$

Part II

$$=\frac{3}{\sqrt{7-2\sqrt{10}}}=\sqrt{\frac{9}{7-2\sqrt{10}}}$$

$$=\sqrt{\frac{9\times\left(7+2\sqrt{10}\right)}{\left(7-2\sqrt{10}\right)\left(7+2\sqrt{10}\right)}}$$

$$=\sqrt{\frac{9\times\left(7+2\sqrt{10}\right)}{7^2-\left(2\sqrt{10}\right)^2}}$$

$$=\sqrt{\frac{9\times\left(7+2\sqrt{10}\right)}{49-40}}$$

$$=\sqrt{\frac{9\times\left(7+2\sqrt{10}\right)}{9}}$$

$$=\sqrt{7+2\sqrt{10}}$$

$$=\sqrt{7+2\times\sqrt{5}\times\sqrt{2}}$$

$$=\sqrt{5+2+2\times\sqrt{5}\times\sqrt{2}}$$

$$=\sqrt{\left(\sqrt{5}\right)^2+\left(\sqrt{2}\right)^2+2\times\sqrt{5}\times\sqrt{2}}$$

$$=\sqrt{\left(\sqrt{5}+\sqrt{2}\right)^2}=\sqrt{5}+\sqrt{2}$$

Part III

$$=\frac{4}{\sqrt{8+4\sqrt{3}}}=\sqrt{\frac{16}{8+4\sqrt{3}}}$$

$$=\sqrt{\frac{16\times\left(8-4\sqrt{3}\right)}{\left(8+4\sqrt{3}\right)\left(8-4\sqrt{3}\right)}}$$

$$=\sqrt{\frac{16\times\left(8-4\sqrt{3}\right)}{8^2-\left(4\sqrt{3}\right)^2}}$$

$$=\sqrt{\frac{16\times\left(8-4\sqrt{3}\right)}{64-48}}$$

$$=\sqrt{\frac{16\times\left(8-4\sqrt{3}\right)}{16}}$$

$$=\sqrt{8-4\sqrt{3}}$$

$$=\sqrt{8-2\times2\times\sqrt{3}}$$

$$=\sqrt{8-2\times\sqrt{2}\times2\times3}$$

$$=\sqrt{8-2\times\sqrt{6}\times\sqrt{2}}$$

$$=\sqrt{6+2-2\times\sqrt{6}\times\sqrt{2}}$$

$$=\sqrt{\left(\sqrt{6}\right)^2+\left(\sqrt{2}\right)^2-2\times\sqrt{6}\times\sqrt{2}}$$

$$=\sqrt{\left(\sqrt{6}-\sqrt{2}\right)^2}=\sqrt{6}-\sqrt{2}$$

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Hence, the given expression
= Part I – Part II – Part III

$=(\sqrt{6}+\sqrt{5})-(\sqrt{5}+\sqrt{2})-(\sqrt{6}-\sqrt{2})$

$=\sqrt{6}+\sqrt{5}-\sqrt{5}-\sqrt{2}-\sqrt{6}+\sqrt{2}=0$

34. (1) $\dfrac{\sqrt{4-\sqrt{7}}}{\sqrt{8+3\sqrt{7}-2\sqrt{2}}}$

$=\dfrac{\sqrt{8-2\sqrt{7}}}{\sqrt{16+6\sqrt{7}-4}}$

[On Multiplying Numerator and Denominator by $\sqrt{2}$]

$=\dfrac{\sqrt{7+1-2\times\sqrt{7}\times1}}{\sqrt{16+2\times3\times\sqrt{7}-4}}$

$=\dfrac{\sqrt{(\sqrt{7})^2+1-2\times\sqrt{7}\times1}}{\sqrt{9+7+2\times3\times\sqrt{7}-4}}$

$=\dfrac{\sqrt{(\sqrt{7}-1)^2}}{\sqrt{(3+\sqrt{7})^2-4}}$

$=\dfrac{\sqrt{7}-1}{3+\sqrt{7}-4}=\dfrac{\sqrt{7}-1}{\sqrt{7}-1}=1$

35. (2) It will be convenient to solve the given problem part-wise.

Part I $=(28+10\sqrt{3})^{\frac{1}{2}}$

$=(28+2\times5\times\sqrt{3})^{\frac{1}{2}}$

$=(28+2\times\sqrt{25}\times\sqrt{3})^{\frac{1}{2}}$

$=(25+3+2\times\sqrt{25}\times\sqrt{3})^{\frac{1}{2}}$

$=\left[(5)^2+(\sqrt{3})^2+2\times\sqrt{25}\times\sqrt{3}\right]^{\frac{1}{2}}$

$=\left[(5+\sqrt{3})^2\right]^{\frac{1}{2}}=5+\sqrt{3}$

Part II

$=(7-4\sqrt{3})^{-\frac{1}{2}}$

$=(7-2\times2\times\sqrt{3})^{-\frac{1}{2}}$

$=(4+3-2\times2\times\sqrt{3})^{-\frac{1}{2}}$

$=\left[(2)^2+(\sqrt{3})^2-2\times2\times\sqrt{3}\right]^{-\frac{1}{2}}$

$=\left[(2-\sqrt{3})^2\right]^{-\frac{1}{2}}$

$=(2-\sqrt{3})^{2\times-\frac{1}{2}}$

$=(2-\sqrt{3})^{-1}=\dfrac{1}{(2-\sqrt{3})}$

$=\dfrac{1\times(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})}$

$=\dfrac{(2+\sqrt{3})}{4-3}=2+\sqrt{3}$

Hence, our given expression
= Part I – Part II

$=(5+\sqrt{3})-(2+\sqrt{3})$

$=5+\sqrt{3}-2-\sqrt{3}=3$

36. (3) Part I $=(28-10\sqrt{3})^{\frac{1}{2}}$

$=(25+3-2\times5\times\sqrt{3})^{\frac{1}{2}}$

$=\left[(5-\sqrt{3})^2\right]^{\frac{1}{2}}=5-\sqrt{3}$

Part II $=(7+4\sqrt{3})^{-\frac{1}{2}}$

$=\left(\dfrac{1}{7+4\sqrt{3}}\right)^{\frac{1}{2}}$

$=\left(\dfrac{1}{4+3+2\times2\times\sqrt{3}}\right)^{\frac{1}{2}}$

$=\left[\dfrac{1}{(2+\sqrt{3})^2}\right]^{\frac{1}{2}}=\dfrac{1}{2+\sqrt{3}}$

$=\dfrac{1\times(2-\sqrt{3})}{(2+\sqrt{3})(2-\sqrt{3})}$

(on Rationalising)

$=\dfrac{2-\sqrt{3}}{4-3}=2-\sqrt{3}$

Part III

$=\dfrac{\sqrt{7}}{\sqrt{16+6\sqrt{7}}-\sqrt{16-6\sqrt{7}}}$

$=\dfrac{\sqrt{7}\left(\sqrt{16+6\sqrt{7}}+\sqrt{16-6\sqrt{7}}\right)}{\left(\sqrt{16+6\sqrt{7}}-\sqrt{16-6\sqrt{7}}\right)\left(\sqrt{16+6\sqrt{7}}+\sqrt{16-6\sqrt{7}}\right)}$

$=\dfrac{\sqrt{7}\left(\sqrt{16+6\sqrt{7}}+\sqrt{16-6\sqrt{7}}\right)}{(16+6\sqrt{7})-(16-6\sqrt{7})}$

$=\dfrac{\sqrt{7}\left(\sqrt{9+7+2\times3\times\sqrt{7}}+\sqrt{9+7-2\times3\times\sqrt{7}}\right)}{16+6\sqrt{7}-16+6\sqrt{7}}$

$=\dfrac{\sqrt{7}\left(\sqrt{(3+\sqrt{7})^2}+\sqrt{(3-\sqrt{7})^2}\right)}{12\sqrt{7}}$

$=\dfrac{3+\sqrt{7}+3-\sqrt{7}}{12}=\dfrac{1}{2}$

Hence the given expression
Part I – Part II + Part III

$=(5-\sqrt{3})-(2-\sqrt{3})+\dfrac{1}{2}$

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$$=5-\sqrt{3}-2+\sqrt{3}+\frac{1}{2}$$

$$=5-2+\frac{1}{2}=3+\frac{1}{2}=3\frac{1}{2}$$

37. (4) Part I

$$=\frac{26-15\sqrt{3}}{\left[5\sqrt{2}-\sqrt{38+5\sqrt{3}}\right]^2}$$

$$=\frac{26-15\sqrt{3}}{(5\sqrt{2})^2+\left(\sqrt{38+5\sqrt{3}}\right)^2-}$$

$$2\times5\sqrt{2}\times\sqrt{38+5\sqrt{3}}$$

[$\because (a-b)^2=a^2+b^2-2ab$]

$$=\frac{26-15\sqrt{3}}{50+38+5\sqrt{3}-10\sqrt{76+10\sqrt{3}}}$$

$$=\frac{26-15\sqrt{3}}{88+5\sqrt{3}-10\sqrt{76+10\sqrt{3}}}$$

$$=\frac{26-15\sqrt{3}}{88+5\sqrt{3}-10\sqrt{75+1+2\times5\sqrt{3}\times1}}$$

$$=\frac{26-15\sqrt{3}}{88+5\sqrt{3}-10\sqrt{(5\sqrt{3}+1)^2}}$$

$$=\frac{26-15\sqrt{3}}{88+5\sqrt{3}-10(5\sqrt{3}+1)}$$

$$=\frac{26-15\sqrt{3}}{88+5\sqrt{3}-50\sqrt{3}-10}$$

$$=\frac{26-15\sqrt{3}}{78-45\sqrt{3}}$$

$$=\frac{26-15\sqrt{3}}{3(26-15\sqrt{3})}=\frac{1}{3}$$

Part II

$$=\frac{\sqrt{10}+\sqrt{18}}{\sqrt{8}+\sqrt{(\sqrt{3}-\sqrt{5})}}$$

[Rationalising the denominator]

$$=\frac{(\sqrt{10}+\sqrt{18})(\sqrt{8}-\sqrt{3-\sqrt{5}})}{(\sqrt{8}+\sqrt{3-\sqrt{5}})(\sqrt{8}-\sqrt{3-\sqrt{5}})}$$

$$=\frac{(\sqrt{10}+\sqrt{18})(\sqrt{8}-\sqrt{3-\sqrt{5}})}{(\sqrt{8})^2-(\sqrt{3-\sqrt{5}})^2}$$

$$=\frac{\sqrt{80}+\sqrt{8\times18}-\sqrt{30-10\sqrt{5}}-\sqrt{54-18\sqrt{5}}}{8-3+\sqrt{5}}$$

$$=\frac{\sqrt{16\times5}+\sqrt{12\times12}-\sqrt{25+5-2\times5\times\sqrt{5}}-\sqrt{9(6-2\sqrt{5})}}{5+\sqrt{5}}$$

$$=\frac{4\sqrt{5}+12-\sqrt{(5)^2+(\sqrt{5})^2-2\times5\times\sqrt{5}}-3\sqrt{5+1-2\times\sqrt{5}\times1}}{5+\sqrt{5}}$$

$$=\frac{4\sqrt{5}+12-\sqrt{(5-\sqrt{5})^2}-3\sqrt{(\sqrt{5}-1)^2}}{5+\sqrt{5}}$$

$$=\frac{4\sqrt{5}+12-(5-\sqrt{5})-3(\sqrt{5}-1)}{5+\sqrt{5}}$$

$$=\frac{4\sqrt{5}+12-5+\sqrt{5}-3\sqrt{5}+3}{5+\sqrt{5}}$$

$$=\frac{10+2\sqrt{5}}{5+\sqrt{5}}=\frac{2(5+\sqrt{5})}{(5+\sqrt{5})}=2$$

Hence the given expression = Part I + Part II

$$=\frac{1}{3}+2=2\frac{1}{3}$$

38. (1) The given expression

$$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{7+4\sqrt{3}}}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{(2)^2+(\sqrt{3})^2+2\times2\times\sqrt{3}}}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{3+8\sqrt{(2+\sqrt{3})^2}}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{3+8(2+\sqrt{3})}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{3+16+8\sqrt{3}}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{19+8\sqrt{3}}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{16+3+2\times4\times\sqrt{3}}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{(4)^2+(\sqrt{3})^2+2\times4\times\sqrt{3}}}$$

$$=\sqrt{-\sqrt{3}+\sqrt{(4+\sqrt{3})^2}}$$

$$=\sqrt{-\sqrt{3}+4+\sqrt{3}}=\sqrt{4}=2$$

39. (1)

$$\left(\frac{81}{16}\right)^{-\frac{3}{4}}\times\left\{\left(\frac{25}{9}\right)^{-\frac{3}{2}}+\left(\frac{5}{2}\right)^{-3}\right\}$$

$$=\left(\frac{16}{81}\right)^{\frac{3}{4}}\times\left\{\left(\frac{9}{25}\right)^{\frac{3}{2}}+\left(\frac{2}{5}\right)^{3}\right\}$$

$$=\left\{\left(\frac{2}{3}\right)^4\right\}^{\frac{3}{4}}\times\left\{\left(\frac{3}{5}\right)^{2\times\frac{3}{2}}+\left(\frac{2}{5}\right)^{3}\right\}$$

$$=\left(\frac{2}{3}\right)^{4\times\frac{3}{4}}\times\left\{\left(\frac{3}{5}\right)^{3}+\left(\frac{2}{5}\right)^{3}\right\}$$

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$$=\left(\frac{2}{3}\right)^3\times\left(\frac{3^3}{5^3}\times\frac{5^3}{2^3}\right)$$

$$=\frac{2^3}{3^3}\times\frac{3^3}{2^3}=1$$

$$\left(\frac{1}{4}\right)^{-2}-3(8)^{\frac{2}{3}}(4)^0+\left(\frac{9}{16}\right)^{\frac{-1}{2}}$$

$$=\left[\left(\frac{1}{2}\right)^2\right]^{-2}-3\left[(2)^3\right]^{\frac{2}{3}}\times 1+\left[\left(\frac{3}{4}\right)^2\right]^{\frac{-1}{2}}$$

$$=\left(\frac{1}{2}\right)^{-4}-3\times 2^2+\left(\frac{3}{4}\right)^{-1}$$

$$=16-12+\frac{4}{3}$$

$$=\frac{48-36+4}{3}=\frac{16}{3}=5\frac{1}{3}$$

41. (3) $\dfrac{(25)^{\frac{3}{2}}\times(243)^{\frac{3}{5}}}{(16)^{\frac{5}{4}}\times(8)^{\frac{4}{3}}}$

$$=\frac{\left(5^2\right)^{\frac{3}{2}}\times\left(3^5\right)^{\frac{3}{5}}}{\left(2^4\right)^{\frac{5}{4}}\times\left(2^3\right)^{\frac{4}{3}}}$$

$$=\frac{5^{2\times\frac{3}{2}}\times 3^{5\times\frac{3}{5}}}{2^{4\times\frac{5}{4}}\times 2^{3\times\frac{4}{3}}}=\frac{5^3\times 3^3}{2^5\times 2^4}$$

$$=\frac{125\times 27}{32\times 16}=\frac{3375}{512}$$

42. (4) $\dfrac{16\times 2^{n+1}-4\times 2^n}{16\times 2^{n+2}-2\times 2^{n+2}}$

$$=\frac{2^4\times 2^{n+1}-2^2\times 2^n}{2^4\times 2^{n+2}-2\times 2^{n+2}}$$

$$=\frac{2^{n+5}-2^{n+2}}{2^{n+6}-2^{n+3}}$$

$$=\frac{2^{n+5}-2^{n+2}}{2\times 2^{n+5}-2\times 2^{n+2}}$$

$$=\frac{2^{n+5}-2^{n+2}}{2\left(2^{n+5}-2^{n+2}\right)}=\frac{1}{2}$$

43. (3) $\dfrac{\left(x^{a+b}\right)^2\left(x^{b+c}\right)^2\left(x^{c+a}\right)^2}{\left(x^a x^b x^c\right)^4}$

$$=\frac{x^{2(a+b)}.x^{2(b+c)}.x^{2(c+a)}}{(x^a)^4(x^b)^4(x^c)^4}$$

$$=\frac{x^{2a+2b}.x^{2b+2c}.x^{2c+2a}}{x^{4a}.x^{4b}.x^{4c}}$$

$$=\frac{x^{2a+2b+2b+2c+2c+2a}}{x^{4a+4b+4c}}$$

$$=\frac{x^{4a+4b+4c}}{x^{4a+4b+4c}}=1$$

44. (2) $25^{x-1}=5^{2x-1}-100$

$\Rightarrow (5^2)^{x-1}=5^{2x-1}-100$

$\Rightarrow 5^{2x-2}-5^{2x-1}=-100$

$\Rightarrow 5^{2x-2}-5^{2x-2}\times 5^1=-100$

$\Rightarrow 5^{2x-2}(1-5)=-100$

$\Rightarrow 5^{2x-2}\times -4=-100$

$\Rightarrow 5^{2x-2}=25$

$\Rightarrow 5^{2x-2}=5^2$

On equating the indices, we have,

$\Rightarrow 2x-2=2$

$\Rightarrow 2x=2+2$

$\Rightarrow 2x=4$

$\therefore x=2$

45. (3) $\dfrac{9^n\times 3^2\times\left(3^{\frac{-n}{2}}\right)^{-2}-(27)^n}{3^{3m}\times 2^3}$

$$=\frac{1}{27}$$

$$\Rightarrow\frac{\left(3^2\right)^n\times 3^2\times 3^{\frac{n}{2}\times -2}-\left(3^3\right)^n}{3^{3m}\times 2^3}$$

$$=\frac{1}{27}$$

$$\Rightarrow\frac{3^{2n}\times 3^2\times 3^n-3^{3n}}{3^{3m}\times 2^3}=\frac{1}{27}$$

$$\Rightarrow\frac{3^{2n+2+n}-3^{3n}}{3^{3m}\times 2^3}=\frac{1}{27}$$

$$\Rightarrow\frac{3^{3n+2}-3^{3n}}{3^{3m}\times 2^3}=\frac{1}{27}$$

$$\Rightarrow\frac{3^{3n}\left(3^2-1\right)}{3^{3m}\times 2^3}=\frac{1}{27}$$

$$\Rightarrow\frac{3^{3n}\times 8}{3^{3m}\times 8}=\frac{1}{27}$$

$$\Rightarrow 3^{3n-3m}=\frac{1}{3^3}$$

$\Rightarrow 3^{3n-3m}=3^{-3}$

(On equating the exponents)

$\Rightarrow 3n-3m=-3$

$\Rightarrow n-m=-1$

$\Rightarrow m-n=1$

46. (4) $\dfrac{a^{-1}}{a^{-1}+b^{-1}}+\dfrac{a^{-1}}{a^{-1}-b^{-1}}$

$$=\frac{\frac{1}{a}}{\frac{1}{a}+\frac{1}{b}}+\frac{\frac{1}{a}}{\frac{1}{a}-\frac{1}{b}}$$

$$=\frac{\frac{1}{a}}{\frac{b+a}{ab}}+\frac{\frac{1}{a}}{\frac{b-a}{ab}}$$

$$=\frac{1}{a}.\frac{ab}{b+a}+\frac{1}{a}.\frac{ab}{b-a}$$

$$=\frac{b}{b+a}+\frac{b}{b-a}$$

$$=\frac{b(b-a)+b(b+a)}{(b+a)(b-a)}$$

$$=\frac{b^2-ba+b^2+ab}{b^2-a^2}$$

$$=\frac{2b^2}{b^2-a^2}$$

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47. (1) $\left(\frac{x^a}{x^b}\right)^{\frac{1}{ab}}\left(\frac{x^b}{x^c}\right)^{\frac{1}{bc}}\left(\frac{x^c}{x^a}\right)^{\frac{1}{ac}}$

$=\left(x^{a-b}\right)^{\frac{1}{ab}}.\left(x^{b-c}\right)^{\frac{1}{bc}}.\left(x^{c-a}\right)^{\frac{1}{ac}}$

$=x^{(a-b)/ab}.x^{(b-c)/bc}.x^{(c-a)/ac}$

$=x^{\frac{1}{b}-\frac{1}{a}}.x^{\frac{1}{c}-\frac{1}{b}}.x^{\frac{1}{a}-\frac{1}{c}}$

$=x^{\frac{1}{b}-\frac{1}{a}+\frac{1}{c}-\frac{1}{b}+\frac{1}{a}-\frac{1}{c}}=x^0=1$

48. (4) $\left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a}$

$=\left(x^{a-b}\right)^{a+b}\left(x^{b-c}\right)^{b+c}\left(x^{c-a}\right)^{c+a}$

$=x^{(a-b)(a+b)}.x^{(b-c)(b+c)}.x^{(c-a)(c+a)}$

$=x^{a^2-b^2}.x^{b^2-c^2}.x^{c^2-a^2}$

$=x^{a^2-b^2+b^2-c^2+c^2-a^2}=x^0=1$

49. (3)

$\left(\frac{x^a}{x^b}\right)^{a^2+ab+b^2}\left(\frac{x^b}{x^c}\right)^{b^2+bc+c^2}\left(\frac{x^c}{x^a}\right)^{c^2+ca+a^2}$

$=\left(x^{a-b}\right)^{a^2+ab+b^2}.\left(x^{b-c}\right)^{b^2+bc+c^2}\left(x^{c-a}\right)^{c^2+ca+a^2}$

$=x^{(a-b)\left(a^2+ab+b^2\right)}.x^{(b-c)\left(b^2+bc+c^2\right)}.x^{(c-a)\left(c^2+ca+a^2\right)}$

$=x^{a^3-b^3}.x^{b^3-c^3}.x^{c^3-a^3}$

$=x^{a^3-b^3+b^3-c^3+c^3-a^3}=x^0=1$

50. (1) The given expression

$=\sqrt{x^{-1}y}.\sqrt{y^{-1}z}.\sqrt{z^{-1}x}$

$=\sqrt{\frac{y}{x}}.\sqrt{\frac{z}{y}}.\sqrt{\frac{x}{z}}$

$=\left(\frac{y}{x}\right)^{\frac{1}{2}}.\left(\frac{z}{y}\right)^{\frac{1}{2}}.\left(\frac{x}{z}\right)^{\frac{1}{2}}$

$=\left(\frac{y}{x}\times\frac{z}{y}\times\frac{x}{z}\right)^{\frac{1}{2}}=1$

51. (3) $\frac{4\sqrt{3}}{2-\sqrt{2}}=\frac{4\sqrt{3}(2+\sqrt{2})}{(2-\sqrt{2})(2+\sqrt{2})}$

$=\frac{4\sqrt{3}(2+\sqrt{2})}{4-2}$

$=2\sqrt{3}(2+\sqrt{2})=4\sqrt{3}+2\sqrt{6}$

$\frac{30}{4\sqrt{3}-3\sqrt{2}}$

$=\frac{30(4\sqrt{3}+3\sqrt{2})}{(4\sqrt{3}-3\sqrt{2})(4\sqrt{3}+\sqrt{2})}$

$=\frac{30(4\sqrt{3}+3\sqrt{2})}{48-18}$

$=4\sqrt{3}+3\sqrt{2}$

$\frac{3\sqrt{2}}{3-2\sqrt{3}}=\frac{3\sqrt{2}(3+2\sqrt{3})}{(3-2\sqrt{3})(3+2\sqrt{3})}$

$=\frac{3\sqrt{2}(3+2\sqrt{3})}{9-12}$

$=-3\sqrt{2}-2\sqrt{6}$

$\therefore$ Expression

$=4\sqrt{3}+2\sqrt{6}-4\sqrt{3}-3\sqrt{2}+3\sqrt{2}+2\sqrt{6}$

$=4\sqrt{6}$

52. (3) $(10^{12}+25)^2-(10^2-25)^2=10^n$

$\because (a+b)^2-(a-b)^2=4ab$

$\therefore 4\times10^{12}\times25=10^n$

$\Rightarrow 10^{14}=10^n$

$\Rightarrow n=14$

53. (2) $\sqrt{10}+\sqrt{20}+\sqrt{40}-\sqrt{5}-\sqrt{80}$

$=\sqrt{10}+\sqrt{4\times5}+\sqrt{4\times10}-\sqrt{5}-\sqrt{16\times5}$

$=\sqrt{10}+2\sqrt{5}+2\sqrt{10}-\sqrt{5}-4\sqrt{5}$

$=3\sqrt{10}+\sqrt{5}-4\sqrt{5}$

$=3\sqrt{10}-3\sqrt{5}=3\left(\sqrt{10}-\sqrt{5}\right)$

$\therefore$ Expression $=\frac{15}{3(\sqrt{10}-\sqrt{5})}$

$=\frac{5}{\sqrt{10}-\sqrt{5}}$

$=\frac{5(\sqrt{10}+\sqrt{5})}{(\sqrt{10}-\sqrt{5})(\sqrt{10}+\sqrt{5})}$

Rationalising the denominator

$=\frac{5(\sqrt{10}+\sqrt{5})}{10-5}$

$=\sqrt{10}+\sqrt{5}=3.162+2.236$

$=5.398$

54. (3) Let $\sqrt{28-10\sqrt{3}}=\sqrt{x}-\sqrt{y}$

$\Rightarrow 28-10\sqrt{3}=x+y-2\sqrt{xy}$

$\Rightarrow x+y=28,\ xy=75$

$\therefore (x-y)^2=(x+y)^2-4xy$

$=784-300=484$

$\Rightarrow x-y=22$

$\therefore x=25,\ y=3$

$\Rightarrow 28-10\sqrt{3}=\sqrt{25}-\sqrt{3}$

Again, let $\sqrt{7+4\sqrt{3}}=\sqrt{x}+\sqrt{y}$

$\Rightarrow 7+4\sqrt{3}=x+y+2\sqrt{xy}$

$\Rightarrow x+y=7,\ xy=12$

$\therefore x-y=(7)^2-4\times12=1$

$\Rightarrow x=4,\ y=3$

$\therefore \sqrt{7+4\sqrt{3}}=\sqrt{4}+\sqrt{3}$

N o w

$\left(28-10\sqrt{3}\right)^{\frac{1}{2}}-\left(7+4\sqrt{3}\right)^{-\frac{1}{2}}$

$=\sqrt{25}-\sqrt{3}-\frac{1}{\sqrt{4}+\sqrt{3}}$

$=\sqrt{25}-\sqrt{3}-\frac{\sqrt{4}-\sqrt{3}}{1}$

$=\sqrt{25}-\sqrt{4}=5-2=3$

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5 AVERAGE

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE-I

1. A student was asked to find the arithmetic mean of the following 12 numbers :

3, 11, 7, 9, 15, 13, 8, 19, 17, 21, 14 and x

He found the mean to be 12. The value of x will be :

(1) 3 (2) 7

(3) 17 (4) 31

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The average of the marks obtained in an examination by 8 students was 51 and by 9 other students was 68. The average marks of all 17 students was :

(1) 59 (2) 59.5

(3) 60 (4) 60.5

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. If the average marks of three batches of 55, 60 and 45 students respectively is 50, 55 and 60, then the average marks of all the students is

(1) 54.68 (2) 53.33

(3) 55 (4) None of these

(SSC CPO S.I. Exam. 12.01.2003

4. The average of 30 results is 20 and the average of other 20 results is 30. What is the average of all the results ?

(1) 24 (2) 48

(3) 25 (4) 50

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. If the average weight of 6 students is 50 kg; that of 2 students is 51 kg; and that of other 2 students is 55 kg; then the average weight of all students is

(1) 61 kg (2) 51.5 kg

(3) 52 kg (4) 51.2 kg

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

6. The average of 10 numbers is 7. If each number is multiplied by 12, then the average of the new set of numbers will be

(1) 7 (2) 19

(3) 82 (4) 84

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

7. The average income of 40 persons is ₹ 4200 and that of another 35 persons is ₹ 4000. The average income of the whole group is :

(1) ₹ 4100 (2) ₹ $4106\frac{1}{3}$

(3) ₹ $4106\frac{2}{3}$ (4) ₹ $4108\frac{1}{3}$

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

8. The average weight of five persons sitting in a boat is 38 kg. The average weight of the boat and the persons sitting in the boat is 52kg. What is the weight of the boat ?

(1) 228 kg (2) 122 kg

(3) 232 kg (4) 242 kg

FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

9. The average marks of 32 boys of section A of class X is 60 whereas the average marks of 40 boys of section B of class X is 33. The average marks for both the sections combined together is

(1) 44 (2) 45

(3) $46\frac{1}{2}$ (4) $45\frac{1}{2}$

(SSC Data Entry Operator Exam. 02.08.2009)

10. Total weekly emoluments of the workers of a factory is ₹ 1534. Average weekly emolument of a worker is ₹ 118. The number of workers in the factory is :

(1) 16 (2) 14

(3) 13 (4) 12

(SSC CHSL DEO & LDC Exam. 27.11.2010)

11. 12 kg of rice costing ₹ 30 per kg is mixed with 8 kg of rice costing ₹ 40 per kg.The average per kg price of mixed rice is

(1) ₹ 38 (2) ₹ 37

(3) ₹ 35 (4) ₹ 34

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

12. If average of 20 observations x_1, x_2, ..., x_{20} is y, then the average of $x_1 - 101$, $x_2 - 101$, $x_3 - 101$, ..., $x_{20} - 101$ is

(1) $y - 20$ (2) $y - 101$

(3) $20y$ (4) $101y$

(SSC CISF Constable (GD) Exam. 05.06.2011)

13. The average of x numbers is y and average of y numbers is x. Then the average of all the numbers taken together is

(1) $\frac{x+y}{2xy}$ (2) $\frac{2xy}{x+y}$

(3) $\frac{x^2+y^2}{x+y}$ (4) $\frac{xy}{x+y}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

14. The average of x numbers is y^2 and the average of y numbers is x^2. So the average of all the numbers taken together is

(1) $\frac{x^3+y^3}{x+y}$ (2) xy

(3) $\frac{x^2+y^2}{x+y}$ (4) $xy^2 + yx^2$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

15. The average of n numbers $x_1, x_2, \ldots x_n$ is $\bar{x}$. Then the value of $\sum_{i=1}^{n}(x_i - \bar{x})$ is equal to

(1) n (2) 0

(3) $n\bar{x}$ (4) $\bar{x}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

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16. A man bought 13 articles at ₹ 70 each, 15 at ₹ 60 each and 12 at ₹ 65 each. The average price per article is
(1) ₹ 60.25 (2) ₹ 64.75
(3) ₹ 65.75 (4) ₹ 62.25
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

17. A library has an average number of 510 visitors on Sunday and 240 on other days. The average number of visitors per day in a month of 30 days beginning with Sunday is :
(1) 285 (2) 295
(3) 300 (4) 290
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

18. The average of 30 numbers is 40 and that of other 40 numbers is 30. The average of all the numbers is
(1) $34\frac{2}{7}$ (2) 35
(3) 34 (4) 34.5
(SSC CHSL DEO & LDC Exam. 20.10.2013)

19. The average of 20 numbers is 15 and the average of first five is 12. The average of the rest is
(1) 16 (2) 15
(3) 14 (4) 13
(SSC Graduate Level Tier-I Exam. 19.05.2013)

20. The average monthly expenditure of a family is ₹2,200 during first three months, ₹2,550 during next four months and ₹3,120 during last five months of the year. If the total savings during the year was ₹1,260, what is the average monthly income ?
(1) ₹ 1,260 (2) ₹ 1,280
(3) ₹ 2,805 (4) ₹ 2,850
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

21. Find the average of 1.11, 0.01, 0.101, 0.001, 0.11
(1) 0.2664 (2) 0.2554
(3) 0.1264 (4) 0.1164
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

22. 4 boys and 3 girls spent ₹ 120 on the average, of which boys spent ₹ 150 on the average. Then the average amount spent by the girls is
(1) ₹ 80 (2) ₹ 60
(3) ₹ 90 (4) ₹ 100
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

23. Six tables and twelve chairs were bought for ₹ 7,800. If the average price of a table is ₹ 750, then the average price of a chair would be
(1) ₹ 250 (2) ₹ 275
(3) ₹ 150 (4) ₹ 175
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

24. Out of 20 boys, 6 are each of 1 m 15 cm height, 8 are of 1 m 10 cm and rest of 1 m 12 cm. The average height of all of them is
(1) 1 m 12.1 cm
(2) 1 m 21.1 cm
(3) 1 m 21 cm
(4) 1 m 12 cm
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

25. There are two groups A and B of a class, consisting of 42 and 28 students respectively. If the average weight of group A is 25 kg and that of group B is 40 kg, find the average weight of the whole class.
(1) 69 kg (2) 31 kg
(3) 70 kg (4) 30 kg
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

26. The average monthly salary of all the employees in an industry is ₹ 12,000. The average salary of male employees is ₹ 15,000 and that of female employees is ₹ 8,000. What is the ratio of male employees to female employees ?
(1) 5 : 2 (2) 3 : 4
(3) 4 : 3 (4) 2 : 5
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

27. The mean of 9 observations is 16. One more observation is included and the new mean becomes 17. The 10th observation is
(1) 9 (2) 16
(3) 26 (4) 30
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

28. The average of 8 numbers is 27. If each of the numbers is multiplied by 8, find the average of new set of numbers.
(1) 1128 (2) 938
(3) 316 (4) 216
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

29. The average of 100 numbers is 44. The average of these 100 numbers and 4 other new numbers is 50. The average of the four new numbers will be
(1) 800 (2) 200
(3) 176 (4) 24
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

30. The average of 30 numbers is 15. The average of the first 18 numbers is 10 and that of the next 11 numbers is 20. The last number is
(1) 56 (2) 52
(3) 60 (4) 50
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

31. The arithmetic mean of the following numbers
1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6 and 7, 7, 7, 7, 7, 7 is
(1) 4 (2) 5
(3) 14 (4) 20
(SSC CGL Tier-II Exam. 21.09.2014)

32. The average of all the numbers between 6 and 50 which are divisible by 5 is
(1) 27.5 (2) 30
(3) 28.5 (4) 22
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

33. There are 100 students in 3 sections A, B and C of a class. The average marks of all the 3 sections was 84. The average of B and C was 87.5 and the average marks of A is 70. The number of students in A was
(1) 30 (2) 35
(3) 20 (4) 25
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

34. The average weight of first 11 persons among 12 persons is 95 kg. The weight of 12th person is 33 kg more than the average weight of all the 12 persons. The weight of the 12th person is
(1) 128.75 kg (2) 128 kg
(3) 131 kg (4) 97.45 kg
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

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35. The average weight of A, B and C is 45 kg. If the average weight of A and B be 40 kg and that of B and C be 43 kg, then the weight (in kg) of B is
(1) 20 (2) 26
(3) 31 (4) 17
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

36. The average of some natural numbers is 15. If 30 is added to first number and 5 is subtracted from the last number the average becomes 17.5 then the number of natural number is
(1) 15 (2) 30
(3) 20 (4) 10
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

37. The average weight of 3 men A, B and C is 84 kg. Another man D joins the group and the average now becomes 80 kg. If another man E whose weight is 3 kg more then that of D, replaces A, then the average weight of B, C, D and E becomes 79 kg. Then weight of A is
(1) 72 kg. (2) 74 kg.
(3) 75 kg. (4) 76 kg.
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting and SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

38. The average weight of 15 oarsmen in a boat is increased by 1.6 kg when one of the crew, who weighs 42 kg is replaced by a new man. Find the weight of the new man (in kg).
(1) 67 (2) 65
(3) 66 (4) 43
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

39. A librarian purchased 50 story-books for his library. But he saw that he could get14 more books by spending Rs. 76 more and the average price per book would be reduced by Re. 1. The average price (in Rs.) of each book he bought, was :
(1) 15 (2) 10
(3) 25 (4) 20
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

40. The average of 1, 3, 5, 7, 9, 11, ... to 25 terms is
(1) 125 (2) 25
(3) 625 (4) 50
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

41. Six friends have an average height of 167 cms. A boy with height 162 cm leaves the group. Find the new average height.
(1) 168 cm (2) 166 cm
(3) 169 cm (4) 167 cm
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

42. The average weight of 8 persons increases by 2.5 kg when a new person comes in place of one of them weighing 65 kg. The weight of the new person is
(1) 84 kg (2) 85 kg
(3) 76 kg (4) 76.5 kg
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

43. Three Science classes A, B and C take a Life Science test. The average score of class A is 83. The average score of class B is 76. The average score of class C is 85. The average score of class A and B is 79 and average score of class B and C is 81. Then the average score of classes A, B and C is
(1) 81.5 (2) 81
(3) 80.5 (4) 80
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

44. The mean high temperature of the first four days of a week is 25°C whereas the mean of the last four days is 25.5°C. If the mean temperature of the whole week is 25.2°C then the temperature on the 4th day is
(1) 25.5°C (2) 25°C
(3) 25.2°C (4) 25.6° C
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

45. The average marks of 50 students in a class is 72. The average marks of boys and girls in that subject are 70 and 75 respectively. The number of boys in the class is
(1) 20 (2) 35
(3) 25 (4) 30
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE-II

1. The average of 9 numbers is 30. The average of first 5 numbers is 25 and that of the last 3 numbers is 35. What is the 6th number?
(1) 20 (2) 30
(3) 40 (4) 50
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. The average of 15 numbers is 7. If the average of the first 8 numbers be 6.5 and the average of last 8 numbers be 9.5, then the middle number is
(1) 20 (2) 21
(3) 23 (4) 18
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. The average of 8 numbers is 20. The average of first two numbers is $15\frac{1}{2}$ and that of the next three is $21\frac{1}{3}$. If the sixth number be less than the seventh and eighth numbers by 4 and 7 respectively, then the eighth number is :
(1) 18 (2) 22
(3) 25 (4) 27
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

4. The average of 20 numbers is 12. The average of the first 12 numbers is 11 and that of the next 7 numbers is 10. The last number is :
(1) 40 (2) 38
(3) 48 (4) 50
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

5. Out of seven given numbers, the average of the first four numbers is 4 and that of the last four numbers is also 4. If the average of all the seven numbers is 3, fourth number is
(1) 3 (2) 4
(3) 7 (4) 11
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

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6. The average temperature of the first 4 days of a week was 37°C and that of the last 4 days of the week was 41°C. If the average temperature of the whole week was 39°C, the temperature of the fourth day was
(1) 38°C (2) 38.5°C
(3) 39°C (4) 40°C
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

7. In a certain year, the average monthly income of a person was ₹ 3,400. For the first eight months of the year, his average monthly income was ₹ 3,160 and for the last five months, it was ₹ 4,120. His income in the eighth month of the year was
(1) ₹ 3,160 (2) ₹ 5,080
(3) ₹ 15,520 (4) ₹ 5,520
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

8. The average of 30 numbers is 12. The average of the first 20 of them is 11 and that of the next 9 is 10. The last number is
(1) 60 (2) 45
(3) 40 (4) 50
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

9. The average of 11 results is 50. If the average of the first six results is 49 and that of the last six is 52, the sixth no. is
(1) 48 (2) 50
(3) 52 (4) 56
(SSC Graduate Level Tier-II Exam. 29.09.2013

10. The average of eight successive numbers is 6.5. The average of the smallest and the greatest numbers among them will be :
(1) 4 (2) 6.5
(3) 7.5 (4) 9
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

11. The average of three numbers is 135. The largest number is 195 and the difference between the other two is 20. The smallest number is
(1) 65 (2) 95
(3) 105 (4) 115
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011, 23.02.2011)

12. Out of four numbers, the average of the first three is 18 and that of the last three is 16. If the last number is 19, the first is
(1) 19 (2) 18
(3) 20 (4) 25
(SSC Constable (GD) & Rifleman (GD) Exam. 29.04.2012 (IInd Sitting)

13. The mean of 11 numbers is 35. If the mean of first 6 numbers is 32 and that of the last 6 numbers is 37, find the sixth number.
(1) 28 (2) 29
(3) 30 (4) 27
(SSC CHSL DEO & LDC Exam. 28.10.2012

14. Out of four numbers, the average of the first three is 15 and that of the last three is 16. If the last number is 19, the first is
(1) 19 (2) 15
(3) 16 (4) 18
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

15. The average of nine numbers is 50. The average of the first five numbers is 54 and that of the last three numbers is 52. Then the sixth number is
(1) 30 (2) 34
(3) 24 (4) 44
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

16. The average of 11 numbers is 63. If the average of first six numbers is 60 and the last six numbers is 65, then the 6th number is
(1) 57 (2) 60
(3) 62 (4) 64
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

17. Three numbers are such that the average of first two numbers is 2, the average of the last two numbers is 3 and the average of the first and the last numbers is 4, then the average of three numbers is equal to
(1) 2 (2) 3.5
(3) 3 (4) 2.5
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

18. The average of the largest and smallest 3 digit numbers formed by 0, 2 and 4 would be
(1) 312 (2) 213
(3) 222 (4) 303
(SSC CGL Tier-II Exam. 13.04.2015 TF No. 567 TL 9)

19. The average of six numbers is 3.95. The average of two of them is 3.4, while the average of the other two is 3.85. The average of the remaining two numbers is
(1) 4.6 (2) 4.5
(3) 4.8 (4) 4.7
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

20. Out of four numbers the average of the first three is 16 and that of the last three is 15. If the last number is 20 then the first number is
(1) 23 (2) 25
(3) 28 (4) 21
(SSC CGL Tier-I Exam. 09.08.2015 (IInd Sitting) TF No. 4239378)

21. Average of n numbers is a. The first number is increased by 2, second one is increased by 4, the third one is increased by 8 and so on. The average of the new numbers is
(1) $a + \frac{2^{n-1}-1}{n}$ (2) $a + 2\frac{2^n-1}{n}$
(3) $a + \frac{2^{n-1}}{n}$ (4) $a + \frac{2^n-1}{n}$
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

22. The average of 12 numbers is 15 and the average of the first two is 14. What is the average of the rest?
(1) 15 (2) $15\frac{1}{5}$
(3) 14 (4) $14\frac{1}{5}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

23. The average of 8 numbers is 21. If each of the numbers is multiplied by 8, the average of the new set of numbers is :
(1) 21 (2) 29
(3) 8 (4) 168
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

24. The average of 13 results is 70. The average of first seven is 65 and that of the last seven is 75, the seventh result is :
(1) 67 (2) 70
(3) 68 (4) 70.5
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

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TYPE-III

1. The average of 7 consecutive numbers is 20. The largest of these numbers is :
(1) 24 (2) 23
(3) 22 (4) 20
(SSC CGL Prelim Exam. 27.02.2000 (Ist Sitting) and SSC Constable (GD) & Rifleman (GD) Exam. 24.04.2012 (Ist Sitting)

2. The average of first nine prime numbers is
(1) 9 (2) 11
(3) $11\frac{2}{9}$ (4) $11\frac{1}{9}$
(SSC CPO S.I. Exam. 12.01.2003)

3. The average of 5 consecutive natural numbers is m. If the next three natural numbers are also included, how much more than m will the average of these 8 numbers be?
(1) 2 (2) 1
(3) 1.4 (4) 1.5
(SSC CPO S.I. Exam. 03.09.2006)

4. The average of the first 100 positive integers is
(1) 100 (2) 51
(3) 50.5 (4) 49.5
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

5. The average of odd numbers upto 100 is
(1) 50.5 (2) 50
(3) 49.5 (4) 49
(SSC Data Entry Operator Exam. 02.08.2009 & SSC CGL Tier-I Exam. 16.05.2010 (IInd Sitting)

6. The average of the squares of first ten natural numbers is
(1) 35.5 (2) 36
(3) 37.5 (4) 38.5
(SSC SAS Exam 26.06.2010 (Paper-1)

7. The arithmetic mean (average) of the first 10 whole numbers is
(1) 5 (2) 4
(3) 5.5 (4) 4.5
(SSC CISF ASI Exam 29.09.2010 (Paper-1)

8. The average of three consecutive odd numbers is 12 more than one third of the first of these numbers. What is the last of the three numbers ?
(1) 15
(2) 17
(3) 19
(4) Data inadequate
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

9. The average of nine consecutive odd numbers is 53. The least odd number is
(1) 22 (2) 27
(3) 35 (4) 45
(SSC Data Entry Operator Exam. 31.08.2008)

10. The average of the first nine integral multiples of 3 is
(1) 21 (2) 12
(3) 15 (4) 18
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

11. The average of seven consecutive positive integers is 26. The smallest of these integers is :
(1) 21 (2) 23
(3) 25 (4) 26
(SSC CHSL DEO & LDC Exam. 27.11.2010)

12. a, b, c, d, e, f, g are consecutive even numbers. j, k, l, m, n are consecutive odd numbers. The average of all the numbers is
(1) $3\left(\frac{a+n}{2}\right)$
(2) $\left(\frac{l+d}{2}\right)$
(3) $\frac{a+b+m+n}{4}$
(4) $\frac{j+c+n+g}{4}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

13. If the average of 6 consecutive even numbers is 25, the difference between the largest and the smallest number is
(1) 8 (2) 10
(3) 12 (4) 14
(SSC Graduate Level Tier-II Exam. 29.09.2013

14. The average of 5 consecutive integers starting with 'm' is n. What is the average of 6 consecutive integers starting with (m + 2) ?
(1) $\frac{2n+5}{2}$ (2) (n +2)
(3) (n + 3) (4) $\frac{2n+9}{2}$
(SSC Graduate Level Tier-II Exam.25.09.2012)

15. Eight consecutive numbers are given. If the average of the two numbers that appear in the middle is 6, then the sum of the eight given numbers is
(1) 54 (2) 64
(3) 36 (4) 48
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

16. The average of four consecutive even numbers is 15. The 2nd highest number is
(1) 12 (2) 18
(3) 14 (4) 16
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

17. Average of first five odd multiples of 3 is
(1) 12 (2) 16
(3) 15 (4) 21
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

18. The average of nine consecutive numbers is n. If the next two numbers are also included the new average will
(1) increase by 2
(2) remain the same
(3) increase by 1.5
(4) increase by 1
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

19. The average of four consecutive even numbers is 9. Find the largest number.
(1) 12 (2) 6
(3) 8 (4) 10
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

20. If a, b, c, d, e are five consecutive odd numbers, their average is
(1) 5(a + 4)
(2) $\frac{abcde}{5}$
(3) 5(a + b + c + d + e)
(4) a + 4
(SSC Graduate Level Tier-I Exam. 19.05.2013 & SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

21. Average of first five prime numbers is
(1) 5.3 (2) 5.6
(3) 5 (4) 3.6
(SSC Multi-Tasking Staf Exam. 17.03.2013, IInd Sittin

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22. What is the average of the first six (positive) odd numbers each of which is divisible by 7?
(1) 42 (2) 43
(3) 47 (4) 49
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

23. The average of first ten prime numbers is
(1) 10.1 (2) 10
(3) 12.9 (4) 13
(SSC Constable (GD) Exam. 12.05.2013)

24. If the average of eight consecutive even numbers be 93, then the greatest number among them is
(1) 100 (2) 86
(3) 102 (4) 98
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

25. The average of 6 consecutive natural numbers is K. If the next two natural numbers are also included, how much more than K will the average of these 8 numbers be?
(1) 1.3 (2) 1
(3) 2 (4) 1.8
(SSC CGL Tier-I Re-Exam, 30.06.2015)

26. The average of five consecutive positive integers is n. If the next two integers are also included, the average of all these integers will
(1) increase by 1.5
(2) increase by 1
(3) remain the same
(4) increase by 2
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

27. The average of all the odd integers between 2 and 22 is:
(1) 14 (2) 12
(3) 13 (4) 11
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE-IV

1. The average monthly income of A and B is ₹ 14000, that of B and C is ₹ 15600 and A and C is ₹ 14400. The monthly income of C is
(1) ₹ 16000 (2) ₹ 15000
(3) ₹ 14000 (4) ₹ 15500
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

2. The average monthly income of X and Y is ₹ 5050. The average monthly income of Y and Z is ₹ 6250 and the average monthly income of X and Z is ₹ 5200. The monthly income of X is :
(1) ₹ 4050 (2) ₹ 3500
(3) ₹ 4000 (4) ₹ 5000
(SSC CGL Prelim Exam. 06.02.2004 (Second Sitting) and SSC SAS Exam 26.06.2010 (Paper-I)

3. The average expenditure of a man for the first five months is ₹ 1200 and for the next seven months is ₹ 1300. If he saves ₹ 2900 in that year, his monthly average income is :
(1) ₹ 1500 (2) ₹ 1600
(3) ₹ 1700 (4) ₹ 1400
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

4. The average per day income of A, B and C is ₹ 450. If the average per day income of A and B be ₹ 400 and that of B and C be ₹ 430, the per day income of B is
(1) ₹ 300 (2) ₹ 310
(3) ₹ 415 (4) ₹ 425
(SSC Data Entry Operator Exam. 31.08.2008)

5. The average salary, per head, of all the workers of an institution is ₹ 60. The average salary of 12 officers is ₹ 400; the average salary, per head, of the rest is ₹ 56. The total number of workers in the institution is
(1) 1030 (2) 1035
(3) 1020 (4) 1032
(SSC CGL Tier-I Exam. 26.10.2014)

6. The average monthly expenditure of a family for the first four months is ₹ 2570, for the next three months ₹ 2490 and for the last five months ₹ 3030. If the family saves ₹ 5320 during the whole year, the average monthly income of the family during the year is
(1) ₹ 3000 (2) ₹ 3185
(3) ₹ 3200 (4) ₹ 3580
(SSC CGL Tier-II Exam. 21.09.2014)

7. A man spends ₹ 1800 monthly on an average for the first four months and ₹ 2000 monthly for the next eight months and saves ₹ 5600 a year. His average monthly income is
(1) ₹ 2000 (2) ₹ 2200
(3) ₹ 2400 (4) ₹ 2600
(SSC CGL Tier-II Exam. 21.09.2014)

8. The average monthly income of P and Q is ₹ 5, 050. The average monthly income of Q and R is ₹ 6, 250 and the average monthly income of P and R is ₹ 5,200. The monthly income of P is
(1) ₹ 3, 500 (2) ₹ 4, 000
(3) ₹ 4, 050 (4) ₹ 5, 000
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

9. The average salary of all the workers in a workshop is ₹ 8,000. The average salary of 7 technicians is ₹ 12,000 and the average salary of the rest is ₹ 6,000. The total number of workers in the workshop is
(1) 20 (2) 21
(3) 22 (4) 23
(SSC CHSL DEO & LDC Exam. 9.11.2014)

10. Average income of 'A' and 'B' is ₹ 200 and average income of 'C' and 'D' is ₹ 250. The average income of A, B, C and D is
(1) ₹ 106.25 (2) ₹ 125
(3) ₹ 200 (4) ₹ 225
(SSC Constable (GD) Exam. 04.10.2015, Ist Sitting)

TYPE-V

1. Of the three numbers whose average is 60, the first is one fourth of the sum of the others. The first number is :
(1) 30 (2) 36
(3) 42 (4) 45
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. Of the three numbers, second is twice the first and also thrice the third. If the average of the three numbers is 44, the largest number is :
(1) 24 (2) 72
(3) 36 (4) 108
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

3. The average of first three numbers is thrice the fourth number. If the average of all the four numbers is 5, then find the fourth number.
(1) 4.5 (2) 5
(3) 2 (4) 4
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) and SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)



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4. Of the three numbers, first is twice the second and second is twice the third. The average of three numbers is 21. The smallest of the three numbers is
(1) 9 (2) 6
(3) 12 (4) 18
(SSC CPO S.I. Exam. 12.01.2003)

5. Of the three numbers, the first is 3 times the second and the third is 5 times the first. If the average of the three numbers is 57, the difference between the largest and the smallest number is
(1) 9 (2) 18
(3) 126 (4) 135
(SSC CPO S.I. Exam. 12.01.2003)

6. Of the three numbers, the first is twice the second and the second is 3 times the third. If their average is 100, the largest of the three numbers is :
(1) 120 (2) 150
(3) 180 (4) 300
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

7. Of the three numbers, the first is twice the second and the second is thrice the third. If the average of the three numbers is 10, the largest number is :
(1) 12 (2) 15
(3) 18 (4) 30
(SSC CPO S.I. Exam. 12.01.2003)

8. The average of first three numbers is double of the fourth number. If the average of all the four numbers is 12, find the 4th number.
(1) 16 (2) $\frac{48}{7}$
(3) 20 (4) $\frac{18}{7}$
(SSC Graduate Level Tier-II Exam. 29.09.2013

9. The average of three numbers is 77. The first number is twice the second and the second number is twice the third. The first number is :
(1) 33 (2) 66
(3) 77 (4) 132
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

10. Out of three numbers, the first is twice the second and is half of the third. If the average of the three numbers is 56, then difference of first and third number is
(1) 12 (2) 20
(3) 24 (4) 48
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. The average of three numbers is 28, the first number is half of the second, the third number is twice the second, then the third number is
(1) 48 (2) 36
(3) 24 (4) 18
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

12. The average of three numbers is 40. The first number is twice the second and the second one is thrice the third number. The difference between the largest and the smallest numbers is
(1) 30 (2) 36
(3) 46 (4) 60
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

13. Among three numbers, the first is twice the second and thrice the third. If the average of the three numbers is 49.5, then the difference between the first and the third number is
(1) 54 (2) 28
(3) 39.5 (4) 41.5
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

14. Out of 4 numbers, whose average is 60, the first one is one-fourth of the sum of the last three. The first number is
(1) 15 (2) 45
(3) 48 (4) 60
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

15. Of the three numbers, the first number is twice of the second and the second is thrice of the third number. If the average of these 3 numbers is 20, then the sum of the largest and smallest numbers is
(1) 24 (2) 42
(3) 54 (4) 60
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

16. If the arithmetic mean of $3a$ and $4b$ is greater than 50, and a is twice b, then the smallest possible integer value of a is
(1) 20 (2) 18
(3) 21 (4) 19
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

17. Of three numbers, the first is 4 times the second and 3 times the third. If the average of all the three numbers is 95, what is the third number ?
(1) 76 (2) 60
(3) 130 (4) 57
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

TYPE-VI

1. The average of marks of 14 student was calculated as 71. But it was later found that the marks of one student had been wrongly entered as 42 instead of 56 and of another as 74 instead of 32. The correct average is :
(1) 67 (2) 68
(3) 69 (4) 71
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. The average weight of three men A, B and C is 84 kg. D joins them and the average weight of the four becomes 80 kg. If E whose weight is 3 kg more than that of D, replaces A, the average weight of B, C, D and E becomes 79 kg. The weight of A is
(1) 65 kg. (2) 70 kg.
(3) 75 kg. (4) 80 kg.
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. The average of a collection of 20 measurements was calculated to be 56 cm. But later it was found that a mistake had occurred in one of the measurements which was recorded as 64 cm., but should have been 61 cm. The correct average must be
(1) 53 cm (2) 54.5 cm
(3) 55.85 cm (4) 56.15 cm
(SSC CPO S.I. Exam. 07.09.2003)

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4. The average of marks in Mathematics for 5 students was found to be 50. Later, it was discovered that in the case of one student the marks 48 were misread as 84. The correct average is :
(1) 40.2 (2) 40.8
(3) 42.8 (4) 48.2
(SSC CPO S.I. Exam. 26.06.2005)

5. The average weight of 15 students in a class increases by 1.5kg when one of the students weighing 40 kg is replaced by a new student. What is the weight (in kg) of the new student ?
(1) 64.5 kg. (2) 56 kg.
(3) 60 kg. (4) 62.5 kg.
(SSC CPO S.I. Exam. 06.09.2009)

6. The average marks of 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct average corresponding to the correct score.
(1) 38.7 (2) 39
(3) 39.7 (4) 41
(SSC CPO S.I. Exam. 06.09.2009)

7. The average weight of a group of 20 boys was calculated to be 89.4 kg and it was later discovered that one weight was misread as 78 kg. instead of 87kg. The correct average weight is
(1) 88.95 kg (2) 89.25 kg
(3) 89.55 kg (4) 89.85 kg
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

8. The average of 18 observations is recorded as 124. Later it was found that two observations with values 64 and 28 were entered wrongly as 46 and 82. Find the correct average of the 18 observations.
(1) $111\frac{7}{9}$ (2) 122
(3) 123 (4) $137\frac{3}{9}$
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

9. The mean of 50 numbers is 30. Later it was discovered that two entries were wrongly entered as 82 and 13 instead of 28 and 31. Find the correct mean.
(1) 36.12 (2) 30.66
(3) 29.28 (4) 38.21
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

10. The average of 25 observations is 13. It was later found that an observation 73 was wrongly entered as 48. The new average is
(1) 12.6 (2) 14
(3) 15 (4) 13.8
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

11. Mean of 10 numbers is 30. Later on it was observed that numbers 15, 23 are wrongly taken as 51, 32. The correct mean is
(1) 25.5 (2) 32
(3) 30 (4) 34·5
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

12. The mean of 50 observations was 36. It was found later that an observation 48 was wrongly taken as 23. The corrected (new) mean is
(1) 35.2 (2) 36.1
(3) 36.5 (4) 39.1
(SSC CGL Prelim Exam.11.05.2003 (Second Sitting)

13. While finding the average of 10 given numbers, a student, by mistake, wrote 64 in place of a number 46 and got his correct average 50. The correct average of the given numbers is :
(1) 48.2 (2) 48.3
(3) 49.1 (4) 49.3
(SSC CHSL DEO & LDC Exam. 27.11.2010)

14. The average of 10 numbers is calculated as 15. It is discovered later on that while calculating the average one number, namely 36, was wrongly read as 26. The correct average is
(1) 20 (2) 18
(3) 16 (4) 14
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

15. A student finds the average of ten 2-digit numbers. While copying numbers, by mistake, he writes one number with its digits interchanged. As a result his answer is 1.8 less than the correct answer. The difference of the digits of the number, in which he made mistake, is
(1) 2 (2) 3
(3) 4 (4) 6
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

16. The average of 27 numbers is 60. If one number is changed from 28 to 82, the average is
(1) 56 (2) 58
(3) 62 (4) 64
(SSC CISF Constable (GD) Exam. 05.06.2011)

17. A tabulator while calculating the average marks of 100 students of an examination, by mistake enters 68, instead of 86 and obtained the average as 58; the actual average marks of those students is
(1) 58.18 (2) 57.82
(3) 58.81 (4) 57.28
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

18. The mean of 20 items is 47. Later it is found that the item 62 is wrongly written as 26. Find the correct mean.
(1) 48·8 (2) 47·7
(3) 49·9 (4) 46·6
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

19. The mean value of 20 observations was found to be 75, but later on it was detected that 97 was misread as 79. Find the correct mean.
(1) 75.7 (2) 75.8
(3) 75.9 (4) 75.6
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

20. The mean of 100 items was 46. Later on it was discovered that an item 16 was misread as 61 and another item 43 was misread as 34. It was also found that the number of items were 90 and not 100. Then what is the correct mean ?
(1) 50 (2) 50.7
(3) 52 (4) 52.7
(SSC Graduate Level Tier-II Exam.16.09.2012)

21. The average of seven numbers is 18. If one of the number is 17 and if it is replaced by 31, then the average becomes :
(1) 21.5 (2) 19.5
(3) 20 (4) 21
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

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22. In an exam, the average marks obtained by the students was found to be 60. After omission of computational errors, the average marks of 100 candidates had to be changed from 60 to 30 and the average with respect to all the examinees came down to 45 marks. The total number of candidates who took the exam, was
(1) 200 (2) 210
(3) 240 (4) 180
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

23. In an examination, the average of marks was found to be 50. For deducting marks for computational errors, the marks of 100 candidates had to be changed from 90 to 60 each and so the average of marks came down to 45. The total number of candidates, who appeared at the examination, was
(1) 600 (2) 300
(3) 200 (4) 150
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

24. The average of 10 items was found to be 80 but while calculating, one of the items was counted as 60 instead of 50. Then the correct average would have been :
(1) 69 (2) 79.25
(3) 79 (4) 79.5
(SSC Multi-Tasking Staff Exam. 10.03.2013)

25. The average of 9 integers is found to be 11. But after the calculation, it was detected that, by mistake, the integer 23 was copied as 32, while calculating the average. After the due correction is made, the new average will be
(1) 10 (2) 9
(3) 10.1 (4) 9.5
(SSC Constable (GD) Exam. 12.05.2013)

26. The average weight of 20 students in a class is increased by 0.75 kg when one of the students weighing 30 kg is replaced by a new student. Weight of the new student (in kg) is :
(1) 35 (2) 40
(3) 45 (4) 50
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

27. Average weight of 25 persons is increased by 1 kg when one man weighing 60 kg is replaced by a new person. Weight of new person is :
(1) 50 kg (2) 61 kg
(3) 86 kg (4) 85 kg
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

28. There are 50 students in a class. One of them weighing 50 kg goes away and a new student joins. By this the average weight of the class increases by $\frac{1}{2}$ kg. The weight of the new student is :
(1) 70 kg (2) 72 kg
(3) 75 kg (4) 76 kg
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

29. The average weight of the 8 oarsmen in boat is increased by $1\frac{1}{2}$ kg when one of the crew who weighs 60kg is replaced by a new man. The weight of the new man (in kg) is
(1) 70 kg (2) 68 kg
(3) 71 kg (4) 72 kg
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

30. The average weight of 12 crewmen in a boat is increased by $\frac{1}{3}$ kg, when one of the crewmen whose weight is 55kg is replaced by a new man. What is the weight of that new man?
(1) 58 kg (2) 60 kg
(3) 57 kg (4) 59 kg
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

31. The average marks obtained by 22 candidates in an examination are 45. The average marks of the first 10 candidates are 55 and those of the last eleven are 40. The number of marks obtained by the eleventh candidate is
(1) 45 (2) 0
(3) 50 (4) 47.5
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

32. The mean of 20 items is 55. If two items 45 and 30 are removed, the new mean of the remaining items is
(1) 65.1 (2) 65.3
(3) 56.9 (4) 56
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

33. The average marks obtained by 40 students of a class is 86. If the 5 highest marks are removed, the average reduces by one mark. The average marks of the top 5 students is
(1) 92 (2) 96
(3) 93 (4) 97
(SSC CGL Tier-I Exam. 19.10.2014)

34. The average of 50 numbers is 38. If two numbers, namely 45 and 55 are discarded, the average of the remaining numbers is
(1) 37.5 (2) 37.9
(3) 36.5 (4) 37.0
(SSC CGL Tier-I Exam. 26.10.2014)

35. The average of six numbers is 20. If one number is removed, the average becomes 15. What is the number removed ?
(1) 5 (2) 35
(3) 112 (4) 45
(SSC CGL Tier-II Exam. 21.09.2014)

36. The average marks secured by 36 students was 52. But it was discovered that an item 64 was misread as 46. What is the correct mean of marks ?
(1) 54 (2) 53.5
(3) 53 (4) 52.5
(SSC CHSL DEO & LDC Exam. 16.11.2014)

37. A boy found that the average of 20 numbers is 35 when he writes a number '61' instead of '16'. The correct average of 20 numbers is
(1) 32.75 (2) 37.25
(3) 34.75 (4) 34.25
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

38. The average of 20 numbers is calculated as 35. It is dicovered later, that while calculating the average, one number, namely 85, was read as 45. The correct average is
(1) 36.5 (2) 37
(3) 37.5 (4) 36
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

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39. The average marks obtained by a student in 6 subjects is 88. On subsequent verification it was found that the marks obtained by him in a subject was wrongly copied as 86 instead of 68. The correct average of the marks obtained by him is
(1) 87 (2) 85
(3) 84 (4) 86
(SSC CGL Tier-I Exam, 16.08.2015 (1st Sitting) TF No. 3196279)

TYPE-VII

1. A cricketer whose bowling average is 24.85, runs per wicket, takes 5 wickets for 52 runs and thereby decreases his average by 0.85. The number of wickets taken by him till the last match was :
(1) 64 (2) 72
(3) 80 (4) 96
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. The average of runs of a cricket player of 10 innings was 32. How many runs must he make in his next inning so as to increase his average of runs by 4 ?
(1) 76 (2) 70
(3) 4 (4) 2
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

3. The bowling average of a cricketer was 12.4. He improves his bowling average by 0.2 points when he takes 5 wickets for 26 runs in his last match. The number of wickets taken by him before the last match was
(1) 125 (2) 150
(3) 175 (4) 200
SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

4. A cricketer had a certain average of runs for his 64 innings. In his 65th innings, he is bowled out for no score on his part. This brings down his average by 2 runs. His new average of runs is
(1) 130 (2) 128
(3) 70 (4) 68
SC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. A cricketer has a certain average of runs for his 8 innings. In the ninth innings, he scores 100 runs, thereby increases his average by 9 runs. His new average of runs is
(1) 20 (2) 24
(3) 28 (4) 32
(SSC CPO S.I. Exam. 09.11.2008)

6. The average of runs scored by a player in 10 innings is 50. How many runs should he score in the 11th innings so that his average is increased by 2 runs ?
(1) 80 runs (2) 72 runs
(3) 60 runs (4) 54 runs
(SSC CPO S.I. Exam. 05.09.2004)

7. A cricket batsman had a certain average of runs for his 11 innings. In the 12th innings, he made a score of 90 runs and thereby his average of runs was decreased by 5. His average of runs after 12th innings is :
(1) 155 (2) 150
(3) 145 (4) 140
(SSC CHSL DEO & LDC Exam. 28.11.2010 (1st Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting)

8. The batting average for 40 innings of a cricket player is 50 runs. His highest score exceeds his lowest score by 172 runs. If these two innings are excluded, the average of the remaining 38 innings is 48 runs. The highest score of the player is
(1) 165 runs (2) 170 runs
(3) 172 runs (4) 174 runs
(SSC CHSL DEO & LDC Exam. 04.12.2011 (1st Sitting (North Zone)

9. The batting average of a cricket player for 64 innings is 62 runs. His highest score exceeds his lowest score by 180 runs. Excluding these two innings, the average of remaining innings becomes 60 runs. His highest score was
(1) 180 runs (2) 209 runs
(3) 212 runs (4) 214 runs
(SSC CHSL DEO & LDC Exam. 11.12.2011 (1st Sitting (East Zone)

10. A cricket player after playing 10 tests scored 100 runs in the 11th test. As a result, the average of his runs is increased by 5. The present average of runs is
(1) 45 (2) 40
(3) 50 (4) 55
(SSC Multi-Tasking Staff Exam. 17.03.2013, 1st Sitting)

11. A cricketer has a mean score of 60 runs in 10 innings. Find out how many runs are to be scored in the eleventh innings to raise the mean score to 62?
(1) 83 (2) 82
(3) 80 (4) 81
(SSC CHSL DEO & LDC Exam. 21.10.2012 (1st Sitting)

12. In a 20 over match, the required run rate to win is 7.2. If the run rate is 6 at the end of the 15th over, the required run rate to win the match is
(1) 1.2 (2) 13.2
(3) 10.8 (4) 12
(SSC CHSL DEO & LDC Exam. 28.10.2012 (1st Sitting)

13. A batsman in his 12th innings makes a score of 63 runs and there by increases his average scores by 2. What is his average after the 12th innings?
(1) 13 (2) 39
(3) 49 (4) 87
(SSC CHSL DEO & LDC Exam. 04.11.2012, 1st Sitting)

14. The batting average for 30 innings of a cricket player is 40 runs. His highest score exceeds his lowest score by 100 runs. If these two innings are not included, the average of the remaining 28 innings is 38 runs. The lowest score of the player is :
(1) 15 (2) 18
(3) 20 (4) 12
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

15. Sachin Tendulkar has a certain average for 11 innings. In the 12th innings he scores 120 runs and thereby increases his average by 5 runs. His new average is
(1) 60 (2) 62
(3) 65 (4) 66
(SSC Graduate Level Tier-II Exam. 29.09.2013)

16. A cricketer whose bowling average is 12.4 runs per wicket, takes 5 wickets for 26 runs and thereby decreases his average by 0.4. The number of wickets taken by him till the last match was
(1) 64 (2) 72
(3) 80 (4) 85
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

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17. The average run of a player is 32 out of 10 innings. How many runs must he make in the next innings so as to increase his average by 6?
(1) 38 (2) 40
(3) 6 (4) 98
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

18. A batsman makes a score of 87 runs in the 17th innings and thus increased his average by 3. Find his average after 17th innings.
(1) 39 (2) 87
(3) 90 (4) 84
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

TYPE-VIII

1. The average of five numbers is 27. If one number is excluded, the average becomes 25. The excluded number is :
(1) 25 (2) 27
(3) 30 (4) 35
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC SO (Commercial Audit) Exam. 16.11.2003)

2. The average of marks of 28 students in Mathematics was 50; 8 students left the school, then this average increased by 5. What is the average of marks obtained by the students who left the school?
(1) 50.5 (2) 37.5
(3) 42.5 (4) 45
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

3. The average weight of 12 parcels is 1.8 kg. Addition of another new parcel reduces the average weight by 50 g. What is the weight of the new parcel?
(1) 1.50 kg (2) 1.10 kg
(3) 1.15 kg (4) 1.01 kg
(SSC CPO S.I. Exam. 07.09.2003)

4. The average of 50 numbers is 38. If two numbers namely 45 and 55 are discarded, the average of the remaining numbers is :
(1) 35 (2) 32.5
(3) 37.5 (4) 36
(SSC Graduate Level Tier-I Exam. 21.04.2013 (Ist Sitting)

5. There are 50 students in a class. Their average weight is 45 kg. When one student leaves the class the average weight reduces by 100g. What is the weight of the student who left the class?
(1) 45 kg (2) 47.9 kg
(3) 49.9 kg (4) 50.1 kg
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

6. Average weight of 25 students of a class is 50 kg. If the weight of the class teacher is included, the average is increased by 1 kg. The weight of the teacher is
(1) 76 kg (2) 77 kg
(3) 74 kg (4) 75 kg
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

7. There were 35 students in a hostel. If the number of students is increased by 7 the expenditure on food increases by ₹ 42 per day while the average expenditure of students is reduced by ₹ 1. What was the initial expenditure on food per day?
(1) ₹ 400 (2) ₹ 432
(3) ₹ 442 (4) ₹ 420
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

8. The average of 6 observations is 45.5. If one new observation is added to the previous observations, then the new average becomes 47. The new observation is
(1) 58 (2) 56
(3) 50 (4) 46
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. The average of five numbers is 140. If one number is excluded, the average of the remaining four numbers is 130. The excluded number is :
(1) 135 (2) 134
(3) 180 (4) 150
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

10. The average of five numbers is 7. When three new numbers are included, the average of the eight numbers becomes 8.5. The average of the three new numbers is
(1) 9 (2) 10.5
(3) 11 (4) 11.5
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

11. The average of six numbers is 32. If each of the first three numbers is increased by 2 and each of the remaining three numbers is decreased by 4, then the new average is
(1) 35 (2) 34
(3) 31 (4) 30
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

12. The mean weight of 34 students of a school is 42 kg. If the weight of the teacher be included, the mean rises by 400 grams. Find the weight of the teacher (in kg).
(1) 55 kg (2) 57 kg
(3) 66 kg (4) 56 kg
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

13. If the mean of 4 observations is 20, when a constant 'C' is added to each observation, the mean becomes 22. The value of C is :
(1) 6 (2) –2
(3) 2 (4) 4
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

14. The average weight of 40 children of a class is 36.2 kg. When three more children with weight 42.3 kg, 39.7 kg and 39.5 kg join the class, the average weight of the 43 children in the class is
(1) 39.2 kg (2) 36.5 kg
(3) 38.35 kg (4) 37.3 kg
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

15. In a class, the average score of girls in an examination is 73 and that of boys is 71. The average score for the whole class is 71.8. Find the percentage of girls.
(1) 40% (2) 50%
(3) 55% (4) 60%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

16. A student finds the average of 10, 2 – digit numbers. If the digits of one of the numbers is interchanged, the average increases by 3.6. The difference between the digits of the 2-digit numbers is
(1) 4 (2) 3
(3) 2 (4) 5
(SSC CGL Tier-I Exam. 19.10.2014

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TYPE–IX

1. The average age of 14 girls and their teacher's age is 15 years. If the teacher's age is excluded, the average reduces by 1. What is the teacher's age?
(1) 35 years (2) 32 years
(3) 30 years (4) 29 years
(SSC CGL Prelim Exam. 27.02.2000 (Ist Sitting) & SSC CGL Tier I, Exam. 24.04.2013)

2. The average age of four brothers is 12 years. If the age of their mother is also included, the average is increased by 5 years. The age of the mother (in years) is :
(1) 37 years (2) 43 years
(3) 48 years (4) 53 years
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. The average age of 8 persons is increased by 2 years, when one of them, whose age is 24 years is replaced by a new person. The age of the new person is :
(1) 42 years (2) 40 years
(3) 38 years (4) 45 years
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The average age of 8 men is increased by 2 years when two of them whose age are 21 and 23 years replaced by two new men. The average age of the two new men is
(1) 22 years (2) 24 years
(3) 28 years (4) 30 years
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. The average age of eleven players of a cricket team decreases by 2 months when two new players are included in the team replacing two players of age 17 years and 20 years. The average age of new player is
(1) 17 years 1 month
(2) 17 years 7 months
(3) 17 years 11 months
(4) 18 years 3 months
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & SSC CGL Exam. 13.11.2005 (IInd sitting)

6. The average age of 20 boys in a class is 12 years. 5 new boys are admitted to the class whose average age is 7 years. The average age of the boys in the class becomes
(1) 8.2 years (2) 9.5 years
(3) 12.5 years (4) 11 years
(SSC CPO S.I. Exam. 07.09.2003)

7. There are 30 students in a class. The average age of first 10 students is 12.5 years. The average age of the remaining 20 students is 13.1 years. The average age (in years) of the students of the whole class is
(1) 12.5 years (2) 12.7 years
(3) 12.8 years (4) 12.9 years
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

8. The average age of 5 boys is 12 years. The average age of 3 others is 16 years. The average age of all the 8 boys is :
(1) $13\frac{1}{2}$ years (2) 14 years
(3) $12\frac{1}{2}$ years (4) 13 years
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. Out of 10 teachers of a school, one teacher retires and at his place a new teacher of age 25 years joins. As a result of it, the average age of the teachers is reduced by 3 years. The age of the retired teacher is
(1) 60 years (2) 58 years
(3) 56 years (4) 55 years
(SSC CPO S.I. Exam. 05.09.2004 & SSC CGL Tier-I Exam. 21.04.2013 (Ist sitting)

10. The average age of 40 students of a class is 15 years. When 10 new students are admitted, the average is increased by 0.2 year. The average age of the new students is :
(1) 15.2 years (2) 16 years
(3) 16.2 years (4) 16.4 years
(SSC CPO S.I. Exam. 26.05.2005 & 09.11.2008)

11. The present average age of a family of four members is 36 years. If the present age of the youngest member of the family be 12 years, the average age of the family at the birth of the youngest member was
(1) 48 years (2) 40 years
(3) 32 years (4) 24 years
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

12. The average age of 40 students of a class is 18 years. When 20 new students are admitted to the same class, the average age of the students of the class is increased by 6 months. The average age of newly admitted student is
(1) 19 years
(2) 19 years 6 months
(3) 20 years
(4) 20 years 6 months
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

13. The average age of group of 20 girls is 15 years and that of another group of 25 boys it is 24 years. The average age of the two groups mixed together is
(1) 19.5 years (2) 20 years
(3) 21 years (4) 21.5 years
(SSC Data Entry Operator Exam. 31.08.2008)

14. The average age of 11 players of a cricket team is increased by 2 months when two of them aged 18 years and 20 years are replaced by two new players. The average age of the new players is
(1) 19 years 1 month
(2) 19 years 6 months
(3) 19 years 11 months
(4) 19 years 5 months
(SSC CGL Exam. 13.11.2005 (Ist sitting) & SSC CGL Tier-I Exam. 26.06.2011 (IInd Sitting)

15. Average age of 8 men is increased by 3 years when two of them whose age are 30 and 34 years are replaced by 2 persons. What is the average age of the 2 persons ?
(1) 24 years (2) 32 years
(3) 44 years (4) 48 years
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

16. The average age of a family of 10 members is 20 years. If the age of the youngest member of the family is 10 years, then the average age of the members of the family just before the birth of the youngest member was approximately
(1) 27.14 years (2) 12.5 years
(3) 14.28 years (4) $11\frac{1}{9}$ years
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

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17. The average age of four boys A, B, C and D is 5 years and the average age of A, B, D, E is 6 years. C is 8 years old. The age of E is (in years)
(1) 12 (2) 13
(3) 14 (4) 15
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

18. 5 years ago, the average age of P and Q was 15 years. Average age of P, Q and R today is 20 years. How old will R be after 10 years?
(1) 35 years (2) 40 years
(3) 30 years (4) 50 years
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

19. The average age of a husband and his wife was 23 years at the beginning of their marriage. After five years they have a one-year old child. The average age of the family of three, when the child was born, was
(1) 23 years (2) 24 years
(3) 18 years (4) 20 years
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

20. Two years ago the average age of a family of 8 members was 18 years. After the addition of a baby, the average age of the family is same today. What is the age of the baby ?
(1) 2 years (2) $1\frac{1}{2}$ years
(3) 1 year (4) $2\frac{1}{2}$ years
(SSC Constable (GD) Exam. 12.05.2013)

21. From a class of 42 boys, a boy aged 10 years goes away and in his place, a new boy is admitted. If on account of this change, the average age of the boys in that class increases by 2 months, the age of the newcomer is :
(1) 19 years
(2) 17 years
(3) 10 years 6 months
(4) 12 years 2 months
(SSC Multi-Tasking Staff Exam. 10.03.2013)

22. The average age of Ram and his two children is 17 years and the average age of Ram's wife and the same children is 16 years. If the age of Ram is 33 years, the age of his wife is (in years):
(1) 31 (2) 32
(3) 35 (4) 30
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

23. The average age of A and B is 20 years. If A is to be replaced by C, the average would be 19 years. The average age of C and A is 21 years. The ages of A, B and C in order (in years) are
(1) 18, 22, 20 (2) 18, 20, 22
(3) 22, 18, 20 (4) 22, 20, 18
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

24. In a family of 5 members, the average age at present is 33 years. The youngest member is 9 years old. The average age of the family just before the birth of the youngest member was
(1) 30 years (2) 29 years
(3) 25 years (4) 24 years
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

25. The average age of 12 players of a team is 25 years. If the captain's age is included, the average age increases by 1 year. The age of the captain is :
(1) 25 yrs. (2) 38 yrs.
(3) 36 yrs. (4) 26 yrs.
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

26. In a class, there are 40 boys and their average age is 16 years. One boy, aged 17 years, leaving the class and another joining, the average age becomes 15.875 years. The age of the new boy is :
(1) 12 years (2) 14.5 years
(3) 15 years (4) 17 years
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

27. The average age of 30 boys in a class is 15 years. One boy, aged 20 years, left the class, but two new boys came in his place whose age differ by 5 years. If the average age of all the boys now in the class becomes 15 years, the age of the younger newcomer is :
(1) 20 years (2) 15 years
(3) 10 years (4) 8 years
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

28. In a class there are 30 boys and their average age is 17 years. On one boy aged 18 years leaving the class and another joining, the average age becomes 16.9 years. The age of new boy is
(1) 25 years (2) 11 years
(3) 13 years (4) 15 years
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

29. Average age of 6 sons of a family is 8 years. Average age of sons together with their parents is 22 years. If the father is older than the mother by 8 years, the age of mother (in years) is :
(1) 44 (2) 52
(3) 60 (4) 68
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

30. Out of 10 teachers of a school, one teacher retires and in his place, a new teacher of age 25 years joins. As a result, average age of teachers reduces by 3 years. The age of the retired teacher is
(1) 50 years (2) 55 years
(3) 58 years (4) 60 years
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

31. 3 years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is the same today. The present age of the baby is :
(1) 3 years (2) 2 years
(3) $1\frac{1}{2}$ years (4) 1 year
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

32. The average age of 45 persons is decreased by $\frac{1}{9}$ year when one of them of 60 years is replaced by a new comer. Then the age of the new comer is :
(1) 45 years (2) 55 years
(3) 59 years (4) 49 years
(SSCCHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

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33. When the average age of a husband and wife and their son was 42 years, the son got married and a child was born just one year after the marriage. When child turned to be five years then the average age of family became 36 years. What was the age of daughter-in-law at the time of marriage ?
(1) 26 years (2) 25 years
(3) 24 years (4) 23 years
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

34. The average age of 30 boys in a class is 15 years. One boy aged 20 years, left the class, but two new boys came in his place whose ages differ by 5 years. If the average age of all the boys now in the class still remains 15 years, the age of the younger newcomer is :
(1) 20 years (2) 15 years
(3) 10 years (4) 8 years
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

35. The average age of 24 boys and their teacher is 15 years. When the teacher's age is excluded, the average age decreases by 1 year. The age of the teacher is
(1) 38 years (2) 39 years
(3) 40 years (4) 41 years
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

36. There were 24 students in a class. One of them, who was 18 years old, left the class and his place was filled up by a newcomer. If the average of the class thereby, was lowered by one month, the age of the newcomer is
(1) 14 years (2) 15 years
(3) 16 years (4) 17 years
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

37. The average age of 30 students is 9 years. If the age of their teacher is included, the average age becomes 10 years. The age of the teacher (in years) is
(1) 27 (2) 31
(3) 35 (4) 40
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

38. From a class of 24 boys, a boy, aged 10 years, leaves the class and in his place a new boy is admitted. As a result, the average age of the class is increased by 2 months. What is the age of the new boy ?
(1) 12 years (2) 15 years
(3) 14 years (4) 13 years
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

39. 5 years ago, the average age of A, B, C and D was 45 years. With E joining them now, the average age of all the five is 49 years. How old is E ?
(1) 25 years (2) 40 years
(3) 45 years (4) 64 years
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

40. In a family, the average age of a father and a mother is 35 years. The average age of the father, mother and their only son is 27 years. What is the age of the son ?
(1) 12 years (2) 11 years
(3) 10.5 years (4) 10 years
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

41. The average age of 9 students and their teacher is 16 years. The average age of the first four students is 19 years and that of the last five is 10 years. The teacher's age is
(1) 36 years (2) 34 years
(3) 30 years (4) 28 years
(SSC (South Zone) Investigator Exam 12.09.2010)

42. Five years ago, the average age of P, Q and R was 25 years and seven years ago, the average age of Q and R was 20 years. The present age of P is
(1) 36 years (2) 29 years
(3) 24 years (4) 21 years
(SSC Data Entry Operator Exam. 31.08.2008)

43. The average age of eleven cricket players is 20 years. If the age of the coach is also included, the average age increases by 10%. The age of the coach is
(1) 48 years (2) 44 years
(3) 40 years (4) 36 years
(SSC Data Entry Operator Exam. 02.08.2009)

44. The average age of a husband and a wife was 27 years when they married 4 years ago. The average age of the husband, the wife and a new-born child is 21 years now. The present age of the child is
(1) 4 years (2) 3 years
(3) 2 years (4) 1 year
(SSC Data Entry Operator Exam. 02.08.2009)

45. The average age of a husband and wife, who were married 4 years ago, was 25 years at the time of their marriage. The average age of the family consisting of husband, wife and a child, born during the interval is 20 years today. The age of the child is
(1) 1 year (2) 2 years
(3) 2.5 years (4) 3 years
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

46. Five years ago, the average age of P and Q was 25. The average age of P, Q and R today is 25. Age of R after 5 years will be
(1) 15 years (2) 20 years
(3) 40 years (4) 35 years
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

47. In a school, the average age of students is 6 years, and the average age of 12 teachers is 40 years. If the average age of the combined group of all the teachers and students is 7 years, then the number of students is :
(1) 396 (2) 400
(3) 408 (4) 416
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

48. In a school with 600 students, the average age of the boys is 12 years and that of the girls is 11 years. If the average age of the school is 11 years and 9 months, then the number of girls in the school is
(1) 450 (2) 150
(3) 250 (4) 350
(SSC Graduate Level Tier-II Exam.16.09.2012)

49. If out of 10 selected students for an examination, 3 were of 20 years, age, 4 of 21 and 3 of 22 years, the average age of the group is
(1) 22 years (2) 21 years
(3) 21.5 years (4) 20 years
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

50. 3 years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is same today. The present age of the baby is
(1) 1 year (2) $1\frac{1}{2}$ year
(3) 2 years (4) 3 years
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

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51. A man had 7 children. When their average age was 12 years, a child aged 6 years died. The average age of remaining six children is
(1) 13 years (2) 10 years
(3) 11 years (4) 14 years
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

52. The average age of a cricket team of 11 players is the same as it was 3 years back because 3 of the players whose current average age of 33 years were replaced by 3 youngsters. The average age of the newcomers is
(1) 23 years (2) 21 years
(3) 22 years (4) 20 years
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

53. The frequency distribution data is given below. If the average age is 17 years, the value of m is

Age (in years)	:	8	20	26	29
Number of people	:	3	2	m	1

(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-II Exam. 21.09.2014)

54. After replacing an old member by a new member, it was found that the average age of five members of a club is the same as it was 3 years ago. The difference between the ages of the replaced and the new members is
(1) 2 years (2) 4 years
(3) 8 years (4) 15 years
(SSC CGL Tier-II Exam. 21.09.2014)

55. Three years ago, the average age of a family of 5 members was 17 years. A baby having been born the average age of the family is the same today. The present age of the baby (in years) is
(1) 2 (2) 2.4
(3) 3 (4) 1.5
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

56. 3 years ago the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is the same today. The present age of the baby is
(1) 1 year (2) $1\frac{1}{2}$ years
(3) 2 years (4) 3 years
(SSC CHSL DEO & LDC Exam. 9.11.2014)

57. Three years ago the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family remains the same today. The age of the baby today is
(1) 3 years (2) 2 years
(3) 1 year (4) 1.5 years
(SSC CHSL DEO & LDC Exam. 16.11.2014)

58. The average age of P, Q and R is 5 years more than R's age. If the total ages of P and Q together is 39 years, then R's age is
(1) 12 years (2) 24 years
(3) 16 years (4) 14 years
(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

59. Three years ago, the average age of a family of 5 members was 17 years. A baby having been born, the average age of the family is the same today. The present age of the baby (in year/s) is
(1) 1 (2) $1\frac{1}{2}$
(3) 2 (4) 3
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

60. The average age of a husband and his wife was 23 years at the time of their marriage. After five years they have a one year old child. The average age of the family now is
(1) 29.3 years (2) 19 years
(3) 23 years (4) 28.5 years
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

61. The average age of 30 students of a class is 14 years 4 months. After admission of 5 new students in the class the average becomes 13 years 9 months. The youngest one of the five new students is 9 years 11 months old. The average age of the remaining 4 new students is
(1) 11 years 2 months
(2) 13 years 6 months
(3) 12 years 4 months
(4) 10 years 4 months
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

62. Out of 10 teachers of a school, one teacher retires and in place of him a new teacher 25 years old joins. As a result of it average age of the teachers reduces by 3 years. Age of the retired teacher (in years) is :
(1) 55 (2) 60
(3) 58 (4) 56
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

63. The average age of mother and her six children is 12 years, which is reduced by 5 years if the age of the mother is excluded. The age of the mother (in years) is :
(1) 50 (2) 40
(3) 48 (4) 42
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE-X

1. A company produces an average of 4000 items per month for the first 3 months. How much items, it must produce on an average per month over the next 9 months to average 4375 items per month over the whole year?
(1) 4500 (2) 4600
(3) 4680 (4) 4710
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. There are in all, 10 balls; some of them are red and the others white. The average cost of all balls is ₹ 28. If the average cost of red balls is ₹ 25 and that of white balls is ₹ 30, the number of white balls is :
(1) 3 (2) 5
(3) 6 (4) 7
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

3. The arithmetic mean of the scores of a group of students in a test was 52. The brightest 20% of them secured a mean score of 80 and the dullest 25% a mean score of 31.The mean score of remaining 55% is :
(1) 45% (2) 50%
(3) 51.4% approx.
(4) 54.6% approx.
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

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4. The average of marks obtained by 120 candidates in a certain examination is 35. If the average marks obtained by passed candidates are 39 and those of the failed candidates are 15, what is the number of candidates who passed the examination ?
(1) 100 (2) 120
(3) 150 (4) 140
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. A man's perision on retirement from service is equal to half the average salary during last 3 years of his service. His salary from 1-1-1983 is ₹ 380 per month with increment of ₹ 40 due on 1-10-83, 1-10-84 and 1-10-85. If he retires on 1-1-86, what pension does he draw per month?
(1) ₹ 205 (2) ₹ 215
(3) ₹ 225 (4) ₹ 230
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

6. The average salary of all the workers in a workshop is ₹ 8000. The average salary of 7 technicians is ₹ 12000 and the average salary of the rest is ₹ 6000. The total number of workers in the workshop is
(1) 20 (2) 21
(3) 23 (4) 22
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

7. The average age of 15 students of a class is 15 years. Out of these the average age of 5 students is 14 years and that of the other 9 students is 16 years. The age of the 15th student is
(1) 11 years (2) 15 years
(3) $15\frac{2}{7}$ years (4) 14 years
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. In a family of 8 adults and some minors, the average consumption of rice per head per month is 10.8 kg; while the average consumption for adults is 15 kg per head and for minors it is 6 kg per head. The number of minors in the family is :
(1) 8 (2) 6
(3) 7 (4) 9
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

9. The average monthly income (in ₹) of certain agricultural workers is S and that of other workers is T. The number of agricultural workers is 11 times that of other workers. Then, the average monthly income (in ₹) of all the workers is :
(1) $\frac{S+11T}{12}$ (2) $\frac{S+T}{12}$
(3) $\frac{11S+T}{12}$ (4) $\frac{1}{11S}+T$
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

10. The average of marks scored by the students of a class is 68. The average of marks of the girls in the class is 80 and that of boys is 60. What is the percentage of boys in the class ?
(1) 40 % (2) 60 %
(3) 65 % (4) 70 %
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. The average monthly salary of the workers in a workshop is Rs. 8,500. If the average monthly salary of 7 technicians is Rs. 10,000 and average monthly salary of the rest is Rs. 7,800, the total number of workers in the workshop is
(1) 18 (2) 20
(3) 22 (4) 24
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

12. The average pocket money of 3 friends A, B, C is ₹ 80 in a particular month. If B spends double and C spends triple of what A spends during that month and if the average of their unspent pocket money is ₹ 60, then A spends (in ₹)
(1) ₹ 10 (2) ₹ 20
(3) ₹ 30 (4) ₹ 40
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

13. The average score of a-class of boys and girls in an examination is A. The ratio of boys and girls in the class is 3 :1. If the average score of the boys is A + 1, the average score of the girls is
(1) A + 1 (2) A – 1
(3) A + 3 (4) A – 3
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

14. If the average of m numbers is n^2 and that of n numbers is m^2, then average of $(m + n)$ numbers is
(1) $\frac{m}{n}$ (2) $m+n$
(3) mn (4) $m-n$
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

15. The average of the three numbers x, y and z is 45. x is greater than the average of y and z by 9. The average of y and z is greater than y by 2. Then the difference of x and z is
(1) 3 (2) 5
(3) 7 (4) 11
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

16. The average expenditure of a man for the first five months of a year is ₹ 5,000 and for the next seven months it is ₹ 5,400. He saves ₹ 2,300 during the year. His average monthly income is :
(1) ₹ 5,425 (2) ₹ 5,500
(3) ₹ 5,446 (4) ₹ 5,600
(SSC CPO S.I. Exam. 16.12.2007)

17. The average of eight numbers is 20. If the sum of first two numbers is 31, the average of the next three numbers is $21\frac{1}{3}$ and the seventh and eighth numbers exceed the sixth number by 4 and 7 respectively, then the eighth number is
(1) 20 (2) 25
(3) 21.6 (4) 25.3
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

18. 30 pens and 75 pencils altogether were purchased for ₹ 510. If the average price of a pencil was ₹ 2, what was the average price of a pen ?
(1) ₹ 9 (2) ₹ 10
(3) ₹ 11 (4) ₹ 12
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

19. The average mathematics marks of two Sections A and B of Class IX in the annual examination is 74. The average marks of Section A is 77.5 and that of Section B is 70. The ratio of the number of students of Section A and B is

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(1) 7 : 8 (2) 7 : 5
(3) 8 : 7 (4) 8 : 5

(SSC CGL Tier-I Exam 19.06.2011 (First Sitting)

20. In a prep school, the average weight of 30 girls in a class among 50 students is 16 kg and that of the remaining students is 15.5 kg. What is the average weight of all the students in the class ?

(1) 15.2 kg. (2) 15.8 kg.
(3) 15.4 kg. (4) 15.6 kg.

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

21. The average salary of all staff of a school is ₹ 10,000. The average salary of 20 teaching staff is ₹ 12,000 and that of non-teaching staff is ₹ 5000, the number of non-teaching staff will be

(1) 7 (2) 8
(3) 10 (4) 12

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

22. B was born when A was 4 years 7 months old and C was born when B was 3 years 4 months old. When C was 5 years 2 months old, then their average age was

(1) 8 years 9 months
(2) 7 years 3 months
(3) 8 years 7 months
(4) 8 years 11 months

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

23. If the average of x and $\frac{1}{x}$ $(x \neq 0)$ is M, then the average of x^2 and $\frac{1}{x^2}$ is :

(1) $1 - M^2$ (2) $1 - 2M$
(3) $2M^2 - 1$ (4) $2M^2 + 1$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. 5 members of a team are weighed consecutively and their average weight calculated after each member is weighed. If the average weight increases by one kg each time, how much heavier is the last player than the first one ?

(1) 4 kg (2) 20 kg
(3) 8 kg (4) 5 kg

(SSC Graduate Level Tier-II Exam.16.09.2012)

25. Out of nine persons, 8 persons spent ₹ 30 each for their meals. The ninth one spent ₹ 20 more than the average expenditure of all the nine. The total money spent by all of them was

(1) ₹ 260 (2) ₹ 290
(3) ₹ 292.50 (4) ₹ 400.50

(SSC Graduate Level Tier-II Exam.16.09.2012)

26. In the afternoon, a student read 100 pages at the rate of 60 pages per hour. In the evening, when she was tired, she read 100 more pages at the rate of. 40 pages per hour. What was her average rate of reading, in pages per hour ?

(1) 60 (2) 70
(3) 48 (4) 50

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

27. Ram aims to score an average of 80 marks in quarterly and half yearly exams. But his average in quarterly is 3 marks less than his target and that in half yearly is 2 marks more than his aim. The difference between the total marks scored in both the exams is 25. Total marks aimed by Ram is :

(1) 400 (2) 410
(3) 420 (4) 380

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

28. While purchasing one item costing ₹400, one has to pay sales tax at 7% and on another costing ₹ 6400, the sales tax was 9%. The per cent of sales tax one has to pay, taking these items together on an average is :

(1) $8\frac{13}{17}$ (2) $8\frac{15}{17}$
(3) $8\frac{1}{2}$ (4) 8

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

29. On mixing two classes A and B of students having average marks 25 and 40 respectively, the overall average obtained is 30. Find the ratio of the students in the classes A and B.

(1) 2 : 1 (2) 5 :8
(3) 5 : 6 (4) 3 : 4

(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

30. A man purchases milk for three consecutive years. In the first year, he purchases milk at the rate of ₹ 7.50 per litre, in the second year, at the rate of ₹ 8.00 per litre and in the third year, at ₹ 8.50 per litre. If he purchases milk worth ₹ 4,080 each year, the average price of milk per litre for the three years is

(1) ₹ 7.68 (2) ₹ 7.98
(3) ₹ 7.54 (4) ₹ 7.83

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

31. A fruit seller sold big, medium and small sized apples for ₹ 15, ₹ 10 and ₹ 5 respectively. The total number of apples sold were in the ratio 3 : 2 : 5. Find the average cost of an apple.

(1) 8 (2) 10
(3) 9 (4) 7

(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

32. A man purchased 7 bags of rice at the rate of ₹ 800 each, 8 bags of rice at ₹ 1000 each and 5 bags of rice at the rate of ₹ 1200 each. What is the average cost of one bag of rice ?

(1) ₹ 1000 (2) ₹ 980
(3) ₹ 1120 (4) ₹ 1050

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

33. The average (arithmetic mean) of 3^{30}, 3^{60} and 3^{90} is

(1) $3^{27} + 3^{57} + 3^{87}$
(2) 3^{60}
(3) $3^{29} + 3^{59} + 3^{89}$
(4) 3^{177}

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

34. In a team of 10 persons, nine persons spent ₹ 40 each for their meal and the remaining one spent ₹ 9 more than the average expenditure of all the 10 persons. The total expenditure for their meal was

(1) ₹ 510 (2) ₹ 310
(3) ₹ 410 (4) ₹ 610

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

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35. In an examination average marks obtained by the girls of a class is 85 and the average marks obtained by the boys of the same class is 87. If the girls and boys are in the ratio 4 : 5, average marks of the whole class (approximately) is closest to
(1) 85.9 (2) 86.1
(3) 86.4 (4) 86.5
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

36. A shop of electronic goods is closed on Monday. The average sales per day for remaining six days of a week is ₹ 15640 and the average sale on Tuesday to Saturday is ₹ 14124. The sales on Sunday is
(1) ₹ 21704 (2) Data inadequate
(3) ₹ 23220 (4) ₹ 20188
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	2. (3)	3. (1)	4. (1)
5. (4)	6. (4)	7. (3)	8. (2)
9. (2)	10. (3)	11. (4)	12. (2)
13. (2)	14. (2)	15. (2)	16. (2)
17. (1)	18. (1)	19. (1)	20. (3)
21. (1)	22. (1)	23. (2)	24. (1)
25. (2)	26. (3)	27. (3)	28. (4)
29. (2)	30. (4)	31. (2)	32. (1)
33. (3)	34. (3)	35. (3)	36. (4)
37. (3)	38. (3)	39. (2)	40. (2)
41. (1)	42. (2)	43. (1)	44. (4)
45. (4)			

TYPE-II

1. (3)	2. (3)	3. (3)	4. (2)
5. (4)	6. (3)	7. (2)	8. (4)
9. (4)	10. (2)	11. (2)	12. (4)
13. (2)	14. (3)	15. (3)	16. (1)
17. (3)	18. (1)	19. (1)	20. (1)
21. (2)	22. (2)	23. (4)	24. (2)

TYPE-III

1. (2)	2. (4)	3. (4)	4. (3)
5. (2)	6. (4)	7. (4)	8. (3)
9. (4)	10. (3)	11. (2)	12. (2)
13. (2)	14. (1)	15. (4)	16. (4)
17. (3)	18. (4)	19. (1)	20. (4)
21. (2)	22. (1)	23. (3)	24. (1)
25. (2)	26. (2)	27. (2)	

TYPE-IV

1. (1)	2. (3)	3. (1)	4. (2)
5. (4)	6. (2)	7. (3)	8. (2)
9. (2)	10. (4)		

TYPE-V

1. (2)	2. (2)	3. (3)	4. (1)
5. (3)	6. (3)	7. (3)	8. (2)
9. (4)	10. (4)	11. (1)	12. (4)
13. (1)	14. (3)	15. (2)	16. (3)
17. (2)			

TYPE-VI

1. (3)	2. (3)	3. (3)	4. (3)
5. (4)	6. (3)	7. (4)	8. (2)
9. (3)	10. (2)	11. (1)	12. (3)
13. (1)	14. (3)	15. (1)	16. (3)
17. (1)	18. (1)	19. (3)	20. (2)
21. (3)	22. (1)	23. (1)	24. (3)
25. (1)	26. (3)	27. (4)	28. (3)
29. (4)	30. (4)	31. (2)	32. (3)
33. (3)	34. (1)	35. (4)	36. (4)
37. (1)	38. (2)	39. (2)	

TYPE-VII

1. (3)	2. (1)	3. (3)	4. (2)
5. (3)	6. (2)	7. (3)	8. (4)
9. (4)	10. (3)	11. (2)	12. (3)
13. (2)	14. (2)	15. (3)	16. (4)
17. (4)	18. (1)		

TYPE-VIII

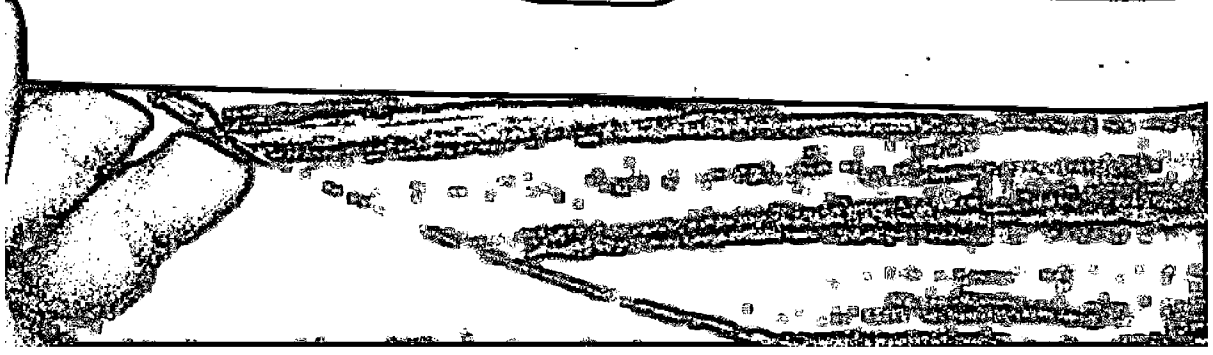
1. (4)	2. (2)	3. (3)	4. (3)
5. (3)	6. (1)	7. (4)	8. (2)
9. (3)	10. (3)	11. (3)	12. (4)
13. (3)	14. (2)	15. (1)	16. (1)

TYPE-IX

1. (4)	2. (1)	3. (2)	4. (4)
5. (2)	6. (4)	7. (4)	8. (1)
9. (4)	10. (2)	11. (3)	12. (2)
13. (2)	14. (3)	15. (3)	16. (4)
17. (1)	18. (3)	19. (3)	20. (1)
21. (2)	22. (4)	23. (3)	24. (1)
25. (2)	26. (1)	27. (2)	28. (4)
29. (3)	30. (2)	31. (2)	32. (2)
33. (1)	34. (2)	35. (2)	36. (3)
37. (4)	38. (3)	39. (3)	40. (2)
41. (2)	42. (1)	43. (2)	44. (4)
45. (2)	46. (2)	47. (1)	48. (2)
49. (2)	50. (3)	51. (1)	52. (3)
53. (1)	54. (4)	55. (1)	56. (3)
57. (2)	58. (1)	59. (3)	60. (2)
61. (4)	62. (1)	63. (4)	

TYPE-X

1. (1)	2. (3)	3. (3)	4. (1)
5. (2)	6. (2)	7. (1)	8. (3)
9. (3)	10. (2)	11. (3)	12. (1)
13. (4)	14. (3)	15. (3)	16. (1)
17. (2)	18. (4)	19. (3)	20. (2)
21. (2)	22. (4)	23. (3)	24. (3)
25. (3)	26. (3)	27. (1)	28. (2)
29. (1)	30. (2)	31. (3)	32. (2)
33. (3)	34. (3)	35. (2)	36. (3)



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EXPLANATIONS

TYPE-I

1. (2) Mean

$$= \frac{3+11+9+7+15+13+8+19+17+21+14+x}{12}$$

According to question,

$$\frac{137+x}{12} = 12$$

$\therefore 137 + x = 144$

$\therefore x = 144 - 137 = 7$

2. (3) Sum of total number of 8 students in exam
$= 8 \times 51 = 408$
Sum of total number of 9 students in exam
$= 9 \times 68 = 612$
$\therefore$ Required average

$$= \frac{408+612}{17} = \frac{1020}{17} = 60$$

3. (1) The required average marks

$$= \frac{55\times50+60\times55+45\times60}{55+60+45}$$

$$= \frac{2750+3300+2700}{160}$$

$$= \frac{8750}{160} = 54.68$$

4. (1) Required average

$$= \frac{20\times30+20\times30}{30+20}$$

$$= \frac{600+600}{50} = \frac{1200}{50} = 24$$

5. (4) Required average weight

$$\frac{(50\times6+51\times2+55\times2)}{10}$$

$$= \frac{300+102+110}{10} = \frac{512}{10}$$

$= 51.2$ kg.

6. (4) If each number is multiplied by a certain number, then the average is also multiplied by that number.
$\therefore$ Required average $= 7\times12 = 84$

7. (3) Average income of whole group

$$= \frac{4200\times40+4000\times35}{75}$$

$$= \frac{168000+140000}{75}$$

$$= \frac{308000}{75} = ₹\ 4106\ \frac{2}{3}$$

8. (2) Weight of the boat
$= 6 \times 52 - 5 \times 38$
$= 312 - 190 = 122$ kg

9. (2) Required average

$$= \frac{32\times60+33\times40}{72}$$

$$= \frac{1920+1320}{72} = \frac{3240}{72} = 45$$

10. (3) Number of workers in the factory $= \frac{1534}{118} = 13$

11. (4) Total cost price of 20kg of mixed rice
₹ (12 × 30 + 8 × 40)
= ₹ 680
$\therefore$ Average per kg price

$$= \frac{680}{20} = ₹\ 34$$

12. (2) Required average

$$\frac{x_1+x_2+....+x_{20}}{20} - \frac{101\times20}{20}$$

$= y - 101$

13. (2) Sum of x numbers $= xy$
Sum of y numbers $= xy$
$\therefore$ Required average

$$= \frac{xy+xy}{x+y} = \frac{2xy}{x+y}$$

14. (2) Total sum of x numbers $= xy^2$
Total sum of y numbers $= yx^2$
$\therefore$ Required average

$$= \frac{xy^2+yx^2}{x+y}$$

$$= \frac{xy(y+x)}{x+y} = xy$$

15. (2) $\frac{x_1+x_2+...x_n}{n} = \bar{x}$

$$\therefore \sum_{i=1}^{n}(x_i - \bar{x})$$

$$= (x_1 - \bar{x}) + (x_2 - \bar{x}) + ...+ (x_n - \bar{x})$$

$$= (x_1 + x_2 + ...+ x_n) - n.\bar{x}$$

$$= n.\left(\frac{x_1+x_2+....+x_n}{n}\right) - n.\bar{x}$$

$$= n\bar{x} - n\bar{x} = 0$$

16. (2) Required average price

$$= \frac{13\times70+15\times60+12\times65}{13+15+12}$$

$$= \frac{910+900+780}{40} = \frac{2590}{40}$$

$= ₹\ 64.75$

17. (1) That month will have 5 su days.
$\therefore$ Required average

$$= \frac{5\times510+25\times240}{30}$$

$$= \frac{2550+6000}{30}$$

$$= \frac{8550}{30} = 285$$

18. (1) Average of all numbers

$$= \frac{30\times40+40\times30}{70}$$

$$= \frac{240}{7} = 34\frac{2}{7}$$

19. (1) If the average of remainin numbers be x, then
$20 \times 15 = 5 \times 12 + 15x$
$\Rightarrow 300 = 60 + 15x$
$\Rightarrow 15x = 300 - 60 = 240$

$$\Rightarrow x = \frac{240}{15} = 16$$

20. (3) Total expenditure of the yea
= ₹ (3 × 2200 + 4 × 2550 + 5 × 3120)
= ₹ (6600 + 10200 + 15600)
= ₹ 32400
$\therefore$ Total income of the year
= ₹ (32400 + 1260)
= ₹ 33660
$\therefore$ Average monthly income

$$= ₹\ \frac{33660}{12} = ₹\ 2805$$

21. (1) Required average

$$= \frac{1.11+0.01+0.101+0.001+0.11}{5}$$

$$= \frac{1.332}{5} = 0.2664$$

22. (1) Total expenditure
$= 120 \times 7 =$ Rs. 840
Total expenditure of 4 boys
$= 150 \times 4$
= ₹ 600
Total expenditure of 3 girls
$= 840 - 600 =$ ₹ 240
$\therefore$ Their average expenditure

$$= \frac{240}{3} = ₹\ 80$$

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23. (2) Average cost of a chair = ₹ x, then
$x \times 12 + 6 \times 750 = 7800$
$\Rightarrow 12x = 7800 - 4500 = 3300$
$\Rightarrow x = \frac{3300}{12} = ₹ 275$

24. (1) Average height
$= \frac{6 \times 1.15 + 8 \times 1.1 + 6 \times 1.12}{20}$
$= \frac{6.9 + 8.8 + 6.72}{20} = \frac{22.42}{20}$
= 1 metre 12.1 cm

25. (2) Required average weight
$= \frac{42 \times 25 + 28 \times 40}{42 + 28}$
$= \frac{1050 + 1120}{70} = \frac{2170}{70} = 31$ kg

26. (3) Male employees = x
Female employees = y
$\therefore (x + y)\ 12000 = x \times 15000 + y \times 8000$
$\Rightarrow (x + y) \times 12 = 15x + 8y$
$\Rightarrow 12x + 12y = 15x + 8y$
$\Rightarrow 3x = 4y$
$\Rightarrow \frac{x}{y} = \frac{4}{3} \Rightarrow x : y = 4 : 3$

27. (3) Mean of Ten observations – Mean of nine observations
Tenth observation
$= 10 \times 17 - 16 \times 9$
$= 170 - 144 = 26$

28. (4) If each item is multiplied by 8, their average gets multiplied by 8.
$\therefore$ Required average
$= 8 \times 27 = 216$

29. (2) Sum of 4 new numbers
$= 50 \times 104 - 100 \times 44$
$= 5200 - 4400 = 800$
$\therefore$ Average $= \frac{800}{4} = 200$

30. (4) Let the last number be x.
According to the question,
$18 \times 10 + 11 \times 20 + x$
$= 30 \times 15$
$\Rightarrow 180 + 220 + x = 450$
$\Rightarrow 400 + x = 450$
$\Rightarrow x = 450 - 400 = 50$

31. (2) Required mean
$= \frac{1 \times 1 + 2 \times 2 + 3 \times 3 + 4 \times 4 + 5 \times 5 + 6 \times 6 + 7 \times 7}{1 + 2 + 3 + 4 + 5 + 6 + 7}$
$= \frac{1 + 4 + 9 + 16 + 25 + 36 + 49}{28}$
$= \frac{140}{28} = 5$

32. (1) Numbers are : 10, 15, 20, 25, 30, 35, 40, 45
Sum = 220
Average $= \frac{220}{8} = 27.5$

33. (3) Number of students in section A = x
$\therefore$ Number of students in sections B and C
$= (100 - x)$
$\therefore x \times 70 + (100 - x) \times 87.5$
$= 84 \times 100$
$\Rightarrow 70x + 87.5 \times 100 - 87.5x$
$= 8400$
$\Rightarrow 8750 - 17.5x = 8400$
$\Rightarrow 17.5x = 8750 - 8400 = 350$
$\Rightarrow x = \frac{350}{17.5} = 20$

34. (3) Weight of 12th person
= x kg (let).
$\therefore$ Average weight of 12 persons
$= \left(\frac{11 \times 95 + x}{12}\right)$ kg
According to the question,
$\frac{11 \times 95 + x}{12} + 33 = x$
$\Rightarrow 1045 + x + 396 = 12x$
$\Rightarrow 1441 = 11x$
$\Rightarrow x = \frac{1441}{11} = 131$ kg.

35. (3) Weight of B = (A + B)'s weight + (B + C)'s weight – (A + B + C)'s weight
$= 40 \times 2 + 43 \times 2 - 45 \times 3$
$= 80 + 86 - 135$
$= 166 - 135 = 31$ kg.

36. (4) Number of natural numbers = x
$\therefore$ Their sum = $15x$
According to the question,
$15x + 30 - 5 = x \times 17.5$
$\Rightarrow 17.5x - 15x = 25$
$\Rightarrow 2.5x = 25$
$\Rightarrow x = \frac{25}{2.5} = 10$

37. (3) D's weight = $80 \times 4 - 84 \times 3$
$= 320 - 252 = 68$ kg.
E's weight = 68 + 3 = 71 kg.
Total weight of (A + B + C + D + E)
$= 84 \times 3 + 68 + 71$
$= 252 + 68 + 71 = 391$ kg.
Total weight of (B + C + D + E)
$= 79 \times 4 = 316$ kg.
$\therefore$ A's weight = 391 – 316 = 75 kg.

38. (3) Weight of new oarsman
$= (42 + 15 \times 1.6)$ kg.
$= (42 + 24)$ kg. $= 66$ kg.

39. (2) Let the average cost of each book bought (of 64 books) be ₹ x.
According to the question,
$64 \times x - 50(x + 1) = 76$
$\Rightarrow 64x - 50x - 50 = 76$
$\Rightarrow 14x = 76 + 50 = 126$
$\Rightarrow x = \frac{126}{14} = 9$
$\therefore$ Required average price
$= 9 + 1 = ₹ 10$

40. (2) Sum of first n odd natural numbers = n^2
$\therefore$ Their average $= \frac{n^2}{n} = n$
$\therefore$ Required average = 25
because n = 25

41. (1) Total height of 5 friends
$= (6 \times 167 - 162)$ cm.
$= (1002 - 162)$ cm.
= 840 cm.
$\therefore$ Required average $= \frac{840}{5}$
= 168 cm.

42. (2) Weight of new person
$= (65 + 8 \times 2.5)$ kg
$= (65 + 20)$ kg
= 85 kg

43. (1) Students in class A $\Rightarrow x$
Students in class B $\Rightarrow y$
Students in class C $\Rightarrow z$
For classes A and B,
$\frac{83x + 76y}{x + y} = 79$
$\Rightarrow 83x + 76y = 79x + 79y$
$\Rightarrow 83x - 79x = 79y - 76y$
$\Rightarrow 4x = 3y$

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For classes B and C

$$\frac{76y+85z}{y+z}=81$$

$\Rightarrow 76y+85z=81y+81z$

$\Rightarrow 5y=4z$

$\therefore 20x=15y=12z$

$\Rightarrow \frac{20x}{60}=\frac{15y}{60}=\frac{12z}{60}$

$\Rightarrow \frac{x}{3}=\frac{y}{4}=\frac{z}{5}$

$\therefore$ Required average

$$=\frac{83\times3+76\times4+85\times5}{3+4+5}$$

$$=\frac{249+304+425}{12}=\frac{978}{12}$$

$=81.5$

44. (4) Temperature on 4th day
$=(4\times25+4\times25.5-25.2\times7)°C$
$=(100+102-176.4)°C$
$=25.6°C$

45. (4) Number of students in the class $=x$ (let)
$\therefore$ Number of girls $=50-x$
According to the question,
$x\times70+(50-x)\times75$
$=50\times72$
$\Rightarrow 70x+3750-75x=3600$
$\Rightarrow 3750-5x=3600$
$\Rightarrow 5x=3750-3600=150$

$$\Rightarrow x=\frac{150}{5}=30$$

TYPE-II

1. (3) According to question,
The average of 9 numbers = 30
Now, The total of 9 numbers
$=30\times9=270$
The average of first 5 numbers
$=25$
$\therefore$ The total of first 5 numbers $=25\times5=125$
and Total of last 3 numbers
$=3\times35=105$
Hence, required answer
$=270-(125+105)$
$=270-230=40$

2. (3) The middle number
$=8\times6.5+8\times9.5-15\times7$
$=52+76-105$
$=128-105=23$

3. (3) Sum of 8 numbers
$=20\times8=160$
Sum of the first two numbers

$$=\frac{31}{2}\times2=31$$

Sum of next three numbers

$$=\frac{64}{3}\times3=64$$

Sum of the remaining three numbers $=160-(31+64)=160-95=65$
Let 6th number $=x$
$\therefore$ 7th number $=x+4$,
8th number $=x+7$
$\Rightarrow x+x+4+x+7=65$
$\Rightarrow 3x=65-11$

$$\Rightarrow x=\frac{54}{3}=18$$

$\therefore$ Eighth number
$=18+7=25$

4. (2) Last number = Sum of 20 numbers – sum of first 12 numbers – sum of next 7 numbers
$=20\times12-11\times12-7\times10$
$=240-132-70=38$

5. (4) Fourth number
$=(4\times4+4\times4-3\times7)$
$=(16+16-21)=11$

6. (3) M + T + W + TH = 4 × 37
$=148°C$ ..... (i)
TH + F + S + S = 4 × 41
$=164°C$ ..... (ii)
M + T +....+ S + S = 7 × 39
$=273°C$ ..... (iii)
$\therefore$ The temperature of the fourth day
$=148+164-273=39°C$

7. (2) Person's income in the eighth month
$=₹(3160\times8+5\times4120-12\times3400)$
$=₹(25280+20600-40800)$
$=₹5080$

8. (4) Last number
$=30\times12-20\times11-9\times10$
$=360-220-90$
$=360-310=50$

9. (4) Sixth result $=6\times49+6\times52-11\times50$
$=294+312-550=56$

10. (2) $x+x+1+x+2+x+3+x+4+x+5+x+6+x+7$
$=6.5\times8=52$
$\Rightarrow 8x+28=52$
$\Rightarrow 8x=52-28=24$
$\Rightarrow x=3$

$\therefore$ Required average $=\frac{3+10}{2}$
$=6.5$

11. (2) According to the question,
$195+x+x+20=135\times3$
$\Rightarrow 2x+215=405$
$\Rightarrow 2x=405-215=190$

$$\therefore x=\frac{190}{2}=95$$

x = Smallest number

12. (4) $a+b+c=18\times3=54$
and, $b+c+d=16\times3=48$
$\therefore a+b+c-b-c-d$
$\Rightarrow 54-48=6$
$\Rightarrow a-d=6$
$\Rightarrow a-19=6$
$\Rightarrow a=19+6=25$

13. (2) Sixth number
$=6\times32+6\times37-11\times35$
$=192+222-385$
$=29$

14. (3) $a+b+c=45$ and
$b+c+d=48$
$\Rightarrow b+c=48-19=29$
$\therefore a+b+c=45$
$\Rightarrow a=45-29=16$

15. (3) The sixth number
$=9\times50-5\times54-3\times52$
$=450-270-156=24$

16. (1) Sixth number $=6\times60+6\times65-11\times63$
$=360+390-693=57$

17. (3) Numbers in order
$\Rightarrow a, b$ and c
$\therefore a+b=2\times2=4$
$b+c=2\times3=6$
$c+a=2\times4=8$
On adding,
$2(a+b+c)=4+6+8=18$

$$\Rightarrow a+b+c=\frac{18}{2}=9$$

$\therefore$ Required average $=\frac{9}{3}=3$

18. (1) Largest 3-digit number formed by 0, 2 and 4 = 420
Smallest number of three digits = 204
$\therefore$ Required average

$$=\frac{420+204}{2}=\frac{624}{2}=312$$

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19. (1) Sum of remaining two numbers
$= 6 \times 3.95 - 2 \times 3.4 - 2 \times 3.85$
$= 23.7 - 6.8 - 7.7 = 9.2$

$\therefore$ Required average $= \frac{9.2}{2} = 4.6$

20. (1) Let three numbers be a,b and c respectively.
$\therefore a + b + c = 16 \times 3 = 48$ ---(i)
$b + c + 20 = 15 \times 3 = 45$
$\Rightarrow b + c = 45 - 20 = 25$ —(ii)
By equation (i) - (ii),
$a = 48 - 25 = 23$

21. (2) Sum of new numbers
$= na + (2 + 4 + 8 + 16 \ldots\ldots$ to n terms)
Now, $S = 2 + 4 + 8 + 16 + \ldots\ldots$ to n terms
Here, a = first term $= 2$

r = common ratio $= \frac{4}{2} = 2$

It is a geometric series.

$\therefore S = \frac{a(r^n - 1)}{r - 1} = \frac{2(2^n - 1)}{2 - 1}$

$= 2(2^n - 1)$
$\therefore$ Required average

$= \frac{na + 2(2^n - 1)}{n}$

$= a + \frac{2(2^n - 1)}{n}$

22. (2) Sum of remaining 10 numbers
$= 12 \times 15 - 2 \times 14$
$= 180 - 28 = 152$

$\therefore$ Required average $= \frac{152}{10}$

$= \frac{76}{5} = 15\frac{1}{5}$

23. (4) When each number is multiplied by 8, the new average gets multiplied by 8. i.e.,
$21 \times 8 = 168$

24. (2) Seventh observation
$= 65 \times 7 + 7 \times 75 - 13 \times 70$
$= 455 + 525 - 910$
$= 980 - 910 = 70$

TYPE-III

1. (2) Average of 7 consecutive numbers is 20.
Since the numbers are consecutive, they form an arithmetic series with common difference 1.
Since, 7 is odd, 20 must be the middle number.
We can write the series as below,
17, 18, 19, 20, 21, 22, 23
$\therefore$ The largest of these numbers is 23.

2. (4) The required average
$= \frac{2+3+5+7+11+13+17+19+23}{9}$

$= \frac{100}{9} = 11\frac{1}{9}$

3. (4) The average will increase by 1.5. As, $\frac{1+2+3+4+5}{5} = 3$,

$\frac{1+2+3+4+5+6+7+8}{8} = 4.5$

$\Rightarrow 4.5 - 3 = 1.5$

4. (3) Tricky approach

$1 + 2 + 3 + \ldots\ldots + n = \frac{n(n+1)}{2}$

Average of these numbers
$= \frac{n+1}{2}$
$\therefore$ Required average
$= \frac{100+1}{2} = 50.5$

5. (2) Tricky Approach
Average of the first n natural odd numbers $= \frac{n}{2}$
Number of odd numbers upto $\frac{100}{2} = 50$ = required average

6. (4) $\frac{1^2 + 2^2 + 3^2 + \ldots + n^2}{n}$

$= \frac{(n+1)(2n+1)}{6}$

$\therefore \frac{1^2 + 2^2 + 3^2 + \ldots + 10^2}{10}$

$= \frac{(10+1)(2\times10+1)}{6}$

$= \frac{11 \times 21}{6} = 38.5$

7. (4) Required average
$= \frac{0+1+2+3+\ldots+9}{10}$

$= \frac{9(9+1)}{2 \times 10} = 4.5$

8. (3) If the smallest number be x, then

$\frac{x}{3} + 12 = x + 2$
$\Rightarrow x + 36 = 3x + 6$
$\Rightarrow 3x - x = 36 - 6$
$\Rightarrow 2x = 30 \Rightarrow x = 15$
$\therefore$ Third number $= 15 + 4 = 19$

9. (4) $x + x + 2 + x + 4 + x + 6 + x + 8 + x + 10 + x + 12 + x + 14 + x + 16$
$= 9 \times 53$
$\Rightarrow 9x + 72 = 477$
$\Rightarrow 9x = 477 - 72 = 405$

$\Rightarrow x = \frac{405}{9} = 45$

10. (3) Required average
$= \frac{3(1+2+3+\ldots\ldots+9)}{9}$

$= \frac{9 \times 10}{2 \times 3} = 15$

11. (2) $x + x + 1 + x + 2 + x + 3 + x + 4 + x + 5 + x + 6 = 26 \times 7$
$\Rightarrow 7x + 21 = 182$
$\Rightarrow 7x = 182 - 21 = 161$

$\Rightarrow x = \frac{161}{7} = 23$

Quicker Approach

Fourth number = 26
$\therefore$ First number = 23

12. (2) Average of a, b, c, d, e, f, g $= d$
Average of $f, k, l, m, n, = l$

$\therefore$ Required average $= \frac{d+l}{2}$

13. (2) Numbers $= x, x+2, \ldots\ldots, x+10$
Required difference
$= x + 10 - x = 10$

14. (1) $m + m + 1 + m + 2 + m + 3 + m + 4 = 5n$
$\Rightarrow 5m + 10 = 5n$
$\Rightarrow m + 2 = n$ ....(i)
Required average
$= m + 2 + m + 3 + m + 4 + \frac{+m+5+m+6+m+7}{6}$

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$= \frac{6m+27}{6}$

$= \frac{2m+9}{2} = \frac{2(n-2)+9}{2} = \frac{2n+5}{2}$

By (i) $[m = n-2]$

15. (4) Let the first number be x.
$\therefore x + 3 + x + 4 = 2 \times 6$
$\Rightarrow 2x + 7 = 12$
$\Rightarrow 2x = 5 \Rightarrow x = \frac{5}{2}$
$\therefore x + (x+1) + \ldots\ldots + (x+7)$
$= 8x + 28$
$= 8 \times \frac{5}{2} + 28 = 20 + 28 = 48$

16. (4) $x + x + 2 + x + 4 + x + 6$
$= 15 \times 4$
$\Rightarrow 4x + 12 = 60$
$\Rightarrow 4x = 60 - 12 = 48$
$\Rightarrow x = \frac{48}{4} = 12$
Hence, the numbers are 12, 14, 16, 18
$\therefore$ The second highest number is 16.

17. (3) Average of first five odd multiples of 3
$= \frac{3(1+3+5+7+9)}{5}$
$= \frac{3 \times 25}{5} = 15$

18. (4) Fifth number $= n$
Tenth number $= n + 5$
Eleventh number $= n + 6$
New average
$= \frac{9n + n + 5 + n + 6}{11}$
$= \frac{11n+11}{11} = \frac{(n+1) \times 11}{11} = n + 1$

19. (1) $x + x + 2 + x + 4 + x + 6$
$= 9 \times 4$
$\Rightarrow 4x + 12 = 36$
$\Rightarrow 4x = 36 - 12 = 24$
$\therefore x = \frac{24}{4} = 6$
$\therefore$ Largest number
$= 6 + 6 = 12$

20. (4) $b = a + 2$
$c = b + 2 = a + 4$
$d = c + 2 = a + 6$
$e = d + 2 = a + 8$
$\therefore$ Required average
$= \frac{a + a + 2 + a + 4 + a + 6 + a + 8}{5}$
$= \frac{5a + 20}{5} = a + 4$

21. (2) Required average
$= \frac{2 + 3 + 5 + 7 + 11}{5}$
$= \frac{28}{5} = 5.6$

22. (1) Required average
$= \frac{7 + 21 + 35 + 49 + 63 + 77}{6}$
$= \frac{7(1 + 3 + 5 + 7 + 9 + 11)}{6}$
$= \frac{7 \times 36}{6} = 42$

23. (3) Required average
$= \frac{2+3+5+7+11+13+17+19+23+29}{10}$
$= \frac{129}{10} = 12.9$

24. (1) Average of 8 consecutive even numbers = 93
$\therefore$ Fifth number = 93 + 1 = 94
$\therefore$ Largest number = 94 + 6
= 100

25. (2) $x + x + 1 + x + 2 + x + 3 + x + 4 + x + 5 = 6K$
$\Rightarrow 6x + 15 = 6K$
$\Rightarrow x + \frac{15}{6} = K$
$\Rightarrow x + \frac{5}{2} = K$ ..... (i)
Again,
$\frac{x + (x+1) + \ldots\ldots\ldots (x+6) + (x+7)}{8}$
$= \frac{8x}{8} + \frac{28}{8} = x + \frac{7}{2}$ ..... (ii)
Now, $x + \frac{7}{2} - x - \frac{5}{2} = 1$

26. (2) Five consecutive integers are : x, $x+1$, $x+2$, $x+3$ and $x+4$
$\therefore$ Their average
$= \frac{x + x + 1 + x + 2 + x + 3 + x + 4}{5}$
$= \frac{5x + 10}{5} = x + 2$
New average
$= \frac{(5x + 10) + x + 5 + x + 6}{7}$
$= \frac{7x + 21}{7} = x + 3$
Difference $= x + 3 - x - 2 = 1$

27. (2) Required average
$= \frac{3+5+7+9+11+13+15+17+19+21}{10}$
$= \frac{120}{10} = 12$

TYPE-IV

1. (1) A + B = ₹ 28,000 ...(i)
B + C = ₹ 31,200 ...(ii)
C + A = 28,800 ...(iii)
Adding,
$2(A + B + C) = 88000$
$\Rightarrow A + B + C = 44000$
From equation (i),
$28000 + C = 44000$
$\Rightarrow C = 44000 - 28000$
= ₹ 16000

2. (3) $X + Y =$ ₹ (2×5050)
= ₹ 10100
$Y + Z =$ ₹ (2×6250)
= ₹ 12500
$Z + X =$ ₹ (2×5200)
= ₹ 10400
Adding all three,
$2(X + Y + Z)$
= ₹ (10100 + 12500 + 10400)
= ₹ 33000
$\Rightarrow X + Y + Z =$ Rs. 16500
$\therefore X = (X + Y + Z) - (Y + Z)$
= ₹ (16500 − 12500)
= ₹ 4000

3. (1) Total annual expenditure of man
= Rs.$(5 \times 1200 + 7 \times 1300)$
= Rs. (6000 + 9100)
= Rs. 15100
His total annual income
= Rs. (15100 + 2900)
= Rs. 18000
$\therefore$ Average monthly income
$= \frac{18000}{12}$ = Rs. 1500

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4. (2) Total daily income of A, B and C = 3 × 450 = ₹ 1350
Total daily income of A and B = 2 × 400 = ₹ 800
Total daily income of B and C = 2 × 430 = ₹ 860
∴ B's daily income = ₹ (800 + 860 − 1350) = ₹ 310

5. (4) Number of other workers except officers = x
$\therefore 12 \times 400 + x \times 56 = (x + 12) \times 60$
$\Rightarrow 4800 + 56x = 60x + 720$
$\Rightarrow 60x - 56x = 4800 - 720$
$\Rightarrow 4x = 4080$
$\Rightarrow x = \frac{4080}{4} = 1020$
∴ Total number of workers = 1020 + 12 = 1032

6. (2) Total annual expenditure of the family = ₹ (4 × 2570 + 3 × 2490 + 5 × 3030)
= ₹ (10280 + 7470 + 15150)
= ₹ 32900
Total income
= ₹ (32900 + 5320)
= ₹ 38220
∴ Required average monthly income = $\frac{38220}{12}$ = ₹ 3185

7. (3) Total expenditure of man in a year
= ₹ (4 × 1800 + 8 × 2000)
= ₹ (7200 + 16000)
= ₹ 23200
Total annual income
= (23200 + 5600)
= ₹ 28800
∴ Average monthly income
= $\frac{28800}{12}$ = ₹ 2400

8. (2) Total monthly income of P and Q = 2 × 5050 = ₹ 10100
Total monthly income of Q and R = 2 × 6250 = ₹ 12500
Total monthly income of P and R = 2 × 5200 = ₹ 10400
On adding all three,
Total monthly income of 2(P + Q + R)
= ₹ (10100 + 12500 + 10400)
= ₹ 33000
∴ Total monthly income of (P + Q + R) = $\frac{33000}{2}$
= ₹ 16500
∴ P's monthly income
= ₹ (16500 − 12500)
= ₹ 4000

9. (2) Total workers = x (let)
$\therefore 7 \times 12000 + (x - 7) \times 6000 = 8000x$
$\Rightarrow 84000 + 6000x - 42000 = 8000x$
$\Rightarrow 8000x - 6000x = 42000$
$\Rightarrow 2000x = 42000$
$\Rightarrow x = \frac{42000}{2000} = 21$

10. (4) Total income of A and B = Rs. (2 × 200) = Rs. 400
Total income of C and D = Rs. (2 × 250) = Rs. 500
∴ Required average = $\frac{400 + 500}{4} = \frac{900}{4}$ = Rs. 225

TYPE-V

1. (2) $x + y + z = 180$
$x = \frac{1}{4}(y + z)$
$\Rightarrow 4x = y + z$
$\Rightarrow 5x = 180, \therefore x = 36$

2. (2) Let third number be x.
∴ Second number = 3x
and first number = $\frac{3x}{2}$
Now, $x + 3x + \frac{3x}{2} = 3 \times 44$
$\Rightarrow \frac{8x + 3x}{2} = 3 \times 44$
$\Rightarrow 11x = 6 \times 44$
$\Rightarrow x = \frac{6 \times 44}{11} = 24$
∴ The largest number = 3x = 3 × 24 = 72

3. (3) Let the numbers be a, b, c,
$\frac{a + b + c}{3} = 3d$
$\Rightarrow a + b + c = 9d$
Again, $\frac{a + b + c + d}{4} = 5$
$\Rightarrow a + b + c + d = 20$
$\Rightarrow 9d + d = 20$
$\Rightarrow 10d = 20 \Rightarrow d = 2$

4. (1) Let the third number be x.
∴ The second number = 2x
and the third number = 2 × 2x = 4x
According to the question,
$\frac{4x + 2x + x}{3} = 21$
$\Rightarrow 7x = 21 \times 3$
$\Rightarrow x = \frac{21 \times 3}{7} = 9$

5. (3) Let second number be x
∴ The first number = 3x
and the third number = 15x
Now, x + 3x + 15x = 3 × 57
$\Rightarrow 19x = 3 \times 57$
$\Rightarrow x = \frac{3 \times 57}{19} = 9$
∴ Required difference = 15x − x = 14x = 14 × 9 = 126

6. (3) Let the third number be x.
∴ Second number = 3x
First number = 6x
$\therefore (x + 3x + 6x) = 100 \times 3$
$\Rightarrow 10x = 300$
$\Rightarrow x = 30$
∴ The largest number = 6x = 6 × 30 = 180

7. (3) Let the third number be x.
∴ Second number = 3x
First number = 6x
Now, $\frac{x + 3x + 6x}{3} = 10$
$\Rightarrow 10x = 30 \Rightarrow x = 3$
∴ The largest number = 6x = 6 × 3 = 18.

8. (2) $\frac{a + b + c}{3} = 2d$
$\Rightarrow a + b + c = 6d$ ...(i)
Also, $\frac{a + b + c + d}{4} = 12$
$\Rightarrow a + b + c + d = 48$
$\Rightarrow 6d + d = 48$
$\Rightarrow 7d = 48$
$\Rightarrow d = \frac{48}{7}$

9. (4) Let the third number = x
∴ Second number = 2x
First number = 4x
Now, $x + 2x + 4x = 3 \times 77$
$\Rightarrow 7x = 3 \times 77$
$\Rightarrow x = \frac{3 \times 77}{7} = 33$
∴ First number = 33 × 4 = 132

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10. (4) Let the numbers be $2x$, x and $4x$ respectively

$\therefore$ Average $= \frac{2x+x+4x}{3}$

$\Rightarrow \frac{7x}{3} = 56$

$\Rightarrow x = \frac{3\times 56}{7} = 24$

$\therefore$ First number
$= 2x = 2 \times 24 = 48$
Third number $= 4x$
$= 4 \times 24 = 96$
$\therefore$ Required difference
$= 96 - 48 = 48$

11. (1) Let the second number be x.

Then first number $= \frac{x}{2}$

and third number $= 2x$
According to the question,

$\frac{x}{2} + x + 2x = 28 \times 3$

$\Rightarrow \frac{x+2x+4x}{2} = 28 \times 3$

$\Rightarrow 7x = 28 \times 3 \times 2$

$\Rightarrow x = \frac{168}{7} = 24$

$\therefore$ Third number $= 2 \times 24 = 48$

12. (4) Let the third number be x.
$\therefore$ Second number $= 3x$
First number $= 6x$

$\therefore \frac{6x+3x+x}{3} = 40$

$\Rightarrow 10x = 120 \Rightarrow x = 12$
$\therefore$ Required difference
$= 6x - x = 5x = 5 \times 12 = 60$

13. (1) Let the second number be x.
$\therefore$ First number $= 2x$

$\therefore$ Third number $= \frac{2x}{3}$

$\therefore 2x + x + \frac{2x}{3} = 49.5 \times 3$

$\Rightarrow 6x + 3x + 2x = 49.5 \times 9 = 445.5$
$\Rightarrow 11x = 445.5$

$\Rightarrow x = \frac{445.5}{11} = 40.5$

$\therefore$ Required difference

$= 2x - \frac{2x}{3} = \frac{4x}{3}$

$= \frac{4 \times 40.5}{3} = 54$

14. (3) Let the first number be x, then,

$x = \frac{240 - x}{4}$

$\Rightarrow 4x = 240 - x$

$\Rightarrow 5x = 240$

$\Rightarrow x = \frac{240}{5} = 48$

15. (2) Let the third number be x.
$\therefore$ Second number $= 3x$
and first number $= 6x$
$\therefore 6x + 3x + x = 3 \times 20$
$\Rightarrow 10x = 60 \Rightarrow x = 6$
$\therefore$ Required sum $= 6x + x = 7x$
$= 7 \times 6 = 42$

16. (3) $\frac{3a+4b}{2} > 50$

$\Rightarrow 3a + 4b > 100$

$\Rightarrow 3a + \frac{4a}{2} > 100 \quad [\because a = 2b]$

$\Rightarrow 3a + 2a > 100$
$\Rightarrow 5a > 100$
$\Rightarrow a > 20$
$\therefore$ Minimum value of $a = 21$

17. (2) Let the third number be x,
$\therefore$ First number $= 3x$

$\therefore$ Second number $= \frac{3x}{4}$

According to the question,

$3x + \frac{3x}{4} + x = 3 \times 95$

$\Rightarrow \frac{12x+3x+4x}{4} = 285$

$\Rightarrow 19x = 285 \times 4$

$\Rightarrow x = \frac{285 \times 4}{19} = 60$

TYPE-VI

1. (3) According to question,
Total marks $= 71 \times 14 = 994$
Correct total marks
$= 994 + (56 - 42) + (32 - 74)$
$= 994 + 14 - 42 = 966$

$\therefore$ Required average $= \frac{966}{14} = 69$

2. (3) Total weight of A, B and C $= 84 \times 3 = 252$ kg.
Again, A + B + C + D $= 80 \times 4 = 320$ kg.
$\therefore$ D $= (320 - 252)$ kg.
$= 68$ kg.
E $= 68 + 3 = 71$ kg.
B + C + D + E $= 79 \times 4$
$= 316$ kg.
Now,
(A + B + C + D) $-$ (B + C + D + E)
$= (320 - 316)$ kg.
$\therefore$ A $-$ E $= 4$ kg.
or A $= 4 + E = 4 + 71 = 75$ kg.

3. (3) Total length of 20 measurements $= 56 \times 20 = 1120$ cm
Correct length of 20 measurements
$= 1120 - 64 + 61 = 1117$

Correct average $= \frac{1117}{20}$

$= 55.85$ cm

4. (3) Total marks obtained by 5 students $= 50 \times 5 = 250$.
Now, in this total marks, 84 is included instead of 48.
$\therefore$ Correct total marks
$= 250 - 84 + 48 = 214$
$\therefore$ Correct average

$= \frac{214}{5} = 42.8$

5. (4) Weight of the new student
$= (40 + 15 \times 1.5)$ kg
$= (40 + 22.5)$ kg
$= 62.5$ kg

6. (3) Total of correct marks
$= 100 \times 40 - 83 + 53 = 3970$
$\therefore$ Correct average marks

$= \frac{3970}{100} = 39.70$

7. (4) Difference in weight
$= 87 - 78 = 9$ kg
$\therefore$ Correct average weight

$= 89.4 + \frac{9}{20}$

$= 89.4 + 0.45 = 89.85$ kg

8. (2) Difference in observations
$= 64 + 28 - 46 - 82 = -36$
$\therefore$ Correct average

$= 124 - \frac{36}{18} = 122$

9. (3) Required average

$= 30 + \frac{(28 + 31 - 82 - 13)}{50}$

$= 30 + \left(-\frac{36}{50}\right)$

$= 30 - 0.72 = 29.28$

10. (2) Difference of two observations
$= 73 - 48 = 25$

$\therefore$ New average $= 13 + \frac{25}{25} = 14$

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1. (1) Difference
$= 15 + 23 - 51 - 32 = -45$
$\therefore$ Correct average
$= 30 - \frac{45}{10} = 25.5$

2. (3) The sum of 50 observations $= 50 \times 36 = 1800$
The correct mean
$= \frac{1800 - 23 + 48}{50}$
$= \frac{1825}{50} = 36.5$

3. (1) Difference of numbers
$= 64 - 46 = 18$
Correct average $= 50 - \frac{18}{10}$
$= 50 - 1.8 = 48.2$

4. (3) Correct total of 10 numbers
$= 15 \times 10 - 26 + 36$
$= 160$
$\therefore$ Correct average $= \frac{160}{10} = 16$

5. (1) Difference in average $= 1.8$
$\therefore$ Difference between the number and the number formed by interchanging the digits
$= 1.8 \times 10 = 18$
($\because 53 - 35 = 18$)
$\therefore$ Number $= 35$
$\therefore$ Difference of digits
$= 5 - 3 = 2$

6. (3) Difference of numbers
$= 82 - 28 = 54$
$\therefore$ Required average
$= 60 + \frac{54}{27} = 62$

7. (1) Difference $= 86 - 68 = 18$
$\therefore$ Actual average $= 58 + \frac{18}{100}$
$= 58.18$

8. (1) Difference $= 62 - 26 = 36$
$\therefore$ Required average
$= 47 + \frac{36}{20}$
$= 47 + 1.8 = 48.8$

9. (3) Difference $= 97 - 79 = 18$
True average $= 75 + \frac{18}{20}$
$= 75.9$

10. (2) Required Average
$= \frac{100 \times 46 - 61 - 34 + 16 + 43}{90}$
$= \frac{4600 - 36}{90} = \frac{4564}{90} = 50.7$

11. (3) Difference $= 31 - 17 = 14$
$\therefore$ Required average
$= 18 + \frac{14}{7} = 20$

12. (1) Let the number of candidates be x, then
$60x - 45x = 30 \times 100$
$\Rightarrow 15x = 3000$
$\Rightarrow x = 200$

13. (1) Let total number of candidates be x.
$\therefore 50x - 30 \times 100 = 45x$
$\Rightarrow 5x = 3000$
$\Rightarrow x = \frac{3000}{5} = 600$

14. (3) Corrected mean
$= \frac{80 \times 10 - 60 + 50}{10}$
$= \frac{800 - 10}{10} = \frac{790}{10} = 79$

15. (1) Sum of 9 integers
$= 9 \times 11 = 99.$
New average
$= \frac{90 + 23 - 32}{9} = \frac{90}{9} = 10.$

16. (3) Required answer
$= 30 + 20 \times 0.75$
$= 30 \text{ kg} + 15\text{kg} = 45\text{kg}$

17. (4) Total weight increased
$= 1 \times 25 = 25$ kg
$\therefore$ Weight of new person
$= 60 + 25 = 85$ kg

18. (3) Total weight increased
$= \frac{1}{2} \times 50 = 25$ kg.
$\therefore$ Weight of the new man
$= 50 + 25 = 75$ kg.

19. (4) Weight of the new oarsman
$= 60 + 8 \times \frac{3}{2}$
$= 60 + 12 = 72$ kg

20. (4) Weight of the new man
$= 55 + \frac{1}{3} \times 12 = 59$ kg.

21. (2) Marks obtained by eleventh candidate
$= 22 \times 45 - (10 \times 55 + 11 \times 40)$
$= 990 - (550 + 440)$
$= 990 - 990 = 0$

22. (3) Sum of 18 items
$= 55 \times 20 - 45 - 30$
$= 1100 - 75 = 1025$
$\therefore$ Required average $= \frac{1025}{18}$
$= 56.9$

23. (3) Sum of marks of top 5 students $= 40 \times 86 - 35 \times 85$
$= 3440 - 2975 = 465$
$\therefore$ Their average $= \frac{465}{5} = 93$

24. (1) Sum of 50 numbers
$= 50 \times 38 = 1900$
Sum of 48 numbers
$= 1900 - 45 - 55 = 1800$
$\therefore$ Required average
$= \frac{1800}{48} = 37.5$

25. (4) Required number = sum of six numbers – sum of five numbers
$= 6 \times 20 - 15 \times 5$
$= 120 - 75 = 45$

26. (4) Difference of correct and incorrect marks $= 64 - 46 = 18$
$\therefore$ Correct mean
$= 52 + \frac{18}{36} = 52.5$

27. (1) Correct average
$= 35 - \left(\frac{61 - 16}{20}\right)$
$= 35 - \frac{45}{20} = 35 - 2.25$
$= 32.75$

28. (2) Correct sum of 20 numbers
$= 20 \times 35 - 45 + 85$
$= 700 + 40 = 740$
$\therefore$ Correct average $= \frac{740}{20} = 37$

29. (2) Correct sum of marks obtained by the student
$= 88 \times 6 - 86 + 68$
$= 528 - 86 + 68 = 510$
$\therefore$ Correct average $= \frac{510}{6} = 85$

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TYPE-VII

1. (3) Let the no. of wickets taken till the last match be n.
∴ Total runs at 24.85 runs per wicket = 24.85n
Total runs after the current match = 24.85n + 52
Total no. of wickets after the current match = n + 5
Bowling Average after the current match
$\Rightarrow \frac{24.85n+52}{n+5} = 24.85 - 0.85$
$\therefore \frac{24.85n+52}{n+5} = 24$
or 24.85n + 52 = 24n + 120
or 0.85n = 120 − 52
or $n = \frac{68}{0.85} = 80$

2. (1) Let the batsman make x runs.
Total runs in 10 innings = 10 × 32 = 320
$\therefore \frac{320+x}{11} = 32 + 4$
$\Rightarrow 320 + x = 36 \times 11$
$\Rightarrow x = 396 - 320 = 76$

3. (3) Let the number of wickets taken by the cricketer before the last match = x
According to the question,
$\frac{12.4x+26}{x+5} = 12.2$
$\Rightarrow 12.4x + 26 = 12.2x + 61$
$\Rightarrow 0.2x = 61 - 26 = 35$
$\Rightarrow x = \frac{35}{0.2} = \frac{350}{2} = 175$

4. (2) Let the cricketer's average of runs for his 64 innings be x runs.
∴ Total number of runs in 64 innings = 64x
According to the question,
$\frac{64x+0}{65} = x - 2$
$\Rightarrow 64x = 65x - 130$
$\Rightarrow x = 130$
∴ New average of runs = x − 2 = 130 − 2 = 128

5. (3) Let the average of runs of the cricketer in 8 innings be x.
According to the question,
$\frac{8x+100}{9} = x + 9$
$\Rightarrow 8x + 100 = 9x + 81$
$\Rightarrow x = 100 - 81 = 19$
∴ New average of runs = 19 + 9 = 28

6. (2) Let the number of runs scored in 11th innings be x.
∴ 10 × 50 + x = 11 × 52
⇒ 500 + x = 572
⇒ x = 572 − 500 = 72 runs

7. (3) Let the batsman's average in 11 innings be x runs.
$\therefore \frac{11x+90}{12} = x - 5$
$\Rightarrow 11x + 90 = 12x - 60$
$\Rightarrow x = 150$
∴ Required average = 150 − 5 = 145

8. (4) Let the highest score be x.
∴ Lowest score = x − 172
∴ x + x − 172 = 40 × 50 − 38 × 48
⇒ 2x − 172 = 2000 − 1824 = 176
⇒ 2x = 176 + 172 = 348
∴ $x = \frac{348}{2} = 174$

9. (4) Let the cricketer's highest score be x runs.
∴ 60 × 62 + x + x − 180 = 64 × 62
⇒ 3720 + 2x − 180 = 3968
⇒ 2x = 428
⇒ x = 214 runs

10. (3) If the average in 10 tests be x, then,
x × 10 + 100 = (x + 5) × 11
⇒ 11x − 10x = 100 − 55
⇒ x = 45
∴ Required average = 50

11. (2) Required runs
= 60 + 11 × 2 = 82 runs

12. (3) Total runs = 20 × 7.2 = 144
Total runs in 15 overs
= 15 × 6 = 90
Runs to be scored in the next 5 overs
= 144 − 90 = 54
∴ Required run-rate
$= \frac{54}{5} = 10.8$

13. (2) Extra runs = 12 × 2 = 24
∴ Required average
= 63 − 24 = 39

14. (2) Lowest score = x
Highest score = x + 100
∴ 28 × 38 + x + x + 100 = 30 × 40
⇒ 1064 + 2x + 100 = 1200
⇒ 2x = 1200 − 1164 = 36
⇒ x = 18

15. (3) Sachin's new average = x runs
Total runs in 11 innings
= 11 (x − 5)
∴ 11 (x − 5) + 120 = 12x
∴ 12x − 11x = 65
∴ x = 65 runs

16. (4) Required number of wickets = x (let)
According to question,
12.4 × x + 26 = (x + 5) (12.4 − 0.4) = (x + 5) × 12
⇒ 12.4x + 26 = 12x + 60
⇒ 12.4x − 12x = 60 − 26
⇒ 0.4x = 34
$\Rightarrow x = \frac{34}{0.4} = \frac{340}{4} = 85$

17. (4) Runs scored in the next innings = x (let)
According to the question,
10 × 32 + x = 11 × 38
⇒ 320 + x = 418
⇒ x = 418 − 320 = 98

18. (1) Average runs in 16 innings
= 87 − 17 × 3 = 87 − 51 = 36
∴ Required average
= 36 + 3 = 39 runs

TYPE-VIII

1. (4) Total sum of five numbers = 27 × 5 = 135
Total sum of four numbers = 25 × 4 = 100
∴ Required number = 135 − 100 = 35

2. (2) Total marks of 28 students = 28x 50 = 1400
Total marks of 20 students = 20 × 55 = 1100
∴ Total marks of 8 students = 1400 − 1100 = 300
∴ Average = $\frac{300}{8} = 37.5$

3. (3) Total weight 12 parcels = 12 × 1.8 = 21.6 kg.
New average of 13 parcels = 1.8 − 0.05 = 1.75 kg.

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Total weight of 13 parcels
$= 13 \times 1.75 = 22.75$ kg.
$\therefore$ Weight of new parcel
$= 22.75 - 21.6 = 1.15$ kg.

4. (3) Required average

$$= \frac{38 \times 50 - 45 - 55}{48}$$

$$= \frac{1800}{48} = 37.5$$

5. (3) Weight of the student who left
$= 50 \times 45 - 49 \times 44.9$
$= 2250 - 2200.1 = 49.9$ kg.

6. (1) Weight of teacher
$= 50 + 26 \times 1 = 76$ kg

7. (4) Suppose the initial expenditure per day = ₹ x

$$\Rightarrow \frac{x}{35} - \frac{x+42}{42} = 1$$

$$\Rightarrow \frac{6x - 5x - 210}{210} = 1$$

$\Rightarrow x = 210 + 210 =$ ₹ 420

8. (2) Let the new observation be x. Then,

$$\frac{x + 6 \times 45.5}{7} = 47$$

$\Rightarrow x + 273 = 47 \times 7 = 329$
$\Rightarrow x = 329 - 273 = 56$

9. (3) Required number
$= 5 \times 140 - 4 \times 130$
$= 700 - 520 = 180$

10. (3) Sum of the three new numbers
$= 8 \times 8.5 - 5 \times 7 = 68 - 35 = 33$

$\therefore$ Required average $= \frac{33}{3} = 11$

11. (3) Change $= 2 \times 3 - 3 \times 4 = -6$

$\therefore$ New average $= 32 - \frac{6}{6} = 31$

12. (4) Weight of the teacher

$$= 42 \text{ kg.} + \frac{35 \times 400}{1000} \text{ kg}$$

$= 42 + 14 = 56$ kg.

13. (3) $4C = 22 \times 4 - 20 \times 4$
$= 88 - 80 = 8$

$$\Rightarrow C = \frac{8}{4} = 2$$

14. (2) Total weight of 40 children
$= 40 \times 36.2$ kg $= 1448$ kg
Total weight of 43 children =
$1448 + 42.3 + 39.7 + 39.5$
$= 1569.5$ kg
$\therefore$ Required average weight

$$= \frac{1569.5}{43} = 36.5 \text{ kg}$$

15. (1) Let the number of boys be x and that of girls be y.
$\therefore 71x + 73y = 71.8(x + y)$
$\Rightarrow 71.8x - 71x = 73y - 71.8y$
$\Rightarrow 0.8x = 1.2y$

$$\Rightarrow \frac{x}{y} = \frac{1.2}{0.8} = \frac{12}{8} = \frac{3}{2}$$

$$\therefore \frac{x}{y} + 1 = \frac{3}{2} + 1 \Rightarrow \frac{x+y}{y} = \frac{5}{2}$$

$\therefore$ Percentage of girls

$$= \frac{y}{x+y} \times 100 = \frac{2}{5} \times 100 = 40\%$$

16. (1) Total increase $= 3.6 \times 10$
$= 36$
$\therefore$ If the number be $10x + y$, then
Number obtained after reversing the digits $= 10y + x$
$\therefore 10y + x - 10x - y = 36$
$\Rightarrow 9y - 9x = 36$
$\Rightarrow 9(y - x) = 36$

$$\Rightarrow y - x = \frac{36}{9} = 4$$

TYPE-IX

1. (4) Total age of 14 girls + 1 teacher $= 15 \times 15 = 225$ yrs.
Average age of 14 girls = 14 yrs.
$\therefore$ Total age of 14 girls
$= 14 \times 14 = 196$ yrs.
$\therefore$ Teacher's age
$= 225 - 196 = 29$ yrs.

2. (1) Average age of 4 brothers
$= 12$ yrs.
Total age of 4 brothers $= 4 \times 12 = 48$ yrs.
Average age of 4 brothers + mother (= 5 persons)
$= 12 + 5 = 17$ yrs.
$\therefore$ Total age of 4 brothers + mother $= 5 \times 17 = 85$ yrs.
$\therefore$ The age of the mother
$= 85 - 48 = 37$ yrs.

3. (2) Age of new person
$= 8 \times 2 + 24$
$= 16 + 24 = 40$ years

4. (4) Overall increase in the total age $= 8 \times 2 = 16$ years
$\therefore$ Total age of two new men
$= 21 + 23 + 16 = 60$ years
$\therefore$ Average age of new men

$$= \frac{60}{2} = 30 \text{ years}$$

5. (2) **Trick**
Average age of new players

$$= \left\{(20 + 17)11 \times \frac{2}{12}\right\} \times \frac{1}{2}$$

$$\frac{422}{12 \times 2} = \frac{211}{12} \Rightarrow 17\frac{7}{12}$$

$= 17$ years 7 months

6. (4) New average age of class

$$= \frac{20 \times 12 + 5 \times 7}{25} = \frac{240 + 35}{25}$$

$$= \frac{275}{25} = 11 \text{ years}$$

7. (4) Average age

$$= \frac{10 \times 12.5 + 20 \times 13.1}{10 + 20}$$

$$= \frac{125 + 262}{30} = 12.9 \text{ years}$$

8. (1) Required average

$$= \frac{5 \times 12 + 3 \times 16}{5 + 3} = \frac{60 + 48}{8}$$

$$= \frac{108}{8} = \frac{27}{2} = 13\frac{1}{2} \text{ years}$$

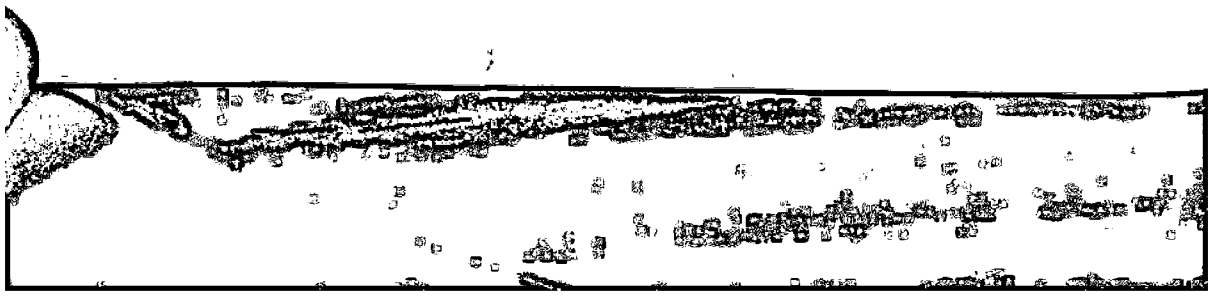
9. (4) The average age is reduced by 3 years.
$\therefore$ Age of the retired teacher
$= 25 + 3 \times 10 = 55$ years

10. (2) Total age of 40 old students
$= 40 \times 15 = 600$ years.
Total age of 40 old and 10 new students $= 50 \times 15.2 = 760$ years
$\therefore$ Total age of 10 new students = 760-600 = 160 years.
$\therefore$ Required average age

$$= \frac{160}{10} = 16 \text{ years.}$$

11. (3) Sum of the present ages of whole family $= 36 \times 4 = 144$ years
Sum of the ages of the family at the birth of youngest member
$= 144 - 4 \times 12 = 96$ years
$\therefore$ Required Average age

$$= \frac{96}{3} = 32 \text{ years}$$



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12. (2) Total age of 20 new students
= (60 × 18.5 − 40 × 18) years
= (1110 − 720) years
= 390 years
∴ Their average age
$= \frac{390}{20}$ = 19.5 years
= 19 years 6 months

13. (2) Required average age
$= \left(\frac{20\times15+25\times24}{20+25}\right)$ years
$= \left(\frac{300+600}{45}\right)$ years
$= \left(\frac{900}{45}\right)$ years = 20 years

14. (3) Total increase = 11 × 2
= 22 months
∴ Sum of the age of both cricketers
= (18 + 20) years 22 months
= 38 years 22 months
∴ Average age = 19 years 11 months

15. (3) Sum of the age of two new persons
= 30 + 34 + 3 × 8
= 88 years
∴ Required average
$= \frac{88}{2}$ = 44 years

16. (4) Sum of the present age of 10 members
= 20 × 10 = 200 years
Total age of 9 members, 10 years ago
= 100 years
Required average
$= \frac{100}{9} = 11\frac{1}{9}$ years

17. (1) A + B + C + D = 20 years
⇒ A + B + D = 20 − 8 = 12 years
Now, A + B + D + E = 24 years
∴ E = 24 − 12 = 12 years

18. (3) Present age of (P + Q)
= 30 + 10 = 40 years
(P + Q + R)'s present age
= 20 × 3 = 60 years
R's present age = 60 − 40
= 20 years
∴ R's age after 10 years
= 20 + 10 = 30 years

19. (3) After five years of marriage,
Husband + wife + child
= 46 + 10 + 1
= 57 years
At the time of birth of child,
Husband + wife + child
= 57 − 3 = 54 years
∴ Required average age
$= \frac{54}{3}$ = 18 years

20. (1) Sum of present ages of 9 member family = 18 × 9
= 162 years
Sum of 8 member's present ages
= 18 × 8 + 2 × 8
= 144 + 16 = 160 years
Child's age = 162 − 160
= 2 years

21. (2) Age of new boy
$= \left(10+\frac{2\times42}{12}\right)$ = 17 years

22. (4) Ram + two children = 51 years
His wife + two children
= 48 years
∴ Ram − wife = 3 years
⇒ 33 − wife = 3 years
∴ Wife = 33 − 3 = 30 years

23. (3) A + B = 2 × 20 = 40
C + B = 2 × 19 = 38
C + A = 2 × 21 = 42
On adding all three,
2 (A + B + C)
= 40 + 38 + 42 = 120
⇒ A + B + C = 60
∴ A = (A + B + C) − (B + C)
= 60 − 38 = 22 years
B = (A + B + C) − (A + C)
= 60 − 42 = 18 years
C = (A + B + C) − (A + B)
= 60 − 40 = 20 years

24. (1) Sum of the present age of family members = 33 × 5 = 165 years
9 years ago,
Sum of their age
= 165 − 9 × 5 = 120 years
∴ Required average age = $\frac{120}{4}$
= 30 years

25. (2) Total age of 12 players
= 12 × 25 = 300
Total age including captain
= 13 × 26 = 338
∴ Age of the captain
= 338 − 300 = 38 years

26. (1) Total age of 40 boys
= 40 × 16 = 640 years
New total age of 40 boys
= 40 × 15.875 = 635 years
∴ Age of new boy
= [635 − (640−17)] = 12 years

27. (2) Total age of 30 boys
= 30 × 15 = 450 years
One boy, aged 20 years, left the class
Now, total age of 29 boys
= 450 − 20 = 430 years
Again, two new boys join the class
Then, the total age of 31 boys
= 15 × 31 = 465 years
∴ Age of two new boys
= 465 − 430 = 35 years
Let the individual age of two boys be x and y years
∴ x + y = 35
x − y = 5 (According to the question)
∴ 2x = 40
$x = \frac{40}{2}$ = 20 years
∴ y = 15 years
∴ Age of the younger new comer = 15 years

28. (4) Age of new boy
= 18 years − total decrease
= (18 − 0.1 × 30) years
= 15 years

29. (3) Let the mother's age
= x years
∴ Father's age = (x + 8) years
Sum of age of 6 sons
= 8 × 6 = 48 years
Sum of age of 6 sons and parents = 22 × 8 = 176 years.
∴ Age of Parents = 176 − 48
= 128 years
⇒ x + x + 8 = 128
⇒ 2x = 120
⇒ x = 60
Hence, mother's age = 60 years

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30. (2) Total age decreased
$= 10 \times 3 = 30$ years.
$\therefore$ Age of the retired teacher
$= 25 + 30 = 55$ years.

31. (2) Total age of 5 members, 3 years ago $= 17 \times 5 = 85$ years
Total age of 5 members, now
$= (85 + 3 \times 5) = 100$ years
Total age of 6 members, now
$= 17 \times 6 = 102$ years
$\therefore$ Age of the baby
$= 102 - 100 = 2$ years

32. (2) Reduction in total age of 45 persons $= 45 \times \frac{1}{9}$
Age of the new person
$= 60 - 45 \times \frac{1}{9} = 55$ years

33. (1) $H + W + S = 42 \times 3 = 126$
$(H + W + S) + D + C = 36 \times 5 = 180$
$(126 + 6 \times 3) + D + C = 180$
$\Rightarrow (126 + 18) + D + C = 180$
$\Rightarrow 144 + D + C = 180$
$\Rightarrow D + C = 180 - 144 = 36$
$\therefore$ Age of daughter-in-law at the time of marriage (D).
$= 36 - (6 + 6) = 26$ years

34. (2) Let the age of younger boy be x years.
$\therefore$ Age of older boy
$= (x + 5)$ years.
Then, total age of 30 boys
$= 30 \times 15 = 450$ years.
Total age of 31 boys after two newcomers join &1 left
$= 450 - 20 + x + x + 5$
$= 435 + 2x$
Clearly, $435 + 2x = 31 \times 15$
$\Rightarrow 2x = 465 - 435$
$\Rightarrow x = \frac{30}{2} = 15$ years

35. (2) The age of the teacher
$= (24 + 1) \times 15 - 24 \times (15 - 1)$
$= 25 \times 15 - 24 \times 14$
$= 375 - 336 = 39$ years.

36. (3) Total age decrease
$= 24 \times 1 = 24$ months $= 2$ years
$\therefore$ Age of newcomer $= 18 - 2$
$= 16$ years.

37. (4) Total age of 30 students
$= 9 \times 30 = 270$ years
Total age of 30 students and a teacher $= 31 \times 10 = 310$ years
$\therefore$ Age of the teacher
$= 310 - 270 = 40$ years

38. (3) Total age increase
$= 2 \times 24 = 48$ months $= 4$ years
$\therefore$ Age of the new boy
$= 10 + 4 = 14$ years.

39. (3) Sum of the present age of A, B, C and D $= 45 \times 4 + 4 \times 5$
$= 180 + 20 = 200$ years
Sum of the present age of A, B, C, D and E $= 49 \times 5 = 245$ years
$\therefore$ Present age of E
$= (245 - 200)$ years $= 45$ years

40. (2) Father + mother
$= 2 \times 35 = 70$ years
Father + mother + son
$= 27 \times 3 = 81$ years
$\therefore$ Son's age $= 81 - 70 = 11$ years

41. (2) Teacher's age
$= 16 \times 10 - 19 \times 4 - 5 \times 10$
$= 160 - 76 - 50 = 34$ years

42. (1) Sum of the present age of P, Q and R
$= (25 \times 3 + 3 \times 5)$ years
$= (75 + 15)$ years $= 90$ years
Sum of the present age of Q and R $= (20 \times 2 + 2 \times 7)$ years
$= 54$ years
$\therefore$ p's present age
$= (90 - 54)$ years $= 36$ years

43. (2) Total age of 11 players
$= 11 \times 20 = 220$ years
Total age of 11 players and the coach $= 12 \times 22 = 264$ years
$\therefore$ Age of the coach
$= (264 - 220)$ years
$= 44$ years

44. (4) Sum of the present age of husband and wife
$= 2 \times 27 + 8 = 62$ years
Sum of the present age of husband, wife and child
$= 21 \times 3 = 63$ years
$\therefore$ present age of the child
$= 63 - 62 = 1$ year

45. (2) Sum of the present age of husband and wife
$= 2 \times 25 + 2 \times 4 = 58$ years
Sum of the present age of husband, wife and child
$= 3 \times 20 = 60$ years
$\therefore$ Child's present age
$= 60 - 58 = 2$ years

46. (2) Sum of the present age of P and Q.
$= 2 \times 25 + 10 = 60$ years
Sum of the present age of P, Q and R $= 25 \times 3 = 75$ years
$\therefore$ R's present age $= 75 - 60$
$= 15$ years
$\therefore$ R's age after 5 years $= 20$ years

47. (1) Let the number of students be n. Then,
$7 = \frac{n \times 6 + 12 \times 40}{n + 12}$
$\Rightarrow 7n + 84 = 6n + 480$
$\Rightarrow n = 480 - 84 = 396$

48. (2) Number of girls $= x$
Number of boys $= 600 - x$
$\therefore (600 - x) \times 12 + 11x$
$= 11\frac{3}{4} \times 600 = \frac{47}{4} \times 600$
$\Rightarrow 7200 - 12x + 11x = 7050$
$\Rightarrow x = 7200 - 7050 = 150$

49. (2) Average age of the whole group
$= \frac{3 \times 20 + 4 \times 21 + 3 \times 22}{10}$
$= \frac{60 + 84 + 66}{10} = \frac{210}{10}$
$= 21$ years

50. (3) Present age of child
$= 17 \times 6 - (17 \times 5 + 3 \times 5)$
$= 102 - (85 + 15) = 102 - 100$
$= 2$ years

51. (1) Total age of remaining 6 children $= 12 \times 7 - 6$
$= 84 - 6 = 78$ years
$\therefore$ Their average age $= \frac{78}{6}$
$= 13$ years

52. (3) Total age of three youngsters
$= 33 \times 3 - 11 \times 3 = 99 - 33$
$= 66$ years
$\therefore$ Required average
$= \frac{66}{3} = 22$ years

53. (1) Required average
$= \frac{8 \times 3 + 20 \times 2 + 26 \times m + 29 \times 1}{3 + 2 + m + 1}$
$\Rightarrow 17 = \frac{24 + 40 + 26m + 29}{6 + m}$

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$\Rightarrow 17(6+m) = 93 + 26m$
$\Rightarrow 102 + 17m = 93 + 26m$
$\Rightarrow 26m - 17m = 102 - 93$
$\Rightarrow 9m = 9 \Rightarrow m = 1$

54. (4) Increase in ages of five members in 3 years
= (3 × 5) years = 15 years
As average age remains same,
∴ Required difference = 15 years

55. (1) Three years ago,
Total age of the family = 17 × 5 = 85 years
Total age of 5 member family today = 85 + 15 = 100 years
Total age of the family with child today = 17 × 6 = 102 years
Age of baby = 102 – 100 = 2 years

56. (3) Five years ago, total age of five members = 17 × 5 = 85 years
Sum of their present ages
= 85 + 3 × 5 = 100 years
Sum of present ages of 6 members
= 17 × 6 = 102 years
∴ Present age of baby
= 102 – 100 = 2 years

57. (2) Total age of 5-member family 3 years ago = 17 × 5 = 85 years
Their total present age
= 85 + 3 × 5 = 100 years
Total present age of 6 members
= 17 × 6 = 102 years
∴ Present age of child
= 102 – 100 = 2 years

58. (1) According to question,

$$\frac{P+Q+R}{3} = R + 5$$

$\Rightarrow P + Q + R = 3R + 15$
$\Rightarrow P + Q = 3R - R + 15$
$\Rightarrow 2R + 15 = P + Q = 39$
$\Rightarrow 2R = 39 - 15 = 24$

$$\Rightarrow R = \frac{24}{2} = 12 \text{ years}$$

59. (3) Total present age of 5 – member family
= (17 × 5 + 3 × 5) years
= 85 + 15 = 100 years
Total present age of 6 – member family = 17 × 6 = 102 years
∴ Present age of child
= 102 – 100 = 2 years

60. (2) Total present age of family
= (2 × 23 + 2 × 5 + 1) years
= (46 + 10 + 1) years = 57 years

$$\therefore \text{ Required average} = \frac{57}{3}$$

= 19 years

61. (4) Total age of initial 30 students
= 14 years 4 months × 30
= 430 years
Total age of 35 students
= 13 years 9 months × 35
= (455 + 26) years 3 months
= 481 years 3 months
∴ Total age of 4 new students
= 481 years 3 months – 430 years – 9 years 11 months
= 481 years 3 months – 439 years 11 months
= 41 years 4 months
∴ Required average

$$= \frac{41 \text{ years } 4 \text{ months}}{4}$$

= 10 years 4 months

62. (1) Age of the retired teacher
= (25 + 3 × 10) years
= 55 years

63. (4) Mother + 6 children ⇒ 12 × 7 = 84 years
6 children ⇒ 6 × 7 = 42 years
∴ Mother's age ⇒ 84 – 42
= 42 years

TYPE-X

1. (1) Let average production of a company in 9 months be x items
∴ According to question,

$$4375 = \frac{3 \times 4000 + 9 \times x}{12}$$

or, 4375 × 12 = 12 × 1000 + 9 × x
∴ 9 × x = 12 (4375 – 1000)
= 12 × 3375

$$\therefore x = \frac{12 \times 3375}{9} = 4500$$

2. (3) Let the number of white balls be x.
∴ Number of red balls = (10 – x)
∴ 10 × 28 = x × 30 + 25 (10 – x)
$\Rightarrow 280 = 30x + 250 - 25x$
$= 5x + 250$
$\Rightarrow 5x = 280 - 250 = 30$
$\Rightarrow x = 6$

3. (3) Let mean score of remaining 55% = x

$$52 = \frac{20 \times 80 + 25 \times 31 + 55 \times x}{100}$$

$\Rightarrow 5200 = 1600 + 775 + 55x$
$\Rightarrow 55x = 5200 - 1600 - 775$
$55x = 2825$

$$\therefore x = \frac{2825}{55} = 51.36 = 51.4\%$$

4. (1) Let the number of successful students = x
∴ Number of unsuccessful students = 120 – x
According to the question,
x × 39 + (120 – x) × 15
= 120 × 35
$\Rightarrow 39x - 15x + 1800 = 4200$
$\Rightarrow 24x = 4200 - 1800 = 2400$
$\Rightarrow x = 100$

5. (2) Total salary of 3 years
= ₹ (380 × 9 + 420 × 12 + 460 × 12 + 500 × 3)
= ₹ (3420 + 5040 + 5520 + 1500)
= ₹ 15480
Average monthly salary

$$= \frac{15480}{36} = ₹\,430$$

∴ Amount of pension

$$= \frac{430}{2} = ₹\,215$$

6. (2) Let the total number of workers be x.
Total salary of all the workers = 8000x
Total salary of 7 technicians = 7 × 12000
= ₹ 84000
Total salary of (x – 7) workers = (x – 7) 6000
∴ (x – 7) 6000 + 84000
= 8000 x
or 8000x – 6000 x
= 84000 – 42000
or 2000 x = 42000

$$\text{or } x = \frac{42000}{2000} = 21$$

7. (1) Total age of 15 students
= 15 × 15 = 225 years.
Total age of 5 students
= 5 × 14 = 70 years
Total age of other 9 students = 9 × 16 = 144 years
∴ The age of 15th student
= 225 – (70 + 144)
= 225 – 214 = 11 years.

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8. (3) Let the number of minors be x.
According to the question,

$$\frac{8\times15+x\times6}{8+x}=10.8$$

$\Rightarrow 120+6x=86.4+10.8x$
$\Rightarrow 10.8x-6x=120-86.4$
$\Rightarrow 4.8x=33.6$

$$\Rightarrow x=\frac{33.6}{4.8}=7$$

9. (3) Let the number of other workers be x.
$\therefore$ Number of agricultural workers $= 11x$
$\therefore$ Required average monthly income

$$=\frac{S\times11x+x\times T}{(11x+x)}$$

$$=₹\frac{11S+T}{12}$$

10. (2) Let the number of boys and girls in the class be x and y respectively.
$\therefore 60x+80y=68(x+y)$
$\Rightarrow 60x+80y=68x+68y$
$\Rightarrow 8x=12y$

$$\Rightarrow 2x=3y\Rightarrow y=\frac{2}{3}x$$

$\therefore$ Required percentage

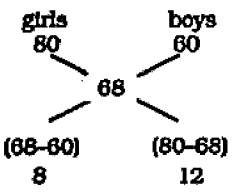
$$=\frac{x}{x+y}\times100$$

$$=\frac{x}{x+\frac{2}{3}x}\times100$$

$$=\frac{3x}{3x+2x}\times100$$

$$=\frac{3}{5}\times100=60\%$$

By Alligation method
Method 2 :
According to the question,



Ratio of girls to boys $= 8 : 12 = 2 : 3$
$\therefore$ Percentage of boys

$$=\frac{3}{5}\times100=60\%$$

11. (3) Let the number of workers be x.
According to the question,
$7\times10000+(x-7)7800=x\times8500$
$\Rightarrow 700+78x-78\times7=85x$
$\Rightarrow 85x-78x=700-546$
$\Rightarrow 7x=154$

$$\Rightarrow x=\frac{154}{7}=22$$

12. (1) $A+B+C=3\times80$
$= ₹240$
Then money spent
$= 240-180=60$
$\Rightarrow A+2A+3A=60$
$\Rightarrow 6A=60$
$\Rightarrow A=₹10$

13. (4) Let the number of boys in the class be $3x$. The ratio of boys and girls in the class is 3 : 1, then the number of girls in the class is x.
$\therefore$ Average score of the girls

$$=\frac{(3x+x)\times A-3x(A+1)}{x}$$

$$=\frac{4xA-3xA-3x}{x}$$

$$=\frac{xA-3x}{x}=\frac{x(A-3)}{x}=A-3$$

14. (3) Total number of 'm' numbers $= m\times n^2$
Total number of 'n' numbers $= n\times m^2$
$\therefore$ Average of $(m+n)$ numbers

$$=\frac{mn^2+m^2n}{m+n}=\frac{mn(n+m)}{m+n}=mn$$

15. (3) $x+y+z=3\times45=135$ ...(i)

$$x=\frac{y+z}{2}+9$$

$\Rightarrow 2x-y-z=18$ ...(ii)

and, $\frac{y+z}{2}=y+2$

$\Rightarrow y+z=2y+4$
$\Rightarrow z-y=7$ ...(iii)
By equations (i) + (ii),
$3x=135+18=153$
$\Rightarrow x=51$
By equations (i) and (iii),
$x+y+z+z-y=135+4=139$
$\Rightarrow x+2z=139$
$\Rightarrow 51+2z=139$
$\Rightarrow 2z=139-51=88$
$\therefore z=44$
$\therefore x-z=51-44=7$

16. (1) Annual expenditure of the man
$= ₹(5\times5000+7\times5400)$
$= ₹(25000+37800)$
$= ₹62800$
Annual savings $= ₹2300$
$\therefore$ Average monthly income

$$=₹\left(\frac{62800+2300}{12}\right)$$

$$=₹\left(\frac{65100}{12}\right)=₹5425$$

17. (2) Sum of the eight numbers
$= 20\times8=160$
Sum of the first two numbers $= 31$
Sum of the next three numbers

$$=\frac{64}{3}\times3=64$$

Let the sixth number $= x$
$\therefore$ Seventh number $= x+4$
and eighth number $= x+7$
$\therefore 31+64+x+x+4+x+7=160$
$\Rightarrow 3x+106=160$
$\Rightarrow 3x=160-106=54$

$$\Rightarrow x=\frac{54}{3}=18$$

$\therefore$ Eighth number
$= x+7=18+7=25$

18. (4) If average cost of 1 pen $= ₹x$, then
$30x+75\times2=510$
$\Rightarrow 30x=510-150=360$

$$\Rightarrow x=\frac{360}{30}=₹12$$

19. (3) If the number of students in section A be x and that in section B be y, then

$$74=\frac{77.5\times x+y\times70}{x+y}$$

$\Rightarrow 74x+74y=77.5x+70y$
$\Rightarrow 77.5x-74x=74y-70y$
$\Rightarrow 3.5x=4y$

$$\Rightarrow \frac{x}{y}=\frac{4}{3.5}=\frac{8}{7}$$

$\Rightarrow 8:7$

20. (2) Required average weight

$$=\frac{30\times16+20\times15.5}{50}$$

$$=\frac{480+310}{50}=\frac{790}{50}=15.8\text{ kg.}$$

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21. (2) Number of non-teaching staff = x

$\therefore 20 \times 12000 + x \times 5000 = (x+20) \times 10000$

$\Rightarrow 240000 + 5000x = (x+20) \times 10000$

$\Rightarrow 240 + 5x = (x+20) \times 10$

$\Rightarrow 10x - 5x = 240 - 200$

$\Rightarrow 5x = 40$

$\Rightarrow x = \frac{40}{5} = 8$

22. (4) C = 5 years 2 months

B = 8 years 6 months

A = 13 years 1 month

$\therefore$ Average

$= \frac{26 \text{ years } 9 \text{ months}}{3}$

$\left[\frac{26\frac{9}{12}}{3} = \frac{26 \text{ years } 9 \text{ months}}{3}\right]$

= 8 years 11 months

23. (3) $\frac{x + \frac{1}{x}}{2} = M$

$\Rightarrow x + \frac{1}{x} = 2M$

Required average

$= \frac{x^2 + \frac{1}{x^2}}{2} = \frac{\left(x + \frac{1}{x}\right)^2 - 2}{2}$

$= \frac{4M^2 - 2}{2} = 2M^2 - 1$

24. (3) Weight of first member = x kg

Weight of second member = $(x+2)$ kg

.....

Weight of fifth member = $(x+8)$ kg

$\therefore$ Difference = $x + 8 - x = 8$ kg

25. (3) Expenditure of 9th person = ₹ x

$\therefore x - \frac{x + 8 \times 30}{9} = 20$

$\therefore \frac{9x - x - 240}{9} = 20$

$\Rightarrow 8x - 240 = 180$

$\Rightarrow 8x = 240 + 180 = 420$

$\Rightarrow x = \frac{420}{8} = 52.5$

Total expenditure = 52.5 + 240 = ₹ 292.5

26. (3) Required average rate of reading

$= \frac{100 + 100}{\frac{100}{60} + \frac{100}{40}}$

$= \frac{200}{\frac{5}{3} + \frac{5}{2}} = \frac{200}{\frac{10+15}{6}}$

$= \frac{200 \times 6}{25} = 48$ pages/hour

27. (1) Let each exam be of 100 marks.

$\therefore$ Difference = 82 − 77 = 5

$\because 5 \equiv 100$ marks

$\therefore 25 \equiv 500$ marks

$\therefore$ Required marks

$= 500 \times \frac{80}{100} = 400$

28. (2) Sales tax on the article sold at ₹ 400

$= \frac{400 \times 7}{100} =$ ₹ 28

Sales tax on the article sold at ₹ 6400

$= \frac{6400 \times 9}{100} =$ ₹ 576

Total tax = 28 + 576 = ₹ 604

Percentage sales tax

$= \frac{604}{6800} \times 100$

$= \frac{151}{17} = 8\frac{15}{17}\%$

29. (1) Number of students in class A = x

Number of students in class B = y

$\therefore 25x + 40y = 30(x + y)$

$\Rightarrow 25x + 40y = 30x + 30y$

$\Rightarrow 30x - 25x = 40y - 30y$

$\Rightarrow 5x = 10y$

$\Rightarrow \frac{x}{y} = \frac{10}{5} = 2 : 1$

30. (2) Quantity of milk :

First year $\Rightarrow \frac{4080}{75}$

= 544 litres

Second year $\Rightarrow \frac{4080}{8}$

= 510 litres

Third year $\Rightarrow \frac{4080}{85}$

= 480 litres

$\therefore$ Required average

$= \frac{3 \times 4080}{544 + 510 + 480}$

$= \frac{12240}{1534} =$ ₹ 7.98 per litre

31. (3) Ratio of values

$= 15 \times 3 : 10 \times 2 : 5 \times 5$

$= 45 : 20 : 25$

$\therefore$ Required average cost

$= \frac{45 + 20 + 25}{10} = \frac{90}{10} =$ ₹ 9

32. (2) Average cost of 1 bag of rice

$= ₹ \left(\frac{7 \times 800 + 8 \times 1000 + 5 \times 1200}{7 + 8 + 5}\right)$

$= ₹ \left(\frac{5600 + 8000 + 6000}{20}\right)$

$= \frac{19600}{20} =$ ₹ 980

33. (3) Arithmetic mean

$= \frac{3^{30} + 3^{60} + 3^{90}}{3}$

$= 3^{29} + 3^{59} + 3^{89}$

34. (3) Let the amount spent by tenth person be Rs x.

According to the question,

$x - \frac{40 \times 9 + x}{10} = 9$

$\Rightarrow \frac{10x - 360 - x}{10} = 9$

$\Rightarrow 9x - 360 = 90$

$\Rightarrow 9x = 360 + 90 = 450$

$\Rightarrow x = \frac{450}{9} =$ Rs. 50

$\therefore$ Total expenditure = $40 \times 9 + x$

= 360 + 50 = Rs. 410

35. (2) Number of girls = $4x$

Number of boys = $5x$

$\therefore$ Required average marks

$= \frac{4x \times 85 + 5x \times 87}{4x + 5x}$

$= \frac{340 + 435}{9} = \frac{775}{9} = 86.1$

36. (3) Sales on Sunday

= Rs. (6 × 15640 − 5 × 14124)

= Rs. (93840 − 70620)

= Rs. 23220

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TEST YOURSELF

1. The average salary of 12 officers in a factory is Rs. 3950 per month and that of other employees of the factory is Rs. 1850 per month. If the average salary of all employees (including the officers) of the factory be Rs. 2150 per month, find the total number of employees in the factory.
(1) 80 (2) 85
(3) 84 (4) 86

2. In a class there are 40 boys and their average age is 16 years. One boy aged 17 years leaves the school and another joins, and their average age becomes 15.95 years. What is the age of the new boy ?
(1) 14 years (2) 15 years
(3) 16 years (4) 18 years

3. The average weight of 29 students is 40 kg. If the weight of teacher be included, the average weight is increased by 300 gms. The weight of the teacher is :
(1) 49 kg (2) 56 kg
(3) 58 kg (4) None of these

4. The difference between the ages of two sisters is half the difference between the ages of their parents. The elder sister is 18 years of age. Their father's age was 32 years when the younger sister was born who is now 15 years old. What is their mother's age?
(1) 40 (2) 41
(3) 42 (4) 43

5. The average of five results is 46 and that of first four is 45. Find the value of the fifth result.
(1) 50 (2) 60
(3) 45 (4) 40

6. Out of three numbers, the first is twice of the second and is half of the third. If the average of three numbers is 56, find the largest number.
(1) 50 (2) 48
(3) 96 (4) 75

7. The average of three numbers is 42. The first is twice the second and the second is twice the third. What is the difference between the largest and the smallest number?
(1) 50 (2) 46
(3) 48 (4) 54

8. The average age of three boys is 15 years. If their ages are in the ratio 3 : 5 : 7, what is the age of the youngest boy?
(1) 9 years
(2) 8 years
(3) 8 years 3 months
(4) None of these

9. a, b, c, d and e are five consecutive odd numbers. What is their average?
(1) $a + 2$ (2) $a + 4$
(3) $a + 3$ (4) $a + 1$

10. The average height of 30 girls out of a class of 40 is 160 cms and that of the remaining girls is 156 cms. What is the average height of the whole class?
(1) 155cm (2) 157 cm
(3) 159 cm (4) None of these

11. The average of 50 numbers is 38. If two numbers, namely 45 and 55 are discarded, what is the average of the remaining numbers?
(1) 38.5 (2) 36.5
(3) 35.5 (4) 37.5

12. The average of 25 results is 18; that of first twelve is 14 and of last twelve is 17. Find the thirteenth result.
(1) 68 (2) 78
(3) 79 (4) 87

13. The average of ten numbers is calculated as 15. It was discovered later on that while calculating the average one number namely 36 was wrongly read as 26. Find the correct average.
(1) 16 (2) 18
(3) 19 (4) 16.5

14. Out of four numbers, the average of first three is 15 and that of last three is 16. If the last number is 19, find the first number.
(1) 14 (2) 15
(3) 16 (4) 18

15. The average of 6 observations is 12. A new seventh observation is included and the new average is decreased by 1. Find the seventh observation.
(1) 5 (2) 7
(3) 8 (4) 9

16. The average of 8 numbers is 21, if each of the numbers is multiplied by 8, find the average of new set of numbers.
(1) 166 (2) 168
(3) 170 (4) 172

17. The average height of 40 students is 163 cm. On a particular day, three students namely A, B, C were absent and the average of the remaining 37 students was found to be 162 cm. If A and B have equal height and the height of C be 2 cm less than that of A, find the height of A.
(1) 170 cm (2) 172 cm
(3) 176 cm (4) 174 cm

18. The average age of a committee of eight members is 40 years. A member aged 55 years retired and his place was taken by another member aged 39 years. Find the average age of the present committee.
(1) 38 years (2) 36 years
(3) 39 years (4) 40 years

19. The average weight of 3 men A, B and C is 84 kg. Another man D joins the group and the average now becomes 80 kg. If another man E whose weight is 3 kg more than that of D, replaces A, then the average weight of B, C, D and E becomes 79 kg. Find the weight of A.
(1) 72 kg (2) 74 kg
(3) 75 kg (4) 76 kg

SHORT ANSWERS

1. (3)	2. (2)	3. (1)	4. (2)
5. (1)	6. (3)	7. (4)	8. (1)
9. (2)	10. (3)	11. (4)	12. (2)
13. (1)	14. (3)	15. (1)	16. (2)
17. (3)	18. (1)	19. (3)	

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EXPLANATIONS

1. (3) Let the number of employees other than officers be x.
∴ Total salary of officers
= Rs. (12 × 3950)
Total salary of other employees
= Rs. (x × 1850)
∴ $2150(x+12) = 12\times3950 + 1850x$
$\Rightarrow 2150x + 25800 = 47400 + 1850x$
$\Rightarrow 2150x - 850x = 47400 - 25800$
$\Rightarrow 300x = 21600$
$\therefore x = \frac{21600}{300} = 72$
∴ Total number of employees
$= x + 12 = 72 + 12 = 84$

2. (2) Total age of 40 boys initially = 16 × 40 = 640 years
Total age of 39 boys
= 640 − 17 = 623 years
New total age = 40 × 15.95
= 638 years
Age of new boy = 638 − 623
= 15 years

3. (1) Weight of teacher
$= \left(\frac{30\times300}{1000} + 40\right)$ kg
= 49 kg

4. (2) Father's present age
= 32 + 15 = 47 years
∴ $47 - x = 2(18 - 15) = 6$
$\Rightarrow x = 47 - 6 = 41$ years

5. (1) Sum total of five results
= 5 × 46 = 230
Sum total of first four results
= 4 × 45 = 180
So, fifth result = 230−180 = 50.

6. (3) Let the first number be x.
Second number $= \frac{x}{2}$
Third number = $2x$
Average $= \frac{x + \frac{x}{2} + 2x}{3} = \frac{7}{6}x$
Given : $\frac{7}{6}x = 56 \Rightarrow x = 48$
So, the three numbers are 48, 24 and 96.

7. (4) Let the third number be x
Second number = $2x$
First number = $4x$
Average $= \frac{x + 2x + 4x}{3} = \frac{7x}{3}$
Given : $\frac{7x}{3} = 42$
or $x = 18$
The smallest number is $x = 18$
The largest number $= 4x = 72$
Difference = 72 − 18 = 54.

8. (1) Let the age of three boys be $3x$, $5x$ and $7x$
Average age $= \frac{3x + 5x + 7x}{3} = 5x$
and , $5x = 15$
$x = 3$ years
The age of the youngest boy = $3x$
= 9 years.

9. (2) Each successive odd number exceeds its predecessor by 2.
$a + b + c + d + e = a + (a + 2) + (a + 4) + (a + 6) + (a + 8)$
$= 5a + 20 = 5(a + 4)$
Average $= \frac{5(a+4)}{5} = a + 4.$

10. (3) Total height of the whole class
= (30 × 160) + (40 − 30) × 156
= 6360 cms
Average height of the whole class
$= \frac{6360}{40} = 159$ cms.

11. (4) Sum total of 50 numbers = 38 × 50 = 1900
Sum total of remaining 48 numbers
= 1900 − (45 + 55) = 1800
and their average $= \frac{1800}{48} = 37.5.$

12. (2) Sum of 25 results
= Average × their number
= 18 × 25 = 450
Similarly,
Sum of 1st twelve results
= 12 × 14 = 168
and sum of last twelve results
= 12 × 17 = 204
∴ Thirteenth result
= 450 − 168 − 204 = 78

13. (1) Since 36 was misread as 26, i.e., 26 was counted while calculating average.
Incorrect average = 15
∴ Incorrect sum of ten numbers
= 10 × 15 = 150
∴ Correct sum total
= 150 + 36 − 26 = 160
∴ Correct average $= \frac{160}{10} = 16$

14. (3) Sum of all four numbers
= 3 × 15 + 19 = 64
Sum of last three numbers
= 3 × 16 = 48
So, first number = 64 − 48 = 16

15. (1) Seventh observation = Sum of 7 observations − Sum total of 6 observations
= (7 × 11) − (6 × 12) = 77 − 72 = 5

16. (2) Sum of eight numbers
= 8 × 21 = 168
Now, each of the numbers is multiplied by 8.
∴ Sum of new eight numbers
= 168 × 8 = 1344
∴ Average of new set of numbers
$= \frac{1344}{8} = 168$

17. (3) Let the height of A, B, C be x cm, x cm and $(x-2)$ cm respectively.
Now, sum of height of 40 students
= 163 × 40 = 6520 cm
Sum of height of 37 students excluding A, B and C
= 162 × 37 = 5994 cm.
∴ Sum of heights of A, B and C
= (6520 − 5994) = 526 cm
$\Rightarrow x + x + x - 2 = 526$
$\Rightarrow 3x = 526 + 2 = 528$
$\Rightarrow x = \frac{528}{3} = 176$ cm
∴ Height of A = 176 cm

18. (1) Sum of age of 8 members = 8 × 40 = 320 years
After a person of age 55 years retires,
Sum of ages of 7 persons
= 320 − 55 = 265 years
Sum of ages of 8 persons when a man of age 39 years joins it
= 265 + 39 = 304 years
∴ Required average $= \frac{304}{8}$
= 38 years

19. (3) Total weight of $(A + B + C)$
= 84 × 3 = 252 kg.
Total weight of $(A + B + C + D)$
= 4 × 80 = 320 kg.
∴ Weight of D = 320 − 252 = 68 kg.
∴ Weight of E = 68 + 3 = 71 kg.
∴ $(B + C + D + E)$'s weight
= 79 × 4 = 316 kg.
Now, $(A+B+C+D) - (B+C+D+E)$
= 320 − 316 = 4 kg.
$\Rightarrow A - E = 4$ kg
$\Rightarrow A = 4 + E = 4 + 71 = 75$ kg.
Hence, weight of A = 75 kg

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6 RATIO AND PROPORTION

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. If a : b = 7 : 9 and b : c =15 : 7, then what is a : c?
(1) 5 : 3 (2) 3 : 5
(3) 7 : 21 (4) 7 : 15
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If $x = \frac{1}{3}y$ and $y = \frac{1}{2}z$, then x : y : z, is equal to :
(1) 3 : 2 : 1 (2) 1 : 2 : 6
(3) 1 : 3 : 6 (4) 2 : 4 : 6
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If p : q = r : s = t : u = 2 : 3, then (mp + nr + ot) : (mq + ns + ou) is equal to :
(1) 1 : 3 (2) 1 : 2
(3) 2 : 3 (4) 3 : 2
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. If a : b = c : d = e : f = 1 : 2, then (pa + qc + re) : (pb + qd + rf) is equal to :
(1) p : (q + r) (2) (p + q) : r
(3) 2 : 3 (4) 1 : 2
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

5. If x : y = 3 : 1, then $x^3 - y^3 : x^3 + y^3$ = ?
(1) 13 : 14 (2) 14 : 13
(3) 10 : 11 (4) 11 : 10
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. The fourth proportional to 0.12, 0.21, 8 is :
(1) 8.9 (2) 56
(3) 14 (4) 17
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

7. The ratio $2^{1.5} : 2^{0.5}$ is the same as :
(1) 2 : 1 (2) 3 : 1
(3) 6 : 1 (4) 3 : 2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

8. If m : n = 3 : 2, then (4m + 5n) : (4m – 5n) is equal to :
(1) 4 : 9 (2) 9 : 4
(3) 11 : 1 (4) 9 : 1
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

9. If A : B = 3 : 4, B : C = 5 : 7 and C : D = 8 : 9 then A : D is equal to
(1) 3 : 7 (2) 7 : 3
(3) 21 : 10 (4) 10 : 21
(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (Middle Zone)

10. If $a : b = \frac{2}{9} : \frac{1}{3}$, $b : c = \frac{2}{7} : \frac{5}{14}$ and $d : c = \frac{7}{10} : \frac{3}{5}$ then a : b : c : d is
(1) 4 : 6 : 7 : 9
(2) 16 : 24 : 30 : 35
(3) 8 : 12 : 15 : 7
(4) 30 : 35 : 24 : 16
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

11. If b is the mean proportional of a and c, then $(a - b)^3 : (b - c)^3$ equals
(1) $a^3 : c^3$ (2) $b^2 : c^2$
(3) $a^2 : c^2$ (4) $a^3 : b^3$
(SSC CPO S.I. Exam. 05.09.2004)

12. ₹ 6200 divided into three parts proportional to $\frac{1}{2} : \frac{1}{3} : \frac{1}{5}$ are respectively
(1) ₹ 3000, ₹ 2000, ₹ 1200
(2) ₹ 3500, ₹ 1500, ₹ 1200
(3) ₹ 2500, ₹ 2000, ₹ 1700
(4) ₹ 2200, ₹ 3000, ₹ 1000
(SSC CPO S.I. Exam. 05.09.2004)

13. 94 is divided into two parts in such a way that the fifth part of the first and the eighth part of the second are in the ratio 3 : 4. The first part is :
(1) 30 (2) 36
(3) 40 (4) 28
(SSC CHSL DEO & LDC Exam, 21.10.2012 (IInd Sitting)

14. If a : b = 5 : 7 and c : d = 2a : 3b, then ac : bd is :
(1) 20 : 38 (2) 50 : 147
(3) 10 : 21 (4) 50 : 151
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

15. If x : y = 3 : 2, then the ratio $2x^2 + 3y^2 : 3x^2 - 2y^2$ is equal to :
(1) 12 : 5 (2) 6 : 5
(3) 30 : 19 (4) 5 : 3
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

16. If a : b = b : c, then $a^4 : b^4$ is equal to
(1) ac : b^2 (2) $a^2 : c^2$
(3) $c^2 : a^2$ (4) b^2 : ac
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

17. If $A : B = \frac{1}{2} : \frac{3}{8}$, $B : C = \frac{1}{3} : \frac{5}{9}$ and $C : D = \frac{5}{6} : \frac{3}{4}$, then the ratio A : B : C : D is
(1) 6 : 4 : 8 : 10
(2) 6 : 8 : 9 : 10
(3) 8 : 6 : 10 : 9
(4) 4 : 6 : 8 : 10
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

18. If A : B : C = 2 : 3 : 4, then ratio $\frac{A}{B} : \frac{B}{C} : \frac{C}{A}$ is equal to
(1) 8 : 9 : 16 (2) 8 : 9 : 12
(3) 8 : 9 : 24 (4) 4 : 9 : 16
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

19. If a : b = c : d = e : f = 1 : 2, then (3a + 5c +7e): (3b + 5d + 7f) is equal to
(1) 8 : 7 (2) 2 : 1
(3) 1 : 4 (4) 1 : 2
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

20. If a : (b+c) = 1 : 3 and c : (a+ b) = 5:7, then b : (a+c) is equal to
(1) 1 : 2 (2) 2 : 3
(3) 1 : 3 (4) 2 : 1
(SSC CPO S.I. Exam. 03.09.2006)

21. If p : q : r = 1 : 2 : 4, then $\sqrt{5p^2 + q^2 + r^2}$ is equal to
(1) 5 (2) 2q
(3) 5p (4) 4r
(SSC CPO S.I. Exam. 03.09.2006)

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22. The mean proportional between $(3+\sqrt{2})$ and $(12-\sqrt{32})$ is

(1) $\sqrt{7}$ (2) $2\sqrt{7}$

(3) 6 (4) $\frac{15-3\sqrt{2}}{2}$

(SSC CPO S.I. Exam. 03.09.2006)

23. If $x : y = 2 : 3$, then the value of $\frac{3x+2y}{9x+5y}$ is equal to

(1) $\frac{11}{4}$ (2) $\frac{4}{11}$

(3) $\frac{1}{2}$ (4) $\frac{5}{14}$

(SSC CPO S.I. Exam. 03.09.2006)

24. If a, b, c are three numbers such that $a : b = 3 : 4$ and $b : c = 8 : 9$, then $a : c$ is equal to

(1) 1 : 3 (2) 2 : 3

(3) 3 : 2 (4) 1 : 2

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

25. If $a : b : c = 2 : 3 : 4$ and $2a - 3b + 4c = 33$, then the value of c is

(1) 6 (2) 9

(3) 12 (4) $\frac{66}{7}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

26. If $a : b = c : d$, then $\frac{ma+nc}{mb+nd}$ is *not* equal to

(1) $\frac{a}{b}$ (2) $\frac{c}{d}$

(3) $\frac{a+c}{b+d}$ (4) $\frac{c-a}{b-d}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

27. The ratio of A to B is 4 : 5 and that of B to C is 2 : 3. If A equals 800, C equals

(1) 1000 (2) 1200

(3) 1500 (4) 2000

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

28. If $a : b : c = 7 : 3 : 5$, then $(a+b+c) : (2a+b-c)$ is equal to

(1) 1 : 2 (2) 2 : 3

(3) 3 : 4 (4) 5 : 4

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

29. If A : B = 2 : 3 and B : C = 4 : 5, then A : B : C is

(1) 2 : 3 : 5 (2) 5 : 4 : 6

(3) 6 : 4 : 5 (4) 8 : 12 : 15

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

30. If two times of A is equal to three times of B and also equal to four times of C, then A : B : C is

(1) 2 : 3 : 4 (2) 3 : 4 : 2

(3) 4 : 6 : 3 (4) 6 : 4 : 3

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

31. If A : B = 2 : 3, B : C = 2 : 4 and C : D = 2 : 5, then A : D is equal to :

(1) 2 : 15 (2) 2 : 5

(3) 1 : 5 (4) 3 : 5

(SSC CPO S.I. Exam. 16.12.2007)

32. If $a : b : c = 3 : 4 : 7$, then the ratio $(a+b+c) : c$ is equal to

(1) 2 : 1 (2) 14 : 3

(3) 7 : 2 (4) 1 : 2

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

33. If A and B are in the ratio 3 : 4, and B and C in the ratio 12 : 13, then A and C will be in the ratio

(1) 3 :13 (2) 9 : 13

(3) 36 :13 (4) 13 : 9

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

34. If A : B = 3 : 2 and B : C = 3 : 4 then A : C is equal to

(1) 1 : 2 (2) 2 : 1

(3) 8 : 9 (4) 9 : 8

(SSC CPO S.I. Exam. 09.11.2008)

35. If $x : y = 2 : 1$, then $(x^2 - y^2) : (x^2 + y^2)$ is

(1) 3 : 5 (2) 5 : 3

(3) 4 : 5 (4) 5 : 6

(SSC CPO S.I. Exam. 06.09.2009)

36. If ₹ 1000 is divided between A and B in the ratio 3 : 2, then A will receive

(1) ₹ 400 (2) ₹ 500

(3) ₹ 600 (4) ₹ 800

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

37. If $W_1 : W_2 = 2 : 3$ and $W_1 : W_3 = 1 : 2$ then $W_2 : W_3$ is

(1) 3 : 4 (2) 4 : 3

(3) 2 : 3 (4) 4 : 5

(SSC CGD Tier-I Exam. 16.05.2010 (Second Sitting)

38. If $3x = 5y = 4z$, then $x : y : z$ is equal to

(1) 9 : 12 : 16 (2) 20 : 12 : 15

(3) 15 : 10 : 9 (4) 8 : 5 : 3

(SSC SAS Exam. 26.06.2010 (Paper-1)

39. If A : B = 3 : 4 and B : C = 6 : 5, then A : (A + C) is equal to

(1) 9 : 10 (2) 10 : 9

(3) 9 : 19 (4) 19 : 9

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

40. If a and b are rational numbers and $a + b\sqrt{3} = \frac{1}{2-\sqrt{3}}$, then $a : b$ is equal to

(1) – 2 : 1 (2) 2 : 1

(3) $\sqrt{3}$: 1 (4) $-\sqrt{3}$: 1

(SSC (South Zone) Investigator Exam. 12.09.2010)

41. If A : B = 3 : 4 and B : C = 8 : 9, then A : B : C is

(1) 8 : 6 : 9 (2) 9 : 8 : 6

(3) 6 : 8 : 9 (4) 3 : 32 : 9

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

42. If 78 is divided into three parts which are in the ratio $1 : \frac{1}{3} : \frac{1}{6}$, the middle part is

(1) $9\frac{1}{3}$ (2) 13

(3) $17\frac{1}{3}$ (4) $18\frac{1}{3}$

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

43. If $x : y = 4 : 5$, then $(3x + y) : (5x + 3y) =$

(1) 3 : 5 (2) 5 : 3

(3) 17 : 35 (4) 35 : 17

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

44. If $x : y = 5 : 6$, then $(3x^2 - 2y^2) : (y^2 - x^2)$ is

(1) 7 : 6 (2) 11 : 3

(3) 3 : 11 (4) 6 : 7

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

45. If $x : y = 3 : 4$, then $4x + 5y : 5x - 2y =$

(1) 7 : 32 (2) 32 : 7

(3) 4 : 3 (4) 5 : 2

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

46. If A : B is 2 : 3, B : C is 6 : 11, then A : B : C is :

(1) 2 : 3 : 11 (2) 4 : 6 : 22

(3) 4 : 6 : 11 (4) 2 : 6 : 11

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

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47. If two-third of A is four-fifth of B, then A : B = ?
(1) 5 : 6 (2) 6 : 5
(3) 10 : 9 (4) 9 :10
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

48. If $\frac{2}{3}$ of A = 75% of B = 0.6 of C, then A : B : C is
(1) 2 : 3 : 3 (2) 3 : 4 : 5
(3) 4 : 5 : 6 (4) 9 : 8 : 10
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & SSC CISF ASI Exam. 29.08.2010)

49. ₹ 33,630 are divided among A, B and C in such a manner that the ratio of the amount of A to that of B is 3 : 7 and the ratio of the amount of B to that of C is 6 : 5. The amount of money received by B is
(1) ₹ 14,868 (2) ₹ 16,257
(3) ₹ 13,290 (4) ₹ 12,390
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

50. If A : B = 3 : 5 and B : C = 4 : 7, then A :B : C is
(1) 6 : 9 : 14 (2) 3 : 5 : 7
(3) 12 : 20 : 21 (4) 12 : 20 : 35
(SSC Data Entry Operator Exam. 31.08.2008)

51. If A = $\frac{4}{5}$ of B and B = $\frac{5}{2}$ of C, then the ratio of A : C is
(1) 1 : 2 (2) 2 : 1
(3) 2 : 3 (4) 1 : 3
(SSC Data Entry Operator Exam. 02.08.2009)

52. If A = $\frac{1}{4}$ B and B = $\frac{1}{2}$ C, then A : B : C is :
(1) 8 : 4 : 1 (2) 4 : 2 : 1
(3) 1 : 4 : 8 (4) 1 : 2 : 4
(SSC CHSL DEO & LDC Exam. 27.11.2010)

53. If 2A=3B = 4C, then A: B: C is :
(1) 2 : 3 : 4 (2) 4 : 3 : 2
(3) 6 : 4 : 3 (4) 3 : 4 : 6
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

54. The ratio $4^{3.5} : 2^5$ is the same as
(1) 4 : 1 (2) 2 : 1
(3) 1 : 2 (4) 1 : 4
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

55. If A : B = 1 : 2, B : C = 3 : 4 C : D = 6 : 9 and D : E = 12 : 16 then A : B : C : D : E is equal to
(1) 1 : 3 : 6 : 12 : 16
(2) 2 : 4 : 6 : 9 : 16
(3) 3 : 4 : 8 : 12 : 16
(4) 3 : 6 : 8 : 12 : 16
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

56. If $x : y = 2 : 5$, then $(5x + 3y) : (5x - 3y)$ is equal to
(1) 5 (2) 3
(3) –3 (4) –5
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

57. If $\frac{a}{b} = \frac{2}{3}$ and $\frac{b}{c} = \frac{4}{5}$, then $(a + b) : (b + c) = ?$
(1) 3 : 4 (3) 4 : 5
(2) 5 : 9 (4) 20 : 27
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

58. Marks of two candidates P and Q are in the ratio of 2 : 5. If the marks of P is 120, marks of Q will be
(1) 120 (2) 240
(3) 300 (4) 360
(SSC CISF Constable (GD) Exam. 05.06.2011)

59. If A : B = 4 : 9 and A : C = 2 : 3, then (A + B) : (A + C) is
(1) 15: 13 (2) 10 : 13
(3) 13: 1 0 (4) 13: 15
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

60. The third proportional to 0.8 and 0.2 is :
(1) 0.05 (2) 0.8
(3) 0.4 (4) 0.032
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

61. If $x : y = 3 : 4$, then the value of $\frac{5x - 2y}{7x + 2y} =$
(1) $\frac{7}{25}$ (2) $\frac{7}{23}$
(3) $\frac{7}{29}$ (4) $\frac{7}{17}$
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

62. There are three numbers A, B, C such that twice A is equal to thrice B and four times B is equal to five times C. Then the ratio between A and C is
(1) 3 : 4 (2) 8 : 15
(3) 15 : 8 (4) 4 : 3
(SSC CPO S.I. Exam. 06.09.2009)

63. On mixing two classes A and B of students having average marks 25 and 40 respectively, the overall average obtained is 30. Find the ratio of the students in the class A and B.
(1) 2 : 1 (2) 5 :8
(3) 5 : 6 (4) 3 : 4
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

64. A fruit seller sold big, medium and small sized apples for ₹ 15, ₹ 10 and ₹ 5 respectively. The total number of apples sold were in the ratio 3 : 2 : 5. Find the average cost of an apple.
(1) ₹ 8 (2) ₹ 10
(3) ₹ 9 (4) ₹ 7
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

65. In a school, the ratio of boys to girls is 4 : 3 and the ratio of girls to teachers is 8 : 1. The ratio of students to teachers is :
(1) 56 : 3 (2) 55 : 1
(3) 49 : 3 (4) 56 : 1
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

66. If $\frac{3x+5}{5x-2} = \frac{2}{3}$, then the value of x is
(1) 11 (2) 19
(3) 23 (4) 7
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

67. A, B and C are batsmen. The ratio of the runs scored by them in a certain match are given below :
A : B = 5 : 3 and B : C = 4 : 5. In all they scored 564 runs. The number of runs scored by B is:
(1) 124 (2) 104
(3) 114 (4) 144
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

68. If $(a + b) : (b + c) : (c + a) = 6 : 7 : 8$ and $(a + b + c) = 14$, then the value of c is
(1) 6 (2) 7
(3) 8 (4) 14
(SSC CHSL DEO & LDC Exam 27.10.2013 IInd Sitting

69. If 5.5 of a = 0.65 of b, then a b is equal to :
(1) 13 : 11 (2) 11 : 13
(3) 13 : 110 (4) 110 : 13
(SSC Multi-Tasking Sta Exam. 10.03.201

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70. The ratio of boys and girls in a college is 5 : 3. If 50 boys leave the college and 50 girls join the college, the ratio becomes 9 : 7. The number of boys in the college is
(1) 300 (2) 400
(3) 500 (4) 600
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

71. A person distributes his pens among four friends A, B, C, D in the ratio $\frac{1}{3}:\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$. What is the minimum number of pens that the person should have?
(1) 57 (2) 65
(3) 75 (4) 45
(SSC Graduate Level Tier-I Exam. 21.04.2013)

72. If A = $\frac{2}{3}$ of B and B = $\frac{4}{5}$ of C, then A : B : C is.
(1) 12 : 8 : 10 (2) 15 : 10 : 8
(3) 10 : 15 : 12 (4) 8 : 12 : 15
(SSC Constable (GD) Exam. 12.05.2013)

73. The ratio of $25^{2.5} : 5^3$ is same as
(1) 5 : 3 (2) 5 : 6
(3) 1 : 25 (4) 25 : 1
(SSC Graduate Level Tier-I Exam. 19.05.2013)

74. The third proportional of 12 and 18 is
(1) 3 (2) 6
(3) 27 (4) 144
(SSC Graduate Level Tier-II Exam. 29.09.2013

75. If x runs are scored by A, y runs by B and z runs by C, then $x : y = y : z = 3 : 2$. If total number of runs scored by A, B and C is 342, the runs scored by each would be respectively
(1) 144, 96, 64 (2) 162, 108, 72
(3) 180, 120, 80 (4) 189, 126, 84
(SSC Graduate Level Tier-II Exam. 29.09.2013)

76. If A : B = 3 : 4 and B : C = 6 : 5, then C : A is
(1) 10 : 9 (2) 9 : 10
(3) 8 : 9 (4) 9 : 8
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

77. Find two mean proportionals between 2 and 54.
(1) 6 and 18 (2) 6 and 12
(3) 12 and 18 (4) 6 and 9
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

78. Which of the following represents a correct proportion ?
(1) 12 : 9 = 16 : 12
(2) 13 : 11 = 5 : 4
(3) 30 : 45 = 13 : 24
(4) 3 : 5 = 2 : 5
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

79. If 18, x and 50 are in continued proportion, then the value of x is
(1) 30 (2) 3
(3) 5 (4) 32
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

80. If A : B = 7 : 9 and B : C = 3 : 5, then A : B : C is equal to
(1) 7 : 9 : 5 (2) 21 : 35 : 45
(3) 7 : 9 : 15 (4) 7 : 3 : 15
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

81. If $x : y = 5 : 2$, then
(1) 22 : 29 (2) 26 : 61
(3) 29 : 22 (4) 61 : 26
(SSC CHSL DEO & LDC Exam. 9.11.2014)

82. The ratio of the length of a school ground to its width is 5 : 2. If the width is 40 m, then the length is
(1) 200 m (2) 100 m
(3) 50 m (4) 80 m
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

83. If $x : y :: 2 : 3$ and $2 : x :: 4 : 8$ the value of y is
(1) 6 (2) 8
(3) 4 (4) 12
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

84. If $(a+b) : \sqrt{ab} = 4 : 1$, where $a > b > 0$, then $a : b$ is
(1) $(2+\sqrt{3}) : (2-\sqrt{3})$
(2) $(2-\sqrt{3}) : (2+\sqrt{3})$
(3) $(3+\sqrt{2}) : (3-\sqrt{2})$
(4) $(3-\sqrt{2}) : (3+\sqrt{2})$
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

85. 12 monkeys can eat 12 bananas in 12 minutes. In how many minutes can 4 monkeys eat 4 bananas ?
(1) 10 (2) 12
(3) 4 (4) 8
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 21.06.2015 (Ist Sitting) TF No. 8037731)

86. What must be added to each term of the ratio 2 : 5 so that it may equal to 5 : 6 ?
(1) 65 (2) 78
(3) 13 (4) 12
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

87. If A : B = 2 : 3 and B : C = 3 : 7, then A + B : B + C : C + A is
(1) 4 : 8 : 9 (2) 5 : 8 : 9
(3) 5 : 10 : 9 (4) 4 : 10 : 9
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

88. If $(x^3 - y^3) : (x^2 + xy + y^2) = 5 : 1$ and $(x^2 - y^2) : (x - y) = 7 : 1$, then the ratio $2x : 3y$ equals
(1) 4 : 1 (2) 2 : 3
(3) 4 : 3 (4) 3 : 2
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

89. If A : B = 2 : 1 and A : C = 1 : 3, then A : B : C is
(1) 1 : 3 : 2 (2) 1 : 2 : 6
(3) 3 : 2 : 1 (4) 2 : 1 : 6
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

90. The mean proportion of 1.21 and 0.09 is
(1) 3.3 (2) 0.33
(3) 3.03 (4) 0.033
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

TYPE–II

1. To get the ratio $p : q$ (for $p \neq q$), one has to add a number to each term of the ratio $x : y$, the number is
(1) $\frac{px+qy}{p-q}$ (2) $\frac{qx-py}{p-q}$
(3) $\frac{px-qy}{p-q}$ (4) $\frac{py-qx}{p-q}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

2. If $x : y = 3 : 4$, then the value of $(4x - y) : (2x + 3y)$ is
(1) 4 : 9 (2) 8 : 9
(3) 4 : 3 (4) 8 : 3
(SSC CHSL DEO & LDC Exam, 11.12.2011 (Ist Sitting (East Zone)

3. If $x : y = 3 : 4$ and $y : z = 3 : 4$, then $\frac{x+y+z}{3z}$ is equal to
(1) $\frac{13}{27}$ (2) $\frac{1}{2}$
(3) $\frac{73}{84}$ (4) $\frac{37}{48}$
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

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4. If A : B = $\frac{1}{2}$: $\frac{1}{3}$, B : C = $\frac{1}{5}$: $\frac{1}{3}$, then (A + B) : (B + C) is equal to
(1) 5 : 8 (2) 9 : 10
(3) 15 : 16 (4) 6 : 15
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

5. If $\frac{x}{y} = \frac{3}{4}$, the ratio of $(2x + 3y)$ and $(3y - 2x)$ is
(1) 2 : 1 (2) 3 : 2
(3) 1 : 1 (4) 3 : 1
(SSC CGL Tier-I Exam. 09.06.2015 (IInd Sitting) TF No. 4239378)

TYPE–III

1. There is a ratio of 5 : 4 between two numbers. If 40 per cent of the first is 12, then 50% of the second number is
(1) 12 (2) 24
(3) 18 (4) 20
(SSC Graduate Level Tier-II Exam.16.09.2012)

2. A milkman makes 20% profit by selling milk mixed with water at ₹ 9 per litre. If the cost price of 1 litre pure milk is ₹ 10, then the ratio of milk and water in the mixture is
(1) 3 : 1 (2) 4 : 1
(3) 3 : 2 (4) 4 : 3
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

3. A man ordered 4 pairs of black socks and some pairs of brown socks. The price of a black socks is double that of a brown pair. While preparing the bill the clerk interchanged the number of black and brown pairs by mistake which increased the bill by 50%. The ratio of the number of black and brown pairs of socks in the original order was :
(1) 2 : 1 (2) 1 : 4
(3) 1 : 2 (4) 4 : 1
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

TYPE–IV

1. The ratio of ages of two students is 3 : 2. One is older to the other by 5 years. What is the age of the younger student ?
(2) 2 years (2) 10 years
(3) $2\frac{1}{2}$ years (4) 15 years
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

2. The ratio of present age of two brothers is 1 : 2 and 5 years back, the ratio was 1 : 3. What will be the ratio of their age after 5 years ?
(1) 1 : 4 (2) 2 : 3
(3) 3 : 5 (4) 5 : 6
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

3. The sum of the age of a father and his son is 100 years now. 5 years ago their age were in the ratio of 2 : 1. The ratio of the age of father and son after 10 years will be
(1) 5 : 3 (2) 4 : 3
(3) 10 : 7 (4) 3 : 5
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

4. Four years ago, the ratio of A's age to B's age was 11 : 14 and four years later their age will be in the ratio 13 : 16. The present age of A is
(1) 48 years (2) 26 years
(3) 44 years (4) 28 years
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. At present, the ratio of the age of Maya and Chhaya is 6 : 5 and fifteen years from now, the ratio will get changed to 9 : 8. Maya's present age is
(1) 21 years (2) 24 years
(3) 30 years (4) 40 years
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

6. The ratio of the age of Ram and Rahim 10 years ago was 1 : 3. The ratio of their age five years hence will be 2 : 3. Then the ratio of their present age is
(1) 1 : 2 (2) 3 : 5
(3) 3 : 4 (4) 2 : 5
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

7. The ratio of the age of a father to that of his son is 5: 2. If the product of their ages in years is 1000, then the father's age (in years) after 10 years will be :
(1) 50 (2) 60
(3) 80 (4) 100
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

8. The ratio between Sumit's and Prakash's age at present is 2 : 3. Sumit is 6 years younger than Prakash. The ratio of Sumit's age to Prakash's age after 6 years will be
(1) 2 : 3 (2) 1 : 2
(3) 4 : 3 (4) 3 : 4
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

9. Harsha is 40 years old and Ritu is 60 years old. How many years ago was the ratio of their ages 3 : 5 ?
(1) 10 years (2) 20 years
(3) 37 years (4) 5 years
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

10. The ratio of present age of two brothers is 1 : 2 and 5 years back the ratio was 1 : 3. What will be the ratio of their age after 5 years ?
(1) 1 : 4 (2) 2 : 3
(3) 3 : 5 (4) 5 : 6
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

11. Four years ago, the ratio of the age of A and B was 2 : 3 and after four years it will become 5 : 7. Find their present age.
(1) 36 years and 40 years
(2) 32 years and 48 years
(3) 40 years and 56 years
(4) 36 years and 52 years
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

12. The average age of boys in the class is twice the number of girls in the class. The ratio of boys and girls in the class of 50 is 4 : 1. The total of the ages (in years) of the boys in the class is
(1) 2000 (2) 2500
(3) 800 (4) 400
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

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13. The ratio of age of two boys is 5 : 6. After two years the ratio will be 7 : 8. The ratio of their age after 12 years will be

(1) $\frac{22}{24}$ (2) $\frac{15}{16}$

(3) $\frac{17}{18}$ (4) $\frac{11}{12}$

(SSC CPO S.I. Exam. 07.09.2003 & SSC CHSL DEO & LDC Exam. 20.10.2013)

14. The ratio of the present age of Puneet and Appu is 2 : 3. After 3 years the ratio of their age will be 3 : 4. The present age of Puneet is :

(1) 3 years (2) 6 years
(3) 9 years (4) 4 years

(SSC CPO S.I. Exam. 26.05.2005)

15. The ratio of the ages of a father and his son 10 years hence will be 5 : 3, while 10 years ago, it was 3:1. The ratio of the age of the son to that of the father today, is

(1) 1 : 2 (2) 1 : 3
(3) 2 : 3 (4) 2 : 5

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

16. The ratio of the present age of Rahul and Rashmi is 2 : 1. The ratio of their age after 30 years will be 7 : 6. What is the present age of Rahul ?

(1) 6 years (2) 10 years
(3) 12 years (4) 20 years

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

17. The present age of A and B are in the ratio 4 : 5 and after 5 years they will be in the ratio 5 : 6. The present age of A is

(1) 10 years (2) 20 years
(3) 25 years (4) 40 years

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

18. The present age of two persons are 36 and 50 years respectively. If after n years the ratio of their age will be 3 : 4, then the value of n is

(1) 4 (2) 7
(3) 6 (4) 3

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

19. The ratio between Sumit's and Prakash's age at present is 2 : 3. Sumit is 6 years younger than Prakash. The ratio of Sumit's age to Prakash's age after 6 years will be

(1) 2 : 3 (2) 1 : 2
(3) 4 : 3 (4) 3 : 4

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

20. The ratio of the ages of two persons is 4 : 7 and the age of one of them is greater than that of the other by 30 years. The sum of their ages (in years) is

(1) 110 (2) 100
(3) 70 (4) 40k

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

21. My grandfather was 9 times older than me 16 years ago. He will be 3 times of my age 8 years from now. Eight years ago, the ratio of my age to that of my grandfather was

(1) 3 : 8 (2) 2 : 5
(3) 1 : 2 (4) 1 : 5

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting) & SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

22. The ratio of the ages of A and B at present is 3:1. Four years earlier the ratio was 4:1. The present age of A is

(1) 48 years (2) 40 years
(3) 36 years (4) 32 years

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

23. Eighteen years ago, the ratio of A's age to B's age was 8 : 13. Their present ratios are 5 : 7. What is the present age of A ?

(1) 60 years (2) 70 years
(3) 50 years (4) 40 years

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

24. The ratio of ages of two persons is 5 : 9 and the age of one of them is greater than the other by 40 years. The sum of their ages in year is

(1) 180 (2) 140
(3) 150 (4) 160

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

25. The current ages of Sonali and Monali are in the ratio 5 : 3. Five years from now, their ages will be in the ratio 10 : 7. Then, Monali's current age is :

(1) 5 years (2) 3 years
(3) 9 years (4) 15 years

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–V

1. The ratio of two numbers is 3 : 8 and their difference is 115. The smaller of the two numbers is :

(1) 184 (2) 194
(3) 69 (4) 59

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. Four numbers are in the ratio 1 : 2 : 3 : 4. Their sum is 16. The sum of the first and fourth number is equal to :

(1) 5 (2) 8
(3) 10 (4) 80

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The sum of two numbers is 40 and their difference is 4. The ratio of the numbers is :

(1) 21 : 19 (2) 22 : 9
(3) 11 : 9 (4) 11 : 18

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. The ratio of two numbers is 10 : 7 and their difference is 105. The sum of these numbers is

(1) 595 (2) 805
(3) 1190 (4) 1610

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. The product of two positive integers is 1575 and their ratio is 9 : 7. The smaller integer is

(1) 25 (2) 35
(3) 45 (4) 70

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. Three numbers are in the ratio of 3 : 2 : 5 and the sum of their squares is 1862. The smallest of these numbers is

(1) 24 (2) 21
(3) 14 (3) 35

(SSC CPO S.I. Exam. 12.01.2003

7. The sum of three numbers is 116. The ratio of second to the third is 9 : 16 and the first to the third is 1 : 4. The second number is

(1) 30 (2) 32
(3) 34 (4) 36

(SSC CPO S.I. Exam. 07.09.2003)

8. The sum of three numbers is 98. If the ratio of the first to the second is 2 : 3 and that of the second to the third is 5 : 8, then the second number is

(1) 49 (2) 48
(3) 30 (4) 20

(SSC CPO S.I. Exam. 07.09.2003)

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9. In a 45 litres mixture of milk and water, the ratio of the milk to water is 2 : 1. When some quantity of water is added to the mixture, this ratio becomes 1 : 2. The quantity of water added is
(1) 10 litres (2) 21 litres
(3) 35 litres (4) 45 litres
(SSC CPO S.I. Exam. 05.09.2004)

10. Of the three numbers, the ratio of the first and the second is 8 : 9 and that of the second and third is 3 : 4. If the product of the first and third number is 2400, then the second number is :
(1) 45 (2) 40
(3) 30 (4) 55
(SSC CPO S.I. Exam. 26.05.2005)

11. Two numbers are in the ratio 2 : 3. If 2 is subtracted from the first and 2 is added to the second, the ratio becomes 1 : 2. The sum of the numbers is :
(1) 30 (2) 28
(3) 24 (4) 10
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

12. Three numbers are in the ratio $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$. The difference between the greatest and the smallest number is 36. The numbers are
(1) 72, 84, 108 (2) 60, 72, 96
(3) 72, 84, 96 (4) 72, 96, 108
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

13. The sum of three numbers is 68. If the ratio of the first to the second be 2 : 3 and that of the second to the third be 5 : 3, then the second number is
(1) 30 (2) 58
(3) 20 (4) 48
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

14. When a particular number is subtracted from each of 7, 9, 11 and 15, the resulting numbers are in proportion. The number to be subtracted is :
(1) 1 (2) 2
(3) 3 (4) 5
(SSC CPO S.I. Exam. 16.12.2007)

15. The two numbers are in the ratio 2 : 3 and their product is 96. The sum of the numbers is
(1) 5 (2) 20
(3) 101 (4) 102
(SSC CPO S.I. Exam. 06.09.2009)

16. The ratio between two numbers is 3 : 4. If each number is increased by 6, the ratio becomes 4 : 5. The difference between the numbers is
(1) 1 (2) 3
(3) 6 (4) 8
(SSC CPO S.I. Exam. 06.09.2009)

17. Two numbers are in the ratio 5 : 7. On diminishing each of them by 40, they become in the ratio 17 : 27. The difference of the numbers is :
(1) 18 (2) 52
(3) 137 (4) 50
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

18. Three numbers are in the ratio 5 : 6 : 7. If the product of the numbers is 5670, then the greatest number is
(1) 15 (2) 18
(3) 21 (4) 28
(SSC CPO S.I. Exam. 06.09.2009)

19. Two numbers are in the ratio 1 : 3. If their sum is 240, then their difference is
(1) 120 (2) 108
(3) 100 (4) 96
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

20. If the sum of two quantities is equal to three times their difference, then the ratio of the two quantities is
(1) 1 : 3 (2) 3 : 1
(3) 2 : 1 (4) 2 : 3
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. Three numbers are in the ratio 3 : 4 : 5. The sum of the largest and the smallest equals the sum of the second and 52. The smallest number is
(1) 20 (2) 27
(3) 39 (4) 52
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

22. Which number when added to each of the numbers 6, 7, 15, 17 will make the resulting numbers proportional ?
(1) 6 (2) 5
(3) 4 (4) 3
(SSC Data Entry Operator Exam. 02.08.2009)

23. What number should be added to each of 6, 14, 18 and 38 so that the resulting numbers make a proportion ?
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 27.11.2010)

24. Of three positive numbers, the ratio of 1st and 2nd is 8 : 9, that of 2nd and 3rd is 3:4. The product of 1st and 3rd is 2400. The sum of the three numbers is
(1) 145 (2) 185
(3) 295 (4) 155
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

25. The ratio between a two – digit number and the sum of the digits of that number is 4 : 1. If the digit at the unit's place is 3 more than the digit at the ten's place, then the number is
(1) 47 (2) 69
(3) 36 (4) 25
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

26. The ratio of number of balls in bags x, y is 2 : 3. Five balls are taken from bag y and are dropped in bag x. Number of balls are equal in each bag now. Number of balls in each bag now is
(1) 45 (2) 20
(3) 30 (4) 25
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

27. If the square of the sum of two numbers is equal to 4 times of their product, then the ratio of these numbers is :
(1) 2 : 1 (2) 1 : 3
(3) 1 : 1 (4) 1 : 2
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

28. Three numbers are in the ratio 2 : 3 : 4. If the sum of their squares is 1856, then the numbers are
(1) 8, 12 and 16
(2) 16, 24 and 32
(3) 12, 18 and 24
(4) None of the above
(SSC Graduate Level Tier-II Exam. 29.09.2013)

29. The number to be added to each of the numbers 7, 16, 43, 79 to make the numbers in proportion is
(1) 2 (2) 3
(3) 5 (4) 1
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

30. The average of two numbers is 62. If 2 is added to the smallest number, the ratio between the numbers becomes 1 : 2. The difference of the numbers is
(1) 62 (2) 40
(3) 84 (4) 44
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

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31. What number should be subtracted from both terms of the ratio 15 : 19 in order to make it 3 : 4 ?
(1) 9 (2) 6
(3) 5 (4) 3
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

32. The sum of two numbers is equal to 20 and their difference is 25. The ratio of the two numbers is
(1) 9 : 1 (2) 7 : 9
(3) 3 : 5 (4) 2 : 7
(SSC CGL Tier-II Exam. 21.09.2014)

33. Two numbers are in the ratio of 2 : 3. If their sum is 125, find the numbers.
(1) 50, 75 (2) 24, 36
(3) 20, 30 (4) 32, 78
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

34. The ratio of three positive numbers is 2 : 3 : 5 and the sum of their squares is 608. The three numbers are
(1) 2, 3, 5 (2) 10, 15, 25
(3) 8, 12, 20 (4) 4, 6, 10
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

35. If the product of two positive numbers is 1575 and their ratio is 7 : 9, then the greater number is
(1) 45 (2) 35
(3) 135 (4) 63
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

36. If A and B are in the ratio 4 : 5 and the difference of their squares is 81, what is the value of A ?
(1) 45 (2) 12
(3) 36 (4) 15
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

37. If two numbers are in the ratio 2 : 3 and the ratio becomes 3 : 4 when 8 is added to both the numbers, then the sum of the two numbers is
(1) 10 (2) 80
(3) 40 (4) 100
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

38. Two numbers are in ratio 5 : 8. If their difference is 48, then the smaller number is
(1) 80 (2) 96
(3) 128 (4) 64
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–VI

1. Two numbers are in the ratio 4 : 5 and their L.C.M. is 180. The smaller number is
(1) 9 (2) 15
(3) 36 (4) 45
(SSC CPO S.I. Exam. 16.12.2007)

2. Two numbers are in the ratio 3 : 4 and their LCM is 180. The first number is
(1) 15 (2) 60
(3) 36 (4) 45
(SSC SAS Exam. 26.06.2010 (Paper-1)

3. Two numbers are in the ratio 3 : 5 and their LCM is 225. The smaller number is
(1) 45 (2) 60
(3) 75 (4) 90
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

4. The ratio of two numbers is 3 : 4 and their LCM is 48. The sum of the two numbers is :
(1) 32 (2) 28
(3) 26 (4) 24
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

5. The ratio of two numbers is 3 : 4 and their LCM is 120. The sum of numbers is
(1) 105 (2) 140
(3) 70 (4) 35
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

6. The ratio of two numbers is 3 : 4 and their HCF is 15. Then the sum of the two numbers is :
(1) 105 (2) 115
(3) 120 (4) 110
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE–VII

1. A and B have money in the ratio 2 : 1. If A gives ₹ 2 to B, the money will be in the ratio 1 : 1. What were the initial amounts they had?
(1) ₹ 12 and ₹ 6
(2) ₹ 16 and ₹ 8
(3) ₹ 8 and ₹ 4
(4) ₹ 6 and ₹ 3
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The ratio of the number of boys and girls of a school with 504 students is 13 : 11. What will be the new ratio if 12 more girls are admitted?
(1) 91 : 81 (2) 81 : 91
(3) 9 : 10 (4) 10 : 9
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. Two numbers are in the ratio $1\frac{1}{2} : 2\frac{2}{3}$. When each of these is increased by 15, they become in the ratio $1\frac{2}{3} : 2\frac{1}{2}$. The greater of the numbers is :
(1) 27 (2) 36
(3) 48 (4) 64
(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (IInd Sitting)

4. The students in three classes are in the ratio 2 : 3 : 5. If 40 students are increased in each class, the ratio changes to 4 : 5 : 7. Originally, the total number of students was :
(1) 100 (2) 180
(3) 200 (4) 400
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. Two numbers are in the ratio 5 : 7. If 9 is subtracted from each of them, their ratio becomes 7 : 11. The difference of the numbers is
(1) 6 (2) 12
(3) 15 (4) 18
(SSC CPO S.I. Exam. 12.01.2003

6. Two numbers are in the ratio 3 : 5. If 9 is subtracted from each, then they are in the ratio 12 : 23. Find the smaller number.
(1) 27 (2) 33
(3) 49 (4) 55
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

7. The ratio of number of boys to that of girls in a group becomes 2:1 when 15 girls leave. But, afterwards, when 45 boys also leave, the ratio becomes 1 : 5. Originally the number of girls in the group was
(1) 20 (2) 30
(3) 40 (4) 50
(SSC CPO S.I. Exam. 05.09.2004)

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8. The students in three classes are in the ratio 2 : 3 : 5. If 20 students are increased in each class, the ratio changes to 4 : 5 : 7. Originally the total number of students was :
(1) 50 (2) 90
(3) 100 (4) 150
(SSC CGL Prelim Exam. 24.02.2002, 13.11.2005 (Ist Sitting) & 04.02.2007 (IInd sitting), & SSC CHSL DEO & LDC Exam. 28.10.2012)

9. The ratio of the number of boys and that of girls in a school having 504 students is 13 :11. What will be the new ratio if 3 more girls are admitted?
(1) 7 : 6 (2) 6 : 7
(3) 10 :11 (4) 13 :14
(SSC CPO S.I. Exam. 03.09.2006)

10. The ratio of the number of ladies to that of gents at a party was 3 : 2. When 20 more gents joined the party, the ratio was reversed. The number of ladies present at the party was
(1) 36 (2) 32
(3) 24 (4) 16
(SSC CPO S.I. Exam. 03.09.2006)

11. In a school having roll strength 286, the ratio of boys and girls is 8 : 5. If 22 more girls get admitted into the school, the ratio of boys and girls becomes
(1) 12 : 7 (2) 10 : 7
(3) 8 : 7 (4) 4 : 3
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

12. The number of students in three classes are in the ratio 2 : 3 : 4. If 12 students are increased in each class, this ratio changes to 8 : 11 :14. The total number of students in the three classes at the beginning was
(1) 162 (2) 108
(3) 96 (4) 54
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

13. What must be added to each term of the ratio 7 : 11, so as to make it equal to 3 : 4 ?
(1) 8 (2) 7.5
(3) 6.5 (4) 5
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

14. Two numbers are in the ratio 7 : 11. If 7 is added to each of the numbers, the ratio becomes 2 : 3. The smaller number is
(1) 39 (2) 49
(3) 66 (4) 77
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

15. Two numbers are in the ratio 3 : 5. If each number is increased by 10, the ratio becomes 5 :7. The smaller number is
(1) 9 (2) 12
(3) 15 (4) 25
(SSC (South Zone) Investigator Exam. 12.09.2010)

16. The ratio between two numbers is 2 : 3. If each number is increased by 4, the ratio between them becomes 5 : 7. The difference between the numbers is
(1) 8 (2) 6
(3) 4 (4) 2
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

17. What number should be added to or subtracted from each term of the ratio 17 : 24 so that it becomes equal to 1 : 2 ?
(1) 5 is subtracted
(2) 10 is added
(3) 7 is added
(4) 10 is subtracted
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

18. Two numbers are such that the ratio between them is 4 : 7. If each is increased by 4, the ratio becomes 3 : 5. The larger number is
(1) 36 (2) 48
(3) 56 (4) 64
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

19. The students in three classes are in the ratio 4 : 6 : 9. If 12 students are increased in each class, the ratio changes to 7 : 9 : 12. Then the total number of students in the three classes before the increase is
(1) 95 (2) 76
(3) 100 (4) 114
(SSC Graduate Level Tier-II Exam.16.09.2012)

20. The total number of students in a school was 660. The ratio between boys and girls was 13 : 9. After some days, 30 girls joined the school and some boys left the school and new ratio between boys and girls became 6 : 5. The number of boys who left the school is :
(1) 50 (2) 40
(3) 30 (4) 60
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

21. If there is a reduction in the number of workers in a factory in the ratio 15 : 11 and an increment in their wage in the ratio 22 : 25, then the ratio by which the total wage of the workers should be decreased is
(1) 6 : 5 (2) 5 : 6
(3) 3 : 7 (4) 3 :5
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

22. Two numbers are in the ratio of 3 : 5. If 9 be subtracted from each, then they are in the ratio of 12 : 23. Find the numbers.
(1) 15, 28 (2) 36, 115
(3) 33, 55 (4) 60, 69
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

23. Three numbers are in the ratio 1 : 2 : 3. By adding 5 to each of them, the new numbers are in the ratio 2 : 3 : 4. The numbers are:
(1) 10, 20, 30 (2) 15, 30, 45
(3) 1, 2, 3 (4) 5, 10, 15
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

24. Ram got twice as many marks in English as in Science. His total marks in English, Science and Maths are 180. If the ratio of his marks in English and Maths is 2 : 3, what is his marks in Science ?
(1) 30 (2) 60
(3) 72 (4) 90
(SSC Graduate Level Tier-II Exam. 29.09.2013)

25. What number should be subtracted from both the terms of the ratio 11 : 15 so as to make it as 2 : 3 ?
(1) 2 (2) 3
(3) 4 (4) 5
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

26. Two numbers are in the ratio of 3 : 5. If 9 is subtracted from each then they are in the ratio 12 : 23. The smaller number is
(1) 55 (2) 33
(3) 28 (4) 36
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

27. The average of 11 numbers is 36, whereas average of 9 of them is 34. If the remaining two numbers are in the ratio of 2 : 3, find the value of the smaller number (between remaining two numbers).
(1) 45 (2) 48
(3) 54 (4) 36
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

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TYPE–VIII

1. Zinc and copper are in the ratio of 5 : 3 in 200 gm of an alloy. How much grams of copper be added to make the ratio as 3 : 5?

(1) $133\frac{1}{3}$ (2) $\frac{1}{200}$

(3) 72 (4) 66

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. The ratio of copper and zinc in brass is 13 : 7. How much zinc will be there in 100 kg of brass?

(1) 20 kg. (2) 55 kg.

(3) 35 kg. (4) 40 kg.

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. In 30 litres mixture of acid, the ratio of acid and water is 2 : 3. What amount of water should be added to the mixture so that the ratio of acid and water becomes 2 : 5?

(1) 10 litres (2) 15 litres

(3) 18 litres (4) 12 litres

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

4. In an alloy, the ratio of copper and zinc is 5 : 2. If 1.250 kg of zinc is mixed in 17 kg 500 g of alloy, then the ratio of copper and zinc will be

(1) 2 : 1 (2) 2 : 3

(3) 3 : 2 (4) 1 : 2

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. There are three containers of equal capacity. The ratio of Sulphuric acid to water in the first container is 3 : 2, that in the second container is 7 : 3 and in the third container it is 11 : 4. If all the liquids are mixed together, then the ratio of Sulphuric acid to water in the mixture will be :

(1) 61 : 29 (2) 61 : 28

(3) 60 : 29 (4) 59 : 29

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. 200 litres of a mixture contains milk and water in the ratio 17 : 3. After the addition of some more milk to it, the ratio of milk to water in the resulting mixture becomes 7 : 1. The quantity of milk added to it was

(1) 20 litres (2) 40 litres

(3) 60 litres (4) 80 litres

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

7. A can contains a mixture of two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the can is filled with B, the ratio of A and B becomes 7 : 9. Litres of liquid A contained by the can initially was

(1) 10 (2) 20

(3) 21 (4) 25

(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

8. A container contains two liquids A and B in the ratio 7 : 5. When 9 litres of mixture are drawn off and the container is filled with B, the ratio of A and B becomes 1:1. How many litres of liquid A was in the container initially?

(1) 26 (2) $16\frac{1}{2}$

(3) $36\frac{3}{4}$ (4) $26\frac{3}{4}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

9. A and B are two alloys of gold and copper prepared by mixing metals in ratios 7 : 2 and 7 : 11 respectively. If equal quantities of the alloys are melted to form a third alloy C, the ratio of gold and copper in C will be :

(1) 7 : 5 (2) 5 : 9

(3) 9 : 5 (4) 5 : 7

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

10. The ratio in which a man must mix rice at ₹ 10.20 per kg and ₹ 14.40 per kg so as to make a mixture worth ₹ 12.60 per kg. is

(1) 4 : 3 (2) 2 : 5

(2) 18 : 24 (4) 3 : 4

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

11. A mixture contains spirit and water in the ratio 3 : 2. If it contains 3 litres more spirit than water, the quantity of spirit in the mixture is

(1) 10 litres (2) 12 litres

(3) 8 litres (4) 9 litres

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

12. A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?

(1) $\frac{1}{3}$ (2) $\frac{1}{4}$

(3) $\frac{1}{5}$ (4) $\frac{1}{7}$

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

13. Two vessels A and B contain milk and water mixed in the ratio 4 : 3 and 2 : 3. The ratio in which these mixtures be mixed to form a new mixture containing half milk and half water is

(1) 7 : 5 (2) 6 : 5

(3) 5 : 6 (4) 4 : 3

(SSC CHSL DEO& LDC Exam. 28.10.2012 (Ist Sitting) & (SSC MTS Exam. 17.03.2013 (Kolkata) 11.11.2011 & 04.02.2011)

14. A container contains 60 kg of milk. From this container 6 kg of milk was taken out and replaced by water. This process was repeated further two times. The amount of milk left in the container is

(1) 34.24 kg (2) 39.64 kg

(3) 43.74 kg (4) 47.6 kg

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

15. The proportion of acid and water in three samples is 2 : 1, 3 : 2 and 5 : 3. A mixture containing equal quantities of all three samples is made. The ratio of water and acid in the mixture is :

(1) 120 : 133 (2) 227 : 133

(3) 227 : 120 (4) 133 : 227

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

16. Two alloys are both made up of copper and tin. The ratio of copper and tin in the first alloy is 1 : 3 and in the second alloy is 2 : 5. In what ratio should the two alloys be mixed to obtain a new alloy in which the ratio of tin and copper be 8 : 3?

(1) 3 : 5 (2) 4 : 7

(3) 3 : 8 (4) 5 : 11

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

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17. A mixture contains alcohol and water in the ratio 4 : 3. If 5 litres of water is added to the mixture, the ratio becomes 4 : 5. The quantity of alcohol in the given mixture is
(1) 3 litres (2) 4 litres
(3) 15 litres (4) 10 litres
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

18. In two alloys A and B, the ratio of zinc to tin is 5 : 2 and 3 : 4 respectively. Seven kg of the alloy A and 21 kg of the alloy B are mixed together to form a new alloy. What will be the ratio of zinc and tin in the new alloy ?
(1) 2 : 1 (2) 1 : 2
(3) 2 : 3 (4) 1 : 1
(SSCCHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

19. Zinc and copper are in the ratio 5 : 3 in 400 gm of an alloy. How much of copper (in grams) should be added to make the ratio 5 : 4?
(1) 50 (2) 66
(3) 72 (4) 200
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

20. Two vessels A and B contain milk and water mixed in the ratio 8 : 5 and 5 : 2 respectively. The ratio in which these two mixtures be mixed to get a new mixture containing $69\frac{3}{13}\%$ milk is:
(1) 3 : 5 (2) 5 : 2
(3) 5 : 7 (4) 2 : 7
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

21. A mixture of 30 litres contain milk and water in the ratio of 7 : 3. How much water should be added to it so that the ratio of milk and water becomes 3 : 7 ?
(1) 40 litres (2) 49 litres
(3) 56 litres (4) 63 litres
(SSC CPO S.I. Exam. 07.09.2003)

22. A barrel contains a mixture of wine and water in the ratio 3 : 1. How much fraction of the mixture must be drawn off and substituted by water so that the ratio of wine and water in the resultant mixture in the barrel becomes 1 : 1 ?
(1) $\frac{1}{4}$ (2) $\frac{1}{3}$
(3) $\frac{3}{4}$ (4) $\frac{2}{3}$
(SSC CGL Prelim Exam. 09.02.2004 (First Sitting)

23. There is 81 litres pure milk in a container. One-third of milk is replaced by water in the container. Again one-third of mixture is extracted and equal amount of water is added. What is the ratio of milk to water in the new mixture?
(1) 1 : 2 (2) 1 : 1
(3) 2 : 1 (4) 4 : 5
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

24. In 80 litres mixture of milk and water the ratio of amount of milk to that of amount of water is 7 : 3. In order to make this ratio 2 : 1, how many litres of water should be added ?
(1) 5 (2) 6
(3) 8 (4) 4
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

25. Vessels A and B contain mixtures of milk and water in the ratios 4 : 5 and 5 : 1 respectively. In what ratio should quantities of mixture be taken from A and B to form a mixture in which milk to water is in the ratio 5 : 4?
(1) 2 : 5 (2) 4 : 3
(3) 5 : 2 (4) 2 : 3
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

26. The milk and water in a mixture are in the ratio 7 : 5. When 15 litres of water are added to it, the ratio of milk and water in the new mixture becomes 7 : 8. The total quantity of water in the new mixture is
(1) 35 litres (2) 40 litres
(3) 60 litres (4) 96 litres
(SSC CPO S.I. Exam. 16.12.2007)

27. In a 729 litres mixture of milk and water, the ratio of milk to water is 7 : 2. To get a new mixture containing milk and water in the ratio 7 : 3, the amount of water to be added is
(1) 81 litres (2) 71 litres
(3) 56 litres (4) 50 litres
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

28. In 40 litres mixture of milk and water the ratio of milk to water is 7 : 1. In order to make the ratio of milk and water 3 : 1, the quantity of water (in litres) that should be added to the mixture will be
(1) 6 (2) $6\frac{1}{2}$
(3) $6\frac{2}{3}$ (4) $6\frac{3}{4}$
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

29. A jar contained a mixture of two liquids A and B in the ratio 4 : 1. When 10 litres of the mixture was taken out and 10 litres of liquid B was poured into the jar, this ratio became 2 : 3. The quantity of liquid A contained in the jar initially was
(1) 4 litres (2) 8 litres
(3) 16 litres (4) 40 litres
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

30. In a mixture of 75 litres, the ratio of milk to water is 2 : 1. The amount of water to be further added to the mixture so as to make the ratio of the milk to water 1 : 2 will be
(1) 45 litres (2) 60 litres
(3) 75 litres (4) 80 litres
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

31. A and B are two alloys of gold and copper prepared by mixing metals in the ratio 5 : 3 and 5 : 11 respectively. Equal quantities of these alloys are melted to form a third alloy C. The ratio of gold and copper in the alloy C is
(1) 25 : 33 (2) 33 : 25
(3) 15 : 17 (4) 17 : 15
(SSC CPO S.I. Exam. 09.11.2008)

32. A mixture contains wine and water in the ratio 3 : 2 and another mixutre contains them in the ratio 4 : 5. How many litres of the later must be mixed with 3 litres of the former so that the resulting mixture may contain equal quantities of wine and water?
(1) $5\frac{2}{5}$ litres (2) $5\frac{2}{3}$ litres
(3) $4\frac{1}{2}$ litres (4) $3\frac{3}{4}$ litres
(SSC SAS Exam. 26.06.2010 (Paper-1)

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33. The ratio of the volume of water and glycerine in 240cc of a mixture is 1 : 3. The quantity of water (in cc) that should be added to the mixture so that the new ratio of the volumes of water and glycerine becomes 2:3 is
(1) 55 cc (2) 60 cc
(3) 62.5 cc (4) 64 cc
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

34. The ratio of the quantities of an acid and water in a mixture is 1 : 3. If 5 litres of acid is further added to the mixture, the new ratio becomes 1 : 2. The quantity of new mixture (in litres) is
(1) 32 (2) 40
(3) 42 (4) 45
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

35. In a mixture of 25 litres, the ratio of acid to water is 4 : 1. Another 3 litres of water is added to the mixture. The ratio of acid to water in the new mixture is
(1) 5 : 2 (2) 2 : 5
(3) 3 : 5 (4) 5 : 3
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

36. Two equal vessels are filled with the mixtures of water and milk in the ratio of 3:4 and 5:3 respectively. If the mixtures are poured into a third vessel, the ratio of water and milk in the third vessel will be
(1) 15 : 12 (2) 53 : 59
(3) 20 : 9 (4) 59 : 53
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

37. Two types of alloy possess gold and silver in the ratio of 7 : 22 and 21 :37. In what ratio should these alloys be mixed so as to have a new alloy in which gold and silver would exist in the ratio 25 : 62 ?
(1) 13 : 8 (2) 8 :13
(3) 13 :12 (4) 6 : 9
(SSC Data Entry Operator Exam. 31.08.2008)

38. In one glass, milk and water are mixed in the ratio 3 : 5 and in another glass they are mixed in the ratio 6 : 1. In what ratio should the contents of the two glasses be mixed together so that the new mixture contains milk and water in the ratio 1 : 1 ?
(1) 20 : 7 (2) 8 : 3
(3) 27 : 4 (4) 25 : 9
(SSC Data Entry Operator Exam. 02.08.2009)

39. In a mixture of 60 litres, the ratio of milk and water is 2 : 1. How much more water must be added to make its ratio 1 : 2 ?
(1) 40 litres (2) 52 litres
(3) 54 litres (4) 60 litres
(SSC CHSL DEO & LDC Exam. 27.11.2010)

40. Two vessels A and B contains acid and water in the ratio 4 : 3 and 5 : 3 respectively. Then the ratio in which these mixtures to be mixed to obtain a new mixture in vessel C containing acid and water in the ratio 3 : 2 is
(1) 5 : 8 (2) 7 : 8
(3) 7 : 5 (4) 4 : 7
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

41. Two containers have acid and water mixed respectively in the ratio 3 : 1 and 5 : 3. To get a new mixture with ratio of acid to water as 2 : 1, the two types have to be mixed in the ratio
(1) 1 : 2 (2) 2 : 1
(3) 2 : 3 (4) 3 : 2
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

42. Acid and water are mixed in a vessel A in the ratio of 5 : 2 and in the vessel B in the ratio 8 : 5. In what proportion should quantities be taken out from the two vessels so as to form a mixture in which the acid and water will be in the ratio of 9 : 4?
(1) 7: 2 (2) 2: 7
(3) 7: 4 (4) 2: 3
(SSCCHSL DEO & LDC Exam. 04.12.2011(Ist Sitting (East Zone)

43. The ratio of spirit and water in two mixturers of 20 litre and 36 litre is 3 : 7 and 7 : 5 respectively. Both the mixtures are mixed together. Now the ratio of the spirit and water in the new mixture is
(1) 25 : 29 (2) 9 : 10
(3) 27 : 29 (4) 27 : 31
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

44. Alcohol and water in two vessels A and B are in the ratio 5 : 3 and 5 : 4 respectively. In what ratio, the liquids in both the vessels be mixed to obtain a new mixture in vessel C in the ratio 7 : 5 ?
(1) 2 : 3 (2) 3 : 2
(3) 3 : 5 (4) 2 : 5
(SSC CHSL DEO & LDC Exam. 11.12.2011(IInd Sitting (East Zone)

45. Two vessels contain milk and water in the ratio 3 : 2 and 7 : 3. Find the ratio in which the contents of the two vessels have to be mixed to get a new mixture in which the ratio of milk and water is 2 : 1.
(1) 2 : 1 (2) 1 : 2
(3) 4 : 1 (4) 1 : 4
(SSC Graduate Level Tier-II Exam.16.09.2012)

46. In two types of stainless steel, the ratio of chromium and steel are 2 : 11 and 5 : 21 respectively. In what proportion should the two types be mixed so that the ratio of chromium to steel in the mixed type becomes 7 : 32 ?
(1) 2 : 3 (2) 3 : 4
(3) 1 : 2 (4) 1 : 3
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

47. A and B are two alloys of gold and copper in the ratio 7 : 2 and 7:11 respectively. If equal quantities of these two alloys are melted to form a new alloy C, then the ratio of gold and copper in C is
(1) 6 : 5 (2) 9 : 4
(3) 12:7 (4) 7:5
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

48. A Can contains a mixture of two liquids A and B in the ratio 7:5. When 9 litres of mixture are drained off and the Can is filled with B, the ratio of A and B becomes 7 : 9. How many litres of liquid A was contained by the Can initially ?
(1) 10 litres (2) 20 litres
(3) 21 litres (4) 25 litres
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

49. The ratio of milk and water in mixtures of four containers are 5 : 3, 2 : 1, 3 : 2 and 7 : 4 respectively. In which container is the quantity of milk, relative to water, minimum ?
(1) First (2) Second
(3) Third (4) Fourth
(SSC CGL Tier-I Exam 16.05.2010 (Second Sitting)

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50. An alloy contains copper, zinc and nickel in the ratio of 5 : 3 : 2. The quantity of nickel (in kg) that must be added to 100 kg of this alloy to have the new ratio 5 : 3 : 3 is

(1) 8 (2) 10
(3) 12 (4) 15

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

51. In an alloy, zinc and copper are in the ratio 1 : 2. In the second alloy, the same elements are in the ratio 2 : 3. If these two alloys be mixed to form a new alloy in which two elements are in the ratio 5 : 8, the ratio of these two alloys in the new alloy is

(1) 3 : 10 (2) 3 : 7
(3) 10 : 3 (4) 7 : 3

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

2. A liquid 'P' is $1\frac{3}{7}$ times as heavy as water and water is $1\frac{2}{5}$ times as heavy as another liquid 'Q'. The amount of liquid 'P' that must be added to 7 litres of the liquid 'Q' so that the mixture may weigh as much as an equal volume of water, will be

(1) 7 litres (2) $5\frac{1}{6}$ litres
(3) 5 litres (4) $4\frac{2}{3}$ litres

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

l. The milk and water in two vessels A and B are in the ratio 4 : 3 and 2 : 3 respectively. In what ratio, the liquids in both the vessels be mixed to obtain a new mixture in vessel C containing half milk and half water ?

(1) 7 : 5 (2) 5 : 2
(3) 3 : 11 (4) 1 : 2

SSC CGL Tier-I Exam. 19.10.2014)

There are two containers of equal capacity. The ratio of milk to water in the first container is 3 : 1, in the second container 5 : 2. If they are mixed up, the ratio of milk to water in the mixture will be

(1) 28 : 41 (2) 41 : 28
(3) 15 : 41 (4) 41 : 15

SC CGL Tier-II Exam. 21.09.2014)

55. Two equal glasses filled with alcohol and water in the proportions 2 : 1 and 3 : 2 are emptied into a third glass. The proportion of alcohol and water in the third glass will be

(1) 13 : 17 (2) 19 : 17
(3) 13 : 11 (4) 19 : 11

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

56. A vessel full of pure acid contains 10 litres of it, of which 2 litres are withdrawn. The vessel is then filled with water. Next 2 litres of the mixture are withdrawn, and again the vessel is filled up with water. The ratio of the acid left in the vessel with that of the original quantity is

(1) 1 : 5 (2) 4 : 5
(3) 4 : 25 (4) 16 : 25

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

57. Gold is 19 times as heavy as water and copper is 9 times as heavy as water. In what ratio should these be mixed to get an alloy 15 times as heavy as water ?

(1) 1 : 1 (2) 1 : 2
(3) 2 : 3 (4) 3 : 2

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

58. 80 litres of a mixture contains milk and water in the ratio of 27 : 5. How much more water is to be added to get a mixture containing milk and water in the ratio of 3 : 1 ?

(1) 5 litres (2) 10 litres
(3) 15 litres (4) 20 litres

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

59. The ratio of two liquids in a mixture is 3 : 5 and that in another mixture is 6 : 1. The ratio in which these two mixtures should be mixed so as to make the ratio of the liquids 7 : 3 is

(1) 44 : 71 (2) 44 : 81
(3) 44 : 91 (4) 44 : 61

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

60. A vessel contains 20 litres of acid. 4 litres of acid is taken out of the vessel and replaced by the same quantity of water. Next 4 litres of the mixture are withdrawn, and again the vessel is filled with the same quantity of acid left in the vessel with the quantity of acid initially in the vessel is

(1) 4 : 5 (2) 4 : 25
(3) 16 : 25 (4) 1 : 5

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

61. In two blends of mixed tea, the ratios of Darjeeling and Assam tea are 4 : 7 and 2 : 5. The ratio in which these two blends should be mixed to get the ratio of Darjeeling and Assam tea in the new mixture as 6 : 13 is

(1) 22 : 35 (2) 26 : 35
(3) 35 : 78 (4) 13 : 22

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

62. In a mixture of three varieties of tea, the ratio of their weights is 4 : 5 : 8. If 5 kg tea of the first variety, 10 kg tea of the second variety and some quantity of tea of the third variety are added to the mixture, the ratio of the weights of three varieties of tea becomes as 5 : 7 : 9. In the final mixture, the quantity (in kg) of the third variety of tea was

(1) 42 (2) 45
(3) 48 (4) 40

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

63. Three vessels whose capacities are 3 : 2 : 1 are completely filled with milk mixed with water. The ratio of milk and water in the mixture of vessels are 5 : 2, 4 : 1 and 4 : 1 respectively. Taking $\frac{1}{3}$ of first, $\frac{1}{2}$ of second and $\frac{1}{7}$ of third mixtures, a new mixture kept in a new vessel is prepared. The percentage of water in the new mixture is

(1) 28 (2) 32
(3) 30 (4) 24

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

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64. 729 ml of a mixture contains milk and water in the ratio 7 : 2. How much more water is to be added to get a new mixture containing milk and water in the ratio 7 : 3 ?
(1) 81 ml (2) 60 ml
(3) 71 ml (4) 52 ml
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443068)

65. Two alloys contain tin and iron in the ratio of 1 : 2 and 2 : 3. If the two alloys are mixed in the proportion of 3 : 4 respectively (by weight), the ratio of tin and iron in the newly formed alloy is :
(1) 10 : 21 (2) 13 : 22
(3) 14 : 25 (4) 12 : 23
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

66. Three utensils contain equal quantity of mixtures of milk and water in the ratio 6 : 1, 5 : 2 and 3 : 1 respectively. If all the solutions are mixed together, the ratio of milk and water in the final mixture is
(1) 65 : 28 (2) 65 : 19
(3) 19 : 65 (4) 19 : 28
(SSC CGL Tier-I Re-Exam, 30.08.2015)

67. 60 kg of an alloy A is mixed with 100 kg of alloy B. If alloy A has lead and tin in the ratio 3 : 2 and alloy B has tin and copper in the ratio 1 : 4, the amount of tin in the new alloy is
(1) 53 kg (2) 44 kg
(3) 80 kg (4) 24 kg
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

68. Three glasses of equal volume contains acid mixed with water. The ratios of acid and water are 2 : 3, 3 : 4 and 4 : 5 respectively. Contents of these glasses are poured in a large vessel. The ratio of acid and water in the large vessel is
(1) 411 : 540 (2) 401 : 544
(3) 417 : 564 (4) 407 : 560
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

69. Two blends of a commodity costing Rs. 35 and Rs. 40 per kg. respectively are mixed in the ratio 2 : 3 by weight. If one-fifth of the mixture is sold at Rs. 46 per kg and the remaining at the rate of Rs. 55 per kg. the profit percent is
(1) 50 (2) 30
(3) 40 (4) 20
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

70. 20 litres of a mixture contains milk and water in the ratio 3 : 1. Then the amount of milk to be added to the mixture so as to have milk and water in ratio 4 : 1 is :
(1) 7 litres (2) 4 litres
(3) 5 litres (4) 6 litres
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

71. A mixture contains milk and water in the ratio 5 : 1. On adding 5 litres of water, the ratio of milk and water becomes 5 : 2. The quantity of milk in the mixture is :
(1) 25 litres (2) 32.5 litres
(3) 16 litres (4) 22.75 litres
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

72. A vessel contains 60 litres of milk. 12 litres of milk is taken out from it and replaced by water. Then again from mixture, 12 litres is again taken out and replaced by water. The ratio of milk and water in the resultant mixture is :
(1) 15:10 (2) 16:9
(3) 9:5 (4) 16:10
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–IX

1. The income of A, B and C are in the ratio 3 : 7 : 4 and their expenses in the ratio 4 : 3 : 5. If A saves ₹ 300 out of an income of ₹ 2,400, the savings of B and C are :
(1) ₹ 4025 and ₹ 575
(2) ₹ 1575 and ₹ 2.625
(3) ₹ 2750 and ₹ 1.525
(4) ₹ 3725 and ₹ 1.525
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. Between two consecutive years my income are in the ratio of 2 : 3 and expenses in the ratio 5 : 9. If my income in the second year is ₹ 45000 and my expenses in the first year is ₹ 25000 my total savings for the two years is :
(1) Nil (2) ₹ 15000
(3) ₹ 10000 (4) ₹ 5000
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A and B have monthly incomes in the ratio 5 : 6 and monthly expenditures in the ratio 3 : 4. If they save ₹ 1800 and ₹ 1600 respectively, find the monthly income of B :
(1) ₹ 3400 (2) ₹ 2700
(3) ₹ 1720 (4) ₹ 7200
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. The ratio of income of two persons is 5 : 3 and that of their expenditures is 9 : 5. Find the income of each person, if they save ₹ 1,300 and ₹ 900 respectively.
(1) ₹ 4,000, ₹ 2,400
(2) ₹ 3,000, ₹ 1,800
(3) ₹ 5,000, ₹ 3,000
(4) ₹ 4,500 ₹ 2,700
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. The annual income of A and B are in the ratio 4 : 3 and the ratio of their expenditures is 3 : 2. If each of them saves ₹ 600 in the year, the annual income of A is
(1) ₹ 4800 (2) ₹ 1800
(3) ₹ 1200 (4) ₹ 2400
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & SSC CPO SI 03.09.2006, 26.05.2005 & SSC MT (Non- Technical) Exam. 27.02.2011)

6. The income of A, B and C are in the ratio 7 : 9 : 12 and their spendings are in the ratio 8 : 9 : 15. If A saves $\frac{1}{4}$th of his income, then the savings of A, B and C are in the ratio of :
(1) 56 : 99 : 69 (2) 69 : 56 : 99
(3) 99 : 56 : 69 (4) 99 : 69 : 56
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & SSC CGL Tier-I Exam. 26.06.2011(IInd sitting)

7. The ratio of income of P and Q is 3 : 4 and the ratio of their expenditures is 2 : 3. If both of them save ₹ 6000, the income of P is
(1) ₹ 20000 (2) ₹ 12000
(3) ₹ 18000 (4) ₹ 24000
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

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8. A man spends a part of his monthly income and saves a part of it. The ratio of his expenditure to his saving is 26 : 3. If his monthly income is ₹ 7250, what is the amount of his monthly savings ?
(1) ₹ 350 (2) ₹ 290
(3) ₹ 750 (4) ₹ 780
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. The monthly salaries of A, B and C are in the ratio 2 : 3 : 5. If C's monthly salary is ₹ 12,000 more than that of A, then B's annual salary is
(1) ₹ 1,20,000 (2) ₹ 1,44,000
(3) ₹ 1,80,000 (4) ₹ 2,40,000
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

10. The ratio of income of two persons is 5 : 3 and that of their expenditures is 9 : 5. If they save ₹ 2600 and ₹1800 respectively, their incomes are :
(1) ₹ 8000; ₹ 4800
(2) ₹ 6000; ₹ 3600
(3) ₹ 10000; ₹ 6000
(4) ₹ 9000; ₹ 5400
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

11. The monthly income of two persons are in the ratio 2 : 3 and their monthly expenses are in the ratio 5 : 9. If each of them saves ₹ 600 per month, then their monthly incomes are
(1) ₹ 1,500; ₹ 2,250
(2) ₹ 1,200; ₹ 1,800
(3) ₹ 1,600; ₹ 2,400
(4) ₹ 1,400; ₹ 2,100
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

12. A person bought some rice and wheat for ₹ 380. The ratio of weight of rice and wheat is 4 : 3 and the price of equal amount of rice and wheat is in the ratio 5 : 6. The rice was bought of worth
(1) ₹ 380 (2) ₹ 300
(3) ₹ 200 (4) ₹ 180
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

13. The ratio of incomes of A and B is 5 : 6. If A gets ₹ 1,100 less than B, their total income (in rupees) is
(1) 9,900 (2) 12,100
(3) 14,400 (4) 10,000
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

14. The income of A and B are in the ratio 5 : 3. The expenses of A, B and C are in the ratio 8 : 5 : 2. If C spends ₹ 2000 and B saves ₹ 700, then A saves
(1) ₹ 1500 (2) ₹ 1000
(3) ₹ 500 (4) ₹ 250
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

15. The ratio of income and expenditure of a person is 11 : 10. If he saves ₹ 9,000 per annum, his monthly income is
(1) ₹ 8,000 (2) ₹ 8,800
(3) ₹ 8,500 (4) ₹ 8,250
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

16. The ratio of the income to the expenditure of a family is 10 : 7. If the family's expenses are ₹10,500, then savings of the family is
(1) ₹ 4, 500 (2) ₹ 10, 000
(3) ₹ 4, 000 (4) ₹ 5, 000
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

17. Monthly income of A and B are in the ratio of 4 : 3 and their expenses bear the ratio 3 : 2. Each of them saves ₹ 6,000 at the end of the month, then the monthly income of A is
(1) ₹ 12,000 (2) ₹ 24,000
(3) ₹ 30,000 (4) ₹ 60,000
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

18. The ratio of weekly income of A and B is 9 : 7 and the ratio of their expenditures is 4 : 3. If each saves ₹ 200 per week, then the sum of their weekly income is
(1) ₹ 3,600 (2) ₹ 3,200
(3) ₹ 4,800 (4) ₹ 5,600
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

19. The ratio of the incomes of A and B as well as of B and C is 3 : 2. If one third of A's income exceeds one fourth of C's income by ₹1000, what is B's income in ₹ ?
(1) 3000 (2) 2500
(3) 3500 (4) 4000
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

20. The income of A and B are in the ratio 2 : 3 and their expenditures are in the ratio 1 : 2. If each saves ₹24,000, find A's income.
(1) ₹ 24,000 (2) ₹ 72,000
(3) ₹ 19,200 (4) ₹ 48,000
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

21. Incomes of A and B are in the ratio 4 : 3 and their annual expenses in the ratio 3 : 2. If each saves ₹ 60,000 at the end of the year, the annual income of A is
(1) ₹ 1,20,000 (2) ₹ 1,50,000
(3) ₹ 2,40,000 (4) ₹ 3,60,000
(SSC Data Entry Operator Exam. 02.08.2009)

22. Ratio between the monthly incomes of A and B is 9 : 8 and the ratio between their expenditures is 8 : 7. If they save ₹ 500 each, find A's monthly income.
(1) ₹ 3,500 (2) ₹ 4,000
(3) ₹ 4,500 (4) ₹ 5,000
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

23. If the annual income of A, B and C are in the ratio 1 : 3 : 7 and the total annual income of A and C is ₹ 8,00,000, then the monthly salary of B (in ₹) is
(1) 20,000 (2) 25,000
(3) 30,000 (4) 15,000
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

24. Annual incomes of Amit and Veeri are in the ratio 3:2, while the ratio of their expenditure is 5 : 3. If at the end of the year each saves ₹ 1,000, the annual income of Amit is
(1) ₹ 9,000 (2) ₹ 8,000
(3) ₹ 7,000 (4) ₹ 6,000
(SSC Graduate Level Tier-II Exam.16.09.2012)

25. The ratio of monthly incomes of A, B is 6 : 5 and their monthly expenditures are in the ratio 4 : 3. If each of them saves ₹ 400 per month, find the sum of their monthly incomes.
(1) 2300 (2) 2400
(3) 2200 (4) 2500
(SSC Graduate Level Tier-I Exam. 21.04.2013)

26. Incomes of x and y are in the ratio 4:3. Their expenditures are in the ratio 12:7. Both save Rs. 3200 at the end of the month, then the income of x is
(1) ₹ 8000 (2) ₹ 6000
(3) ₹ 2000 (4) ₹ 4000
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

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27. The incomes of A and B are in the ratio 3 : 2 and their expenditures are in the ratio 5 : 3. If each saves Rs. 1000, then A's income is
(1) Rs. 6000 (2) Rs. 4000
(3) Rs. 2000 (4) Rs. 5000
(SSC CGL Tier-I Re-Exam. 30.08.2015)

28. A and B have their monthly incomes in the ratio 8 : 5, while their monthly expenditures are in the ratio 5 : 3. If they have saved Rs. 12,000 and Rs. 10,000 monthly respectively, then the difference in their monthly incomes is
(1) Rs. 52,000 (2) Rs. 42,000
(3) Rs. 44,000 (4) Rs. 46,000
(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099685)

TYPE–X

1. ₹ 180 contained in a box consists of one rupee, 50 paise and 25 paise coins in the ratio 2 : 3 : 4. What is the number of 50 paise coins?
(1) 60 (2) 120
(3) 150 (4) 160
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. If 378 coins consist of rupees, 50 paise and 25 paise coins, whose values are in the ratio of 13 : 11 : 7, the number of 50 paise coins will be :
(1) 132 (2) 128
(3) 136 (4) 133
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

3. A bag contains ₹ 90 in coins of denominations of 50 paise, 25 paise and 10 paise. If coins of 50 paise, 25 paise and 10 paise are in the ratio 2 : 3 : 5, then the number of 25 paise coins in the bag is
(1) 80 (2) 120
(3) 100 (4) 135
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. There are ₹ 225 consisting of one rupee, 50 paise and 25 paise coins. The ratio of their numbers in that order is 8 : 5 : 3. The number of one-rupee coins is :
(1) 80 (2) 112
(3) 160 (4) 172
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

5. A box contains 1-rupee, 50-paise and 25-paise coins in the ratio 8 : 5 : 3. If the total amount of money in the box is ₹ 112.50, the number of 50-paise coins is
(1) 80 (2) 50
(3) 30 (4) 42
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. In a bag, there are three types of coins — 1-rupee, 50 paise and 25-paise in the ratio of 3 : 8 : 20. Their total value is ₹ 372. The total number of coins is
(1) 1200 (2) 961
(3) 744 (4) 612
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

7. A box has 210 coins of denominations one-rupee and fifty paise only. The ratio of their respective values is 13 : 11. The number of one-rupee coins is
(1) 65 (2) 66
(3) 77 (4) 78
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. A boy has a few coins of denominations 50 paise, 25 paise and 10 paise in the ratio 1 : 2 : 3. If the total amount of the coins is ₹ 6.50, the number of 10 paise coins is
(1) 5 (2) 10
(3) 15 (4) 20
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. A man has in all ₹ 640 in the denominations of one-rupee, five-rupee and ten-rupee notes. The number of each type of notes are equal. What is the total number of notes he has ?
(1) 150 (2) 120
(3) 100 (4) 90
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

10. A bag contains three types of coins-rupee-coins, 50p-coins and 25 p-coins totalling 175 coins. If the total value of the coins of each kind be the same, the total amount in the bag is
(1) ₹ 75 (2) ₹ 175
(3) ₹ 300 (4) ₹ 126
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

11. There are 480 coins in half rupees, quarter rupees and 10 paise coins and their values are proportional to 5 : 3 : 1. The number of coins in each case are
(1) 100, 200, 180
(2) 50, 30, 400
(3) 150, 180, 150
(4) 300, 90, 90
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

12. A box contains 420 coins in rupee, 50 paise and 20 paise coins. The ratio of their rupee values being 13 : 11 : 7. The number of 50 paise coins is
(1) 42 (2) 78
(3) 66 (4) 132
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

13. A box contains ₹ 56 in the form of coins of one rupee, 50 paise and 25 paise. The number of 50 paise coins is double the number of 25 paise coins and four times the number of one rupee coins. How many 50 paise coins are there in the box?
(1) 52 (2) 64
(3) 32 (4) 16
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

14. The salaries of A, B and C are in the ratio 1 : 3 : 4. If the salaries are increased by 5%, 10% and 15% respectively, then the increased salaries will be in the ratio
(1) 20 : 66 : 95 (2) 21 : 66 : 95
(3) 21 : 66 : 92 (4) 19 : 66 : 92
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

15. Three persons A, B, C whose salaries together amount to ₹ 72000 spend 80, 85 and 75 percent of their salaries respectively. If their savings are in the ratio 8 : 9 : 20, then A's salary is
(1) ₹ 20,000 (2) ₹ 16,000
(3) ₹ 22,000 (4) ₹ 18,000
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

16. A box contains 280 coins of one-rupee, 50-paise and 25-paise. The values of each kind of the coins are in the ratio of 8 : 4 : 3. Then the number of 50-paise coins is
(1) 70 (2) 60
(3) 80 (4) 90
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

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TYPE–XI

1. By mistake, instead of dividing ₹ 117 among A, B and C in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$ it was divided in the ratio of 2 : 3 : 4. Who gains the most and by how much?
(1) A, ₹ 28 (2) B, ₹ 3
(3) C, ₹ 20 (4) C, ₹ 25
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If a sum of money is to be divided among A, B, C such that A's share is equal to twice B's share and B's share is 4 times C's share, then their shares are in the ratio:
(1) 1 : 2 : 4 (2) 1 : 4 : 1
(3) 8 : 4 : 1 (4) 2 : 4 : 1
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. Divide ₹ 7,500 among A, B and C such that A's share to B's share is in ratio 5 : 2 and B's share to C's share is in the ratio 7 : 13. How much will B receive?
(1) ₹ 1,400 (2) ₹ 3,500
(3) ₹ 2,600 (4) ₹ 7,000
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A sum of ₹ 1240 is distributed among A, B and C such that the ratio of amount received by A and B is 6 : 5 and that of B and C is 10 : 9 repectively. Find the share of C.
(1) ₹ 480 (2) ₹ 360
(3) ₹ 400 (4) ₹ 630
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. ₹ 3400 is divided among A, B, C, D in such a way that the share of A and B, B and C, C and D may be as 2 : 3, 4 : 3 and 2 : 3 respectively. The sum of shares of B and D is
(1) ₹ 2040 (2) ₹ 1680
(3) ₹ 2000 (4) ₹ 1720
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

6. ₹ 750 are divided among A, B and C in such a manner that A : B is 5 : 2 and B : C is 7 : 13. What is A's share ?
(1) ₹ 350 (2) ₹ 260
(3) ₹ 140 (4) ₹ 250
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

7. ₹ 68000 is divided among A, B and C in the ratio of $\frac{1}{2}:\frac{1}{4}:\frac{5}{16}$. The difference of the greatest and the smallest part is :
(1) ₹ 6000 (2) ₹ 14440
(3) ₹ 9200 (4) ₹ 16000
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

8. ₹ 6,400 are divided among three workers in the ratio $\frac{3}{5}:2:\frac{5}{3}$. The share (in rupees) of the second worker is
(1) 3,200 (2) 3,840
(3) 2,560 (4) 3,000
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

9. Divide ₹ 1250 among A, B, C, so that A gets $\frac{2}{9}$ of B's share and C gets $\frac{3}{4}$ of A's share.
(1) ₹ 200, ₹ 800, ₹ 250
(2) ₹ 200, ₹ 900, ₹ 150
(3) ₹ 150, ₹ 800, ₹ 300
(4) ₹ 200, ₹ 900, ₹ 75
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

10. A sum of ₹ 9000 is to be distributed among A, B and C in the ratio 4 : 5 : 6. What will be the difference between A's and C's shares?
(1) ₹ 600 (2) ₹ 1000
(3) ₹ 900 (4) ₹ 1200
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

11. A sum of ₹ 370 is to be divided among A, B and C such that $\frac{\text{A's Share}}{\text{B's Share}} = \frac{\text{B's Share}}{\text{C's Share}} = \frac{3}{4}$, A's share (in rupees) is
(1) 240 (2) 120
(3) 100 (4) 90
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

12. An amount of money is to be distributed among P, Q and R in the ratio of 2 : 7 : 9. The total of P's and Q's share is equal to R's share. What is the difference between the shares of P and Q ?
(1) ₹ 5000 (2) ₹ 7500
(3) ₹ 9000
(4) Information inadequate
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

13. ₹ 2010 are to be divided among A, B and C in such a way that if A gets ₹ 5 then B must get Rs. 12 and if B gets ₹ 4 then C must get ₹ 5.50. The share of C will exceed that of B by
(1) ₹ 620 (2) ₹ 430
(3) ₹ 360 (4) ₹ 270
(SSC CPO S.I. Exam. 16.12.2007)

14. ₹ 600 are divided among A, B and C so that ₹ 40 more than $\frac{2}{5}$ of A's share, ₹ 20 more than $\frac{2}{7}$ of B's share and ₹ 10 more than $\frac{9}{17}$ of C's share are all equal. A's share is
(1) ₹ 180 (2) ₹ 160
(3) ₹ 150 (4) ₹ 140
(SSC SAS Exam. 28.06.2010 (Paper-1)

15. A sum of ₹ 86, 700 is to be divided among A, B and C in such a manner that for every rupee that A gets, B gets 90 paise and for every rupee that B gets, C gets 100 paise. B's share will be
(1) ₹ 26, 010 (2) ₹ 27,000
(3) ₹ 28,000 (4) ₹ 28, 090
(SSC Data Entry Operator Exam. 31.08.2008)

16. A sum of ₹ 7,000 is divided among A, B, C in such a way that the shares of A and B are in the ratio 2 : 3 and those of B and C are in the ratio 4 : 5. The share of B is
(1) ₹ 2,400 (2) ₹ 3,000
(3) ₹ 1,600 (4) ₹ 2,000
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

17. ₹ 180 are to be divided among 66 persons (men and women). The ratio of the total amount of money received by men and women is 5 : 4. But the ratio of the money received by each man and woman is 3 : 2. The number of men is
(1) 20 (2) 24
(3) 30 (4) 36

18. ₹ 738 is divided among A, B, C so that their shares are in the ratio of 2 : 3 : 4. B's share is
(1) ₹ 328 (2) ₹ 246
(3) ₹ 264 (4) ₹ 164
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

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19. ₹ 1740 is divided among A, B, and C such that 0.5 of A = ₹ 0.6 of B = ₹ 0.75 of C. Then C will get
(1) ₹ 580 (2) ₹ 696
(3) ₹ 348 (4) ₹ 464
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

20. A certain amount of money is divided among x, y and z. If x receives 25% more than y and y receives 25% less than z, then $x : y : z$ is equal to
(1) 14 : 12 : 13
(2) 15 : 12 : 16
(3) 10 : 9 : 12
(4) 12 : 10 : 11
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

21. A sum of ₹ 53 is divided among A, B and C in such a way that A gets ₹ 7 more than what B gets and B gets ₹ 8 more than what C gets. The ratio of their share is
(1) 16 : 9 : 18 (2) 25 : 18 : 10
(3) 18 : 25 : 10 (4) 15 : 8 : 30
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

22. ₹ 700 is divided among A, B, C in such a way that the ratio of the amount of A and B is 2 : 3 and that of B and C is 4 : 5. Find the amount (in ₹) each received, in the order A, B, C.
(1) 150, 250, 300
(2) 160, 240, 300
(3) 150, 250, 290
(4) 150, 240, 310
(SSC Graduate Level Tier-I Exam. 21.04.2013)

23. Divide ₹ 2,600 among A, B, C in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$. Find the share of each.
(1) ₹ 1,200, ₹ 600, ₹ 800
(2) ₹ 1,200, ₹ 800, ₹ 600
(3) ₹ 600, ₹ 800, ₹ 1,200
(4) ₹ 800, ₹ 600, ₹ 1,200
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

24. A sum of ₹ 300 is divided among P, Q and R in such a way that Q gets ₹ 30 more than P and R gets ₹ 60 more than Q. The ratio of their share is
(1) 5 : 3 : 2 (2) 2 : 3 : 5
(3) 3 : 2 : 5 (4) 2 : 5 : 3
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

25. ₹ 900 is divided among A, B, C; the division is such that $\frac{1}{2}$ of A's money = $\frac{1}{3}$ of B's money = $\frac{1}{4}$ of C's money. Find the amount (in ₹) received by A, B, C.
(1) 300, 400, 200
(2) 350, 450, 100
(3) 200, 300, 400
(4) 400, 150, 350
(SSC Graduate Level Tier-II Exam. 29.09.2013)

26. If ₹ 126.50 is divided among A, B and C in the ratio of 2 : 5 : 4, the share of B exceeds that of A by
(1) ₹ 36.50 (2) ₹ 35.50
(3) ₹ 34.50 (4) ₹ 33.50
(SSC Graduate Level Tier-II Exam. 29.09.2013)

27. A sum of ₹ 76 is divided among A, B and C in such a way that A gets ₹ 7 more than that what B gets and B gets ₹ 6 more than what C gets. The ratio of their shares is
(1) 19 : 24 : 33 (2) 32 : 25 : 19
(3) 32 : 24 : 20 (4) 19 : 25 : 33
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

28. ₹ 3,000 is divided between A, B and C, so that A receives $\frac{1}{3}$ as much as B and C together receive and B receives $\frac{2}{3}$ as much as A and C together receive. Then the share of C is
(1) ₹ 600 (2) ₹ 525
(3) ₹ 1,625 (4) ₹ 1,050
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

29. ₹ 555 was to be divided among A, B and C in the ratio of $\frac{1}{4} : \frac{1}{5} : \frac{1}{6}$. But by mistake it was divided in the ratio of 4 : 5 : 6. The amount in excess received by C was
(1) ₹ 72 (2) ₹ 75
(3) ₹ 22 (4) ₹ 52
(SSC CGL Tier-I Exam. 26.10.2014)

30. A man divides his property so that his son's share to his wife's and wife's share to his daughter's are both as in the ratio 3 : 1. If the daughter gets ₹ 10,000 less than son, the value (in rupees) of the whole property is
(1) ₹ 16,250 (2) ₹ 16,000
(3) ₹ 18,250 (4) ₹ 17,000
(SSC CGL Tier-II Exam. 21.09.2014)

31. A sum of ₹ 730 was divided among A, B and C in such a way that if A gets ₹ 3, then B gets ₹ 4 and if B gets ₹ 3.50 then C gets ₹ 3. The share of B exceeds that of C by
(1) ₹ 30 (2) ₹ 40
(3) ₹ 70 (4) ₹ 210
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

32. A sum of money is divided among A, B, C and D in the proportion of 7 : 6 : 3 : 5. If B gets ₹ 270 more than C, then share of D is
(1) ₹ 250 (2) ₹ 350
(3) ₹ 450 (4) ₹ 455
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

33. In a partnership business, B's capital was half of A's. If after 8 months, B withdrew half of his capital and after 2 months more A withdrew $\frac{1}{4}$ th of his capital, then the profit ratio of A and B will be
(1) 5 : 2 (2) 10 : 23
(3) 2 : 5 (4) 23 : 10
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

34. A and B invest in the ratio 3 : 5. After 6 months, C joins the business investing an amount equal to B's. At the end of the year what will be the ratio of their profits ?
(1) 6 : 10 : 5 (2) 3 : 5 : 2
(3) 8 : 10 : 5 (4) 3 : 5 : 5
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

35. A and B entered into a partnership investing Rs 16000 and Rs. 12000 respectively. After 3 months A withdrew Rs. 5000 while B invested Rs. 5000 more. After 3 more months C joins the business with a capital of Rs 21000. The share of B exceeds that of C, out of a total profit of Rs. 26400 after one year by
(1) Rs. 2400 (2) Rs. 1200
(3) Rs. 3600 (4) Rs. 4800
(SSC CGL Tier-I Exam, 09.06.2015 (IInd Sitting) TF No. 4239378)

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36. In a business A and C invested amounts in the ratio 2 : 1, whereas A and B invested amounts in the ratio 3 : 2. If their annual profit be Rs. 157300, then B's share in the profit is
(1) Rs. 24200 (2) Rs. 48000
(3) Rs. 36300 (4) Rs. 48400
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

TYPE–XII

1. How many sides does a regular polygon have whose interior and exterior angles are in the ratio 2 : 1?
(1) 3 (2) 5
(3) 6 (4) 12
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. The smallest integer, which subtracted from both the terms of 6 : 7 gives a ratio less than 16 : 21, is :
(1) 5 (2) 4
(3) 3 (4) 2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. Two numbers are in the ratio 17 : 45. One-third of the smaller is less than $\frac{1}{5}$ of the bigger by 15. The smaller number is
(1) $25\frac{1}{2}$ (2) $67\frac{1}{2}$
(3) $76\frac{1}{2}$ (4) $86\frac{1}{2}$
(SSC CPO S.I. Exam. 12.01.2003

4. Tea worth ₹126 per kg and ₹135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth ₹153 per kg, the price of the third variety per kg will be
(1) ₹175.5 (2) ₹ 180.0
(3) ₹169.5 (4) ₹170.0
(SSC CHSL DEO & LDC Exam, 21.10.2012 (Ist Sitting)

5. Same quantity of rice is required for each member of a family of 15 members. On a particular day, due to the absence of some members of the family, the consumption of rice was reduced in the ratio 5 : 3. The number of members absent on that day was
(1) 3 (2) 6
(3) 8 (4) 9
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

6. Instead of dividing ₹ 117 among P, Q, R in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$, by mistake it was divided in the ratio 2 : 3: 4. Who gained in the transaction ?
(1) Only P (2) Only Q
(3) Only R (4) Both Q and R
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

7. The ratio of the first and second class train fares between two stations is 3 : 1 and that of the numbers of passengers travelling between the two stations by first and second classes is 1 : 50. If on a particular day, ₹ 1, 325 are collected from passengers travelling between the two stations, then the amount collected from the second class passengers is
(1) ₹ 1,250 (2) ₹ 1,000
(3) ₹ 850 (4) ₹ 750
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

8. In an innings of a cricket match, three players A, B and C scored a total of 361 runs. If the ratio of the number of runs scored by A to that scored by B and also number of runs scored by B to that scored by C be 3 : 2, the number of runs scored by A was
(1) 171 (2) 181
(3) 185 (4) 161
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. In an examination, the number of those who passed and the number of those who failed were in the ratio 25 : 4. If five more had appeared and the number of failures was 2 less than earlier, the ratio of passers to failures would have been 22 : 3. The total number who appeared at the examination is
(1) 145 (2) 150
(3) 155 (4) 180
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. In a cricket match the total number of runs scored by Sachin, Vinod and Sourav is 285. The ratio of the number of runs scored by Sachin and Sourav is 3 : 2 and that of the runs scored by Sourav and Vinod is also 3 : 2. The number of runs scored by Sachin in that match is
(1) 135 (2) 90
(3) 60 (4) 140
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

11. The total marks obtained by Arun in English and Mathematics are 170. If the difference between his marks in these two subjects is 10, then the ratio of his marks in these subjects is
(1) 7 : 8 (2) 8 : 7
(3) 9 : 8 (4) 9 : 7
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

12. The weight of Mr. Gupta and Mrs. Gupta are in the ratio 7 : 8 and their total weight is 120 kg. After taking a dieting course Mr. Gupta reduces by 6 kg and the ratio between their weights changes to 5 : 6. So Mrs. Gupta has reduced by
(1) 2 kg (2) 4 kg
(3) 3 kg (4) 5 kg
(SSC CPO S.I. Exam. 06.09.2009)

13. The ratio of the numbers of boys and girls in a school was 5 : 3. Some new boys and girls were admitted to the school, in the ratio 5 : 7. At this, the total number of students in the school became 1200, and the ratio of boys to girls changed to 7 : 5. The number of students in the school before new admissions was
(1) 700 (2) 720
(3) 900 (4) 960
(SSC SAS Exam. 26.06.2010 (Paper-1)

14. The price of a refrigerator and a television set are in the ratio 5 : 3. If the refrigerator costs ₹ 5500 more than the television set, then the price of the refrigerator is:
(1) ₹ 27500 (2) ₹ 8250
(3) ₹ 13750 (4) ₹ 16500
(SSC CHSL DEO & LDC Exam, 21.10.2012 (IInd Sitting)

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15. A man leaves ₹ 8,600 to be divided among 5 sons, 4 daughters and 2 nephews. If each daughter receives four times as much as each nephew and each son receives five times as much as each nephew, how much does each daughter receive?
(1) ₹ 100 (2) ₹ 600
(3) ₹ 800 (4) ₹ 1,000
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

16. A and B together have ₹ 158. C has ₹ 101 less than what A and B together have, and B has ₹ 23 more than C. The amount of A is :
(1) ₹ 80 (2) ₹ 78
(3) ₹ 57 (4) ₹ 88
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

17. A sum of ₹ 340.68 is distributed among L, M and N such that L gets ₹ 5.72 more than N and M gets Rs. 2.24 more than L. N gets
(1) ₹ 109 (2) ₹ 110.90
(3) ₹ 113.56 (4) ₹ 114.72
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

18. The ratio of the first and second class fares between two railway stations is 4 : 1 and that of the number of passengers travelling by first and second classes is 1 : 40. If on a day ₹ 1,100 are collected as total fare, the amount collected from the first class passengers is
(1) ₹ 315 (2) ₹ 275
(3) ₹ 137.50 (4) ₹ 100
(SSC Data Entry Operator Exam. 02.08.2009)

19. Three persons walk from place A to place B. Their speeds are in the ratio 4 :3 : 5. The ratio of the time taken by them to reach B will be :
(1) 10 : 15 : 13 (2) 2 : 3 : 4
(3) 15 : 20 : 12 (4)16 : 18 : 15
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

20. From each of the two given unequal numbers, half the smaller number is subtracted. Then, of the resulting numbers, the larger one is five times than the smaller one. Then the ratio of the larger to smaller one is
(1) 2 : 1 (2) 3 : 2
(3) 3 : 1 (4) 1 : 4
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

21. A person ordered 4 shirts of brand *A* and some shirts of brand *B*. The price of one shirt of brand *A* was twice that of brand *B*. When the order was executed, it was found that the numbers of the two brands has been interchanged. This increased the bill by 40%. The ratio of the number of brand *A* shirts to that of brand *B* shirts in the original order was
(1) 1 : 2 (2) 1 : 3
(3) 1 : 4 (4) 1 : 5
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

22. The ratio of successful and unsuccessful examinees in an examination in a school is 6 : 1. The ratio would have been 9 : 1 if 6 more examinees had been successful. The total number of examinees is
(1) 140 (2) 120
(3) 200 (4) 160
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

23. A box filled with paper bundles weighs 36 kg. If the weight of the box and paper bundles respectively are in the ratio of 3 : 22, then the weight of the papers (in grams) is
(1) 30680 grams (2) 30710 grams
(3) 31500 grams (4) 31680 grams
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

24. Two numbers are such that the square of one is 224 less than 8 times the square of the other. If the numbers are in the ratio of 3 :4, then their values are
(1) 12, 16 (2) 6, 8
(3) 9, 12 (4) 12, 9
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

25. In a school, 10% of number of girls is equal to $\frac{1}{20}$ th of number of boys. Ratio between the number of boys to number of girls is
(1) 1 : 2 (2) 2 : 1
(3) 1 : 4 (4) 4 : 1
(SSC Graduate Level Tier-I Exam. 19.05.2013)

26. A policeman starts to chase a thief. When the thief goes 10 steps the policeman moves 8 steps. 5 steps of the policeman is equal to 7 steps of the thief. The ratio of the speeds of the policeman and the thief is
(1) 25 : 28 (2) 25 : 26
(3) 28 : 25 (4) 56 : 25
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

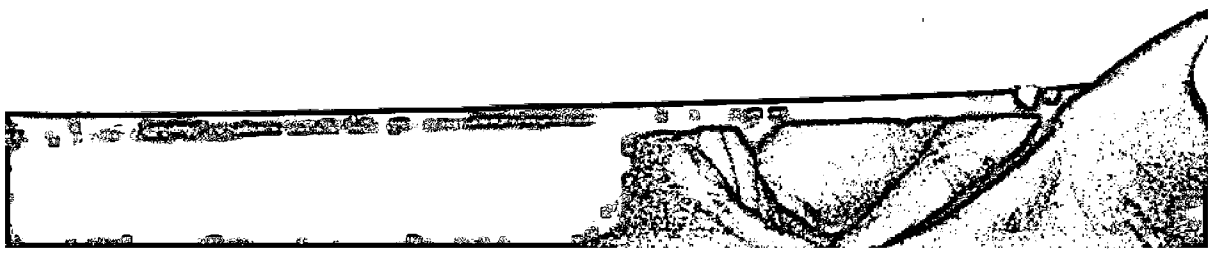
27. A got twice as many marks in English as in Science. His total marks in English, Science and Mathematics is 180. If the ratio of his marks in English and Mathematics is 2 : 3, what is his marks in Science ?
(1) 20 (2) 60
(3) 30 (4) 40
(SSC CHSL DEO & LDC Exam. 16.11.2014)

28. Tom is chasing Jerry. In the same interval of time Tom jumps 8 times while Jerry jumps 6 times. But the distance covered by Tom in 7 jumps is equal to the distance covered by Jerry in 5 jumps. The ratio of speed of Tom and Jerry is
(1) 48 : 35 (2) 28 : 15
(3) 24 : 20 (3) 20 : 21
(SSC CHSL DEO & LDC Exam. 16.11.2014)

29. In a library the ratio of story books and other books is 7 : 2 and there are 1512 story books. Due the collection of some more story books the said ratio becomes 15 : 4. The number of story books collected is
(1) 108 (2) 100
(3) 205 (4) 97
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

30. In a 500 metre race, the ratio of speeds of two runners P and Q is 3 : 5. P has a start of 200 metre then the distance between P and Q at the finish of the race is
(1) P wins by 100 metre
(2) Both reach at the same time
(3) Q wins by 100 metre
(4) Q wins by 50 metre
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

31. In a school there were 1554 students and the ratio of the number of the boys and girls was 4 : 3. After a few days, 30 girls joined the school but a few boys left; as a result the ratio of the boys and girls became 7 : 6. The number of boys who left the school is
(1) 76 (2) 74
(3) 84 (4) 86
(SSC CGL Tier-II Exam 25.10.2015, TF No. 1099685



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SHORT ANSWERS

TYPE-I

1. (1)	2. (3)	3. (3)	4. (4)
5. (1)	6. (3)	7. (1)	8. (3)
9. (4)	10. (2)	11. (4)	12. (1)
13. (1)	14. (2)	15. (3)	16. (2)
17. (3)	18. (3)	19. (4)	20. (1)
21. (3)	22. (2)	23. (2)	24. (2)
25. (3)	26. (3)	27. (3)	28. (4)
29. (4)	30. (4)	31. (1)	32. (1)
33. (2)	34. (4)	35. (1)	36. (3)
37. (1)	38. (2)	39. (3)	40. (2)
41. (3)	42. (3)	43. (3)	44. (3)
45. (2)	46. (3)	47. (2)	48. (4)
49. (1)	50. (4)	51. (2)	52. (3)
53. (3)	54. (1)	55. (4)	56. (4)
57. (4)	58. (3)	59. (3)	60. (1)
61. (3)	62. (3)	63. (1)	64. (3)
65. (1)	66. (2)	67. (4)	68. (1)
69. (3)	70. (3)	71. (1)	72. (4)
73. (4)	74. (3)	75. (2)	76. (1)
77. (1)	78. (1)	79. (1)	80. (3)
81. (3)	82. (2)	83. (1)	84. (1)
85. (2)	86. (3)	87. (3)	88. (1)
89. (4)	90. (2)		

TYPE-II

1. (2)	2. (1)	3. (4)	4. (3)
5. (4)			

TYPE-III

1. (1)	2. (1)	3. (2)	

TYPE-IV

1. (2)	2. (3)	3. (1)	4. (1)
5. (3)	6. (2)	7. (2)	8. (4)
9. (1)	10. (3)	11. (4)	12. (3)
13. (3)	14. (2)	15. (1)	16. (3)
17. (2)	18. (3)	19. (4)	20. (1)
21. (4)	22. (3)	23. (3)	24. (2)
25. (3)			

TYPE-V

1. (3)	2. (2)	3. (3)	4. (1)
5. (2)	6. (3)	7. (4)	8. (3)
9. (4)	10. (1)	11. (1)	12. (4)
13. (1)	14. (3)	15. (2)	16. (3)
17. (4)	18. (3)	19. (1)	20. (3)
21. (3)	22. (4)	23. (2)	24. (1)
25. (3)	26. (2)	27. (3)	28. (2)
29. (3)	30. (4)	31. (4)	32. (1)
33. (1)	34. (3)	35. (1)	36. (2)
37. (3)	38. (1)		

TYPE-VI

1. (3)	2. (4)	3. (1)	4. (2)
5. (3)	6. (1)		

TYPE-VII

1. (3)	2. (1)	3. (3)	4. (3)
5. (2)	6. (2)	7. (3)	8. (3)
9. (1)	10. (3)	11. (4)	12. (1)
13. (4)	14. (2)	15. (3)	16. (1)
17. (4)	18. (3)	19. (2)	20. (3)
21. (1)	22. (3)	23. (4)	24. (1)
25. (2)	26. (2)	27. (4)	

TYPE-VIII

1. (1)	2. (3)	3. (4)	4. (1)
5. (1)	6. (2)	7. (3)	8. (3)
9. (1)	10. (4)	11. (4)	12. (3)
13. (1)	14. (3)	15. (2)	16. (2)
17. (4)	18. (4)	19. (1)	20. (4)
21. (1)	22. (2)	23. (4)	24. (4)
25. (3)	26. (2)	27. (1)	28. (3)
29. (4)	30. (3)	31. (3)	32. (1)
33. (2)	34. (4)	35. (1)	36. (4)
37. (1)	38. (1)	39. (4)	40. (2)
41. (1)	42. (2)	43. (3)	44. (2)
45. (2)	46. (3)	47. (4)	48. (3)
49. (3)	50. (2)	51. (1)	52. (4)
53. (1)	54. (4)	55. (4)	56. (4)
57. (4)	58. (2)	59. (3)	60. (3)
61. (1)	62. (2)	63. (4)	64. (1)
65. (2)	66. (2)	67. (2)	68. (2)
69. (3)	70. (3)	71. (1)	72. (2)

TYPE-IX

1. (1)	2. (4)	3. (4)	4. (1)
5. (4)	6. (1)	7. (3)	8. (3)
9. (2)	10. (1)	11. (3)	12. (3)
13. (2)	14. (1)	15. (4)	16. (1)
17. (2)	18. (2)	19. (1)	20. (4)
21. (3)	22. (3)	23. (2)	24. (4)
25. (3)	26. (1)	27. (1)	28. (2)

TYPE-X

1. (2)	2. (1)	3. (2)	4. (3)
5. (2)	6. (2)	7. (4)	8. (3)
9. (2)	10. (1)	11. (3)	12. (4)
13. (2)	14. (3)	15. (2)	16. (3)

TYPE-XI

1. (4)	2. (3)	3. (1)	4. (2)
5. (1)	6. (1)	7. (4)	8. (4)
9. (2)	10. (4)	11. (4)	12. (4)
13. (4)	14. (3)	15. (2)	16. (1)
17. (3)	18. (2)	19. (4)	20. (2)
21. (2)	22. (2)	23. (2)	24. (2)
25. (3)	26. (3)	27. (2)	28. (4)
29. (1)	30. (1)	31. (2)	32. (3)
33. (4)	34. (1)	35. (3)	36. (4)

TYPE-XII

1. (3)	2. (3)	3. (3)	4. (1)
5. (4)	6. (3)	7. (1)	8. (1)
9. (1)	10. (1)	11. (3)	12. (2)
13. (4)	14. (3)	15. (3)	16. (2)
17. (1)	18. (4)	19. (3)	20. (3)
21. (2)	22. (1)	23. (4)	24. (2)
25. (2)	26. (3)	27. (3)	28. (4)
29. (1)	30. (2)	31. (1)	

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EXPLANATIONS

TYPE-I

1. (1) $a : c = (a : b) \times (b : c)$

$= \frac{7}{9} \times \frac{15}{7} = \frac{15}{9} = 5 : 3$

2. (3) $x = \frac{1}{3}y \Rightarrow x : y = 1 : 3$

Again, $y = \frac{1}{2}z \Rightarrow y : z$

$= 1 : 2 = 3 : 6$

$\therefore x : y : z = 1 : 3 : 6$

3. (3) If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f}$, then each of these ratios is equal to $\frac{a+c+e}{b+d+f}$

Here,

$\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{3}$

$\Rightarrow \frac{mp}{mq} = \frac{nr}{ns} = \frac{ot}{ou} = \frac{2}{3}$

$\Rightarrow \frac{mp+nr+ot}{mq+ns+ou} = \frac{2}{3}$ or 2 : 3

4. (4) $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{1}{2}$

$\Rightarrow \frac{pa}{pb} = \frac{qc}{qd} = \frac{re}{rf} = \frac{1}{2}$

$\Rightarrow \frac{pa+qc+re}{pb+qd+rf} = \frac{1}{2}$ or 1 : 2

5. (1) $\frac{x}{y} = \frac{3}{1} \Rightarrow \frac{x^3}{y^3} = \frac{27}{1}$

$\Rightarrow \frac{x^3-y^3}{x^3-y^3} = \frac{27-1}{27+1}$

[By componendo and dividendo]

$= \frac{26}{28} = \frac{13}{14} = 13 : 14$

6. (3) Let the fourth proportional be x

Then, $\frac{0.12}{0.21} = \frac{8}{x}$

or $x = 8 \times \frac{0.21}{0.12}$

or $x = 8 \times \frac{21}{12}$

or $x = 14$

7. (1) Required ratio $= \frac{2^{1.5}}{2^{0.5}}$

$= \frac{2^{1.5-0.5}}{1}$

$\frac{2}{1} = 2 : 1$

8. (3) $\frac{m}{n} = \frac{3}{2}$ (Given)

$\therefore \frac{4m+5n}{4m-5n} = \frac{4\left(\frac{m}{n}\right)+5}{4\left(\frac{m}{n}\right)-5}$

$= \frac{4 \times \frac{3}{2}+5}{4 \times \frac{3}{2}-5} = \frac{6+5}{6-5} = 11:1$

9. (4) $A : D = \frac{A}{D} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D}$

$= \frac{3}{4} \times \frac{5}{7} \times \frac{8}{9} = \frac{10}{21} = 10 : 21$

10. (2) $a : b = \frac{2}{9} : \frac{1}{3} = 2 : 3$

$b : c = \frac{2}{7} : \frac{5}{14} = 4 : 5$

$d : c = \frac{7}{10} : \frac{3}{5} = 7 : 6$

$\Rightarrow c : d = 6 : 7$

Thus,

$a : b = 2 : 3$
$b : c = 4 : 5$
$c : d = 6 : 7$

$a : b : c : d = 2 \times 4 \times 6 : 3 \times 4 \times 6 : 3 \times 5 \times 6 : 3 \times 5 \times 7$

$= 16 : 24 : 30 : 35$

11. (4) Since b is the mean proportional of a and c.

$\therefore \frac{a}{b} = \frac{b}{c} = k$ (Suppose)

$\therefore a = bk, b = ck$

$\therefore \frac{(a-b)^3}{(b-c)^3} = \frac{(bk-b)^3}{(ck-c)^3}$

$= \frac{b^3(k-1)^3}{c^3(k-1)^3} = \frac{b^3}{c^3} = \frac{a^3}{b^3}$

12. (1) Ratio $= \frac{1}{2} : \frac{1}{3} : \frac{1}{5}$

$= \frac{1}{2} \times 30 : \frac{1}{3} \times 30 : \frac{1}{5} \times 30$

$= 15 : 10 : 6$

Sum of the ratios

$= 15 + 10 + 6 = 31$

$\therefore$ First part $= ₹ \frac{15}{31} \times 6200$

$= ₹ 3000$

Second part $= ₹ \frac{10}{31} \times 6200$

$= ₹ 2000$

Third part $= ₹ \frac{6}{31} \times 6200$

$= ₹ 1200$

13. (1) First part $= x$ and second part $= 94 - x$

$\therefore \frac{\frac{x}{5}}{\frac{94-x}{8}} = \frac{3}{4}$

$\Rightarrow \frac{x}{5} \times \frac{8}{(94-x)} = \frac{3}{4}$

$\Rightarrow 32x = 15 \times 94 - 15x$

$\Rightarrow 47x = 15 \times 94$

$\Rightarrow x = \frac{15 \times 94}{47} = 30$

14. (2) $\frac{a}{b} = \frac{5}{7}, \frac{c}{d} = \frac{2a}{3b}$

$\Rightarrow \frac{a}{b} \times \frac{c}{d} = \frac{5}{7} \times \frac{2a}{3b}$

$\Rightarrow \frac{ac}{bd} = \frac{10}{21} \times \frac{5}{7} = \frac{50}{147}$

$= 50 : 147$

15. (3) $x : y = 3 : 2$

$\Rightarrow x^2 : y^2 = 9 : 4$

$\therefore \frac{2x^2+3y^2}{3x^2-2y^2} = \frac{2\frac{x^2}{y^2}+3}{3\frac{x^2}{y^2}-2}$

$= \frac{2 \times \frac{9}{4}+3}{3 \times \frac{9}{4}-2} = \frac{\frac{18+12}{4}}{\frac{27-8}{4}}$

$= 30 : 19$

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16. (2) $\frac{a}{b}=\frac{b}{c}$

$\Rightarrow b^2=ac \Rightarrow b^4=a^2c^2$

$\therefore \frac{a^4}{b^4}=\frac{a^4}{a^2c^2}=\frac{a^2}{c^2}$

17. (3) $A:B=\frac{1}{2}:\frac{3}{8}=4:3=8:6$

$B:C=\frac{1}{3}:\frac{5}{9}=3:5=6:10$

$C:D=\frac{5}{6}:\frac{3}{4}=10:9$

$\therefore A:B:C:D=8:6:10:9$

18. (3) $A:B:C=2:3:4$

$\therefore \frac{A}{B}=\frac{2}{3}, \frac{B}{C}=\frac{3}{4}, \frac{C}{A}=\frac{4}{2}=2$

$\therefore \frac{A}{B}:\frac{B}{C}:\frac{C}{A}=\frac{2}{3}:\frac{3}{4}:\frac{2}{1}$

$=8:9:24$

19. (4) $\frac{a}{b}=\frac{c}{d}=\frac{e}{f}=\frac{1}{2}$

$\therefore \frac{3a}{3b}=\frac{5c}{5d}=\frac{7e}{7f}=\frac{1}{2}$

$\therefore \frac{3a+5c+7e}{3b+5d+7f}=\frac{1}{2}=1:2$

20. (1) $a:(b+c)=1:3$

$\Rightarrow \frac{b+c}{a}=\frac{3}{1} \Rightarrow \frac{b+c}{a}+1=\frac{3}{1}+1$

$\Rightarrow \frac{a+b+c}{a}=\frac{3+1}{1}=\frac{4}{1}$ ..... (i)

Similarly,

$\frac{a+b}{c}=\frac{7}{5}$

$\Rightarrow \frac{a+b+c}{c}=\frac{12}{5}$ ..... (ii)

On dividing (i) by (ii),

$\frac{c}{a}=\frac{4\times5}{12}=\frac{5}{3}=k$ ..... (iii)

From equation (i), $b=4k$

$\therefore \frac{b}{a+c}=\frac{4k}{3k+5k}=1:2$

21. (3) $\frac{p}{1}=\frac{q}{2}=\frac{r}{4}=k$ (let)

$\Rightarrow p=k, q=2k, r=4k$

$\therefore \sqrt{5p^2+q^2+r^2}$

$=\sqrt{5k^2+4k^2+16k^2}=\sqrt{25k^2}$

$=5k=5p$

22. (2) Mean proportional

$=\sqrt{(3+\sqrt{2})(12-\sqrt{32})}$

$=\sqrt{(3+\sqrt{2})4(3-\sqrt{2})}$

$=2\sqrt{9-2}=2\sqrt{7}$

23. (2) Given, $\frac{x}{y}=\frac{2}{3}$ ..... (i)

Expression $=\frac{3x+2y}{9x+5y}$

$=\frac{3\frac{x}{y}+2}{9\frac{x}{y}+5}=\frac{3\times\frac{2}{3}+2}{9\times\frac{2}{3}+5}$ [from (i)]

$=\frac{2+2}{11}=\frac{4}{11}$

24. (2) We can write $a : c$ by compounding $a : b$ and $b : c$

$\frac{a}{c}=\frac{a}{b}\times\frac{b}{c}, \frac{a}{c}=\frac{3}{4}\times\frac{8}{9}, \frac{a}{c}=\frac{2}{3}$

$\Rightarrow a:c=2:3$

25. (3) $a:b:c=2:3:4$

$\therefore \frac{a}{2}=\frac{b}{3}=\frac{c}{4}=k$ (let)

$\Rightarrow a=2k, b=3k$, and $c=4k$

Given $2a-3b+4c=33$

$\Rightarrow 2\times2k-3\times3k+4\times4k=33$

$\Rightarrow 4k-9k+16k=33$

$\Rightarrow 11k=33 \Rightarrow k=\frac{33}{11}=3$

$\therefore c=4k=4\times3=12$

26. (3) $a:b=c:d$

$\Rightarrow \frac{a}{b}=\frac{c}{d}=\frac{ma}{mb}=\frac{nc}{nd}$

$\Rightarrow \frac{a+c}{b+d}=\frac{ma+nc}{mb+nd}$

27. (3) $A:B=4:5$

$B:C=2:3$

$\therefore A:B:C=4\times2:5\times2:5\times3$

$=8:10:15$

If A equals 800, then C equals 1500.

28. (4) $a:b:c=7:3:5$

$\Rightarrow \frac{a}{7}=\frac{b}{3}=\frac{c}{5}=k$ (let)

$\Rightarrow a=7k, b=3k, c=5k$

Now $(a+b+c):(2a+b-c)$

$=(7k+3k+5k):(2\times7k+3k-5k)$

$=15k:12k=5:4$

29. (4) $A:B=2:3$

$B:C=4:5$

$\therefore A:B:C=2\times4:3\times4:3\times5$

$=8:12:15$

30. (4) According to the question,

$2A=3B \Rightarrow B=\frac{2}{3}A$

and $2A=4C \Rightarrow C=\frac{1}{2}A$

$\therefore A:B:C=A:\frac{2}{3}A:\frac{1}{2}A$

$=1:\frac{2}{3}:\frac{1}{2}=6:4:3$

31. (1) $\frac{A}{B}\times\frac{B}{C}\times\frac{C}{D}=\frac{2}{3}\times\frac{2}{4}\times\frac{2}{5}$

$\Rightarrow \frac{A}{D}=\frac{2}{15}$

$=2:15$

32. (1) $\frac{a}{3}=\frac{b}{4}=\frac{c}{7}=k$

$\Rightarrow a=3k, b=4k$ and $c=7k$

$\Rightarrow \frac{a+b+c}{c}=\frac{3k+4k+7k}{7k}$

$=\frac{14k}{7k}=\frac{2}{1}=2:1$

33. (2) $A:B=3:4=9:12$

$B:C=12:13$

$\therefore A:B:C=9:12:13$

$\Rightarrow A:C=9:13$

34. (4) $A:B=3:2$

$B:C=3:4$

$\therefore A:B:C=3\times3:2\times3:2\times4$

$=9:6:8$

$\therefore A:C=9:8$

35. (1) Here, $\frac{x}{y}=\frac{2}{1} \Rightarrow \frac{x^2}{y^2}=\frac{4}{1}$

$\therefore \frac{x^2-y^2}{x^2+y^2}=\frac{\frac{x^2}{y^2}-1}{\frac{x^2}{y^2}+1}$

$=\frac{4-1}{4+1}=\frac{3}{5}=3:5$

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36. (3) A's share

$= ₹\left(\frac{3}{5}\times 1000\right) = ₹\ 600$

37. (1) Tricky Approach

$\frac{W_1}{W_2} = \frac{2}{3}$

$\Rightarrow \frac{W_2}{W_1} = \frac{3}{2}$ and $\frac{W_1}{W_3} = \frac{1}{2}$

$\therefore \frac{W_2}{W_1}\times\frac{W_1}{W_3} = \frac{W_2}{W_3} = \frac{3}{2}\times\frac{1}{2} = \frac{3}{4}$

$= 3 : 4$

38. (2) $3x = 5y = 4z$

LCM of 3, 5 and 4 = 60

$\therefore \frac{3x}{60} = \frac{5y}{60} = \frac{4z}{60}$

$\Rightarrow \frac{x}{20} = \frac{y}{12} = \frac{z}{15}$

$\therefore x : y : z = 20 : 12 : 15$

39. (3) $\frac{A}{B}\times\frac{B}{C} = \frac{3}{4}\times\frac{6}{5}$

$\Rightarrow \frac{A}{C} = \frac{9}{10} \Rightarrow \frac{C}{A} = \frac{10}{9}$

$\Rightarrow \frac{C}{A}+1 = \frac{10}{9}+1$

$= \frac{C+A}{A} = \frac{10+9}{9} = \frac{19}{9}$

$\Rightarrow A : (A + C) = 9 : 19$

40. (2) $a + b\sqrt{3}$

$= \frac{1}{2-\sqrt{3}} = 2+\sqrt{3}$

(After rationalising)

$\Rightarrow a = 2$ and $b = 1$

$\therefore a : b = 2 : 1$

41. (3) A : B = 3 : 4 = 6 : 8

B : C = 8 : 9

$\therefore$ A : B : C = 6 : 8 : 9

42. (3) Ratio = $1 : \frac{1}{3} : \frac{1}{6}$

$= 6 : 2 : 1$

Sum of the ratios = 6 + 2+1 = 9

$\therefore$ Middle part = $\frac{2}{9}\times 78$

$= \frac{52}{3} = 17\frac{1}{3}$

43. (3) $\frac{x}{y} = \frac{4}{5}$

$\therefore \frac{3x+y}{5x+3y} = \frac{3\left(\frac{x}{y}\right)+1}{5\left(\frac{x}{y}\right)+3}$

$= \frac{3\times\frac{4}{5}+1}{5\times\frac{4}{5}+3} = \frac{\frac{12+5}{5}}{7}$

$= \frac{17}{35} = 17 : 35$

44. (3) $\frac{x}{y} = \frac{5}{6}$

$\therefore \frac{3x^2-2y^2}{y^2-x^2} = \frac{3.\frac{x^2}{y^2}-2}{1-\frac{x^2}{y^2}}$

$= \frac{3\times\frac{25}{36}-2}{1-\frac{25}{36}} = \frac{75-72}{36-25} = \frac{3}{11}$

$= 3 : 11$

45. (2) $\frac{x}{y} = \frac{3}{4}$ (Given)

$\therefore \frac{4x+5y}{5x-2y} = \frac{4\frac{x}{y}+5}{5\frac{x}{y}-2}$

$= \frac{4\times\frac{3}{4}+5}{5\times\frac{3}{4}-2} = \frac{8}{\frac{15-8}{4}}$

$= \frac{8\times 4}{7} = \frac{32}{7}$

46. (3) A : B = 2 : 3 = 4 : 6

B : C = 6 : 11

$\therefore$ A : B : C = 4 : 6 : 11

47. (2) $A\times\frac{2}{3} = B\times\frac{4}{5}$

$\Rightarrow \frac{A}{B} = \frac{4}{5}\times\frac{3}{2} = 6 : 5$

48. (4) According to the question,

$A\times\frac{2}{3} = B\times\frac{75}{100} = C\times\frac{6}{10}$

$\Rightarrow A\times\frac{2}{3} = B\times\frac{3}{4} = C\times\frac{3}{5}$

Now, $A\times\frac{2}{3} = B\times\frac{3}{4}$

$\Rightarrow \frac{A}{B} = \frac{3}{4}\times\frac{3}{2} = \frac{9}{8} \Rightarrow A : B = 9 : 8$

and $B\times\frac{3}{4} = C\times\frac{3}{5}$

$\Rightarrow \frac{B}{C} = \frac{3}{5}\times\frac{4}{3} = \frac{4}{5} = \frac{8}{10}$

$= B : C = 8 : 10$

$\therefore A : B : C = 9 : 8 : 10$

49. (1) A : B = 3 : 7

B : C = 6 : 5

A : B : C = 3×6 : 7×6 : 7×5

= 18 : 42 : 35

Sum of the ratios

= 18 + 42 + 35 = 95

$\therefore$ B's share

$= ₹\left(\frac{42}{95}\times 33630\right) = ₹14868$

50. (4) A : B = 3 : 5 = 12 : 20

B : C = 4 : 7 = 20 : 35

$\therefore$ A : B : C = 12 : 20 : 35

51. (2) $\frac{A}{B} = \frac{4}{5}$; $\frac{B}{C} = \frac{5}{2}$

$\therefore \frac{A}{C} = \frac{A}{B}\times\frac{B}{C} = \frac{4}{5}\times\frac{5}{2} = 2:1$

52. (3) $A = \frac{1}{4}B$

$\Rightarrow$ A : B = 1 : 4

B : C = 1 : 2 = 4 : 8

$\therefore$ A : B : C = 1:4: 8

53. (3) 2A = 3B = 4C

$\Rightarrow \frac{2A}{12} = \frac{3B}{12} = \frac{4C}{12}$

$\Rightarrow \frac{A}{6} = \frac{B}{4} = \frac{C}{3}$

$\Rightarrow$ A : B : C = 6 : 4 : 3

54. (1) $4^{3.5} : 2^5 = 4^3\times 4^{0.5} : 32$

$= 64\times 2 : 32 = 4 : 1$

55. (4) A : B = 1 : 2 = 3 : 6

B : C = 3 : 4 = 6 : 8

C : D = 6 : 9 = 2 : 3 = 8 : 12

D : E = 12 : 16

$\therefore$ A : B : C : D : E

= 3 : 6 : 8 : 12 : 16

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56. (4) $\frac{x}{y}=\frac{2}{5}$ (Given)

$$\therefore \frac{5x+3y}{5x-3y}=\frac{5\left(\frac{x}{y}\right)+3}{5\left(\frac{x}{y}\right)-3}$$

(Dividing numerator and denominator by y)

$$=\frac{5\times\frac{2}{5}+3}{5\times\frac{2}{5}-3}=\frac{2+3}{2-3}=-5$$

57. (4) $a:b=2:3$

$b:c=4:5$

$\therefore a:b:c=2\times4:3\times4:3\times5$

$=8:12:15$

$$\therefore \frac{a+b}{b+c}=\frac{8+12}{12+15}=\frac{20}{27}$$

$=20:27$

58. (3) Marks of Q $=\frac{5}{2}\times120=300$

59. (3) $A:B=4:9$

$A:C=2:3=4:6$

$$\therefore \frac{A+B}{A+C}=\frac{4+9}{4+6}=\frac{13}{10}$$

60. (1) If the third proportional be x, then

$0.8:0.2::0.2:x$

$\Rightarrow 0.8\times x=0.2\times0.2$

$$\Rightarrow x=\frac{0.2\times0.2}{0.8}=\frac{4}{80}=0.05$$

61. (3) $\frac{x}{y}=\frac{3}{4}$ (Given)

$$\therefore \frac{5x-2y}{7x+2y}=\frac{5\frac{x}{y}-2}{7\frac{x}{y}+2}$$

$$=\frac{5\times\frac{3}{4}-2}{7\times\frac{3}{4}+2}=\frac{\frac{15-8}{4}}{\frac{21+8}{4}}=\frac{7}{29}$$

62. (3) As given,

$2A=3B$

$\Rightarrow A:B=3:2$

and, $4B=5C$

$\Rightarrow B:C=5:4$

$\therefore A:B:C$

$=3\times5:2\times5:2\times4$

$=15:10:8$

$\therefore A:C=15:8$

63. (1) Number of students in class A $=x$

Number of students in class B $=y$

$\therefore 25x+40y=30(x+y)$

$\Rightarrow 25x+40y=30x+30y$

$\Rightarrow 30x-25x=40y-30y$

$\Rightarrow 5x=10y$

$$\Rightarrow \frac{x}{y}=\frac{10}{5}=2:1$$

64. (3) Ratio of values

$=15\times3:10\times2:5\times5$

$=45:20:25$

$\therefore$ Required average cost

$$=\frac{45+20+25}{10}=\frac{90}{10}=₹9$$

65. (1) Boys : Girls

$=4:3=32:24$

Girls : Teachers

$=8:1=24:3$

$\therefore$ Boys : Girls : Teachers

$=32:24:3$

$\therefore$ Required ratio

$=(32+24):3=56:3$

66. (2) $\frac{3x+5}{5x-2}=\frac{2}{3}$

$\Rightarrow 10x-4=9x+15$

$\Rightarrow 10x-9x=15+4=19$

$\Rightarrow x=19$

67. (4) $A:B=5:3$

$B:C=4:5$

$\therefore A:B:C$

$=5\times4:3\times4:3\times5$

$=20:12:15$

Sum of ratios

$=20+12+15=47$

$\therefore$ Runs scored by B

$$=\frac{12}{47}\times564=144$$

68. (1) $\frac{a+b}{6}=\frac{b+c}{7}=\frac{c+a}{8}=k$

$\Rightarrow a+b=6k;\ b+c=7k;$

$c+a=8k$

$\therefore a+b+b+c+c+a$

$=6k+7k+8k$

$\Rightarrow 2(a+b+c)=21k$

$\Rightarrow 2\times14=21k \Rightarrow k=\frac{4}{3}$

$\therefore c=(a+b+c)-(a+b)$

$=14-6\times\frac{4}{3}=14-8=6$

69. (3) $a\times5.5=b\times0.65$

$$\Rightarrow \frac{a}{b}=\frac{0.65}{5.5}=\frac{65}{550}=\frac{13}{110}$$

70. (3) Original number of boys $=5x$

Original number of girls $=3x$

$$\therefore \frac{5x-50}{3x+50}=\frac{9}{7}$$

$\Rightarrow 35x-350=27x+450$

$\Rightarrow 35x-27x=350+450$

$\Rightarrow 8x=800$

$\Rightarrow x=100$

Number of boys $=5x$

$=5\times100=500$

71. (1) $A:B:C$

$$=\frac{1}{3}:\frac{1}{4}:\frac{1}{5}:\frac{1}{6}$$

$$=\frac{1}{3}\times60:\frac{1}{4}\times60:\frac{1}{5}\times60:\frac{1}{6}\times60$$

[LCM of 3, 4, 5 & 6 = 60]

$=20:15:12:10$

$\therefore$ Minimum number of pens

$=20+15+12+10=57$

72. (4) $A=B\times\frac{2}{3}$

$\Rightarrow A:B=2:3=8:12$

$B=C\times\frac{4}{5}$

$\Rightarrow B:C=4:5=12:15$

$\therefore A:B:C=8:12:15$

73. (4) $25^{2.5}:5^3$

$=(5^2)^{2.5}:5^3$

$=5^5:5^3$

$=5^2:1$

$=25:1$

74. (3) Third proportional of 12 and 18 $=x$

$\therefore 12:18=18:x$

$$\Rightarrow x=\frac{18\times18}{12}=27$$

75. (2) $x:y=3:2=9:6$

$y:z=3:2=6:4$

$\therefore x:y:z=9:6:4$

$\therefore 9a+6a+4a=342$

$\Rightarrow 19a=342$

$\Rightarrow a=342\div19=18$

$\therefore A \Rightarrow 18\times9=162$

$B \Rightarrow 18\times6=108$

$C \Rightarrow 18\times4=72$

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76. (1) $\frac{A}{B}=\frac{3}{4}, \frac{B}{C}=\frac{6}{5}$

$\Rightarrow \frac{A}{B}\times\frac{B}{C}=\frac{3}{4}\times\frac{6}{5}=\frac{9}{10}$

$\Rightarrow \frac{A}{C}=\frac{9}{10}\Rightarrow \frac{C}{A}=\frac{10}{9}$

77. (1) $\frac{2}{x}=\frac{y}{54}$

$\Rightarrow xy = 2\times 54 = 6\times 18$

78. (1) $\frac{12}{9}=\frac{16}{12}$

$\Rightarrow 12\times 12 = 9\times 16$

$\Rightarrow 144 = 144.$

79. (1) $\frac{18}{x}=\frac{x}{50}$

$\Rightarrow x^2 = 18\times 50$

$= 900$

$\Rightarrow x = \sqrt{900} = 30$

80. (3) A : B = 7 : 9

B : C = 3 : 5

∴ A : B : C

$= 7\times 3 : 9\times 3 : 9\times 5$

$= 7 : 9 : 15$

81. (3) $\frac{x}{y}=\frac{5}{2}$ (Given)

Expression $= \frac{8x+9y}{8x+2y}$

$= \frac{\frac{8x+9y}{y}}{\frac{8x+2y}{y}}$

$= \frac{8\frac{x}{y}+9}{8\frac{x}{y}+2} = \frac{8\times\frac{5}{2}+9}{8\times\frac{5}{2}+2}$

$= \frac{20+9}{20+2} = \frac{29}{22} = 29 : 22$

82. (2) Length : breadth = 5 : 2

Breadth = 40 metre

∴ Length $= \frac{5}{2}\times 40 = 100$ metre

83. (1) $\frac{2}{x}=\frac{4}{8}\Rightarrow 4x = 2\times 8$

$\Rightarrow x = \frac{2\times 8}{4} = 4$

$\therefore \frac{x}{y}=\frac{2}{3}$

$\Rightarrow \frac{4}{y}=\frac{2}{3}$

$\Rightarrow 2y = 4\times 3$

$\Rightarrow y = \frac{4\times 3}{2} = 6$

84. (1) $\frac{a+b}{\sqrt{ab}}=\frac{4}{1}\Rightarrow \frac{a+b}{2\sqrt{ab}}=\frac{2}{1}$

By componendo and dividendo,

$\frac{a+b+2\sqrt{ab}}{a+b-2\sqrt{ab}}=\frac{3}{1}$

$\Rightarrow \frac{\left(\sqrt{a}+\sqrt{b}\right)^2}{\left(\sqrt{a}-\sqrt{b}\right)^2}=\frac{(\sqrt{3})^2}{(1)^2}$

$\Rightarrow \frac{\sqrt{a}+\sqrt{b}}{\sqrt{a}-\sqrt{b}}=\frac{\sqrt{3}}{1}$

Again using componendo and dividendo,

$\frac{2\sqrt{a}}{2\sqrt{b}}=\frac{\sqrt{3}+1}{\sqrt{3}-1}$

$\Rightarrow \frac{\sqrt{a}}{\sqrt{b}}=\frac{\sqrt{3}+1}{\sqrt{3}-1}$

On squaring both sides

$\frac{a}{b}=\left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)^2=\frac{3+1+2\sqrt{3}}{3+1-2\sqrt{3}}$

$= \frac{4+2\sqrt{3}}{4-2\sqrt{3}}=\frac{2+\sqrt{3}}{2-\sqrt{3}}$

$= 2+\sqrt{3} : 2-\sqrt{3}$

85. (2)

Monkey	Banana	Time
12 ↑	12 ↓	12 ↓
4	4	x

$\therefore \left.\begin{matrix}4:12\\12:4\end{matrix}\right\} :: 12 : x$

$\Rightarrow 4\times 12\times x = 12\times 12\times 4$

$\Rightarrow x = \frac{12\times 12\times 4}{4\times 12}$

$= 12$ minutes

86. (3) Let x be added to each term.

According to the question,

$\frac{2+x}{5+x}=\frac{5}{6}$

$\Rightarrow 12+6x = 25+5x$

$\Rightarrow 6x-5x = 25-12$

$\Rightarrow x = 13$

87. (3) A : B = 2 : 3

B : C = 3 : 7

∴ A : B : C = 2 : 3 : 7

∴ A = 2k, B = 3k, C = 7k

∴ A + B = 5k; B + C = 10k,

C + A = 9k

∴ Required ratio = 5k : 10k : 9k

= 5 : 10 : 9

88. (1) $\frac{x^3-y^3}{x^2+xy+y^2}=\frac{5}{1}$

$\Rightarrow \frac{(x-y)(x^2+xy+y^2)}{x^2+xy+y^2}=5$

$\Rightarrow x-y = 5$ ....(i)

Again,

$\frac{x^2-y^2}{x-y}=7$

$\Rightarrow \frac{(x+y)(x-y)}{x-y}=7$

$\Rightarrow x+y = 7$ ....(ii)

On adding equations (i) and (ii),

$2x = 12\Rightarrow x = 6$

From equation (ii),

$x+y = 7\Rightarrow y = 7-6 = 1$

$\therefore \frac{2x}{3y}=\frac{2\times 6}{3\times 1}=4 : 1$

89. (4) A : B = 2 : 1

A : C = 1 : 3 = 2 : 6

∴ A : B : C = 2 : 1 : 6

90. (2) $\frac{1\cdot 21}{x}=\frac{x}{0.09}$

Where = x = mean Proportion

$\Rightarrow x^2 = 1.21\times 0.09$

$\Rightarrow x^2 = 1.1\times 1.1\times 0.3\times 0.3$

$\Rightarrow x = 1.1\times 0.3 = 0.33$

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TYPE-II

1. (2) Let the number to be added be z.

$$\therefore \frac{x+z}{y+z}=\frac{p}{q}$$

$\Rightarrow qx+zq=py+zp$

$\Rightarrow zp-zq=qx-py$

$\Rightarrow z(p-q)=qx-py$

$$\Rightarrow z=\frac{qx-py}{p-q}$$

2. (1) $\frac{x}{y}=\frac{3}{4}$

$$\therefore \frac{4x-y}{2x+3y}=\frac{4\frac{x}{y}-1}{2\frac{x}{y}+3}$$

$$=\frac{4\times\frac{3}{4}-1}{2\times\frac{3}{4}+3}$$

$$=\frac{2}{\frac{3}{2}+3}=\frac{2\times2}{9}=4:9$$

3. (4) $x:y=3:4=9:12$

$y:z=3:4=12:16$

$\therefore x:y:z=9:12:16$

$$\therefore \frac{x+y+z}{3z}=\frac{9k+12k+16k}{3\times16k}$$

$$=\frac{37}{48}$$

4. (3) $A:B=\frac{1}{2}:\frac{1}{3}=3:2$

$B:C=\frac{1}{5}:\frac{1}{3}=3:5$

$\frac{A}{B}=\frac{3}{2}$

$$\Rightarrow \frac{A+B}{B}=\frac{3+2}{2}=\frac{5}{2}$$

$\frac{B}{C}=3:5\Rightarrow\frac{C}{B}=\frac{5}{3}$

$$\Rightarrow \frac{C+B}{B}=\frac{5}{3}+1=\frac{8}{3}$$

$$\therefore \frac{A+B}{C+B}=\frac{5}{2}+\frac{8}{3}$$

$$=\frac{5}{2}\times\frac{3}{8}=\frac{15}{16}=15:16$$

5. (4) $\frac{x}{y}=\frac{3}{4}$ (Given)

$$\therefore \frac{2x+3y}{3y-2x}=\frac{2\frac{x}{y}+\frac{3y}{y}}{\frac{3y}{y}-\frac{2x}{y}}$$

(Dividing numerator and denominator by y)

$$=\frac{2.\frac{x}{y}+3}{3-2.\frac{x}{y}}=\frac{2\times\frac{3}{4}+3}{3-2\times\frac{3}{4}}$$

$$=\frac{\frac{3}{2}+3}{3-\frac{3}{2}}$$

$$=\frac{3+6}{6-3}=\frac{9}{3}=3:1$$

TYPE-III

1. (1) Let numbers = $5x$ and $4x$

$$\therefore 5x\times\frac{40}{100}=12$$

$\Rightarrow 2x=12\Rightarrow x=6$ and

Second number $=6\times4=24$

$$\therefore 50\% \text{ of } 24=24\times\frac{50}{100}=12$$

2. (1) Milk : Water = K : 1

$\therefore$ S.P. $=(K+1)\times9$

C.P. $=10K$

Gain $=9-K$

$$\text{Gain \%}=\frac{9-K}{10K}\times100$$

$$\Rightarrow \frac{9-K}{10K}\times100=20$$

$\Rightarrow 90-10K=20K$

$\Rightarrow 30K=90\Rightarrow K=3$

$\therefore$ Ratio $=3:1$

3. (2) Number of brown socks = x

Price of brown socks = ₹ y per pair

Price of black socks = ₹ $2y$ per pair

$\therefore 4y+x\times2y$

$$=\frac{150}{100}(4\times2y+xy)$$

$$\Rightarrow 4+2x=\frac{3}{2}(8+x)$$

$\Rightarrow 8+4x=24+3x$

$\Rightarrow x=24-8=16$

$\therefore$ Required ratio $=4:16$

$=1:4$

TYPE-IV

1. (2) Let their age be $3x$ and $2x$ years.

$\therefore 3x-2x=5$

$\Rightarrow x=5$

$\therefore$ Younger student's age

$=2x=2\times5=10$ years

2. (3) Let the present age of brothers be x and $2x$ years.

Then, 5 years ago,

$$\frac{x-5}{2x-5}=\frac{1}{3}$$

$\Rightarrow 3x-15=2x-5$

$\Rightarrow x=15-5=10$

$\therefore$ Age of elder brother

$=10\times2=20$

$\therefore$ Required ratio

$$=\frac{10+5}{20+5}=\frac{15}{25}=3:5$$

3. (1) 5 years ago, let the age of father = $2x$ years (let)

Then, Age of son = x years

$\therefore 2x+5+x+5=100$

$\Rightarrow 3x=100-10=90$

$$\Rightarrow x=\frac{90}{3}=30$$

$\therefore$ Father's present age

$=2x+5=60+5=65$ years

Son's present age $=x+5$

$=30+5$

$=35$ years.

After 10 years,

$$\text{Ratio}=\frac{65+10}{35+10}=\frac{75}{45}=\frac{5}{3}=5:3$$

4. (1) Let the age of A and B four years ago be $11x$ and $14x$ years respectively.

According to the question,

After 4 years from now,

$$\frac{11x+8}{14x+8}=\frac{13}{16}$$

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$\Rightarrow 176x + 128 = 182x + 104$

$\Rightarrow 182x - 176x = 128 - 104$

$\Rightarrow 6x = 24 \Rightarrow x = \frac{24}{6} = 4$

$\therefore$ A's present age $= (11x + 4)$ years

$= 11 \times 4 + 4 = 48$ years

5. (3) Let Maya's present age be $6x$ years and Chhaya's present age be $5x$ years.

After 15 years,

$$\frac{6x+15}{5x+15} = \frac{9}{8}$$

$\Rightarrow 48x + 120 = 45x + 135$

$\Rightarrow 48x - 45x = 135 - 120$

$\Rightarrow 3x = 15 \Rightarrow x = 5$

$\therefore$ Maya's present age $= 6x$

$= 6 \times 5 = 30$ years

6. (2) Let the age of Ram and Rahim 10 years ago be x and $3x$ years respectively.

After 5 years from now,

$$\frac{x+15}{3x+15} = \frac{2}{3}$$

$\Rightarrow 6x + 30 = 3x + 45$

$\Rightarrow 3x = 45 - 30 = 15$

$\Rightarrow x = 5$

$\therefore$ Ratio of their present age

$= (x + 10) : (3x + 10)$

$= 15 : 25 = 3 : 5$

7. (2) Let father's age be $5x$ years.

Son's age $= 2x$ years

$\therefore 5x \times 2x = 1000$

$\Rightarrow x^2 = 100 \Rightarrow x = 10$

$\therefore$ Father's age after 10 years

$= 5x + 10$

$= 5 \times 10 + 10 = 60$ years

8. (4) Sumit's present age

$= 2x$ years

Prakash's present age

$= 3x$ years

$\therefore 3x - 2x = 6$

$x = 6$

$\therefore$ Required ratio

$= (2 \times 6 + 6) : (3 \times 6 + 6)$

$= 18 : 24 = 3 : 4$

9. (1) Let x years ago the ratio of their age was 3 : 5

$\therefore$ According to the question

$$\frac{40-x}{60-x} = \frac{3}{5}$$

$\Rightarrow 200 - 5x = 180 - 3x$

$\Rightarrow 2x = 20$

$\therefore x = 10$ years

10. (3) Let the present age of two brothers be x and $2x$ years.

Now, $\frac{x-5}{2x-5} = \frac{1}{3}$

$\Rightarrow 3x - 15 = 2x - 5$

$\Rightarrow 3x - 2x = 15 - 5$

$\Rightarrow x = 10$

$\therefore$ Their present age

$= 10$ and 20 years

After 5 years their required ratio

$= \frac{15}{25} = \frac{3}{5} = 3 : 5$

11. (4) Four years ago let the age of A and B be $2x$ and $3x$ years respectively.

According to the question

$$\frac{2x+4+4}{3x+4+4} = \frac{5}{7}$$

$$\Rightarrow \frac{2x+8}{3x+8} = \frac{5}{7}$$

$\Rightarrow 14x + 56 = 15x + 40$

$\Rightarrow x = 16$

Present age of A $= 2x + 4$

$= 2 \times 16 + 4 = 36$ years

Present age of B

$= 3x + 4 = 3 \times 16 + 4$

$= 52$ years

12. (3) Boys in class $= \frac{4}{5} \times 50 = 40$

Girls $= \frac{1}{5} \times 50 = 10$

Average age of boys $= 10 \times 2$

$= 20$ years

$\therefore$ Total age of boys $= 20 \times 40$

$= 800$ years

13. (3) The present age of boys are $5x$ and $6x$ years respectively.

After 2 years,

$\frac{5x+2}{6x+2} = \frac{7}{8} \Rightarrow 42x + 14 = 40x + 16$

$\Rightarrow 2x = 2 \Rightarrow x = 1$

Ratio after 12 years

$\Rightarrow 5x + 12 : 6x + 12 = 17 : 18$

14. (2) Let the present age of Puneet and Appu be $2x$ and $3x$ years respectively.

After 3 years,

$$\frac{2x+3}{3x+3} = \frac{3}{4}$$

$\Rightarrow 9x + 9 = 8x + 12$

$\Rightarrow x = 3$

$\therefore$ Present age of Puneet

$= 2x = 2 \times 3 = 6$ years

15. (1) Let the age of father 10 years hence is $5x$ years, then age of son 10 years hence will be $3x$ years.

According to the question,

$$\frac{5x-10-10}{3x-10-10} = \frac{3}{1}$$

$$\Rightarrow \frac{5x-20}{3x-20} = \frac{3}{1}$$

$\Rightarrow 5x - 20 = 9x - 60$

$\Rightarrow 4x = 40$ or $x = 10$

$\therefore$ Required ratio

$= (3x - 10) : (5x - 10)$

$= 20 : 40 = 1 : 2$

16. (3) Let the present age of Rahul and Rashmi be $2x$ and x years respectively.

After 30 years,

$$\frac{2x+30}{x+30} = \frac{7}{6}$$

$\Rightarrow 12x + 180 = 7x + 210$

$\Rightarrow 12x - 7x = 210 - 180$

$\Rightarrow 5x = 30 \Rightarrow x = \frac{30}{5} = 6$

$\therefore$ Rahul's present age

$= 2x = 2 \times 6 = 12$ years

17. (2) Let the present age of A and B be $4x$ and $5x$ years respectively,

According to the question,

$$\frac{4x+5}{5x+5} = \frac{5}{6}$$

$\Rightarrow 25x + 25 = 24x + 30$

$\Rightarrow x = 30 - 25 = 5$

$\therefore$ A's present age

$= 4x = 4 \times 5 = 20$ years

18. (3) $\frac{36+n}{50+n} = \frac{3}{4}$

$\Rightarrow 144 + 4n = 150 + 3n$

$\Rightarrow 4n - 3n = 150 - 144$

$\Rightarrow n = 6$

19. (4) Sumit's present age

$= 2x$ years

Prakash's present age

$= 3x$ years

$\therefore 3x - 2x = 6$

$x = 6$

$\therefore$ Required ratio

$= (2 \times 6 + 6) : (3 \times 6 + 6)$

$= 18 : 24 = 3 : 4$

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20. (1) Ages of the persons = $4x$ and $7x$ years.

$\therefore 7x - 4x = 30 \Rightarrow 3x = 30$

$\Rightarrow x = 10$

$\therefore$ Sum of their ages $= 4x + 7x$

$= 11x$ years

$= 11 \times 10 = 110$ years

21. (4) 16 years ago,

My age = x years

My grandfather's age = $9x$ years

After 8 years from the present,

$9x + 16 + 8 = 3(x + 8 + 16)$

$\Rightarrow 9x + 24 = 3x + 24 + 48$

$\Rightarrow 9x + 24 = 3x + 72$

$\Rightarrow 9x - 3x = 72 - 24 \Rightarrow 6x = 48$

$\Rightarrow x = \frac{48}{6} = 8$

Required ratio 8 years ago,

$= (x + 8) : (9x + 8)$

$= (8 + 8) : (9 \times 8 + 8)$

$= 16 : 80 = 1 : 5$

22. (3) A's present age = $3x$ years

B's present age = x years

4 years ago,

$\frac{3x - 4}{x - 4} = \frac{4}{1}$

$\Rightarrow 4x - 16 = 3x - 4$

$\Rightarrow 4x - 3x = 16 - 4$

$\Rightarrow x = 12$

$\therefore$ A's present age

$= 3x = 3 \times 12 = 36$ years

23. (3) 18 years ago,

A's age = $8x$ years

B's age = $13x$ years

$\therefore$ At present,

$\frac{8x + 18}{13x + 18} = \frac{5}{7}$

$\Rightarrow 56x + 126 = 65x + 90$

$\Rightarrow 65x - 56x = 126 - 90$

$\Rightarrow 9x = 36 \Rightarrow x = \frac{36}{9} = 4$

$\therefore$ A's present age $= 8x + 18$

$= 8 \times 4 + 18 = 50$ years

24. (2) Age of first person = $5x$ years

Age of second person

= $9x$ years

According to the question,

$9x - 5x = 40 \Rightarrow 4x = 40$

$\Rightarrow x = 10$

$\therefore$ Sum of their ages

$= 5x + 9x = 14x$

$= 14 \times 10 = 140$ years

25. (3) Sonali's present age

= $5x$ years

Monali's present age = $3x$ years

According to the question,

After 5 years,

$\frac{5x + 5}{3x + 5} = \frac{10}{7}$

$\Rightarrow \frac{x + 1}{3x + 5} = \frac{2}{7}$

$\Rightarrow 7x + 7 = 6x + 10$

$\Rightarrow 7x - 6x = 10 - 7$

$\Rightarrow x = 3$

$\therefore$ Monali's present age $= 3x$

$= 9$ years

TYPE-V

1. (3) Let the numbers be 3x and 8x.

$\therefore 8x - 3x = 115$

$\Rightarrow 5x = 115 \Rightarrow x = \frac{115}{5} = 23$

$\therefore$ The smaller number

$= 3x = 3 \times 23 = 69$

2. (2) $x + 2x + 3x + 4x = 16$

$\therefore x = \frac{16}{10} = 1.6$

$\therefore$ Sum $= 1.6 + 6.4 = 8$

3. (3) Let the two numbers be x and y.

$\therefore$ According to question,

$x + y = 40$ .....(i)

$x - y = 4$ ....(ii)

From equation (i) and (ii), we get

$x = 22$ and $y = 18$

$\therefore$ Required ratio

$= \frac{22}{18} = \frac{11}{9} = 11 : 9$

4. (1) Let the nos. be 10x & 7 x then, $10x - 7x = 105$

$\Rightarrow 3x = 105 \Rightarrow x = 35$

$\therefore$ Sum $= 10x + 7x = 17x$

$= 17 \times 35 = 595$

5. (2) Let the integers be $9x$ and $7x$ respectively.

According to the question,

$9x \times 7x = 1575$

$\Rightarrow x^2 = \frac{1575}{63}$

$\Rightarrow x^2 = 25$

$\Rightarrow x = 5$

[x being positive (+ve) integer]

$\therefore$ Smaller integer

$= 7x = 7 \times 5 = 35$

6. (3) Let the numbers be 3x, 2x and 5x respectively.

Now, $(3x)^2 + (2x)^2 + (5x)^2$

$= 1862$

$\Rightarrow 9x^2 + 4x^2 + 25x^2 = 1862$

$\Rightarrow 38x^2 = 1862$

$\Rightarrow x^2 = \frac{1862}{38} = 49$

$\Rightarrow x = \sqrt{49} = 7$

$\therefore$ The smallest number

$= 2x = 2 \times 7 = 14$

7. (4)

Number	II		III		I
	9	:	16		
			4	:	1
	36	:	64	:	16
	9	:	16	:	4

Therefore, second number

$= \frac{9}{9 + 16 + 4} \times 116 = \frac{9}{29} \times 116$

$= 36$

8. (3) Let the numbers be x, y and z. Then

$x : y = 2 : 3$; $y : z = 5 : 8$

$\therefore x : y : z = 2 \times 5 : 3 \times 5 : 3 \times 8$

$= 10 : 15 : 24$

Sum of the ratios

$= 10 + 15 + 24 = 49$

$\therefore$ The second number

$= \frac{15}{49} \times 98 = 30$

9. (4) Quantity of milk in 45 litres

$= \frac{2}{3} \times 45 = 30$ litres.

$\therefore$ Water $= (45 - 15)$

$= 15$ litres

Let x litres of water be added.

$\therefore \frac{30}{15 + x} = \frac{1}{2}$

$\Rightarrow 15 + x = 60$

$\Rightarrow x = 60 - 15 = 45$ litres.

10. (1) Let the numbers be a, b and c.

Now, $a : b = 8 : 9$

$b : c = 3 : 4$

$\therefore a : b : c$

$= 8 \times 3 : 9 \times 3 : 9 \times 4$

$= 24 : 27 : 36 = 8 : 9 : 12$

$\therefore \frac{a}{8} = \frac{b}{9} = \frac{c}{12} = k$

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$\Rightarrow a = 8k,\ b = 9k,\ c = 12k$
According to the question,
$8k \times 12k = 2400$

$\Rightarrow k^2 = \frac{2400}{8\times12} = 25$

$\Rightarrow k = 5$
$\therefore$ Second number
$= 9k = 9 \times 5 = 45$

11. (1) Let the number be $2x$ and $3x$.
Then.

$\frac{2x-2}{3x+2} = \frac{1}{2}$

$\Rightarrow 4x - 4 = 3x + 2$
$\Rightarrow x = 6$
$\therefore$ Sum of numbers $= 5x$
$= 5 \times 6 = 30$

12. (4) Ratio of numbers

$= \frac{1}{2} : \frac{2}{3} : \frac{3}{4}$

$= \frac{1}{2} \times 12 : \frac{2}{3}\times12 : \frac{3}{4}\times12$

$= 6 : 8 : 9$
Let the numbers be $6x$, $8x$ and $9x$.
Now, $9x - 6x = 36$
$\Rightarrow x = 12$
$\therefore$ Numbers are
72, 96 and 108.

13. (1) Let the numbers be a, b and c. Then
$a : b = 2 : 3$
$b : c = 5 : 3$
$\therefore\ a : b : c = 2\times5 : 3\times5 : 3\times3$
$= 10 : 15 : 9$
Let the numbers now be $10x$, $15x$ and $9x$
$\therefore\ 10x + 15x + 9x = 68$

$\Rightarrow 34x = 68 \Rightarrow x = \frac{68}{34} = 2$

$\therefore$ Second number $= 15x$
$= 15 \times 2 = 30$

14. (3) Let the number to be subtracted be x.
According to the question,

$\frac{7-x}{9-x} = \frac{11-x}{15-x}$

Now, check through options
Clearly, putting $x = 3$,

Each ratio $= \frac{2}{3}$.

Note : Solve such questions orally by mental exercise.

15. (2) Let the numbers be $2x$ and $3x$.
$\therefore\ 2x \times 3x = 96$

$\Rightarrow x^2 = \frac{96}{6} = 16$

$\therefore\ x = \sqrt{16} = 4$
$\therefore$ Sum $= 2x + 3x = 5x$
$= 5 \times 4 = 20$

16. (3) Let the numbers be $3x$ and $4x$.

$\therefore \frac{3x+6}{4x+6} = \frac{4}{5}$

$\Rightarrow 16x + 24 = 15x + 30$
$\Rightarrow x = 30 - 24 = 6$
$\therefore$ Required difference $= 6$

17. (4) Let the two numbers are x and y.
According to the question,

$\frac{x}{y} = \frac{5}{7}$

$7x = 5y$
$7x - 5y = 0$ ...(I)

Again, $\frac{x-40}{y-40} = \frac{17}{27}$

$\Rightarrow 27x - 1080 = 17y - 680$
$\Rightarrow 27x - 17y = 1080 - 680$
$\Rightarrow 27x - 17y = 400$ ...(II)
From (I) $\times$ 17 – (II) $\times$ 5, we have
$119x - 85y = 0$
$135x - 85y = 2000$
– + –

$-16x = -2000$
$\therefore x = 125$

Putting the value of x in equation (I)
$7 \times 125 = 5y$

$\therefore y = \frac{7\times125}{5} = 175$

$\therefore$ Difference of the numbers
$= 175 - 125 = 50$

18. (3) Let the numbers be $5x$, $6x$ and $7x$ respectively.
$\therefore\ 5x \times 6x \times 7x = 5670$

$\Rightarrow x^3 = \frac{5670}{5\times6\times7} = 27$

$\therefore\ x = \sqrt[3]{27} = 3$

$\therefore$ The greatest number $= 7x$
$= 7 \times 3 = 21$

19. (1) Let the numbers be $3x$ and x,
Then, $3x + x = 240$
$\Rightarrow 4x = 240$

$\Rightarrow x = \frac{240}{4} = 60$

$\therefore$ Difference $= 3x - x = 2x$
$= 2 \times 60 = 120$

20. (3) $x + y = 3(x - y)$
$\Rightarrow x + y = 3x - 3y \Rightarrow 2x = 4y$

$\Rightarrow \frac{x}{y} = \frac{2}{1} \Rightarrow x : y = 2 : 1$

21. (3) Let the numbers be $3x$, $4x$ and $5x$.
$\therefore\ 5x + 3x = 4x + 52$
$\Rightarrow 4x = 52 \Rightarrow x = 13$
$\therefore$ The smallest number
$= 3x = 3 \times 13 = 39$

22. (4) Let required number be x.

$\therefore \frac{6+x}{7+x} = \frac{15+x}{17+x}$

$\Rightarrow 102 + 17x + 6x + x^2$
$= 105 + 7x + 15x + x^2$
$\Rightarrow 23x - 22x = 105 - 102$
$\Rightarrow x = 3$

Note : It is convenient to solve it orally using options

$\frac{6+3}{7+3} = \frac{15+3}{17+3} \Rightarrow \frac{9}{10} = \frac{18}{20}$

23. (2) $\frac{6+x}{14+x} = \frac{18+x}{38+x}$
From the given alternatives

$\frac{6+2}{14+2} = \frac{18+2}{38+2}$

$\Rightarrow \frac{1}{2} = \frac{1}{2}$

24. (1) A : B = 8 : 9
B : C = 3 : 4 = 9 : 12
$\therefore$ A : B : C = 8 : 9 : 12
$\therefore$ Numbers = $8x$, $9x$ and $12x$
$\therefore\ 8x \times 12x = 2400$

$\Rightarrow x^2 = \frac{2400}{8\times12} = 25$

$\therefore\ x = \sqrt{25} = 5$
$\therefore$ A + B + C = $8x + 9x + 12x$
$= 29x$
$= 29 \times 5 = 145$

25. (3) Check through options
Number = 36
3 + 6 = 9; 6 – 3 = 3
and 36 : 9 = 4 : 1

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Otherwise- $10x+y : x+y = 4:1$

$\Rightarrow 10x+(x+3) : x+(x+3) = 4:1$

$\Rightarrow \frac{11x+3}{2x+3} = \frac{4}{1}$

$\Rightarrow 11x+3 = 8x+12$

$\Rightarrow 3x = 9 \Rightarrow x = 3$ and $y = 6$

Then the number is 36.

26. (2) Number of balls in bag x and y respectively $= 2a$ and $3a$

$\therefore 3a-5 = 2a+3$

$\Rightarrow a = 5+3 = 8$

$\therefore$ Total number of balls $= 5a = 40$

$\therefore$ Balls in each bag $= 20$

27. (3) $(x+y)^2 = 4xy$

$\Rightarrow x^2+y^2+2xy-4xy = 0$

$\Rightarrow (x-y)^2 = 0 \Rightarrow x = y$

$\Rightarrow x : y = 1:1$

28. (2) Numbers $= 2x$, $3x$ and $4x$

$\therefore (2x)^2+(3x)^2+(4x)^2 = 1856$

$\Rightarrow 4x^2+9x^2+16x^2 = 1856$

$\Rightarrow 29x^2 = 1856$

$\Rightarrow x^2 = 1856 \div 29 = 64$

$\therefore x = \sqrt{64} = 8$

$\therefore$ Numbers = 16, 24 and 32

29. (3) From the given options number = 5, because

$$\frac{7+5}{16+5} = \frac{43+5}{79+5}$$

$$\Rightarrow \frac{12}{21} = \frac{48}{84}$$

[check other options likewise]

30. (4) Average of two no's = 62

$\therefore$ Sum of the numbers $= 62 \times 2 = 124$

Sum of the numbers $= 124$

If the larger number be x, then smaller number $= 124-x$

$$\therefore \frac{124-x+2}{x} = \frac{1}{2}$$

$\Rightarrow 252-2x = x$

$\Rightarrow 3x = 252 \Rightarrow x = 84$

$\therefore$ Smaller number $= 124-84 = 40$

$\therefore$ Difference $= 84-40 = 44$

31. (4) Let x be subtracted from each term of $\frac{15}{19}$.

$$\therefore \frac{15-x}{19-x} = \frac{3}{4}$$

$\Rightarrow 57-3x = 60-4x$

$\Rightarrow x = 3$

32. (1) Numbers are x and y

$\therefore x+y = 25$

$x-y = 20$

On adding,

$2x = 45$

$$\Rightarrow x = \frac{45}{2} = 22.5$$

From equation (i),

$22.5+y = 25$

$\Rightarrow y = 25-22.5 = 2.5$

$\therefore$ Required ratio $= 22.5 : 2.5 = 9:1$

33. (1) $\therefore$ Ratio of numbers $= 2:3$

Sum of ratios $= 2+3 = 5$

$$\therefore \text{First number} = \frac{2}{5} \times 125 = 50$$

$$\text{Second number} = \frac{3}{5} \times 125 = 75$$

34. (3) Numbers $= 2x$, $3x$ and $5x$,

According to question,

$(2x)^2+(3x)^2+(5x)^2 = 608$

$\Rightarrow 4x^2+9x^2+25x^2 = 608$

$\Rightarrow 38x^2 = 608$

$$\Rightarrow x^2 = \frac{608}{38} = 16$$

$\Rightarrow x = \sqrt{16} = 4$

$\therefore$ Numbers $\Rightarrow 2x = 2 \times 4 = 8$

$3x = 3 \times 4 = 12$

$5x = 5 \times 4 = 20$

35. (1) Numbers $= 7x$ and $9x$ (let)

According to the question,

$7x \times 9x = 1575$

$$\Rightarrow x^2 = \frac{1575}{7 \times 9} = 25$$

$\Rightarrow x = \sqrt{25} = 5$

$\therefore$ Larger number $= 9x$

$= 9 \times 5 = 45$

36. (2) Let $A = 4x$ and $B = 5x$.

According to the question,

$(5x)^2-(4x)^2 = 81$

$\Rightarrow 25x^2-16x^2 = 81$

$\Rightarrow 9x^2 = 81 \Rightarrow x^2 = 9$

$\Rightarrow x = \sqrt{9} = 3$

$\therefore A = 4x = 4 \times 3 = 12$

37. (3) Let the numbers be $2x$ and $3x$ respectively.

According to the question,

$$\frac{2x+8}{3x+8} = \frac{3}{4}$$

$\Rightarrow 9x+24 = 8x+32$

$\Rightarrow 9x-8x = 32-24 = 8$

$\Rightarrow x = 8$

$\therefore$ Sum of numbers $= 2x+3x$

$= 5x$

$= 5 \times 8 = 40$

38. (1) Numbers $= 5x$ and $8x$

According to the question,

$8x-5x = 48$

$\Rightarrow 3x = 48 \Rightarrow x = 16$

$\therefore$ Smaller number $= 5x$

$= 5 \times 16 = 80$

TYPE-VI

1. (3) Let the numbers be $4x$ and $5x$.

Their LCM $= 20x$

According to the question,

$20x = 180$

$$\Rightarrow x = \frac{180}{20} = 9$$

$\therefore$ Smaller number

$= 4x = 4 \times 9 = 36$

2. (4) If the numbers be $3x$ and $4x$, then their LCM $= 12x$

$$\therefore 12x = 180 \Rightarrow x = \frac{180}{12} = 15$$

$\therefore$ First number $= 3x = 45$

3. (1) Let the numbers be $3x$ and $5x$.

$\therefore$ LCM $= 15x$

$$\therefore 15x = 225 \Rightarrow x = \frac{225}{15} = 15$$

$\therefore$ Smaller number

$= 3x = 3 \times 15 = 45$

4. (2) Let the numbers be $3x$ and $4x$.

$\therefore$ LCM $= 12x$

$\therefore 12x = 48 \Rightarrow x = 4$

$\therefore$ Sum of numbers $= 7x$

$= 7 \times 4 = 28$

5. (3) Numbers are : $3x$ and $4x$

Their LCM $= 12x$

$\therefore 12x = 120$

$$\Rightarrow x = \frac{120}{12} = 10$$

$\therefore$ Sum of numbers $= 3x+4x$

$= 7x = 7 \times 10 = 70$

6. (1) Let the numbers be $3x$ and $4x$.

Their HCF $= x = 15$

$\therefore$ Sum of numbers $= 3x+4x =$

$7x = 15 \times 7 = 105$

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TYPE-VII

1. (3) Let A and B have ₹ 2x and ₹ x initially.

$\therefore 2x-2 = x+2$

$\Rightarrow x = 4$

$\therefore$ Initial amount with A = ₹ 8

$\therefore$ Initial amount with B = ₹ 4.

2. (1) Total numbers of girls in the school

$$= 504 \times \frac{11}{13+11}$$

$$= 504 \times \frac{11}{24} = 231$$

Total numbers of boys in the school

$$= 504 \times \frac{13}{13+11}$$

$$= 504 \times \frac{13}{29} = 273$$

Now, total no. of girls when 12 more girls are admitted

$= 231 + 12 = 243$

$\therefore$ Required ratio

$= 273 : 243 = 91 : 81$

3. (3) Let the numbers be $\frac{3}{2}x$ and $\frac{8}{3}x$

According to question,

$$\frac{\frac{3}{2}x+15}{\frac{8x}{3}+15} = \frac{\frac{5}{3}}{\frac{5}{2}}$$

$$\Rightarrow \frac{\frac{3x+30}{2}}{\frac{8x+45}{3}} = \frac{2}{3}$$

$$\Rightarrow \frac{3(3x+30)}{2(8x+45)} = \frac{2}{3}$$

$$\Rightarrow \frac{9x+90}{16x+90} = \frac{2}{3}$$

$\Rightarrow 27x + 270 = 32x + 180$

$\Rightarrow 32x - 27x = 270 - 180 = 90$

$\Rightarrow 5x = 90 \Rightarrow x = 18$

$\therefore$ The greater number

$$= \frac{8}{3}x = \frac{8}{3} \times 18 = 48$$

4. (3) Let the number of students in three classes be 2x, 3x and 5x respectively.

Due to increase of 40 students in each class, we have

$$\frac{2x+40}{3x+40} = \frac{4}{5}$$

$\Rightarrow 10x + 200 = 12x + 160$

$\Rightarrow 2x = 200 - 160 \Rightarrow 2x = 40$

$\Rightarrow x = 20$

$\therefore$ Original strength

$= 10x = 10 \times 20 = 200$

5. (2) Let the numbers be 5x and 7x.

Now, $\frac{5x-9}{7x-9} = \frac{7}{11}$

$\Rightarrow 11(5x-9) = 7(7x-9)$

$\Rightarrow 55x - 99 = 49x - 63$

$\Rightarrow 55x - 49x = 99 - 63$

$\Rightarrow 6x = 36$

$\Rightarrow x = 6$

$\therefore$ Required difference

$= 7x - 5x = 2x = 2 \times 6 = 12$

6. (2) Let the numbers be 3x and 5x.

$$\therefore \frac{3x-9}{5x-9} = \frac{12}{23}$$

$\Rightarrow 69x - 60x = 207 - 108$

$$\Rightarrow x = \frac{99}{9} = 11$$

$\therefore$ The smaller number

$= 3x = 33$

7. (3) Let the original number of boys and girls be x and y respectively.

Then

$$\frac{x}{y-15} = \frac{2}{1}$$

$\Rightarrow x = 2y - 30$ ....(i)

Again, $\frac{x-45}{y-15} = \frac{1}{5}$

$\Rightarrow 5x - 225 = y - 15$

$\Rightarrow 5x = y - 15 + 225$

$\Rightarrow 5(2y-30) = y + 210$ [From equation (i)]

$\Rightarrow 10y - 150 = y + 210$

$\Rightarrow 10y - y = 210 + 150$

$\Rightarrow 9y = 360$

$$\Rightarrow y = \frac{360}{9} = 40$$

8. (3) Let the original number of students in three classes be 2x, 3x and 5x respectively.

As given,

$$\frac{2x+20}{3x+20} = \frac{4}{5}$$

$\Rightarrow 10x + 100 = 12x + 80$

$\Rightarrow 12x - 10x = 100 - 80$

$\Rightarrow 2x = 20$

$$\Rightarrow x = \frac{20}{2} = 10$$

$\therefore$ Total number of students originally

$= 2x + 3x + 5x = 10x$

$= 10 \times 10 = 100$

9. (1) Number of boys

$$= \frac{13}{13+11} \times 504$$

$$= \frac{13}{24} \times 504 = 273$$

Number of girls

$= 504 - 273 = 231$

3 girls are admitted.

$\therefore$ Required ratio = 273 : 234

$= 7 : 6$

10. (3) Let the number of ladies and gents be 3x and 2x respectively.

According to the question,

$$\frac{3x}{2x+20} = \frac{2}{3}$$

$\Rightarrow 9x = 4x + 40 \Rightarrow 5x = 40$

$\Rightarrow x = 8$

$\therefore$ Number of ladies = 3x

$= 3 \times 8 = 24$

11. (4) Initially number of boys

$$= \frac{8}{8+5} \times 286 = \frac{8}{13} \times 286 = 176$$

$\therefore$ Number of girls

$$= \frac{5}{13} \times 286 = 110$$

22 more girls get admitted.

$\therefore$ Required ratio

$$= \frac{176}{110+22} = \frac{176}{132} = \frac{4}{3} = 4 : 3$$

12. (1) Let the original number of students be 2x, 3x and 4x in three class.

According to the question,

$$\frac{2x+12}{3x+12} = \frac{8}{11}$$

$\Rightarrow 24x + 96 = 22x + 132$

$\Rightarrow 2x = 132 - 96 = 36$

$$\Rightarrow x = \frac{36}{2} = 18$$

$\therefore$ Original number of students

$= 2x + 3x + 4x$

$= 9x = 9 \times 18 = 162$

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13. (4) Let the required number be x.

$\therefore \frac{7+x}{11+x}=\frac{3}{4}$

$\Rightarrow 28+4x=33+3x$

$\Rightarrow x=33-28=5$

14. (2) Let the numbers be $7x$ and $11x$ respectively.

$\therefore \frac{7x+7}{11x+7}=\frac{2}{3}$

$\therefore 22x+14=21x+21$

$\Rightarrow x=7$

$\therefore$ Smaller number

$=7x=7\times7=49$

15. (3) Let the numbers be $3x$ and $5x$.

$\therefore \frac{3x+10}{5x+10}=\frac{5}{7}$

$\Rightarrow 25x+50=21x+70$

$\Rightarrow 4x=20$

$\Rightarrow x=5$

$\therefore$ Smaller number $=3x$

$=3\times5=15$

16. (1) Let the numbers be $2x$ and $3x$.

$\therefore \frac{2x+4}{3x+4}=\frac{5}{7}$

$\therefore 15x+20=14x+28$

$\Rightarrow x=28-20=8$ = Required difference

17. (4) Let the number x be added.

$\therefore \frac{17+x}{24+x}=\frac{1}{2}$

$\Rightarrow 34+2x=24+x$

$\Rightarrow 2x-x=24-34$

$\Rightarrow x=-10$

Hence, 10 should be subtracted.

18. (3) Let the numbers be $4x$ and $7x$.

$\therefore \frac{4x+4}{7x+4}=\frac{3}{5}$

$\Rightarrow 21x+12=20x+20$

$\Rightarrow 21x-20x=20-12$

$\Rightarrow x=8$

$\therefore$ Larger number

$=7x=7\times8=56$

19. (2) Let the original number of students be $4x$, $6x$ and $9x$.

$\therefore \frac{4x+12}{6x+12}=\frac{7}{9}$

$\Rightarrow 42x+84=36x+108$

$\Rightarrow 42x-36x=108-84$

$\Rightarrow 6x=24$

$\Rightarrow x=4$

$\therefore$ Required number of students

$=19x=19\times4=76$

20. (3) In the first case,

$\text{Boys}=660\times\frac{13}{22}=390$

$\text{Girls}=660\times\frac{9}{22}=270$

If x boys leave the school, then

$\frac{390-x}{270+30}=\frac{6}{5}$

$\Rightarrow 390-x=360$

$\Rightarrow x=390-360=30$

21. (1) Tricky Approach

Required ratio

$=15\times22:11\times25=6:5$

22. (3) According to the question,

$\frac{3x-9}{5x-9}=\frac{12}{23}$

(Numbers = $3x$ and $5x$)

$\Rightarrow 69x-207=60x-108$

$\Rightarrow 9x=207-108=99$

$\Rightarrow x=11$

$\therefore$ Required numbers $\Rightarrow 3\times11=33$ and $5\times11=55$

23. (4) Numbers = x, $2x$ and $3x$

$\therefore \frac{x+5}{2x+5}=\frac{2}{3}$

$\Rightarrow 4x+10=3x+15$

$\Rightarrow x=5$

$\Rightarrow$ Numbers = 5, 10 and 15

24. (1) Marks in English $=2x$

Marks in Maths $=3x$

Marks in Science $=x$

$\therefore x+2x+3x=180$

$\Rightarrow 6x=180\Rightarrow x=30$

25. (2) Required number $=x$

$\therefore \frac{11-x}{15-x}=\frac{2}{3}$

$\Rightarrow 33-3x=30-2x$

$\Rightarrow 3x-2x=33-30$

$\Rightarrow x=3$

26. (2) Numbers = $3x$ and $5x$ (let)

According to question,

$\frac{3x-9}{5x-9}=\frac{12}{23}$

$\Rightarrow 69x-207=60x-108$

$\Rightarrow 69x-60x=207-108$

$\Rightarrow 9x=99\Rightarrow x=\frac{99}{9}=11$

$\therefore$ Smaller number $=3x$

$=3\times11=33$

27. (4) According to the question,

Sum of remaining two numbers

$=11\times36-9\times34$

$=396-306=90$

Ratio of the remaining two numbers $=2:3$

$\therefore$ Smaller number

$=\frac{2}{5}\times90=36$

TYPE-VIII

1. (1) Weight of zinc

$=200\times\frac{5}{8}=125$ gram

Weight of copper

$=200\times\frac{3}{8}=75$ gram.

Let the ratio of 125 gram zinc and x gram copper be 3 : 5

$\therefore \frac{125}{x}=\frac{3}{5}$

$\therefore x=\frac{125\times5}{3}=\frac{625}{3}$ gram

$\because$ Addition of copper in mixture

$=\frac{625}{3}-75=\frac{625-225}{3}$

$=\frac{400}{3}=133\frac{1}{3}$ gram.

2. (3) $\because$ In 20 gm of brass, quantity of zinc = 7gm

$\therefore$ In 100 gm of brass, quantity of zinc $=7\times5=35$ gm.

3. (4) In 30 litres of mixture,

$\text{Acid}=\frac{2}{5}\times30=12$ litres

$\text{Water}=\frac{3}{5}\times100=18$ litres

$\therefore \frac{12}{18+x}=\frac{2}{5}$

$\Rightarrow 60=36+2x$

$\Rightarrow 2x=60-36=24$

$\Rightarrow x=12$ litres of water.

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4. (1) Weight of copper in 17kg 500 gm i.e. 17500 gm of alloy

$= \frac{5}{7} \times 17500 = 12500$ gm

Weight of zinc = (17500 – 12500) = 5000 gm

1250 gm of zinc is mixed in alloy.

∴ Total weight of zinc = 1250 + 5000 = 6250 gm.

∴ Required ratio = 12500 : 6250 = 2 : 1

5. (1) In the new vessel, we have.

Sulphuric acid

$= \frac{3}{5} + \frac{7}{10} + \frac{11}{15}$

$= \frac{18+21+22}{30} = \frac{61}{30}$

Water $= \frac{2}{5} + \frac{3}{10} + \frac{4}{15}$

$= \frac{12+9+8}{30} = \frac{29}{30}$

∴ Sulphuric acid : Water

$= \frac{61}{30} : \frac{29}{30} = 61 : 29$

6. (2) Let the quantity of additional milk added = x litres

In the mixture of 200 litres,

Quantity of milk $= \frac{17}{20} \times 200$

= 170 litres

Quantity of water = 30 litres

According to the question,

$\frac{170+x}{30} = \frac{7}{1}$

$\Rightarrow 170 + x = 210$

$\Rightarrow x = 210 - 170$

= 40 litres

7. (3) Let A = $7x$ litre, B = $5x$ litre

In 9 litres of mixture,

$A = \frac{7x}{12x} \times 9 = \frac{21}{4}$ litres

$B = \frac{5x}{12x} \times 9 = \frac{15}{4}$ litres

In new situation,

$\frac{7x - \frac{21}{4}}{5x - \frac{15}{4} + 9} = \frac{7}{9}$

$\Rightarrow \frac{28x - 21}{20x - 15 + 36} = \frac{7}{9}$

$\Rightarrow 252x - 189 = 140x + 147$

$\Rightarrow 112x = 336 \Rightarrow x = 3$

∴ Initial quantity of liquid A = $7x = 7 \times 3 = 21$ litres

8. (3) Let Liquid A = $7x$ litres

Liquid B = $5x$ litres

In 9 litres,

$A = \frac{7}{12} \times 9 = \frac{21}{4}$ litres

$B = \frac{5}{12} \times 9 = \frac{15}{4}$ litres

$\therefore 7x - \frac{21}{4} = 5x - \frac{15}{4} + 9$

$\Rightarrow 2x = \frac{21}{4} - \frac{15}{4} + 9$

$\Rightarrow 2x = \frac{21 - 15 + 36}{4} = \frac{42}{4}$

$\Rightarrow x = \frac{21}{4}$

$\therefore$ Liquid A $= 7 \times \frac{21}{4}$

$= \frac{147}{4} = 36\frac{3}{4}$ litre

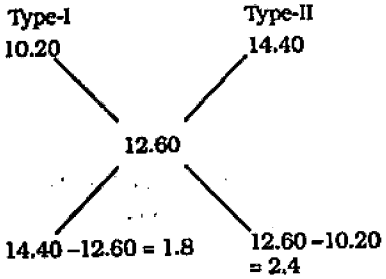
9. (1) Gold $= \frac{7}{9} : \frac{7}{18} = \frac{14}{18} : \frac{7}{18}$

∴ Gold in new mixture = 14 + 7 = 21

and copper = 18 × 2 – 21 = 36 – 21 = 15

∴ Required ratio = 21 : 15 = 7 : 5

10. (4)



∴ Required ratio = 1.8 : 2.4 = 18 : 24 = 3 : 4

11. (4) Let the amount of water be x litres.

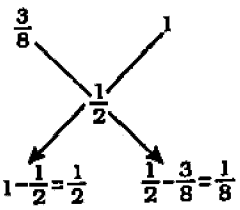
Then, $\frac{x+3}{x} = \frac{3}{2}$

or $2x + 6 = 3x$

or $x = 6$

∴ The quantity of spirit in the mixture = $x + 3 = 6 + 3 = 9$ litres

12. (3)

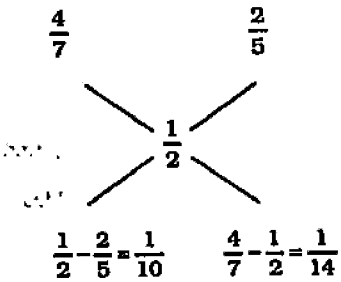


Ratio = 4 : 1

∴ Required quantity = $\frac{1}{5}$

13. (1)

Mixture -I Mixture – II



∴ Required ratio

$= \frac{1}{10} : \frac{1}{14} = 7 : 5$

14. (3) Amount of milk left = Initial amount ×

$\left(1 - \frac{\text{Amount taken out in each operation}}{\text{Initial amount}}\right)$

$= 60\left(1 - \frac{6}{60}\right)^3$

$= 60\left(1 - \frac{1}{10}\right)^3$

$= 60 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10}$

= 43.74 kg.

15. (2) Required ratio

$= \left(\frac{2}{3} + \frac{3}{5} + \frac{5}{8}\right) : \left(\frac{1}{3} + \frac{2}{5} + \frac{3}{8}\right)$

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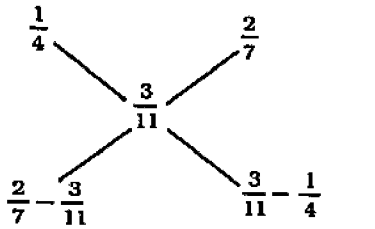
$= \left(\frac{80+72+75}{120}\right) :$

$\left(\frac{40+48+45}{120}\right)$

$= 227 : 133$

16. (2) By rule of alligation,

Alloy-I (copper) Alloy-II (Copper)



Required ratio

$= \frac{1}{77} : \frac{1}{44} = 4:7$

17. (4) In original mixture,

Alcohol = $4x$ litres

Water = $3x$ litres

On adding 5 litres of water,

$\frac{4x}{3x+5} = \frac{4}{5}$

$\Rightarrow 20x = 12x + 20$

$\Rightarrow 8x = 20$

$\Rightarrow x = \frac{20}{8} = \frac{5}{2}$

$\Rightarrow$ Quantity of alcohol

$= 4x = 4 \times \frac{5}{2}$

$= 10$ litres

18. (4) In 7 kg of alloy A,

Zinc = 5 kg, Tin = 2 kg

In 21 kg of alloy B

Zinc $= \frac{21 \times 3}{7} = 9$ kg

Tin $= \frac{21 \times 4}{7} = 12$ kg

$\therefore$ Required ratio

$= (5 + 9) : (2 + 12) = 14 : 14$

or $1 : 1$

19. (1) In 400 gm of alloy,

Zinc $= \frac{5}{8} \times 400 = 250$ gm.

Copper $= \frac{3}{8} \times 400 = 150$ gm.

If x gm of copper be mixed, then

$\frac{250}{150+x} = \frac{5}{4}$

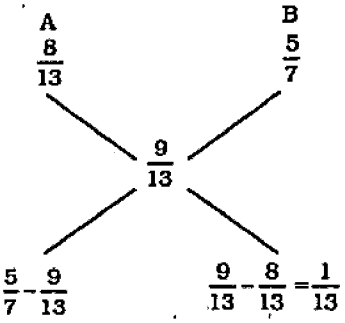
$\Rightarrow 750 + 5x = 1000$

$\Rightarrow 5x = 1000 - 750 = 250$

$\Rightarrow x = 50$ gm.

20. (4) Milk in the resulting mixture

$= \frac{9}{13}$



$= \frac{65-63}{7 \times 13} = \frac{2}{7 \times 13}$

$\therefore$ Required ratio

$= \frac{2}{7 \times 13} : \frac{1}{13}$

$= 2 : 7$

21. (1) Quantity of milk in 30 litre mixture $= \frac{30}{10} \times 7 = 21$ litres

Quantity of water

$= \frac{30}{10} \times 3 = 9$ litres

Suppose x litres more water is added.

According to question,

$\frac{21}{9+x} = \frac{3}{7}$

$\Rightarrow 9 + x = 49$

$\Rightarrow x = 40$ litres

22. (2) Let the barrel contain 4 litres of mixture.

$\therefore$ Wine = 3 litres

Water = 1 litre

Let x litre mixture is taken out.

$\therefore$ Wine in $(4 - x)$ litres mixture

$= \frac{3}{4}(4 - x)$

On adding x litres water, water in mixture

$= (4 - x) \times \frac{1}{4} + x$

$= 1 - \frac{x}{4} + x$

$= \frac{4 - x + 4x}{4} = \frac{4 + 3x}{4}$

$\therefore \frac{3}{4}(4 - x) = \frac{4 + 3x}{4}$

$\Rightarrow 3 - \frac{3x}{4} = 1 + \frac{3x}{4}$

$\Rightarrow 2 = \frac{6x}{4}$

$\Rightarrow x = \frac{2 \times 4}{6} = \frac{4}{3}$

$\therefore$ Required answer

$= \frac{\frac{4}{3}}{4} = \frac{1}{3}$

23. (4) Quantity of milk in the last

$= 81\left(1 - \frac{27}{81}\right)^2 = 81\left(1 - \frac{1}{3}\right)^2$

$= 81 \times \frac{2}{3} \times \frac{2}{3} = 36$

Quantity of water in the last

$= 81 - 36 = 45$

$\therefore$ Ratio $= \frac{36}{45} = \frac{4}{5} = 4 : 5$

24. (4) Quantity of milk

$= \frac{7}{10} \times 80 = 56$ litres

Quantity of water

$= \frac{3}{10} \times 80 = 24$ litres

Let x litre water be added

Then, $\frac{56}{24+x} = \frac{2}{1}$

$\Rightarrow 24 + x = 28$

$x = 4$ litres

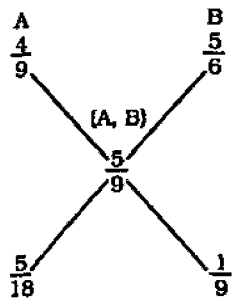
25. (3) First of all we write the fraction of milk present in three mixtures.

In A; $\frac{4}{9}$ and In B; $\frac{5}{6}$

In combination of A and B; $\frac{5}{9}$

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From alligation rule,



$= \frac{5}{18} : \frac{1}{9}$

$\Rightarrow \frac{5}{18} : \frac{2}{18} \Rightarrow 5 : 2$

So, ratio of
A : B = 5 : 2

26. (2) Let the quantity of milk in the mixture = $7x$ litres and that of water = $5x$ litres.
According to the question,

$$\frac{7x}{5x+15} = \frac{7}{8}$$

$\Rightarrow 56x = 35x + 105$
$\Rightarrow 56x - 35x = 105$
$\Rightarrow 21x = 105$

$\Rightarrow x = \frac{105}{21} = 5$

$\therefore$ Required quantity of water
$= (5x + 15)$ litres
$= 5 \times 5 + 15 = 40$ litres

27. (1) Quantity of milk in 729 litres of mixture

$= \frac{7}{9} \times 729 = 567$ litres

$\therefore$ Quantity of water
$= (729 - 567)$ litres $= 162$ litres.
Let x litres of water is mixed to get the required ratio of 7 : 3

$\therefore \frac{567}{162 + x} = \frac{7}{3}$

$\Rightarrow 7x + 1134 = 1701$
$\Rightarrow 7x = 1701 - 1134 = 567$

$\Rightarrow x = \frac{567}{7} = 81$ litres

28. (3) In 40 litres mixture,
Quantity of milk

$= \frac{7}{8} \times 40 = 35$ litres

Quantity of water = 5 litres
Let x litres of water be mixed

$\therefore \frac{35}{5 + x} = \frac{3}{1}$

$\Rightarrow 3x + 15 = 35$
$\Rightarrow 3x = 20$

$\Rightarrow x = \frac{20}{3} = 6\frac{2}{3}$ litres

29. (4) Let the initial quantity of liquids A and B in the jar be $4x$ and x litres respectively.
After taking out 10 litres of the mixture,
Liquid A

$= 4x - \frac{4}{5} \times 10 = (4x - 8)$ litres

Liquid B

$= 4x - \frac{1}{5} \times 10 = (4x - 2)$ litres

After pouring 10 litres of liquid B,

$$\frac{4x - 8}{4x - 2 + 10} = \frac{2}{3}$$

$\Rightarrow 12x - 24 = 8x + 16$
$\Rightarrow 4x = 40$

$\Rightarrow x = \frac{40}{4} = 10$

$\therefore$ Quantity of liquid A = $4x$
$= 4 \times 10 = 40$ litres

30. (3) In 75 litres of the mixture,

Milk = $\frac{2}{3} \times 75 = 50$ litres

Water = $\frac{1}{3} \times 75 = 25$ litres

Let x litres of water be added.
Then,

$$\frac{50}{x + 25} = \frac{1}{2}$$

$\Rightarrow x + 25 = 100$
$\Rightarrow x = 75$ litres

31. (3) Let 1 kg of each of the alloys A and B be mixed together.
In alloy A,

Quantity of gold = $\frac{5}{8}$ kg.

Quantity of copper = $\frac{3}{8}$ kg.

In alloy B,

Quantity of gold = $\frac{5}{16}$ kg.

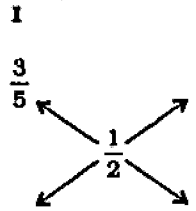
Quantity of copper = $\frac{11}{16}$ kg.

$\therefore$ Required ratio

$= \left(\frac{5}{8} + \frac{5}{16}\right) : \left(\frac{3}{8} + \frac{11}{16}\right)$

$= \frac{15}{16} : \frac{17}{16} = 15 : 17$

32. (1) By the rule of alligation,



$\frac{1}{2} - \frac{4}{9} = \frac{1}{18}$ $\quad \frac{3}{5} - \frac{1}{2} = \frac{6 - 5}{10} = \frac{1}{10}$

$\therefore$ Required ratio = $\frac{1}{18} : \frac{1}{10} = 5 : 9$

$= 3 : \frac{9}{5} \times 3 = 3 : 5\frac{2}{5}$

$\therefore 5\frac{2}{5}$ litre must be added

33. (2) In the original mixture,
water = 60 cc
Glycerine = 180 cc
Let x cc of water be mixed.

$\therefore \frac{60 + x}{180} = \frac{2}{3}$

$\Rightarrow 180 + 3x = 360$
$\Rightarrow 3x = 360 - 180 = 180$

$\therefore x = \frac{180}{3} = 60$ cc

34. (4) Let the quantity of acid in original mixture be x litre and that of water be $3x$ litres.

$\therefore \frac{x + 5}{3x} = \frac{1}{2}$

$\Rightarrow 2x + 10 = 3x$
$\Rightarrow x = 10$
$\therefore$ Quantity of new mixture
$= 4x + 5 = 45$ litres

35. (1) In 25 litres of mixture,

Acid = $\frac{4}{5} \times 25 = 20$ litres

Water = 5 litres.
After adding 3 litres of water, quantity becomes 8 litres
$\therefore$ New ratio = 20 : 8 = 5 : 2

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36. (4) Let the capacity of each vessel =1 litre

In First Vessel

Water = $\frac{3}{7}$ litre

Milk = $\frac{4}{7}$ litre

In Second Vessel

Water = $\frac{5}{8}$ litre

Milk = $\frac{3}{8}$ litre

In 2 litres of mixture,
Water : milk

$= \frac{3}{7}+\frac{5}{8} : \frac{4}{7}+\frac{3}{8}$

$= \frac{24+35}{56} : \frac{32+21}{56} = 59 : 53$

37. (1) Quantity of gold in 1 kg of alloy 'A' = $\frac{7}{29}$

Quantity of gold in 1kg of alloy 'B' = $\frac{21}{58}$

Quantity of gold in 1 kg of alloy 'C' = $\frac{25}{87}$

∴ Required ratio

$= \left(\frac{21}{58}-\frac{25}{87}\right) : \left(\frac{25}{87}-\frac{7}{29}\right)$

$= \frac{63-50}{174} : \frac{25-21}{87}$

$= \frac{13}{174} : \frac{4}{87} = 13 : 8$

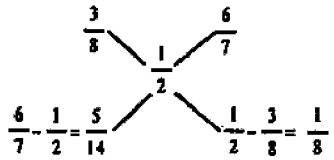
38. (1) In glass I

Milk = $\frac{3}{8}$, water = $\frac{5}{8}$

In glass II,

Milk = $\frac{6}{7}$, water = $\frac{1}{7}$

By Alligation rule,



∴ Required ratio

$= \frac{5}{14} : \frac{1}{8} = 20 : 7$

39. (4) In original mixture,
Milk = 40 litres
Water = 20 litres
If x litres of water is mixed,

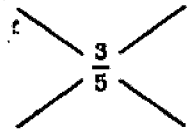
$\frac{40}{20+x} = \frac{1}{2}$

$\Rightarrow 20 + x = 80 \Rightarrow x = 60$ litres

40. (2) By alligation rule

Mixture -I Mixture – II

Acid = $\frac{4}{7}$ Acid = $\frac{5}{8}$



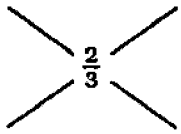
$\frac{5}{8}-\frac{3}{5} = \frac{1}{40}$ $\frac{3}{5}-\frac{4}{7} = \frac{1}{35}$

∴ Required ratio

$= \frac{1}{40} : \frac{1}{35} = 7 : 8$

41. (1) Solution -I Solution - II

Acid = $\frac{3}{4}$ Acid $\frac{5}{8}$



$\frac{2}{3}-\frac{5}{8}$ $\frac{3}{4}-\frac{2}{3}$

$= \frac{16-15}{24} = \frac{1}{24}$ $= \frac{9-8}{12} = \frac{1}{12}$

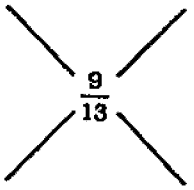
∴ Required ratio

$= \frac{1}{24} : \frac{1}{12} = 1 : 2$

42. (2) By alligation rule,

Mixture-I Mixture-II

Acid = $\frac{5}{7}$ Acid = $\frac{8}{13}$



$\frac{5}{7}-\frac{9}{13}$ $\frac{9}{13}-\frac{8}{13} = \frac{1}{13}$

$= \frac{65-63}{91} = \frac{2}{91}$

∴ Required ratio

$= \frac{2}{91} : \frac{1}{13} = 2 : 7$

43. (3) In 20 litres of mixture,

Spirit = $\frac{3}{10} \times 20 = 6$ litres,

Water = 14 litres
In 36 litres of mixture

Spirit = $\frac{7}{12} \times 36 = 21$ litres

Water = 15 litres

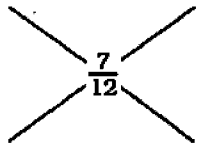
∴ Required ratio

= (21 + 6) : (14 + 15) = 27 : 29

44. (2) By Alligation Rule

Mixture-I Mixture II

Alcohol = $\frac{5}{8}$ Alcohol = $\frac{5}{9}$



$\frac{7}{12}-\frac{5}{9}$ $\frac{5}{8}-\frac{7}{12}$

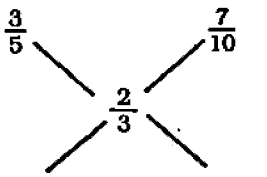
$= \frac{21-20}{36}$ $= \frac{15-14}{24}$

$= \frac{1}{36}$ $= \frac{1}{24}$

∴ Ratio = $\frac{1}{36} : \frac{1}{24} = 3 : 2$

45. (2) By Alligation Rule

Milk-I Milk-II



$\frac{7}{10}-\frac{2}{3}$ $\frac{2}{3}-\frac{3}{5} = \frac{1}{15}$

$= \frac{21-20}{30}$ $= \frac{10-9}{15}$

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$= \frac{1}{30} : \frac{1}{15}$

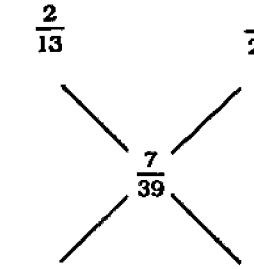
$\therefore$ Required ratio $= \frac{1}{30} : \frac{1}{15}$

$= 1 : 2$

46. (3) By Alligation Rule

Stainless Steel	I	II	III
Chromium	$\frac{2}{13}$	$\frac{5}{26}$	$\frac{7}{39}$

By Alligation Rule,



$= \frac{15-14}{78} = \frac{1}{78}$ $= \frac{7-6}{39} = \frac{1}{39}$

$\therefore$ Required ratio = 1 : 2

47. (4) 1 kg of each mixture is taken.

A $\Rightarrow$ 7 : 2 = 14 : 4

Gold $= \frac{14}{18}$; Copper $= \frac{4}{18}$

B $\Rightarrow$ 7 : 11

Gold $= \frac{7}{18}$; Copper $= \frac{11}{18}$

$\therefore$ Required ratio

$= \left(\frac{14}{18}+\frac{7}{18}\right) : \left(\frac{4}{18}+\frac{11}{18}\right)$

$= 21 : 15 = 7 : 5$

48. (3) Let the original quantity be $12x$ litres.

In 9 litres of the mixture,

Liquid A $= \frac{7}{12} \times 9 = \frac{21}{4}$ litres

Liquid B $= \frac{5}{12} \times 9 = \frac{15}{4}$ litres

According to question,

$$\frac{7x - \frac{21}{4}}{5x - \frac{15}{4} + 9} = \frac{7}{9}$$

$$\Rightarrow \frac{28x-21}{20x-15+36} = \frac{7}{9}$$

$$\Rightarrow \frac{28x-21}{20x+21} = \frac{7}{9}$$

$$\Rightarrow \frac{4x-3}{20x+21} = \frac{1}{9}$$

$\Rightarrow 36x - 27 = 20x + 21$

$\Rightarrow 36x - 20x = 21 + 27$

$\Rightarrow 16x = 48$

$\Rightarrow x = 3$

Original quantity of liquid A

$= 7x = 7 \times 3 = 21$ litres

49. (3) Milk in first vessel

$= \frac{5}{8} = 0.625$

Milk in second vessel

$= \frac{2}{3} = 0.66$

Milk in third vessel $= \frac{3}{5} = 0.6$

Milk in fourth vessel

$= \frac{7}{11} = 0.636$

50. (2) Let x kg of nickel be mixed.

$\therefore \frac{20+x}{100+x} = \frac{3}{11}$

$\Rightarrow 220 + 11x = 300 + 3x$

$\Rightarrow 11x - 3x = 300 - 220$

$\Rightarrow 8x = 80$

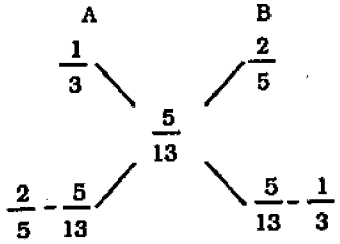
$\Rightarrow x = 10$ kg.

51. (1) In first alloy, zinc $= \frac{1}{3}$

In second alloy, zinc $= \frac{2}{5}$

In the new alloy, zinc $= \frac{5}{13}$

By the rule of Alligation,



$\therefore$ Required ratio

$= \left(\frac{2}{5}-\frac{5}{13}\right) : \left(\frac{5}{13}-\frac{1}{3}\right)$

$= \frac{26-25}{65} : \frac{15-13}{39}$

$= \frac{1}{65} : \frac{2}{39} = \frac{1}{5} : \frac{2}{3} = 3 : 10$

52. (4) Let x litres of liquid P be mixed to 7 litres of liquid Q.

According to the question,

$$x \times \frac{10}{7} + \frac{5}{7} \times 7 = x + 7$$

$$\Rightarrow \frac{10x}{7} + 5 = x + 7$$

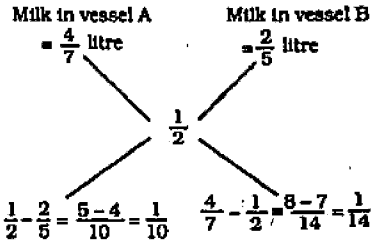
$\Rightarrow 10x + 35 = 7x + 49$

$\Rightarrow 10x - 7x = 49 - 35$

$\Rightarrow 3x = 14$

$\Rightarrow x = \frac{14}{3} = 4\frac{2}{3}$ litres

53. (1) By the rule of alligation,



$\therefore$ Required ratio $= \frac{1}{10} : \frac{1}{14}$

$= 14 : 10 = 7 : 5$

54. (4) Capacity of each container $= x$ litre (let)

In first container,

Milk $= \frac{3x}{4}$ litres,

Water $= \frac{x}{4}$ litres

In second container,

Milk $= \frac{5x}{7}$ litres,

Water $= \frac{2x}{7}$ litres

On mixing both,

Quantity of milk $= \frac{3x}{4} + \frac{5x}{7}$

$= \frac{21x+20x}{28} = \frac{41x}{28}$ litres

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Quantity of water = $\frac{x}{4}+\frac{2x}{7}$

$=\frac{7x+8x}{28}$ litres $=\frac{15x}{28}$ litres

∴ Required ratio

$=\frac{41x}{28}:\frac{15x}{28}=41:15$

55. (4) Let the volume of each glass be = x litres.

∴ Required ratio

= Alcohal : water

$=\left(\frac{2x}{3}+\frac{3x}{5}\right):\left(\frac{x}{3}+\frac{2x}{5}\right)$

$=\left(\frac{10x+9x}{15}\right):\left(\frac{5x+6x}{15}\right)$

= 19 : 11

56. (4) Quantity of remaining acid

= Initial quantitly

$\left(1-\frac{\text{Quantity taken out}}{\text{Total initial quantity}}\right)^n$

$=10\left(1-\frac{2}{10}\right)^2=10\times\left(\frac{4}{5}\right)^2$

$=10\times\frac{4}{5}\times\frac{4}{5}=\frac{32}{5}$ litres

Required ratio $=\frac{32}{5}:10$

= 32 : 50

= 16 : 25

57. (4) G = 19W and C = 9W

Let 1 gm of gold is mixed with x gm of copper such that $(x + 1)$ gm of alloy is formed.

∴ $19W + 9Wx = (x + 1) \times 15W$

$\Rightarrow 19 + 9x = 15x + 15$

$\Rightarrow 15x - 9x = 19 - 15 \Rightarrow 6x = 4$

$\Rightarrow x=\frac{2}{3}$

∴ Gold : Copper $= 1:\frac{2}{3}$

= 3 : 2

58. (2) In 80 litres of mixture,

Milk : Water = 27 : 5

∴ Milk $\Rightarrow \frac{27}{32}\times 80$

= 67.5 litres

Water $\Rightarrow$ 80 – 67.5

= 12.5 litres

Let x litres of water is mixed.

According to question,

$\frac{67.5}{12.5+x}=\frac{3}{1}$

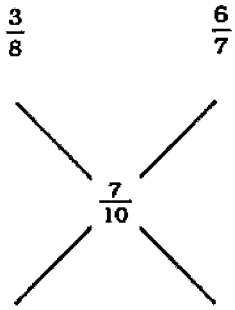
$\Rightarrow 37.5 + 3x = 67.5$

$\Rightarrow 3x = 67.5 - 37.5 = 30$

$\Rightarrow x = 10$ litres

59. (3) By the rule of alligation

liquid I in mixture I, liquid I in mixture II,



$=\frac{60-49}{70}=\frac{11}{70}$ $=\frac{28-15}{40}=\frac{13}{40}$

∴ Required ratio $=\frac{11}{70}:\frac{13}{4}$

= 11 × 4 : 13 × 7

= 44 : 91

60. (3) Remaining acid

= Initial quantity

$\left(1-\frac{\text{quantity taken out}}{\text{Original quantity}}\right)$

$=20\left(1-\frac{4}{20}\right)^2$

$=20\left(1-\frac{1}{5}\right)^2$

$=20\times\frac{4}{5}\times\frac{4}{5}$

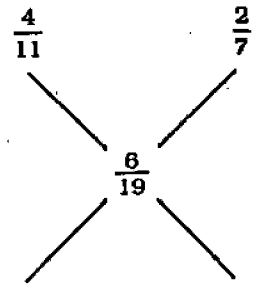
= 12. 8 litres

∴ Required ratio = 12.8 : 20

= 128 : 200 = 16 : 25

61. (1) By the rule of alligation,

Mixture I Darjeeling tea, Mixture II Darjeeling tea



$\frac{6}{19}-\frac{2}{7}$ $\frac{4}{11}-\frac{6}{19}$

$=\frac{42-38}{19\times7}$ $=\frac{76-66}{11\times19}$

$=\frac{4}{19\times7}$ $=\frac{10}{11\times19}$

∴ Required ratio

$=\frac{4}{19\times7}:\frac{10}{11\times19}$

$=\frac{4}{7}:\frac{10}{11}$

= 44 : 70 = 22 : 35

62. (2) Let quantity of first variety of tea = $4x$ kg.

Quantity of second variety of tea = $5x$ kg.

Quantity of third variety of tea = $8x$ kg.

Let y kg of third variety of tea be mixed.

∴ Resultant ratio = $(4x + 5) : (5x + 10) : (8x + y)$

$\therefore \frac{4x+5}{5x+10}=\frac{5}{7}$

$\Rightarrow 28x + 35 = 25x + 50$

$\Rightarrow 28x - 25x = 50 - 35$

$\Rightarrow 3x = 15 \Rightarrow x=\frac{15}{3}=5$

$\therefore \frac{5x+10}{8x+y}=\frac{7}{9}$

$\Rightarrow \frac{5\times5+10}{8\times5+y}=\frac{7}{9}$

$\Rightarrow \frac{35}{40+y}=\frac{7}{9}$

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$\Rightarrow 40 + y = 9 \times 5$

$\Rightarrow y = 45 - 40 = 5$ kg.

$\therefore$ Required quantity of third variety of tea

$= 8x + y = 8 \times 5 + 5 = 45$ kg.

63. (4) Let there be 3 litres, 2 litres and 1 litre of mixtures in three vessels respectively.

Vessel I

In 1 litre of mixture,

Milk $= \frac{5}{7}$ litre, water $= \frac{2}{7}$ litre

Vessel II

In 1 litre of mixture,

Milk $= \frac{4}{5}$ litre, water $= \frac{1}{5}$ litre

Vessel III

In $\frac{1}{7}$ litre of mixture,

Milk $= \frac{4}{5} \times \frac{1}{7} = \frac{4}{35}$ litre

Water $= \frac{1}{35}$ litre

In new vessel,

Mixture $= 1 + 1 + \frac{1}{7}$

$= 2 + \frac{1}{7} = \frac{14+1}{7} = \frac{15}{7}$ litres

Water $= \frac{2}{7} + \frac{1}{5} + \frac{1}{35}$

$= \frac{10+7+1}{35} = \frac{18}{35}$ litre

Required percentage

$= \frac{\frac{18}{35}}{\frac{15}{7}} \times 100$

$= \frac{18}{35} \times \frac{7}{15} \times 100 = 24\%$

64. (1) In 729 ml of mixture,

Milk $= \frac{7}{9} \times 729 = 567$ ml

Water $= \frac{2}{9} \times 729 = 162$ ml.

Let x ml of water be mixed.

$\therefore \frac{567}{162 + x} = \frac{7}{3}$

$\Rightarrow 162 \times 7 + 7x = 567 \times 3$

$\Rightarrow 1134 + 7x = 1701$

$\Rightarrow 7x = 1701 - 1134 = 567$

$\Rightarrow x = \frac{567}{7} = 81$ ml.

65. (2) Let 3kg of first alloy and 4 kg of second alloy be mixed together.

$\therefore$ In 3 kg of mixture,

Tin = 1 kg.

Iron = 2 kg.

In 4 kg of mixture,

Tin $= \frac{2}{5} \times 4 = \frac{8}{5} = 1.6$ kg.

Iron $= \frac{3}{5} \times 4 = \frac{12}{5} = 2.4$ kg.

$\therefore$ Required ratio

$= (1 + 1.6) : (2 + 2.4) = 2.6 : 4.4$

$= 13 : 22$

66. (2) Let each vessel contain 1 litre of mixture.

$\therefore$ Total quantity of milk

$= \frac{6}{7} + \frac{5}{7} + \frac{3}{4}$

$= \frac{24+20+21}{28} = \frac{65}{28}$ litre

Total quantity of water

$= \frac{1}{7} + \frac{2}{7} + \frac{1}{4}$

$= \frac{4+8+7}{28} = \frac{19}{28}$ litre

$\therefore$ Required ratio $= \frac{65}{28} : \frac{19}{28}$

$= 65 : 19$

67. (2) In 60 kg of alloy A,

Lead $= \frac{3}{5} \times 60 = 36$ kg.

Tin $= \frac{2}{5} \times 60 = 24$ kg.

In 100 kg of alloy B,

Tin $= \frac{1}{5} \times 100 = 20$ kg.

In 160 kg of new alloy,

Tin = 24 + 20 = 44 kg.

68. (2) Let the capacity of each glass be 1 litre.

On mixing all three mixtures together,

Acid $\Rightarrow \frac{2}{5} + \frac{3}{7} + \frac{4}{9}$

$= \frac{126+135+140}{315}$

$= \frac{401}{315}$ litre

Water $\Rightarrow \frac{3}{5} + \frac{4}{7} + \frac{5}{9}$

$= \frac{189+180+175}{315} = \frac{544}{315}$

$\therefore$ Required ratio

$= \frac{401}{315} : \frac{544}{315} = 401 : 544$

69. (3) Let 5 kg of mixture be prepared.

$\therefore$ C.P. of 5 kg of mixture

$=$ Rs. $(2 \times 35 + 3 \times 40)$

$=$ Rs. $(70 + 120)$

$=$ Rs. 190

Total S.P. of this mixture

$=$ Rs. $(46 + 4 \times 55)$

$=$ Rs. $(46 + 220) =$ Rs. 266

$\therefore$ Profit per cent

$= \left(\frac{266-190}{190}\right) \times 100$

$= \frac{7600}{190} = 40\%$

70. (3) In 20 litres of mixture,

Milk $\Rightarrow \frac{3}{4} \times 20 = 15$ litres

Water $\Rightarrow \frac{1}{4} \times 20 = 5$ litres

Let the quantity of milk added be x litres.

According to the question,

$\frac{15+x}{5} = \frac{4}{1}$

$\Rightarrow 15 + x = 4 \times 5$

$\Rightarrow x = 20 - 15 = 5$ litres

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71. (1) Quantity of milk in the mixture = $5x$ litres
Quantity of water = x litres
According to the question,
On adding 5 litres of water,

$$\frac{5x}{x+5} = \frac{5}{2}$$

$\Rightarrow 10x = 5x + 25$
$\Rightarrow 5x = 25 \Rightarrow x = 5$
$\therefore$ Required quantity of milk
$= 5 \times 5 = 25$ litres

72. (2) Remaining amount of milk = Initial quantity

$$\left(1 - \frac{\text{quantity taken out}}{\text{Initial quantity}}\right)^n$$

$$= 60\left(1 - \frac{12}{60}\right)^2$$

$$= 60\left(1 - \frac{1}{5}\right)^2$$

$$= 60 \times \frac{4}{5} \times \frac{4}{5} = 38.4 \text{ litres}$$

Quantity of water $= 60 - 38.4$
$= 21.6$ litres
$\therefore$ Required ratio
$= 38.4 : 21.6 = 16 : 9$

TYPE-IX

1. (1) Let the income of A, B and C be ₹ 3x, ₹ 7x and ₹ 4x respectively and their expenses be ₹ 4y, ₹ 3y and ₹ 5y respectively.
$\therefore 3x = 2400$
$\Rightarrow x = 800$
$\therefore 4y = 2400 - 300 = 2100$
$\Rightarrow y = 525$
$\therefore$ B's saving $= (7x - 3y)$
$=$ ₹ $(7 \times 800 - 3 \times 525)$
$=$ ₹ $(5600 - 1575)$
$=$ ₹ 4025
and C's savings $=$ ₹ $(4x - 5y)$
$=$ ₹ $(3200 - 2625) =$ ₹ 575

2. (4) Income in the second year
= ₹ 45000
Income in the first year
= ₹ 30000
Expense in the first year
= ₹ 25000
Expense in the second year
= ₹ 45000
$\therefore$ Total saving
$= 75000 - 70000 =$ ₹ 5000

3. (4) Given

$$\frac{\text{Monthly income of A}}{\text{Monthly income of B}} = \frac{5}{6}$$

$\therefore$ Monthly income of A
$= 5x$
and that of B $= 6x$ (x is a constant)
According to the question

$$\frac{5x - 1800}{6x - 1600} = \frac{3}{4}$$

$20x - 7200 = 18x - 4800$
$2x = 2400$
$\therefore x = 1200$
$\therefore$ Monthly income of B
$= 1200 \times 6 =$ ₹ 7200

4. (1) Let income of two persons be 5x and 3x.
and their expenses be 9y and 5y respectively.
Then, $5x - 9y = 1300$ ..(i)
and $3x - 5y = 900$ ..(ii)
By $9 \times$ (ii) $- 5 \times$ (i), we get
$27x - 45y = 8100$
$25x - 45y = 6500$
$- \quad + \quad -$

$2x = 1600$
$\Rightarrow x = 800$
Now, income of first person
$= 5x = 5 \times 800 =$ ₹ 4000
and that of second person
$= 3x = 3 \times 800 =$ ₹ 2400

5. (4) Let the annual income of A and B be ₹ 4x and 3x respectively. Also let their annual expenditures be ₹ $3y$ and $2y$ respectively
According to question,
$4x - 3y = 600$ ...(i)
$3x - 2y = 600$ ...(ii)
From equation (i) and (ii)
$4x - 3y = 3x - 2y \Rightarrow x = y$
From equation (i)
$4x - 3x = 600 \Rightarrow x = 600$
Annual income of A
$= 4x = 4 \times 600 =$ ₹ 2400

6. (1) Income of A = ₹ 7x ;
B = ₹ 9x and C = ₹ 12x
Expenses of A = ₹ 8y ;
B = ₹ 9y and C = ₹ 15y

$$\therefore 7x - 8y = \frac{1}{4} \times 7x$$

$$\Rightarrow 7x - \frac{7x}{4} = 8y$$

$$\Rightarrow \frac{21x}{4} = 8y \Rightarrow 21x = 32y.$$

$$\therefore \text{A's saving} = \frac{1}{4} \times 7x$$

$$= \frac{1}{4} \times \frac{32}{3} y = \frac{8}{3} y$$

B's saving $= 9x - 9y$

$$= 9 \times \frac{32}{21} y - 9y$$

$$= \frac{96y - 63y}{7}$$

$$= \frac{33y}{7}$$

C's saving $= 12x - 15y$

$$= 12 \times \frac{32}{21} y - 15y$$

$$= \frac{128y - 105y}{7}$$

$$= \frac{23y}{7}$$

$\therefore$ Required ratio

$$= \frac{8}{3} y : \frac{33}{7} y : \frac{23}{7} y$$

$= 56 : 99 : 69$

7. (3) Let the income of P and Q be ₹ $3x$ and $4x$ respectively.
Again, let their expenditures be ₹ $2y$ and $3y$ respectively.
According to the question.
$3x - 2y = 6000$ ...(i)
and $4x - 3y = 6000$ ...(ii)
From equations (i) and (ii)
$3x - 2y = 4x - 3y$
or, $4x - 3x = 3y - 2y$
or, $x = y$
From equation (i),
$\Rightarrow 3x - 2x = 6000$
$x = 6000$
The income of P = ₹ $3x$
$=$ ₹ $(3 \times 6000) =$ ₹ 18000

8. (3) Let his expenditures be ₹ $26x$ and savings be ₹ $3x$.
$\therefore 26x + 3x = 7250$
$\Rightarrow 29x = 7250$

$$\Rightarrow x = \frac{7250}{29} = 250$$

$\therefore$ Savings $= 3x =$ ₹ 750

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9. (2) Let the monthly salary of A, B & C be $2x$, $3x$ and $5x$
now, $5x - 2x = 12,000$
$\Rightarrow 3x = 12000$ or $x = 4000$
$\therefore$ Monthly salary of B $= 3 \times 4000$
$= 12,000$
$\Rightarrow$ Annual salary of B
$= 12000 \times 12 = ₹\ 144000$

10. (1) Let the income of two persons be ₹ $5x$ and ₹ $3x$ respectively and their expenditures be ₹ $9y$ and $5y$ respectively.
As given,
$5x - 9y = 2600$ ...(i)
$3x - 5y = 1800$ ...(ii)
By $5 \times$ (i) $- 9 \times$ (ii) we get
$25x - 27x = 13000 - 16200$
$\Rightarrow -2x = -3200$

$$\Rightarrow x = \frac{3200}{2} = 1600$$

$\therefore$ First person's income
$= ₹(1600 \times 5) = ₹\ 8000$
Second person's income
$= 3x = ₹\ (1600 \times 3)$
$= ₹\ 4800$

11. (3) Let the income of two persons (A and B) be ₹ $2x$ and ₹ $3x$ respectively. Again let the expenditures of A and B be ₹ $5y$ and ₹ $9y$ respectively.
$\therefore 2x - 5y = 600$ ...(i)
$3x - 9y = 600$ ...(ii)
From equations (i) and (ii),
$2x - 5y = 3x - 9y$
$\Rightarrow x = 4y$
From equation (i),
$2 \times 4y - 5y = 600$
$\Rightarrow 3y = 600$
$= y = 200$
$\therefore x = 4 \times 200 = 800$
$\therefore$ A's income $= 2x = 2 \times 800$
$= ₹\ 1600$
B's income $= 3x = 3 \times 800$
$= ₹\ 2400$

12. (3) Rice : Wheat
$= 4 \times 5 : 3 \times 6$
$= 20 : 18 = 10 : 9$
$\therefore$ Total cost of rice

$$= \frac{10}{19} \times 380 = ₹\ 200$$

13. (2) Let the income of A be ₹ $5x$ and that of B be ₹ $6x$.
According to the question,
$6x - 5x = 1100$
$\Rightarrow x = 1100$
$\therefore$ Total income $= 5x + 6x$
$= ₹\ 11x$
$= ₹\ (11 \times 1100) = ₹\ 12100$

14. (1) Let the income of A and B be ₹ $5x$ and ₹ $3x$ respectively.
Let the expenses of A, B and C be ₹ $8y$, Rs. $5y$ and ₹ $2y$ respectively. Then,
$2y = 2000$

$$\Rightarrow y = \frac{2000}{2} = 1000$$

B saves = ₹ 700
$\therefore 3x - 5y = 700$
$\Rightarrow 3x - 5 \times 1000 = 700$
$\Rightarrow 3x = 700 + 5000 = 5700$

$$\Rightarrow x = \frac{5700}{3} = 1900$$

$\therefore$ A's saving = ₹ $(5x - 8y)$
$= ₹\ (5 \times 1900 - 8 \times 1000)$
$= ₹\ (9500 - 8000) = ₹\ 1500$

15. (4) Let the income of man be ₹ $= 11x$ and his expenditure be ₹ $10x$.
$\therefore$ Savings $= x = ₹\ 9000$
$\therefore$ Monthly income of man

$$= \frac{11 \times 9000}{12} = ₹\ 8250$$

16. (1) Income of the family

$$= \frac{10}{7} \times 10500 = ₹\ 15000$$

Savings $= 15000 - 10500$
$= ₹\ 4500$

17. (2) Let the monthly income of A and B be ₹ $4x$ and ₹ $3x$ respectively and their expenditures be ₹ $3y$ and Rs. $2y$ respectively.
$\therefore 4x - 3y = 6000$
and $3x - 2y = 6000$
$\Rightarrow 4x - 3y = 3x - 2y$
$\Rightarrow x = y$
$\therefore 4x - 3y = 6000$
$\Rightarrow x = 6000$
$\Rightarrow$ A's monthly income $= 4x$
$= ₹\ 24000$

18. (2) Let A's and B's weekly income be ₹ $9x$ and ₹ $7x$ and their expenditures be ₹ $4y$ and $3y$ respectively.
Then, $9x - 4y = 200$ ...(i)
and $7x - 3y = 200$ ...(ii)
$\Rightarrow 9x - 4y = 7x - 3y$
$\Rightarrow 9x - 7x = 4y - 3y$
$\Rightarrow 2x = y$ ...(iii)
From equation (i),
$9x - 4y = 200$
$\Rightarrow 9x - 8x = 200$
$\Rightarrow x = 200$
$\therefore$ Sum of their weekly income
$= 16x = 16 \times 200 = ₹\ 3200$

19. (1) A : B $= 3 : 2 = 9 : 6$
B : C $= 3 : 2 = 6 : 4$
$\therefore$ A : B : C $= 9 : 6 : 4$

$$\therefore \frac{9x}{3} - \frac{4x}{4} = 1000$$

$\Rightarrow 3x - x = 1000$
$\Rightarrow 2x = 1000$
$\Rightarrow x = 500$
$\therefore$ B's income $= 6x = 6 \times 500$
$= ₹\ 3000$

20. (4) Let the income of A and B be ₹ $2x$ and ₹ $3x$. and their expenditures be ₹ y and ₹ $2y$ respectively.
$\therefore 2x - y = 24000$ ...(i)
and $3x - 2y = 24000$ ...(ii)
By equation (i) $\times 2 -$ (ii),
$4x - 2y - 3x + 2y = 24000$
$\Rightarrow x = 24000$
$\therefore$ A's income $= 2 \times 24000$
$= ₹\ 48000$

21. (3) Let the annual income of A and B be ₹ $4x$ and ₹ $3x$ and their income be Rs. $3y$ and Rs. $2y$. respectively.
$\therefore 4x - 3y = 60000$ ...(i)
and $3x - 2y = 60000$ ...(ii)
Clearly, $4x - 3y = 3x - 2y$
$\Rightarrow x = y$
From equation (i),
$x = 60000$
$\therefore$ A's annual income
$= 4x = 4 \times 60000$
$= ₹\ 240000$

22. (3) If the ratio of the income of A and B be $a : b$ and that of their expenses be $c : d$ and each saves ₹ x, then,

$$\text{A's income} = \frac{ax(d - c)}{ad - bc}$$

$$= \frac{9 \times 500(7 - 8)}{9 \times 7 - 8 \times 8}$$

$= 9 \times 500 = ₹\ 4500$

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23. (2) Let Annual Income of A, B and C be x, $3x$ and $7x$

$x + 7x = 800000$

$\Rightarrow 8x = 800000$

$\Rightarrow x = 100000$

$\therefore$ B's monthly income

$= \frac{100000 \times 3}{12} = ₹\ 25000$

24. (4) Amit's income = ₹ $3x$ and his expenditure = ₹ $5y$

Veeri's income = ₹ $2x$ and his expenditure = ₹ $3y$

$\therefore 3x - 5y = 2x - 3y$

$\Rightarrow x = 2y$

$\therefore 3x - 5y = 1000$

$\Rightarrow 6y - 5y = 1000 \Rightarrow y = 1000$

$\therefore x = 2000$

$\therefore$ Amit's income

$= 3x = 3 \times 2000 = ₹\ 6000$

25. (3) Income of A and B

= ₹ $6x$ and $5x$

Expenses of A and B

= ₹ $4y$ and $3y$

$\therefore 6x - 4y = 400$ ...(i)

$5x - 3y = 400$ ...(ii)

By equation (i)$\times 3$ – (ii) $\times 4$

$\Rightarrow 18x - 12y - 20x + 12y$

$= 1200 - 1600$

$\Rightarrow 2x = 400 \Rightarrow x = 200$

$\therefore$ Total income

$= 6x + 5x = 11x = ₹\ 2200$

26. (1) x's income = Rs. $4a$

y's income = Rs. $3a$

x's expenditure = Rs. $12b$

y's expenditure = Rs. $7b$

$\therefore 4a - 12b = 3200$

$\Rightarrow a - 3b = 800$ ...(i)

Again, $3a - 7b = 3200$ ...(ii)

By equation (i) $\times 7$ – (ii) $\times 3$,

$$\begin{array}{r} 7a - 21b = 5600 \\ 9a - 21b = 9600 \\ - \quad + \quad - \\ \hline -2a = -4000 \end{array}$$

$\Rightarrow a = 2000$

$\Rightarrow x$'s income = $4a$

$= 4 \times 2000 = $ Rs. 8000

27. (1) Let incomes of A and B be Rs. $3x$ and Rs. $2x$ respectively. Let the expenditures of A and B be Rs. $5y$ and Rs. $3y$ respectively.

According to the question,

$3x - 5y =$ Rs. 1000 .... (i)

$2x - 3y =$ Rs. 1000 .... (ii)

By equation (i) $\times 2$ – (ii) $\times 3$,

$$\begin{array}{r} 6x - 10y = 2000 \\ 6x - 9y = 3000 \\ - \quad + \quad - \\ \hline -y = -1000 \end{array}$$

$\therefore y = 1000$

From equation (i),

$3x - 5 \times 1000 = 1000$

$\Rightarrow 3x = 1000 + 5000 =$ Rs. 6000

= A's income

28. (2) A's monthly income = Rs. $8x$

A's monthly expenditure= Rs. $5y$

B's monthly income = Rs. $5x$

B's monthly expenditure= Rs. $3y$

According to the question,

$8x - 5y = 12000$ ....(i)

$5x - 3y = 10000$ ....(ii)

By equation (i) $\times 3$ – (ii) $\times 5$,

$24x - 15y = 36000$

$25x - 15y = 50000$

$$\begin{array}{r} - \quad + \quad - \\ \hline -x = -14000 \end{array}$$

$\Rightarrow x = 14000$

Difference between monthly incomes of A and B = $8x - 5x$

= Rs. $3x$ = Rs. (3×14000)

= Rs. 42000

TYPE-X

1. (2) Ratio of the values

$= 2 : \frac{3}{2} : \frac{4}{4}$

$= 4 : 3 : 2$

$\therefore$ Value of 50 paise coins

$= \frac{3}{9} \times 180 = ₹\ 60$

Numbers of 50 paise coins

= 120.

2. (1) The ratio of values of rupee, 50 paise and 25 paise coins = 13 : 11 : 7

$\therefore$ Ratio of their numbers

$= 13 \times 1 : 11 \times 2 : 7 \times 4$

$= 13 : 22 : 28$

Sum of the ratios

$= 13 + 22 + 28 = 63$

$\therefore$ Required number of 50 paise coins $= \frac{22}{63} \times 378 = 132$

3. (2) Ratio of values of 50 paise, 25 paise and 10 paise coins

$= \frac{2}{2} : \frac{3}{4} : \frac{5}{10} = 1 : \frac{3}{4} : \frac{1}{2}$

$= 4 : 3 : 2$

Sum of the ratios = $4 + 3 + 2 = 9$

Value of 25 paise coins

$= \frac{3}{9} \times 90 = ₹\ 30$

Number of 25 paise coins

$= 30 \times 4 = 120$

4. (3) Ratio of the number of coins

= 8 : 5 :3

Ratio of their values

$= 8 : \frac{5}{2} : \frac{3}{4} = 32 : 10 : 3$

Sum of the ratios

$= 32 + 10 + 3 = 45$

$\therefore$ Value of one rupee coins

$= \frac{32}{45} \times 225 = ₹\ 160$

$\therefore$ Number of one rupee coins

= 160

5. (2) Ratio of number of 1 rupee, 50-paise and 25 paise coins

= 8 : 5 : 3

Ratio of their respective values

$= 8 : \frac{5}{2} : \frac{3}{4} = 32 : 10 : 3$

Sum of the ratios

$= 32 + 10 + 3 = 45$

Value of 50 paise coins

$= ₹ \left(\frac{10}{45} \times 112.5\right) = ₹\ 25$

$\therefore$ Number of 50 paise coins

$= 25 \times 2 = 50$

6. (2) Ratio of the number of coins of Re. 1, 50 paise and 25 paise

= 3 : 8 : 20

Ratio of the values of these coins

$= 3 : \frac{8}{2} : \frac{20}{4} = 3 : 4 : 5$

$\therefore$ Value of 1 rupee coins

$= \frac{3}{12} \times 372 = ₹\ 93$

Value of 50 paise coins

$= \frac{4}{12} \times 372 = ₹\ 124$

Value of 25 paise coins

$= \frac{5}{12} \times 372 = ₹\ 155$

$\therefore$ Number of coins

$= 93 + 124 \times 2 + 155 \times 4$

$= 93 + 248 + 620 = 961$

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7. (4) Respective ratio of the number of coins
$= 13 : 11 \times 2 = 13 : 22$
$\therefore$ Number of 1 rupee coins
$= \frac{13}{13+22} \times 210$
$= \frac{13}{35} \times 210 = 78$

8. (3) Ratio of the value of coins
$= \frac{1}{2} : \frac{2}{4} : \frac{3}{10} = 5 : 5 : 3$
$\therefore$ Value of the 10-paise coins
$= ₹\left(\frac{3}{13} \times 6.50\right) = ₹\ 1.5$
$\therefore$ Number of 10-paise coins
$= 1.5 \times 10 = 15$

9. (2) Let the number of each type of notes be x
$\therefore x + 5x + 10x = 640$
$\Rightarrow 16x = 640 \Rightarrow x = 40$
$\therefore$ Total number of notes
$= 3 \times 40 = 120$

10. (1) Let the number of coins of 1-rupee coin be x.
Total value of the coins of each kind is same, then the number of 50 paisa coins = $2x$ and the number of 25 paisa coins = $4x$.
According to the question.
$x + 2x + 4x = 175$
$7x = 175 \therefore x = \frac{175}{7} = 25$
$\therefore$ Total amount in bag
$= 25 + 25 + 25 = ₹\ 75$

11. (3) Ratio of values = 5 : 3 : 1
Ratio of their numbers
$= 10 : 12 : 10 = 5 : 6 : 5$
$\therefore$ Number of 50 paise coins
$= \frac{5}{16} \times 480 = 150$
Number of 25 paise coins
$= \frac{6}{16} \times 480 = 180$
Number of 10 paise coins
$= \frac{5}{16} \times 480 = 150$

12. (4) Ratio of their values =13:11:7
Ratio of their numbers
$= 13 : 22 : 35$
$\therefore 13x + 22x + 35x = 420$
$\Rightarrow 70x = 420 \Rightarrow x = 6$
$\therefore$ Number of 50 paise coins
$= 22x = 22 \times 6 = 132$

13. (2) Number of 1-rupee coins = x
Number of 50 paise coins = $4x$
Number of 25 paise coins = $2x$
$\therefore$ Ratio of their values
$= x : \frac{4x}{2} : \frac{2x}{4} = 2 : 4 : 1$
$\therefore$ Value of 50-paise coins
$= \frac{4}{7} \times 56 = ₹\ 32$
$\therefore$ Their number = $32 \times 2 = 64$
Aliter :
$(x)(1) + (4x)\left(\frac{1}{2}\right) + (2x)\left(\frac{1}{4}\right) = 56$
$x + 2x + \frac{1}{2}x = 56$
$\Rightarrow x = 56 \times \frac{2}{7} = 16$
$\Rightarrow$ No. of 50p coins $= 4 \times 16 = 64$.

14. (3) Let the initial salaries of A, B and C be ₹ x, ₹ $3x$ and ₹ $4x$ respectively.
Respective ratio after corresponding increase
$= \frac{x \times 105}{100} : \frac{3x \times 110}{100} : \frac{4x \times 115}{100}$
$= 105 : 330 : 460$
$= 21 : 66 : 92$

15. (2) If the salaries of A, B and C be ₹ x, ₹ y and ₹ z respectively, then
$\frac{x \times 20}{100} : \frac{y \times 15}{100} : \frac{z \times 25}{100}$
$\Rightarrow \frac{x}{5} : \frac{3y}{20} : \frac{z}{4} = 8 : 9 : 20$
$\Rightarrow x : y : z = 40 : 60 : 80$
$= 2 : 3 : 4$
$\therefore$ A's salary $= \frac{2}{9} \times 72000$
$= ₹\ 16000$

16. (3) Ratio of the values of one rupee, 50 paise and 25 paise coins
$= 8 : 4 : 3$
Ratio of their number
$= 8 : 4 \times 2 : 3 \times 4 = 2 : 2 : 3$
Sum of ratios = 2 + 2 + 3 = 7
$\therefore$ Number of 50-paise coins
$= \frac{2}{7} \times 280 = 80$

TYPE-XI

1. (4) Orginal ratio of A, B and C
$= \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$
$\therefore$ Share of A
$= \frac{6}{13} \times 117 = ₹\ 54$
Share of B
$= \frac{4}{13} \times 117 = ₹\ 36$
and share of C
$= \frac{3}{13} \times 117 = ₹\ 27$
The ratio of A, B and C by mistake = 2 : 3 : 4
$\therefore$ Share of A $= \frac{2}{9} \times 117 = ₹\ 26$
Share of B $= \frac{3}{9} \times 117 = ₹\ 39$
Share of C $= \frac{4}{9} \times 117 = ₹\ 52$
Therefore, it is clear from above calculation that C gains maximum i.e. ₹ 25.

2. (3) According to question,
A : B = 2 : 1
B : C = 4 : 1
$\therefore$ A : B : C = 8 : 4 : 1

3. (1) A : B = 5 : 2
B : C = 7 : 13
$\therefore$ A : B : C
$= 5 \times 7 : 2 \times 7 : 2 \times 13$
$= 35 : 14 : 26$
Sum of the ratios
$= 35 + 14 + 26 = 75$
Total amount = ₹ 7500
$\therefore$ B's share = ₹ $\frac{14}{75} \times 7500$
= ₹ 1400

4. (2) A : B = 6 : 5, B : C = 10 : 9
A : B : C = 6 : 5
10 : 9
60 : 50 : 45
=12 : 10 : 9
According to the question
(12 + 10 + 9) units $\Rightarrow$ 1240
9 units = $\frac{1240}{31} \times 9$
$\Rightarrow$ ₹ 360

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5. (1)

$$\begin{array}{l} A:B = 2:3 \\ B:C = 4:3 \\ \hline C:D = 2:3 \\ \hline A:B:C:D = 2\times2:3\times2:3\times3:3\times3 \end{array}$$

or, A : B : C : D = 16 : 24 : 18 : 27

Sum of the ratios

= 16 + 24 + 18 + 27 = 85

B's share = ₹ $\frac{24}{85}\times3400$

= ₹ 960

D's share = ₹ $\frac{27}{85}\times3400$

= ₹ 1080

The required sum

= ₹ (1080 + 960) = ₹ 2040

6. (1) $\begin{array}{l} A:B = 5:2 \\ B:C = 7:13 \\ \hline A:B:C = 5\times7:7\times2:2\times13 \\ = 35:14:26 \end{array}$

Sum of the ratios

= 35 + 14 + 26 = 75

A's share = ₹ $\frac{35}{75}\times750$

= ₹ 350

7. (4) Ratio = $\frac{1}{2}:\frac{1}{4}:\frac{5}{16}$

= 8 : 4 : 5

Sum of ratios = 8 + 4 + 5 = 17

∴ Required answer

= ₹ $\left(\frac{8-4}{17}\right)\times68000$

= ₹ $\frac{4}{17}\times68000$

= ₹ 16000

(4) Ratio = $\frac{3}{5}:2:\frac{5}{3}$

= 9 : 30 : 25

Sum of ratios = 9 + 30 + 25

= 64

∴ Share of second worker

= $\frac{30}{64}\times6400$

= ₹ 3000

(2) $A = B\times\frac{2}{9}=\frac{2B}{9}$

$C=\frac{3A}{4}$; $A=\frac{4}{3}C$

∴ Ratio of A : B : C = 4 : 18 : 3

Share of A = $\frac{4}{25}\times1250$ = ₹ 200

Share of B = $\frac{18}{25}\times1250$ = ₹ 900

Share of C = $\frac{3}{25}\times1250$ = ₹ 150

10. (4) A's share = $9000\times\frac{4}{15}$

= 600 × 4 = ₹ 2400

C's share = $9000\times\frac{6}{15}$

= 600 × 6 = ₹ 3600

∴ Difference = 3600 − 2400

= ₹ 1200

11. (4) $\begin{array}{l} A:B = 3:4 \\ B:C = 3:4 \\ \hline A:B:C = 9:12:16 \end{array}$

∴ A's share = $\frac{9}{9+12+16}\times$₹ 370

= ₹ 90

12. (4) Let the amount to be distributed be ₹ x.

P : Q : R = 2 : 7 : 9

Sum of the ratios

= 2 + 7 + 9 = 18

∴ $P=\frac{2}{18}\times x=\frac{x}{9}$

$Q=\frac{7}{18}x$

$R=\frac{9x}{18}=\frac{x}{2}$

As given,

$\frac{x}{9}+\frac{7x}{18}=\frac{x}{2}$

Thus, we get no conclusion. Amount should necessarily be known.

13. (4) According to the question,

A : B = 5 : 12 = 10 : 24

B : C = 4 : 5.50 = 24 : 33

∴ A : B : C = 10 : 24 : 33

Sum of the ratios

= 10 + 24 + 33 = 67

Difference between the shares of C and B

= ₹ $\left(\frac{33-24}{67}\times2010\right)$

= ₹ $\left(\frac{9}{67}\times2010\right)$ = ₹ 270

14. (3) $\frac{2}{5}A+40=\frac{2}{7}B+20$

$=\frac{9}{17}C+10=x$

∴ $A=\frac{5}{2}(x-40), B=\frac{7}{2}(x-20)$

and, $C=\frac{17}{9}(x-10)$

∴ $\frac{5}{2}(x-40)+\frac{7}{2}(x-20)+\frac{17}{9}(x-10)$

= 600

⇒ x = 100

∴ A's share = ₹ $\frac{5}{2}(100-40)$

= ₹ 150

15. (2) When A gets 100 paise, B gets 90 Paise

When B gets 100 paise, C gets 110 paise

∴ When B gets 90 paise, C gets

$\frac{110}{100}\times90$ = 99 paise

∴ A : B : C = 100 : 90 : 99

Sum of the ratios

= 100 + 90 + 99 = 289

∴ B' share = $\left(\frac{90}{289}\times86700\right)$

= ₹ 27000

16. (1) A : B = 2 : 3

B : C = 4 : 5

∴ A : B : C = 8 : 12 : 15

∴ B's share = $\frac{12}{35}\times7000$

= ₹ 2400

17. (3) Suppose amount received by men = 5x.

and amount received by women = 4x

According to question

5x + 4x = 180

⇒ 9x = 180 ⇒ x = 20

∴ Amount received by men

= ₹ 100

Amount received by women = ₹ 80

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Suppose the number of men be y and that of women be $(66 - y)$. According to question

$$\frac{\frac{100}{y}}{\frac{80}{66-y}} = \frac{3}{2}$$

$$\Rightarrow \frac{100}{y} \times \frac{66-y}{80} = \frac{3}{2}$$

$$\Rightarrow \frac{5(66-y)}{4y} = \frac{3}{2}$$

$\Rightarrow 660 - 10y = 12y$

$\Rightarrow 22y = 660 \Rightarrow y = 30$

18. (2) B's share

$$= \frac{3}{(2+3+4)} \times 738$$

$$= \frac{3}{9} \times 738 = ₹ 246$$

19. (4) $A \times 0.5 = B \times 0.6 = C \times 0.75$

$$\Rightarrow \frac{A \times 5}{10} = \frac{B \times 6}{10} = C \times \frac{75}{100}$$

$$\Rightarrow \frac{A}{2} = \frac{B}{\frac{5}{3}} = \frac{C}{\frac{4}{3}}$$

$$\therefore A : B : C = 2 : \frac{5}{3} : \frac{4}{3}$$

$= 6 : 5 : 4$

∴ C's share

$$= \frac{4}{15} \times 1740 = ₹ 464$$

20. (2) Amount received by y = ₹ 100.

Amount received by x = ₹ 125.

Amount received by z

$$= \frac{100 \times 100}{75} = ₹ \frac{400}{3}$$

∴ Required ratio

$$= 125 : 100 : \frac{400}{3}$$

$$= 5 : 4 : \frac{16}{3} = 15 : 12 : 16$$

21. (2) $B = C + 8$

$A = C + 8 + 7 = C + 15$

$\therefore C + 15 + C + 8 + C = 53$

$\Rightarrow 3C + 23 = 53$

$\Rightarrow 3C = 53 - 23 = 30$

$\Rightarrow C = ₹ 10$

$\therefore B = C + 8 = 10 + 8 = ₹ 18$

$A = C + 15 = 10 + 15$

$= ₹ 25$

$\therefore A : B : C = 25 : 18 : 10$

22. (2) $A : B = 2 : 3 = 8 : 12$

$B : C = 4 : 5 = 12 : 15$

$\therefore A : B : C = 8 : 12 : 15$

Sum of ratios = 35

$$\therefore \text{A's share} = \frac{8}{35} \times 700$$

$= ₹ 160$

$$\text{B's share} = \frac{12}{35} \times 700$$

$= ₹ 240$

$$\text{C's share} = \frac{15}{35} \times 700$$

$= ₹ 300$

23. (2) $A : B : C = \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

$$= \frac{1}{2} \times 12 : \frac{1}{3} \times 12 : \frac{1}{4} \times 12$$

[LCM of 2, 3 and 4 = 12]

$= 6 : 4 : 3$

$$\text{A's share} = \frac{6}{13} \times 2600$$

$= ₹ 1200$

$$\text{B's share} = \frac{4}{13} \times 2600$$

$= ₹ 800$

$$\text{C's share} = \frac{3}{13} \times 2600 = ₹ 600$$

24. (2) According to question,

$P + Q + R = ₹ 300$

Now, $Q = P + 30$

$R = Q + 60$

$= P + 30 + 60 = P + 90$

Hence, $P + Q + R = ₹ 300$

$\Rightarrow P + P + 30 + P + 90 = 300$

$\Rightarrow 3P + 120 = 300$

$$\Rightarrow P = \frac{180}{3} = 60.$$

$\therefore$ Share of P = ₹ 60, Q = ₹ 90

R = ₹ 150

$\Rightarrow P : Q : R = 60 : 90 : 150$

$= 6 : 9 : 15$

$= 2 : 3 : 5$:

25. (3) $A \times \frac{1}{2} = B \times \frac{1}{3} = C \times \frac{1}{4}$

$$\Rightarrow \frac{A}{2} = \frac{B}{3} = \frac{C}{4}$$

$\therefore A : B : C = 2 : 3 : 4$

$$\therefore A \Rightarrow \frac{2}{9} \times 900 = ₹ 200$$

$$B \Rightarrow \frac{3}{9} \times 900 = ₹ 300$$

$$C \Rightarrow \frac{4}{9} \times 900 = ₹ 400$$

26. (3) $A : B : C = 2 : 5 : 4$

Sum of ratios $= 2 + 5 + 4 = 11$

Difference

$$= \left(\frac{5}{11} - \frac{2}{11}\right) \times 126.50$$

$$= \frac{3}{11} \times 126.50 = ₹ 34.50$$

27. (2) B's share = Rs. b

A's share = Rs. $(b + 7)$

C's Share = Rs. $(b - 6)$

$\therefore b + b + 7 + b - 6 = 76$

$\Rightarrow 3b = 76 - 1 = 75$

$\Rightarrow b$ = Rs. 25

$\therefore$ A's share = 25 + 7 = Rs. 32

C's share = 25 – 6 = Rs. 19

$\therefore$ Required ratio = 32 : 25 : 19

28. (4) $A = \frac{1}{3}(B + C)$

$\Rightarrow 3A = B + C$ ...(i)

$$B = \frac{2}{3}(A + C)$$

$\Rightarrow 3B = 2A + 2C$ ...(ii)

From equation (i),

$3A = B + C$

$\Rightarrow 9A = 3B + 3C$

$\Rightarrow 9A = 2A + 2C + 3C$

$\Rightarrow 7A = 5C$ ...(iii)

From equation (ii),

$$3B = 2\left(\frac{5C}{7}\right) + 2C$$

$\Rightarrow 21B = 10C + 14C$

$\Rightarrow 21B = 24C$

$\Rightarrow 7B = 8C$ ...(iv)

From equations (iii) and (iv),

$$C = \frac{7A}{5} = \frac{7B}{8}$$

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$\therefore \frac{A}{5}=\frac{B}{8}=\frac{C}{7}$

C's share $= \frac{7}{(5+8+7)}\times 3000$

$= ₹\left(\frac{7}{20}\times 3000\right) = ₹\ 1050$

29. (1) **Case I**

$A : B : C = \frac{1}{4} : \frac{1}{5} : \frac{1}{6}$

$= \frac{1}{4}\times 60 : \frac{1}{5}\times 60 : \frac{1}{6}\times 60$

[LCM of 4, 5 and 6 = 60]

$= 15 : 12 : 10$

Sum of ratios = 15 + 12 + 10 = 37

$\therefore$ C's share $= \frac{10}{37}\times 555$

$= ₹\ 150$

Case II

A : B : C = 4 : 5 : 6

Sum of ratios = 4 + 5 + 6 = 15

$\therefore$ C's share $= \frac{6}{15}\times 555$

$= ₹\ 222$

$\therefore$ Required answer

$= ₹\ (222 - 150) = ₹\ 72$

30. (1) Son : wife = 3 : 1 = 9 : 3

Wife : daughter = 3 : 1

$\therefore$ Son : wife : daughter

= 9 : 3 : 1

Sum of ratios = 9 + 3 + 1 = 13

If total wealth be ₹ x, then

Son's share − daughter's share

= ₹ 10,000

$\Rightarrow \frac{9x}{13}-\frac{x}{13}=10{,}000$

$\Rightarrow \frac{9x-x}{13}=10{,}000$

$\Rightarrow 8x = 13{,}00{,}00$

$\Rightarrow x = \frac{13{,}00{,}00}{8} = ₹\ 16250$

31. (2) A : B = 3 : 4

B : C = 3.5 : 3 = 7 : 6

$\therefore$ A : B : C = (3 × 7) : (4 × 7) : (4 × 6)

= 21 : 28 : 24

Sum of ratios = 21+28 + 24 = 73

$\therefore$ Difference between the shares of B and C

$= \left(\frac{28-24}{73}\right)\times 730$

$= 4 \times 10 = Rs.\ 40$

32. (3) A : B : C : D = 7 : 6 : 3 : 5

Sum of ratios = 7+ 6 + 3 + 5 = 21

$\therefore$ Difference of shares of B and C = Rs. 270

If the total amount be Rs. x, then

$\left(\frac{6-3}{21}\right)x = 270$

$\Rightarrow 3x = 21 \times 270$

$\Rightarrow x = \frac{21\times 270}{3} = Rs.\ 1890$

$\therefore$ D's share $= \frac{5}{21}\times 1890$

$= Rs.\ 450$

33. (4) B's capital = Rs. x

$\therefore$ A's capital = Rs. $2x$.

Ratio of equivalent capitals of A and B for 1 month

$= \left(2x\times 10+\frac{3x}{2}\times 2\right) :$

$\left(x\times 8+\frac{x}{2}\times 4\right)$

$= (20x + 3x) : (8x + 2x)$

$= 23x : 10x = 23 : 10$

34. (1) A's investment = Rs. $3x$

B's investment = Rs. $5x$

C's investment = Rs. $5x$

Ratio of the equivalent capitals of A, B and C for 1 month

$= (3x \times 12) : (5x \times 12) : (5x \times 6)$

$= 36x : 60x : 30x$

$= 6 : 10 : 5$

35. (3) Ratio of equivalent capitals of A, B and C for 1 month

$= (16000 \times 3 + 11000 \times 9) : (12000\times 3 + 17000\times 9) : (21000\times 6)$

$= (48000 + 99000) : (36000 + 153000) : 126000$

$= 147000 : 189000 : 126000$

$= 49 : 63 : 42$

$= 7 : 9 : 6$

Sum of ratios = 7 + 9 + 6 = 22

$\therefore$ Required difference

$= Rs.\left(\frac{9-6}{22}\times 26400\right)$

$= Rs.\ \frac{3\times 26400}{22} = Rs.\ 3600$

36. (4) A : C = 2 : 1 = 6 : 3

A : B = 3 : 2 = 6 : 4

$\therefore$ A : B : C = 6 : 4 : 3

$\therefore$ Sum of the terms of ratio = 6 + 4 + 3 = 13

$\therefore$ B's share

$= Rs.\left(\frac{4}{13}\times 157300\right)$

$= Rs.\ 48400$

TYPE-XII

1. (3) Let interior angle = I and exterior angle = E

According to questions,

$\frac{I}{E}=\frac{2}{1} \Rightarrow 2E = I.1$ or, $E = \frac{I}{2}$

But I + E = 180°

$I+\frac{I}{2}=180$

$\frac{3}{2}I=180$

$I=\frac{2}{3}\times 180$

I = 120°

We know that each interior angle of a regular polygon of n sides is given by

$I=\frac{n-2}{n}\times 180°$

$120° = \frac{n-2}{n}\times 180°$

$\Rightarrow \frac{n-2}{n}=\frac{120°}{180°}=\frac{2}{3}$

$\Rightarrow 3n - 6 = 2n \Rightarrow n = 6$

2. (3) Required answer

$\frac{6-x}{7-x}<\frac{16}{21}$

Check through options

$=\frac{6-3}{7-3}=\frac{3}{4}<\frac{16}{21}$

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3.(3) Let the numbers be 17x and 45x respectively.
According to the question,

$$\frac{1}{5} \text{ of } 45x - \frac{1}{3} \text{ of } 17x = 15$$

$$\Rightarrow 9x - \frac{17x}{3} = 15$$

$$\Rightarrow \frac{27x - 17x}{3} = 15$$

$$\Rightarrow 10x = 15 \times 3$$

$$\Rightarrow x = \frac{15 \times 3}{10} = \frac{9}{2}$$

∴ The required number

$$= 17x = \frac{17 \times 9}{2} = \frac{153}{2} = 76\frac{1}{2}$$

4. (1) Price of the third variety
$= x$ per kg.
∴ $126 + 135 + 2x = 4 \times 153$
$\Rightarrow 261 + 2x = 612$
$\Rightarrow 2x = 612 - 261 = 351$

$$\Rightarrow x = \frac{351}{2} = ₹\ 175.5$$

5. (4) Given ratio is total members :

absentees = 5 : 3 i.e. $\frac{3}{5}$

Hence, Number of persons absent

$$= \frac{3}{5} \times 15 = 9$$

6. (3) **Case I,**

$$P : Q : R = \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$$

$= 6 : 4 : 3$
Case II,
$P : Q : R = 2 : 3 : 4$
Clearly, R will gain.

7. (1) Ratio of first and second class fares = 3 : 1
Ratio of number of passengers
= 1 : 50
∴ Ratio of total amount
$= 3 \times 1 : 1 \times 50 = 3 : 50$
∴ Amount collected from second class passengers

$$= ₹\left(\frac{50}{53} \times 1325\right) = ₹\ 1250$$

8. (1) A : B = 3 : 2 = 9 : 6
B : C = 3 : 2 = 6 : 4
∴ A : B : C = 9 : 6 : 4
Total runs = 361
∴ Number of runs scored by A

$$= \frac{9}{(9+6+4)} \times 361$$

$$= \frac{9}{19} \times 361 = 171$$

9. (1) Let the number of failures $= 4x$ and that of passers $= 25x$
∴ Total number of students
$= 4x + 25x = 29x$
In case II
Number of students $= 29x + 5$
Number of failures $= 4x - 2$
∴ Number of passers
$= 29x + 5 - 4x + 2 = 25x + 7$
∴ According to the question,

$$\frac{25x+7}{4x-2} = \frac{22}{3}$$

$$\Rightarrow 88x - 44 = 75x + 21$$
$$\Rightarrow 88x - 75x = 44 + 21$$
$$\Rightarrow 13x = 65$$

$$\Rightarrow x = \frac{65}{13} = 5$$

∴ Total number of students
$= 29x = 29 \times 5 = 145$

10. (1) Sachin : Sourav = 3 : 2
Sourav : Vinod = 3 : 2
Ratio of the runs scored by Sachin, Sourav and Vinod respectively $= 3 \times 3 : 2 \times 3 : 2 \times 2$
= 9 : 6 : 4
∴ Runs scored by Sachin

$$= \frac{9}{19} \times 285 = 135$$

11. (3) According to the question,
$E + M = 170$ ....(i)
$E - M = 10$ ....(ii)
Adding both the equations,
$2E = 180 \Rightarrow E = 90$
From equation (i),
$M = 170 - 90 = 80$

$$\therefore \frac{E}{M} = \frac{9}{8} = 9 : 8$$

12. (2) Let the initial weights of Mr. Gupta and Mrs. Gupta be $7x$ and $8x$ kg respectively.
$\therefore 7x + 8x = 120$
$\Rightarrow 15x = 120$

$$\Rightarrow x = \frac{120}{15} = 8$$

∴ Mr. Gupta's weight $= 7 \times 8$
$= 56$ kg
Mrs. Gupta's weight
$= 8 \times 8 = 64$ kg
Let Mrs. Gupta reduce her weight by y kg.

$$\therefore \frac{56-6}{64-y} = \frac{5}{6}$$

$$\Rightarrow \frac{50}{64-y} = \frac{5}{6}$$

$\Rightarrow 64 - y = 60$
$\Rightarrow y = 64 - 60 = 4$ kg

13. (4) Let the original number of boys and girls be $5x$ and $3x$ respectively and that of new boys and girls be $5y$ and $7y$ respectively.
$\therefore 5x + 3x + 5y + 7y = 1200$
$\Rightarrow 2x + 3y = 300$ .....(i)
and, $\frac{5x+5y}{3x+7y} = \frac{7}{5}$

$$\Rightarrow 25x + 25y = 21x + 49y$$
$$\Rightarrow 4x = 24y$$
$$\Rightarrow x = 6y \quad \text{..... (ii)}$$

From equation (i),
$4x + 6y = 600$
$\Rightarrow 5x = 600 \Rightarrow x = 120$
∴ Original number of students
$= 8x = 960$

14. (3) CP of refrigerator = ₹ $5x$
CP of television = ₹ $3x$
$\therefore 2x = 5500$

$$\Rightarrow x = \frac{5500}{2} = 2750$$

∴ CP of refrigerator
$= 5 \times 2750 = ₹\ 13750$

15. (3) According to question,
Son : Daughter : Nephew
$= 5x : 4x : x$
But 5 sons : 4 daughters : 2 nephews
$= 25x : 16x : 2x$
and $25x + 16x + 2x = ₹\ 8600$
$43x = ₹\ 8600$
$x = ₹\ 200$
∴ Required answer
$= 4 \times 200 = ₹\ 800$

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16. (2) A + B = 158
C = 158 − 101 = 57
Also B = 57 + 23 = 80
∴ The amount with A
= ₹ (158 − 80) = ₹ 78

17. (1) L = N + 5.72
M = L + 2.24
= N + 5.72 + 2.24
M = N + 7.96
L + M + N = 340.68
N + 5.72 + N + 7.96 + N
= 340.68 ⇒ 3N = 327

$\Rightarrow N = \frac{327}{3} = ₹\ 109$

18. (4) Ratio of the first and second class fares (total)
= 1 × 4 : 1 × 40
= 4 : 40 = 1 : 10
∴ Amount collected from the first class passengers

$= \frac{1}{11} \times 1100 = ₹100$

19. (3) Time taken is inversely proportional to relevant speeds.

∴ Required ratio $= \frac{1}{4} : \frac{1}{3} : \frac{1}{5}$

$= \frac{1}{4} \times 60 : \frac{1}{3} \times 60 : \frac{1}{5} \times 60$

= 15 : 20 : 12

20. (3) let the numbers be x and y where $x > y$.

$\therefore x - \frac{y}{2} = 5\left(y - \frac{y}{2}\right) = \frac{5y}{2}$

$\Rightarrow x = \frac{y}{2} + \frac{5y}{2} = 3y \Rightarrow \frac{x}{y} = \frac{3}{1}$

21. (2) Let the number of shirts of brand B be x.
Let the cost of a shirt of brand B be ₹ 1.
∴ Original cost = 4 × 2 + x
= ₹ (8 + x)
In case II,

$4 + 2x = (8 + x) \times \frac{140}{100} = (8 + x)\frac{7}{5}$

⇒ 20 + 10x = 56 + 7x
⇒ 10x − 7x = 56 − 20 = 36
⇒ 3x = 36 ⇒ x = 12
∴ Required ratio
= 4 : 12 = 1 : 3

22. (1) Total students
= 6x + x = 7x

$\therefore \frac{6x + 6}{x - 6} = \frac{9}{1}$

⇒ 6x + 6 = 9x − 54
⇒ 9x − 6x = 54 + 6 = 60
⇒ 3x = 60 ⇒ x = 20
∴ Total number of students
= 7 × 20 = 140

23. (4) Weight of paper bundles

$= \left(\frac{22}{25} \times 36\right)$ kg

$= \left(\frac{22 \times 36 \times 1000}{25}\right)$ gm

= 31680 gm

24. (2) Numbers = 3x and 4x
∴ $(4x)^2 = 8 \times (3x)^2 - 224$
⇒ $16x^2 = 72x^2 - 224$
⇒ $72x^2 - 16x^2 = 224$

$\Rightarrow 56x^2 = 224 \Rightarrow x^2 = \frac{224}{56} = 4$

$\Rightarrow x = \sqrt{4} = 2$

∴ Numbers = 6 and 8

25. (2) If boys = x and girls = y, then

$y \times \frac{10}{100} = \frac{x}{20} \Rightarrow \frac{y}{10} = \frac{x}{20}$

$\Rightarrow \frac{x}{y} = \frac{20}{10} = \frac{2}{1} = 2 : 1$

26. (3) 5 steps of policeman = 7 steps of thief

∴ 8 steps of policeman $= \frac{7}{5} \times 8$

$= \frac{56}{5}$ steps of thief

∴ Required ratio $= \frac{56}{5} : 10$

= 56 : 50
= 28 : 25

27. (3) Marks obtained by A in English = 2x (let)
Marks obtained in Maths = 3x
Marks obtained in Science = x
According to the question,
2x + 3x + x = 180
⇒ 6x = 180

$\Rightarrow x = \frac{180}{6} = 30$

= Marks obtained in science

28. (4) 7 jumps of Tom = 5 jumps of Jerry

∴ 8 jumps of Tom $= \frac{5}{7} \times 8$

$= \frac{40}{7}$ jumps of Jerry

∴ Required ratio $= \frac{40}{7} : 6$

= 40 : 42 = 20 : 21

29. (1) Story books ⇒ 1512

Other books ⇒ $\frac{2}{7} \times 1512$

= 432
Additional story books = x

$\therefore \frac{1512 + x}{432} = \frac{15}{4}$

⇒ 6048 + 4x = 432 × 15 = 6480
⇒ 4x = 6480 − 6048 = 432

$\Rightarrow x = \frac{432}{4} = 108$

30. (2) Time taken by P in covering 300 metre

$= \frac{300}{3} = 100$ seconds

Distance covered by Q in 100 seconds
= 5 × 100 = 500 metre
So, both reach at the same time.

31. (1) In the school,

Boys ⇒ $\frac{4}{7} \times 1554 = 888$

Girls ⇒ $\frac{3}{7} \times 1554 = 666$

After 30 days,
Girls = 666 + 30 = 696
If x boys leave the school, then.
According to the question,

$\frac{888 - x}{696} = \frac{7}{6}$

$\Rightarrow \frac{888 - x}{116} = 7$

⇒ 888 − x = 116 × 7 = 812
⇒ x = 888 − 812 = 76

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TEST YOURSELF

1. The sum of the squares of two positive numbers is greater than their product by 28. If the ratio of the numbers 2 : 3, find the numbers.
(1) 4 and 6 (2) 6 and 9
(3) 8 and 12 (4) None of these

2. 3 litres of a mixture containing wine and water in the ratio 3 : 7 and 4 litres of another mixture containing wine and water in the ratio 3 : 5 are mixed together. What is the ratio of wine and water in the resulting mixture ?
(1) 11 : 23 (2) 12 : 23
(3) 13 : 24 (4) 12 : 27

3. When the market price per kg of rice and wheat be in the ratio 3 : 2, the monthly expenses of a family towards rice and wheat are in the ratio 5 : 6. If the market price of rice and wheat becomes in the ratio 4 : 3, what will be the ratio of expenses towards them ? (Assume that amount of rice and wheat consumed remains unaltered.)
(1) 20 : 29 (2) 20 : 27
(3) 18 : 25 (4) 21 : 37

4. Three vessels of equal volumes contain water and syrup in the ratio 4 : 1, 5 : 2 and 7 : 3 respectively. When they are thoroughly mixed together in a large vessel, find the resulting ratio of water and syrup in the mixture. (Assume that in the mixture total volume remains unaltered).
(1) 11 : 30 (2) 19 : 11
(3) 31 : 11 (4) 11 : 35

5. A, B and C go into a business as partners with the agreement that their shares of profit will be in the proportion of their capitals. If A's capital : B's capital = 2: 3, and B's capital : C's capital = 2 : 5, find their shares in a profit of Rs. 3250.
(1) Rs. 520, Rs. 780, Rs. 1950
(2) Rs. 540, Rs. 760, Rs. 1950
(3) Rs. 540, Rs. 780, Rs. 1930

6. One morning after purchasing 6 litres of milk from a milk man, a householder found that the weight of this quantity of milk was 6.144 kg. If one litre of the pure milk weighs 1.032 kg and that of one litre of the pure water 1 kg, then how much water was added to milk ?
(1) 0.5 kg (2) 1.2 kg
(3) 0.05 kg (4) 1.5 kg

7. 5 men, 6 women and 7 boys finished a work in 3 days and got the remuneration of Rs. 2137.50 for it. If the work of 1 man, 1 woman, and 1 boy in one day be in the proportion of $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$, what sum did each man get on a day ?
(1) Rs. 196 (2) Rs. 197
(3) Rs. 198 (4) Rs. 199

8. Twenty years ago the ratio between the ages of Sita and Meena was 1 : 4 and at present it is 1 : 2. What is the age of Sita at present?
(1) 25 (2) 35
(3) 30 (4) None of these

9. A mixture contains alcohol and water in the ratio 4 : 3. If 5 litres of water is added to the mixture the ratio becomes 4 : 5. The quantity of alcohol in the given mixture is :
(1) 12 litres (2) 10 litres
(3) 14 litres (4) 16 litres

10. If $x : y = 8 : 9$, then $5x - 4y : 3x + 2y$ is equal to :
(1) 2 : 19 (2) 3 : 17
(3) 2 : 21 (4) None of these

11. Determine the fourth proportional to 9.6 m 7.2 m 28.8 m.
(1) 22.6 m. (2) 21.6 m.
(3) 23.6 m. (4) 20.6 m.

12. Find the mean proportional between 100 and 625.
(1) 350 (2) 225
(3) 250 (4) 275

13. Find the third proportional between 9 and 27.
(1) 36 (2) 54
(3) 27 (4) 81

14. If $A : B = 3 : 4$, $B : C = 8 : 10$ and $C : D = 15 : 17$, then find $A : B : C : D$.
(1) 9 : 12 : 15 : 17
(2) 9 : 15 : 12 : 17
(3) 9 : 17 : 12 : 15
(4) 9 : 15 : 17 : 12

15. If $A : B = 1 : 2$, $B : C = 3 : 4$, $C : D = 2 : 3$ and $D : E = 3 : 4$, then find $A : B : C : D : E$.
(1) 3 : 8 : 6 : 12 : 16
(2) 3 : 6 : 8 : 12 : 16
(3) 3 : 16 : 6 : 8 : 12
(4) 3 : 12 : 6 : 8 : 16

16. If $(2x + 3) : (5x - 38)$ be the duplicate ratio of $\sqrt{5} : \sqrt{6}$. Find the value of x.
(1) 8 (2) 32
(3) 16 (4) 18

17. If $(3x - 7) : (4x + 3)$ is sub-triplicate ratio of 8 : 27, find the value of x.
(1) 9 (2) 54
(3) 18 (4) 27

18. If $\frac{x}{y} = \frac{2}{5}$ find the ratio of $9x + 6y : 5x + 3y$.
(1) $\frac{48}{25}$ (2) $\frac{25}{48}$
(3) $\frac{3}{13}$ (4) $\frac{12}{25}$

19. What must be added to each term of the ratio 7 : 13, so that the ratio becomes 2 : 3.
(1) 4 (2) 5
(3) 6 (4) 7

20. What must be added to the numbers 10, 20, 30 and 50 so that the sums are proportional?
(1) 15 (2) 12
(3) 10 (4) 8

21. The ratio between two numbers is 3 : 4. If their LCM is 120, find the numbers.
(1) 35 and 40 (2) 25 and 35
(3) 25 and 30 (4) 30 and 40

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22. If b is the mean proportional between a and c, then $\frac{a^2-b^2+c^2}{a^{-2}-b^{-2}+c^{-2}}=?$

(1) b^4 (2) $2b^2$
(3) $2b^3$ (4) $2b$

23. $\frac{4a+9b}{4a-9b}=\frac{4c+9d}{4c-9d}$ then $\frac{a}{b}=?$

(1) $\frac{c^2}{d}$ (2) $\frac{c}{d}$
(3) $\frac{-2c}{d}$ (4) $\frac{c}{2d}$

24. If $P=\frac{4xy}{x+y}$, find the value of $\frac{P+2x}{P-2x}+\frac{P+2y}{P-2y}$.

(1) 4 (2) 1
(3) 2 (4) 6

25. A shopkeeper mixes 12 kgs of rice at ₹ 8 per kg with 6 kgs of rice at ₹ 10 per kg. Find the cost per kg of the mixture.

(1) ₹ 8.67 (2) ₹ 8.50
(3) ₹ 7.67 (4) ₹ 7.50

26. In what ratio a trader should mix two varieties of tea one at ₹ 62 per kg and other at ₹ 72 per kg in order to obtain the mixture worth ₹ 65 per kg ?

(1) 4 : 3 (2) 7 : 3
(3) 8 : 3 (4) 3 : 8

27. In what proportion may three kinds of tea prices at ₹ 80, ₹ 70 and ₹ 50 per kg be mixed to produce a mixture worth ₹ 60 per kg?

(1) 2 : 2 : 3 (2) 2 : 1 : 3
(3) 1 : 2 : 3 (4) 1 : 1 : 3

28. In what proportion may three kinds of rice bought at ₹ 6, ₹ 10 and ₹ 14 be mixed to produce a mixture which would earn 40% on selling it at ₹ 11.20 per kg?

(1) 4 : 1 : 1 (2) 3 : 1 : 1
(3) 2 : 1 : 1 (4) 2 : 2 : 1

29. Find the proportion in which three types of sugar at ₹ 12, ₹ 14 and ₹ 20 may be mixed so as to obtain a mixture worth ₹ 15 per kg?

(1) 15 : 5 : 6 (2) 5 : 15 : 6
(3) 3 : 12 : 16 (4) 4 : 12 : 15

30. Two vessels A and B contain milk and water in the ratios 7 : 5 and 17 : 7 respectively. In what ratio mixture from two vessels should be mixed to get a new mixture containing milk and water in the ratio 5 : 3 ?

(1) 1 : 3 (2) 2 : 3
(3) 2 : 1 (4) 3 : 2

31. Two vessels A and B contain mixtures of milk and water in the ratios 4 : 1 and 9 : 11 respectively. They are mixed in the ratio of 3 : 2. Find the ratio of milk and water in the resulting mixture.

(1) 12 : 25 (2) 15 : 37
(3) 17 : 19 (4) 33 : 17

32. A person has two solutions of sugar with 30% and 50% concentration respectively. In what ratio should he mix two solutions to get 45% concentration in the resulting mixture ?

(1) 1 : 3 (2) 2 : 3
(3) 2 : 5 (4) 5 : 2

33. 49 litres of milk has 80% milk concentration. How much water be added to make its concentration 70% ?

(1) 6 litres (2) 7 litres
(3) 6.5 litres (4) 7.5 litres

34. 6 litres of milk and water mixture has 75% milk in it. How much milk should be added to the mixture to make it 90% pure ?

(1) 10 litres (2) 8 litres
(3) 9 litres (4) 12 litres

35. 12 litres of a mixture has wine and water in the ratio 2 : 3. How much water must be added to get wine to water ratio of 3 : 7 in the resultant mixture ?

(1) 4.5 litres (2) 3.5 litres
(3) 3 litres (4) 4 litres

36. 55 litres of a mixture has milk and water in the ratio 7 : 4. How much water must be added to get milk and water in the ratio 7 : 6 in the resulting mixture.

(1) 16 litres (2) 15 litres
(3) 12 litres (4) 10 litres

SHORT ANSWERS

1. (1)	2. (2)	3. (2)	4. (3)
5. (1)	6. (3)	7. (2)	8. (3)
9. (2)	10. (3)	11. (2)	12. (3)
13. (4)	14. (1)	15. (2)	16. (3)
17. (4)	18. (1)	19. (2)	20. (3)
21. (4)	22. (1)	23. (2)	24. (3)
25. (1)	26. (2)	27. (4)	28. (1)
29. (2)	30. (3)	31. (4)	32. (1)
33. (2)	34. (3)	35. (4)	36. (4)

EXPLANATIONS

1. (1) Let the numbers be $2x$ and $3x$.

$\therefore (3x)^2 + (2x)^2 - 2x \times 3x = 28$

$\Rightarrow 13x^2 - 6x^2 = 28$

$\Rightarrow 7x^2 = 28$

$\Rightarrow x^2 = \frac{28}{7} = 4$

$\Rightarrow x = \sqrt{4} = 2$

$\therefore$ Numbers are : 4 and 6

2. (2) In 3 litres of mixture,

Wine $= \frac{3\times3}{10} = \frac{9}{10}$ litre

Water $= \frac{7}{10}\times3 = \frac{21}{10}$ litre

In 4 litres of mixture,

Wine $= \frac{3}{8}\times4 = \frac{3}{2}$ litres

Water $= \frac{5}{8}\times4 = \frac{5}{2}$ litres

In resulting mixture,

Wine : Water

$= \left(\frac{9}{10}+\frac{3}{2}\right) : \left(\frac{21}{10}+\frac{5}{2}\right)$

$= 24 : 46 = 12 : 23$

3. (2) Market price per kg :

Rice = Rs. $3x$

Wheat = Rs. $2x$

Monthly expenses :

Rice = Rs. $5y$

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Wheat = Rs. $6y$

Amount of rice = $\frac{5y}{3x}$ kg

Amount of wheat = $\frac{6y}{2x}$ kg

New price :
Rice = Rs. $4z$/kg
Wheat = Rs. $3z$/kg
∴ Required ratio

$= \frac{5y \times 4z}{3x} : \frac{6y}{2x} \times 3z$

$= \frac{20}{3} : \frac{18}{2}$

= 20 : 27

4. (3) Let the capacity of each vessel be x litres.
∴ Ratio

$= \left(\frac{4x}{5} + \frac{5x}{7} + \frac{7x}{10}\right) :$

$\left(\frac{x}{5} + \frac{2x}{7} + \frac{3x}{10}\right)$

$= \frac{56x + 50x + 49x}{70} :$

$\frac{14x + 20x + 21x}{70}$

$= \frac{155x}{70} : \frac{55x}{70} = 31 : 11$

5. (1) A : B = 2 : 3 = 4 : 6
B : C = 2 : 5 = 6 : 15
A : B : C = 4 : 6 : 15
A + B + C = 4 + 6 + 15 = 25

A's share = $\frac{4}{25} \times 3250$

= Rs. 520

B's share = $\frac{6}{25} \times 3250$

= Rs. 780

C's share = $\frac{15}{25} \times 3250$

= Rs. 1950

6. (3) Weight of 1 kg of impure milk

$= \frac{6.144}{6} = 1.024$ kg

Weight of water

$= 6 - \frac{1.024}{1.032} \times 6$

= 6 – 5.95
= 0.05 kg

7. (2) Ratio of wages of 1 man, 1 woman and 1 boy

$= \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$

Each man's wages

$= \frac{6}{13} \times \frac{2137.5}{5} =$ Rs. 197

8. (3) 20 years ago,
Sita's age = x years
Meena's age = $4x$ years

$\therefore \frac{x + 20}{4x + 20} = \frac{1}{2}$

$\Rightarrow 2x + 40 = 4x + 20$
$\Rightarrow 2x = 20 \Rightarrow x = 10$
∴ Sita's present age = 30 years

9. (2) $\frac{4x}{3x + 5} = \frac{4}{5}$

$\Rightarrow 20x = 12x + 20$
$\Rightarrow 8x = 20 \Rightarrow x = 2.5$
∴ Quantity of alcohol
= 4 × 2.5 = 10 litres

10. (3) $\frac{x}{y} = \frac{8}{9}$ (Given)

$\therefore \frac{5x - 4y}{3x + 2y} = \frac{5\frac{x}{y} - 4}{3\frac{x}{y} + 2}$

$= \frac{5 \times \frac{8}{9} - 4}{3 \times \frac{8}{9} + 2}$

$= \frac{40 - 36}{24 + 18} = \frac{4}{42} = \frac{2}{21}$

11. (2) Let the fourth proportional be x.
∴ 9.6 kg : 7.2 kg. : : 28.8 m : x m
or, 9.6 : 7.2 : : 28.8 : x

Then, $\frac{9.6}{7.2} = \frac{28.8}{x}$

$\Rightarrow 9.6 \times x = 7.2 \times 28.8$

$\Rightarrow x = \frac{7.2 \times 28.8}{9.6} = 21.6m$

12. (3) Let the mean proportional be x.
∴ 100 : x : x : 625

Then, $\frac{100}{x} = \frac{x}{625}$

$\Rightarrow x^2 = 100 \times 625$

$\Rightarrow x = \sqrt{100 \times 625} = 10 \times 25$

= 250

13. (4) Let the third proportional be x.
Since the third proportional to 9 and 27 is the same as fourth proportional to 9, 27, 27
∴ 9 : 27 : : 27 : x

$\therefore \frac{9}{27} = \frac{27}{x}$

$\Rightarrow 9 \times x = 27 \times 27$

$\Rightarrow x = \frac{27 \times 27}{9} = 81$

14. (1) $A : B = 3 : 4$ $B : C = 8 : 10$
$C : D = 15 : 17$
∴ $A : B : C : D = 3 \times 8 \times 15 : 4 \times 8 \times 15 : 4 \times 10 \times 15 : 4 \times 10 \times 17 = 9 : 12 : 15 : 17$

15. (2) $A : B = 1 : 2$
$B : C = 3 : 4$
$C : D = 2 : 3$
$D : E = 3 : 4$
∴ $A : B : C : D : E$
$= 1 \times 3 \times 2 \times 3 : 2 \times 3 \times 2 \times 3 : 2 \times 4 \times 2 \times 3 : 2 \times 4 \times 3 \times 3 : 2 \times 4 \times 3 \times 4 = 3 : 6 : 8 : 12 : 16$

16. (3) Since $(2x + 3) : (5x - 38)$ is the duplicate ratio of $\sqrt{5} : \sqrt{6}$, therefore

$\frac{2x + 3}{5x - 38} = \left(\frac{\sqrt{5}}{\sqrt{6}}\right)^2$

$\Rightarrow \frac{2x + 3}{5x - 38} = \frac{5}{6}$

$\Rightarrow 6(2x + 3) = 5(5x - 38)$
$\Rightarrow 12x + 18 = 25x - 190$
$\Rightarrow 25x - 12x = 18 + 190$
$\Rightarrow 13x = 208$

$\Rightarrow x = \frac{208}{13} = 16$

17. (4) Since $(3x - 7) : (4x + 3)$ is the sub-triplicate ratio of 8 : 27, therefore,

$\frac{3x - 7}{4x + 3} = 3\sqrt{\frac{8}{27}} = \frac{2}{3}$

$\Rightarrow 3(3x - 7) = 2(4x + 3)$
$\Rightarrow 9x - 21 = 8x + 6$
$\Rightarrow 9x - 8x = 21 + 6$
$\Rightarrow x = 27$

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18. (1) We have, $\frac{x}{y}=\frac{2}{5}$

$\therefore 9x+6y : 5x+3y = \frac{9x+6y}{5x+3y}$

$= \frac{9\frac{x}{y}+6}{5\frac{x}{y}+3}$

(On dividing Numerator and Denominator by y)

$= \frac{9\times\frac{2}{5}+6}{5\times\frac{2}{5}+3} = \frac{\frac{18+30}{5}}{2+3}$

$= \frac{48}{5\times5} = \frac{48}{25}$

19. (2) Let x be added to each term.

Then, $\frac{7+x}{13+x}=\frac{2}{3}$

$\Rightarrow 3(7+x) = 2(13+x)$

$\Rightarrow 21+3x = 26+2x$

$\Rightarrow 3x-2x\ \ 26-21$

$\Rightarrow x = 5$

$\therefore$ 5 must be added to each term.

20. (3) Let x be added in each number to make them proportional.

$\therefore 10+x : 20+x :: 30+x : 50+x$

Then, $\frac{10+x}{20+x}=\frac{30+x}{50+x}$

$\Rightarrow (10+x)(50+x) = (20+x)(30+x)$

$\Rightarrow 500+50x+10x+x^2 = 600+20x+30x+x^2$

$\Rightarrow 500+60x+x^2 = 600+50x+x^2$

$\Rightarrow 60x-50x = 600-500 = 100$

$\Rightarrow 10x = 100$

$\Rightarrow x = \frac{100}{10} = 10$

21. (4) Let the numbers be $3x$ and $4x$.

Then, LCM of $3x$ and $4x$

$= 3\times4\times x = 12x$

$\therefore 12x = 120$

$\Rightarrow x = 10$

So the numbers are $3x$

$= 3\times10 = 30$ and,

$4x = 4\times10 = 40$

22. (1) Here b is the mean proportional between a and c.

$\therefore a : b :: b : c$

$\Rightarrow \frac{a}{b}=\frac{b}{c} \Rightarrow b^2 = ac$

Now, $\frac{a^2-b^2+c^2}{a^{-2}-b^{-2}+c^{-2}}$

$= \frac{a^2-b^2+c^2}{\frac{1}{a^2}-\frac{1}{b^2}+\frac{1}{c^2}}$

$= \frac{a^2-ac+c^2}{\frac{1}{a^2}-\frac{1}{ac}+\frac{1}{c^2}}$

$= \frac{a^2-ac+c^2}{\frac{c^2-ac+a^2}{a^2c^2}}$

$= \frac{(a^2-ac+c^2)a^2c^2}{c^2-ac+a^2} = a^2c^2$

$= (ac)^2 = (b^2)^2 = b^4$

23. (2) Here, $\frac{4a+9b}{4a-9b}=\frac{4c+9d}{4c-9d}$

On applying componendo and dividendo, we have

$\frac{4a+9b+4a-9b}{4a+9b-4a+9b}$

$= \frac{4c+9d+4c-9d}{4c+9d-4c+9d}$

$\Rightarrow \frac{8a}{18b}=\frac{8c}{18d} \Rightarrow \frac{a}{b}=\frac{c}{d}$

24. (3) We have

$P = \frac{4xy}{x+y} = \frac{2x\times2y}{x+y}$

$\Rightarrow \frac{P}{2x}=\frac{2y}{x+y}$

and, $\frac{P}{2y}=\frac{2x}{x+y}$

Now, $\frac{P}{2x}=\frac{2y}{x+y}$

On applying componendo and dividendo, we have

$\frac{P+2x}{P-2x}=\frac{2y+x+y}{2y-x-y}$

$= \frac{x+3y}{y-x}$ ...(i)

Again, $\frac{P}{2y}=\frac{2x}{x+y}$

$\Rightarrow \frac{P+2y}{P-2y}=\frac{2x+x+y}{2x-x-y}$

$= \frac{3x+y}{x-y}$ ...(ii)

(i) and (ii)

$\frac{P+2x}{P-2x}+\frac{P+2y}{P-2y}$

$= \frac{x+3y}{y-x}+\frac{3x+y}{x-y}$

$= \frac{3x+y}{x-y}+\frac{x+3y}{y-x}$

$= \frac{3x+y}{x-y}-\frac{x+3y}{x-y}$

$= \frac{3x+y-x-3y}{x-y}$

$= \frac{2x-2y}{x-y} = 2$

25. (1) Total quantity of the mixture $= 12+6 = 18$ kgs.

Cost of 12 kgs of rice at ₹ 8 per kg = ₹ (12×8) = ₹ 96

Cost of 6 kgs of rice at ₹ 10 per kg

= ₹ (6×10) = ₹ 60

$\therefore$ Total cost of 18 kgs of the mixture

= ₹ $(96+60)$ = ₹ 156

$\therefore$ Cost per kg of the mixture

$= \frac{\text{Rs. } 156}{18 \text{ kgs}} =$ ₹ 8.67 per kg

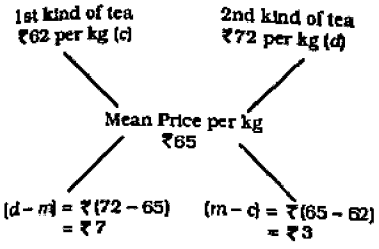
[Because cost of the mixture lies somewhere in the middle of ₹ 8 and ₹ 10, so this type of problem is known as **'Alligation medial'**].

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26. (2) C.P. of 1 kg tea of Ist quality = ₹ 62

C.P. of 1 kg tea of 2nd quality = ₹ 72.

Mean Price = ₹ 65



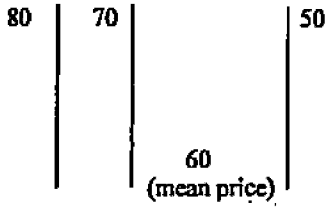
Using Alligation Rule,

$$\frac{\text{Quantity of 1st tea}}{\text{Quantity of 2nd tea}} = \frac{d-m}{m-c} = \frac{7}{3}$$

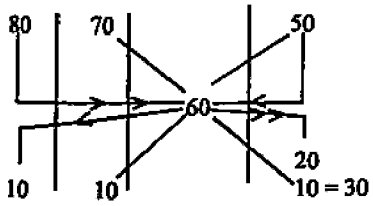
Therefore, they must be mixed in the ratio of 7 : 3.

[Since this problem is the inverse of above type problem, it is called **'Alligation alternate'**].

27. (4) Write the prices in ascending or descending order as shown below :



Make pairs by choosing one from each side of the mean price and apply Alligation Rule. Then add the quantity obtained under each price. This will give the ratio in which the ingredients should be mixed.



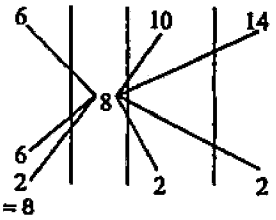
So, Required ratio = 10 : 10 : 30 or 1 : 1 : 3.

28. (1) SP of mixture = ₹ 11.20 per kg.

Profit = 40%.

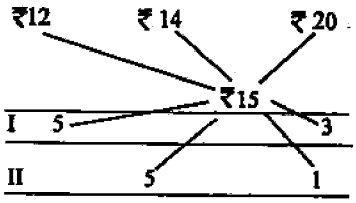
$$\text{CP of mixture} = 11.20 \times \frac{100}{140}$$

= ₹ 8 per kg.



Required ratio = 8 : 2 : 2 or 4 : 1 : 1.

29. (2)



Required proportion = 5 : 5 : (3 + 1) or 5 : 5 : 4.

Note : We can find other alternatives too by adding multiples of the quantities obtained at I and II. This will give us infinite number of alternatives. Care must be taken not to mix up quantities of one pair with another.

For example,

(i)

I	5		3
II		(5×2)	(1×2)
	5	10	5

= 5 : 10 : 5 = 1 : 2 : 1

(ii)

I	5×2		3×2
II		5	1
	10	5	7

= 10 : 5 : 7

(iii)

I	5		3
II		5×3	1×3
	5	15	6

= 5 : 15 : 6

30. (3) First of all we write the fraction of milk present in three mixtures.

Mixture *A*.

Ratio of milk and water = 7 : 5.

Sum of the ratios = 7 + 5 = 12

$\therefore$ Fraction of milk = $\frac{7}{12}$

Similarly,

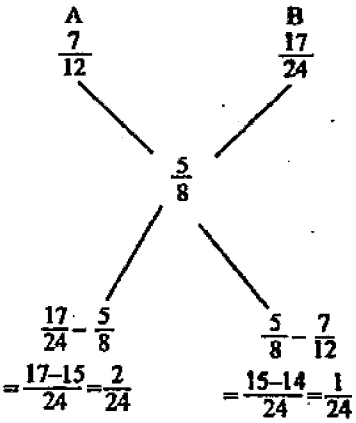
In mixture *B*,

Fraction of milk = $\frac{17}{24}$

In combination of *A* and *B*,

Fraction of milk = $\frac{5}{8}$

We now apply Alligation Rule on these fractions.

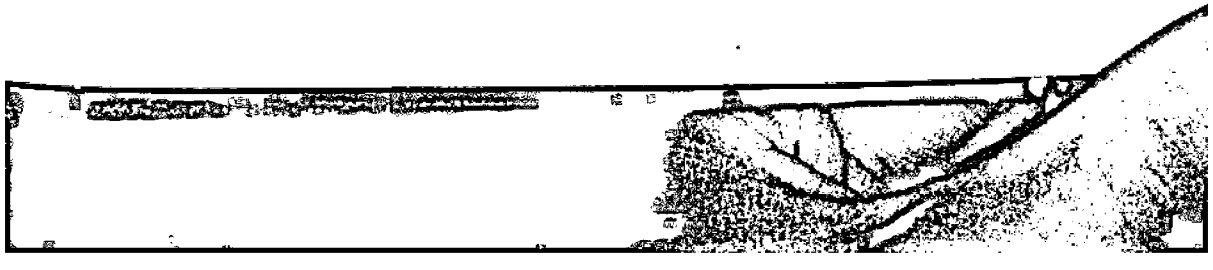


$\therefore$ Ratio of *A* & *B*

$= \frac{2}{24} : \frac{1}{24} = 2 : 1.$

31. (4) First of all we write the fraction of milk and water in each mixture.

	Milk	Water
A	$\frac{4}{5}$	$\frac{1}{5}$
B	$\frac{9}{20}$	$\frac{11}{20}$



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Both A and B are mixed in the ratio 3 : 2.

$\therefore$ $(3A + 2B)$ will have ratio of milk and water as follows :

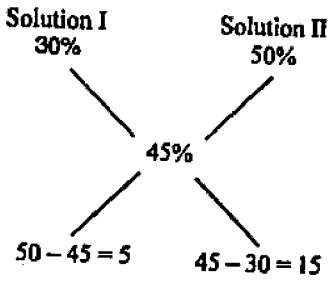
$$\text{Milk : Water} = \left(3\times\frac{4}{5}+\frac{2\times9}{20}\right) : \left(3\times\frac{1}{5}+\frac{2\times11}{20}\right)$$

$$= \left(\frac{12}{5}+\frac{9}{10}\right) : \left(\frac{3}{5}+\frac{11}{10}\right)$$

$$= \frac{33}{10} : \frac{17}{10} = 33:17$$

So, ratio of milk and water in the resulting mixture = 33 : 17

32. (1)



$$\therefore \frac{\text{30\% Concentrated Solution}}{\text{50\% Concentrated Solution}} = \frac{5}{15} = \frac{1}{3}$$

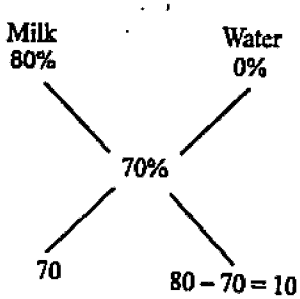
Hence, the required ratio = 1 : 3

33. (2) The given milk has 80% concentration of milk.

Water to be added has 0% milk concentration.

Final concentration of solution is 70%.

By Alligation Rule,



So, water should be added to the given milk in the ratio 10 : 70 or 1 : 7.

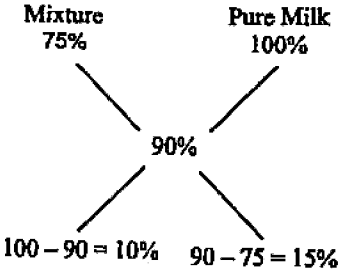
$\therefore$ Quantity of water to be added

$$= \frac{1}{7}\times49 = 7 \text{ litres}$$

34. (3) The given solution has 75% milk.

Milk to be added has 100% milk.

By Alligation Rule



Ratio = 10 : 15 = 2 : 3

$\therefore$ Milk should be added to the given mixture in the ratio 3 : 2.

$\therefore$ Quantity of milk to be added

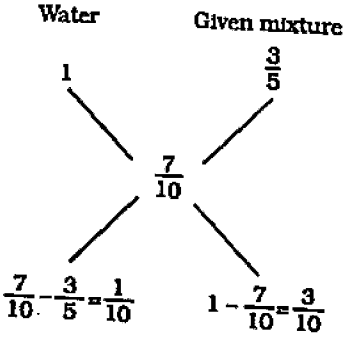
$$= \frac{3}{2}\times6 = 9 \text{ litres.}$$

35. (4) In the given mixture, wine : water = 2 : 3

Fraction of water in the given mixture $= \frac{3}{5}$

For water to be added, fraction = 1

Fraction of water in the resultant mixture $= \frac{7}{10}$



So, water must be added to the mixture in the ratio 1 : 3.

Quantity of water to be added

$$= \frac{1}{3}\times12 = 4 \text{ litres.}$$

36. (4) Milk : Water = 7 : 4

Sum of the ratios = 7 + 4 = 11

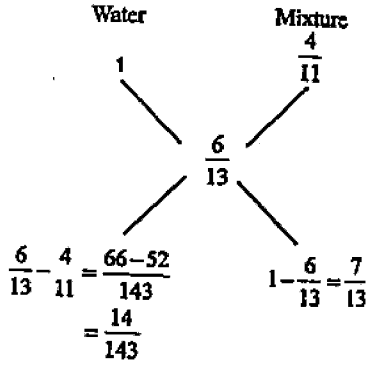
$\therefore$ Fraction of water in the given mixture $= \frac{4}{11}$.

For water to be added, fraction =

Similarly,

Fraction of water in the resulting mixture $= \frac{6}{13}$.

By Alligation Rule.



So, water must be added to the mixture in the ratio $\frac{14}{143} : \frac{7}{13}$

$$= \frac{2}{11} : 1 = 2 : 11.$$

$\therefore$ Quantity of water to be added

$$= \frac{2}{11}\times55 = 10 \text{ litres.}$$

□□□

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7 PERCENTAGE

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. If 80% of A = 50% of B and B = x% of A, then the value of x is :
(1) 400 (2) 300
(3) 160 (4) 150
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If x is 80% of y, what percent of y is x ?
(1) 75% (2) 80%
(3) 100% (4) 125%
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

3. If 8% of x is the same as 4% of y, then 20% of x is the same as:
(1) 10% of y (2) 16% of y
(3) 80% of y (4) 50% of y
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. A student multiplied a number by $\frac{3}{5}$ instead of $\frac{5}{3}$. What is the percentage error in the calculation ?
(1) 44% (2) 34%
(3) 54% (4) 64%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

5. If p% of p is 36, then p is equal to :
(1) 3600 (2) 600
(3) 60 (4) 15
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. 2 is what percent of 50?
(1) 2 (2) 2.5
(3) 4 (4) 5
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

7. $\frac{2}{3}$ is what percent of $\frac{1}{3}$?
(1) 50% (2) $33\frac{1}{3}\%$
(3) 150% (4) 200%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

8. 0.15% of $33\frac{1}{3}\%$ of ₹ 10000 is :
(1) ₹ 5 (2) ₹ 150
(3) ₹ 0.05 (4) ₹ 105
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

9. 30% of x is 72. The value of x is:
(1) 216 (2) 240
(3) 480 (4) 640
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

10. If 15% of (A + B) = 25% of (A – B), then what per cent of B is equal to A?
(1) 10% (2) 60%
(3) 200% (4) 400%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

11. What is 20% of 25% of 300?
(1) 150 (2) 60
(3) 45 (4) 15
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

12. If x% of $\frac{25}{2}$ is 150, then the value of x is :
(1) 1000 (2) 1200
(3) 1400 (4) 1500
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

13. If 50% of (x – y) = 30% of (x + y), then what per cent of x is y?
(1) 25% (2) $33\frac{1}{3}\%$
(3) 40% (4) 400%
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & 13.11.2005 (Ist Sitting)

14. If 50 % of P = 25% of Q, then P = x% of Q. Find x.
(1) 0.5 (2) 2
(3) 50 (4) 0.005
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

15. If 20% of A = 50% of B, then what per cent of A is B ?
(1) 30% (2) 40%
(3) 25% (4) 15%
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

16. In a school 40% of the students play football and 50% play cricket. If 18% of the students neither play football nor cricket, the percentage of the students playing both is :
(1) 40% (2) 32%
(3) 22% (4) 8%
(SSC CPO S.I. Exam. 26.05.2005)

17. If 20% of (P + Q) = 50% of (P–Q), then find P : Q
(1) 7 : 8 (2) 7 : 3
(3) 7 : 5 (4) 5 : 7
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

18. 0.01 is what per cent of 0.1 ?
(1) 10 (2) $\frac{1}{10}$
(3) 100 (4) $\frac{1}{100}$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

19. 65g is what per cent of 2 kg ?
(1) $\frac{13}{4}$ (2) $\frac{65}{2}$
(3) $\frac{15}{8}$ (4) $\frac{13}{8}$
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

20. Half of 1 per cent, written as a decimal, is
(1) 0.2 (2) 0.02
(3) 0.005 (4) 0.05
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

21. The time duration of 1 hour 45 minutes is what percent of a day?
(1) 7.218 % (2) 7.292 %
(3) 8.3 % (4) 8.24 %
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

22. 1.14 expressed as a per cent of 1.9 is
(1) 6% (2) 10%
(3) 60% (4) 90%
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

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23. 32 is what per cent of 80 ?
(1) 24% (2) 25.6%
(3) 36% (4) 40%
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

24. If 90% of A = 30% of B and B = x% of A, then the value of x is
(1) 800 (2) 300
(3) 700 (4) 400
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

25. If 90% of A = 30% of B and B = 2x% of A, then the value of x is
(1) 450 (2) 400
(3) 300 (4) 150
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

26. If 30% of A is added to 40% of B, the answer is 80% of B. What percentage of A is B?
(1) 30% (2) 40%
(3) 70% (4) 75%
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

27. If 40% of (A + B) = 60% of (A – B) then $\frac{2A-3B}{A+B}$ is
(1) $\frac{7}{6}$ (2) $\frac{6}{7}$
(3) $\frac{5}{6}$ (4) $\frac{6}{5}$
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

28. 0.001 is equivalent to
(1) 10% (2) 1%
(3) 0.01% (4) 0.1%
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

29. What percent of 3.5 kg is 70 gms ?
(1) 3% (2) 4%
(3) 5% (4) 2%
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

30. One-third of 1206 is what percent of 134 ?
(1) 100% (2) 150%
(3) 200% (4) 300%
(SSC CISF Constable (GD) Exam. 05.06.2011)

31. If 120% of a is equal to 80% of b, then $\frac{b+a}{b-a}$ is equal to
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CHSL DEO CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

32. If 20% of (A + B) = 50% of B, then value of $\frac{2A-B}{2A+B}$ is
(1) $\frac{1}{2}$ (2) $\frac{1}{3}$
(3) $\frac{1}{4}$ (4) 1
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

33. If x% of a is the same as y% of b, then z% of b will be
(1) $\frac{yz}{x}$% of a (2) $\frac{zx}{y}$% of a
(3) $\frac{xy}{z}$% of a (4) $\frac{y}{z}$% of a
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

34. If Y% of one hour is 1 minute 12 seconds, then Y is equal to
(1) 2 (2) 1
(3) $\frac{1}{2}$ (4) $\frac{1}{4}$
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

35. What percent of 3.6 kg is 72 gms. ?
(1) 32% (2) 22%
(3) 12% (4) 2%
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

36. 31% of employees pay tax in the year 2008. Non-tax paying employees are 20,700. The total number of employees is :
(1) 31,160 (2) 64,750
(3) 30,000 (4) 66,775
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

37. A team played 40 games in a season and won in 24 of them. What percent of games played did the team win?
(1) 70% (2) 40%
(3) 60% (4) 35%
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

38. If 125% of x is 100, then x is :
(1) 80 (2) 150
(3) 400 (4) 125
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

39. 498 is 17% less than the number by
(1) 610 (2) 580
(3) 600 (4) 620
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

40. Given A is 50% larger than C and B is 25% larger than C, then A is what percent larger than B ?
(1) 25% (2) 50%
(3) 75% (4) 20%
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

41. In a big garden 60% of the trees are coconut trees, 25% of the number of coconut trees are mango trees and 20% of the number of mango trees are apple trees. If the number of apple trees are 1500, then the number of trees in the garden is :
(1) 48000 (2) 50000
(3) 51000 (4) 45000
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

42. The population of a village is 25,000. One fifth are females and the rest are males. 5% of males and 40% of females are uneducated. What percentage on the whole are educated?
(1) 75% (2) 88%
(3) 55% (4) 85%
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

43. What is to be added to 15% of 160 so that the sum may be equal to 25% of 240 ?
(1) 24 (2) 84
(3) 60 (4) 36
(SSC Multi-Tasking Staff Exam. 10.03.2013)

44. A number is divided into two parts in such a way that 80% of 1st part is 3 more than 60% of 2nd part and 80% of 2nd part is 6 more than 90% of the 1st part. Then the number is
(1) 125 (2) 130
(3) 135 (4) 145
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

45. In a college, 40% of the students were allotted group A, 75% of the remaining were given group B and the remaining 12 students were given group C. Then the number of students who applied for the group is
(1) 100 (2) 60
(3) 80 (4) 92
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

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46. A box has 100 blue balls, 50 red balls, 50 black balls. 25% of blue balls and 50% of red balls are taken away. Percentage of black balls at present is
(1) 50% (2) 25%
(3) $33\frac{1}{3}\%$ (4) 40%
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

47. A dozen pairs of socks quoted at ₹ 180 are available at discount of 20%. How many pairs of socks can be bought for ₹ 48?
(1) 3 pairs (2) 4 pairs
(3) 2 pairs (4) 5 pairs
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

48. If three-fifth of sixty per cent of a number is 36, the number is
(1) 100 (2) 80
(3) 75 (4) 90
(SSC CPO S.I. Exam. 03.09.2006)

49. If 50% of (P – Q) = 30% of (P + Q) and Q = x% of P, then the value of x is :
(1) 30 (2) 25
(3) 20 (4) 50
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

50. Out of two numbers, 40% of the greater number is equal to 60% of the smaller. If the sum of the numbers is 150, then the greater number is
(1) 70 (2) 80
(3) 90 (4) 60
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

51. If 80% of a number added to 80 gives the result as the number itself, then the number is
(1) 200 (2) 300
(3) 400 (4) 500
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

52. If 120 is 20% of a number, then 120% of that number will be :
(1) 20 (2) 120
(3) 480 (4) 720
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC SO Exam. 16.11.2003 & Data Entry & LDC Exam. 10.11.2013)

53. When 60 is subtracted from 60% of a number, the result is 60. The number is :
(1) 120 (2) 150
(3) 180 (4) 200
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

54. When 75% of a number is added to 75, the result is the same number. Find the number :
(1) 225 (2) 270
(3) 300 (4) 325
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

55. Two numbers are respectively 20% and 50% of a third number. What per cent is the first number of the second?
(1) 10% (2) 20%
(3) 30% (4) 40%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

56. Two numbers are respectively 25% and 20% less than a third number. What per cent is the first number of the second ?
(1) 5% (2) 75%
(3) 80% (4) 93.75%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

57. The sum of the numbers of boys and girls in a school is 150. If the number of boys is x, the number of girls becomes x% of the total number of students. The number of boys is :
(1) 90 (2) 50
(3) 40 (4) 60
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

58. 18% of which number is equal to 12% of 75 ?
(1) 50 (2) 100
(3) 2 (4) $\frac{3}{2}$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

59. Difference of two numbers is 1660. If $6\frac{1}{2}\%$ of one number is $8\frac{1}{2}\%$ of the other number, the smaller number is
(1) 7055 (2) 5395
(3) 3735 (4) 2075
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

60. When 75 is added to 75% of a number, the answer is the number. Find 40% of that number.
(1) 100 (2) 80
(3) 120 (4) 160
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

61. The number that is to be added to 10% of 320 to have the sum as 30% of 230 is
(1) 37 (2) 32
(3) 23 (4) 73
(SSC CGL Tier-II Exam. 21.09.2014

62. If X is 20% less than Y, then find the values of $\frac{Y-X}{Y}$ and $\frac{X}{X-Y}$.
(1) $\frac{1}{5}, -4$ (2) $5, -\frac{1}{4}$
(3) $\frac{2}{5}, -\frac{5}{2}$ (4) $\frac{3}{5}, -\frac{5}{3}$
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

63. 1% of 1% of 25% of 1000 is
(1) 0.025 (2) 0.0025
(3) 0.25 (4) 0.000025
(SSC CHSL DEO & LDC Exam. 9.11.2014)

64. 25% of 120 + 40% + 380 = ? of 637
(1) $\frac{2}{7}$ (2) $\frac{1}{7}$
(3) $\frac{4}{7}$ (4) $\frac{3}{7}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

65. In a village 30% of the population is literate. If the total population of the village is 6,600, then the number of illiterate is
(1) 1980 (2) 4620
(3) 2200 (4) 3280
(SSC CHSL DEO & LDC Exam. 16.11.2014)

66. If 8% of x = 4% of y, then 20% of x is
(1) 10% of y (2) 16% of y
(3) 40% of y (4) 80% of y
(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

67. If 40% of $\frac{4}{5}$ of $\frac{3}{4}$ of a number is 48, then what is 1% of the same number ?
(1) 20 (2) 2
(3) 10 (4) 1
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

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68. The sum of (16% of 24.2) and (10% of 2.42) is
(1) 4.114 (2) 41.14
(3) 411.4 (4) 0.4114
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

69. What percent of 15 hours is 18 seconds ?
(1) 30% (2) $\frac{1}{30}$%
(3) 36% (4) $\frac{1}{36}$%
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

70. If x% of y% of 80 is the same as 25% of 900, then the value of xy is
(1) 30100 (2) 32500
(3) 28125 (4) 34200
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

71. A supply of juice lasts for 35 days. If its use is increased by 40% the number of days would the same amount of juice lasts, is
(1) 25 days (2) 30 days
(3) 24 days (4) 27days
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

72. If 60% of A = 30% of B, B = 40% of C, C = x% of A, then value of x is
(1) 200 (2) 500
(3) 800 (4) 300
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

73. In an office, 40% of the staff is female. 70% of the female staff and 50% of the male staff are married. The percentage of the unmarried staff in the office is
(1) 64 (2) 60
(3) 54 (4) 42
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

74. 50% of a number when added to 50 is equal to the number. The number is
(1) 50 (2) 75
(3) 100 (4) 150
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

75. $83\frac{1}{3}$% of Rs. 90 is equal to 60% of ?
(1) Rs. 123 (2) Rs. 124
(3) Rs. 122 (4) Rs. 125
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

76. 51% of a whole number is 714. 25% of that number is
(1) 350 (2) 450
(3) 550 (4) 250
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–II

1. If x is less than y by 25% then y exceed x by :
(1) $33\frac{1}{3}$% (2) 25%
(3) 75% (4) $66\frac{2}{3}$%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. If x is 10% more than y, then by what per cent is y less than x ?
(1) $9\frac{1}{11}$% (2) $7\frac{1}{11}$%
(3) $8\frac{1}{11}$% (4) $10\frac{1}{11}$%
(SSC CPO S.I. Exam. 07.09.2003)

3. If A's height is 10% more than B's height, by how much per cent less is B's height than that of A ?
(1) 10% (2) $10\frac{1}{9}$%
(3) $10\frac{1}{11}$% (4) $9\frac{1}{11}$%
(SSC CPO S.I. Exam. 26.05.2005)

4. B got 20% marks less than A. What per cent marks did A got more than B ?
(1) 20% (2) 25%
(3) 12% (4) 80%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

5. If x earns 25% more than y. What percent less does y earn than x ?
(1) 16% (2) 10%
(3) 20% (4) 25%
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

6. The difference of two numbers is 20% of the larger number. If the smaller number is 20, the larger number is :
(1) 25 (2) 45
(3) 50 (4) 80
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

7. If a number x is 10% less than another number y and y is 10% more than 125, then x is equal to :
(1) 150 (2) 143
(3) 140.55 (4) 123.75
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

8. Two numbers are respectively $12\frac{1}{2}$% and 25% more than a third number. The first number as percentage of second number is
(1) 50 (2) 60
(3) 75 (4) 90
(SSC CPO S.I. Exam. 12.01.2003

9. Which number is 40% less than 90 ?
(1) 36 (2) 54
(3) 50 (4) 60
(SSC CPO S.I. Exam. 07.09.2003)

10. Two numbers are less than a third number by 30% and 37% respectively. The per cent by which the second number is less than the first is
(1) 10% (2) 7%
(3) 4% (4) 3%
(SSC SAS Exam 26.06.2010 (Paper-1)

11. A number when reduced by 10% gives 30. The number is
(1) $33\frac{1}{2}$ (2) $33\frac{1}{3}$
(3) 40 (4) 35
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

12. How much $66\frac{2}{3}$% of Rs. 312 exceeds Rs. 200?
(1) Rs. 96 (2) Rs. 4
(3) Rs. 8 (4) Rs. 104
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

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TYPE–III

1. A person who spends $66\frac{2}{3}\%$ of his income is able to save ₹ 1,200 per month. His monthly expenses (in ₹) is :
(1) 1,200 (2) 2,400
(3) 3,000 (4) 3,200
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The income of C is 20% more than B's and the income of B is 25% more than A's. Find by how much per cent is C's income more than A's ?
(1) 150% (2) 50%
(3) 25% (4) 35%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If A's income is 40% less than that of B, how much percent B's income is more than that of A?
(1) 60% (2) 40%
(3) 66.66% (4) 33.33%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. What per cent decrease in salaries would exactly cancel out the 20 per cent increase?
(1) 20% (2) $16\frac{2}{3}\%$
(3) $33\frac{1}{3}\%$ (4) 18%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. Income of A is 10% more than income of B. Let B's income be x% less than A's income. Find x.
(1) $9\frac{1}{11}\%$ (2) $10\frac{1}{11}\%$
(3) 11% (4) 10%
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & 13.11.2005 (IInd Sitting) & (SSC CPO SI Exam. 12.12.2010 (Paper-I) & (SSC Investigater Exam. 12.09.2010)

6. If the income of Ram is $12\frac{1}{2}\%$ more than that of Shyam, the income of Shyam is less than that of Ram by
(1) $11\frac{1}{9}\%$ (2) $13\frac{1}{2}\%$
(3) $87\frac{1}{2}\%$ (4) $88\frac{1}{9}\%$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

7. If 60% of A's income is equal to 75% of B's income, then B's income is equal to x% of A's income. The value of x is :
(1) 70 (2) 60
(3) 80 (4) 90
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. A person gave 20% of his income to his elder son, 30% of the remaining to the younger son and 10% of the balance, he donated to a trust. He is left with ₹ 10080. His income was :
(1) ₹ 50000 (2) ₹ 40000
(3) ₹ 30000 (4) ₹ 20000
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

9. Radha spends 40% of her salary on food, 20% on house rent, 10% on entertainment and 10% on conveyance. If her savings at the end of a month are ₹ 1500, then her salary per month (in ₹) is
(1) ₹ 8000 (2) ₹ 7500
(3) ₹ 6000 (4) ₹ 10000
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. If the monthly salary of an employee is increased by $2\frac{2}{3}\%$, he gets 72 rupees more. His monthly salary (in rupees) is
(1) 7200 (2) 3600
(3) 2700 (4) 2000
(SSC CPO S.I. Exam. 07.09.2003)

11. If the total monthly income of 16 persons is ₹ 80,800 and the income of one of them is 120% of the average income, then his income is
(1) ₹ 5,050 (2) ₹ 6,060
(3) ₹ 6,160 (4) ₹ 6,600
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

12. Mita's income is 25% more than that of Sita. What percent is Sita's income less than that of Mita ?
(1) 25% (2) 24%
(3) $22\frac{1}{2}\%$ (4) 20%
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

13. A man spends $12\frac{1}{2}\%$ of his salary on items of daily use and 30% of the remainder on house rent. After that he is left with ₹ 2940. How much is his salary ?
(1) ₹ 4800 (2) ₹ 5200
(3) ₹ 4500 (4) ₹ 4000
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

14. The monthly income of a person was ₹ 13,500 and his monthly expenditure was ₹ 9,000. Next year his income increased by 14% and his expenditure increased by 7%. The per cent increase in his savings was
(1) 7% (2) 21%
(3) 28% (4) 35%
(SSC CGL Prelim Exam. 08.02.2004 (IInd Sitting) & (SSC Section Officer Exam. 25.09.2005)

15. A worker suffers a 20% cut in his wages. He may regain his original wages by obtaining a rise of
(1) 27.5% (2) 25.0%
(3) 22.5% (4) 20.0%
(SSC CPO S.I. Exam. 05.09.2004)

16. Given that 10% of A's income = 15% of B's income = 20% of C's income. If sum of their income is ₹ 7800, then B's income is:
(1) ₹ 3600 (2) ₹ 3000
(3) ₹ 2400 (4) ₹ 1800
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

17. If A's income is 25% less than B's income, by how much percent is B's income more than that of A ?
(1) 25% (2) 30%
(3) $33\frac{1}{3}\%$ (4) $66\frac{2}{3}\%$
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

18. A's salary is 50% more than that of B. How much per cent is B's salary less than that of A?
(1) 50% (2) $33\frac{1}{3}\%$
(3) 45% (4) $66\frac{2}{3}\%$
(SSC CPO S.I. Exam. 03.09.2006)

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19. Tulsiram's salary is 20% more than that of Kashyap. If Tulsiram saves ₹ 720 which is 4% of his salary, then Kashyap's salary is
(1) ₹ 15,000 (2) ₹ 12,000
(3) ₹ 10,000 (4) ₹ 22,000
(SSC CPO S.I. Exam. 06.09.2009)

20. A's salary is 40% of B's salary and B's salary is 25% of C's salary. What percentage of C's salary is A's salary?
(1) 5% (2) 10%
(3) 15% (4) 20%
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. If A's income is 50% less than that of B's, then B's income is what per cent more than that of A?
(1) 125% (2) 100%
(3) 75% (4) 50%
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

22. X's income is 20% more than that of Y. What per cent is Y's income less than X?
(1) $83\frac{1}{3}\%$ (2) $16\frac{2}{3}\%$
(3) $83\frac{2}{3}\%$ (4) $16\frac{1}{3}\%$
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC HSL DEO & LDC Exam. 27.11.2010)

23. The allowances of an empolyee constitutes 165% of his basic pay. If he receives ₹ 11925 as gross salary, then his basic pay is (in ₹):
(1) 4000 (2) 5000
(3) 4500 (4) 5500
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

24. If Nita's salary is 25 per cent more than Papiya's salary, then the percentage by which Papiya's salary is less than Nita's salary is
(1) 15% (2) 20%
(3) 25% (4) 32%
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

25. The salary of a person is decreased by 25% and then the decreased salary is increased by 25%. His new salary in comparison with his original salary is
(1) the same (2) 6.25% more
(3) 6.25% less (4) 0.625% less
(SSC Data Entry Operator Exam. 02.08.2009)

26. Ram saves 14% of his salary while Shyam saves 22%. If both get the same salary and Shyam saves ₹ 1540, what is the savings of Ram?
(1) ₹ 990 (2) ₹ 980
(3) ₹ 890 (4) ₹ 880
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

27. A's salary is 25% more than B's salary. B's salary is how much less than A's salary?
(1) 20 % (2) 24 %
(3) 25 % (4) 27.5 %
(SSC Section officer commercial Audit Exam. 16.11.2003 & SSC CPO S.I. Exam. 12.01.2003) & (SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

28. A man spends 75% of his income. His income increased by 20% and he increased his expenditure by 15%. His savings will then be increased by
(1) 33% (2) $33\frac{1}{3}\%$
(3) 35% (4) 40%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

29. Nitin's salary was reduced by 10% and then the reduced salary was increased by 10%. His new salary in comparison with his original salary is
(1) the same (2) 1% more
(3) 1% less (4) 5% less
(SSC Data Entry Operator Exam. 31.08.2008)

30. A man spends 40% of his monthly salary on food and one-third of the remaining on transport. If he saves ₹ 4,500 per month, which is equal to half the balance after spending on food and transport, his monthly salary is
(1) ₹ 11,250 (2) ₹ 22,500
(3) ₹ 25,000 (4) ₹ 45,000
(SSC Data Entry Operator Exam. 31.08.2008)

31. A saves 20% of his monthly salary. If his monthly expenditure is ₹ 6,000, then his monthly savings is
(1) ₹1,500 (2) ₹1,800
(3) ₹1,200 (4) ₹ 4,800
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

32. A's salary is increased by 10% and then decreased by 10%. Then, change in salary is
(1) 0% (2) 1% decrease
(3) 1% increase (4) 2% decrease
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

33. Kishan spends 30% of his salary on food and donates 3% in a Charitable Trust. He spends ₹ 2,310 on these two items, then total salary for that month is
(1) ₹ 6,000 (2) ₹ 8,000
(3) ₹ 9,000 (4) ₹ 7,000
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

34. A clerk received an annual salary of ₹ 3,660 in the year 1975. This was 20% more than his salary in 1974. What was his salary in 1974?
(1) ₹ 3,005 (2) ₹ 3,000
(3) ₹ 3,500 (4) ₹ 3,050
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

35. Out of his total income, Mr. Kapur spends 20% on house rent and 70% of the rest on house-hold expenses. If he saves ₹ 1,800, what is his total income (in rupees)?
(1) ₹ 7,800 (2) ₹ 7,000
(3) ₹ 8,000 (4) ₹ 7,500
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

36. Arbind spends 75% of his income and saves the rest. His income is increasesd by 20% and he increases his expenditure by 10%. Then the increase in savings in percentage is
(1) 55% (2) 52%
(3) 50% (4) 48%
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

37. The enhanced salary of a man becomes ₹ 24,000 after 20% increment. His previous salary was
(1) ₹ 20,000 (2) ₹ 21,000
(3) ₹ 16,000 (4) ₹ 18,000
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

38. The salary of a person was reduced by 10%. By what per cent should his reduced salary be raised so as to bring it at par with his orignal salary?
(1) 9% (2) $11\frac{1}{9}\%$
(3) $9\frac{1}{11}\%$ (4) 11%
(SSC CGL Prelim Exam. 06.02.2004 (First Sitting)

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39. If A's salary is 50% more than that of B, then B's salary is less than A's by

(1) 33% (2) $40\frac{1}{3}\%$

(3) $45\frac{1}{3}\%$ (4) $33\frac{1}{3}\%$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

40. Mr. X spends 35% of his salary on food and 5% of his salary on children education. In January 2011, he spent ₹ 17, 600 on these two items. His salary for that month is

(1) ₹ 40, 000 (2) ₹ 44, 000

(3) ₹ 48, 000 (4) ₹ 46, 000

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

41. The monthly salaries of A and B together amount to Rs. 40,000. A spends 85% of his salary and B, 95% of his salary. If now their savings are the same, then the salary (in Rs.) of A is

(1) Rs. 10,000 (2) Rs. 12,000

(3) Rs. 16,000 (4) Rs. 18,000

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

42. 25% of annual salary of A is equal to eighty percent of annual salary of B. Monthly salary of B is 40% of the monthly salary of C. Annual salary of C is Rs. 6 lac. What is the monthly salary of A?

(1) Rs. 60,000 (2) Rs. 62,000

(3) Rs. 64,000 (4) Rs. 56,000

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

43. Two numbers are less than a third number by 30% and 37% respectively. How much percent is the second number less than the first?

(1) 10 (2) 4

(3) 3 (4) 7

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

44. A man spends 75% of his income. His income is increased by 20% and he increased his expenditure by 10%. His savings are increased by

(1) $37\frac{1}{2}\%$ (2) 50%

(3) 25% (4) 10%

(SSC CGL Tier-I Exam. 09.08.2015 (IInd Sitting) TF No. 4239378)

45. Ram babu donated 3% of his income to a charity and deposited 12% of the rest in bank. If now he has Rs. 12804, then his income was :

(1) Rs. 17460 (2) Rs. 15000

(3) Rs. 7500 (4) Rs. 14550

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE–IV

1. If A exceeds B by 40%, B is less than C by 20%, then A : C is :

(1) 28 : 25 (2) 26 : 25

(3) 3 : 2 (4) 3 : 1

(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC Section Officer Exam. 16.11.2003)

2. If 10% of m is the same as 20% of n, then m : n is equal to :

(1) 2 : 1 (2) 1 : 2

(3) 1 : 10 (4) 1 : 20

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. The ratio 5 : 4 expressed as a per cent equals :

(1) 125% (2) 80%

(3) 40% (4) 12.5%

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. The ratio of the number of boys and girls in a college is 3 : 2. If 20% of boys and 25% of girls are adults, the percentage of those students who are not adults, is

(1) 58% (2) 67.5%

(3) 78% (4) 82.5%

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC DEO Exam. 02.08.2009)

5. The ratio of the number of boys to that of girls in a school is 4 : 1. If 75% of boys and 70% of the girls are scholarship-holders, then the percentage of students who do not get scholarship is

(1) 50% (2) 28%

(3) 75% (4) 26%

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

6. Two numbers are in the ratio 2 : 3. If 20% of the smaller number added to 20 is equal to the sum of 10% of the larger number and 25, then the smaller number is

(1) 100 (2) 160

(3) 180 (4) 200

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

7. Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is

(1) 2 : 5 (2) 3 : 5

(3) 4 : 5 (4) 6 : 7

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003 & CPO SI Exam. 26.05.2005) & (SSC CGL Exam. 13.11.2005 (First Sitting)

8. The difference of two numbers is 45% of their sum. The ratio of the larger number to the smaller number is

(1) 20 : 9 (2) 9 : 20

(3) 29 : 11 (4) 11 : 29

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting) & (SSC CGL Exam. 27.07.2008 (IInd Sitting) & (SSC HSL DEO & LDC Exam. 27.11.2010) & (SSC CGL Tier-1 Exam. 26.06.2011 (Ist Sitting) & (SSC MTS Exam. 10.03.2013 (Patna)

9. If 30% of A = 0.25 of B = $\frac{1}{5}$ of C, then A : B : C is equal to :

(1) 5 : 6 : 4 (2) 5 : 24 : 7

(3) 6 : 5 : 4 (4) 10 : 12 : 15

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

10. In a class, the number of girls is 20% more than that of the boys. The strength of the class is 66. If 4 more girls are admitted to the class, the ratio of the number of boys to that of the girls is

(1) 1 : 2 (2) 3 : 4

(3) 1 : 4 (4) 3 : 5

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. The ratio of the number of boys and girls in a school is 3 : 2. If 20% of the boys and 30% of the girls are scholarship holders, then the percentage of students, who do not get scholarship, is

(1) 50% (2) 72%

(3) 75% (4) 76%

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

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12. The expenses on rice, fish and oil of a family are in the ratio 12 : 17 : 3. The prices of these articles are increased by 20%, 30% and 50% respectively. The total expenses of family on these articles are increased by

(1) $14\frac{1}{8}\%$ (2) $7\frac{1}{8}\%$

(3) $56\frac{1}{8}\%$ (4) $28\frac{1}{8}\%$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

13. If 20% of A = 30% of B = $\frac{1}{6}$ of C, then A : B : C is

(1) 2 : 3 : 16
(2) 3 : 2 : 16
(3) 10 : 15 : 18
(4) 15 : 10 : 18

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

14. The bus fare and train fare of a place from Kolkata were ₹ 20 and ₹ 30 respectively. Train fare has been increased by 20% and the bus fare has been increased by 10%. The ratio of new train fare to new bus fare is

(1) 11 : 18 (2) 18 : 11
(3) 5 : 3 (4) 3 : 5

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

15. The difference of two numbers is 15% of their sum. The ratio of the larger number to the smaller number is

(1) 23 : 17 (2) 11 : 9
(3) 17 : 11 (4) 23 : 11

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

16. The price of sugar is increased by 20%. If the expenditure on sugar has to be kept the same as earlier, the ratio between the reduction in consumption and the original consumption is

(1) 1 : 3 (2) 1 : 4
(3) 1 : 6 (4) 1 : 5

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

17. Rama's expenditures and savings are in the ratio 5 : 3. If her income increases by 12% and expenditure by 15%, then by how much per cent do her savings increase ?

(1) 12% (2) 7%
(3) 8% (4) 13%

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

18. The ratio of two numbers is 4:5 when the first is increased by 20% and the second is decreased by 20%, the ratio of the resulting numbers is

(1) 4 : 5 (2) 5 : 4
(3) 5 : 6 (4) 6 : 5

(SSC CPO S.I. Exam. 09.11.2008)

19. If 60% of A = $\frac{3}{4}$ of B, then A : B is

(1) 9 : 20 (2) 20 : 9
(3) 4 : 5 (4) 5 : 4

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

20. If A exceeds B by 60% and B is less than C by 20%, then A : C is

(1) 32 : 25 (2) 25 : 32
(3) 8 : 5 (4) 4 : 5

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. If 30% of (B – A) = 18% of (B + A), then the ratio A : B is equal to

(1) 4 : 1 (2) 1 : 4
(3) 5 : 4 (4) 5 : 9

(SSC CPO S.I. Exam.12.12.2010 (Paper-I)

22. The ratio of the number of boys and girls in a school is 3 : 2. If 20% of the boys and 25% of the girls are scholarship holders, then the percentage of the students, who do not get the scholarship, is :

(1) 78% (2) 75%
(3) 60% (4) 55%

(SSC CHSL DEO & LDC Exam. 27.11.2010)

23. When 60% of a number is subtracted from another number, the second number reduces to its 52%; the ratio of the first number to the second number is :

(1) 6: 5 (2) 5: 3
(3) 5: 4 (4) 4: 5

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

24. The population of a town is 3,11,250. The ratio between women and men is 43 : 40. If there are 24% literate among men and 8% literate among women, the total number of literate persons in the town is

(1) 41,800 (2) 48,900
(3) 56,800 (4) 99,600

(SSC Graduate Level Tier-II Exam.16.09.2012)

25. The prices of a school bag and a shoe are in the ratio 7 : 5. The price of a school bag is ₹ 200 more than the price of a shoe. Then the price of a shoe is

(1) ₹ 200 (2) ₹ 700
(3) ₹ 500 (4) ₹ 1,200

(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)

26. If 15% of x is same as 20 % of y then $x : y$ is

(1) 4 : 3 (2) 5 : 4
(3) 6 : 5 (4) 3 : 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

27. The ratio of the number of boys and girls in a school is 2 : 3. If 25% of the boys and 30% of the girls are scholarship holders, the percentage of the school students who are not scholarship holders is

(1) 72 (2) 36
(3) 54 (4) 60

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

28. Two numbers A and B are such that the sum of 5% of A and 4% of B is $\frac{2}{3}$ rd of the sum of 6% of A and 8% of B. The ratio A : B is

(1) 4 : 3 (2) 3 : 4
(3) 1 : 1 (4) 2 : 3

(SSC CGL Tier-I Exam. 19.10.2014)

29. In what ratio must 25% hydrochloric acid be mixed with 60% hydrochloric acid to get a mixture of 40% hydrochloric acid ?

(1) 5 : 12 (2) 4 : 3
(3) 3 : 4 (4) 12 : 5

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , 1st Sitting TF No. 333 LO 2)

30. If 50% of x = 30% y, then $x : y$ is

(1) 2 : 3 (2) 5 : 3
(3) 3 : 2 (4) 3 : 5

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

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31. The ratio of the number of boys to that of girls in a village is 3 : 2. If 30% of boys and 70% of girls appeared in an examination, the ratio of the number of villagers, appreared in the examination to that not appeared in the same examination is

(1) 9 : 14 (2) 23 : 27

(3) 1 : 1 (4) 27 : 23

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

32. A milkman mixed some water with milk to gain 25% by selling the mixture at the cost price. The ratio of water and milk is respectively

(1) 5 : 4 (2) 4 : 5

(3) 1 : 5 (4) 1 : 4

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

33. The ratio of syrup and water in a mixture is 3 : 1, then the percentage of syrup in this mixture is :

(1) 75% (2) 25%

(3) $66\frac{2}{3}\%$ (4) $33\frac{1}{3}\%$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

TYPE–V

1. A sample of 50 litres of glycerine is found to be adulterated to the extent of 20%. How much pure glycerine should be added to it so as to bring down the percentage of impurity to 5% ?

(1) 155 litres (2) 150 litres

(3) 150.4 litres (4) 149 litres

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

2. 1 litre of water is added to 5 litres of alcohol-water solution containing 40% alcohol strength. The strength of alcohol in the new solution will be

(1) 30% (2) 33%

(3) $33\frac{2}{3}\%$ (4) $33\frac{1}{3}\%$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. If 4 litres of water is evaporated on boiling from 12 litres of salt solution containing 7 percentage salt, the percentage of salt in the remaining solution is

(1) 10.5% (2) 11.5%

(3) 12% (4) 13%

(SSC CPO S.I. Exam. 06.09.2009)

4. A vessel has 60 litres of solution of acid and water having 80% acid. How much water be added to make it a solution in which acid forms 60% ?

(1) 48 litres (2) 20 litres

(3) 36 litres

(4) None of these

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

5. 75 gm of sugar solution has 30% sugar in it. Then the quantity of sugar that should be added to the solution to make the quantity of the sugar 70% in the solution, is

(1) 125 gm (2) 100 gm

(3) 120 gm (4) 130 gm

(SSCCHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

6. A litre of pure alcohol is added to 6 litres of 30% alcohol solution. The percentage of water in the solution is

(1) 50% (2) 65%

(3) 60% (4) 40%

(SSC CHSL DEO& LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

7. An ore contains 25% of an alloy that has 90% iron. Other than this, in the remaining 75% of the ore, there is no iron. To obtain 60 kg of pure iron, the quantity of the ore needed (in kgs) is approximately :

(1) 250.57 (2) 266.67

(3) 275.23 (4) 300

(SSCCHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

8. How much water must be added to 100 ml of 80 per cent solution of boric acid to reduce it to a 50 per cent solution ?

(1) 30 ml (2) 40 ml

(3) 50 ml (4) 60 ml

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

9. In one litre of a mixture of alcohol and water, water is 30%. The amount of alcohol that must be added to the mixture so that the part of water in the mixture becomes 15% is :

(1) 1000 ml (2) 700 ml

(3) 300 ml (4) 900 ml

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

10. One type of liquid contains 20% water and the second type of liquid contains 35% of water. A glass is filled with 10 parts of first liquid and 4 parts of second liquid. The water in the new mixture in the glass is

(1) 37% (2) 46%

(3) $12\frac{1}{7}\%$ (4) $24\frac{2}{7}\%$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

11. 40 litres of a mixture of milk and water contains 10% of water, the water to be added, to make the water content 20% in the new mixture is :

(1) 6 litres (2) 6.5 litres

(3) 5.5 litres (4) 5 litres

(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (HSL DEO LDC Exam. 28.11.2010)

12. How much pure alcohol has to be added to 400 ml of a solution containing 15% of alcohol to change the concentration of alcohol in the mixture to 32% ?

(1) 60 ml (2) 100 ml

(3) 128 ml (4) 68 ml

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

13. In 50 gm alloy of gold and silver, the gold is 80% by weight. How much gold should be mixed to this alloy so that the weight of gold would become 95% ?

(1) 200 gm (2) 150 gm

(3) 50 gm (4) 10 gm

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

14. 200 litres of a mixture contains 15% water and the rest is milk. The amount of milk that must be added so that the resulting mixture contains 87.5% milk is

(1) 30 litres (2) 35 litres

(3) 40 litres (4) 45 litres

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

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15. In what ratio must a mixture of 30% alcohol strength be mixed with that of 50% alcohol strength so as to get a mixture of 45% alcohol strength ?
(1) 1 : 2 (2) 1 : 3
(3) 2 : 1 (4) 3 : 1
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

16. The ratio in which two sugar solutions of the concentrations 15% and 40% are to be mixed to get a solution of concentration 30% is
(1) 2 : 3 (2) 3 : 2
(3) 8 : 9 (4) 9 : 8
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

17. 15 litres of a mixture contains alcohol and water in the ratio 1 : 4. If 3 litres of Water is mixed in it, the percentage of alcohol in the new mixture will be
(1) 15% (2) $16\frac{2}{3}\%$
(3) 17% (4) $18\frac{1}{2}\%$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

18. In an alloy there is 12% of copper. To get 69 kg of copper, how much alloy will be required ?
(1) 424 kg (2) 575 kg
(3) 828 kg (4) $1736\frac{2}{3}$ kg
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

19. In what ratio must 25% of alcohol be mixed with 50% of alcohol to get a mixture of 40% strength alcohol ?
(1) 1 : 2 (2) 2 : 1
(3) 2 : 3 (4) 3 : 2
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (1st Sitting)

20. 20 litres of a mixture contains 20% alcohol and the rest water. If 4 litres of water be mixed in it, the percentage of alcohol in the new mixture will be
(1) $33\frac{1}{3}\%$ (2) $16\frac{2}{3}\%$
(3) 25% (4) $12\frac{1}{2}\%$
(SSC CGL Tier-II Exam. 21.09.2014)

21. 300 grams of sugar solution has 40% of sugar in it. How much sugar should be added to make it 50% in the solution?
(1) 40 gram (2) 10 gram
(3) 60 gram (4) 80 gram
(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099685)

TYPE–VI

1. Price of sugar rises by 20%. By how much percent should the consumption of sugar be reduced so that the expenditure does not change?
(1) 20% (2) 10%
(3) $16\frac{2}{3}\%$ (4) 15%
(SSC CGL Prelim Exam. 04.07.1999 (1st Sitting) & (SSC CGL Tier-I Exam. 19.06.2011 (1st Sitting)

2. If food prices go up by 10%, by how much should a man reduce his consumption so as not to increase his expenditure?
(1) $9\frac{1}{11}\%$ (2) 10%
(3) $11\frac{1}{9}\%$
(4) The data is not sufficient
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. In the new budget, the price of kerosene oil rose by 25%. By how much per cent must a person reduce his consumption of kerosene oil so that his expenditure on it does not increase ?
(1) 20% (2) 25%
(3) 50% (4) 40%
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Exam. 13.11.2005 (IInd Sitting)

4. If the price of tea is increased by 20%, by how much per cent the consumption of tea be reduced so that there is no increase in the expenditure on it ?
(1) $83\frac{1}{3}\%$ (2) 20%
(3) $16\frac{2}{3}\%$ (4) $8\frac{1}{3}\%$
(SSC CPO S.I. Exam. 05.09.2004)

5. If the price of a commodity is decreased by 20% and its consumption is increased by 20%, what will be the increase or decrease in the expenditure on the commodity ?
(1) 4% increase (2) 4% decrease
(3) 8% decrease (4) 8% increase
(SSC CPO S.I. Exam. 16.12.2007)

6. The price of a certain item is increased by 15%. If a consumer wants to keep his expenditure on the item the same as before, how much per cent must he reduce his consumption of that item ?
(1) 15% (2) $13\frac{1}{23}\%$
(3) $16\frac{2}{3}\%$ (4) $10\frac{20}{23}\%$
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

7. If the price of a commodity is increased by 50%, by what fraction must its consumption be reduced so as to keep the same expenditure on its consumption?
(1) $\frac{1}{4}$ (2) $\frac{1}{3}$
(3) $\frac{1}{2}$ (4) $\frac{2}{3}$
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. If the price of rice be raised by 25%, the percent by which a house-holder must reduce his consumption of rice so as not to increase his expenditure on rice is
(1) 225% (2) 25.75%
(3) 25% (4) 20%
(SSC Multi-Tasking Staff Exam. 17.03.2013, 1st Sitting)

9. If the duty on an article is reduced by 40% of its present rate, by how much per cent must its consumption increase in order that the revenue remains unaltered ?
(1) 60% (2) $62\frac{1}{3}\%$
(3) 72% (4) $66\frac{2}{3}\%$
(SSC CPO S.I. Exam. 09.11.2008)

10. Price of milk has increased by 20%. To keep the expenditure unchanged, the present consumption is to be reduced by :
(1) 20% (2) 18%
(3) 10% (4) $16\frac{2}{3}\%$
(SSC Multi-Tasking Staff Exam. 10.03.2013)

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11. The price of a commodity rises from ₹ 6 per kg to ₹ 7.50 per kg. If the expenditure cannot increase, the percentage of reduction in consumption is
(1) 15% (2) 20%
(3) 25% (4) 30%
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

12. Water tax is increased by 20% but its consumption is decreased by 20%. Then the increase or decrease in the expenditure of the money is
(1) 5% decrease (2) 4% decrease
(3) No change (4) 4% increase
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

13. Price of a commodity has increased by 60%. By what per cent must a consumer reduce the consumption of the commodity so as not to increase the expenditure ?
(1) 37% (2) 37.5%
(3) 40.5% (4) 60%
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

14. The price of petrol is increased by 25%. By how much per cent a car owner should reduce his consumption of petrol so that the expenditure on petrol would not be increased ?
(1) 25% (2) 30%
(3) 50% (4) 20%
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

15. If the price of petrol be raised by 20%, then the percentage by which a car owner must reduce his consumption so as not to increase his expenditure on petrol is
(1) $16\frac{1}{3}\%$ (2) $16\frac{2}{3}\%$
(3) $15\frac{2}{3}\%$ (4) $15\frac{1}{3}\%$
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

TYPE–VII

1. In an examination, there were 1000 boys and 800 girls. 60% of the boys and 50% of the girls passed. Find the percent of the candidates failed ?
(1) 46.4% (2) 48.4%
(3) 44.4% (4) 49.6%
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. In an examination, a student who gets 20% of the maximum marks fails by 5 marks. Another student who scores 30% of the maximum marks gets 20 marks more than the pass marks. The necessary percentage required for passing is :
(1) 32% (2) 23%
(3) 22% (4) 20%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. In an examination a candidate must secure 40% marks to pass. A candidate, who gets 220 marks, fails by 20 marks. What are the maximum marks for the examination?
(1) 1200 (2) 800
(3) 600 (4) 450
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. A student has to obtain 33% of total marks to pass. He got 25% of total marks and failed by 40 marks. The number of total marks is
(1) 800 (2) 300
(3) 500 (4) 1000
(SSC CPO S.I. Exam. 12.01.2003

5. Two students appeared at an examination. One of them secured 9 marks more than the other and his marks were 56% of the sum of their marks. The marks obtained by them are :
(1) 42, 33 (2) 43, 34
(3) 41, 32 (4) 39, 30
(SSC CGL Prelim Exam. 09.02.2004 (Second Sitting)

6. In the annual examination Mahuya got 10% less marks than Supriyo in Mathematics. Mahuya got 81 marks. The marks of Supriyo are
(1) 90 (2) 87
(3) 88 (4) 89
(SSC CHSL DEO & LDC Exam. 20.10.2013)

7. A student has to secure 40% marks to pass. He gets 90 marks and fails by 10 marks. Maximum marks are :
(1) 200 (2) 225
(3) 250 (4) 275
(SSC CPO S.I. Exam. 26.05.2005)

8. In an examination, 65% of the students passed in Mathematics, 48% passed in Physics and 30% passed in both. How much per cent of students failed in both the subjects ?
(1) 17% (2) 43%
(3) 13% (4) 47%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. 72% of the students of a certain class took Biology and 44% took Mathematics. If each student took at least one subject from Biology or Mathematics and 40 took both, then the total number of students in the class is :
(1) 200 (2) 240
(3) 250 (4) 320
(SSC CPO S.I. Exam. 16.12.2007)

10. In an examination, a student had to obtain 33% of the maximum marks to pass. He got 125 marks and failed by 40 marks. The maximum marks were
(1) 500 (2) 600
(3) 800 (4) 1000
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

11. For an examination it is required to get 36 % of maximum marks to pass. A student got 113 marks and failed by 85 marks. The maximum marks for the examination are :
(1) 500 (2) 550
(3) 565 (4) 620
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

12. A student scored 32% marks in science subjects out of 300. How much should he score in language papers out of 200 if he is to get overall 46% marks ?
(1) 72% (2) 67%
(3) 66% (4) 60%
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. In an examination in which full marks were 500, A got 10% less than B. B got 25% more than C. C got 20% less than D. If A got 360 marks, what percentage of full marks was obtained by D ?
(1) 90% (2) 80%
(3) 50% (4) 60%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

14. In an examination, 1100 boys and 900 girls appeared. 50% of the boys and 40% of the girls passed the examination. The percentage of candidates who failed
(1) 45% (2) 45.5%
(3) 50% (4) 54·5%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

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15. In an examination 80% of the boys passed in English and 85% passed in Mathematics, while 75% passed in both. If 45 boys failed in both, the number of boys who sat for the examination was
(1) 400 (2) 450
(3) 200 (4) 150
(SSC CPO SI Exam. 09.11.2008) & (SSC Constable (GD) Exam.12.05.2013)

16. In a class 60% of the student pass in Hindi and 45% pass in Sanskrit. If 25% of them pass in atleast one subject, what percentage of the students fail in both the subjects?
(1) 80% (2) 75%
(3) 20% (4) 25%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

17. In an examination 60% of the students pass in English, 70% pass in Hindi and 40% pass in both. What percent of students fail in both English and Hindi?
(1) 10% (2) 20%
(3) 25% (4) 30%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

18. In an examination 70% of the candidates passed in English, 80% passed in Mathematics, 10% failed in both the subjects. If 144 candidates passed in both, the total number of candidates were :
(1) 125 (2) 200
(3) 240 (4) 375
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

19. A candidate who gets 20% marks in an examination fails by 30 marks but another candidate who gets 32% gets 42 marks more than the passing marks. Then the percentage of pass marks is :
(1) 52% (2) 50%
(3) 33% (4) 25%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

20. In an examination there were 640 boys and 360 girls, 60% of boys and 80% of girls were successful. The percentage of failure was :
(1) 20% (2) 60%
(3) 30.5% (4) 32.8%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

21. In an examination 34% failed in Mathematics and 42% failed in English. If 20% failed in both the subjects, the percentage of students who passed in both subjects was
(1) 54% (2) 50%
(3) 44% (4) 56%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

22. A candidate secured 30% marks in an examination and failed by 6 marks. Another secured 40% marks and got 6 marks more than the bare minimum to pass. The maximum marks are
(1) 150 (2) 120
(3) 100 (4) 180
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

23. In an examination, 52% students failed in Hindi and 42% in English. If 17% failed in both the subjects, what percentage of students passed in both the subjects ?
(1) 38% (2) 33%
(3) 23% (4) 18%
(SSC CGL Prelim Exam. 08.02.2004 (1st Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I) & (SSC GL Tier-II Exam. 16.09.2012)

24. In a group of students, 70% can speak English and 65% can speak Hindi. If 27% of the students can speak none of the the two languages, then what per cent of the group can speak both the languages ?
(1) 38% (2) 62%
(3) 28% (4) 23%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

25. 25% of the candidates who appeared in an examination failed to qualify and only 450 candidates qualified. The number of candidates, who appeared in the examination, was
(1) 700 (2) 600
(3) 550 (4) 500
(SSC CPO S.I. Exam. 05.09.2004)

26. In two successive years 100 and 75 students of a school appeared at the final examination. Respectively, 75% and 60% of them passed. The average rate of pass is
(1) $68\frac{4}{7}\%$ (2) 78%
(3) $80\frac{1}{2}\%$ (4) 80%
(SSC CPO S.I. Exam. 03.09.2006)

27. A student has to secure minimum 35% marks to pass in an examination. If he gets 200 marks and fails by 10 marks, then the maximum marks are
(1) 300 (2) 400
(3) 500 (4) 600
(SSC CPO S.I. Exam. 03.09.2006)

28. A candidate who scores 30 per cent fails by 5 marks, while another candidate who scores 40 per cent marks gets 10 more than minimum pass marks. The minimum marks required to pass are
(1) 50 (2) 70
(3) 100 (4) 150
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

29. In an examination, 60% of the candidates passed in English and 70% of the candidates passed in Mathematics, but 20% failed in both of these subjects. If 2500 candidates passed in both the subjects, the number of candidates who appeared at the examination was
(1) 3000 (2) 3500
(3) 4000 (4) 5000
(SSC CGL Prelim Exam. 04.02.2007) (First Sitting)

30. In a test a student got 30% marks and failed by 25 marks. In the same test another student got 40% marks and secured 25 marks more than the essential minimum pass marks. The maximum marks for the test were
(1) 400 (2) 480
(3) 500 (4) 580
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

31. In an examination 80% candidates passed in English and 85% candidates passed in Mathematics. If 73% candidates passed in both these subjects, then what per cent of candidates failed in both the subjects ?
(1) 8% (2) 15%
(3) 27% (4) 35%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

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32. In an examination, 35% of the candidates failed in Mathematics and 25% in English. If 10% failed in both Mathematics and English, then how much percent of candidates passed in both the subjects ?
(1) 50% (2) 55%
(3) 57% (4) 60%
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

33. In an examination, 93% of students passed and 259 failed. The total number of students appearing at the examination was
(1) 3700 (2) 3850
(3) 3950 (4) 4200
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

34. 90% of the students in a school passed in English, 85% passed in Mathematics and 150 students passed in both the subjects. If no student failed in both the subjects, find the total number of students.
(1) 120 (2) 220
(3) 200 (4) 300
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

35. Three sets of 40, 50 and 60 students appeared for an examination and the pass percentage was 100, 90 and 80 respectively. The pass percentage of the whole set is
(1) $88\frac{2}{3}\%$ (2) $84\frac{2}{3}\%$
(3) $88\frac{1}{3}\%$ (4) $84\frac{1}{3}\%$
(SSC Graduate Level Tier-II Exam. 29.09.2013)

36. In an examination A got 25% marks more than B, B got 10% less than C and C got 25% more than D. If D got 320 marks out of 500, the marks obtained by A were
(1) 405 (2) 450
(3) 360 (4) 400
(SSC Graduate Level Tier-II Exam. 29.09.2013

37. In two successive years, 80 and 60 students of a school appeared at the final examination of which 60% and 80% passed respectively. The average rate of students passed (in percent) is
(1) 68% (2) $68\frac{4}{7}\%$
(3) 70% (4) $72\frac{3}{7}\%$
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

38. In an examination, 19% students fail in Mathematics and 10% students fail in English. If 7% of all students fail in both subjects, then the number of students passed in both subjects is
(1) 36 % of all students
(2) 64% of all students
(3) 71% of all students
(4) 78% of all students
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

39. A class has two sections, which contain 20 and 30 students. The pass percentage of these sections are 80% and 60% respectively. The pass percentage of whole class is
(1) 60 (2) 68
(3) 70 (4) 78
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

40. In an examination 75% candidates passed in English and 60% passed in Mathematics. 25% failed in both and 240 passed the examination. Find the total number of candidates.
(1) 492 (2) 300
(3) 500 (4) 400
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

41. In a quarterly examination a student secured 30% marks and failed by 12 marks. In the same examination another student secured 40% marks and got 28 marks more than minimum marks to pass. The maximum marks in the examination is
(1) 300 (2) 500
(3) 700 (4) 400
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

42. In an examination there are three subjects of 100 marks each. A student scores 60% in the first subject and 80% in the second subject. He scored 70% in aggregate. His percentage of marks in the third subject is
(1) 80 (2) 60
(3) 65 (4) 70
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

43. In an examination, a student must get 36% marks to pass. A student who gets 190 marks failed by 35 marks. The total marks in that examination is
(1) 450 (2) 810
(3) 500 (4) 625
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

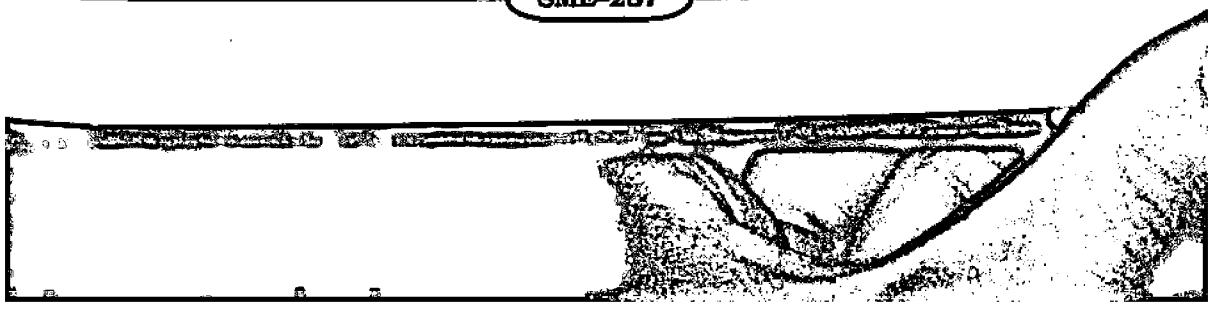
44. A candidate who gest 20% marks in an examination, fails by 30 marks. But if he gets 32% marks, he gets 42 marks more than the minimum pass marks. Find the pass percentage of marks.
(1) 52% (2) 20%
(3) 25% (4) 12%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

TYPE–VIII

1. Salary of a person is first increased by 20%, then it is decreased by 20%. Percentage change in his salary is :
(1) 4% decreased
(2) 4% increased
(3) 8% decreased
(4) 20% increased
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. A number is increased by 20% and then it is decreased by 10%. Find the net increase or decrease per cent.
(1) 10% increase
(2) 10% decrease
(3) 8% increase
(4) 8% decrease
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. The tax imposed on an article is decreased by 10% and its consumption increases by 10%. Find the percentage change in revenue from it.
(1) 10% increase (2) 2% decrease
(3) 1% decrease (4) 11% increase
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)



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4. The price of an article was decreased by 10% and again reduced by 10%. By what per cent should the price have been reduced once, in order to produce the same effect as these two successive reductions ?
(1) 15% (2) 19%
(3) 20% (4) 25%
(SSC CPO S.I. Exam. 12.01.2003)

5. If price of a book is first decreased by 25% and then increased by 20%, the net change in the price of the book will be
(1) 10% decrease
(2) 5% decrease
(3) no change
(4) 5% increase
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting))

6. The price of an article is reduced by 25% but the daily sale of the article is increased by 30%. The net effect on the daily sale receipts is
(1) $2\frac{1}{2}$% increase
(2) $2\frac{1}{2}$% decrease
(3) 2 % increase
(4) 2% decrease
(SSC CGL Prelim Exam. 27.07.2003 (Second Sitting))

7. Two successive price increases of 10% and 10% of an article are equivalent to a single price increase of
(1) 19% (2) 20%
(3) 21% (4) 22%
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting))

8. The price of an article was first increased by 10% and then again by 20%. If the last increased price be ₹ 33, the original price was
(1) ₹ 30 (2) ₹ 27.50
(3) ₹ 26.50 (4) ₹ 25
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting))

9. If a number is increased by 20% and the resulting number is again increased by 20%, what per cent is the total increase ?
(1) 48% (2) 44%
(3) 41% (4) 40%
(SSC SAS Exam 26.06.2010 (Paper-1))

10. A number is increased by 10% and then it is decreased by 10%. The net change in the number is
(1) no increase or decrease
(2) 2% decrease
(3) 1% increase
(4) 1% decrease
(SSC CGL Prelim Exam. 11.05.2003 (1st Sitting) & (SSC (South Zone) Investigator Exam. 12.09.2010) & CHSL DEO & LDC Exam. 04.11.2012)

11. A number is first increased by 10% and then it is further increased by 20%. The original number is increased altogether by
(1) 30% (2) 15%
(3) 32% (4) 36%
(SSC CGL Exam. 04.02.2007 (1st Sitting) & (FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (1st Sitting))

12. When the price of an article was reduced by 20% its sale increased by 80%. What was the net effect on the sale?
(1) 44% increase
(2) 44% decrease
(3) 66% increase
(4) 75% increase
(SSC CGL Tier-I Exam 19.06.2011 (First Sitting))

13. The length of a rectangle is increased by 10% and breadth decreased by 10% Then the area of the new rectangle is
(1) neither decreased nor increased
(2) increased by 1%
(3) decreased by 1%
(4) decreased by 10%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting))

14. When the price of cloth was reduced by 25%, the quantity of cloth sold increased by 20%. What was the effect on gross receipt of the shop?
(1) 5% increase
(2) 5% decrease
(3) 10% increase
(4) 10% decrease
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

15. The cost of an article worth ₹ 100 is increased by 10% first and again increased by 10%. The total increase in rupees is
(1) 20 (2) 21
(3) 110 (4) 121
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

16. The numerator of a fraction is increased by 20% and denominator is decreased by 20%. The value of the fraction becomes $\frac{4}{5}$. The original fraction is
(1) $\frac{2}{3}$ (2) $\frac{8}{15}$
(3) $\frac{7}{11}$ (4) $\frac{4}{5}$
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

17. If the numerator of a fraction is increased by 20% and the denominator is decreased by 5%, the value of the new fraction becomes $\frac{5}{2}$. The original fraction is
(1) $\frac{24}{19}$ (2) $\frac{3}{18}$
(3) $\frac{95}{48}$ (4) $\frac{48}{95}$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting))

18. If a number is increased by 25% and the resulting number is decreased by 25%, then the percentage increase or decrease finally is
(1) no change
(2) decreased by $6\frac{1}{4}$%
(3) increased by $6\frac{1}{4}$%
(4) increased by 6%
(SSC CHSL DEO & LDC Exam. 10.11.2013, 1st Sitting)

19. The sum of two numbers is 520. If the bigger number is decreased by 4% and the smaller number is increased by 12%, then the numbers obtained are equal. The smaller number is
(1) 280 (2) 210
(3) 240 (4) 300
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

20. The price of an article is first decreased by 20% and then increased by 30%. If the resulting price is ₹ 416, the original price of the article is
(1) ₹ 350 (2) ₹ 405
(3) ₹ 400 (4) ₹ 450
(SSC Graduate Level Tier-I Exam. 19.05.2013)

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21. A number increased by $22\frac{1}{2}\%$ gives 98. The number is
(1) 45 (2) 18
(3) 80 (4) 81
(SSC Graduate Level Tier-II Exam. 29.09.2013)

22. The price of an article is decreased by 10%. To restore its former value the new price must be increased by :
(1) 10% (2) 11%
(3) $9\frac{1}{11}\%$ (4) $11\frac{1}{9}\%$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

23. A number reduced by 25% becomes 225. What per cent should it be increased so that it becomes 375?
(1) 25% (2) 30%
(3) 35% (4) 75%
(SSC CPO S.I. Exam. 05.09.2004)

24. A number is increased by 20% and then again by 20%. By what per cent should the increased number be reduced so as to get back the original number ?
(1) $30\frac{5}{9}\%$ (2) $19\frac{11}{31}\%$
(3) 40% (4) 44%
(SSC CGL Prelim Exam. 08.02.2004) (First Sitting)

25. The number of employees working in a farm is increased by 25% and the wages per head are decreased by 25%. If it results in x % decrease in total wages, then the value of x is
(1) 0% (2) 25%
(3) 20% (4) $\frac{25}{4}\%$
(SSC CGL Prelim Exam. 08.02.2004) (Second Sitting)

26. A number is first decreased by 10% and then increased by 10%. The number so obtained is 50 less than the original number. The original number is
(1) 5900 (2) 5000
(3) 5500 (4) 5050
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

27. If the income tax is increased by 19%, the net income is reduced by 1%. The rate of income tax is
(1) 6% (2) 4%
(3) 5% (4) 7.2%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

28. A man spends 75% of his income. His income increases by 20% and his expenditure also increases by 10%. The percentage of increase in his savings is
(1) 40% (2) 30%
(3) 50% (4) 25%
(SSC CGL Tier-I Exam. 19.10.2014)

29. If each side of a cube is increased by 10% the volume of the cube will increase by
(1) 30% (2) 10%
(3) 33.1% (4) 25%
(SSC CGL Tier-II Exam. 21.09.2014)

30. The strength of a school increases and decreases in every alternate year by 10%. It started with increase in 2000. Then the strength of the school in 2003 as compared to that in 2000 was
(1) increased by 8.9%
(2) decreased by 8.9%
(3) increased by 9.8%
(4) decreased by 9.8%
(SSC CGL Tier-II Exam. 21.09.2014)

31. The difference between the value of the number increased by 20% and the value of the number decreased by 25% is 36. Find the number.
(1) 7.2 (2) 0.8
(3) 720 (4) 80
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

32. A number is first decreased by 20%. The decreased number is then increased by 20%. The resulting number is less than the original number by 20. Then the original number is
(1) 200 (2) 400
(3) 500 (4) 600
(SSC CHSL DEO Exam. 02.11.2014 (1st Sitting)

33. A number is increased by x%; to get back to the original number, it is to be reduced by
(1) $x\%$ (2) $\frac{100x}{100+x}\%$
(3) $\frac{10x}{100+x}\%$ (4) $\frac{x}{100+x}\%$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (1st Sitting) (TF No. 8037731)

TYPE–IX

1. 8% of the voters in an election did not cast their votes. In this election, there were only two candidates. The winner by obtaining 48% of the total votes defeated his contestant by 1100 votes. The total number of voters in the election was :
(1) 21000 (2) 23500
(3) 22000 (4) 27500
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

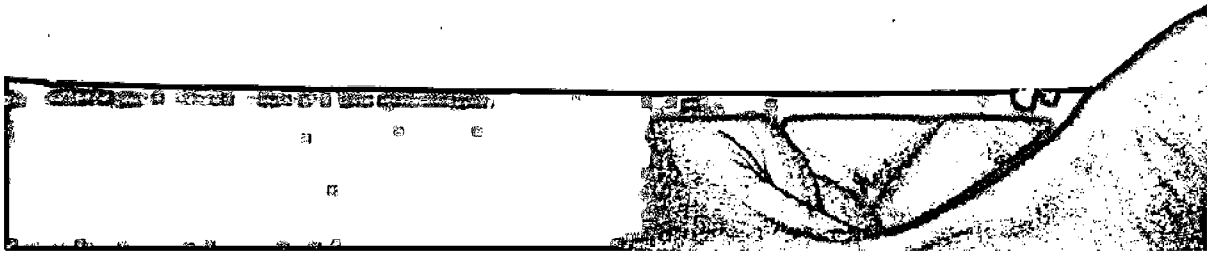
2. In an election between two candidates, 75% of the voters cast their votes, out of which 2% votes were declared invalid. A candidate got 9261 votes which were 75% of the valid votes. The total number of voters enrolled in that election was
(1) 16000 (2) 16400
(3) 16800 (4) 18000
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. In an election between two candidates, the candidate getting 60% of the votes polled, is elected by a majority of 14,000 votes. The number of votes polled by the winning candidate is
(1) 28,000 (2) 32,000
(3) 42,000 (4) 46,000
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

4. In an office 40% of the staff is female, 40% of the females and 60% of the males voted for me. The percentage of votes I got was
(1) 24% (2) 42%
(3) 50% (4) 52%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

5. In an election there were only two candidates. One of the candidates secured 40% of votes and is defeated by the other candidate by 298 votes. The total number of votes polled is
(1) 745 (2) 1460
(3) 1490 (4) 1500
(SSC Graduate Level Tier-II Exam.16.09.2012)

6. In an assembly election, a candidate got 55% of the total valid votes. 2% of the total votes were declared invalid. If the total number of voters is 104000, then the number of valid votes polled in favour of the candidate is:
(1) 56506 (2) 56650
(3) 56560 (4) 56056
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)



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7. Two candidates contested in an election. One got 60% of the votes and won by 1600 votes. What is the number of votes polled ?
(1) 9000 (2) 8000
(3) 10000 (4) 7500
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

8. In an election, three candidates contested. The first candidate got 40% votes and the second got 36% votes. If total number of votes polled were 36000, find the number of votes got by the 3rd candidate.
(1) 8040 (2) 8640
(3) 9360 (4) 9640
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

9. Two persons contested an election of Parliament. The winning candidate secured 57% of the total votes polled and won by a majority of 42,000 votes. The number of total votes polled is
(1) 5,00,000 (2) 6,00,000
(3) 3,00,000 (4) 4,00,000
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

10. In an election, a candidate who gets 84 % of the votes is elected by a majority of 476 votes. What is the total number of votes polled ?
(1) 900 (2) 810
(3) 600 (4) 700
(SSC CGL Tier-I Exam. 26.10.2014)

11. At an election there were two candidates. A candidate got 38% of votes and lost by 7200 number of votes. The total number of valid votes were
(1) 13000 (2) 13800
(3) 16200 (4) 30000
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

12. In a college election a candidate secured 62% of the votes and is elected by a margin of 144 votes. The total number of votes polled is :
(1) 925 (2) 600
(3) 1200 (4) 800
(SSC Constable (GD) Exam. 04.10.2015, Ist Sitting)

TYPE–X

1. The present population of a city is 180000. If it increases at the rate of 10% per annum, its population after 2 years will be :
(1) 207800 (2) 227800
(3) 217800 (4) 237800
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

2. The value of an equipment depreciates by 20% each year. How much less will the value of the equipment be after 3 years ?
(1) 48.8% (2) 51.2%
(3) 54% (4) 60%
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

3. A district has 64000 inhabitants. If the population increases at the rate of $2\frac{1}{2}\%$ per annum, the number of inhabitants at the end of 3 years will be
(1) 70000 (2) 69200
(3) 68921 (4) 68911
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. The value of a property depreciates every year by 10% of its value at the beginning of the year. The present value of the property is ₹ 8100. What was its value 2 years ago ?
(1) ₹ 10,000
(2) $₹\left(\frac{90}{100}\right)^2 \times 8100$
(3) $₹\left(\frac{100}{110}\right)^2 \times 8100$
(4) ₹ 9801
(SSC CPO S.I. Exam. 07.09.2003)

5. The population of a town 2 years ago was 62,500. Due to migration to big cities, it decreases every year at the rate of 4%. The present population of the town is:
(1) 57,600 (2) 56,700
(3) 76,000 (4) 75,000
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. The population of a town increases every year by 4%. If its present population is 50,000, then after 2 years it will be
(1) 53,900 (2) 54,000
(3) 54,080 (4) 54,900
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

7. A man received ₹ 8,80,000 as his annual salary of the year 2007 which was 10% more than his annual salary in 2006. His annual salary in the year 2006 was
(1) ₹ 4,80,000 (2) ₹ 8,00,000
(3) ₹ 4,00,000 (4) ₹ 8,40,000
(SSC Data Entry Operator Exam. 02.09.2009)

8. Present population of a village is 67600. It has been increasing annually at the rate of 4%. What was the population of the village two years ago ?
(1) 62500 (2) 63000
(3) 64756 (4) 65200
(SSC CHSL DEO & LDC Exam. 27.11.2010)

9. The value of a machine depreciates by 5% every year. If its present value is ₹ 2,00,000, its value after 2 years will be
(1) ₹ 1,80,500 (2) ₹ 1,99,000
(3) ₹ 1,80,000 (4) ₹ 2,10,000
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

10. The value of a property decreases every year at the rate of 5%. If its present value is ₹ 4,11,540, what was its value 3 years ago ?
(1) ₹ 4,50,000 (2) ₹ 4,60,000
(3) ₹ 4,75,000 (4) ₹ 4,80,000
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

11. If the population of a town is 64000 and its annual increase is 10%, then its correct population at the end of 3 years will be :
(1) 80000 (2) 85184
(3) 85000 (4) 85100
(SSC (CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

12. The population of a village decreases at the rate of 20% per annum. If its population 2 years ago was 10,000, the present population is
(1) 4600 (2) 6400
(3) 7600 (4) 6000
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

13. If a man receives on one-fourth of his capital 3% interest, on two third 5% and on the remainder 11%, the percentage he receives on the whole is
(1) 4.5 (2) 5
(3) 5.5 (4) 5.2
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

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14. The value of a machine is ₹ 6,250. It decreases by 10% during the first year, 20% during the second year and 30% during the third year. What will be the value of the machine after 3 years?
(1) ₹ 2,650 (2) ₹ 3,050
(3) ₹ 3,150 (4) ₹ 3,510
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

15. The value of a machine depreciates every year by 10%. If its present value is ₹ 50,000 then the value of the machine after 2 years is _____.
(1) ₹ 40,050 (2) ₹ 45,000
(3) ₹ 40,005 (4) ₹ 40,500
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

16. The value of a machine depreciates every year at the rate of 10% on its value at the beginning of that year. If the current value of the machine is ₹ 729, its worth 3years ago was:
(1) ₹1000 (2) ₹ 750.87
(3) ₹ 947.10 (4) ₹ 800
(SSC Graduate Level Tier-I Exam. 21.04.2013)

17. Raman's salary is increased by 5% this year. If his present salary is ₹ 1,806, the last year's salary was
(1) ₹ 1720 (2) ₹ 1620
(3) ₹1520 (4) ₹ 1801
(SSC Constable (GD) Exam. 12.05.2013)

18. In a town, the population was 8000. In one year, male population increased by 10% and female population increased by 8% but the total population increased by 9%. The number of males in the town was :
(1) 4000 (2) 4500
(3) 5000 (4) 6000
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

19. The population of a village was 9800. In a year, with the increase in population of males by 8% and that of females by 5%, the population of the village became 10458. What was the number of males in the village before increase ?
(1) 4200 (2) 4410
(3) 5600 (4) 6048
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

20. The population of a village has increased annually at the rate of 25%. If at the end of 3 years it is 10,000, the population in the beginning of the first year was
(1) 5120 (2) 5000
(3) 4900 (4) 4500
(SSC CPO S.I. Exam. 07.09.2003)

21. If population of women in a village is 90% of population of men, what is the population of men as a percentage of population of women ?
(1) 100% (2) 105%
(3) 108% (4) 111%
(SSC CISF Constable (GD) Exam. 05.06.2011)

22. The population of a town increases each year by 4% of its total at the beginning of the year. If the population on 1st January 2001 was 500000, what was it on 1st January, 2004 ?
(1) 562432 (2) 652432
(3) 465223 (4) 564232
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

23. The population of a village increases by 5% annually. If its present population is 4410, then its population 2 years ago was
(1) 4500 (2) 4000
(3) 3800 (4) 3500
(SSC CHSL DEO & LDC Exam. 9.11.2014)

24. A TV was bought at a price of ₹ 21,000. After one year the value of TV was depreciated by 5%. Find the value of the TV after one year.
(1) ₹ 19,950 (2) ₹ 20,950
(3) ₹ 18,950 (4) ₹ 17,950
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

25. From 1980-1990, the population of a country increased by 20%. From 1990-2000, the population of the country increased by 20%. From 2000-2010, the population of the country increased by 20%. Then the overall increased population (in percentage) of the country from 1980-2010 was
(1) 72.2 % (2) 60 %
(3) 72.8 % (4) 62.8 %
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

26. Of the 1000 inhabitants in a town 60% are males of whom 20% are literate. If of all the inhabitants, 25% are literate, then what percentage of the females of the town are literate ?
(1) 27.5 (2) 32.5
(3) 37.5 (4) 22.5
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

27. In a factory, the production of cycles rose to 48, 400 from 40,000 in 2 years. The rate of growth per annum is
(1) 9% (2) 8%
(3) 10.5% (4) 10%
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

28. The present price of a scooter is Rs. 7,290. If its value decreases every year by 10%, then its value 3 years back was
(1) Rs. 10, 500 (2) Rs. 8,000
(3) Rs. 10,000 (4) Rs. 11,500
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

29. The population of a town increases by 5% every year. If the present population is 9261, the population 3 years ago was
(1) 8000 (2) 5700
(3) 6000 (4) 7500
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

30. An epidemic broke out in a village in which 5% of the population died. Of the remaining, 20% fled out of panic. If the present population is 4655, then the population of the village originally was
(1) 6000 (2) 6125
(3) 5955 (4) 5995
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

TYPE–XI

1. The Government reduced the price of sugar by 10 per cent. By this a consumer can buy 6.2 kg more sugar for ₹ 837. The reduced price per kg of sugar is
(1) ₹ 12.50 (2) ₹ 13.00
(3) ₹ 13.50 (4) ₹ 14.00
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

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2. The price of sugar is reduced by 20%. Now a person can buy 500g more sugar for ₹ 36. The original price of the sugar per kilogram was
(1) ₹ 14.40 (2) ₹ 18
(3) ₹ 15.60 (4) ₹ 16.50
(SSC CGL Prelim Exam. 27.07.2006 (First Sitting)

3. A reduction of 10% in the price of sugar enables a housewife to buy 6.2 kg more for ₹ 1116. The reduced price per kg is
(1) ₹ 12 (2) ₹ 14
(3) ₹ 16 (4) ₹ 18
(SSC CPO S.I. Exam. 06.09.2009)

4. When the price of sugar decreases by 10%, a man could buy 1 kg more for ₹ 270. Then the original price of sugar per kg is
(1) ₹ 25 (2) ₹ 30
(3) ₹ 27 (4) ₹ 32
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

5. A reduction of 20% in the price of an apple enables a man to buy 10 apples more for ₹ 54. The reduced price of apples per dozen is
(1) ₹ 4.32 (2) ₹ 12.96
(3) ₹ 10.80 (4) ₹ 14.40
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

6. Due to an increase of 50% in the price of eggs, 4 eggs less are available for ₹ 24. The present rate of eggs per dozen is :
(1) ₹ 24 (2) ₹ 27
(3) ₹ 36 (4) ₹ 42
(SSC CHSL DEO & LDC Exam. 27.11.2010)

7. A reduction of 20% in the price of wheat enables Lalita to buy 5 kg more wheat for ₹ 320. The original rate (in rupees per kg) of wheat was
(1) 16 (2) 18
(3) 20 (4) 21
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

8. Due to an increase of 20% in the price of eggs, 2 eggs less are available for ₹ 24. The present rate of eggs per dozen is :
(1) ₹ 25.00 (2) ₹ 26.20
(3) ₹ 27.80 (4) ₹ 28.80
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

9. A reduction of 25% in the price of rice enables a person to buy 10 kg more rice for ₹ 600. The reduced per kg price of rice is
(1) ₹ 30 (2) ₹ 25
(3) ₹ 20 (4) ₹ 15
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

10. A reduction in the price of apples enables a person to purchase 3 apples for ₹ 1 instead of ₹1.25. What is the % of reduction in price (approximately) ?
(1) 20% (2) 25%
(3) 30% (4) $33\frac{1}{3}\%$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

11. A number, on subtracting 15 from it, reduces to its 80%. What is 40% of the number?
(1) 75 (2) 60
(3) 30 (4) 90
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

12. A reduction of 21% in the price of an item enables a person to buy 3 kg more for ₹ 100. The reduced price of item per kg is
(1) ₹ 5.50 (2) ₹ 7.50
(3) ₹ 10.50 (4) ₹ 7.00
(SSC CGL Tier-II Exam. 21.09.2014)

13. A reduction of 20% in the price of sugar enables a purchaser to obtain 8 kg more for Rs. 160. Then the price per kg before reduction was
(1) Rs. 5 (2) Rs. 6
(3) Rs. 10 (4) Rs. 4
(SSC CGL Tier-II Exam. 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

14. The price of an item was increased by 10%. This reduced the monthly total sales by 20%. The overall effect on the value of monthly sales is a
(1) 10% increase
(2) 10% decrease
(3) 12% increase
(4) 12% decrease
(SSC CGL Tier-I Re-Exam, 30.08.2015)

TYPE–XII

1. In a school 70% of the students are girls. The number of boys are 510. Then the total number of students in the school is :
(1) 850 (2) 1700
(3) 1830 (4) 1900
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If 60% of the students in a school are boys and the number of girls is 972, how many boys are there in the school ?
(1) 1258 (2) 1458
(3) 1324 (4) 1624
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If 70% of the students in a school are boys and the number of girls be 504, the number of boys is :
(1) 1176 (2) 1008
(3) 1208 (4) 3024
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. If the sales tax on a television set increases from $7\frac{1}{2}\%$ to 8%, what more amount will have to be paid for the television whose price (excluding sales taxes) is ₹ 19000 ?
(1) ₹ 190 (2) ₹ 95
(3) ₹ 180 (4) ₹ 90
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. A spider climbed $62\frac{1}{2}\%$ of the height of the pole in one hour and in the next hour it covered $12\frac{1}{2}\%$ of the remaining height. If pole's height is 192 m, then distance climbed in second hour is
(1) 3 m (2) 5 m
(3) 7 m (4) 9 m
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

6. Fresh fruit contains 68% water and dry fruit contains 20% water. How much dry fruit can be obtained from 100 kgs of fresh fruits ?
(1) 32 kgs. (2) 40 kgs.
(3) 52 kgs. (4) 80 kgs.
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

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7. An individual pays 30% income tax. On this tax he has to pay a surcharge of 10%. Thus, the net tax rate, he has to pay, is
(1) 45% (2) 40%
(3) 33% (4) 27%
(SSC CPO S.I. Exam. 05.09.2004)

8. X has twice as much money as that of Y and Y has 50% more money than that of Z. If the average money of all of them is ₹ 110, then the money, which X has, is
(1) ₹ 55 (2) ₹ 60
(3) ₹ 90 (4) ₹ 180
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. p is six times as large as q. The per cent that q is less than p, is
(1) $83\frac{1}{3}\%$ (2) 70%
(3) $63\frac{1}{3}\%$ (4) 50%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. In the expression xy^2, the values of both variables x and y are decreased by 20%. By this, the value of the expression is decreased by
(1) 40% (2) 80%
(3) 48.8% (4) 51.2%
(SSC CPO S.I. Exam. 16.12.2007)

11. Two numbers are respectively 10% and 25% more than a third number. What per cent is the first of the second ?
(1) 88% (2) 65%
(3) 75% (4) 80%
(SSC CPO S.I. Exam. 06.09.2009)

12. A boy who was asked to find $3\frac{1}{2}\%$ of a sum of money misread the question and found $5\frac{1}{2}\%$ of it. His answer was ₹ 220. What would have been the correct answer ?
(1) ₹ 120 (2) ₹ 140
(3) ₹ 160 (4) ₹ 150
(SSC CPO S.I. Exam. 06.09.2009)

13. In a factory 60% of the workers are above 30 years and of these 75% are males and the rest are females. If there are 1350 male workers above 30 years, the total number of workers in the factory is
(1) 3000 (2) 2000
(3) 1800 (4) 1500
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

14. First and second numbers are less than a third number by 30% and 37% respectively. The second number is less than the first by
(1) 7% (2) 4%
(3) 3% (4) 10%
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

15. Rani's weight is 25% that of Meena's and 40% that of Tara's. What percentage of Tara's weight is equal to Meena's weight?
(1) 160% (2) 140%
(3) 120% (4) 100%
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

16. Out of 2500 people, only 60% have the saving habit. If 30% save with bank, 32% with post office and the rest with shares, the number of shareholders are
(1) 450 (2) 570
(3) 950 (4) 1250
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

17. The value of a commodity depreciates 10% annually. If it was purchased 3 years ago and its present value is ₹ 5,832, what was its purchase price ?
(1) ₹ 7200 (2) ₹ 7862
(3) ₹ 8000 (4) ₹ 8500
(SSC CPO S.I. Exam. 09.11.2008)

18. A and B are two fixed points 5 cm apart and C is a point on AB such that AC is 3 cm. If the length of AC is increased by 6%, the length of CB is decreased by
(1) 6% (2) 7%
(3) 8% (4) 9%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

19. If 24-carat gold is considered to be hundred per cent pure gold, then the percentage of pure gold in 22-carat gold is :
(1) $91\frac{3}{4}\%$ (2) $91\frac{2}{3}\%$
(3) $91\frac{1}{3}\%$ (4) $90\frac{2}{3}\%$
(SSC CHSL DEO & LDC Exam. 27.11.2010)

20. In a class, the average score of girls in an examination is 73 and that of boys is 71. The average score for the whole class is 71.8. Find the percentage of girls.
(1) 40% (2) 50%
(3) 55% (4) 60%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

21. Shelf A has $\frac{4}{5}$ of the number of books that shelf B has. If 25% of the books in A are transferred to B and then 25% of the books from B are transferred to A, then the percentage of the total number of books that A will have is
(1) 25% (2) 50%
(3) 75% (4) 100%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

22. Tickets for all but 100 seats in a 10,000 seat stadium were sold. Of the tickets sold, 20% were sold at half price and the remaining tickets were sold at the full price of ₹ 20. The total revenue from the ticket sales, in ₹ was
(1) 158400 (2) 178200
(3) 180000 (4) 198000
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

23. Neha's weight is 140% of Tina's weight. Mina's weight is 90% of Lina's weight. Lina weighs twice as much as Tina. If Neha's weight is x% of Mina's weight, then x is equal to :
(1) $64\frac{2}{9}$ (2) $77\frac{7}{9}$
(3) 90 (4) $128\frac{4}{7}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. The number of seats in a cinema hall is increased by 25%. The cost of each ticket is also increased by 10%. The effect of these changes on the revenue collection will be an increase of
(1) 37.5% (2) 45.5%
(3) 47.5% (4) 49.5%
(SSC Data Entry Operator Exam. 31.08.2008)

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25. A man had a certain amount with him. He spent 20% of that to buy an article and 5% of the remaining on transport. Then he gifted ₹ 120. If he is left with ₹1,400, the amount he spent on transport is
(1) ₹ 76 (2) ₹ 61
(3) ₹ 95 (4) ₹ 80
(SSC Graduate Level Tier-II Exam.16.09.2012)

26. 31% of employees pay tax in the year 2008. Non-tax paying employees are 20,700. The total number of employees are :
(1) 31,160 (2) 64,750
(3) 30,000 (4) 66,775
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

27. A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had :
(1) 588 apples (2) 600 apples
(3) 672 apples (4) 700 apples
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

28. Two numbers are more than the third number by 20% and 50% respectively. First number is what per cent of the second number ?
(1) 100% (2) 150%
(3) 80% (4) 120%
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC Data Entry Operator Exam. 02.08.2009)

29. A batsman scored 110 runs which included 3 boundaries and 8 sixes. What per cent of his total score, did he make by running between the wickets ?
(1) 45% (2) $45\frac{5}{11}\%$
(3) $54\frac{6}{11}\%$ (4) 55%
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

30. The price of an article was increased by r%. Later the new price was decreased by r%. If the latest price was ₹1, then the original price was :
(1) ₹1 (2) ₹ $\frac{1-r^2}{100}$
(3) ₹ $\frac{\sqrt{1-r^2}}{100}$ (4) ₹ $\left(\frac{10000}{10000-r^2}\right)$
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

31. If a number x is 10% less than another number y and y is 10% more than 125, then x is equal to
(1) 150 (2) 143
(3) 140.55 (4) 123.75
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

32. An interval of 3 hours 40 minutes is wrongly estimated as 3 hours 45.5 minutes. The error percentage is
(1) 5.5% (2) 5.2%
(3) 5% (4) 2.5%
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

33. In a village, each of the 60% of families has a cow; each of the 30% of families has a buffalo and each of the 15% of families has both a cow and buffalo. In all there are 96 families in the village. How many families do not have a cow or a buffalo ?
(1) 20 (2) 24
(3) 26 (4) 28
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

34. A man invests a part of ₹ 10,000 at 5% and the remainder at 6%. The 5% investment yields annually ₹ 76.50 more than the 6% investment . The amount invested at 6% is
(1) ₹ 3,600 (2) ₹ 3,550
(3) ₹ 3,850 (4) ₹ 4,000
(SSC CPO S.I. Exam. 09.11.2008)

35. For every set of 19 kites sold, a vendor gives 1 kite extra, free of cost. In order to give a discount of 10%, the number of extra kites he should give in a sale of 27 kites to the nearest integer is
(1) 3 (2) 6
(3) 7 (4) 8
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

36. A number is divided into two parts in such a way that 80% of 1st part is 3 more than 60% of 2nd part and 80% of 2nd part is 6 more than 90% of the 1st part. Then the number is
(1) 125 (2) 130
(3) 135 (4) 145
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

37. A man invested ₹ 27,000 in $12\frac{1}{2}\%$ stock at 108, then his yield percentage is
(1) $18\frac{3}{4}\%$ (2) $11\frac{31}{54}\%$
(3) 15% (4) $8\frac{1}{2}\%$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

38. The percentage of metals in a mine of lead ore is 60%. Now the percentage of silver is $\frac{3}{4}\%$ of metals and the rest is lead. If the mass of ore extracted from this mine is 8000 kg, the mass (in kg) of lead is :
(1) 4763 (2) 4762
(3) 4764 (4) 4761
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

39. The sum of two positive numbers is 20% of the sum of their squares and 25% of the difference of their squares. If the numbers are x and y then, $\frac{x+y}{x^2}$ is equal to
(1) $\frac{1}{4}$ (2) $\frac{3}{8}$
(3) $\frac{1}{3}$ (4) $\frac{2}{9}$
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

40. A man bought some eggs of which 10% are rotten. He gives 80% of the remainder to his neighbours. Now he is left out with 36 eggs. How many eggs he bought ?
(1) 40 (2) 100
(3) 200 (4) 72
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6836838)

41. A man gives 50% of his money to his son and 30% to his daughter. 80% of the rest is donated to a trust. If he is left with Rs. 16,000 now, how much money did he have in the beginning?
(1) Rs. 40,000
(2) Rs. 8,00,000
(3) Rs. 80,000
(4) Rs. 4,00,000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

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SHORT ANSWERS

TYPE-I

1. (3)	2. (4)	3. (1)	4. (4)
5. (3)	6. (3)	7. (4)	8. (1)
9. (2)	10. (4)	11. (4)	12. (2)
13. (1)	14. (3)	15. (2)	16. (4)
17. (2)	18. (1)	19. (1)	20. (3)
21. (2)	22. (3)	23. (4)	24. (2)
25. (4)	26. (4)	27. (1)	28. (4)
29. (4)	30. (4)	31. (1)	32. (1)
33. (2)	34. (1)	35. (4)	36. (3)
37. (3)	38. (1)	39. (3)	40. (4)
41. (2)	42. (2)	43. (4)	44. (3)
45. (3)	46. (3)	47. (2)	48. (1)
49. (2)	50. (3)	51. (3)	52. (4)
53. (2)	54. (3)	55. (4)	56. (4)
57. (4)	58. (1)	59. (2)	60. (3)
61. (1)	62. (1)	63. (1)	64. (1)
65. (2)	66. (1)	67. (2)	68. (1)
69. (2)	70. (3)	71. (1)	72. (2)
73. (4)	74. (3)	75. (4)	76. (1)

TYPE-II

1. (1)	2. (1)	3. (4)	4. (2)
5. (3)	6. (1)	7. (4)	8. (4)
9. (2)	10. (1)	11. (2)	12. (3)

TYPE-III

1. (2)	2. (2)	3. (3)	4. (2)
5. (1)	6. (1)	7. (3)	8. (4)
9. (2)	10. (3)	11. (2)	12. (4)
13. (1)	14. (3)	15. (2)	16. (3)
17. (3)	18. (2)	19. (1)	20. (2)
21. (2)	22. (2)	23. (3)	24. (2)
25. (3)	26. (2)	27. (1)	28. (3)
29. (3)	30. (2)	31. (1)	32. (2)
33. (4)	34. (4)	35. (4)	36. (3)
37. (1)	38. (2)	39. (4)	40. (2)
41. (1)	42. (3)	43. (1)	44. (2)
45. (2)			

TYPE-IV

1. (1)	2. (1)	3. (1)	4. (3)
5. (4)	6. (1)	7. (3)	8. (3)
9. (4)	10. (2)	11. (4)	12. (4)
13. (4)	14. (2)	15. (1)	16. (3)
17. (2)	18. (4)	19. (4)	20. (1)
21. (2)	22. (1)	23. (4)	24. (2)
25. (3)	26. (1)	27. (1)	28. (1)
29. (3)	30. (4)	31. (2)	32. (4)
33. (1)			

TYPE-V

1. (2)	2. (4)	3. (1)	4. (2)
5. (2)	6. (3)	7. (2)	8. (4)
9. (1)	10. (4)	11. (4)	12. (2)
13. (2)	14. (3)	15. (2)	16. (1)
17. (2)	18. (2)	19. (3)	20. (2)
21. (3)			

TYPE-VI

1. (3)	2. (1)	3. (1)	4. (3)
5. (2)	6. (2)	7. (2)	8. (4)
9. (4)	10. (4)	11. (2)	12. (2)
13. (2)	14. (4)	15. (2)	

TYPE-VII

1. (3)	2. (3)	3. (3)	4. (3)
5. (1)	6. (1)	7. (3)	8. (1)
9. (3)	10. (1)	11. (2)	12. (2)
13. (2)	14. (4)	15. (2)	16. (2)
17. (1)	18. (3)	19. (4)	20. (4)
21. (3)	22. (2)	23. (3)	24. (2)
25. (2)	26. (1)	27. (4)	28. (1)
29. (4)	30. (3)	31. (1)	32. (1)
33. (1)	34. (3)	35. (1)	36. (2)
37. (2)	38. (4)	39. (2)	40. (4)
41. (4)	42. (4)	43. (4)	44. (3)

TYPE-VIII

1. (1)	2. (3)	3. (3)	4. (2)
5. (1)	6. (2)	7. (3)	8. (4)
9. (2)	10. (4)	11. (3)	12. (1)
13. (3)	14. (4)	15. (2)	16. (2)
17. (3)	18. (2)	19. (3)	20. (3)
21. (3)	22. (4)	23. (1)	24. (1)
25. (4)	26. (2)	27. (3)	28. (3)
29. (3)	30. (1)	31. (4)	32. (3)
33. (2)			

TYPE-IX

1. (4)	2. (3)	3. (3)	4. (4)
5. (3)	6. (4)	7. (2)	8. (2)
9. (3)	10. (4)	11. (4)	12. (2)

TYPE-X

1. (3)	2. (1)	3. (3)	4. (1)
5. (1)	6. (3)	7. (2)	8. (1)
9. (1)	10. (4)	11. (2)	12. (2)
13. (2)	14. (3)	15. (4)	16. (1)
17. (1)	18. (1)	19. (3)	20. (1)
21. (4)	22. (1)	23. (2)	24. (1)
25. (3)	26. (2)	27. (4)	28. (3)
29. (1)	30. (2)		

TYPE-XI

1. (3)	2. (2)	3. (4)	4. (2)
5. (2)	6. (3)	7. (1)	8. (4)
9. (4)	10. (1)	11. (3)	12. (4)
13. (1)	14. (4)		

TYPE-XII

1. (2)	2. (2)	3. (1)	4. (2)
5. (4)	6. (3)	7. (3)	8. (4)
9. (1)	10. (3)	11. (1)	12. (2)
13. (1)	14. (4)	15. (1)	16. (2)
17. (3)	18. (4)	19. (2)	20. (1)
21. (2)	22. (2)	23. (2)	24. (1)
25. (4)	26. (3)	27. (4)	28. (3)
29. (2)	30. (4)	31. (4)	32. (4)
33. (2)	34. (3)	35. (1)	36. (3)
37. (2)	38. (3)	39. (4)	40. (3)
41. (4)			

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EXPLANATIONS

TYPE-I

1. (3) According to question,

$$A\times\frac{80}{100}=B\times\frac{50}{100}$$

$$\therefore B=\frac{A\times80}{50}=1.6A$$

$\therefore$ B = 160% of A

$\therefore$ x = 160

2. (4) According to question,

$$y=\frac{100\times100}{80}\text{ of }x$$

$\therefore$ y = 125% of x

3. (1) $\frac{8x}{100}=\frac{4y}{100}$

$\Rightarrow y=2x$

$\therefore$ 20% of x = 10% of y.

4. (4) Let x be the multiplicand.

$$\therefore \text{ Error}=\frac{5}{3}x-\frac{3}{5}x$$

$$=\frac{25x-9x}{15}=\frac{16x}{15}$$

$\therefore$ Percentage error

$$=\frac{\frac{16x}{15}}{\frac{5}{3}x}\times100$$

$$=\frac{16x}{15}\times\frac{3}{5x}\times100=64\%$$

5. (3) p% of p = 36

$$\Rightarrow \frac{p}{100}\times p=36$$

$\Rightarrow p^2=3600$

$\Rightarrow p=60$

6. (3) Let 2 be x% of 50

$\Rightarrow$ x% of 50 = 2

$$\Rightarrow \frac{x}{100}\times50=2\Rightarrow\frac{x}{2}=2$$

$\therefore x=4$

7. (4) Let x % of $\frac{1}{3}=\frac{2}{3}$

$$\Rightarrow x\%=\frac{2\times3}{3}=2\Rightarrow x=200\%$$

8. (1) 0.15% of $33\frac{1}{3}$% of ₹ 10000

$$=\frac{0.15}{100}\times\frac{100}{300}\times10000=₹5$$

9. (2) 30% of x = 72

$$\therefore x=\frac{72\times100}{30}=240$$

10. (4) 15% of (A + B)
= 25% of (A − B)

$$\Rightarrow \frac{15}{100}(A+B)=\frac{25}{100}(A-B)$$

$\Rightarrow$ 15 (A + B) = 25 (A − B)

$\Rightarrow$ 15 A + 15 B = 25A − 25 B

$\Rightarrow$ 10 A = 40 B

$\Rightarrow$ A = 4 B

Now, let x% of B is equal to A

$$\therefore \frac{x}{100}\times B=A\Rightarrow\frac{x}{100}\times B=4B$$

$\therefore$ x = 400%

11. (4) 20% of 25% of 300

$$=\frac{20}{100}\times\frac{25}{100}\times300$$

$$=\frac{1}{5}\times\frac{1}{4}\times300=15$$

12. (2) x% of $\frac{25}{2}=150$

$$\Rightarrow\frac{x}{100}\times\frac{25}{2}=150$$

$$\Rightarrow\frac{x}{8}=150$$

$\Rightarrow$ x = 150 × 8 = 1200

13. (1) 50% of (x − y)
= 30% of (x + y)

$$\Rightarrow\frac{1}{2}(x-y)=\frac{3}{10}(x+y)$$

$$\Rightarrow\frac{x}{2}-\frac{3x}{10}=\frac{3}{10}y+\frac{y}{2}$$

$$\Rightarrow\frac{5x-3x}{10}=\frac{3y+5y}{10}$$

$$\Rightarrow\frac{x}{5}=\frac{4y}{5}$$

$\therefore x=4y$

$\Rightarrow y=\frac{x}{4}$ or $\frac{x}{4}\times100\%=25x$

Obviously, y is 25% of x

14. (3) $P\times\frac{50}{100}=Q\times\frac{25}{100}$

$\Rightarrow P\times50=Q\times25$

$$\Rightarrow P=\frac{Q\times25}{50}\Rightarrow P=\frac{Q}{2}$$

P = Q x %

$$\therefore Q\times\frac{x}{100}=\frac{Q}{2}$$

$$\Rightarrow x=\frac{100}{2}=50$$

15. (2) 20% of A = 50% of B

$$\Rightarrow 2A=5B\Rightarrow A=\frac{5B}{2}$$

Let B is x % of A.

$$\therefore\frac{5B}{2}\times\frac{x}{100}=B$$

$$\Rightarrow x=\frac{200}{5}=40\%$$

16. (4) Since 18% of the students neither play football nor cricket. It means 82% of the students either play football or cricket or both.

Using set theory

$\therefore n(A\cup B)=n(A)+n(B)-n(A\cap B)$

$\Rightarrow 82=40+50-n(A\cap B)$

$\Rightarrow n(A\cap B)=90-82=8$

$\therefore$ 8% students play both games.

17. (2) $\frac{20(P+Q)}{100}=\frac{50}{100}(P-Q)$

$$\Rightarrow\frac{P+Q}{P-Q}=\frac{5}{2}$$

$$\Rightarrow\frac{2P}{2Q}=\frac{5+2}{5-2}$$

[By componendo & dividendo]

$$\Rightarrow\frac{P}{Q}=\frac{7}{3}\text{ or }7:3$$

18. (1) Let x % × 0.1 = 0.01

$$\Rightarrow\frac{x}{100}\times0.1=0.01$$

$$\Rightarrow x=\frac{0.01\times100}{0.1}=10$$

19. (1) Required percentage

$$=\frac{65}{2000}\times100=\frac{13}{4}$$

[$\because$ 2kg = 2000g]

20. (3) 1% = $\frac{1}{100}$

$$\therefore\frac{1}{100}\times\frac{1}{2}=\frac{1}{200}=0.005$$

21. (2) 1 hour 45 minutes

$=1\frac{3}{4}$ hours = $\frac{7}{4}$ hours

1 day = 24 hours

$\therefore$ Required per cent

$$=\frac{\frac{7}{4}}{24}\times100$$

$$=\frac{7}{4\times24}\times100$$

= 7.292%

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22. (3) Required percentage

$= \frac{1.14}{1.9} \times 100 = 60\%$

23. (4) Required percentage

$= \frac{32}{80} \times 100 = 40\%$

24. (2) $A \times \frac{90}{100} = \frac{B \times 30}{100}$

$\Rightarrow A \times 3 = B$

$\Rightarrow A \times x\% = A \times 3$

$\Rightarrow \frac{x}{100} = 3 \Rightarrow x = 300$

25. (4) $\frac{A \times 90}{100} = \frac{B \times 30}{100}$

$\Rightarrow 3A = B$

$\Rightarrow 3A = A \times \frac{2x}{100}$

$\Rightarrow 300 = 2x \Rightarrow x = 150$

26. (4) $A \times \frac{30}{100} + \frac{B \times 40}{100} = \frac{B \times 80}{100}$

$\Rightarrow A \times 30 = B \times 40$

$\Rightarrow \frac{A}{B} = \frac{40}{30} = \frac{4}{3}$

$\Rightarrow \frac{B}{A} = \frac{3}{4}$

$\Rightarrow \frac{B}{A} \times 100 = \frac{3}{4} \times 100 = 75\%$

27. (1) $(A + B) \times \frac{40}{100}$

$= (A - B) \times \frac{60}{100}$

$\Rightarrow 2(A + B) = 3(A - B)$

$\Rightarrow 2A + 2B = 3A - 3B$

$\Rightarrow A = 5B$

$\therefore \frac{2A - 3B}{A + B} = \frac{10B - 3B}{5B + B}$

$= \frac{7B}{6B} = \frac{7}{6}$

28. (4) $0.1\% = \frac{0.1}{100} = 0.001$

29. (4) Required percentage

$= \frac{70}{3.5 \times 1000} \times 100 = 2\%$

30. (4) $\frac{1}{3}$ of $1206 = 1206 \times \frac{1}{3} = 402$

$\therefore$ Required percent

$= \frac{402}{134} \times 100 = 300\%$

31. (1) $a \times \frac{120}{100} = b \times \frac{80}{100}$

$\Rightarrow \frac{b}{a} = \frac{120}{80} = \frac{3}{2}$

$\therefore \frac{b+a}{b-a} = \frac{\frac{b}{a}+1}{\frac{b}{a}-1} = \frac{\frac{3}{2}+1}{\frac{3}{2}-1} = \frac{\frac{5}{2}}{\frac{1}{2}} = 5$

32. (1) $(A + B) \times \frac{20}{100} = B \times \frac{50}{100}$

$\Rightarrow \frac{A+B}{5} = \frac{B}{2}$

$\Rightarrow 2A + 2B = 5B$

$\Rightarrow 2A = 3B$

$\Rightarrow \frac{2A}{B} = 3$ or $2A = 3B$

$\therefore \frac{2A - B}{2A + B} = \frac{2\frac{A}{B} - 1}{2\frac{A}{B} + 1} = \frac{3-1}{3+1}$

$= \frac{2}{4} = \frac{1}{2} = \frac{3B - B}{3B + B} = \frac{2B}{4B}$

33. (2) $\frac{ax}{100} = \frac{by}{100}$

$\Rightarrow b = \frac{ax}{y}$

$\therefore z\%$ of $b = \frac{ax}{y} \times \frac{z}{100}$

$= \frac{xz}{y}\%$ of a

34. (1) $60 \times 60 \times \frac{y}{100}$

$=$ 1 minute 12 seconds

$\Rightarrow 36y = 72 \Rightarrow y = 2$

35. (4) Required percentage

$= \frac{72}{3.6 \times 1000} \times 100 = 2\%$

36. (3) Let the total number of employees be x.

$\therefore x \times \frac{69}{100} = 20700$

$\Rightarrow x = \frac{20700 \times 100}{69} = 30000$

37. (3) Required percentage

$= \frac{24}{40} \times 100 = 60\%$

38. (1) $x \times \frac{125}{100} = 100$

$\Rightarrow x = \frac{100 \times 100}{125} = 80$

39. (3) $x \times \frac{83}{100} = 498$

$\Rightarrow x = \frac{498 \times 100}{83} = 600$

40. (4) Let C = 100

Then, A = 150

B = 125

$\therefore$ Required percentage

$= \frac{150 - 125}{125} \times 100 = 20\%$

41. (2) If the number of trees in the garden be x, then

$x \times \frac{60}{100} \times \frac{25}{100} \times \frac{20}{100} = 1500$

$\Rightarrow x \times \frac{3}{5} \times \frac{1}{4} \times \frac{1}{5} = 1500$

$\Rightarrow x = \frac{1500 \times 5 \times 4 \times 5}{3}$

$= 50000$

42. (2) Males $= 25000 \times \frac{4}{5} = 20000$

Females = 5000

Educated males

$= 20000 \times \frac{95}{100} = 19000$

Educated females

$= \frac{5000 \times 60}{100} = 3000$

Total educated persons

= 22000

$\therefore$ Required per cent

$= \frac{22000}{25000} \times 100 = 88\%$

43. (4) Required number

$= \frac{240 \times 25}{100} - \frac{160 \times 15}{100}$

$= 60 - 24 = 36$

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44. (3) First part = ₹ x and second part = ₹ y.

$$\therefore \frac{x\times 80}{100}=\frac{y\times 60}{100}+3$$

$$\Rightarrow \frac{4x}{5}=\frac{3y}{5}+3$$

$\Rightarrow 4x-3y=15$ ...(i)

Again,

$$\frac{4y}{5}=\frac{9x}{10}+6$$

$\Rightarrow 8y=9x+60$

$\Rightarrow 8y-9x=60$ ...(ii)

By equation (i) × 8 + (ii) × 3,

$32x-24y=120$

$24y-27x=180$

$5x=300 \Rightarrow x=60$

From equation (i)

$4\times 60-3y=15$

$\Rightarrow 3y=240-15=225$

$$\Rightarrow y=\frac{225}{3}=75$$

$\therefore x+y=60+75=135$

45. (3) Group A = 40%

$$\text{Group B} = \frac{60\times 75}{100}=45\%$$

Group C = 15%

If the total number of students be x, then

$$\frac{x\times 15}{100}=12$$

$$\Rightarrow x=\frac{12\times 100}{15}=80$$

46. (3) After taking away respective balls,

Number of balls in the box = 75 + 25 + 50 = 150

∴ Percentage of black balls

$$=\frac{50}{150}\times 100$$

$$=\frac{100}{3}=33\frac{1}{3}\%$$

47. (2) ∵ S.P. of a dozen pairs of socks

$$=\frac{180\times 80}{100}=₹\ 144$$

∴ S.P. of 1 pair of socks

$$=\frac{144}{12}=₹\ 12$$

∴ No of pairs available for ₹ 48 $= \frac{48}{12}=4$

48. (1) Let the number be x.

$$\therefore \frac{3}{5}\times\frac{60}{100}\times x=36$$

$$\Rightarrow x=\frac{36\times 5\times 5}{3\times 3}=100$$

49. (2) $$\frac{P-Q}{2}=(P+Q)\times\frac{30}{100}$$

$\Rightarrow 5(P-Q)=(P+Q)\times 3$

$\Rightarrow 5P-3P=5Q+3Q$

$\Rightarrow 2P=8Q$

$$\Rightarrow P=4Q=4\times\frac{P\times x}{100}$$

$$\Rightarrow \frac{4x}{100}=1\Rightarrow x=25$$

50. (3) Let greater number be x.

∴ Smaller number = $150-x$

According to the question,

$$\frac{40\times x}{100}=\frac{60(150-x)}{100}$$

$\Rightarrow 2x=3\times 150-3x$

$\Rightarrow 5x=3\times 150$

$\Rightarrow x=90$

51. (3) Let the number be x. According to the question

80% of $x+80=x$

$$\Rightarrow \frac{80x}{100}+80=x$$

$$\Rightarrow \frac{4x}{5}+80=x$$

$$\Rightarrow \frac{x}{5}=80\Rightarrow x=400$$

52. (4) Suppose number be x

20% of $x=120$

$$x\times\frac{20}{100}=120$$

$$x=\frac{120\times 100}{20}=600$$

$$600\times 120\%=600\times\frac{120}{100}=720$$

53. (2) Let the number be x. Then

$x-60\%$ of $x=60$

$\Rightarrow x-0.60x=60$

$\Rightarrow 0.4x=60$

$$\Rightarrow x=\frac{60}{0.4}\Rightarrow x=\frac{600}{4}$$

$x=150$

∴ The number is 150

54. (3) Let number be x.

∴ According to question,

75% of $x+75=x$

$$\frac{3x}{4}+75=x\Rightarrow x-\frac{3x}{4}=75$$

$x=75\times 4=300$

55. (4) Let the third number be x,

According to the question;

$$\text{First number}=\frac{20}{100}\times x=\frac{x}{5}$$

$$\text{Second number}=\frac{50}{100}\times x=\frac{x}{2}$$

∴ Required percentage

$$=\frac{\frac{x}{5}\times 100}{\frac{x}{2}}=\frac{x}{5}\times\frac{2}{x}\times 100=40\%$$

56. (4) **Rule :** If two numbers are respectively x% and y% less than the third number, first number as a percentage of second is $\frac{100-x}{100-y}\times 100\%$

∴ Required percentage

$$=\frac{100-25}{100-20}\times 100\%$$

$$=\frac{75}{80}\times 100\%=93.75\%$$

57. (4) According to question

$$x+\frac{x\times 150}{100}=150$$

$$\Rightarrow x+\frac{3}{2}x=150$$

$\Rightarrow 2x+3x=2\times 150=300$

$\Rightarrow 5x=300\Rightarrow x=60$

58. (1) Let the number be x.

According to the question,

$$x\times\frac{18}{100}=75\times\frac{12}{100}$$

$$\Rightarrow x=\frac{75\times 12}{18}=50$$

59. (2) Let the numbers be x and y and $x>y$.

According to the question,

$6\frac{1}{2}\%$ of $x=8\frac{1}{2}\%$ of y

or $\frac{13}{2}\%$ of $x=\frac{17}{2}\%$ of y

or $13x=17y$

or $x=\frac{17}{13}y$

$$\therefore \frac{17}{13}y-y=1660$$

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$$\text{or } \frac{17y-13y}{13}=1660$$
$$\text{or } 4y=1660\times13$$
$$\text{or } y=\frac{1660\times13}{4}=5395$$

60. (3) If the number be x, then
$$x\times\frac{75}{100}+75=x$$
$$\Rightarrow\frac{3x}{4}+75=x$$
$$\Rightarrow x-\frac{3x}{4}=75$$
$$\Rightarrow\frac{x}{4}=75$$
$$\Rightarrow x=4\times75=300$$
$\therefore$ 40% of 300
$$=\frac{300\times40}{100}=120$$

61. (1) Number to be added $= x$ (let)
$$\therefore\frac{320\times10}{100}+x=\frac{230\times30}{100}$$
$$\Rightarrow 32+x=69$$
$$\Rightarrow x=69-32=37$$

62. (1) X is 20% less than Y.
If Y = 100, X = 80
$$\therefore\frac{Y-X}{Y}=\frac{100-80}{100}$$
$$=\frac{20}{100}=\frac{1}{5}$$
$$\frac{X}{X-Y}=\frac{80}{80-100}$$
$$=\frac{80}{-20}=-4$$

63. (1) 1% of 1% of 25% of 1000
$$=1000\times\frac{25}{100}\times\frac{1}{100}\times\frac{1}{100}$$
$$=0.025$$

64. (1) $\frac{120\times25}{100}+\frac{380\times40}{100}$
$$=637\times ?$$
$$\Rightarrow 30+152=637\times ?$$
$$\Rightarrow 182=637\times ?$$
$$\Rightarrow ?=\frac{182}{637}=\frac{2}{7}$$

65. (2) Population of the illiterate in the village
$$=(100-30)\%\text{ of }6600$$
$$=\frac{6600\times70}{100}=4620$$

66. (1) 8% of x = 4% of y
$$\Rightarrow x\times\frac{8}{100}=\frac{y\times4}{100}$$
$$\Rightarrow x=\frac{4}{8}y=\frac{y}{2}$$
$$\therefore 20\%\text{ of }x=\frac{20}{100}\text{ of }\frac{y}{2}$$
$$=\frac{10}{100}\text{ of }y$$
$$=10\%\text{ of }y$$

67. (2) Let the number be x.
$$\therefore x\times\frac{3}{4}\times\frac{4}{5}\times\frac{40}{100}=48$$
$$\Rightarrow x\times\frac{3}{5}\times\frac{2}{5}=48$$
$$\Rightarrow x=\frac{48\times5\times5}{3\times2}=200$$
$\therefore$ 1% of 200
$$=200\times\frac{1}{100}=2$$

68. (1) Required sum
$$=\frac{24.2\times16}{100}+\frac{2.42\times10}{100}$$
$$=3.872+0.242$$
$$=4.114$$

69. (2) x% of 15 hours = 18 seconds
$\Rightarrow x$% of $15\times60\times60$ seconds = 18 seconds
$$\Rightarrow\frac{15\times60\times60\times x}{100}=18$$
$$\Rightarrow x=\frac{18}{15\times6\times6}=\frac{1}{30}\%$$

70. (3) $80\times\frac{y}{100}\times\frac{x}{100}$
$$=\frac{900\times25}{100}$$
$$\Rightarrow\frac{xy\times80}{10000}=9\times25$$
$$\Rightarrow xy=\frac{9\times25\times10000}{80}$$
$$=28125$$

71. (1) Required time $=\frac{35\times100}{140}$
$= 25$ days

72. (2) According to the question,
$$\frac{60A}{100}=\frac{30B}{100}$$
$$\Rightarrow\frac{3A}{5}=\frac{3B}{10}=\frac{3}{10}\times\frac{40}{100}C$$
$$\Rightarrow\frac{3A}{5}=\frac{3C}{25}=\frac{3}{25}\times A\times\frac{x}{100}$$
$$\Rightarrow\frac{3}{5}=\frac{3x}{2500}$$
$$\Rightarrow 5x=2500$$
$$\Rightarrow x=\frac{2500}{5}=500$$

73. (4) Total staff strength in the office = 100 (let)
Females = 40
Males = 60
$$\text{Married females}=\frac{40\times70}{100}=28$$
Unmarried females = 40 − 28 = 12
Unmarried males = 30
$\therefore$ Unmarried staff
= 30 + 12 = 42
i.e. 42%

74. (3) Let the number be x.
According to the question,
$$\frac{x\times50}{100}+50=x$$
$$\Rightarrow\frac{x}{2}+50=x$$
$$\Rightarrow x-\frac{x}{2}=50$$
$$\Rightarrow\frac{x}{2}=50$$
$$\Rightarrow x=100$$

75. (4) Let the required amount be Rs. x.
According to the question,
$$90\times83\frac{1}{3}\%=x\times60\%$$
$$\Rightarrow 90\times\frac{250}{3}=x\times60$$
$$\Rightarrow x=\frac{30\times250}{60}=\text{Rs. }125$$

76. (1) Let the whole number be x.
According to the question,
51% of $x = 714$
$$\Rightarrow\frac{x\times51}{100}=714$$
$$\Rightarrow x=\frac{714\times100}{51}=1400$$
$\therefore$ 25% of 1400
$$=\frac{1400\times25}{100}=350$$

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TYPE-II

1. (1) Let y be 100.
$\therefore x = 75$
$\therefore$ Required percentage
$= \frac{25\times100}{75} = \frac{100}{3} = 33\frac{1}{3}\%$

2. (1) Required per cent decrease
$= \frac{10}{100+10}\times100$
$= \frac{10}{100}\times100 = 9\frac{1}{11}\%$

3. (4) If the first value is r% more than the second value, then second is $\left[\frac{r}{100+r}\times100\right]\%$ less than the first value.
Here r = 10%.
$\therefore$ Required percentage
$= \frac{10}{110}\times100 = \frac{100}{11} = 9\frac{1}{11}\%$

4. (2) Required percentage
$= \frac{20}{100-20}\times100 = 25\%$

5. (3) Required percentage
$= \frac{25}{100+25}\times100 = 20\%$

6. (1) Let the larger number be x
$\Rightarrow$ According to question,
$x - 20 = 20\%$ of x
or, $x - 20 = \frac{x}{5}$
or, $x - \frac{x}{5} = 20$
or, $5x - x = 20 \times 5$
or, $4x = 20 \times 5$
$\Rightarrow x = 5 \times 5 = 25$

7. (4) y is 10% more than 125
$= 125\times\frac{110}{100} = 137.5 = y$
and x is 10% less than y
$= \frac{90}{100}\times y = \frac{90}{100}\times137.5$
$= 123.75$

8. (4) If the third number is 100, then the numbers are $100 + \frac{25}{2} = \frac{225}{2}$ and 125 respectively.
$\therefore$ First number as a percentage of the second
$= \frac{225}{2\times125}\times100 = 90$

Rule : If two numbers are respectively x% and y% more than a third number the first as a percent of second is
$\frac{100+x}{100+y}\times100\%$

9. (2) Required number
$= 60\%$ of $90 = \frac{90\times60}{100} = 54$

10. (1) Third number = 100
First number = 70
Second number = 63
$\therefore$ Required percentage
$= \frac{7}{70}\times100 = 10$

11. (2) Let the number be x
then, $x\times\frac{90}{100} = 30$
$\Rightarrow x = \frac{3000}{90} = \frac{100}{3} = 33\frac{1}{3}$

12. (3) According to the question,
Required difference
$= \text{Rs.}\left(312\times\frac{200}{3}\% - 200\right)$
$= \text{Rs.}\left(312\times\frac{200}{300} - 200\right)$
$= \text{Rs.}\ (208 - 200) = \text{Rs. } 8$

TYPE-III

1. (2) Savings $= 100\% - 66\frac{2}{3}\%$
$= 33\frac{1}{3}\%$ $\because 33\frac{1}{3}\% = ₹\ 1200$
$\therefore 100\% = \frac{1200}{100}\times3\times100$
$= ₹\ 3600$
$\therefore$ Expenses = 3600 – 1200
$= ₹\ 2400$

2. (2) Suppose income of A = ₹ 100
$\therefore$ Income of B = ₹ 125
Income of C = ₹ 150
$\therefore$ Required percentage
$= \frac{50\times100}{100} = 50\%$

3. (3) Required percentage
$= \frac{x}{100-x}\times100$
$= \frac{40}{60}\times100 = \frac{200}{3}$
$= 66.66\%$

4. (2) **Tricky approach**
Required answer
$= \left(\frac{20}{100+20}\times100\right)\%$
$= \left(\frac{20}{120}\times100\right)\% = \frac{50}{3}\% = 16\frac{2}{3}\%$

5. (1) **Tricky approach**
$x = \left(\frac{10}{100+10}\times100\right)\%$
$= \left(\frac{1000}{110}\right)\% = \left(\frac{100}{11}\right)\% = 9\frac{1}{11}\%$

Note : If A is r% more than B, then B is
$\left(\frac{r}{100+r}\times100\right)\%$ less than A.

6. (1) **Tricky approach**
Required $\% = \frac{R\times100}{100\pm R}$
$\therefore$ Required $\% = \frac{12.5\times100}{100+12.5}$
$= \frac{1250}{112.5} = \frac{100}{9} = 11\frac{1}{9}$

7. (3) Let A's income = ₹ a
and B's income = ₹ b
$a \times 60\% = b \times 75\%$
$\Rightarrow a \times 4 = 5 \times b$
$\Rightarrow \frac{b}{a} = \frac{4}{5}$
Now, $b = a \times x\%$
$\Rightarrow \frac{b}{a} = \frac{x}{100} \Rightarrow \frac{x}{100} = \frac{4}{5}$
$\Rightarrow x = \frac{4}{5}\times100 = 80$

8. (4) Let income be ₹ 100
$\therefore$ Sum given to elder son
= 20% of ₹ 100 = ₹ 20
Remaining Sum = Rs. 80
Sum given to younger son
= 30% of ₹ 80 = ₹ 24

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= Rs. (80 – 24) = Rs. 56
Sum given to the trust
= 10% of ₹ 56 = ₹ 5.6
∴ Remaining sum
= ₹ (56 – 5.6) = ₹ 50.4
∴ When ₹ 50.4 remains, total income = ₹ 100
∴ When ₹ 10080 remains, total income

$$= \frac{100 \times 10080}{50.4} = ₹\ 20000$$

9. (2) Radha's total percentage expenditure
= (40 + 20 + 10 + 10)% = 80%
Percentage savings
= 100 – 80 = 20%
Now, 20% of her total salary
= 1500

$$\text{Her total salary} = \frac{1500 \times 100}{20}$$

= ₹ 7500

10. (3) Suppose monthly income = ₹ x

Then, $\frac{8}{3}\%$ of $x = 72$

$$\Rightarrow x \times \frac{8}{300} = 72$$

$$\Rightarrow \frac{72 \times 300}{8} = ₹\ 2700$$

11. (2) Let the required income be ₹ x
Average monthly income

$$= ₹\left(\frac{80800}{16}\right) = ₹\ 5050$$

$\therefore x$ = 120% of 5050

$$= ₹\left(\frac{120}{100} \times 5050\right) = ₹\ 6060$$

12. (4) Required percentage

$$= \frac{25}{100+25} \times 100 = 20\%$$

13. (1) Let man's salary be ₹ x.
∴ His expenditure on items of daily use

$$= \frac{25}{2}\% \text{ of } x$$

$$= \frac{25 \times x}{200} = \frac{x}{8}$$

So, remaining amount

$$= x - \frac{x}{8} = ₹\ \frac{7x}{8}$$

Expenditure on house rent

$$= 30\% \text{ of } ₹\ \frac{7x}{8}$$

$$= \frac{30}{100} \times \frac{7x}{8} = ₹\ \frac{21x}{80}$$

Now, remaining amount

$$= \frac{7x}{8} - \frac{21x}{80}$$

$$= \frac{70x - 21x}{80} = ₹\ \frac{49x}{80}$$

According to the question,

$$\therefore \frac{49x}{80} = 2940$$

$$\Rightarrow x = \frac{2940 \times 80}{49}$$

= ₹ 4800

14. (3) Original savings
= ₹ (13500 – 9000)
= ₹ 4500
New income = 114% of ₹ 13500
= ₹ (114 × 135)
= ₹ 15390
New expenditure
= 107% of ₹ 9000
= ₹ (107 × 90)
= ₹ 9630
New savings
= ₹ (15390 – 9630)
= ₹ 5760
∴ Percentage increase in savings

$$= \frac{5760 - 4500}{4500} \times 100$$

$$= \frac{1260}{45} = 28\%$$

15. (2) Required percentage of increase = $\frac{r}{100-r} \times 100$

$$= \frac{20}{100-20} \times 100$$

$$= \frac{20}{80} \times 100 = 25\%$$

16. (3) 10% of A = 15% of B
= 20% of C
$\Rightarrow$ 10A = 15B = 20C

$$\Rightarrow \frac{10A}{60} = \frac{15B}{60} = \frac{20C}{60}$$

$$\Rightarrow \frac{A}{6} = \frac{B}{4} = \frac{C}{3}$$

∴ A : B : C = 6 : 4 : 3
∴ 6x + 4x + 3x = 7800
$\Rightarrow$ 13 x = 7800

$$\Rightarrow x = \frac{7800}{13} = 600$$

∴ B's income = 4x
= 600 × 4 = ₹ 2400

17. (3) **Tricky approach**
Required percentage

$$= \frac{25}{100-25} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$$

18. (2) **Tricky approach**
Required percentage

$$= \left(\frac{50}{100+50} \times 100\right)\%$$

$$= \frac{50}{150} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

19. (1) Let Tulsiram's salary be ₹ x.

$$\therefore \frac{x \times 4}{100} = 720$$

$$\Rightarrow x = \frac{720 \times 100}{4}$$

= ₹ 18000
∴ Kashyap's salary

$$= ₹\left(\frac{100}{120} \times 18000\right) = ₹\ 15000$$

20. (2) Let B's salary = ₹ 100
∴ C's salary = ₹ 400
and A's salary = ₹ 40
∴ Required percentage

$$= \frac{40}{400} \times 100 = 10\%$$

21. (2) **Tricky approach**
Required percentage

$$= \frac{50}{100-50} \times 100 = 100\%$$

Otherwise $\Rightarrow$ Let's B income = ₹ 100 Þ A income = ₹ 50.

$$\text{Required \%} = \frac{100-50}{50} \times 100$$

= 100%

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22. (2) ∴ Required percentage

$$= \frac{20}{100+20} \times 100$$

$$= \frac{50}{3} = 16\frac{2}{3}\%$$

23. (3) Basic pay of the employee

$$= 11925 \times \frac{100}{265} = ₹\ 4500$$

24. (2) Required percentage

$$= \frac{25}{100+25} \times 100 = \frac{25}{125} \times 100$$

$$= 20\%$$

25. (3) Effective change

$$= \left(-25 + 25 - \frac{25 \times 25}{100}\right)\%$$

$$= -6.25\%$$

The negative sign shows decrease.

26. (2) If Shyam's salary be ₹ x, then

$$\frac{22 \times x}{100} = 1540$$

$$\Rightarrow x = \frac{1540 \times 100}{22} = ₹\ 7000$$

∴ Ram's savings

$$= \frac{14 \times 7000}{100} = ₹\ 980$$

27. (1) Required percentage

$$= \frac{25}{125} \times 100 = 20\%$$

28. (3) Let man's income = ₹ 100

Savings = 100 − 75 = ₹ 25

New income = ₹ 120

Savings

$$= 120 - \frac{75 \times 115}{100} = 120 - \frac{345}{4}$$

$$= \frac{480 - 345}{4} = ₹\frac{135}{4}$$

Increase in savings

$$= \frac{135}{4} - 25 = ₹\frac{35}{4}$$

∴ Percentage increase

$$= \frac{\frac{35}{4}}{25} \times 100 = 35\%$$

9. (3) Let Nitin's initial salary be 100

After 10% reduction,

New salary = 90% of 100 = ₹ 90

Again after 10% increase

New salary = $\frac{90 \times 110}{100}$ = ₹ 99

∴ Percentage decrease = 1 %

30. (2) Suppose monthly income of the man is Rs. x.

Expenditure on food

$$= 40\% \text{ of } x = ₹\ \frac{2x}{5}$$

Remaining amount $= x - \frac{2x}{5}$

$$= ₹\ \frac{3x}{5}$$

Expenditure on transport

$$= \frac{1}{3} \times \frac{3x}{5} = ₹\ \frac{x}{5}$$

Remaining amount

$$= \frac{3x}{5} - \frac{x}{5} = \frac{2x}{5}$$

According to question

$$\frac{1}{2} \times \frac{2x}{5} = 4500$$

$$\therefore x = 4500 \times 5 = ₹\ 22,500$$

31. (1) If the monthly income of A is ₹ x, then

$$\frac{x \times 80}{100} = 6000$$

$$\Rightarrow x = \frac{6000 \times 100}{80} = ₹\ 7500$$

∴ Savings = 7500 − 6000

= ₹ 1500

32. (2) Change in salary

$$= -\frac{10 \times 10}{100} = -1\%$$

Negative sign shows decrease.

33. (4) If the total salary of Kishan be ₹ x, then

$$x \times \frac{33}{100} = 2310$$

$$\Rightarrow x = \frac{2310 \times 100}{33} = ₹\ 7000$$

34. (4) Salary of clerk in 1974

$$= \frac{3660 \times 100}{100+20} = ₹\ 3050$$

35. (4) Total percentage of expenditure

$$= \left(20 + \frac{80 \times 70}{100}\right)\% = 76\%$$

If total income be ₹ x, then

$$x \times \frac{24}{100} = 1800$$

$$\Rightarrow x = \frac{1800 \times 100}{24} = ₹\ 7500$$

36. (3) Arbind's income = ₹ 100

Expenditure = ₹ 75

Savings = ₹ 25

New income = ₹120

Expenditure = 75 + 7.5 = ₹ 82.5

Savings = 120 − 82.5 = ₹ 37.5

Required percentage

$$= \frac{37.5 - 25}{25} \times 100 = 50\%$$

37. (1) Man's previous salary

$$= 24000 \times \frac{100}{120} = ₹\ 20000$$

38. (2) Required per cent increase

$$= \left(\frac{r}{100-r} \times 100\right)\%$$

$$= \frac{10}{100-10} \times 100 = \frac{100}{9}$$

$$= 11\frac{1}{9}\%$$

39. (4) Required percentage

$$= \frac{R}{100+R} \times 100$$

$$= \frac{50}{100+50} \times 100$$

$$= \frac{50}{150} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\ \%$$

40. (2) Pecentage of expenditure on food and education

= 35 + 5 = 40%

If the monthly salary of X be Rs. x, then

$$\frac{x \times 40}{100} = 17600$$

$$\Rightarrow x \times 40 = 17600 \times 100$$

$$\Rightarrow x = \frac{1760000}{40} = ₹\ 44000$$

41. (1) A's monthly salary = Rs. x

∴ B's monthly salary

= Rs. (40000 − x)

A spends 85% of his income.

∴ A's savings = $\frac{15x}{100}$ = Rs. $\frac{3x}{20}$

B's savings = (40000 − x) × $\frac{5}{100}$

= Rs. $\left(\frac{40000 - x}{20}\right)$

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$\therefore \frac{3x}{20} = \frac{40000 - x}{20}$

$\Rightarrow 3x = 40000 - x$

$\Rightarrow 4x = 40000$

$\Rightarrow x = \frac{40000}{4}$ = Rs. 10000

42. (3) C's monthly salary

$= \frac{600000}{12}$ = Rs. 50000

B's monthly salary

$= \frac{50000 \times 40}{100}$

= Rs. 20000

$\frac{1}{4}$ of A's monthly salary

$= \frac{20000 \times 80}{100}$

$\Rightarrow$ A's monthly salary

= Rs. (16000 × 4)

= Rs. 64000

43. (1) Let the third number be 100.

$\therefore$ First number = 70

Second number = 63

Required percent

$= \frac{70 - 63}{70} \times 100$

$= \frac{7}{70} \times 100 = 10\%$

44. (2) Man's income = Rs. 100 (let).

$\therefore$ Expenditure = Rs. 75

Savings = Rs. 25

New income = Rs. 120

Expenditure = $\frac{75 \times 110}{100}$

= Rs. 82.5

Savings = Rs. (120 – 82.5)

= Rs. 37.5

$\therefore$ Required percentage

$= \left(\frac{37.5 - 25}{25}\right) \times 100$

$= \frac{12.5 \times 100}{25} = 50\%$

45. (2) Let Ram Babu's salary be Rs. x

Remaining amount after donations to charity

= Rs. $\frac{97x}{100}$

After depositing money in the bank,

Remaining amount

$= \frac{97x}{100} \times \frac{88}{100}$

$\therefore \frac{97x \times 88}{10000} = 12804$

$\Rightarrow x = \frac{12804 \times 10000}{97 \times 88}$

= Rs. 15000

TYPE-IV

1. (1) Let B = 100

$\therefore$ According to question,

A is 40% greater than B.

$\therefore$ A = 140

$\therefore$ B is 20% less than C

$\therefore$ 0.8C = 100

$\therefore$ C = 125

$\therefore$ A : C = 140 : 125 = 28 : 25

2. (1) 10% of m = 20% of n

$\Rightarrow \frac{10}{100} \times m = \frac{20}{100} \times n$

$\Rightarrow \frac{m}{n} = \frac{10}{5} = \frac{2}{1}$

$\therefore$ m : n = 2 : 1

3. (1) 5 : 4 when expressed as per cent $= \frac{5}{4} \times 100 = 125\%$

4. (3) Let the number of boys and girls in the college be $3x$ and $2x$ respectively. Number of minor boys

$= 3x \times \frac{80}{100} = \frac{12x}{5}$

Number of minor girls

$= 2x \times \frac{75}{100} = \frac{3x}{2}$

Total number of minor students

$= \frac{12x}{5} + \frac{3x}{2}$

$= \frac{24x + 15x}{10} = \frac{39x}{10}$

Required percentage

$= \frac{39x}{10 \times 5x} \times 100 = 78\%$

(As total students = $3x + 2x$)

5. (4) Let the number of boys and girls be $4x$ and x respectively.

Number of boys who hold scholarship.

$= \frac{75}{100} \times 4x = 3x$

and number of girls who hold scholarship

$= \frac{70 \times x}{100} = \frac{7x}{10}$

Number of students who do not hold scholarship

$= 5x - 3x - \frac{7x}{10} = 2x - \frac{7x}{10}$

$= \frac{20x - 7x}{10} = \frac{13x}{10}$

The required percentage

$= \frac{\frac{13x}{10}}{5x} \times 100$

$= \frac{13x}{10 \times 5x} \times 100 = 26\%$

6. (1) Let the numbers be $2x$ and $3x$.

According to the question,

$\left(\frac{20}{100} \times 2x\right) + 20$

$= \left(\frac{10}{100} \times 3x\right) + 25$

$\Rightarrow \frac{2x}{5} + 20 = \frac{3x}{10} + 25$

$\Rightarrow \frac{2x}{5} - \frac{3x}{10} = 25 - 20$

$\Rightarrow \frac{4x - 3x}{10} = 5 \Rightarrow x = 50$

$\therefore$ The smaller number

$= 2x = 100$

7. (3) Let the third number be 100.

$\therefore$ First number = 120

Second number = 150

$\therefore$ Required ratio

$= \frac{120}{150} = \frac{4}{5}$ or 4 : 5

8. (3) Let the numbers be x and y and x is greater than y. Then

$x - y$ = 45% of $(x + y)$

$\Rightarrow x - y = \frac{45}{100}(x + y)$

$\Rightarrow x - y = \frac{9}{20}(x + y)$

$\Rightarrow 20x - 20y = 9x + 9y$

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$\Rightarrow 20x - 9x = 20y + 9y$
$\Rightarrow 11x = 29y$
$\Rightarrow \frac{x}{y} = \frac{29}{11}$
or 29 : 11

9. (4) 30% of A = 25% of B
$\Rightarrow$ 30 A = 25 B
$\Rightarrow$ A : B = 25 : 30 = 5 : 6
Again,
25% of B = 20% of C
$\Rightarrow$ 25 B = 20C
$\Rightarrow$ 5B = 4C
$\Rightarrow$ B : C = 4 : 5
$\therefore$ A : B : C = 5 × 4 : 4 × 6 : 6 × 5
= 20 : 24 : 30 = 10 : 12 : 15

10. (2) Let number of boys be x.
Then, $x + \frac{120}{100}x = 66$
$\Rightarrow x + \frac{6x}{5} = 66$
$\Rightarrow \frac{5x + 6x}{5} = 66$
$\Rightarrow x = \frac{66 \times 5}{11} = 30$
$\therefore$ Number of girls
= 66 – 30 = 36
$\therefore$ New ratio = 30 : (36 + 4)
= 30 : 40 = 3 : 4

11. (4) Let the number of boys
= $3x$ and that of girls = $2x$
Number of boys who do not hold scholarship = 80% of $3x$
$= 3x \times \frac{80}{100} = \frac{12x}{5}$
Number of girls who do not hold scholarship
$= 2x \times \frac{70}{100} = \frac{14x}{10}$
$\therefore$ Number of students who do not hold scholarship
$= \frac{12x}{5} + \frac{14x}{10} = \frac{24x + 14x}{10}$
$= \frac{38x}{10}$
$\therefore$ Required percentage
$= \frac{\frac{38x}{10}}{5x} \times 100$
$= \frac{38}{10 \times 5} \times 100 = 76\%$

12. (4) Let the initial expenses on rice, fish and oil be ₹ $12x$, ₹ $17x$ and ₹ $3x$ respectively.
$\therefore$ Total expenditure
= ₹ $(12x + 17x + 3x)$
= ₹ $32x$
After increase,
Expenditure on rice
$= \frac{120}{100} \times 12x$ = ₹ $14.4x$
Expenditure on fish
$= \frac{130}{100} \times 17x$ = ₹ $22.1x$
Expenditure on oil
$= \frac{150}{100} \times 3x$ = ₹ $4.5x$
Total expenditure
= ₹ $(14.4x + 22.1x + 4.5x)$
= ₹ $41x$
Increase = ₹ $(41x - 32x)$
= ₹ $9x$
$\therefore$ Percentage increase
$= \frac{9x}{32x} \times 100 = \frac{225}{8} = 28\frac{1}{8}\%$

13. (4) 20 % of A = 30 % of B
$= \frac{1}{6}$ of C
$\Rightarrow \frac{20A}{100} = \frac{30B}{100} = \frac{C}{6}$
$\Rightarrow \frac{A}{5} = \frac{B}{\frac{10}{3}} = \frac{C}{6} = k$ (let)
$\Rightarrow$ A = $5k$, B = $\frac{10}{3}k$, C = $6k$
$\therefore$ A : B : C = $5k : \frac{10k}{3} : 6k$
= 15 : 10 : 18

14. (2) Increased train fare
$= ₹ \left(\frac{120}{100} \times 30\right)$ = ₹ 36
Increased bus fare
$= ₹ \left(\frac{110}{100} \times 20\right)$ = ₹ 22
$\therefore$ Required ratio = 36 : 22
= 18 : 11

15. (1) Let the numbers be x and y where $x > y$. Then,
$x - y = \frac{15}{100}(x + y)$
$\Rightarrow x - y = \frac{3}{20}(x + y)$
$\Rightarrow 20x - 20y = 3x + 3y$
$\Rightarrow 20x - 3x = 20y + 3y$
$\Rightarrow 17x = 23y \Rightarrow \frac{x}{y} = \frac{23}{17}$

16. (3) The raised price = $\frac{120}{100}$ of the former price
$\therefore$ The householder must now consume $\frac{100}{120}$ of the original amount
$\therefore$ The reduction in consumption
$= \left(1 - \frac{100}{120}\right)$ of the original consumption = $\frac{1}{6}$ of the original consumption
i.e. 1 : 6

17. (2) Let Rama's expenditure
= $5x$
Savings = $3x$
$\therefore$ Rama's income = $5x + 3x = 8x$
After increase,
Rama's income = $\frac{112}{100} \times 8x$
= $8.96x$
Rama's expenditure
$= \frac{5x \times 115}{100} = 5.75x$
Rama's savings
= $(8.96x - 5.75x)$
= $3.21x$
$\therefore$ Rama's saving per cent
$= \left(\frac{3.21x - 3x}{3x}\right) \times 100$
$= \frac{0.21}{3} \times 100 = 7$

18. (4) Let the numbers be $4x$ and $5x$. After corresponding increase or decrease,
Required ratio
$= 4x \times \frac{120}{100} : 5x \times \frac{80}{100}$
= $12x : 10x$
= 6 : 5

19. (4) $\frac{A \times 60}{100} = B \times \frac{3}{4}$
$\Rightarrow A \times \frac{3}{5} = B \times \frac{3}{4}$
$\Rightarrow \frac{A}{B} = \frac{3}{4} \times \frac{5}{3} = 5 : 4$

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20. (1) Let C = 100
$\therefore$ B = 80

$A = \frac{80 \times 160}{100} = 128$

$\therefore$ A : C = 128 : 100 = 32 : 25

21. (2) $(B-A) \times \frac{30}{100} = (B+A) \times \frac{18}{100}$

$\therefore \frac{B-A}{B+A} = \frac{18}{30} = \frac{3}{5}$

By componendo and dividendo,

$\frac{2B}{-2A} = \frac{3+5}{3-5} = \frac{8}{-2} = \frac{4}{-1}$

$\Rightarrow \frac{B}{A} = \frac{4}{1}$

$\Rightarrow$ A : B = 1 : 4

22. (1) Boys = 30, Girls = 20 (let)
Boys getting no scholarship = 24
Girls getting no scholarship = 15
Sum = 24 + 15 = 39
$\therefore$ Required percentage

$= \frac{39}{50} \times 100 = 78\%$

23. (4) Let the first number be x and second number be y.

$\therefore y - \frac{60x}{100} = \frac{52y}{100}$

$\Rightarrow 100y - 60x = 52y$

$\Rightarrow 48y = 60x$

$\therefore \frac{x}{y} = \frac{48}{60} = \frac{4}{5}$ or 4 : 5

24. (2) Women $= \frac{43}{83} \times 311250$

= 161250
Men = 311250 − 161250
= 150000
$\therefore$ Total number of literate persons

$= \frac{161250 \times 8}{100} + 150000 \times \frac{24}{100}$

= 12900 + 36000 = 48900

25. (3) $7x - 5x = 200$

$\Rightarrow 2x = 200 \Rightarrow x = 100$

$\therefore$ Price of a pair of shoes
$= 5x = 5 \times 100 = ₹\ 500$

26. (1) $x \times \frac{15}{100} = y \times \frac{20}{100}$

$\Rightarrow x \times 15 = y \times 20$

$\Rightarrow \frac{x}{y} = \frac{20}{15} = \frac{4}{3} = 4 : 3$

27. (1) Boys in school = $2x$
Girls = $3x$
Students who are not scholarship holders :

Boys $\Rightarrow \frac{2x \times 75}{100} = \frac{6x}{4}$

Girls $\Rightarrow \frac{3x \times 70}{100} = \frac{21x}{10}$

Total students who donot hold scholarship $= \frac{6x}{4} + \frac{21x}{10}$

$= \frac{30x + 42x}{20} = \frac{72x}{20} = \frac{18x}{5}$

$\therefore$ Required percentage

$= \frac{\frac{18x}{5}}{5x} \times 100 = 72\%$

28. (1) Numbers $\Rightarrow$ A and B

$\therefore \frac{A \times 5}{100} + \frac{B \times 4}{100}$

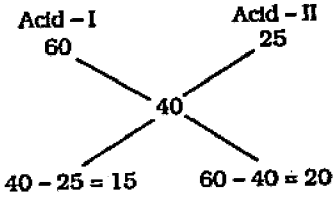
$= \frac{2}{3}\left(\frac{A \times 6}{100} + \frac{B \times 8}{100}\right)$

$\Rightarrow 5A + 4B = \frac{12A + 16B}{3}$

$\Rightarrow 15A + 12B = 12A + 16B$
$\Rightarrow 15A - 12A = 16B - 12B$
$\Rightarrow 3A = 4B$

$\Rightarrow \frac{A}{B} = \frac{4}{3} = 4 : 3$

29. (3) By alligation,



$\therefore$ Required ratio = 15 : 20
= 3 : 4

30. (4) 50% of x = 30% of y

$\Rightarrow \frac{x \times 50}{100} = \frac{y \times 30}{100}$

$\Rightarrow \frac{x}{y} = \frac{30}{50} = \frac{3}{5} = 3 : 5$

31. (2) Boys in the village = $3x$
Girls in the village = $2x$
Villagers who appeared in the examination

$= \frac{3x \times 30}{100} + \frac{2x \times 70}{100}$

$= \frac{9x}{10} + \frac{14x}{10} = \frac{23x}{10}$

Villagers who did not appear in the examination

$= \frac{3x \times 70}{100} + \frac{2x \times 30}{100}$

$= \frac{21x}{10} + \frac{6x}{10} = \frac{27x}{10}$

$\therefore$ Required ratio $= \frac{23x}{10} : \frac{27x}{10}$

= 23 : 27

32. (4) C.P. of 1 litre of milk = Rs. 100
$\therefore$ Mixture sold for Rs. 125

$= \frac{125}{100} = \frac{5}{4}$ litre

$\therefore$ Quantity of water $= \frac{5}{4} - 1$

$= \frac{1}{4}$ litre

$\therefore$ Required ratio $= \frac{1}{4} : 1$

= 1 : 4

33. (1) Percentage of syrup

$= \frac{3}{4} \times 100 = 75\%$

TYPE-V

1. (2) Glycerine in mixture
= 40 litres
Water = 10 litres
Let x litres of pure glycerine is mixed with the mixture.

$\therefore \frac{40 + x}{50 + x} = \frac{95}{100} = \frac{19}{20}$

$\Rightarrow 800 + 20x = 950 + 19x$
$\Rightarrow x = 950 - 800 = 150$ litres.

2. (4) Alcohol in original solution

$= \frac{40}{100} \times 5 = 2$ litres

Water in original solution
= 3 litres
On adding 1 litre water, water becomes 4 litres.
Now, 6 litres of solution contains 2 litres of alcohol.
$\therefore$ 100 litres of solution contains

$= \frac{2}{6} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$ alcohol.

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3. (1) In 12 litres salt solution,

$\text{Salt} = \frac{7\times12}{100} = 0.84$ units

$\text{Water} = \frac{93\times12}{100} = 11.16$ units

After evaporation,
Percentage of salt

$= \frac{0.84}{8}\times100 = 10.5\%$

4. (2) In 60 litres of solution, Water

$= \frac{60\times20}{100} = 12$ litres

On adding x litres of water,

$\frac{12+x}{60+x}\times100 = 40$

$\Rightarrow 60 + 5x = 120 + 2x$
$\Rightarrow 3x = 60$
$\Rightarrow x = 20$ litres

5. (2) Sugar in original solution

$= \frac{75\times30}{100} = 22.5$ gm

Let x gm of sugar be mixed.

$\therefore \frac{22.5+x}{75+x}\times100 = 70$

$\Rightarrow 2250 + 100x = 75 \times 70 + 70x$
$\Rightarrow 2250 + 100x = 5250 + 70x$
$\Rightarrow 30x = 5250 - 2250 = 3000$

$\Rightarrow x = \frac{3000}{30} = 100$ gm

6. (3) In 30% alcohol solution,

$\text{Alcohol} = \frac{30}{100}\times6 = 1.8$ litres

Water = 4.2 litres
On mixing 1 litre of pure alcohol,
Percentage of water

$= \frac{4.2}{7}\times100 = 60\%$

7. (2) In 4 kg of ore, iron = 0.9 kg.
$\therefore$ Quantity of ore for 60 kg of iron

$= \frac{60\times4}{0.9}$

$= 266.67$ kg

8. (4) Let x ml of water be added.

$\therefore \frac{20+x}{100+x}\times100 = 50$

$\Rightarrow 40 + 2x = 100 + x$
$\Rightarrow x = 60$ ml

9. (1) In 1 litre i.e. 1000 ml of mixture,
Alcohol = 700 ml.
Water = 300 ml.
Let x ml of alcohol is mixed.

$\therefore \frac{300}{1000+x}\times100 = 15$

$\Rightarrow 1000 + x = 2000$
$\Rightarrow x = 1000$ ml.

10. (4) In 10 litres of first type of liquid,

$\text{Water} = \frac{1}{5}\times10 = 2$ litres

In 4 litres of second type of liquid,

$\text{Water} = 4\times\frac{35}{100} = \frac{7}{5}$ litres

Total amount of water

$= 2 + \frac{7}{5} = \frac{17}{5}$ litres

Required percentage

$= \frac{\frac{17}{5}}{14}\times100$

$= \frac{170}{7} = 24\frac{2}{7}\%$

11. (4) Water content in 40 litres of

$\text{mixture} = 40\times\frac{10}{100}$

$= 4$ litres
$\therefore$ Milk content $= 40 - 4$
$= 36$ litres
Let x litres of water is mixed.

Then, $\frac{4+x}{40+x} = \frac{20}{100}$

$\Rightarrow \frac{4+x}{40+x} = \frac{1}{5}$
$\Rightarrow 20 + 5x = 40 + x$
$\Rightarrow 4x = 20 \Rightarrow x = 5$ litres

12. (2) $\text{Alcohol} = \left(\frac{15}{100}\times400\right)\text{ml}$

$= 60$ ml.
Water = 340 ml.
Let x ml of alcohol be added.

Then, $\frac{60+x}{400+x}\times100 = 32$

or $\frac{60+x}{400+x} = \frac{32}{100} = \frac{8}{25}$
or $1500 + 25x = 3200 + 8x$
or $17x = 1700$
or $x = 100$ ml

13. (2) Initial quantity of gold

$= \frac{50\times80}{100} = 40$ gm

Let 'x' gm be mixed.

$(40 + x) = (50 + x)\times\frac{95}{100}$

$\Rightarrow 40 + x = (50 + x)\times\frac{19}{20}$

$\Rightarrow 800 + 20x = 950 + 19x$
$\Rightarrow x = 150$ gm

14. (3) In 200 litres of mixture,

$\text{Quantity of milk} = \frac{85}{100}\times200$

$= 170$ litres
Quantity of water = 30 litres
Let the quantity of additional milk added be x litres.
According to the question,

$\frac{170+x}{200+x}\times100 = 87.5$

$\Rightarrow (170 + x)\times100$
$= 17500 + 87.5x$
$\Rightarrow 100x - 87.5x$
$= 17500 - 17000$
$\Rightarrow 12.5x = 500$

$\Rightarrow x = \frac{500}{12.5} = 40$ litres

15. (2) Let x litres of first mixture is mixed with y litres of the second mixture.
According to the question,

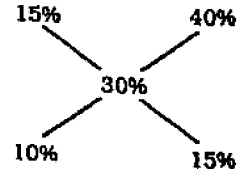
$\frac{x\times\frac{30}{100} + y\times\frac{50}{100}}{x\times\frac{70}{100} + y\times\frac{50}{100}} = \frac{45}{55}$

$\Rightarrow \frac{0.3x + 0.5y}{0.7x + 0.5y} = \frac{9}{11}$

$\Rightarrow 6.3x + 4.5y = 3.3x + 5.5y$
$\Rightarrow 6.3x - 3.3x = 5.5y - 4.5y$
$\Rightarrow 3x = y$

$\Rightarrow \frac{x}{y} = 1:3$

16. (1) Solution I Solution II



$\therefore$ Required ratio = 10 : 15 = 2 : 3

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17. (2) Alcohol $= 15 \times \frac{1}{5} = 3$ litres

Water $= 15 \times \frac{4}{5} = 12$ litres

$\therefore$ Required percentage

$= \frac{3}{15+3} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

18. (2) $\because$ 12 kg copper is contained in 100 kg of alloy

69 kg copper is contained in

$\therefore \frac{100}{12} \times 69 = 575$ kg of alloy

19. (3)

Alcohol I $\frac{1}{4}$ — Alcohol II $\frac{1}{2}$

Mean value $\frac{2}{5}$

$\frac{1}{2} - \frac{2}{5} = \frac{5-4}{10} = \frac{1}{10}$

$\frac{2}{5} - \frac{1}{4} = \frac{8-5}{20} = \frac{3}{20}$

$\therefore$ Required ratio $= \frac{1}{10} : \frac{3}{20}$

$= 2 : 3$

20. (2) In 20 litres of mixture,

Alcohol $\Rightarrow \frac{20 \times 20}{100} = 4$ litres

Water $\Rightarrow$ 20 - 4 = 16 litres

On adding 4 litres of water,

Quantity of water $\Rightarrow 16 + 4$

$= 20$ litres

Quantity of mixture = 24 litres

$\therefore$ Required per cent

$= \frac{4}{24} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$

21. (3) In 300 gm of solution,

Sugar $= \frac{300 \times 40}{100} = 120$ gm.

Let x gm of sugar be mixed.

According to the question,

$\frac{120+x}{300+x} = \frac{1}{2}$

$\Rightarrow 240 + 2x = 300 + x$

$\Rightarrow 2x - x = 300 - 240$

$\Rightarrow x = 60$ gm.

TYPE-VI

1. (3) **Tricky approach**

Required percentage decrease

$= \frac{\text{Increase}}{100 + \text{Increase}} \times 100$

$= \frac{20}{100+20} \times 100$

$= \frac{100}{6} = 16\frac{2}{3}\%$

2. (1) Required answer

$= \frac{10}{(100+10)} \times 100$

$= \frac{10}{110} \times 100 = \frac{110}{11}\% = 9\frac{1}{11}\%$

3. (1) Required reduction in consumption

$= \frac{x}{100+x} \times 100\%$

where $x = 25$

$= \frac{25}{100+25} \times 100 = 20\%$

4. (3) Reduction in consumption

$= \left\{\frac{R}{100+R} \times 100\right\}\%$

$= \left(\frac{20}{120} \times 100\right)\%$

$= \frac{50}{3}\% = 16\frac{2}{3}\%$

5. (2) Let the CP of each article = ₹ 100 and consumption = 100 units

Initial expenditure = ₹ (100 × 100) = ₹ 10000

New price of article = ₹ 80

Consumption = 120 units

Expenditure = ₹ (120 × 80) = ₹ 9600

Decrease = ₹ (10000 - 9600) = ₹ 400

$\therefore$ Percentage decrease

$= \frac{400 \times 100}{10000} = 4\%$

6. (2) If the price of a commodity increases by R%, then reduction in consumption, not to increase the expenditure is given by

$\left(\frac{R}{100+R} \times 100\right)\%$

$= \frac{15}{100+15} \times 100 = \frac{15}{115} \times 100$

$= \frac{300}{23} = 13\frac{1}{23}\%$

7. (2) Required fractional decrease

$= \frac{R}{100+R} = \frac{50}{100+50} = \frac{1}{3}$

8. (4) Percentage decrease

$= \frac{25}{125} \times 100 = 20\%$

9. (4) Required increase percent

$= \frac{40}{100-40} \times 100$

$= \frac{40}{60} \times 100 = \frac{200}{3} = 66\frac{2}{3}\%$

10. (4) Required percentage decrease

$= \frac{20}{100+20} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

11. (2) Percentage increase

$= \frac{7.50-6}{6} \times 100 = 25\%$

$\therefore$ Percentage decrease in consumption $= \frac{25}{125} \times 100 = 20\%$

12. (2) Percentage effect

$= \left(20 - 20 + \frac{20 \times -20}{100}\right)\%$

$= -4\%$

Negative sign shows decrease.

13. (2) If the reduction in consumption be x%, then

$60 - x - \frac{60x}{100} = 0$

$\Rightarrow 60 - x - \frac{3x}{5} = 0$

$\Rightarrow 300 - 5x - 3x = 0$

$\Rightarrow 8x = 300$

$\Rightarrow x = \frac{300}{8} = 37.5\%$

14. (4) Required per cent

$= \frac{25 \times 100}{125} = 20\%$

15. (2) Percentage decrease in the consumption of petrol

$= \left(\frac{20}{100+20} \times 100\right)\%$

$= \frac{50}{3} = 16\frac{2}{3}\%$

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TYPE-VII

1. (3) Total candidates
$= 1000 + 800 = 1800$
The candidates who are passed
$= 1000 \times \frac{60}{100} + 800 \times \frac{50}{100}$
$= 600 + 400 = 1000$
The number of candidates who failed $= 1800 - 1000 = 800$
$\therefore$ Required percent
$= \frac{800}{1800} \times 100 = 44.4\%$

2. (3) Let the maximum marks be x.
According to question,
20% of $x + 5 = 30\%$ of $x - 20$
$\Rightarrow (30 - 20)\%$ of $x = 25$
$\Rightarrow x = \frac{25 \times 100}{10} = 250$
$\therefore$ Passing marks
$= 20\%$ of $250 + 5 = 55$
$\therefore$ % Passing marks
$= \frac{55}{250} \times 100 = 22\%$

3. (3) **Tricky approach**
According to question,
$40\% \Rightarrow 220 + 20$
or $40\% \Rightarrow 240$
$\therefore 100\% \Rightarrow \frac{240}{40} \times 100 = 600$

4. (3) Let the total marks be x.
According to the question,
25% of $x + 40 = 33\%$ of x
$\Rightarrow (33 - 25)\%$ of $x = 40$
$\Rightarrow 8\%$ of $x = 40$
$\Rightarrow x = \frac{40 \times 100}{8} = 500$

5. (1) Let the marks obtained by first student be x.
$\therefore$ Marks obtained by second student $= x + 9$
Sum of their marks
$= 2x + 9$
As given,
$x + 9 = 56\%$ of $(2x + 9)$
$\Rightarrow x + 9 = \frac{56}{100} \times (2x + 9)$
$\Rightarrow x + 9 = \frac{14}{25} \times (2x + 9)$
$\Rightarrow 25x + 225 = 28x + 126$
$\Rightarrow 3x = 225 - 126$
$\Rightarrow x = \frac{99}{3} = 33$
$\therefore$ Marks obtained are 42 and 33.

6. (1) Let marks obtained by Supriyo $= x$
$\therefore \frac{9x}{10} = 81 \Rightarrow x = \frac{81 \times 10}{9} = 90$

7. (3) Let the maximum marks be x.
According to the question,
40% of $x = 90 + 10$
$\Rightarrow x = \frac{100 \times 100}{40} = 250$

8. (1) $n(M) = 65$, $n(P) = 48$, $n(M \cap P) = 30$
$\therefore n(M \cup P) = n(M) + n(P) - n(M \cap P)$
$= 65 + 48 - 30 = 83$
$\therefore$ Per cent of students passed $= 83$
$\therefore$ Per cent of students failed $= 17$
Method 2 :
Students passed only in Math
$= 65 - 30 = 35\%$
Students passed only in Physics
$= 48 - 30 = 18\%$
$\therefore$ Total passing %
$= 35 + 18 + 30 = 83\%$
$\therefore$ Failed $= 100 - 83 = 17\%$

9. (3) Let the number of students in the class be 100.
$\therefore$ Number of students in Biology = 72 and number of students in Maths = 44.
$\therefore$ Number of students opting for both subjects
$= 72 + 44 - 100 = 16$
$\because$ When 16 students opt for both subjects, total number of students = 100
$\therefore$ When 40 students opt for both subjects, total number of students $= \frac{100}{16} \times 40 = 250$

10. (1) Let the maximum marks be x.
$\therefore \frac{x \times 33}{100} = 125 + 40 = 165$
$\Rightarrow x = \frac{165 \times 100}{33} = 500$

11. (2) Let maximum marks be x, then,
$\frac{36 \times x}{100} = 113 + 85 = 198$
$\Rightarrow x = \frac{198 \times 100}{36} = 550$

12. (2) 46% of 500
$= \frac{500 \times 46}{100} = 230$
32% of $300 = \frac{300 \times 32}{100} = 96$
Required marks $= 230 - 96 = 134$
Let $x\%$ of $200 = 134$
$\Rightarrow \frac{200 \times x}{100} = 134$
$\Rightarrow 2x = 134$
$\Rightarrow x = \frac{134}{2} = 67\%$

13. (2) A = 360;
$B = \frac{360 \times 100}{90} = 400$
$C = \frac{400 \times 100}{125} = 320$
$D = \frac{320 \times 100}{80} = 400$
$\therefore$ Required percentage
$= \frac{400}{500} \times 100 = 80\%$

14. (4) Failed candidates
$= \frac{1100 \times 50}{100} + \frac{900 \times 60}{100}$
$= 550 + 540 = 1090$
$\therefore$ Required percentage
$= \frac{1090}{2000} \times 100 = 54.5\%$

15. (2) Successful boys in English or Maths or both
$= 80 + 85 - 75 = 90\%$
Unsuccessful boys = 10%
$\therefore$ Total number of boys
$= \frac{100}{10} \times 45 = 450$

16. (2) 25% of students pass in at least one subject i.e.; they pass in one or both subjects.
$\therefore$ % of students who don't pass or fail in both subjects
$= (100 - 25)\% = 75\%$

17. (1) The percentage of students who pass in one or two or both subjects
$= 60 + 70 - 40 = 90$
$\therefore$ Percentage of failed students
$= 100 - 90 = 10\%$

18. (3) Let total number of candidates = 100
70 candidates passed in English and 30 failed in it.
80 candidates passed in Maths and 20 failed in it.
10 candidates failed in English and Maths both.
$\therefore$ Out of 30 failed in English, 10 failed in Maths also.

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$\therefore$ 30 – 10 = 20 failed in English alone.
Similarly,
20 – 10 = 10 failed in Maths alone.
$\therefore$ Total number of failures
= 20 + 10 + 10 = 40
$\therefore$ 100 – 40 = 60 candidates passed in both subjects.
Now, if 60 candidates pass, total strength = 100
$\therefore$ For 144 candidates, total strength $= \frac{100}{60} \times 144 = 240$

19. (4) Difference of percentages of maximum marks obtained by two candidates = 32% – 20% = 12%
Difference of scores between two candidates = 30 +42 = 72
$\therefore$ 12% of maximum marks = 72
$\therefore$ Maximum marks
$= \frac{72 \times 100}{12} = 600$
$\therefore$ Pass marks = 20% of 600 + 30
= 120 + 30 = 150
$\therefore$ Required percentage
$= \frac{150}{600} \times 100 = 25\%$

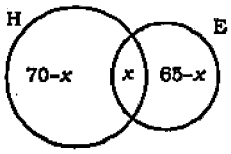
20. (4) Total number of students = 640 + 360 = 1000
Number of successful boys = 60% of 640 = 384
Number of successful girls = 80% of 360 = 288
Total number of successful students = 384 + 288 = 672
Number of unsuccessful students = 1000 – 672 = 328
$\therefore$ Required percentage
$= \frac{328 \times 100}{1000} = 32.8\%$

21. (3) Let total number of students = 100
Number of failures in Maths = 34
Number of failures in English = 42
Number of failures in both subjects = 20
Number of failures in Maths or English or both
= 34 + 42 – 20 = 56
Number of students who passed in both subjects
= 100 – 56 = 44
The required percentage = 44%

22. (2) Difference of percentage
= (40 – 30)% = 10%
Difference of marks = 6 + 6 = 12
$\because$ 10% of total marks = 12
Total marks $= \frac{12 \times 100}{10} = 120$

23. (3) Let the total number of students = 100
$\therefore$ Number of students who failed in Hindi or English or both
= 52 + 42 – 17 = 77
$\therefore$ Number of students who passed in both subjects
= 100 – 77 = 23%
$\therefore$ Required percentage = 23

24. (2) Let total number of students = 100
$\therefore$ 27 students speak none of the two languages.
It means only 73 students speak either Hindi or English or both.
Let x students speak both languages.



$\therefore$ 73 = 70 – x + x + 65 – x
$\Rightarrow x$ = 70 + 65 – 73 = 62%

25. (2) Clearly, 75 candidates qualify
$\therefore$ 75% of appearing candidates = 450
$\therefore$ Number of appearing candidates
$= \frac{450 \times 100}{75} = 600$

26. (1) Number of students passed in first year = 75
Number of students passed in second year $= \frac{60 \times 75}{100} = 45$
Total number of passed students
= 75+45=120
Total number of appeared students =175
$\therefore$ Required percentage
$= \frac{120}{175} \times 100 = 68\frac{4}{7}\%$

27. (4) Let the maximum marks be x.
According to the question,
35% of x = 200 +10
$\Rightarrow \frac{35x}{100} = 210$
$\Rightarrow x = \frac{210 \times 100}{35} = 600$

28. (1) Let the full marks in that examination were x.
According to the question,
$\frac{30x}{100} + 5 = \frac{40x}{100} - 10$
$\Rightarrow \frac{4x}{10} - \frac{3x}{10} = 10 + 5$
$\Rightarrow \frac{x}{10} = 15$
$\therefore x = 150$
$\therefore$ Minimum pass marks
$\frac{30}{100} \times 150 + 5 = 50$

29. (4) Let the total number of candidates = x
$\therefore$ Number of candidates passed in English = 0.6x
Number of candidates passed in Maths = 0.7x
Number of candidates failed in both subjects = 0.2x
Number of candidates passed in atleast one subject
= x – 0.2x = 0.8x
$\therefore$ 0.6 x + 0.7x – 2500 = 0.8 x
$\Rightarrow$ 1.3x – 0.8x = 2500
$\Rightarrow$ 0.5x = 2500
$\Rightarrow x = \frac{2500}{0.5} = 5000$

30. (3) Let the maximum marks in the examination = x.
According to the question,
$\frac{40x}{100} - \frac{30x}{100} = 50$
$\Rightarrow \frac{10x}{100} = 50$
$\Rightarrow x = \frac{50 \times 100}{10} = 500$

31. (1) Let total candidates be 'x'
Percentage of the candidates passing in English or Mathematics or both
= n(E) + n(M) – n (E $\cap$ M)
= 80 + 85 – 73 = 92
$\Rightarrow$ Percentage of candidates who failed in both the subjects
= 100 – 92 = 8 or 8%

32. (1) Percentage of students who failed in Maths or English or both
= (25 + 35 – 10)% = 50%
$\therefore$ Required percentage
= (100 – 50)% = 50%

33. (1) If the total number of students be x, then
7% of x = 259
$\Rightarrow \frac{x \times 7}{100} = 259$
$\Rightarrow x = \frac{259 \times 100}{7} = 3700$

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34. (3) If the total number of students be x, then

$$x = \frac{90x}{100} + \frac{85x}{100} - 150$$

$\Rightarrow 100x = 90x + 85x - 15000$

$\Rightarrow 175x - 100x = 15000$

$\Rightarrow 75x = 15000$

$\Rightarrow x = 200$

35. (1) Required percentage

$$= \frac{40\times100 + 50\times90 + 60\times80}{40+50+60}$$

$$= 88\frac{2}{3}\%$$

36. (2) If D gets 100 marks, then
Marks obtained by C = 125
Marks obtained by B

$$= \frac{125\times90}{100}$$

Marks obtained by A

$$= \frac{125\times90}{100}\times\frac{125}{100}$$

$$\because 100 = \frac{125\times125\times90}{10000}$$

$$\therefore 320 = \frac{125\times125\times90\times320}{1000000}$$

$= 450$

37. (2) Total examinees
$= 80 + 60 = 140$
Total successful examinees

$$= \frac{80\times60}{100} + \frac{60\times80}{100}$$

$= 48 + 48 = 96.$
$\therefore$ Required percent

$$= \frac{96}{140}\times100 = \frac{480}{7} = 68\frac{4}{7}\%$$

38. (4) $n(A \cup B)$

$= n(A) + n(B) - n(A \cap B)$

$= 19 + 10 - 7 = 22\%$

i.e. 22% of students are unsuccessful in either one or two subjects.

$\therefore$ Percentage of successful students $= 100 - 22 = 78\%$

39. (2) Successful students in both classes

$$= \frac{20\times80}{100} + \frac{30\times60}{100}$$

$= 16 + 18 = 34$
$\therefore$ Required percentage

$$= \frac{34}{50}\times100 = 68\%$$

OR

Required percentage

$$= \frac{20\times80 + 30\times60}{50}$$

$$= \frac{1600+1800}{50} = \frac{3400}{50}$$

$= 68\%$

40. (4) Failures in English
$= 100 - 75 = 25$
Failures in Maths $= 100-60 = 40$
Failures in both subjects $= 25$
Failures in English only
$= 25 - 25 = 0$
Failures n Maths only
$= 40 - 25 = 15$
Failures in one or both subjects
$= 25 + 15 = 40$
Percentage of successfuls
$= 100 - 40 = 60$
Let total students be x.

$$\therefore x\times\frac{60}{100} = 240$$

$$\Rightarrow x = \frac{240\times100}{60} = 400$$

41. (4) Maximum marks in the examination $= x$ (let)

$$\therefore \frac{40x}{100} - \frac{30x}{100} = 12 + 28$$

$$\Rightarrow \frac{10x}{100} = 40 \Rightarrow x = 40\times10$$

$= 400$

42. (4) Total marks scored in all three subjects

$$= \frac{300\times70}{100} = 210$$

$\therefore$ Marks scored in third subject
$= 210 - 60 - 80 = 70$

43. (4) Let total marks in the exam be x.
According to the question,

$$\frac{x\times36}{100} = 190 + 35 = 225$$

$$\Rightarrow x\times36 = 225\times100$$

$$\Rightarrow x = \frac{225\times100}{36} = 625$$

44. (3) Let the full marks of exam be x.
According to the question,

$$\frac{x\times32}{100} - \frac{x\times20}{100} = 30 + 42$$

$$\Rightarrow \frac{12x}{100} = 72$$

$$\Rightarrow x = \frac{72\times100}{12} = 600$$

$\therefore$ Minimum marks to pass

$$= \frac{600\times20}{100} + 30$$

$= 120 + 30 = 150$
$\therefore$ Required percentage

$$= \frac{150}{600}\times100 = 25\%$$

TYPE-VIII

1. (1) Change in his salary

$$= \left(20 - 20 - \frac{20\times20}{100}\right)\%$$

$$= \left(-\frac{400}{100}\right)\% = -4\%$$

i.e. 4% decrease
Note : If A is first increased by x% and then decreased by y% the net % change

$$= \left(x - y - \frac{xy}{100}\right)\%$$

If the result is positive, the change indicates increase and if the result is negative, the change indicates decrease.

2. (3) Net % change

$$= \left(A + B + \frac{AB}{100}\right)\%$$

Here, A = 20%, B = – 10%
$\therefore$ Net % change

$$= 20 - 10 - \frac{200}{100}$$

$= 10 - 2 = 8\%$
+ ve sign shows increase

3. (3) **Tricky approach**
Required change

$$= \frac{(10)^2}{100}\% \text{ decrease}$$

$= 1\%$ decrease

4. (2) A single equivalent reduction to reduction series of x%, y%

$$= \left(x + y - \frac{xy}{100}\right)\%$$

$$= \left(10 + 10 - \frac{10\times10}{100}\right)\%$$

$= (20 - 1)\% = 19\%$

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5. (1) The net change in price

$$=\left(-25+20-\frac{25\times20}{100}\right)\%$$

$=(-25+20-5)\%=-10\%$

Negative sign shows decrease.

6. (2) Let the price of the article be ₹ 100 and the daily sale be 100 units.
∴ Revenue day = 100 × 100
= ₹ 10000
New receipts = 75 × 130
= ₹ 9750
Decrease = ₹ (10000 − 9750)
= ₹ 250
∴ % decrease

$$=\frac{250}{10000}\times100=2\frac{1}{2}\%$$

7. (3) Tricky approach
Single equivalent percentage increase in price

$$=\left(10+10+\frac{10\times10}{100}\right)\%=21\%$$

8. (4) Tricky Approach
Effective increase percentage

$$=\left(10+20+\frac{20\times10}{100}\right)\%=32\%$$

$$\therefore\ x\times\frac{132}{100}=33$$

$$\Rightarrow x=\frac{33\times100}{132}=₹25$$

9. (2) Effective percentage increase

$$=\left(20+20+\frac{20\times20}{100}\right)\%=44\%$$

10. (4) Net change

$$=\left(10-10-\frac{10\times10}{100}\right)\%$$

$=-1\%=1\%$ decrease

11. (3) Required percentage increase

$$=\left(10+20+\frac{10\times20}{100}\right)\%=32\%$$

12. (1) Required effect

$$=\left(80-20-\frac{80\times20}{100}\right)\%$$

$=(60-16)\%=44\%$

Positive sign shows increase.

13. (3) Net effect

$$=\left(x+y+\frac{xy}{100}\right)\%$$

$$=\left(10-10-\frac{10\times10}{100}\right)\%=-1\%$$

Negative sign shows decrease.

14. (4) Required per cent effect

$$=\left(20-25-\frac{20\times25}{100}\right)\%$$

$=(-5-5)\%=-10\%$

Negative sign shows decrease

15. (2) Percentage effect

$$=\left(10+10+\frac{10\times10}{100}\right)\%=21\%$$

∴ Increase = ₹ 21

16. (2) Original fraction $=\frac{x}{y}$

$$\therefore\ \frac{\frac{120}{100}x}{y\times\frac{80}{100}}=\frac{4}{5}$$

$$\Rightarrow\frac{120x}{80y}=\frac{4}{5}\Rightarrow\frac{6x}{4y}=\frac{4}{5}$$

$$\Rightarrow\frac{x}{y}=\frac{4}{5}\times\frac{4}{6}=\frac{8}{15}$$

17. (3) Let original fraction be $\frac{x}{y}$

According to the question,

$$\frac{\frac{120}{100}x}{\frac{95y}{100}}=\frac{5}{2}\Rightarrow\frac{120x}{95y}=\frac{5}{2}$$

$$\Rightarrow\frac{x}{y}=\frac{5}{2}\times\frac{95}{120}=\frac{95}{48}$$

18. (2) Effective value

$$=\left(x+y+\frac{xy}{100}\right)\%$$

$$=\left(25-25-\frac{25\times25}{100}\right)\%$$

[Here, $x=25$, $y=-25$]

$=-6.25\%=6\frac{1}{4}\%$ decreased

(Negative value shows decrease).

19. (3) Larger number = x and smaller number = $520-x$

$$\therefore\ \frac{96x}{100}=\frac{(520-x)}{100}\times112$$

$\Rightarrow 96x=520\times112-112x$
$\Rightarrow 112x+96x=520\times112$
$\Rightarrow 208x=520\times112$

$$\Rightarrow x=\frac{520\times112}{208}=280$$

∴ Smaller number
= 520 − 280 = 240

20. (3) If the original price of article be ₹ x, then

$$x\times\frac{80}{100}\times\frac{130}{100}=416$$

$$\Rightarrow x=\frac{416\times100\times100}{80\times130}=₹400$$

21. (3) If the number be x, then

$$x\times\frac{245}{200}=98$$

$$\Rightarrow x=\frac{98\times200}{245}=80$$

22. (4) Let the original price be ₹100
New price after 10% decrease
= ₹ 90
In order to restore the price to its original value, it must be increased by ₹ 10
% increase

$$=\frac{10}{90}\times100=\frac{100}{9}=11\frac{1}{9}\%$$

23. (1) Clearly, 75% of the number = 225

$$\therefore\ \text{Number}=\frac{225\times100}{75}=300$$

Again, 125% of 300 = 375
Hence, the number should be increased by 25%

24. (1) Let the number be 100.
After 20% increase, number = 120
After 20% increase of 120, number

$$=120\times\frac{120}{100}=144$$

∴ Per cent decrease

$$=\frac{44}{144}\times100$$

$$=\frac{275}{9}=30\frac{5}{9}\%$$

25. (4) Let the original number of employees be 100 and wages per head be ₹ 100.
Total wages = ₹ (100 × 100)
= ₹ 10000
New number of employees = 125
New wages per head = ₹ 75
Total new wages
= ₹ (125 × 75) = ₹ 9375
Decrease
= ₹ (10000 − 9375)
= ₹ 625
∴ Percentage decrease

$$=\frac{625}{10000}\times100$$

$$=\frac{625}{100}=\frac{25}{4}\%$$



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26. (2) Let original number be x.

$$\therefore \frac{90}{100}x \times \frac{110}{100} = x - 50$$

$$\Rightarrow \frac{99x}{100} = x - 50$$

$$\Rightarrow x - \frac{99x}{100} = 50$$

$$\Rightarrow \frac{x}{100} = 50$$

$$\Rightarrow x = 5000$$

27. (3) Let the income be ₹ x and the rate of income tax be y %
According to the question,

$$\frac{xy \times 1.19}{100} - \frac{xy}{100} = \left(x - \frac{xy}{100}\right) \times \frac{1}{100}$$

$$\Rightarrow 1.19\,xy - xy = x - \frac{xy}{100}$$

$$\Rightarrow 0.19\,y = 1 - \frac{y}{100}$$

$$\Rightarrow \frac{y}{100} + 0.19y = 1 \Rightarrow y\left(\frac{1+19}{100}\right) = 1$$

$$\Rightarrow y = \frac{100}{20} = 5\%$$

28. (3) Man's income = ₹ 100 (let)
Expenditure = ₹ 75
Savings = ₹ 25

$$\text{New income} = \frac{100 \times 120}{100}$$

= ₹ 120

$$\text{New expenditure} = \frac{75 \times 110}{100} =$$

₹ 82.5
Savings = 120 − 82.5 = ₹ 37.5
Increase in savings = 37.5 − 25
= ₹ 12.5
∴ Increase per cent

$$= \frac{12.5}{25} \times 100 = 50\ \%$$

29. (3) Single equivalent increase for 10% and 10%

$$= \left(10 + 10 + \frac{10 \times 10}{100}\right)\% = 21\%$$

Again, single equivalent increase for 21% and 10%

$$= \left(21 + 10 + \frac{21 \times 10}{100}\right)\%$$

= 31 + 2.1 = 33.1%

Note : Volume of cube = (Edge)^3

Hence, formula $\left(x + y + \frac{xy}{100}\right)\%$ should be used twice.

30. (1) Increase in first year = 10%
Decrease in 2nd year = 10%
Effective result

$$= \left(10 - 10 - \frac{10 \times 10}{100}\right)\%$$

= −1%
Increase in 3rd year = 10%
∴ Effective result

$$= \left(10 - 1 - \frac{10 \times 1}{100}\right)\%$$

= (9 − 0.1)% = 8.9% (increase)

31. (4) Let the number be x.
∴ (20 + 25)% of x = 36

$$\Rightarrow \frac{45x}{100} = 36$$

$$\Rightarrow x = \frac{36 \times 100}{45} = 80$$

32. (3) Effective percentage

$$= \left(-20 + 20 - \frac{20 \times 20}{100}\right) = -4\%$$

If the number be x, then
4% of x = 20

$$\Rightarrow x \times \frac{4}{100} = 20$$

$$\Rightarrow x = \frac{20 \times 100}{4} = 500$$

33. (2)

Initial value $\xrightarrow{\text{increasing value}}$

$\frac{P \times x}{100}$ → increased value → $P + \frac{Px}{100}$

$$= P\left(\frac{100 + x}{100}\right)$$

∴ Required answer

$$= \left(\frac{x}{100 + x} \times 100\right)\%$$

TYPE-IX

1. (4) Let the total number of votes be 100.
Number of uncast votes = 8
∴ Number of votes polled = 92
Number of votes obtained by the winner = 48
∴ Number of votes obtained by the loser = 92 − 48 = 44
If the difference of win be 4 votes, total voters = 100
∴ When the difference be 1100 votes, total voters

$$= \frac{100}{4} \times 1100 = 27500$$

2. (3) Let the total number of voters enrolled be x.
Number of votes polled

$$= 75\% \text{ of } x = \frac{3x}{4}$$

Number of valid votes

$$= \frac{3x}{4} - \frac{2}{100} \times \frac{3x}{4} = \frac{3x}{4} - \frac{3x}{200}$$

$$= \frac{147x}{200}$$

Now, 75% of $\frac{147x}{200} = 9261$

$$\text{or } \frac{3}{4} \text{ of } \frac{147x}{200} = 9261$$

$$\text{or } x = \frac{9261 \times 4 \times 200}{3 \times 147} = 16800$$

3. (3) Difference of percentage of votes = 60% − 40% = 20%
∴ 20% of total votes = 14000
∴ 60% of total votes

$$= \frac{14000}{20} \times 60 = 42000$$

4. (4) Let total employees = 100
∴ Required percentage

$$= \frac{40 \times 40}{100} + \frac{60 \times 60}{100}$$

= 16 + 36 = 52%

5. (3) Let votes polled = x

$$\therefore x \times \left(\frac{60 - 40}{100}\right) = 298$$

$$\Rightarrow x \times \frac{1}{5} = 298$$

$$\Rightarrow x = 298 \times 5 = 1490$$

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6. (4) Number of valid votes

$= 104000 \times \frac{98}{100} = 101920$

$\therefore$ Valid votes received by the candidate

$= \frac{101920 \times 55}{100} = 56056$

7. (2) If the number of votes polled be x, then

$\frac{x \times 20}{100} = 1600$

$\Rightarrow x = \frac{1600 \times 100}{20} = 8000$

8. (2) Vote percentage of third candidate

$= 100 - 40 - 36 = 24\%$

$\therefore$ Votes got by third candidate

$= \frac{36000 \times 24}{100} = 8640$

9. (3) Total votes polled $= x$

$\therefore (57 - 43)\%$ of $x = 42000$

$\Rightarrow x \times \frac{14}{100} = 42000$

$\Rightarrow x = \frac{42000 \times 100}{14} = 300000$

10. (4) Total number of votes polled $= x$

$\therefore \frac{x \times 84}{100} - \frac{x \times 16}{100} = 476$

$\Rightarrow \frac{68x}{100} = 476$

$\Rightarrow x = \frac{476 \times 100}{68} = 700$

11. (4) Number of valid votes $= x$ (let)

$\therefore (62 - 38)\%$ of $x = 7200$

$\Rightarrow x \times \frac{24}{100} = 7200$

$\Rightarrow x = \frac{7200 \times 100}{24} = 30000$

12. (2) Total number of votes polled $= x$ (let)

According to the question,

$\frac{x \times 62}{100} - \frac{x \times (100 - 62)}{100} = 144$

$\Rightarrow \frac{62x}{100} - \frac{38x}{100} = 144$

$\Rightarrow \frac{24x}{100} = 144$

$\Rightarrow 24x = 144 \times 100$

$\Rightarrow x = \frac{144 \times 100}{24} = 600$

TYPE-X

1. (3) Required population after two years

$= 180000\left(1 + \frac{10}{100}\right)^2$

$= 180000 \times \frac{11}{10} \times \frac{11}{10} = 217800$

2. (1) If the present worth of the equipment be ₹ 100, then its price after 3 years

$= 100 \times \left(\frac{80}{100}\right)^3 = ₹ 51.2$

$\therefore$ Depriciation $= 48.8\%$

3. (3) $P = P_0\left(1 + \frac{R}{100}\right)^T$

$= 64000\left(1 + \frac{5}{200}\right)^3$

$= 64000\left(\frac{41}{40}\right)^3$

$= \frac{64000 \times 41 \times 41 \times 41}{40 \times 40 \times 40}$

$= 68921$

4. (1) Suppose the value of property two years ago was ₹ x

According to question

$\therefore x\left(1 - \frac{10}{100}\right)^2 = 8100$

$\Rightarrow x\left(\frac{90}{100}\right)^2 = 8100$

$\Rightarrow x = \frac{8100 \times 10 \times 10}{9 \times 9}$

$= ₹ 10000$

5. (1) Let the present population be P.

$\therefore P = 62500\left(1 - \frac{4}{100}\right)^2$

$= 62500 \times \frac{24}{25} \times \frac{24}{25} = 57600$

6. (3) Required population

$= 50000\left(1 + \frac{4}{100}\right)^2$

$= 50000 \times \frac{26}{25} \times \frac{26}{25} = 54080$

7. (2) Let the man's annual salary in 2006 be ₹ x.

$\therefore \frac{110x}{100} = 880000$

$\Rightarrow x = \frac{880000 \times 100}{110} = ₹ 800000$

8. (1) Population of the village two years ago

$= \frac{P}{\left(1 + \frac{R}{100}\right)^2} = \frac{67600}{\left(1 + \frac{4}{100}\right)^2}$

$= \frac{67600 \times 25 \times 25}{26 \times 26} = 62500$

9. (1) $A = P\left(1 - \frac{R}{100}\right)^T$

$= 200000\left(1 - \frac{5}{100}\right)^2$

$= 200000 \times \frac{19}{20} \times \frac{19}{20}$

$= ₹ 180500$

10. (4) Value of the property 3 years ago

$= \frac{P}{\left(1 - \frac{R}{100}\right)^T} = \frac{411540}{\left(1 - \frac{5}{100}\right)^3}$

$= \frac{411540 \times 20 \times 20 \times 20}{19 \times 19 \times 19}$

$= ₹ 480000$

11. (2) Population of town

$= P\left(1 + \frac{R}{100}\right)^T$

$= 64000\left(1 + \frac{10}{100}\right)^3$

$= 64000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

$= 85184$

12. (2) Present population

$= 10000\left(1 - \frac{20}{100}\right)^2$

$= 10000 \times \frac{4}{5} \times \frac{4}{5} = 6400$

13. (2) Required percent

$= \frac{1}{4} \times 3 + \frac{2}{3} \times 5 + \left(1 - \frac{1}{4} - \frac{2}{3}\right) \times 11$

$= \frac{3}{4} + \frac{10}{3} + \frac{11}{12} = \frac{9 + 40 + 11}{12} = 5\%$

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14. (3) Required price of the machine

$= 6250\left(1-\frac{10}{100}\right)\left(1-\frac{20}{100}\right)\left(1-\frac{30}{100}\right)$

$= 6250\times\frac{90}{100}\times\frac{80}{100}\times\frac{70}{100}$

= ₹ 3150

15. (4) Required value

$= 50000\left(1-\frac{10}{100}\right)^2$

$= 50000\times\frac{9\times9}{100}$ = ₹ 40500

16. (1) If the price of machine 3years ago be ₹ x. then

$729 = x\left(1-\frac{10}{100}\right)^3$

$\Rightarrow 729 = x\times\left(\frac{9}{10}\right)^3$

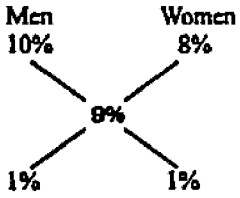
$\Rightarrow x$ = ₹ 1000

17. (1) Required Raman's salary

$=\frac{100}{100+5}\times1806$

$=\frac{100}{105}\times1806$ = ₹ 1720

18. (1) **By Alligation Rule**



∴ Men : Women = 1 : 1

∴ Number of men

$=\frac{1}{2}\times8000$ = 4000

19. (3) Let the number of males = x

∴ Number of females= 9800 – x

According to the question,

$x\times\frac{108}{100}+(9800-x)\times\frac{105}{100}=10458$

$\Rightarrow 108x + 9800\times105 - 105x = 1045800$

$\Rightarrow 3x + 1029000 = 1045800$

$\Rightarrow 3x = 1045800 - 1029000 = 16800$

$\Rightarrow x=\frac{16800}{3}=5600$

20. (1) Population in the beginning of the year

$=\frac{\text{Population after 3 years}}{\left(1+\frac{\text{Rate}}{100}\right)^{\text{Time}}}$

$=\frac{10000}{\left(1+\frac{25}{100}\right)^3}=\frac{10000}{\left(\frac{5}{4}\right)^3}$

$=\frac{10000\times64}{125}=5120$

21. (4) If the number of men be 100, then

Number of women = 90

∴ Required per cent

$=\frac{100}{90}\times100\approx111\%$

22. (1) Required population

$= P\left(1+\frac{R}{100}\right)^T$

$= 500000\left(1+\frac{4}{100}\right)^3$

$= 500000\times\left(1+\frac{1}{25}\right)^3$

$= 500000\times\frac{26}{25}\times\frac{26}{25}\times\frac{26}{25}$

= 562432

23. (2) If the population of village two years ago be P_0. then

$P = P_0\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 4410 = P_0\left(1+\frac{5}{100}\right)^2$

$\Rightarrow 4410 = P_0\left(1+\frac{1}{20}\right)^2$

$\Rightarrow 4410 = P_0\left(\frac{21}{20}\right)^2$

$\Rightarrow 4410 = \frac{441P_0}{400}$

$\Rightarrow P_0=\frac{4410\times400}{441}=4000$

24. (1) Value of TV after one year

$= 21000\times(100-5)\%$

$=\frac{21000\times95}{100}$ = Rs. 19950

25. (3) Single equivalent increase for 20% and 20%

$=\left(20+20+\frac{20\times20}{100}\right)\%$

= 44%

Single equivalent increase for 44% and 20%

$=\left(44+20+\frac{44\times20}{100}\right)\%$

= (64 + 8.8) % = 72.8%

26. (2) Population of town = 1000

Males ⇒ 600

Females ⇒ 400

Literate males

$\Rightarrow\frac{600\times20}{100}=120$

Total literate inhabitants

$=\frac{1000\times25}{100}=250$

∴ Literate females

= 250 – 120 = 130

∴ Required percent

$=\frac{130}{400}\times100=32.5\%$

27. (4) If the rate of increase per annum be R%, then

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 48400 = 40000\left(1+\frac{R}{100}\right)^2$

$\Rightarrow\frac{484}{400}=\left(1+\frac{R}{100}\right)^2$

$\Rightarrow\frac{121}{100}=\left(\frac{11}{10}\right)^2=\left(1+\frac{R}{100}\right)^2$

$\Rightarrow 1+\frac{R}{100}=\frac{11}{10}$

$\Rightarrow\frac{R}{100}=\frac{11}{10}-1=\frac{1}{10}$

$\Rightarrow R=\frac{100}{10}$ = 10% per annum

28. (3) $A = P\left(1-\frac{R}{100}\right)^3$

$\Rightarrow 7290 = P\left(1-\frac{10}{100}\right)^3 = P\left(\frac{9}{10}\right)$

$\Rightarrow 7290 = P\times\frac{9}{10}\times\frac{9}{10}\times\frac{9}{10}$

$\Rightarrow P=\frac{7290\times10\times10\times10}{9\times9\times9}$

= Rs. 10000

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29. (1) $P = P_0\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 9261 = P_0\left(1+\frac{5}{100}\right)^3$

$\Rightarrow 9261 = P_0\left(1+\frac{1}{20}\right)^3$

$\Rightarrow 9261 = P_0\left(\frac{21}{20}\right)^3$

$\Rightarrow P_0 = \frac{9261\times20\times20\times20}{21\times21\times21}$

$= 8000$

30. (2) Original population of village $= x$ (let)
According to the question,

$x\times\frac{95}{100}\times\frac{80}{100} = 4655$

$\Rightarrow x = \frac{4655\times100\times100}{95\times80}$

$= 6125$

TYPE-XI

1. (3) 10 per cent of ₹ 837

$= \frac{10}{100}\times837 = ₹\ 83.7$

∴ Reduced per kg price

$= \frac{83.7}{6.2} = ₹\ 13.50$

2. (2) Let the original price of sugar $= ₹\ x$ /kg.
Reduced price of sugar
$= 80\%$ of x

$= \frac{x\times80}{100} = ₹\ \frac{4x}{5}$ kg

$\therefore \frac{36}{\frac{4x}{5}} - \frac{36}{x} = \frac{1}{2}$

$\Rightarrow \frac{45}{x} - \frac{36}{x} = \frac{1}{2}$

$\Rightarrow \frac{9}{x} = \frac{1}{2}$

$\Rightarrow x = 9\times2 = ₹\ 18$/Kg

3. (4) Reduced price of 6.2kg of sugar
$= 10\%$ of ₹ 1116
$= ₹\ 111.6$
∴ Reduced price per kg

$= ₹\left(\frac{111.6}{6.2}\right) = ₹\ 18$

4. (2) Let the original price of sugar be ₹ x/kg.

∴ New price $= ₹\ \frac{9x}{10}$ /kg

$\therefore \frac{270}{\frac{9x}{10}} - \frac{270}{x} = 1$

$\Rightarrow \frac{300}{x} - \frac{270}{x} = 1 \Leftrightarrow \frac{30}{x} = 1$

$\Rightarrow x = ₹\ 30$/kg

5. (2) Let the original price of apples be ₹ x/ dozen

∴ New price $= ₹\ \frac{4x}{5}$/dozen

$\therefore \frac{54}{\frac{4x}{5}} - \frac{54}{x} = \frac{10}{12}$

$\Rightarrow 54\left(\frac{5}{4x} - \frac{1}{x}\right) = \frac{5}{6}$

$\Rightarrow 54\left(\frac{5-4}{4x}\right) = \frac{5}{6}$

$\Rightarrow \frac{54}{4x} = \frac{5}{6} \Rightarrow 4x = \frac{54\times6}{5}$

$\therefore \frac{4x}{5} = \frac{54\times6}{5\times5} = ₹\ 12.96$

6. (3) The original price of 1 egg $= ₹\ x$

Present price $= ₹\ \frac{3}{2}x$

$\therefore \frac{24}{x} - \frac{24}{\frac{3x}{2}} = 4$

$\Rightarrow \frac{24}{x}\left(1-\frac{2}{3}\right) = 4$

$\Rightarrow \frac{8}{x} = 4 \Rightarrow x = 2$

∴ Present price of eggs per dozen $= 12\times\frac{3}{2}\times2 = ₹\ 36$

7. (1) Original price of wheat $= ₹\ x$ /kg.
New price of wheat

$= ₹\ \frac{4x}{5}$ /kg

$\therefore \frac{320}{\frac{4x}{5}} - \frac{320}{x} = 5$

$\Rightarrow 320\left(\frac{5}{4x} - \frac{1}{x}\right) = 5$

$\Rightarrow 320\left(\frac{5-4}{4x}\right) = 5$

$\Rightarrow \frac{320}{4x} = 5$

$\Rightarrow x = \frac{320}{4\times5} = ₹\ 16$

8. (4) Original rate $= ₹\ x$ per egg

New rate $= ₹\ \frac{6x}{5}$ per egg

$\therefore \frac{24}{x} - \frac{24\times5}{6x} = 2$

$\Rightarrow \frac{24}{x} - \frac{20}{x} = 2$

$\Rightarrow \frac{4}{x} = 2 \Rightarrow x = 2$

∴ New rate $= ₹\ \frac{12}{5}$ per egg.

∴ Rate per dozen of eggs

$= ₹\left(\frac{12}{5}\times12\right) = ₹\ 28.80$

9. (4) Let original price of rice per kg $= ₹\ x$ (let)
∴ New price of rice per kg

$= ₹\ \frac{3x}{4}$

$\therefore \frac{600}{\frac{3x}{4}} - \frac{600}{x} = 10$

$\Rightarrow 600\left(\frac{4}{3x} - \frac{1}{x}\right) = 10$

$\Rightarrow 600\left(\frac{4-3}{3x}\right) = 10$

$\Rightarrow \frac{600}{3x} = 10$

$\Rightarrow x = \frac{600}{30} = ₹\ 20$

∴ New price $= \frac{3x}{4} = \frac{3\times20}{4}$

$= ₹\ 15$/kg

Method 2 :

Short method

If the price of an article is reduced by $a\%$ and buyer gets c kg more for some ₹ b, the new price per kg of article $= \frac{ab}{100\times c}$

$= \frac{25\times600}{100\times10} = ₹\ 15$

10. (1) Percentage decrease

$= \frac{0.25}{1.25}\times100 = 20\%$

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11. (3) If the number be x, then

$x - 15 = \frac{4x}{5}$

$\Rightarrow 5x - 75 = 4x \Rightarrow x = 75$

$\therefore$ 40% of $75 = \frac{75 \times 40}{100} = 30$

12. (4) Original price of article = ₹ x per kg.

New price = ₹ $\frac{79x}{100}$ per kg

$\therefore \frac{100}{\frac{79x}{100}} - \frac{100}{x} = 3$

$\Rightarrow \frac{10000}{79x} - \frac{100}{x} = 3$

$\Rightarrow \frac{10000 - 7900}{79x} = 3$

$\Rightarrow \frac{2100}{79x} = 3$

$\Rightarrow \frac{700}{79x} = 1$

$\Rightarrow 79x = 700 \Rightarrow x = \frac{700}{79}$

$\therefore$ New price

$= \frac{79x}{100} = \frac{79}{100} \times \frac{700}{79}$

= ₹ 7 per kg

13. (1) Let the original price of sugar be Rs. x per kg.

Reduced price

= Rs. $\frac{80x}{100}$ = Rs. $\frac{4x}{5}$ per kg.

According to the question,

$\frac{160}{\frac{4x}{5}} - \frac{160}{x} = 8$

$\Rightarrow \frac{40 \times 5}{x} - \frac{160}{x} = 8$

$\Rightarrow \frac{200}{x} - \frac{160}{x} = 8$

$\Rightarrow \frac{40}{x} = 8$

$\Rightarrow 8x = 40$

$\Rightarrow x = \frac{40}{8} = 5$ per kg.

14. (4) Required percentage change

$= \left(10 - 20 + \frac{10 \times (-20)}{100}\right)\%$

= −12% Negative sign shows decrease.

TYPE-XII

1. (2) Percentage of boys = 100% − 70% = 30%

Let total no. of students be x

$\therefore$ According to question,

30% of $x = 510$

$\therefore x = \frac{510}{30} \times 100 = 1700$

2. (2) 40% of students = 972

$\therefore$ 60% of students

$= \frac{972}{40} \times 60 = 1458$

3. (1) Number of boys

$= \frac{70}{30} \times 504 = 1176$

4. (2) **Tricky approach**

Required sum

= 0.5% of 19000

$= 19{,}000 \times \frac{0.5}{100}$

$= 19{,}000 \times \frac{5}{1000} =$ ₹ 95

5. (4) Remaining height

$\left(192 - \frac{125}{2}\% \text{ of } 192\right)$

= 192 − 120 = 72 m

$\therefore$ Required distance (distance covered in second hour) then,

$= \frac{25}{2}\%$ of 72

$= \frac{25 \times 72}{2 \times 100} = 9$ m

6. (3) Water in 100 kg fresh fruit = 68%

Water in dry fruit = 20%

Decrease = 48%

$\therefore$ Dry fruit obtained = 100 − 48 = 52 kg.

7. (3) The net tax rate

$= \left(30 + 30 \times \frac{10}{100}\right)\% = 33\%$

8. (4) Let z have x

$\therefore$ Money with Y $= \frac{3}{2}x$ and

Money with X = $3x$

$\therefore 3x + \frac{3x}{2} + x = 3 \times 110$

$\Rightarrow \frac{6x + 3x + 2x}{2} = 330$

$\Rightarrow 11x = 2 \times 330$

$\Rightarrow x = \frac{2 \times 330}{11} = 60$ $\therefore$ Money with X = $3x$ = ₹ (3×60) = ₹180

9. (1) If a number is x% more than other, then the other number is less than the first number by

$\frac{x}{100 + x} \times 100\%$

$\therefore$ Required answer

$= \frac{500}{100 + 500} \times 100 = \frac{500}{600} \times 100$

$= \frac{250}{3} = 83\frac{1}{3}$

Method 2: Let $q = x$, $p = 6x$

$p - q = 6x - x = 5x$

In % = $\frac{5x}{6x} \times 100 = 83\frac{1}{3}\%$

10. (3) Let $x = 10$ and $y = 10$

$\therefore xy^2 = 10 \times 10 \times 10 = 1000$ units

Decreasing values of x and y by 20%,

Expression = $xy^2 = 8 \times 8 \times 8$ = 512

Decrease = 1000 − 512 = 488 units

Percentage decrease

= $\frac{488}{1000} \times 100 = 48.8\%$

11. (1) If two numbers are respectively x% and y% more than a third number, the first as a per cent of second is

= $\frac{100 + x}{100 + y} \times 100 = \frac{110}{125} \times 100$

= 88%

12. (2) Let sum of money be x.

$\therefore \frac{11}{2}\%$ of $x = 220$

$\Rightarrow x = \frac{220 \times 200}{11} = 4000$

$\therefore 3\frac{1}{2}\%$ of $4000 = \frac{7}{2} \times \frac{4000}{100}$

= ₹ 140

13. (1) Let the total number of workers in the factory be x.

$\therefore x \times \frac{60}{100} \times \frac{75}{100} = 1350$

$\Rightarrow x$

$= \frac{1350 \times 100 \times 100}{60 \times 75} = 3000$

14. (4) Let the third number = 100.

$\therefore$ First number = 70

Second number = 63

$\therefore$ Required per cent

= $\frac{70 - 63}{70} \times 100 = 10\%$

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15. (1) Let Rani's weight be x kg.
$\therefore$ Meena's weight = $4x$ kg.

Tara's weight = $\frac{5x}{2}$ kg.

$\therefore$ Required percentage

$= \frac{4x}{\frac{5x}{2}} \times 100 = 160\%$

16. (2) Number of people who have the saving habit

$= \frac{2500 \times 60}{100} = 1500$

$\therefore$ Number of shareholders
= (100 – 62)% of 1500

$= \frac{1500 \times 38}{100} = 570$

17. (3) Let the original price of the article be ₹ x.
According to the question,

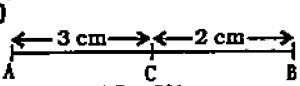
$5832 = x\left(1 - \frac{10}{100}\right)^3$

$\Rightarrow 5832 = x \times \left(\frac{9}{10}\right)^3$

$x = \frac{5832 \times 10 \times 10 \times 10}{9 \times 9 \times 9}$

= ₹ 8000

18. (4)



Increase in AC = 6%

$\therefore$ Increased AC = $\frac{106}{100} \times 3$

= 3.18 cm
$\therefore$ Decreased CB = 5 – 3.18
= 1.82 cm.
$\therefore$ Decrease = 2 – 1.82
= 0.18 cm
$\therefore$ Percentage decrease

$= \frac{0.18}{2} \times 100 = 9\%$

19. (2) $\because$ 24 = 100%

$\therefore 22 = \frac{100}{24} \times 22 = 91\frac{2}{3}\%$

20. (1) Let the number of boys be x and that of girls be y.
Then, $71x + 73y = 71.8(x + y)$
$\Rightarrow 71.8x - 71x = 73y - 71.8y$
$\Rightarrow 0.8x = 1.2y$

$\Rightarrow \frac{x}{y} = \frac{1.2}{0.8} = \frac{12}{8} = \frac{3}{2}$

$\therefore \frac{x}{y} + 1 = \frac{3}{2} + 1 \Rightarrow \frac{x+y}{y} = \frac{5}{2}$

$\therefore$ Percentage of girls

$= \frac{y}{x+y} \times 100 = \frac{2}{5} \times 100 = 40\%$

21. (2) Let the number of books in shelf B be 100.
$\therefore$ Number of books in shelf A = 80

On transferring 25% i.e. $\frac{1}{4}$ of books of shelf A to shelf B.
B = 100 + 20 = 120

Again, on transferring $\frac{1}{4}$ of books of shelf B to shelf A.

$A = 60 + \frac{120}{4} = 90$

$\therefore$ Required percentage

$= \frac{90}{180} \times 100 = 50\%$

22. (2) Total revenue earned

$= ₹\left(9900 \times \frac{20}{100} \times 10 + 9900 \times \frac{80}{100} \times 20\right)$

= ₹ (19800 + 158400)
= ₹ 178200

23. (2) Let Tina's weight = 1 kg
Lina's weight = 2 kg
Neha's weight = 1.4kg
Mina's weight = 1.8 kg.

$\therefore \frac{1.8x}{100} = 1.4$

$\Rightarrow x = \frac{1.4 \times 100}{1.8} = \frac{700}{9} = 77\frac{7}{9}$

24. (1) Let the number of seats initially in the cinema hall be 100 and the cost of each ticket be ₹ 100.
$\therefore$ Total revenue = 100 x 100
= ₹ 10000
In second condition,
Number of seats = 125
Cost of each ticket = ₹ 110
$\therefore$ New revenue
= 125 x 110 = ₹ 13750
Increase in revenue collection
= ₹. (13750 – 10000) = ₹ 3750
$\therefore$ Percentage increase

$= \frac{3750}{10000} \times 100 = 37.5\%$

Aliter : % Increase in revenue

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(25 + 10 + \frac{25 \times 10}{100}\right)\% = 37.5\%$

25. (4) Total amount = ₹ x

$\therefore x - \frac{x}{5} - \frac{4x}{5} \times \frac{5}{100} - 120$

= 1400

$\Rightarrow x - \frac{x}{5} - \frac{x}{25} = 1520$

$\Rightarrow \frac{25x - 5x - x}{25} = 1520$

$\Rightarrow \frac{19x}{25} = 1520$

$\Rightarrow x = \frac{1520 \times 25}{19} = ₹ 2000$

$\therefore$ Expenditure on transport

$= \frac{1}{25} \times 2000 = ₹ 80$

26. (3) Let the total number of employees be x.

$\therefore x \times \frac{69}{100} = 20700$

$\Rightarrow x = \frac{20700 \times 100}{69} = 30000$

27. (4) Let the fruit seller had originally x apples.
According to the question:
x – 40% of x = 420

$\Rightarrow x - \frac{40}{100} \times x = 420$

$\Rightarrow x - \frac{2x}{5} = 420$

$\Rightarrow \frac{5x - 2x}{5} = 420$

$\Rightarrow \frac{3x}{5} = 420$

$\therefore x = \frac{420 \times 5}{3} = 700$

Method-2 :
60% = 420 (Directly)

$\therefore 100\% = 420 \times \frac{100}{60} = 700$

28. (3) Let third number = 100
First number = 120
Second number = 150
Required percentage

$= \frac{120}{150} \times 100 = 80\%$

29. (2) The batsman scored 3 x 4 + 8 x 6 = 60 runs by boundaries and sixes respectively. Then,
Runs scored by running
= 110 – 60 = 50
$\therefore$ Required percentage

$= \frac{50}{110} \times 100 = \frac{500}{11}$

$= 45\frac{5}{11}\%$

30. (4) Let the initial value be A.
When it is increased by r% it becomes :

$A + r\% \text{ of } A = \frac{A(r + 100)}{100}$

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Now, when it is decreased by r%, it becomes

$\frac{A(r+100)}{100} - r\%$ of $\frac{A(r+100)}{100}$

$= \frac{A(r+100)}{100}\left(1-\frac{r}{100}\right)$

$= \frac{A(r+100)(100-r)}{10000}$

$\therefore A\left(\frac{10000-r^2}{10000}\right)=1$

$\Rightarrow A = ₹\frac{10000}{(10000-r^2)}$

31. (4) $y = \frac{110}{100}\times 125 = 137.5$

$\therefore x = 90\%$ of y

$= \frac{90\times 137.5}{100} = 123.75$

32. (4) Error = 5.5 minutes

$\therefore$ Error per cent

$= \frac{5.5}{3\times 60+40}\times 100 = 2.5$ per cent

33. (2) Per cent of families having either a cow or a buffalo or both = 60 + 30 − 15 = 75

It means 25 per cent of families do not have a cow or a buffalo.

$\therefore$ Required number of families

$= 25\%$ of $96 = 96\times\frac{25}{100} = 24$

34. (3) Let the amount invested at 6% = ₹ x

$\therefore$ Amount invested at 5% = ₹ $(10000 - x)$

According to the question,

$\frac{(10000-x)\times 5}{100} - \frac{x\times 6}{100} = 76.50$

$\Rightarrow 50000 - 5x - 6x = 7650$

$\Rightarrow 50000 - 11x = 7650$

$\Rightarrow 11x = 50000 - 7650 = 42350$

$\Rightarrow x = \left(\frac{42350}{11}\right) = ₹\ 3850$

35. (1) Kites of ₹ 20 are available for ₹ 19.

Hence, discount = 5%

i.e. $\frac{1}{20}\times 100$

If one gets kites of ₹ 20 for ₹ 18, discount = 10%

$\therefore$ Required answer

20 kites → 2 kites

27 kites → $= \frac{2}{20}\times 27 = 3$

36. (3) First part = ₹ x and second part = ₹ y.

According to question,

$\frac{x\times 80}{100} = \frac{y\times 60}{100} + 3$

$\Rightarrow \frac{4x}{5} = \frac{3y}{5} + 3$

$\Rightarrow 4x - 3y = 15$ ...(i)

Again,

$\frac{4y}{5} = \frac{9x}{10} + 6$

$\Rightarrow 8y = 9x + 60$

$\Rightarrow 8y - 9x = 60$ ...(ii)

By equation (i) × 8 + (ii) × 3,

$32x - 24y = 120$

$24y - 27x = 180$

$5x = 300 \Rightarrow x = 60$

From equation (i)

$4 \times 60 - 3y = 15$

$\Rightarrow 3y = 240 - 15 = 225$

$\Rightarrow y = \frac{225}{3} = 75$

$\therefore x + y = 60 + 75 = 135$

37. (2) Value of ₹ 100 stock = ₹ 108

$\because$ Income on investing ₹ 108 = ₹ $\frac{25}{2}$

$\therefore$ Income on investment of ₹ 27000

$= ₹\left(\frac{25}{2\times 108}\times 27000\right)$

= ₹ 3125

$\therefore$ Gain per cent

$= \frac{3125}{27000}\times 100$

$= \frac{625}{54} = 11\frac{31}{54}\%$

38. (3) Required mass of lead

$= 8000 \times \frac{60}{100} \times \left(1-\frac{3}{400}\right)$

$= 8000 \times \frac{60}{100} \times \frac{397}{400}$

= 4764 kg.

39. (4) According to the question,

$x + y = (x^2 + y^2) \times \frac{1}{5}$

Again, $x + y = (x^2 - y^2) \times \frac{1}{4}$

$\therefore \frac{x^2+y^2}{5} = \frac{x^2-y^2}{4}$

$\Rightarrow 5x^2 - 5y^2 = 4x^2 + 4y^2$

$\Rightarrow 5x^2 - 4x^2 = 5y^2 + 4y^2$

$\Rightarrow x^2 = 9y^2$

$\Rightarrow x = 3y$

$\therefore \frac{x+y}{x^2} = \frac{x^2+y^2}{5x^2}$

$= \frac{9y^2+y^2}{5\times 9y^2} = \frac{10y^2}{45y^2} = \frac{2}{9}$

40. (3) Let the total number of eggs bought be x.

10% of eggs are rotten.

$\therefore$ Remaining eggs = $\frac{90x}{100}$

$= \frac{9x}{10}$

After giving 80% of eggs to the neighbour,

Remaining eggs = $\frac{9x\times 20}{10\times 100}$

$= \frac{9x}{50}$

According to the question,

$\frac{9x}{50} = 36 \Rightarrow 9x = 36 \times 50$

$\Rightarrow x = \frac{36\times 50}{9} = 200$

41. (4) Amount with man in the beginning = Rs. x (let).

Amount given to son and daughter = 80%.

Remaining amount

$= 20\%$ of x = Rs. $\frac{x}{5}$

Remaining amount after donations to trust

$= \frac{x}{5}\times\frac{20}{100}$ = Rs. $\frac{x}{25}$

$\therefore \frac{x}{25} = 16000$

$\Rightarrow x = 16000 \times 25$ = Rs. 400000

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TEST YOURSELF

1. The value of a car at the beginning of a year is 10% less than the value of the same car at the beginning of the previous year. If the car is valued at Rs. 1,45,800 on 1st January, 2000, what was its value on 1st January, 1997 ?
(1) Rs. 200000 (2) Rs. 250000
(3) Rs. 185000 (4) None of these

2. In an examination 42% of the candidates failed in physics, 24% of the candidates failed in Chemistry and 14% of the candidates failed in both the subjects. If 72 candidates passed in both, find the total number of candidates in the examination.
(1) 120 (2) 130
(3) 150 (4) 160

3. The number of students appeared from a school for the Madhyamik Examination in three consecutive years are in the ratio 7 : 8 : 10 and 75%, 87.5% and 93.75% of the students of respective years were successful. What is the percentage of students who were successful during these three years taken together ?
(1) 85.5% (2) 86.5%
(3) 87% (4) 88.5%

4. An alloy contains 89% of copper; find how much copper is to be mixed to a sample of alloy so as to get 44 kgs of a new metal having 90% copper in it.
(1) 2 kg (2) 3 kg
(3) 2.5 kg (4) 4 kg

5. If the numerator of a fraction is increased by 150% and the denominator of the fraction is increased by 300% the resultant fraction is $\frac{5}{18}$. What is the original fraction?
(1) $\frac{4}{9}$ (2) $\frac{8}{9}$
(3) $\frac{6}{9}$ (4)None of these

6. An alloy of gold and silver weighs 50 gms. It contains 80% gold. How much gold should be added to the alloy so that percentage of gold is increased to 90?
(1) 45 gm (2) 40 gm
(3) 50 gm (4) None of these

7. 5% of income of A is equal to 15% of income of B and 10% of income of B is equal to 20% of income of C. If income of C is ₹ 2000, then total income of A, B and C is:
(1) 26,000 (2) 16,000
(3) 18,000 (4) 20,000

8. The population of a town is 10,000. If the males increases by 5% and the females by 6%, the population will be 10,540. How many females are there?
(1) 4000 (2) 4500
(3) 4800 (4) 5400

9. A reduction of 21% in the price of wheat enables a person to buy 10.5 kg more for ₹100. What is the reduced price per kg ?
(1) ₹ 2 (2) ₹ 3
(3) ₹ 2.50 (4) ₹ 3.50

10. Mahima secured 50% marks in Hindi, 60% in English and 70% in Maths as well as in science. What were her total marks if the maximum marks obtainable in each of these 4 subjects was 50?
(1) 175 (2) 150
(3) 125 (4) None of these

11. When 50 is subtracted from 50% of a number, result is 50. The number is :
(1) 150 (2) 400
(3) 200 (4) 300

12. A person makes a profit of ₹ 60000 in his business. 40% of the profit he reinvests in his business for its diversification. Of the remaining profit he distributes 30% as bonus to his employees, 20% he denotes in charity and rest on advertisement. Find the amount spent on advertisement.
(1) ₹ 18000 (2)₹ 12000
(3) ₹ 16000 (4)₹ 20000

13. If 60% of students in a school are boys and the total number of girls in the school is 460, find the number of boys in the school.
(1) 680 (2)690
(3) 700 (4)720

14. Find the total output of a coalmine, if after 24% wastage the net output is 68,400 tonnes.
(1) 95000 tonnes
(2) 85000 tonnes
(3) 90000 tonnes
(4) None of these

15. If A's salary is 50% more than B's then by what per cent B's salary is less than A's salary ?
(1) 50 % (2)25%
(3) 23% (4)33.3%

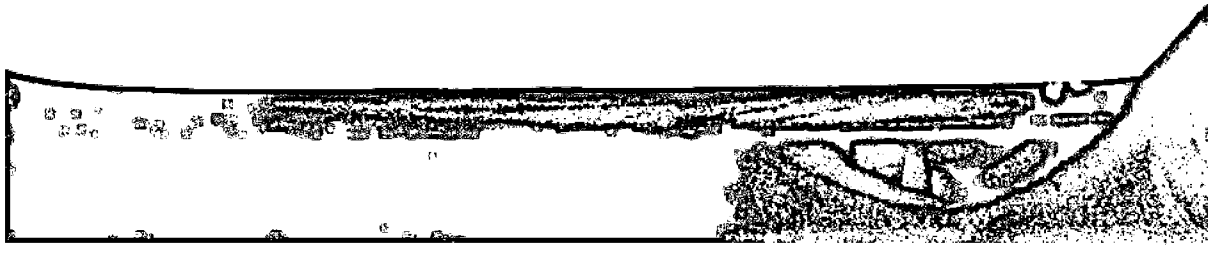
16. Quicklime contains 28.6% of oxygen by weight. Determine the weight of oxygen in 750 gm quicklime.
(1) 214.5 gm (2)224.5 gm
(3) 234.5 gm (4)235.5 gm

17. Price of a commodity has increased by 60%. By what per cent must a consumer reduce the consumption of the commodity so as not to increase the expenditure ?
(1) 35.5 % (2)37.5 %
(3) 38.5 % (4)25%

18. Sohan saves 14% of his salary while George saves 22%. If both get the same salary and George saves ₹ 1540, find the savings of Sohan.
(1) ₹ 950 (2)₹ 960
(3) ₹ 980 (4)₹ 990

19. In a quarterly examination, a student secured 30% marks and failed by 12 marks. In the same examination, another student secured 40% marks and got 28 marks more than bare minimum marks to pass. Find the pass percentage.
(1) 24% (2)28%
(3) 25% (4)33%

20. In an election between two candidates A and B, A got 65% of the total votes cast and won the election by 2748 votes. Find the total number of votes cast if no vote is declared invalid.
(1) 9160 (2)9260
(3) 9060 (4)9360



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21. In an examination, 40% marks are required to pass. A obtains 10% less than the number of marks required to pass. B obtains $11\frac{1}{9}\%$ less than A and C, $41\frac{3}{17}$ per cent less than the number of marks obtained by A and B together. Marks obtained by C is
(1) 42 (2) 40
(3) 38 (4) 36

22. A reduction of 25% in the price of apples would enable a purchaser to get 2 kg apples more for Rs. 240. Find the original price per kg of apples.
(1) ₹ 35 (2) ₹ 30
(3) ₹ 40 (4) None of these

23. 10% of the soldiers of an army are killed in the battle. 10% of the remaining soldiers died of disease and 10% of the remaining men were disabled. Now only 729000 soldiers are left in the army. How many soldiers were there in all in the army in the beginning?
(1) 990000 (2) 9900000
(3) 9800000 (4) 1000000

24. From the salary of an officer 10% is deducted as house rent; 15% of the rest he spends on children's education; 10% of the balance he spends on clothes. After this expenditure, he is left with ₹ 2754. Find his salary.
(1) ₹ 4500 (2) ₹ 4000
(3) ₹ 4200 (4) None of these

25. The tax on an article decreases by 10% and its consumption increases by 10%. Find the effect per cent on its revenue.
(1) 1% increase (2) 2% decrease
(3) 1% decrease (4) 2% increase

26. In a direct election between two contestants for the post of secretary, 4% of the total votes cast are declared to be illegal. One contestant secures 55% of the valid votes and wins with a majority of 240 votes, find the total number of votes cast.
(1) 3500 (2) 2400
(3) 2200 (4) 2500

SHORT ANSWERS

1. (1)	2. (3)	3. (2)	4. (4)
5. (1)	6. (3)	7. (3)	8. (1)
9. (3)	10. (3)	11. (3)	12. (1)
13. (2)	14. (3)	15. (4)	16. (1)
17. (2)	18. (3)	19. (4)	20. (1)
21. (2)	22. (3)	23. (4)	24. (2)
25. (3)	26. (4)		

EXPLANATIONS

1. (1) Clearly, if the car is valued at Rs. 90 in 2000, it was valued at Rs. 100 in 1999.
∴ Value of the car in 1999
$= \frac{145800 \times 100}{90}$
In this way, value of car in 1997
$= \frac{145800 \times 100 \times 100 \times 100}{90 \times 90 \times 90}$
= Rs. 200000

2. (3) Percentage of students failed only in :
Physics = 42 – 14 = 28
Chemistry = 24 – 14 = 10
∴ Percentage of students who failed in Physics or Chemistry or both = 28 + 10 + 14 = 52
∴ Percentage of candidates who passed
= 100 – 52 = 48
If the total number of students be x, then
$x \times \frac{48}{100} = 72$
$\Rightarrow x = \frac{72 \times 100}{48} = 150$

3. (2) Number of successful students :
First Year $\Rightarrow \frac{7x \times 75}{100} = \frac{21x}{4}$
$= 5.25x$
Second year $\Rightarrow \frac{8x \times 87.5}{100} = 7x$
Third year $\Rightarrow \frac{10x \times 93.75}{100}$
$= 9.375x$
Total successful students
$= 21.625x$
Required percentage
$= \frac{21.625x}{25x} \times 100 = 86.5\%$

4. (4) In 100 gm of alloy,
Copper = 89 gm.
Let x gm. of copper be mixed.
$\frac{89+x}{11} = \frac{90}{10}$
$\Rightarrow x = 99 - 89 = 10$gm
To get 44 kg of new alloy, copper to be mixed
$= \frac{44 \times 1000 \times 100}{1100} = 4$ kg.

5. (1) Let original fraction be $\frac{x}{y}$.
$\therefore \frac{x \times 250}{y \times 400} = \frac{5}{18}$
$\Rightarrow \frac{x}{y} = \frac{5}{18} \times \frac{400}{250} = \frac{4}{9}$

6. (3) In original alloy,
Gold = 40 gm
Silver = 10 gm
Let x gm of gold is added.
$\therefore \frac{40+x}{50+x} = \frac{90}{100} = \frac{9}{10}$
$\Rightarrow 400 + 10x = 450 + 9x$
$\Rightarrow x = 50$ gm.

7. (3) $\frac{A \times 5}{100} = \frac{B \times 15}{100}$
$\Rightarrow \frac{A}{B} = \frac{15}{5} = \frac{3}{1}$
Again, $\frac{B \times 10}{100} = \frac{C \times 20}{100}$
$\Rightarrow \frac{B}{C} = \frac{2}{1}$
∴ A : B = 3 : 1 = 6 : 2
B : C = 2 : 1
∴ A : B : C = 6 : 2 : 1
∴ Total income = 9 × 2000
= Rs. 18000

8. (1) If the number of women be x, then men = 10000 – x
$\therefore \frac{x \times 6}{100} + \frac{(10000 - x) \times 5}{100}$
$= 10540 - 10000 = 540$
$\Rightarrow 6x + 50000 - 5x = 54000$
$\Rightarrow x = 4000$

9. (1) Original price of wheat
= Rs. x /kg.
New price = Rs. $\frac{79x}{100}$ per kg
$\therefore \frac{100}{\frac{79x}{100}} - \frac{100}{x} = 10.5$

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$\Rightarrow 100\left(\frac{100-79}{79x}\right) = 10.5$

$\Rightarrow 100 \times 21 = 10.5 \times 79x$

$\Rightarrow \frac{79x}{100} = \frac{21}{10.5}$ = Rs.2.50 per kg

10. (3) Total marks obtained
= 25 + 30 + 70 = 125

11. (3) If the number be x, then

$\frac{x}{2} - 50 = 50$

$\Rightarrow \frac{x}{2} = 100$

$\Rightarrow x = 200$

12. (1) Total profit = ₹ 60000
Amount reinvested in business
= 40% of ₹ 60000
= ₹ 24000
Remaining amount of the profit
= 60% of ₹ 60000
= ₹ 36000
Bonus to employees
= 30% of ₹ 36000
= ₹ 10800
Donation for charity
= 20% of ₹ 36000 = ₹ 7200
Amount spent on advertisement
= ₹ (36000 – 10800 – 7200)
= ₹ 18000

13. (2) Let the total number of students be x.
Given, Number of boys

$= \frac{60}{100}x$. ..... (i)

Number of girls = 460
$\Rightarrow$ Number of boys = $x - 460$ ..... (ii)
From equations (i) and (ii),

$\Rightarrow x - 460 = \frac{60x}{100}$

$\Rightarrow 460 = \frac{40}{100}x$

$\Rightarrow x = \frac{460 \times 100}{40} = 1150$

$\therefore$ Number of boys = 1150 – 460
= 690.

14. (3) Let the total output be x tonnes.
Then, net output

$= x - \frac{24}{100} \times x = \frac{76x}{100}$

$\Rightarrow \frac{76}{100}x = 68{,}400$

$\Rightarrow x = \frac{68{,}400 \times 100}{76}$

= 90,000 tonnes.

15. (4) Let the salary of B = ₹ 100.
Then, salary of A

$= 100 + \frac{50}{100} \times 100$ = ₹. 150

$\therefore$ B's salary is ₹ 50 less than A's salary.
$\therefore$ Percentage of B's income less than A

$= \frac{50}{150} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$.

Hence, B's salary is less than A's salary by 33.3%.

16. (1) 100 gm quicklime contains oxygen = 28.6 gm.
$\therefore$ 1 gm quicklime contains oxygen = $\frac{28.6}{100}$
Hence, 750 gm quicklime contains

oxygen = $\frac{28.6}{100} \times 750$

= 214.5 gm.
Hence, weight of oxygen in 750 gm quicklime is 214.5 gm.

17. (2) Let the price of commodity be ₹ x per kg.
Increase in price = 60%
$\therefore$ Increased price of 1 kg
= ₹ 1.6x
If ₹ 1.6x is price of 1 kg

x is price of $\frac{x}{(1.6)x} = \frac{10}{16}$kg

$\therefore$ In order to keep the expenditure same, consumption should be reduced by

$1 - \frac{10}{16} = \frac{16-10}{16} = \frac{6}{16}$kg

Percentage reduction in consumption

$= \frac{6}{16} \times 100 = \frac{75}{2} = 37.5\%$

18. (3) Let the total salary of each of them = ₹ x.

Sohan saves = ₹. $\frac{14}{100}x$

and George saves

$= \frac{22}{100}x = 1540$

$\Rightarrow x$ = ₹ 7000

$\therefore$ Sohan saves = $\frac{14}{100} \times 7000$

= ₹ 980

19. (4) Let the maximum marks be x.

A student scored = $\frac{30}{100}x$, and failed by 12 marks.

$\therefore$ Passing marks = $\frac{30}{100}x + 12$

Another student scored = $\frac{40}{100}x$ and got 28 marks more than passing marks.

$\therefore$ Passing marks = $\frac{40}{100}x - 28$

$\Rightarrow \frac{30}{100}x + 12 = \frac{40}{100}x - 28$

$\Rightarrow \frac{10}{100}x = 40 \Rightarrow x = 400$

$\therefore$ Maximum marks = 400
Hence, Passing marks

$= \frac{30}{100} \times 400 + 12 = 132$

$\therefore$ Pass percentage

$= \frac{132}{400} \times 100 = 33\%$

The pass percentage = 33%

20. (1) Let the total number of votes cast = x.
Number of votes got by

A = $\frac{65}{100}x$ ..... (i)

$\Rightarrow$ B got

$= x - \frac{65}{100}x = \frac{100x - 65x}{100} = \frac{35}{100}x$

A won the election by 2748 votes.
$\therefore$ Number of votes for A

$= \frac{35}{100}x + 2748$ ..... (ii)

Form equations (i) and (ii).

$\Rightarrow \frac{65}{100}x = \frac{35}{100}x + 2748$

$\Rightarrow \frac{30x}{100} = 2748$

$\Rightarrow x = \frac{2748 \times 100}{30} = 9160$

$\therefore$ Total number of votes cast
= 9160

21. (2) Suppose the maximum marks = 100
$\therefore$ Marks required to pass = 40
$\because$ A gets 10% less than pass marks.
$\therefore$ Marks secured by

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$A = \frac{40 \times 90}{100} = 36$

$\because$ B gets $11\frac{1}{9}\%$ marks less than A.

$\therefore$ Marks secured dy B

$$= \frac{36 \times \left(100 - 11\frac{1}{9}\right)}{100}$$

$$= \frac{36 \times \left(\frac{900-100}{9}\right)}{100}$$

$$= 36 \times \frac{800}{9} \times \frac{1}{100} = 32$$

Total marks obtained by A and B = 36 + 32 = 68

$\because$ C gets $41\frac{3}{17}\%$ marks less than the marks obtained by A and B together.

$\therefore$ C's marks

$$\frac{68 \times \left(100 - 41\frac{3}{17}\right)}{100}$$

$$= \frac{68 \times \left(100 - \frac{700}{17}\right)}{100}$$

$$= \frac{68 \times \frac{1000}{17}}{100}$$

$$= 68 \times \frac{1000}{17} \times \frac{1}{100} = 40$$

22. (3) Let the original price be ₹ x per kg.

Reduction in price = ₹ $\frac{25}{100}x$

$\therefore$ Reduced price = $x - \frac{25}{100}x$

$= \frac{75}{100}x$ .... (i)

With ₹ 240, purchaser can purchase 2 kg more apples.

Now, 25% of 240

$= \frac{25}{100} \times 240 =$ ₹ 60

$\Rightarrow$ Reduced price of 2 kg of apples = Rs. 60

$\therefore$ Reduced price of 1 kg of apples = ₹ 30 .... (ii)

From equations (i) and (ii),

$\frac{75}{100} \times x = 30$

$\Rightarrow x = \frac{30 \times 100}{75} =$ ₹40

The original price of 1 kg apples = Rs. 40.

23. (4) Let the total number of soldiers in all in the army in the beginning = 100.

$\therefore$ Number of soldiers killed in the battle

$= \frac{10}{100} \times 100 = 10$

$\therefore$ Remaining soldiers

= 100 – 10 = 90

Number of soldiers who died of disease = $\frac{10}{100} \times 90 = 9$

$\therefore$ Remaining soldiers = 90–9= 81

Number of disabled soldiers

$= \frac{10}{100} \times 81 = \frac{81}{10}$

$\therefore$ Remaining soldiers

$= 81 - \frac{81}{10} = \frac{810-81}{10} = \frac{729}{10}$

$\therefore$ If $\frac{729}{10}$ soldiers are left, then total number of soldiers = 100

$\therefore$ If 1 soldier is left, then total number of soldiers

$= \frac{100 \times 10}{729}$

$\because$ If 729000 soldiers are left, then total number of soldiers

$= \frac{100 \times 10 \times 729000}{729} = 1000000.$

24. (2) Let the salary be ₹ 100. Then, House rent = ₹ 10; Balance = ₹ (100 – 10) = ₹ 90.

Expenditure on children's education = 15% of ₹ 90

$= \frac{15 \times 90}{100} =$ ₹ $\frac{27}{2}$

Balance now = $\left(90 - \frac{27}{2}\right)$

$= \left(\frac{180-27}{2}\right) =$ ₹$\frac{153}{2}$

Expenditure on clothes

$= \left(10\% \text{ of } \frac{153}{2}\right) =$ ₹$\left(\frac{153}{20}\right)$

Now, balance

$= \left(\frac{153}{2} - \frac{153}{20}\right) =$ ₹ $\frac{1377}{20}$

If last balance is ₹ $\frac{1377}{20}$, then salary = ₹ 100.

If last balance is ₹ 2754, then salary

$= ₹ \left(\frac{100 \times 20}{1377} \times 2754\right)$

= ₹ 4000.

25. (3) Let the original consumption be 1 unit & tax on it be ₹ 100.

So, revenue = ₹ (100 × 1) = ₹ 100.

New consumption

$= \left(\frac{110}{100} \times 1\right) = \frac{11}{10}$ units.

Now, tax on 1 unit = ₹ 90

Tax on $\frac{11}{10}$ units

$= \left(90 \times \frac{11}{10}\right) =$ ₹ 99.

$\therefore$ Decrease in revenue = 1 %.

26. (4) Suppose total number of votes cast = x.

$\therefore$ Number of illegal votes = 4% of $x = \frac{4x}{100} = \frac{x}{25}$

$\therefore$ Number of valid votes

$= x - \frac{x}{25} = \frac{25x-x}{25} = \frac{24x}{25}$

Votes secured by the contestant who is defeated

$= \frac{24x}{25} - \frac{24x}{25} \times \frac{55}{100}$

$= \frac{24x}{25}\left(1 - \frac{55}{100}\right) = \frac{24x}{25} \times \frac{45}{100}$

According to the question,

$\frac{24x}{25} \times \frac{55}{100} - 240 = \frac{24x}{25} \times \frac{45}{100}$

$\Rightarrow \frac{24x}{25}\left(\frac{55}{100} - \frac{45}{100}\right) = 240$

$\Rightarrow \frac{24x}{25} \cdot \frac{10}{100} = 240$

$\Rightarrow \frac{24x}{250} = 240$

$\Rightarrow x = \frac{250 \times 240}{24} = 2500$

$\therefore$ Total number of votes cast = 2500 □□□



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8 PROFIT AND LOSS

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. A man buys a cycle for ₹ 1400 and sells it at a loss of 15%. What is the selling price of the cycle?
(1) ₹ 1202 (2) ₹ 1190
(3) ₹ 1160 (4) ₹ 1000
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. On selling an article for ₹ 651, there is a loss of 7%. The cost price of that article is
(1) ₹ 744 (2) ₹ 751
(3) ₹ 793 (4) ₹ 700
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. A milkman bought 70 litres of milk for ₹ 630 and added 5 litres of water. If he sells it at ₹ 9.00 per litre, his profit percentage is
(1) $8\frac{1}{5}\%$ (2) 7%
(3) $8\frac{2}{5}\%$ (4) $7\frac{1}{7}\%$
(SSC CISF Constable (GD) Exam. 05.06.2011)

4. In terms of percentage profit, which is the best transaction?

	C.P. (in ₹)	Profit (in ₹)
(I)	36	17
(II)	50	24
(III)	40	19
(IV)	60	29

(1) I (2) II
(3) III (4) IV
(SSC CPO S.I. Exam. 12.01.2003)

5. A man bought an old typewriter for ₹ 1200 and spent ₹ 200 on its repair. He sold it for ₹ 1680. His profit per cent is :
(1) 20% (2) 10%
(3) 8% (4) 16%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

6. If the cost price is 95% of the selling price, what is the profit percent ?
(1) 4% (2) 4.75%
(3) 5% (4) 5.26%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

7. A merchant buys an article for ₹ 27 and sells it at a profit of 10% of the selling price. The selling price of the article is :
(1) ₹ 29.70 (2) ₹ 30
(3) ₹ 37 (4) ₹ 32
(SSC CPO S.I. Exam. 26.05.2005)

8. If the cost price of an article is 80% of its selling price, the profit per cent is :
(1) 20 % (2) $22\frac{1}{2}\%$
(3) 24% (4) 25%
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

9. Krishnan bought a camera and paid 20% less than its original price. He sold it at 40% profit on the price he had paid. The percentage of profit earned by Krishnan on the original price was
(1) 22% (2) 32%
(3) 12% (4) 15%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. By what per cent must the cost price be raised in fixing the sale price in order that there may be a profit of 20% after allowing a commission of 10% ?
(1) 25% (2) $133\frac{1}{3}\%$
(3) $33\frac{1}{3}\%$ (4) 30%
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

11. By selling an article, a man makes a profit of 25% of its selling price. His profit per cent is
(1) 20% (2) 25%
(3) $16\frac{2}{3}\%$ (4) $33\frac{1}{3}\%$
(SSC CGLTier-I Exam. 16.05.2010 (First Sitting)

12. If there is a profit of 20% on the cost price of an article, the percentage of profit calculated on its selling price will be
(1) 24 (2) $16\frac{2}{3}$
(3) $8\frac{1}{3}$ (4) 20
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

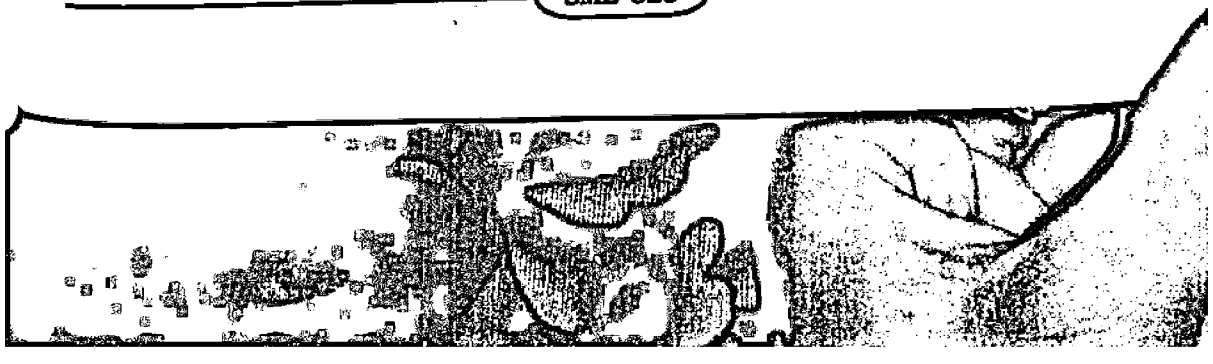
13. A man purchased a bedsheet for ₹ 450 and sold it at a gain of 10% calculated on the selling price. The selling price of the bedsheet was
(1) ₹ 460 (2) ₹ 475
(3) ₹ 480 (4) ₹ 500
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

14. By selling an article for ₹ 960 a man incurs a loss of 4%; what was the cost price ?
(1) ₹1,000 (2) ₹ 784
(3) ₹ 498.4 (4) ₹ 300
(SSC CISF Constable (GD) Exam. 05.06.2011)

15. A salesman expects a gain of 13% on his cost price. If in a month his sale was ₹7,91,000, what was his profit ?
(1) ₹85,659 (2) ₹88,300
(3) ₹91,000 (4) ₹97,786
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

16. By selling a car for ₹ 64,000, Mr. Rao lost 20%. Then the cost price of the car is :
(1) ₹ 72,000 (2) ₹ 76,800
(3) ₹ 80,000 (4) ₹ 84,000
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

17. A retailer buys a radio for ₹ 225. His overhead expenses are ₹ 15. He sells the radio for ₹300. The profit per cent of the retailer is :
(1) 25% (2) $26\frac{2}{3}\%$
(3) 20% (4) $33\frac{1}{3}\%$
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting) & (SSC Constable & GD Exam. 12.05.2013)



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18. An item when sold for ₹1,690 earned 30% profit on the cost price. Then the cost price is
(1) ₹ 507 (2) ₹ 630
(3) ₹1,300 (4) ₹ 130
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

19. A fan is listed at ₹150 and a discount of 20% is given. Then the selling price is
(1) ₹180 (2) ₹150
(3) ₹120 (4) ₹110
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

20. By selling 33 metres of cloth, a person gains the cost of 11 metres. Find his gain%.
(1) $33\frac{1}{3}\%$ (2) $33\frac{1}{2}\%$
(3) 33% (4) $34\frac{1}{3}\%$
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

21. While selling to the retailer, a company allows 30% discount on the marked price of their products. If the retailer sells those products at marked price, his profit % will be :
(1) 30% (2) $42\frac{1}{7}\%$
(3) 40% (4) $42\frac{6}{7}\%$
(SSC Multi-Tasking Staff Exam. 10.03.2013)

22. A merchant purchases a wrist watch for ₹ 450 and fixes its list price in such a way that after allowing a discount of 10%, he earns a profit of 20%. Then the list price of the watch is
(1) ₹ 650 (2) ₹ 700
(3) ₹ 550 (4) ₹ 600
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

23. The cost price of a radio is ₹ 600. The 5% of the cost price is charged towards transportation. After adding that, if the net profit to be made is 15%, then the selling price of the radio must be
(1) ₹ 704.50 (2) ₹ 724.50
(3) ₹ 664.50 (4) ₹ 684.50
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

24. If a shirt costs ₹ 64 after 20% discount is allowed, what was its original price in ₹ ?
(1) 76.80 (2) 80
(3) 88 (4) 86.80
(SSC Constable (GD) Exam. 12.05.2013)

25. The total cost of 8 buckets and 5 mugs is ₹ 92 and the total cost of 5 buckets and 8 mugs is ₹ 77. Find the cost of 2 mugs and 3 buckets.
(1) ₹ 35 (2) ₹ 70
(3) ₹ 30 (4) ₹ 38
(SSC Graduate Level Tier-I Exam. 19.05.2013)

26. If books bought at prices from ₹ 150 to ₹ 300 are sold at prices ranging from ₹ 250 to ₹ 350, what is the greatest possible profit that might be made in selling 15 books ?
(1) Cannot be determined
(2) ₹ 750
(3) ₹ 4,250
(4) ₹ 3,000
(SSC CHSL DEO & LDC Exam. 20.10.2013)

27. If there is a profit of 20% on the cost price, the percentage of profit on the sale price is
(1) $16\frac{2}{3}\%$ (2) 12 %
(3) $15\frac{1}{3}\%$ (4) 16 %
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

28. Nisha bought a number of oranges at 2 for a rupee and an equal number at 3 for a rupee. To make a profit of 20% she should sell a dozen for
(1) ₹ 6 (2) ₹ 8
(3) ₹ 10 (4) ₹ 12
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

29. There is a profit of 20% on the cost price of an article. The % of profit, when calculated on selling price is
(1) $16\frac{2}{3}\%$ (2) 20%
(3) $33\frac{1}{3}\%$ (4) None of these
(SSC CGL Tier-II Exam. 21.09.2014)

30. If selling price of an article is $1\frac{1}{3}$ of cost price, find gain %.
(1) 25% (2) $33\frac{1}{3}\%$
(3) 1.33% (4) $66\frac{2}{3}\%$
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

31. A merchant loses 10% by selling an article. If the cost price of the article is ₹ 15, then the selling price of the article is
(1) ₹ 13.20 (2) ₹ 16.50
(3) ₹ 12.30 (4) ₹ 13.50
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

32. Pooja wants to sell a watch at a profit of 20%. She bought it at 10% less and sold it at ₹ 30 less, but still she gained 20%. The cost price of watch is
(1) ₹ 240 (2) ₹ 220
(3) ₹ 250 (4) ₹ 225
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

33. A fruit merchant makes a profit of 25% by selling mangoes at a certain price. If he charges Re. 1 more on each mango, he would gain 50%. At first the price of one mango was
(1) Rs. 5 (2) Rs. 7
(3) Rs. 4 (4) Rs. 6
(SSC Constable (GD) Exam. 04.10.2015, Ist Sitting)

34. There is 10% loss if an article is sold at Rs. 270. Then the cost price of the article is
(1) Rs. 300 (2) Rs. 270
(3) Rs. 320 (4) Rs. 250
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

35. If bananas are bought at the rate of 4 for a rupee, how many must be sold for a rupee so as to gain $33\frac{1}{3}\%$?
(1) 2.5 (2) 2
(3) 3 (4) 4
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

36. By selling an article for Rs. 450, I lose 20%. For what price should I sell it to gain 20% ?
(1) Rs. 490 (2) Rs. 675
(3) Rs. 470 (4) Rs. 562.50
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

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TYPE–II

1. The cost price of 36 books is equal to the selling price of 30 books. The gain per cent is :
(1) 20% (2) $16\frac{4}{6}$%
(3) 18% (4) $82\frac{2}{6}$%
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The cost price of 15 articles is same as the selling price of 10 articles. The profit percent is :
(1) 30% (2) 40%
(3) 50% (4) 45%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The selling price of 5 articles is the same as the cost price of 3 articles. The gain or loss percent is :
(1) 20% gain (2) 25% gain
(3) 33.33% loss (4) 40% loss
(SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting) & (SSC CGL Tier-I Exam. 16.05.2010 (IInd Sitting) & (SSC SAS Exam. 26.06.2010)

4. If the cost price of 15 tables be equal to the selling price of 20 tables, the loss per cent is :
(1) 20% (2) 30%
(3) 25% (4) 37.5%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting) and SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

5. The cost price of 18 articles is equal to the selling price of 15 articles. The gain per cent is :
(1) 15% (2) 20%
(3) 25% (4) 18%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

6. A person sells 400 mangoes at the cost price of 320 mangoes. His percentage of loss is
(1) 10% (2) 15%
(3) 20% (4) 25%
(SSC CHSL DEO & LDC Exam. 11.12.2011(1st Sitting (Delhi Zone)

7. If the cost price of 50 oranges is equal to the selling price of 40 oranges, then the profit per cent is
(1) 5% (2) 10%
(3) 20% (4) 25%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. If the cost price of 12 oranges is equal to selling price of 10 oranges, then the percentage of profit is
(1) $16\frac{2}{3}$% (2) 20%
(3) 18% (4) 25%
(SSC CGL Prelim Exam. 11.05.2003 (IInd Sitting) & (SSC SO (Commercial) Exam. 16.11.2003)

9. If the cost price of 10 articles is equal to the selling price of 9 articles, the gain or loss per cent is
(1) $11\frac{1}{9}$% profit
(2) $7\frac{6}{17}$% profit
(3) $11\frac{1}{9}$% loss
(4) $1\frac{12}{13}$% loss
(SSC CPO S.I. Exam. 07.09.2003)

10. A man sells 320 mangoes at the cost price of 400 mangoes. His gain percent is :
(1) 15% (2) 20%
(3) 25% (4) 10%
(SSC CGL Prelim Exam. 24.02.2002 & (SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

11. If the cost price of 12 pens is equal to the selling price of 8 pens, the gain per cent is :
(1) $33\frac{1}{3}$% (2) $66\frac{2}{3}$%
(3) 25% (4) 50%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

12. The cost price of 8 articles is equal to the selling price of 9 articles. The profit or loss per cent in the transaction is
(1) $12\frac{1}{2}$% loss (2) $12\frac{1}{2}$% profit
(3) $11\frac{1}{9}$% loss (4) $11\frac{1}{9}$% profit
(SSC CPO S.I. Exam. 05.09.2004)

13. A sold an article to B at 20% profit and B sold to C at 15% loss. If A sold it to C at the selling price of B, then A would make
(1) 5% profit (2) 2% profit
(3) 2% loss (4) 5% loss
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

14. If the cost price of 10 articles is equal to the selling price of 7 articles, then the gain or loss per cent is :
(1) 51% gain (2) $42\frac{6}{7}$% gain
(3) 35 % loss (4) $42\frac{6}{7}$% loss
(SSC CPO S.I. Exam. 26.05.2005)

15. Mahesh purchased a radio at $\frac{9}{10}$ of its selling price and sold it at 8% more than its original selling price. His gain per cent is :
(1) 20 % (2) 18%
(3) 10 % (4) 8 %
(SSC CHSL DEO & LDC Exam. 28.11.2010 (1st Sitting)

16. A coconut merchant finds that the cost price of 2750 coconuts is the same as the selling price of 2500 coconuts. The loss or gain per cent is
(1) 5% loss (2) 15% loss
(3) 20% gain (4) 10% gain
(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (SSC CPO S.I. Exam. 03.09.2006)

17. If the cost price of 10 articles is equal to the selling price of 16 articles, then the loss per cent is
(1) 30% (2) 37.5%
(3) 42.5% (4) 45%
(SSC CISF ASI Exam. 29.08.2010 (Paper-1) & (SSC (South Zone) Investigator Exam 12.09.2010) & (SSC CHSL DEO & LDC Exam. 04.12.2011)

18. If the selling price of 4 articles is equal to the cost price of 5 articles, the profit percent is
(1) 20% (2) $22\frac{1}{2}$%
(3) 25% (4) 30%
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

19. The selling price of 10 oranges is the cost price of 13 oranges. Then the profit percentage is
(1) 30% (2) 10%
(3) 13% (4) 3%
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

20. If the selling price of 10 articles is equal to the cost price of 11 articles, then the gain percent is
(1) 10% (2) 11%
(3) 15% (4) 25%
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

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21. If the cost price of 10 articles is equal to the selling price of 8 articles, then gain per cent is
(1) 10% (2) 8%
(3) 50% (4) 25%
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

22. The cost price of 25 articles is equal to the selling price of 20 of them. The gain or loss percent is given by
(1) 20% loss (2) 25% gain
(3) 60% loss (4) 75% gain
(SSC CPO S.I. Exam. 12.01.2003) & (SSC CHSL DEO & LDC Exam. 04.12.2011) & FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

23. The cost price of 24 apples is the same as the selling price of 18 apples. The percentage of gain is :
(1) $12\frac{1}{2}\%$ (2) $14\frac{2}{3}\%$
(3) $16\frac{2}{3}\%$ (4) $33\frac{1}{3}\%$
(SSC CHSL DEO & LDC Exam. 27.11.2010)

24. The cost price of 400 lemons is equal to the selling price of 320 lemons. Then the profit percent is
(1) 15% (2) 20%
(3) 25% (4) 40%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

25. The cost price of 20 oranges is same with selling price of 16 oranges. The profit percentage is
(1) 30% (2) 20%
(3) 25% (4) 16%
(SSC CPO S.I. Exam. 05.09.2004) & (SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

26. The selling price of 12 articles is equal to the cost price of 15 articles. The gain per cent is
(1) $6\frac{2}{3}\%$ (2) 20%
(3) 25% (4) 80%
(SSC CGL Tier-I Exam. 19.06.2011 & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

27. If the cost price of 18 articles is equal to the selling price of 16 articles, the gain or loss is
(1) 25% gain (2) 25% loss
(3) $12\frac{1}{2}\%$ loss (4) $12\frac{1}{2}\%$ gain
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

28. The cost price of 40 articles is the same as the selling price of 25 articles. Find the gain per cent.
(1) 65% (2) 60%
(3) 15% (4) 75%
(SSC Graduate Level Tier-II Exam.16.09.2012)

29. The cost price of a book is ₹ 150. At what price should it be sold to gain 20% ?
(1) ₹ 120 (2) ₹ 180
(3) ₹ 100 (4) ₹ 80
(SSC CHSL DEO & LDC Exam. 20.10.2013)

30. A cloth merchant on selling 33 metres of cloth obtains a profit equal to the selling price of 11 metres of cloth. The profit percent is
(1) 40% (2) 22%
(3) 50% (4) 11%
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

31. A shopkeeper buys 144 items at 90 paise each. On the way 20 items are broken. He sells the remainder at ₹ 1.20 each. His gain per cent correct to one place of decimal is
(1) 13.8% (2) 14.6%
(3) 14.8% (4) 15.8%
(SSC CGL Tier-II Exam. 21.09.2014)

32. If goods be purchased for ₹ 450 and one third sold at a loss of 10%. At what gain percent should the remainder be sold so as to gain 20% on the whole transaction ?
(1) 32% (2) 35%
(3) 28% (4) 30%
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

33. A shoe company sold 50 pairs of shoes on a day costing ₹ 189.50 each for ₹ 10,000. Then the profit obtained in ₹ is
(1) 522 (2) 525
(3) 573 (4) 612
(SSC CHSL DEO & LDC Exam. 16.11.2014)

34. Salim had to sell vegetables worth ₹ 5,750 for ₹ 4,500 due to heavy rainfall. What is the loss percentage that he has incurred ?
(1) 21.74% (2) 23.47%
(3) 20% (4) 23.45%
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

35. A shopkeeper purchases an article for Rs. 3,550 and spends Rs. 50 on it for its repair. If he then sold the article for Rs. 3,816, the percent of profit is
(1) 6% (2) 6.08%
(3) 7.38% (4) 7.49%
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

36. A shopkeeper buys two cameras at the same price. He sells one camera at a profit of 18% and the other at a price 10% less than the selling price of the first. His total profit or loss per cent is
(1) 12.1% profit (2) 12.1% loss
(3) 12.2% profit (4) 11.1% loss
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

37. A shopkeeper sold his goods at half the list price and thus lost 20%. If he had sold on the listed price, his gain percentage would be
(1) 60 % (2) 20 %
(3) 72 % (4) 35 %
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

38. By selling 20 metres of cloth a man gains the selling price of 4 metres of cloth. The gain percent is
(1) 25 (2) 30
(3) 35 (4) 20
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

39. Ten articles were bought for Rs. 8, and sold at 8 for Rs. 10. The gain percent is
(1) 54.75% (2) 57.25%
(3) 56.25% (4) 55%
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

40. If a shop-keeper purchases cashewnut at Rs. 250 per kg. and sells it at Rs. 10 per 50 grams. then he will have
(1) 25% Loss (2) 25% Profit
(3) 20% Profit (4) 20% Loss
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 21.06.2015 (Ist Sitting) TF No. 8037731)

41. Cost price of 100 books is equal to the selling price of 60 books. The gain percentage/loss percentage is
(1) $66\frac{3}{2}\%$ (2) 67%
(3) 66% (4) $66\frac{2}{3}\%$
(SSC CGL Tier-I Exam, 09.06.2015 (IInd Sitting) TF No. 4239378 and SSC CGL Tier-I Exam, 16.06.2015 (Ist Sitting) TF No. 3196279)

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42. If the cost price of 10 articles equals selling price of 9 articles, the gain or loss percent will be

(1) $11\frac{1}{9}$% loss (2) $1\frac{1}{9}$% loss

(3) $1\frac{1}{9}$% gain (4) $11\frac{1}{9}$% gain

(SSC CGL Tier-I Re-Exam, 30.08.2015)

43. Ritu purchased $2\frac{1}{2}$ dozen eggs at the rate of Rs. 20 per dozen. She found that 6 eggs were rotten. She sold the remaining eggs at the rate of Rs. 22 per dozen. Then her profit or loss percent is :

(1) 12% loss (2) 12% profit

(3) 10% loss (4) 10% profit

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

44. Ram sold two horses at the same price. In one he gets a profit of 10% and in the other he gets a loss of 10%. Then Ram gets

(1) 2% loss

(2) No loss or profit

(3) 1% loss

(4) 1% profit

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

45. A man purchases some oranges at the rate of 3 for Rs. 40 and the same quantity at 5 for Rs. 60. If he sells all the oranges at the rate of 3 for Rs. 50, find his gain or loss percent (to the nearest integer).

(1) 32% profit(2) 31% loss

(3) 34% loss (4) 31% profit

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

46. An article is sold at a profit of 25%. If the selling price is doubled, the profit will be :

(1) 200% (2) 50%

(3) 100% (4) 150%

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

47. A man purchased an article for Rs. 1500 and sold it at 25% above the cost price. If he has to pay Rs. 75 as tax on it, his net profit percentage will be :

(1) 20% (2) 25%

(3) 30% (4) 15%

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

48. If a man were to sell his hand-cart for Rs. 720, he would lose 25%. At what price must he sell it to gain 25%?

(1) Rs. 1200 (2) Rs. 960

(3) Rs. 1152 (4) Rs. 768

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

49. If the Cost Price of 25 chairs is equal to the selling price of 30 chairs, then the loss % is :

(1) 25% (2) 20%

(3) 5% (4) $16\frac{2}{3}$%

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

50. A fruit seller buys oranges at the rate of Rs. 10 per dozen and sells at the rate of Rs. 12 per dozen. His gain percent is :

(1) 20% (2) 15%

(3) 12% (4) $8\frac{1}{3}$%

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE-III

1. Oranges are bought at rate of 7 for ₹ 3. At what rate per hundred must they be sold to gain 33%?

(1) ₹ 56 (2) ₹ 60

(3) ₹ 58 (4) ₹ 57

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A man buys 12 articles for ₹ 12 and sells them at the rate of ₹ 1.25 per article. His gain percentage is :

(1) 20% (2) 25%

(3) 15% (4) 18%

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. 12 copies of a book were sold for ₹ 1800/- thereby gaining cost-price of 3 copies. The cost price of a copy is :

(1) ₹ 120/- (2) ₹ 150/-

(3) ₹ 1200/- (4) ₹ 1500/-

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. If I would have purchased 11 articles for ₹ 10 and sold all the articles at the rate of 10 for ₹ 11, the profit per cent would have been :

(1) 10% (2) 11%

(3) 21% (4) 100%

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

5. A person buys some pencils at 5 for a rupee and sells them at 3 for a rupee. His gain per cent will be :

(1) $66\frac{2}{3}$% (2) $76\frac{2}{3}$%

(3) $56\frac{2}{3}$% (4) $46\frac{2}{3}$%

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

6. 100 oranges are bought for ₹ 350 and sold at the rate of ₹ 48 per dozen. The percentage of profit or loss is :

(1) 15% loss (2) 15% gain

(3) $14\frac{2}{7}$% loss (4) $14\frac{2}{7}$% profit

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

7. Oranges are bought at the rate of 10 for ₹ 25 and sold at the rate of 9 for ₹ 25. The profit percent is

(1) $9\frac{1}{11}$% (2) 10%

(3) $11\frac{1}{9}$% (4) $12\frac{1}{2}$%

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. The cost price of two dozen bananas is ₹ 32. After selling 18 bananas at the rate of ₹ 12 per dozen, the shopkeeper reduced the rate to ₹ 4 per dozen. The per cent loss is

(1) 25.2% (2) 32.4%

(3) 36.5% (4) 37.5%

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

9. Some articles were bought at 6 for ₹ 5, and sold at 5 for ₹ 6. Gain per cent is :

(1) 5% (2) 6%

(3) 30% (4) 44%

(SSC CGL Prelim Exam. 08.02.2004 & 04.02.2007 (Ist & IInd Sitting)

10. Ramesh bought 10 cycles for ₹500 each. He spent ₹2,000 on the repair of all cycles. He sold five of them for ₹750 each and the remaining for ₹ 550 each. Then the total gain or loss % is

(1) Gain of $8\frac{1}{3}$%

(2) Loss of $8\frac{1}{3}$%

(3) Gain of $7\frac{2}{3}$%

(4) Loss of $7\frac{1}{7}$%

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)



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11. On selling 17 balls at ₹ 720, there is a loss equal to the cost price of 5 balls. The cost price of a ball is :
(1) ₹ 45 (2) ₹ 50
(3) ₹ 60 (4) ₹ 55
(SSC CGL Prelim Exam. 06.02.2004 (Second Sitting)

12. I purchased 120 exercise books at the rate of ₹ 3 each and sold $\frac{1}{3}$ of them at the rate of ₹ 4 each, $\frac{1}{2}$ of them at the rate of ₹ 5 each and the rest at the cost price. My profit per cent was
(1) 44% (2) $44\frac{4}{9}\%$
(3) $44\frac{2}{3}\%$ (4) 45%
(SSC CPO S.I. Exam. 05.09.2004)

13. A person bought some articles at the rate of 5 per rupee and the same number at the rate of 4 per rupee. He mixed both the types and sold at the rate of 9 for 2 rupees. In this business he suffered a loss of ₹ 3. The total number of articles bought by him was
(1) 1090 (2) 1080
(3) 540 (4) 545
(SSC CPO S.I. Exam. 05.09.2004)

14. A man bought pencils at the rate of 6 for ₹ 4 and sold them at the rate of 4 for ₹ 6. His gain% in the transaction is :
(1) 75% (2) 80%
(3) 125% (4) 100%
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

15. Ravi buys some toffees at 2 for a rupee and sells them at 5 for a rupee. His loss percent is
(1) 120% (2) 90%
(3) 30% (4) 60%
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

16. A fruit seller buys lemons at 2 for a rupee and sells them at 5 for three rupees. His profit per cent is
(1) 10% (2) 15%
(3) 20% (4) 25%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

17. By selling a tape-recorder ₹ for 950, I lose 5%. What per cent shall I gain by selling it for ₹ 1040?
(1) 5 (2) 4
(3) 4.5 (4) 9
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

18. A person buys 100 cups at ₹ 10 each. On the way 10 cups are broken. He sells the remaining cups at ₹ 11 each. His loss per cent is
(1) $\frac{1}{2}\%$ (2) 1%
(3) $1\frac{1}{2}\%$ (4) 2%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

19. Mohan bought 25 books for ₹ 2,000 and sold them at a profit equal to the selling price of 5 books. The selling price of 1 book is
(1) ₹100 (2) ₹120
(3) ₹150 (4) ₹ 200
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

20. A shopman bought pens at the rate of 7 for ₹10 and sold them at a profit of 40%. How many pens would a customer get for ₹ 10 ?
(1) 6 (2) 4
(3) 5 (4) 3
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

21. By selling 12 oranges for ₹ 60, a man loses 25%. The number of oranges he has to sell for ₹ 100, so as to gain 25% is
(1) 10 (2) 11
(3) 12 (4) 15
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

22. A man buys a certain number of oranges at 20 for ₹ 60 and an equal number at 30 for ₹ 60. He mixes them and sells them at 25 for ₹ 60. What is gain or loss per cent ?
(1) Gain of 4%
(2) Loss of 4%
(3) Neither gain nor loss
(4) Loss of 5%
(SSC CPO S.I. Exam. 09.11.2008)

23. A fruit vendor bought bananas at the rate of 5 for a rupee and sold them 4 for a rupee. The percent gain or loss is
(1) $12\frac{1}{2}\%$ gain (2) 25% loss
(3) 25% gain (4) $12\frac{1}{2}\%$ loss
(SSC CPO S.I. Exam. 06.09.2009)

24. A man sold 20 apples for ₹ 100 and gained 20%. How many apples did he buy for ₹100?
(1) 20 (2) 22
(3) 24 (4) 25
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

25. A man purchased some eggs at 3 for ₹ 5 and sold them at 5 for ₹ 12. Thus he gained ₹ 143 in all. The number of eggs he bought is
(1) 210 (2) 200
(3) 195 (4) 190
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

26. A man bought oranges at the rate of 8 for ₹ 34 and sold them at the rate of 12 for ₹ 57. How many oranges should be sold to earn a net profit of ₹ 45 ?
(1) 90 (2) 100
(3) 135 (4) 150
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

27. A person bought 50 pens for ₹ 50 each. He sold 40 of them at a loss of 5%. He wants to gain 10% on the whole. Then his gain percent on the remaining pens should be
(1) 15% (2) 40%
(3) 50% (4) 70%
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

28. If toys are bought at ₹ 5 each and sold at ₹ 4.50 each, then the loss percent is :
(1) 10% (2) 11%
(3) 12% (4) 13%
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

29. By selling 14 watches of equal cost price at the rate of ₹ 450 each, there is a profit equal to the cost price of 4 watches. The cost price of a watch is
(1) ₹ 350 (2) ₹ 360
(3) ₹ 375 (4) ₹ 400
(SSC Data Entry Operator Exam. 31.08.2008)

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30. A man buys some articles at ₹ P per dozen and sells them at ₹ $\frac{P}{8}$ per piece. His profit per cent is
(1) 30% (2) 40%
(3) 50% (4) 60%
(SSC Data Entry Operator Exam. 02.06.2009)

31. A vendor sells lemons at the rate of 5 for ₹ 14, gaining thereby 40%. For how much did he buy a dozen lemons ?
(1) ₹ 20 (2) ₹ 21
(3) ₹ 24 (4) ₹ 28
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

32. If I purchased 11 books for ₹ 100 and sold 10 books for ₹ 110, the percentage of profit per book sold is
(1) 10% (2) 11·5%
(3) 17·3% (4) 21%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

33. A shop-keeper sold a sewing machine for ₹ 1,080 at a loss of 10%. At what price should he has to sold it so as to gain 10% on it ? (in ₹)
(1) 1,069 (2) 1,200
(3) 1,230 (4) 1,320
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

34. A fruit-seller buys some oranges and by selling 40% of them he realises the cost price of all the oranges. As the oranges being to grow over-ripe, he reduces the price and sells 80% of the remaining oranges at half the previous rate of profit. The rest of the oranges being rotten are thrown away. The overall percentage of profit is
(1) 80 (2) 84
(3) 94 (4) 96
(SSC CGL Tier-I Exam. 19.10.2014)

35. An item costing ₹ 200 is being sold at 10% loss. If the price is further reduced by 5%, the selling price will be
(1) ₹ 170 (2) ₹ 171
(3) ₹ 175 (4) ₹ 179
(SSC CGL Tier-II Exam. 21.09.2014)

36. By selling an article for ₹ 102, there is a loss of 15%, when the article is sold for ₹ 134.40, the net result in the transaction is
(1) 12% gain (2) 12% loss
(3) 10% loss (4) 15% gain
(SSC CGL Tier-II Exam. 21.09.2014)

37. Two toys are sold at ₹ 504 each. One toy brings the dealer a gain of 12% and the other a loss of 4%.The gain or loss per cent by selling both the toys is
(1) $3\frac{5}{13}$% Profit
(2) $4\frac{5}{13}$% Profit
(3) $5\frac{1}{13}$% Profit
(4) $2\frac{3}{13}$% loss
(SSC CGL Tier-II Exam. 21.09.2014)

38. A sold a horse to B for ₹ 4800 by losing 20%. B sells it to C at a price which would have given A a profit of 15%. B's gain is
(1) ₹ 1800 (2) ₹ 1900
(3) ₹ 2000 (4) ₹ 2100
(SSC CGL Tier-II Exam. 21.09.2014)

39. A fruit vendor buys apples at the rate of 10 for ₹ 100.How many should he sell for ₹ 100, so that he makes a profit of 25% ?
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

40. A table is sold at a profit of 13%. If it is sold for ₹ 25 more, profit is 18 %. Cost price of table is
(1) ₹ 100 (2) ₹ 500
(3) ₹ 200 (4) ₹ 1, 000
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

41. A man sold his watch at a loss of 5%. Had he sold it for ₹ 56.25 more, he would have gained 10%. What is the cost price of the watch (in ₹) ?
(1) 370 (2) 365
(3) 375 (4) 390
(SSC CHSL DEO & LDC Exam. 9.11.2014)

42. Kamala bought a bicycle for ₹ 1,650. She had to sell it at a loss of 8%. She sold it for
(1) ₹ 1, 581 (2) ₹ 1, 518
(3) ₹ 1, 510 (4) ₹ 1, 508
(SSC CHSL DEO & LDC Exam. 16.11.2014)

43. A table is sold at Rs. 1,800 at a loss of 10%. At what price should it be sold to earn a profit of 15%?
(1) ₹ 2,070 (2) ₹ 1,890
(3) ₹ 2,000 (4) ₹ 2,300
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

44. A manufacturer sells an item to a wholesale dealer at a profit of 18%. The wholesaler sells the same to a retailer at a profit of 20%. The retailer in turn sells it to a customer for ₹ 15045 thereby earning a profit of 25%. The cost price of the manufacturer is
(1) ₹ 8000 (2) ₹ 8500
(3) ₹ 9000 (4) ₹ 10000
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

45. A man sold an article at a gain of 5%. Had he sold it for Rs. 40 more, he would have gained 8%. The cost price of the article is
(1) Rs. 6,000 (2) Rs. 10,000
(3) Rs. 12,000 (4) Rs. 8,000
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

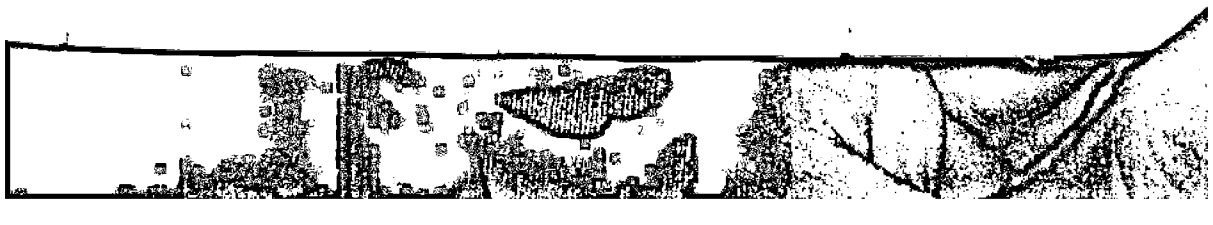
46. A radio is sold at a profit of 20%. Had it been sold for Rs. 60 more the profit would have been 30%. The cost price of the radio is
(1) Rs. 500 (2) Rs. 600
(3) Rs. 550 (4) Rs. 620
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

47. A dealer sold a bicycle at a profit of 10%. Had he bought the bicycle at 10% less price and sold it at a price Rs. 60 more, he would have gained 25%. The cost price of the bicycle was
(1) Rs. 2400 (2) Rs. 2600
(3) Rs. 2000 (4) Rs. 2200
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

TYPE–IV

1. The ratio of cost price and selling price is 5 : 4, the loss per cent is :
(1) 20% (2) 25%
(3) 40% (4) 50%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. The ratio of the C.P. and S.P. of an article is 20 : 21. What is the gain per cent ?
(1) 5% (2) 5.5%
(3) 6% (4) 6.25%
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CPO SI Exam. 03.09.2006 & SSC CISF ASI Exam. 29.08.2010)



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3. The cash difference between selling prices of an article at a profit of 4% and 6% is ₹ 3. The ratio of the two selling prices is
(1) 51 : 52 (2) 52 : 53
(3) 51 : 53 (4) 52 : 55
(SSC CPO S.I. Exam. 12.01.2003)

4. A milkman makes 20% profit by selling milk mixed with water at ₹ 9 per litre. If the cost price of 1 litre pure milk is ₹ 10, then the ratio of milk and water in the said mixture is
(1) 3 : 1 (2) 4 : 1
(3) 3 : 2 (4) 4 : 3
(SSC CHSL DEO & LDC Exam, 28.10.2012, Ist Sitting)

5. The prices of a refrigerator and a television set are in the ratio 5 : 3. If the refrigerator costs ₹ 5500 more than the television set, then the price of the refrigerator is:
(1) ₹ 27500 (2) ₹ 8250
(3) ₹ 13750 (4) ₹ 16500
(SSC CHSL DEO & LDC Exam, 21.10.2012, IInd Sitting)

6. Nita blends two varieties of tea—one costing ₹ 180 per kg and another costing ₹ 200 per kg in the ratio 5 : 3. If she sells the blended variety at ₹ 210 per kg, then her gain percent is
(1) 10% (2) 11%
(3) 12% (4) 13%
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

7. Partha earns 15 per cent on an investment but loses 10 per cent on another investment. If the ratio of two investments is 3 : 5, then the combined loss percent is
(1) $\frac{5}{4}$% (2) $\frac{4}{5}$%
(3) $\frac{8}{5}$% (4) $-\frac{5}{8}$%
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

8. The ratio of cost price and selling price of an article is 8 : 9. The profit per cent is
(1) 20% (2) 15%
(3) 12.5% (4) 10%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

9. A shopkeeper earns a profit of 12% on selling a book at 10% discount on the printed price. The ratio of the cost price and the printed price of the book is
(1) 99 : 125 (2) 25 : 37
(3) 50 : 61 (4) 45 : 56
(SSC CGL Prelim Exam. 27.07.2006 (Ist Sitting) & (SSC CGL Exam.19.05.2013)

10. If an article is sold at 200% profit, then the ratio of its cost price to its selling price will be
(1) 1 : 2 (2) 2 : 1
(3) 1 : 3 (4) 3 : 1
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

11. An article is sold at 5% profit. The ratio of selling price and cost price will be
(1) 1 : 5 (2) 20 : 21
(3) 21 : 20 (4) 5 : 1
(SSC (South Zone) Investigator Exam 12.09.2010)

12. If the ratio of cost price and the selling price is 5 : 6, the gain per cent is
(1) 20% (2) $33\frac{1}{3}$%
(3) 25% (4) 30%
(SSC CGL Prelim Exam. 11.05.2003 (IInd Sitting) & (SSC CPO S.I. Exam. 07.09.2003) & (SSC CPO S.I. Exam. 12.12.2010)

13. If the cost price and selling price of an article are in the ratio 10 : 11, then the percentage of profit is :
(1) 10% (2) 9%
(3) 3% (4) 1%
(SSC CGL Tier-I Exam.16.05.2010) & SSC CHSL DEO & LDC Exam. 27.11.2010)

14. The cost price : selling price of an article is $a : b$. If b is 200% of a then the percentage of profit on cost price is
(1) 75% (2) 125%
(3) 100% (4) 200%
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

15. A invests ₹ 64,000 in a business. After few months B joined him with ₹ 48,000. At the end of year, the total profit was divided between them in the ratio 2 : 1. After how many months did B join?
(1) 8 (2) 4
(3) 6 (4) 7
(SSC CHSL DEO & LDC Exam. 20.10.2013)

16. The ratio, in which tea costing ₹ 192 per kg is to be mixed with tea costing ₹ 150 per kg so that the mixed tea, when sold for ₹ 194.40 per kg, gives a profit of 20%, is
(1) 2 : 5 (2) 3 : 5
(3) 5 : 3 (4) 5 : 2
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

17. In what ratio Darjeeling Tea costing ₹ 320 per kg be mixed with Assam Tea costing ₹ 250 per kg so that there is a gain of 20% by selling the mixture at ₹ 324 per kg ?
(1) 1 : 2 (2) 2 : 3
(3) 3 : 2 (4) 2 : 5
(SSC SAS Exam 26.06.2010 (Paper-1)

18. The ratio of the quantities of sugar, in which sugar costing ₹ 20 per kg. and ₹ 15 per kg. should be mixed so that there will be neither loss nor gain on selling the mixed sugar at the rate of ₹ 16 per kg, is
(1) 2 : 1 (2) 1 : 2
(3) 4 :1 (4) 1 : 4
(SSC Data Entry Operator Exam. 31.08.2008)

19. The ratio in which the Darjeeling tea at ₹32 per kg is mixed with the Assam tea at ₹25 per kg so as to gain 20% by selling the mixture at ₹32.40 per kg is
(1) 4 : 3 (2) 3 : 4
(3) 5 : 2 (4) 2 : 5
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

20. In what ratio must a grocer mix tea at ₹ 60 a kg, and ₹ 65 a kg, so that by selling the mixture at ₹ 68.20 a kg, he may gain 10%?
(1) 3 : 2 (2) 3 : 4
(3) 3 : 5 (4) 4 : 5
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

21. 7 kg of tea costing ₹ 280 per kg is mixed with 9 kg of tea costing ₹ 240 per kg. The average price per kg of the mixed tea is
(1) ₹ 255.80 (2) ₹ 257.50
(3) ₹ 267.20 (4) ₹ 267.50
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

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22. A shopkeeper bought 15kg of rice at the rate of ₹29 per kg and 25kg of rice at the rate of ₹20 per kg. He sold the mixture of both types of rice at the rate of ₹27 per kg. His profit in this transaction is
(1) ₹125 (2) ₹150
(3) ₹ 140 (4) ₹145
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

23. A, B and C are partners of a company. During a particular year A received one-third of the profit, B received one-fourth of the profit and C received the remaining ₹ 5,000. How much did A receive?
(1) ₹ 5,000 (2) ₹ 4,000
(3) ₹ 3,000 (4) ₹ 1,000
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

24. A, B and C entered into a partnership. A invested ₹ 2,560 and B ₹ 2,000. At the end of the year, they gained ₹ 1,105, out of which A got ₹ 320. C's capital was
(1) ₹ 4,280 (2) ₹ 2,840
(3) ₹ 4,820 (4) ₹ 4,028
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

25. A, B and C entered into partnership in a business. A got $\frac{3}{5}$ of the profit and B and C distributed the remaining profit equally. If C got ₹ 400 less than A, the total profit was
(1) ₹ 1600 (2) ₹ 1200
(3) ₹ 1000 (4) ₹ 800
(SSC CPO S.I. Exam. 09.11.2008)

26. ₹ 864 is divided among A, B and C such that 8 times A's share is equal to 12 times B's share and also equal to 6 times C's share. How much did B get?
(1) ₹ 399 (2) ₹ 192
(3) ₹ 288 (4) ₹ 72
(SSC Graduate Level Tier-II Exam.16.09.2012)

27. At the beginning of a partnership business, the capital of B was $\frac{3}{2}$ times that of A. After 8 months B withdrew $\frac{1}{2}$ of his capital and after 10 months A withdrew $\frac{1}{4}$ th of his capital. At the end of the year, if the profit incurred is ₹ 53,000, find the amount received by A.
(1) ₹ 30,800 (2) ₹ 32,000
(3) ₹ 30,000 (4) ₹ 23,000
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

28. A, B and C rent a pasture. A puts in 10 oxen for 7 months, B 12 oxen for 5 months and C 15 oxen for 3 months for grazing. If the rent of the pasture is ₹ 175/-, how much must C pay as his share of rent?
(1) ₹ 45/- (2) ₹ 50/-
(3) ₹ 55/- (4) ₹ 60/-
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

29. A, B, C enter into a partnership. A contributes ₹ 3,20,000 for 4 months, B contributes ₹ 5,10,000 for 3 months and C contributes ₹ 2,70,000 for 5 months. If the total profit be ₹ 1,24,800, then A's share in the profit is
(1) ₹ 38,400 (2) ₹ 45,900
(3) ₹ 40,500 (4) ₹ 41,500
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

30. A started a business with a capital of ₹ 1,00,000. One year later, B joined him with a capital of ₹ 2,00,000. At the end of 3 years from the start of the business, the profit earned was 84,000. The share of B in the profit exceeded the share of A by
(1) ₹ 10,000 (2) ₹ 12,000
(3) ₹ 14,000 (4) ₹ 15,000
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

31. A, B and C started a business by investing ₹ 40500, ₹ 45000 and ₹ 60000 respectively. After 6 months C withdrew ₹ 15000 while A invested ₹ 4500 more. In annual profit of ₹ 56100, the share of C will exceed that of A by
(1) ₹ 900 (2) ₹1100
(3) ₹ 3000 (4) ₹ 3900
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

32. In a business partnership among A, B, C and D, the profit is shared as follows:

$$\frac{\text{A's share}}{\text{B's share}} = \frac{\text{B's share}}{\text{C's share}} = \frac{\text{C's share}}{\text{D's share}} = \frac{1}{3}$$

If the total profit is ₹ 4,00,000, then, the share of C is
(1) ₹ 1,12,500 (2) ₹ 1,37,500
(3) ₹ 90,000 (4) ₹ 2,70,000
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

33. A starts business with ₹ 3500/- and after 5 months, B joins with A as his partner. After a year, the profit is divided in the ratio 2 : 3. What is B's contribution in the capital?
(1) ₹ 8000/- (2) ₹ 8500/-
(3) ₹ 9000/- (4) ₹ 7500/-
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

34. A began business with ₹ 45000 and was joined afterwards by B with ₹ 54000. After how many months did B join if the profits at the end of the year were divided in the ratio 2 : 1 ?
(1) 4 (2) 5
(3) 6 (4) 7
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

35. A, B and C entered into a business and their investments ratio was 5 : 4 : 3. After 4 months B invested ₹ 1,000 more and after 8 months C invested ₹ 2,000 more. At the end of one year the profit ratio was 15 : 14 : 11, then the investment of C at the beginning was
(1) ₹ 3000 (2) ₹ 6000
(3) ₹ 4500 (4) ₹ 7500
(SSC CHSL DEO Exam. 27.10.2013 IInd Sitting)

36. A, B and C started a business with their investments in the ratio 1 : 2 : 4. After 6 months A increased his capital by 50% and B invested twice the amount as before, while C withdrew $\frac{1}{4}$ of his own investment. The ratio of their profits at the end of the year was
(1) 10 : 5 : 9 (2) 5 : 12 : 14
(3) 6 : 9 : 17 (4) 5 : 14 : 16
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

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37. A total profit of ₹ 3,600 is to be distributed amongst A, B and C such that A : B = 5 : 4 and B : C = 8 : 9. The share of C in the profit is
(1) ₹ 1, 200 (2) ₹ 1, 500
(3) ₹ 1, 650 (4) ₹ 1, 700
(SSC CHSL DEO & LDC Exam. 9.11.2014)

38. Two types of tea costing ₹ 180 per kg and ₹ 280 per kg should be mixed in the ratio so that the mixture obtained, sold at ₹ 320 per kg to earn a profit of 20% is
(1) 3:13 (2) 1:13
(3) 4:13 (4) 2:13
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

39. A profit of 12% is made when a mobile phone is sold at ₹ P and there is 4% loss when the phone is sold at ₹ Q. Then Q : P is
(1) 1 : 1 (2) 4 : 5
(3) 6 : 7 (4) 3 : 1
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

40. If the ratio of cost price to selling price is 10 : 11, then the rate of per cent of profit is
(1) 1.1% (2) 0.1%
(3) 10% (4) 1%
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. If a sum of Rs. 1,170 was distributed among A, B and C in the ratio 2 : 3 : 4, by mistake, in place of $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$, who was benefited most and by how much ?
(1) B, Rs. 220 (2) C, Rs. 250
(3) B, Rs. 270 (4) A, Rs. 280
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

42. Costs of two watches were in the ratio of 16 : 23. The cost of first watch increases by 10% and that of second by Rs. 477. Now the costs of two watches are in a ratio of 11 : 20. The price of the second watch (in Rs.) in the beginning was
(1) 932 (2) 1219
(3) 1696 (4) 848
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

43. The liquids, X and Y are mixed in the ratio of 3 : 2 and the mixture is sold at Rs. 11 per litre at a profit of 10%. If the liquid X costs Rs. 2 more per litre than Y, the cost of X per litre is (in Rs.) :
(1) 10.80 (2) 11.75
(3) 9.50 (4) 11
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

44. In what proportion must water be added with milk to gain 20% by selling the mixture at cost price?
(1) 1 : 5 (2) 4 : 1
(3) 5 : 1 (4) 1 : 1
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 06.12.2015 (Ist Sitting) TF No. 1375232)

45. A and B invest in a business in the ratio 3 : 2. If 5% of the total profit goes to charity and A's share in profit is Rs. 8,550, then total profit is
(1) Rs. 15,760 (2) Rs.15,735
(3) Rs. 14,250 (4) Rs. 15,000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–V

1. Find the selling price of an article if a shopkeeper allows two successive discounts of 5% each on the marked price of ₹ 80.
(1) ₹ 70.20 (2) ₹ 70.10
(3) ₹ 72.00 (4) ₹ 72.20
(SSC CPO S.I. Exam. 12.01.2003)

2. An item costing ₹ 840 was sold by a shopkeeper at a gain of 10% and it was again sold by the new buyer at a loss of 5%. Final selling price of the item is :
(1) ₹ 877.80 (2) ₹ 798
(3) ₹ 924 (4) ₹ 37.80
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

3. A shopkeeper gains 20% while buying the goods and 30% while selling them. Find his total gain per cent.
(1) 50% (2) 36%
(3) 56% (4) 40%
(SSC CPO S.I. Exam. 26.05.2005)

4. Salary of a person is increased by 20%, then it is decreased by 20%. Change in his salary is :
(1) 4% decreased
(2) 4% increased
(3) 8% decreased
(4) neither decrease nor increase
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

5. A grocery dealer cheats to the extent of 10% while buying as well as selling by using false weight. What is his increase in the profit % ?
(1) 20% (2) 21%
(3) 22% (4) None of these
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

TYPE–VI

1. By selling an article for ₹ 240, a man incurs a loss of 10%. At what price should he sell it, so that he makes a profit of 20% ?
(1) ₹ 264 (2) ₹ 288
(3) ₹ 300 (4) ₹ 320
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & SSC S.O. Exam. 16.11.2003)

2. By selling an article for ₹ 480 a person lost 20%. For what should he sell it to make a profit of 20%?
(1) ₹ 800 (2) ₹ 760
(3) ₹ 720 (4) ₹ 680
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. By selling an article for ₹ 72, there is a loss of 10%. In order to gain 5%, its selling price should be :
(1) ₹ 87 (2) ₹ 85
(3) ₹ 80 (4) ₹ 84
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. If an article is sold for ₹ 178 at a loss of 11%, what should be its selling price in order to earn a profit of 11%?
(1) ₹ 222.50 (2) ₹ 267
(3) ₹ 435 (4) ₹ 222
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. On selling an article for ₹ 105 a trader loses 9%. To gain 30% he should sell the article at
(1) ₹ 126 (2) ₹ 144
(3) ₹ 150 (4) ₹ 139
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

6. A shopkeeper bought 80kg of sugar at the rate of ₹ 13.50 per kg. He mixed it with 120kg of sugar costing ₹ 16 per kg. In order to make a profit of 20%, he must sell the mixture at
(1) ₹ 18 per kg
(2) ₹ 17 per kg
(3) ₹ 16.40 per kg
(4) ₹ 15 per kg
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

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7. To gain 10% on selling sample milk at the cost price of pure milk, the quantity of water to be mixed with 50 kg. of pure milk is
(1) 2.5 Kg. (2) 5 Kg.
(3) 7.5 Kg. (4) 10 Kg.
(SSC CPO S.I. Exam. 09.11.2008)

8. By selling an article for ₹ 69, there is a loss of 8%, when the article is sold for ₹ 78, the gain or loss per cent is :
(1) neither loss nor gain
(2) 4% gain
(3) 4% loss
(4) 40% gain
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. A loss of 20% is incurred when 6 articles are sold for a rupee. To gain 20% how many articles should be sold for a rupee ?
(1) 1 (2) 2
(3) 3 (4) 4
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

10. By selling a plot of land for ₹ 45,000 a person loses 10%. At what price should he sell it to gain 15%?
(1) ₹ 50,000 (2) ₹ 55,000
(3) ₹ 57,500 (4) ₹ 60,000
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

11. A radio is sold for ₹ 990 at a profit of 10%. What would have been the actual profit or loss on it, had it been sold for Rs. 890 ?
(1) ₹ 10 loss (2) ₹ 10 profit
(3) ₹ 90 loss (4) ₹ 90 profit
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

12. By selling a table for ₹ 1140, a man loses 5%. In order to gain 5%, the table must be sold for
(1) ₹ 1260 (2) ₹ 1320
(3) ₹ 1180 (4) ₹ 1250
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

13. A radio dealer sold a radio at a loss of 2.5%. Had he sold it for ₹100 more, he would have gained $7\frac{1}{2}\%$. In order to gain $12\frac{1}{2}\%$, he should sell it for
(1) ₹ 1080 (2) ₹ 1125
(3) ₹ 850 (4) ₹ 925
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

14. By selling a fan for ₹ 600, a man loses 10%. To make a gain of 20%, the selling price of the fan should be
(1) ₹ 900 (2) ₹ 1000
(3) ₹ 700 (4) ₹ 800
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

15. A man sells a car to his friend at 10% loss. If the friend sells it for ₹ 54,000 and gains 20%, the original cost price of the car was
(1) ₹ 25,000 (2) ₹ 35,000
(3) ₹ 45,000 (4) ₹ 50,000
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

16. On selling an article for ₹ 170, a shopkeeper loses 15%. In order to gain 20%, he must sell that article at :
(1) ₹ 215.50 (2) ₹ 212.50
(3) ₹ 240 (4) ₹ 210
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

17. If a man were to sell his chair for ₹ 720, he would lose 25%. To gain 25% he should sell it for
(1) ₹ 1,200 (2) ₹ 1,000
(3) ₹ 960 (4) ₹ 900
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

18. By selling a basket for ₹ 19.50, a shopkeeper gains 30%. For how much should he sell it to gain 40% ?
(1) ₹ 21 (2) ₹ 21.50
(3) ₹ 24 (4) ₹ 23
(SSC CPO S.I. Exam. 08.09.2009)

19. A man bought 20 dozen eggs for ₹ 720. What should be the selling price of each egg if he wants to make a profit of 20% ?
(1) ₹ 3.25 (2) ₹ 3.30
(3) ₹ 3.50 (4) ₹ 3.60
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

20. By selling an article for ₹ 665, there is a loss of 5%. In order to make a profit of 12%, the selling price of the article must be
(1) ₹ 812 (2) ₹ 800
(3) ₹ 790 (4) ₹ 784
(SSC Data Entry Operator Exam. 31.08.2008)

21. By selling an article for ₹ 700 a man lost 30%. At what price should he have sold it to gain 30% ?
(1) ₹ 910 (2) ₹ 1200
(3) ₹ 1232 (4) ₹ 1300
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

22. If a man were to sell his wrist-watch for ₹720, he would lose 25%. What price must he sell at for to gain 25% ?
(1) ₹960 (2) ₹900
(3) ₹1000 (4) ₹1200
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting) & 04.11.2012

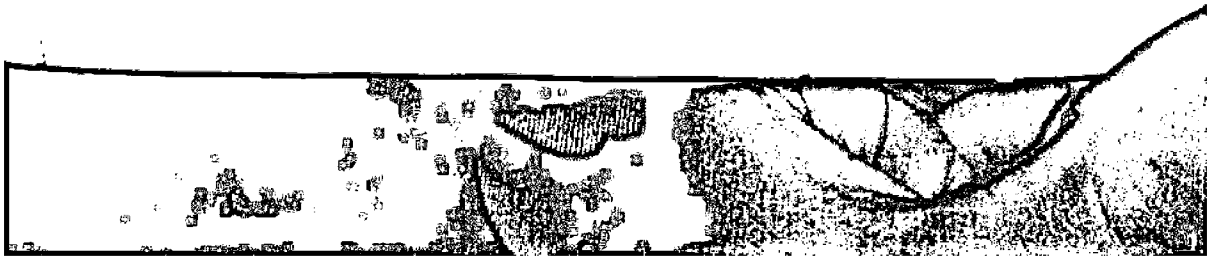
23. An article was sold at a profit of 12%. If the cost price would be 10% less and selling price would be ₹ 5.75 more, there would be profit of 30%. Then at what price it should be sold to make a profit of 20% ?
(1) ₹ 115 (2) ₹ 120
(3) ₹ 138 (4) ₹ 215
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

24. By selling 80 ball pens for ₹ 140 a retailer loses 30%. How many ball pens should he sell for ₹104 so as to make a profit of 30%?
(1) 32 (2) 52
(3) 48 (4) 42
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

25. By selling 90 ball pens for ₹ 160 a person loses 20%. The number of ball pens, which should be sold for ₹ 96 so as to have a profit of 20% is
(1) 36 (2) 37
(3) 46 (4) 47
(SSC Constable (GD) Exam. 12.05.2013)

26. Sourav purchased 30 kg of rice at the rate of ₹ 10 per kg and 35 kg at the rate of ₹ 11 per kg. He mixed the two. At what price per kg (in ₹) should he sell the mixture to make a 30% profit in the transaction ?
(1) 12.5 (2) 13
(3) 13.7 (4) 14.25
(SSC Graduate Level Tier-II Exam. 29.09.2013

27. Mr. Y purchased a flat for ₹ 9,25, 000 and spent ₹ 35, 000 for its renovation. If he sold the flat for ₹ 10, 60, 000 then his profit percent is
(1) 15.0 (2) 17.5
(3) 20.0 (4) 12.5
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)



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TYPE–VII

1. If the sales tax be reduced from $3\frac{1}{2}\%$ to $3\frac{1}{3}\%$, what difference does it make to a person who purchases an article whose marked price is ₹ 8,400 ?
(1) ₹ 20 (2) ₹ 15
(3) ₹ 14 (4) ₹. 10
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

2. By selling an article at $\frac{2}{3}$ of the marked price, there is a loss of 10%. The profit percent, when the article is sold at the marked price, is
(1) 20% (2) 30%
(3) 35% (4) 40%
(SSC CPO S.I. Exam. 07.09.2003)

3. A tradesman allows a discount of 15% on the marked price. How much above the cost price must he mark his goods as to gain 19%?
(1) 34% (2) 40%
(3) 25% (4) 30%
(SSC CPO S.I. Exam. 09.11.2008)

4. Rita bought a television set with 20% discount on the labelled price. She made a profit of ₹ 800 by selling it for ₹ 16,800. The labelled price of the set was
(1) ₹ 18,000 (2) ₹ 20,000
(3) ₹ 20,800 (4) ₹ 24,000
(SSC CPO S.I. Exam. 09.11.2008)

5. The cost price of an article is ₹ 800. After allowing a discount of 10%, a gain of 12.5% was made. Then the marked price of the article is
(1) ₹ 1,000 (2) ₹ 1,100
(3) ₹ 1,200 (4) ₹ 1,300
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

6. A shopkeeper allows 23% commission on his advertised price and still makes a profit of 10%. If he gains ₹ 56 on one item, his advertised price of the item, (in ₹) is
(1) 820 (2) 780
(3) 790 (4) 800
(SSC CGL Tier-I Exam 26.06.2011 (Second Sitting)

7. At what per cent above the cost price, must a shop-keeper marks his goods so that he gains 20% even after giving a discount of 10% on the marked price ?
(1) 25% (2) 30%
(3) $33\frac{1}{3}\%$ (4) $37\frac{1}{2}\%$
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. The marked price of an article is 10% higher than cost price. A discount of 10% is given on marked price. In this kind of sale, the seller bears :
(1) no loss, no gain
(2) a loss of 5%
(3) a gain of 1%
(4) a loss of 1%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

9. The marked price of an article is 50% above cost price. When marked price is increased by 20% and selling price is increased by 20%, the profit doubles. If original marked price is ₹ 300, then original selling price is
(1) ₹ 200 (2) ₹ 250
(3) ₹ 240 (4) ₹ 275
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

10. The cost of manufacture of a tape recorder is ₹ 1,500. The manufacturer fixes the marked price 20% above the cost of manufacture and allows a discount in such a way as to get a profit of 8%. The rate of discount is
(1) 12% (2) 8%
(3) 20% (4) 10%
(SSC CGL Tier-I Exam. 11.11.2012 (Ist Sitting) & (SSC MTS Exam. 17.03.2013 (Kolkata)

11. How much percent above the cost price should a shopkeeper mark his goods so as to earn a profit of 32% after allowing a discount of 12% on the marked price ?
(1) 50% (2) 40%
(3) 60% (4) 45%
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

12. A dealer purchased a washing machine for ₹7,660. After allowing a discount of 12% on its marked price, he still gains 10%. Find the marked price of the washing machine.
(1) ₹9,575 (2) ₹8,426
(3) ₹8,246 (4) ₹9,755
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

13. A publisher printed 2000 copies of a book at a cost of ₹ 70,000. He distributes 400 copies free as specimen copies. He gave 30% discount on printed price and the printed price of each book is ₹ 75. What is his gain or loss percentage ?
(1) 20% gain (2) 20% loss
(3) 10% loss (4) 10% gain
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

14. Richa purchased an article at $\frac{4}{5}$ of its list price and sold it at 20% more than the list price. Richa's profit percent was
(1) 50% (2) 40%
(3) 30% (4) 25%
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

15. To gain 8% after allowing a discount of 10%, by what per cent cost price should be hiked in the list price ?
(1) 9% (2) 11%
(3) 18% (4) 20%
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

16. A shopkeeper sold sarees at ₹ 266 each after giving 5% discount on labelled price. Had he not given the discount, he would have earned a profit of 12% on the cost price. What was the cost price of each saree?
(1) ₹ 280 (2) ₹ 260
(3) ₹ 240 (4) ₹ 250
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

17. Arvind purchased a wrist watch with 30% discount on the labelled price. He sold it with 40% profit on the price he bought. What was his percent loss on the labelled price?
(1) 2% (2) 6%
(3) 4% (4) 8%
(SSC Graduate Level Tier-I Exam. 21.04.2013)

18. The profit percent of a book seller if he sells book at marked price after enjoying a commission of 25% on marked price will be :
(1) 30% (2) 25%
(3) 20% (4) $33\frac{1}{3}\%$
(SSC CHSL DEO& LDC Exam. 04.11.2012, Ist Sitting)

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19. A shopkeeper offers a discount of 10% on his articles. The marked price of the article is ₹ 450. The selling price should be
(1) ₹ 395 (2) ₹ 410
(3) ₹ 405 (4) ₹ 400
(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)

20. A shopkeeper marked the selling price of his goods in such a way that after giving a discount of 10% he gains 17%. How much per cent above the cost price is the marked price?
(1) 36% (2) 27%
(3) 30% (4) 40%
(SSC Constable (GD) Exam. 12.05.2013 & (SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

21. A tradesman marks his goods 30% more than the cost price. If he allows a discount of $6\frac{1}{4}\%$, then his gain percent is
(1) $23\frac{3}{4}\%$ (2) 22%
(3) $21\frac{7}{8}\%$ (4) 30%
(SSC Graduate Level Tier-II Exam. 29.09.2013

22. A trader marked the price of a commodity so as to include a profit of 25%, but allowed a discount of 16% on the marked price. His actual profit will be
(1) 16% (2) 25%
(3) 5% (4) 9%
(SSC Multi-Tasking Staff Exam. 17.03.2013, 1st Sitting)

23. A got 30% concession on the label price of an article sold for ₹ 8,750 with 25% profit on the price he bought. The label price was
(1) ₹ 13,000 (2) ₹ 16,000
(3) ₹ 12,000 (4) ₹ 10,000
(SSC CHSL DEO & LDC Exam. 20.10.2013)

24. A shopkeeper allows a rebate of 12% on the marked price of an article such that the selling price is ₹ 440. Then the marked price of the article is
(1) ₹ 490 (2) ₹ 500
(3) ₹ 600 (4) ₹ 550
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

25. Pratap buys a watch at $\frac{4}{5}$ th of its marked price and sells it for 17% more than its marked price. His profit based on its cost is
(1) Rs. 20 (2) Rs. 25
(3) Rs. 37 (4) Rs. 17
(SSC CGL Tier-II Exam. 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

26. Mohan purchased a bag with 20 percent discount on the labelled price. He sold it at 40 percent profit on the price he bought. The percentage of profit on the labelled price is :
(1) 20% (2) 12%
(3) 18% (4) 24%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (1st Sitting) TF No. 1375232)

TYPE–VIII

1. Profit after selling a commodity for ₹ 524 is the same as loss after selling it for ₹ 452. The cost price of the commodity is
(1) ₹ 480 (2) ₹ 500
(3) ₹ 488 (4) ₹ 485
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

2. A clock was sold for ₹ 144. If the percentage of profit was numerically equal to the cost price, the cost of the clock was
(1) ₹ 72 (2) ₹ 80
(3) ₹ 90 (4) ₹ 100
(SSC CGL Prelim Exam. 13.11.2005 (1st Sitting) & (SSC CPO SI. Exam. 16.09.2009) & (SSC CGL Tier-I Exam. 26.06.2011 (IInd Sitting)

3. By selling 144 hens Mahesh suffered a loss equal to the selling price of 6 hens. His loss per cent is
(1) 4% (2) 3%
(3) 9% (4) $4\frac{1}{2}\%$
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

4. If the profit per cent got on selling an article is numerically equal to its cost price in rupees and the selling price is ₹ 39, then cost price (in ₹) will be
(1) 20 (2) 22
(3) 28 (4) 30
(SSC CPO S.I. Exam. 09.11.2008)

5. By selling 1 dozen ball pens, a shopkeeper earned the profit equal to the selling price of 4 ball pens. His profit per cent is
(1) 50% (2) 40%
(3) $33\frac{1}{3}\%$ (4) $31\frac{1}{4}\%$
(SSC Data Entry Operator Exam. 02.08.2009)

6. A merchant sold an article for ₹ 75 at a profit percent equal to its cost price. The cost price of the article was :
(1) ₹ 45 (2) ₹ 50
(3) ₹ 54 (4) ₹ 60
(SSC CHSL DEO & LDC Exam. 27.11.2010)

7. If the profit on selling an article for ₹ 425 is the same as the loss on selling it for ₹ 355, then the cost price of the article is
(1) ₹ 370 (2) ₹ 380
(3) ₹ 390 (4) ₹ 400
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (1st Sitting)

8. The loss incurred on selling 21 articles equals the selling price of 3 articles. Then the loss per cent is
(1) $9\frac{1}{11}\%$ (2) 10%
(3) $12\frac{1}{2}\%$ (4) $11\frac{1}{9}\%$
(SSC Multi-Tasking Staff Exam. 10.03.2013, 1st Sitting : Patna)

9. A man sold 250 chairs and had a gain equal to selling price of 50 chairs. His profit per cent is :
(1) 20% (2) 25%
(3) 50% (4) 15%
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

10. On selling 17 balls at ₹ 720, there is a loss equal to the cost price of 5 balls. The cost price (in ₹) of a ball is
(1) 45 (2) 50
(3) 55 (4) 60
(SSC Graduate Level Tier-II Exam. 29.09.2013

11. A vendor loses the selling price of 4 oranges on selling 36 oranges. His loss per cent is
(1) $12\frac{1}{2}\%$ (2) 9%
(3) 10% (4) $11\frac{1}{2}\%$
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

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TYPE–IX

1. An article is sold at a loss of 10%. Had it been sold for ₹ 9 more, there would have been a gain of $12\frac{1}{2}\%$ on it. The cost price of the article is :
(1) ₹ 40 (2) ₹ 45
(3) ₹ 50 (4) ₹ 35
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. A man sold an article at a loss of 20%. If he has sold that article for ₹ 12 more he would have gained 10%. Find the cost price of that article :
(1) ₹ 60 (2) ₹ 40
(3) ₹ 30 (4) ₹ 22
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

3. If an article is sold for ₹ 178 at a loss of 11%, what should be its selling price in order to earn a profit of 11% ?
(1) ₹ 222.50 (2) ₹ 267
(3) ₹ 222 (4) ₹ 220
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

4. A man sells an article at 10% loss. If he had sold it at ₹ 10 more, he would have gained 10%. The cost price of the article is
(1) ₹ 50 (2) ₹ 55
(3) ₹ 100 (4) ₹ 110
(SSC CPO S.I. Exam. 03.09.2006)

5. A book seller sells a book at a profit of 10%. If he had bought it at 4% less and sold it for ₹ 6 more, he would have gained $18\frac{3}{4}\%$. The cost price of the book is
(1) ₹ 130 (2) ₹ 140
(3) ₹ 150 (4) ₹ 160
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. A man sells his typewriter at 5% loss. If he sells it for ₹ 80 more, he will gain 5%. The cost price of the typewriter is
(1) ₹ 1,600 (2) ₹ 1,200
(3) ₹ 1,000 (4) ₹ 800
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

7. A businessman sells a commodity at 10% profit. If he had bought it at 10% less and sold it for ₹ 2 less, then he would have gained $16\frac{2}{3}\%$. The cost price of the commodity is
(1) ₹ 32 (2) ₹ 36
(3) ₹ 40 (4) ₹ 48
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. A cooker is sold at a gain of 16%. If it has been sold for ₹ 20 more, 20% would have been gained. The cost price of the cooker is
(1) ₹ 350 (2) ₹ 400
(3) ₹ 500 (4) ₹ 600
(SSC CPO S.I. Exam. 06.09.2009)

9. On selling an almirah for ₹ 2576, a person got a profit of 12%. Had it been bought for ₹ 100 less, the profit per cent would have been
(1) $11\frac{1}{9}\%$ (2) $13\frac{1}{3}\%$
(3) $17\frac{1}{11}\%$ (4) $17\frac{9}{11}\%$
(SSC SAS Exam 26.06.2010 (Paper-I)

10. A man sold an article at a loss of 20%. If he had sold it for ₹ 50 more, he would have gained 5%. The cost price of the article was
(1) ₹ 250 (2) ₹ 300
(3) ₹ 180 (4) ₹ 200
(SSC Data Entry Operator Exam. 31.08.2008)

11. When an article is sold at a gain of 20%, it yields ₹ 60 more than when it is sold at a loss of 20%. The cost price of the article is
(1) ₹ 200 (2) ₹ 150
(3) ₹ 140 (4) ₹ 120
(SSC Data Entry Operator Exam. 02.08.2009)

12. Aniruddha sold a bicycle at a gain of 8%. Had it been sold for ₹75 more, the gain would have been 14%. The cost price of the bicycle was
(1) ₹ 1200 (2) ₹ 1250
(3) ₹ 1350 (4) ₹ 1500
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. A book vendor sold a book at a loss of 20%. Had he sold it for ₹ 108 more, he would have earned a profit of 30%. Find the cost price of the book ?
(1) ₹ 216 (2) ₹ 648
(3) ₹ 240 (4) ₹ 432
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

14. If an article is sold at 5% gain instead of 5% loss, the man gains ₹ 5 more. Find the cost price of that article
(1) ₹ 100 (2) ₹ 105
(3) ₹ 50 (4) ₹ 110
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

15. An article is sold at a gain of 15%. Had it been sold for ₹ 27 more, the profit would have been 20%. The cost price of the article is
(1) ₹ 500 (2) ₹ 700
(3) ₹ 540 (4) ₹ 545
(SSC Graduate Level Tier-II Exam. 29.09.2013

16. A man sells an article at a gain of 15%. If he had bought it at 10% less and sold it for ₹ 4 less, he would have gained 25%. The cost price of the article is
(1) ₹ 140 (2) ₹ 150
(3) ₹ 160 (4) ₹ 185
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

17. An article is sold at a loss of 10%. Had it been sold for ₹ 90 more, there would have been a gain of 5%. The original sale price of the article (in ₹) is :
(1) 540 (2) 600
(3) 628 (4) 650
(SSC Multi-Tasking Staff Exam. 10.03.2013)

18. A man sold an article at a loss of 20%. If he could sell it for ₹ 200 more , he would make a profit of 5%. The cost price of the article is
(1) ₹ 700 (2) ₹ 800
(3) ₹ 850 (4) ₹ 900
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

19. A businessman bought an article and sold it at a loss of 5%. If he had bought it for 10% less and sold it for ₹ 33 more, he would have had a profit of 30%. The cost price of the article is
(1) ₹ 330 (2) ₹ 155
(3) ₹ 150 (4) ₹ 300
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

20. An article was sold at 16% gain. Had it been sold for ₹200 more. the gain would have been 20%. Then the cost price of the article is:
(1) ₹ 5000 (2) ₹ 4800
(3) ₹4500 (4) ₹ 5200
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

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21. A man purchased 150 pens at the rate of ₹12 per pen. He sold 50 pens at a gain of 10%. The percentage gain at which he must sell the remaining pens so as to gain 15% on the whole outlay is

(1) $21\frac{1}{2}\%$ (2) 20%

(3) 17% (4) $17\frac{1}{2}\%$

(SSC Graduate Level Tier-II Exam.16.09.2012)

22. By selling 4 articles for 1 rupee, a man loses 4%. Had he sold three articles per rupee, the profit would have been :

(1) 30% (2) 28%

(3) 16% (4) 12%

(SSC Multi-Tasking Staff Exam. 10.03.2013)

23. A shopkeeper sells an article at a loss of $12\frac{1}{2}\%$. Had he sold it for ₹ 51.80 more, he would have earned a profit of 6%. The cost price of the article is

(1) ₹ 280 (2) ₹ 300

(3) ₹ 380 (4) ₹ 400

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

24. Mohan sold his watch at 10% loss. If he had sold it for ₹ 45 more, he would have made 5% profit. The selling price (in ₹) of the watch was

(1) 300 (2) 900

(3) 110 (4) 270

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

25. Yogita sold a plasma TV at 20% gain to Shyamla. Shyamla sold it to Deepa at 10% profit. If Deepa had to pay ₹ 33,000 for the plasma TV, find the cost price of the plasma TV for Yogita.

(1) ₹ 30,000 (2) ₹ 25,000

(3) ₹ 35,000 (4) ₹ 40,000

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

26. A sells a cycle to B at a profit of 20% and B sells it to C at a loss of 25%. If C bought the cycle for ₹ P, then the cost price of it for A was

(1) ₹ $\frac{1}{20}$ P (2) ₹ $\frac{9}{10}$ P

(3) ₹ $\frac{9}{20}$ P (4) ₹ $\frac{10}{9}$ P

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

27. The profit obtained by selling an article for Rs. 625 is same as the loss incurred if it is sold for Rs. 545. The price at which it is to be sold to realize a profit of Rs. 65 on the cost price is

(1) Rs. 640 (2) Rs. 630

(3) Rs. 650 (4) Rs. 660

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

28. There would be a 10% loss, if rice is sold at Rs. 54 per kg. To earn a profit of 20%, the price of rice per kg will be

(1) Rs. 65 (2) Rs. 70

(3) Rs. 63 (4) Rs. 72

(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099685)

29. A merchant has 1000 kg sugar, part of which sells at 8% profit and the rest at 18% profit. He gain 14% on the whole. The quantity sold at 8% profit is :

(1) 560 kg. (2) 600 kg.

(3) 640 kg. (4) 400 kg.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

30. By selling 12 kg of potatoes for Rs. 63, a shopkeeper gains 5%. What does he gain or lose percent by selling 50 kg of the same potatoes for Rs. 247.50?

(1) 1% loss

(2) No profit, no loss

(3) 2.5% loss

(4) 1% profit

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692915)

31. A shopkeeper sold an article at a loss of 20%. But if he could sell it at Rs. 200 more, he could earn a profit of 5%. The cost price of the article is

(1) Rs. 800 (2) Rs. 1,000

(3) Rs. 1,200 (4) Rs. 600

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692915)

TYPE–X

1. A sells a bicycle to B at a profit of 20%. B sells it to C at a profit of 25%. If C pays ₹ 225/- for it, the cost price of the bicycle for A is :

(1) ₹ 110 (2) ₹ 125

(3) ₹ 120 (4) ₹ 150

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A saleable article passes successively in the hands of three traders. Each trader sold it further at a gain of 25% of the cost price. If the last trader sold it for Rs. 250 then what was the cost price for the first trader ?

(1) ₹ 128 (2) ₹ 150

(3) ₹ 192 (4) ₹ 200

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

3. A car worth ₹ 1,50,000 was sold by X to Y at 5% profit. Y sold the car back to X at 2% loss. In the entire transaction

(1) X gained ₹ 4,350

(2) Y lost ₹ 4,350

(3) X gained ₹ 3,150

(4) X lost ₹ 3,150

(SSC CPO S.I. Exam. 16.12.2007)

4. A manufacturer sells an article to a wholesale dealer at a profit of 10%. The wholesale dealer sells it to a shopkeeper at 20% profit. The shopkeeper sells it to a customer for ₹ 56,100 at a loss of 15%. Then the cost price of the article to the manufacturer is

(1) ₹ 25,000 (2) ₹ 10,000

(3) ₹ 50,000 (4) ₹ 55,000

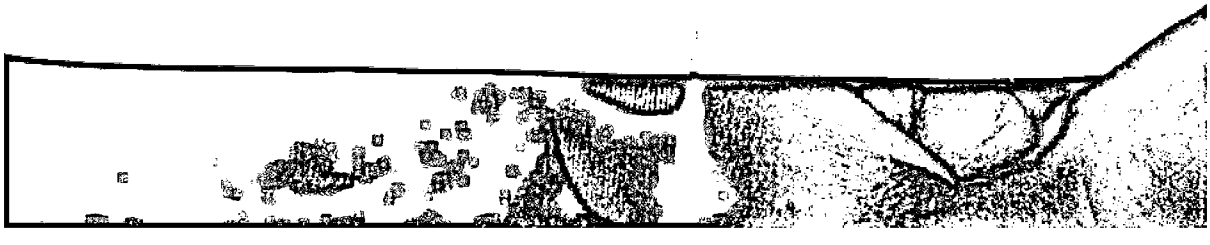
(SSC Graduate Level Tier-II Exam.16.09.2012)

5. A sells an article to B making a profit of $\frac{1}{5}$ of his outlay. B sells it to C, gaining 20%. If C sells it for ₹ 600 and incurs a loss of $\frac{1}{6}$ of his outlay, the cost price of article for A is

(1) ₹ 600 (2) ₹ 500

(3) ₹ 720 (4) ₹ 800

(SSC Graduate Level Tier-II Exam.16.09.2012)



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4. A sells a cycle to B at a profit of 5% and B sells it to C at a profit of 10%. If C pays ₹ 2310 for it, the cost price of A is
(1) ₹ 2000 (2) ₹ 2100
(3) ₹ 1900 (4) ₹ 2010
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

5. A sells a cycle to B at a profit of 10%, B sells to C at a profit of 20%. If C pays ₹ 264 for it, how much did A pay for it?
(1) ₹ 200 (2) ₹ 220
(3) ₹ 225 (4) ₹ 234
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

6. A man purchased an article and sold it to B at a profit of 25% and B sold it to C at a loss of 10% and C paid ₹675 for it. For how much did A purchase it (in ₹) ?
(1) 625 (2) 575
(3) 600 (4) 550
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

7. A sold a tape-recorder to B for ₹4,860 at a loss of 19%. Again B sold it to C at a price that would give A a profit of 17%. The gain% of B is
(1) $22\frac{2}{9}\%$ (2) $33\frac{1}{3}\%$
(3) $44\frac{4}{9}\%$ (4) $66\frac{2}{3}\%$
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

8. A piece of land came to a person through three middleman each gaining 20%. If the person purchased the land for ₹ 3,45,600 the original cost of the land was
(1) ₹ 1,00,000 (2) ₹ 1,50,000
(3) ₹ 1,75,800 (4) ₹ 2,00,000
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. A sells an article to B at a gain of 10%, B sells it to C at a gain of 5%. If C pays ₹ 462 for it, what did it cost to A ?
(1) ₹ 500 (2) ₹ 450
(3) ₹ 600 (4) ₹ 400
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

10. A sells an article to B at a gain of 10%. B sells it to C at a gain of $7\frac{1}{2}\%$. C disposes of it at a loss of 25%. If the prime cost to the manufacturer A was ₹ 3200 then the price obtained by C is
(1) ₹ 2800 (2) ₹ 2580
(3) ₹ 2670 (4) ₹ 2838
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

11. A sells an article to B at a gain of 20% and B sells it to C at a gain of 10% and C sells it to D at a gain of $12\frac{1}{2}\%$. If D pays ₹ 29.70, A purchased the article for
(1) ₹ 40 (2) ₹ 10
(3) ₹ 20 (4) ₹ 30
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

12. A sells a suitcase to B at 10% profit. B sells it to C at 30% profit. If C pays ₹ 2,860 for it, then the price at which A bought it is
(1) ₹ 1,000 (2) ₹ 1,600
(3) ₹ 2,000 (4) ₹ 2,500
(SSC Graduate Level Tier-II Exam. 29.09.2013

TYPE–XI

1. A house and a shop were sold for ₹ 1 lakh each. In this transaction, the house sale resulted into 20% loss whereas the shop sale into 20% profit. The entire transaction resulted in :
(1) no loss no gain
(2) gain of ₹ $\frac{1}{24}$ lakh
(3) loss of ₹ $\frac{1}{12}$ lakh
(4) loss of ₹ $\frac{1}{18}$ lakh
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A shopkeeper sells two T.V. sets at the same price. There is a gain of 20% on one TV and a loss of 20% on the other. State which of the following statement is correct :
(1) The shopkeeper makes no net gain or profit
(2) The shopkeeper loses by 2%
(3) The shopkeeper gains by 4%
(4) The shopkeeper loses by 4%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. A man sells two articles at ₹ 99 each. On one he gains 10% and on the other he loses 10%. What is his gain or loss per cent on the whole transaction ?
(1) Loss, 1% (2) Loss, 1.5%
(3) Profit, 1% (4) Profit, 1.5%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A man sells two pipes at ₹ 12 each. He gains 20% on one and loses 20% on the other. In the whole transaction, there is
(1) neither loss nor gain
(2) profit of ₹ 1
(3) loss of ₹ 1
(4) Profit of ₹ 2
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

5. Kewal sells two tape recorders at the same price. On one, he gains 10% and on the other he loses 10%. The total gain or loss in the transaction is
(1) 1% gain
(2) 1% loss
(3) No loss or gain
(4) 2% loss
(SSC CPO S.I. Exam. 12.01.2003)

6. A person sells two machines at ₹ 396 each. On one he gains 10% and on the other he loses 10%. His profit or loss in the whole transaction is :
(1) no gain no loss
(2) 1% loss
(3) 1% profit
(4) 8% profit
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

7. A dealer sold two types of goods for ₹ 10,000 each. On one of them, he lost 20% and on the other he gained 20%. His gain or loss per cent in the entire transaction was
(1) 2% loss (2) 2% gain
(3) 4% gain (4) 4% loss
(SSC Graduate Level Tier-II Exam.16.09.2012)

8. A television and a refrigerator were sold for ₹ 12,000 each. If the television was sold at a loss of 20% of the cost and the refrigerator at a gain of 20% of the cost, the entire transaction resulted in
(1) No loss or gain
(2) Loss of ₹ 1,000
(3) Gain of ₹ 1,000
(4) Loss of ₹ 1,200
(SSC CPO S.I. Exam. 07.09.2003)

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9. A man had 100 kgs of sugar, part of which he sold at 7% profit and rest at 17% profit. He gained 10% on the whole. How much did he sell at 7% profit ?
(1) 65 kg (2) 35 kg
(3) 30 kg (4) 70 kg
(SSC CGL Prelim Exam. 09.02.2004 (First Sitting)

10. A man bought two goats for ₹ 1008. He sold one at a loss of 20% and other at a profit of 44%. If each goat was sold for the same price, the cost price of the goat which was sold at loss, was :
(1) ₹ 648 (2) ₹ 360
(3) ₹ 568 (4) ₹ 440
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

11. Two bicycles were sold for ₹ 3990 each, gaining 5% on one and losing 5% on other. The gain or loss per cent on the whole transaction is :
(1) neither gain nor loss
(2) 2.5% gain
(3) 2.5% loss
(4) 0.25% loss
(SSC CPO S.I. Exam. 26.05.2005)

12. A man sold two watches for ₹ 240 each. On one he gains 20% and incurs a loss of 20% on another. What is his gain or loss per cent in this transaction ?
(1) 1% profit (2) 2% loss
(3) 4% profit (4) 4% loss
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

13. When the price of cloth was reduced by 25%, the quantity of cloth sold increased by 20%. What was the effect on gross receipt of the shop?
(1) 5% increase
(2) 5% decrease
(3) 10% increase
(4) 10% decrease
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

14. A cloth merchant sold half of his cloth at 20% profit, half of the remaining cloth at 20% loss and the rest was sold at his cost price. In the total transaction, his gain or loss will be
(1) 5% profit
(2) Neither loss nor gain
(3) 5% loss
(4) 10% profit
(SSC SAS Exam 26.06.2010 (Paper-1)

15. The total cost price of two watches is ₹ 840. One is sold at a profit of 16 per cent and the other at a loss of 12 per cent. There is no loss or gain in the whole transaction. The cost price of the watch on which the shopkeeper gains, is
(1) ₹ 360 (2) ₹ 370
(3) ₹ 380 (4) ₹ 390
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

16. A car and a jeep were sold for ₹ 121000 each. The car was sold at a loss of 20% while the jeep at a gain of 20%. The entire transaction resulted in
(1) neither loss nor gain
(2) gain of ₹ 1000
(3) loss of ₹ 10000
(4) gain of ₹ 500
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

17. Two-third of a consignment was sold at a profit of 5% and the remainder at a loss of 2%. If the total profit was ₹ 400, then the value of the consignment was
(1) ₹ 15,000 (2) ₹ 15,500
(3) ₹ 16,000 (4) ₹16,500
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

18. A man buys a field of agricultural land for ₹ 3,60,000. He sells one-third at a loss of 20% and two-fifths at a gain of 25%. At what price must he sell the remaining field so as to make an overall profit of 10 % ?
(1) ₹ 1,00,000 (2) ₹ 1,15,000
(3) ₹ 1,20,000 (4) ₹ 1,25,000
(SSC CPO S.I. Exam. 16.12.2007)

19. A trader bought two horses for ₹19,500. He sold one at a loss of 20% and the other at a profit of 15%. If the selling price of each horse is the same, then their cost price are respectively.
(1) ₹ 10,000 and ₹ 9,500
(2) ₹ 11,500 and ₹ 8,000
(3) ₹ 12,000 and ₹ 7,500
(4) ₹ 10,500 and ₹ 9,000
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

20. A person bought two articles A and B for ₹ 5,000. He sold A at 20% profit and B at 10% loss. He thus gained 2% on his outlay. The cost price of A was
(1) ₹ 3,000 (2) ₹ 2,500
(3) ₹ 2,000 (4) ₹ 3,500
(SSC Data Entry Operator Exam. 31.08.2008)

21. A man sold two articles at ₹ 375 each. On one, he gains 25% and on the other, he loses 25%. The gain or loss% on the whole transaction is
(1) 6% (2) $4\frac{1}{6}\%$
(3) 5% (4) $6\frac{1}{4}\%$
(SSC CHSL DEO & LDC Exam. 04.11.2012, 1st Sitting)

22. A man bought a horse and a carriage for ₹ 40,000. He sold the horse at a gain of 10 % and the carriage at a loss of 5%. He gained 1% on his whole transaction. The cost price of the horse was :
(1) ₹ 15000 (2) ₹ 16000
(3) ₹ 18000 (4) ₹ 20000
(SSC Multi-Tasking Staff Exam. 10.03.2013)

23. A person bought two bicycles for ₹ 1600 and sold the first at 10% profit and the second at 20% profit. If he sold the first at 20% profit and the second at 10% profit, he would get ₹ 5 more. The difference of the cost price of the two bicycles was :
(1) ₹ 50 (2) ₹ 40
(3) ₹ 25 (4) ₹ 75
(SSC Graduate Level Tier-I Exam. 21.04.2013)

24. A shopkeeper sells an article at 15% gain. Had he sold it for ₹18 more, he would have gained 18%. The cost price (in ₹) of the article is
(1) 540 (2) 318
(3) 600 (4) 350
(SSC CHSL DEO & LDC Exam. 10.11.2013, 1st Sitting)

25. Two items A and B are sold at a profit of 10% and 15% respectively. If the amount of profit received is the same, then the cost price of A and B may be
(1) ₹ 1,000, ₹ 1,500
(2) ₹ 5,000 ₹ 2,000
(3) ₹ 3,000, ₹ 2,000
(4) ₹ 3,000, ₹ 5,000
(SSC Graduate Level Tier-II Exam. 29.09.2013

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26. A cloth merchant sold half of his cloth at 40% profit, half of remaining at 40% loss and the rest was sold at the cost price. In the total transaction his gain or loss will be

(1) 20% gain (2) 25% loss
(3) 10% gain (4) 15% loss

(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

27. A man sells two chairs at ₹ 120 each and by doing so gains 25% on one chair and loses 25% on the other. His loss on the whole in ₹ is

(1) 20 (2) 16
(3) 25 (4) 30

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

28. A man purchases two fans for ₹ 2,160. By selling one fan at a profit of 15% and the other at a loss of 9% he neither gains nor loses in the whole transaction. Find the cost price of each fan in ₹.

(1) 710,1450 (2) 1530,630
(3) 810, 1350 (4) 1340,820

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

29. A shopkeeper purchased a TV for ₹ 2,000 and a radio for ₹ 750. He sells the TV at a profit of 20% and the radio at a loss of 5%. The total loss or gain is

(1) Gain ₹ 352.50
(2) Gain ₹ 362.50
(3) Loss ₹ 332
(4) Loss ₹ 300

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

30. Some toffees were bought at the rate of 11 for ₹ 10 and the same number at the rate of 9 for ₹ 10. If the whole lot was sold at one rupee per toffee, then the gain or loss in the whole transaction was

(1) loss of 1%
(2) gain of 1%
(3) neither gain nor loss
(4) gain of 1.5%

(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting)

31. A fruit seller buys some oranges at the rate of 4 for ₹ 10 and an equal number more at 5 for ₹ 10. He sells the whole lot at 9 for ₹ 20. What is his loss or gain per cent ?

(1) Loss per cent $1\frac{19}{81}\%$

(2) Gain percent $1\frac{19}{81}\%$

(3) No loss or no profit
(4) Loss per cent 2%

(SSC Graduate Level Tier-I Exam. 21.04.2013)

32. A shopkeeper blends two varieties of tea costing ₹ 18 and ₹ 13 per 100 gm in the ratio 7 : 3. He sells the blended variety at the rate of ₹ 18.15 per 100 gm. His percentage gain in the transaction is

(1) 10% (2) 12%
(3) 14% (4) 8%

(SSC CHSL DEO & LDC Exam. 20.10.2013)

33. Nikita bought 30 kg of wheat at the rate of ₹ 9.50 per kg and 40 kg of wheat at the rate of ₹ 8.50 per kg and mixed them. She sold the mixture at the rate of ₹ 8.90 per kg. Her total profit or loss in the transaction was :

(1) ₹ 2 loss (2) ₹ 2 profit
(3) ₹ 7 loss (4) ₹ 7 profit

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

34. Krishna purchased a number of articles at ₹10 for each and the same number for ₹ 14 each. He mixed them together and sold them for ₹ 13 each. Then his gain or loss percent is

(1) Loss $8\frac{1}{3}\%$ (2) Gain $8\frac{2}{3}\%$

(3) Loss $8\frac{2}{3}\%$ (4) Gain $8\frac{1}{3}\%$

(SSC CGL Tier-I Exam 26.06.2011 (First Sitting)

35. A shopkeeper bought 15kg of rice at the rate of ₹29 per kg and 25kg of rice at the rate of ₹20 per kg. He sold the mixture of both types of rice at the rate of ₹27 per kg. His profit in this transaction is

(1) ₹125 (2) ₹150
(3) ₹ 140 (4) ₹145

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

36. A dealer sold $\frac{3}{4}$ th of his articles at a gain of 24% and the remaining at the cost price. Percentage of gain in the whole transaction is

(1) 15% (2) 18%
(3) 24% (4) 32%

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011) & SSC MTS Exam.10.03.2013, Patna (Ist Sitting)

37. A man buys a toy for ₹ 25 and sells it for ₹ 30. His gain per cent is

(1) 20% (2) 5%
(3) 10% (4) 2.5%

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 8)

TYPE–XII

1. The difference between the selling prices of an article at a profit of 15% and at a profit of 10% is ₹ 10. The cost price of the article is

(1) ₹ 100 (2) ₹ 120
(3) ₹ 150 (4) ₹ 200

(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

2. The difference between the selling price and cost price of an article is ₹ 210. If the profit percent is 25, then the selling price of the article is

(1) ₹ 950 (2) ₹1,050
(3) ₹1,150 (4) ₹1,250

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

3. If the difference between the selling prices of an article at profit of 6% and 4% is ₹ 3, then the cost price of the article should be :

(1) ₹100 (2) ₹150
(3) ₹175 (4) ₹200

(SSC CHSL DEO & LDC Exam. 27.11.2010)

TYPE–XIII

1. A trader bought 10 kg of apples for ₹ 405 out of which 1 kg of apples were found to be rotten. If he wishes to make a profit of 10%, at what rate should he sell the remaining apples per kg?

(1) ₹ 45 (2) ₹ 49.50
(3) ₹ 50 (4) ₹ 51

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A reduction of 20% in the price of salt enabled a purchaser to obtain 4 kg. more for ₹ 100. The reduced price of salt per kg is :

(1) ₹ 4 (2) ₹ 5
(3) ₹ 6.25 (4) ₹ 6.50

(SSC CGL Prelim Exam. 11.05.2003)

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3. If the cost of pins reduces by ₹ 4 per dozen, 12 more pins can be purchased for ₹ 48. The cost of pins per dozen after reduction is:
(1) ₹ 8 (2) ₹ 12
(3) ₹ 16 (4) ₹ 20
(SSC CPO S.I. Exam.16.12.2007) (First Sitting)

4. A tradesman sold an article at a loss of 20%. If the selling price had been increased by ₹ 100, there would have been a gain of 5%. The cost price of the article was :
(1) ₹ 200 (2) ₹ 25
(3) ₹ 400 (4) ₹ 250
(SSC CGL Prelim Exam. 09.02.2004 (First Sitting)

5. If the price of eraser is reduced by 25% a person can buy 2 more erasers for a rupee. How many erasers are available for a rupee?
(1) 8 (2) 6
(3) 4 (4) 2
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

6. A reduction of 15% in the price of apples would enable a purchaser to get 2 kg more apples for ₹ 240. The new price (per kg) of apples is
(1) ₹ 15 (2) ₹ 18
(3) ₹ 20 (4) ₹ 36
(SSC CPO S.I. Exam. 03.09.2006)

7. An increase of 20% in the price of mangoes enables a person to purchase 4 mangoes less for ₹ 40. The price of 15 mangoes before increase was
(1) ₹ 10 (2) ₹ 15
(3) ₹ 20 (4) ₹ 25
(SSC CPO S.I. Exam. 09.11.2008)

8. The reduction of ₹ 12 in the selling price of an article will change 5% gain into $2\frac{1}{2}$% loss. The cost price of the article is
(1) ₹ 140 (2) ₹ 160
(3) ₹ 80 (4) ₹ 100
(SSC Multi-Tasking Staff Exam. 17.03.2013 (1st Sitting)

9. A tradesman marks his goods at 25 p.c. above the cost price. If he reduces the marked price by $12\frac{1}{2}$ p.c., then his profit will be
(1) $9\frac{3}{8}$ p.c. (2) $7\frac{3}{5}$ p.c.
(3) $6\frac{3}{8}$ p.c. (4) $5\frac{1}{3}$ p.c.
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

10. If a man reduces the selling price of a fan from Rs. 1,250 to Rs. 1,000, his loss increases by 20%. The cost price of the fan is
(1) Rs. 2,400 (2) Rs. 2,450
(3) Rs. 2,500 (4) Rs. 2,350
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

11. A manufacturer fixes his selling price at 33% over the cost of production. If cost of production goes up by 12% and manufacturer raises his selling price by 10%, his percentage profit is
(1) $28\frac{3}{8}$% (2) $30\frac{5}{8}$%
(3) $36\frac{5}{9}$% (4) 35%
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–XIV

1. A man wanted to sell an article with 20% profit; but he actually sold at 20% loss for ₹ 480. At what price he wanted to sell it to earn the profit?
(1) ₹ 720 (2) ₹ 840
(3) ₹ 600 (4) ₹ 750
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If a man estimates his loss as 20% of the selling price, then his loss per cent is :
(1) 20% (2) 25%
(3) $\frac{40}{3}$% (4) $\frac{50}{3}$%
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC CGL Exam. 19.06.2011)

3. If 3 toys are sold at the cost price of 4 toys of the same kind, the profit will be :
(1) 25% (2) $33\frac{1}{3}$%
(3) $66\frac{2}{3}$% (4) 50%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A house worth ₹ 1,50,000 is sold by X at a 5% profit to Y, Y sells the house back to X at a 2% loss. Then in the entire transaction?
(1) X gains ₹ 4,350
(2) X loses ₹ 4,350
(3) X gains ₹ 3,150
(4) X loses ₹ 3,150
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. A book-seller bought 200 textbooks for ₹ 12,000. He wanted to sell them at a profit so that he got 20 books free. At what profit percent should he sell them?
(1) 10% (2) 11%
(3) 11.5% (4) 12%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. By selling a table for ₹ 350 instead of ₹ 400, loss per cent increases by 5%. The cost price of table is :
(1) ₹ 1,050 (2) ₹ 417.50
(3) ₹ 435 (4) ₹ 1,000
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

7. If selling price of an article is $\frac{8}{5}$ times its cost price, the profit per cent on it is :
(1) 120% (2) 160%
(3) 40% (4) 60%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

8. The price of a jewel, passing through three hands, rises on the whole by 65%. If the first and the second sellers earned 20% and 25% profit respectively, the profit earned by the third seller is
(1) 20% (2) 15%
(3) 10% (4) 5%
(SSC CPO S.I. Exam. 12.01.2003

9. A merchant fixes the sale price of his goods at 15% above the cost price. He sells his goods at 12% less than the fixed price. His percentage of profit is :
(1) $2\frac{1}{2}$% (2) $1\frac{1}{5}$%
(3) $1\frac{1}{2}$% (4) 2%
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)



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10. A person sells a table at a profit of 10%. If he had bought the table at 5% less cost and sold for ₹ 80 more, he would have gained 20%. The cost price of the table is
(1) ₹ 3,200 (2) ₹ 2,500
(3) ₹ 2,000 (4) ₹ 200
(SSC CPO S.I. Exam. 07.09.2003)

11. Joseph's salary is reduced by 10%. In order to have his salary back to his original amount, it must be raised by
(1) 12.5% (2) $11\frac{1}{9}\%$
(3) 10% (4) 11%
(SSC CPO S.I. Exam. 07.09.2003) & (SSC S.O. (Commercial Audit) Exam. 16.11.2003)

12. A man bought a certain quantity of rice at the rate of ₹650 per quintal. 20% of the rice was spoiled. At what rate should he sell the remaining rice to gain 20% on the outlay?
(1) ₹775 (2) ₹850
(3) ₹890 (4) ₹975
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

13. A person sells an article for ₹ 75 and gains as much per cent as the cost price of the article in rupees. The cost price of the article is
(1) ₹ 37.50 (2) ₹ 40
(3) ₹ 50 (4) ₹ 150
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

14. An article is sold at a profit of 20%. If it had been sold at a profit of 25%, it would have fetched ₹ 35 more. The cost price of the article is :
(1) ₹ 650 (2) ₹ 700
(3) ₹ 750 (4) ₹ 800
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

15. A man gains 20% by selling an article for a certain price. If he sells it at double the price, the percentage of profit will be :
(1) 40% (2) 140%
(3) 100% (4) 120%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

16. A dealer makes a profit of 20% even after giving a 10% discount on the advertised price of a scooter. If he makes a profit of ₹ 7500 on the sale of the scooter, the advertised price was
(1) ₹ 45000 (2) ₹ 47500
(3) ₹ 50000 (4) ₹ 52500
(SSC CPO S.I. Exam. 05.09.2004)

17. A man gets ₹ 13 more by selling an article at a profit of $12\frac{1}{2}\%$ and than selling it at a loss of $12\frac{1}{2}\%$. The cost price of the article is :
(1) ₹ 25.50 (2) ₹ 38
(3) ₹ 52 (4) ₹ 65
(SSC CPO S.I. Exam. 26.05.2005)

18. By selling a table for ₹ 350 instead of ₹ 400, loss per cent increases by 5%. The cost price of the table is :
(1) ₹ 1050 (2) ₹ 417.50
(3) ₹ 435 (4) ₹ 1000
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

19. The percentage of loss when an article is sold at ₹ 50 is the same as that of the profit when it is sold at ₹ 70. The above-mentioned percentage of profit or loss on the article is
(1) 10% (2) $16\frac{2}{3}\%$
(3) 20% (4) $22\frac{2}{3}\%$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

20. If an article is sold at a gain of 5% instead of being sold at a loss of 5%, one gets ₹ 5 more. What is the cost price of the article ?
(1) ₹ 100 (2) ₹ 105
(3) ₹ 50 (4) ₹ 110
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

21. Raghavan purchased a scooter at $\frac{13}{15}$ of its selling price and sold it at 12% more than its selling price. His gain is.
(1) 20% (2) 30%
(3) $38\frac{1}{13}\%$ (4) $29\frac{3}{13}\%$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

22. An article passing through two hands is sold at a profit of 38% at the original cost price. If the first dealer makes a profit of 20%, then the profit per cent made by the second is
(1) 15% (2) 12%
(3) 10% (4) 5%
(SSC CPO S.I. Exam. 03.09.2006)

23. If a manufacturer gains 10 per cent, wholesaler 15 per cent and retailer 25 per cent, then the production cost of an article, whose retail price is ₹ 1,265, is
(1) ₹ 700 (2) ₹ 750
(3) ₹ 800 (4) ₹ 900
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

24. A tradesman, by means of a false balance defrauds 10 per cent in buying goods and also defrauds 10 per cent in selling. His gain percent is
(1) 10% (2) 11%
(3) 21% (4) 100%
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

25. By selling 100 pencils, a shopkeeper gains the selling price of 20 pencils. His gain per cent is
(1) 25% (2) 20%
(3) 15% (4) 12%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

26. A dealer sold $\frac{3}{4}$ of his articles at a gain of 20% and the remaining at cost price. The gain per cent earned by him in the whole transaction is
(1) 13% (2) 14%
(3) 15% (4) 16%
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

27. An increase of ₹ 3 in the selling price of an article turns a loss of $7\frac{1}{2}\%$ into a gain of $7\frac{1}{2}\%$. The cost price (in ₹) of the article is:
(1) 25 (2) 20
(3) 15 (4) 10
(SSC CPO S.I. Exam. 16.12.2007)

28. One trader calculates the percentage of profit on the buying price and another calculates on the selling price. When their selling prices are the same, then the difference of their actual profits is ₹ 85 and both claim to have made 20% profit. What is the selling price of each ?
(1) ₹ 1700 (2) ₹ 2100
(3) ₹ 2550 (4) ₹ 2750
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

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29. A sells a article to B at a profit of 10% B sells the article back to A at a loss of 10%. In this transaction
(1) A neither loses nor gains
(2) A makes a profit of 11%
(3) A makes a profit of 20%
(4) B loses 20%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

30. If the selling price of an article is doubled, then its loss per cent is converted into equal profit per cent. The loss per cent on the article is
(1) $26\frac{2}{3}\%$ (2) 33%
(3) $33\frac{1}{3}\%$ (4) 34%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

31. A man sold some articles at a gain of 10%. He spent his total sale proceeds to purchase such articles again. This time, while selling them, he incurred a loss of 10%. His loss or gain in the transaction was
(1) 1% loss
(2) 1% gain
(3) no profit no loss
(4) 2% loss
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

32. A merchant finds his profit as 20% of the selling price. His actual profit percent is
(1) 20% (2) 22%
(3) 25% (4) 30%
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

33. A person sold a TV for ₹ 9,400 and he lost a particular amount. When he sold another TV of the same type at ₹ 10,600, his gain was double the former loss. What was the cost price of each TV?
(1) ₹ 9,800 (2) ₹ 10,000
(3) ₹ 10,200 (4) ₹ 10,400
(SSC CPO S.I. Exam. 06.09.2009)

34. By selling a bicycle for ₹ 2,850, a shopkeeper gains 14%. If the profit is reduced to 8%, then the selling price will be
(1) ₹ 2,600 (2) ₹ 2,700
(3) ₹ 2,800 (4) ₹ 3,000
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

35. If the percentage of profit calculated on selling price of an article is 20%, percentage of profit calculated on cost price will be
(1) 16% (2) 24%
(3) 25% (4) 28%
(SSC (South Zone) Investigator Exam 12.09.2010)

36. If selling price of an article is reduced by 60%, then there is a loss of 10% on cost price. The initial profit percent was
(1) 70% (2) 80%
(3) 100% (4) 125%
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

37. X sells two articles for ₹ 4,000 each with no loss and no gain in the transaction. If one was sold at a gain of 25% the other is sold at a loss of
(1) 25% (2) $18\frac{2}{9}\%$
(3) 20% (4) $16\frac{2}{3}\%$
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

38. A dishonest shopkeeper, using a faulty balance makes a profit of 5% while buying as well as while selling his goods. His actual gain percent in the whole process amounts to
(1) 11% (2) 10%
(3) 10.25% (4) 10.5%
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

39. A man sells two articles for ₹ 5000 each neither losing nor gaining in the deal. If he sold one of them at a gain of 25%, the other article is sold at a loss of
(1) $15\frac{2}{3}\%$ (2) $16\frac{2}{3}\%$
(3) $17\frac{1}{3}\%$ (4) $18\frac{1}{3}\%$
(SSC CGL Tier-1 Exam 20.06.2011 (Second Sitting)

40. By selling 60 articles a vendor gains the selling price of 15 articles. Find his gain percentage.
(1) 25 % (2) $33\frac{1}{3}\%$
(3) 20% (4) $28\frac{4}{7}\%$
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

41. If the total cost of 73 articles having equal cost is ₹ 5,110 and the total selling price of 89 such articles is ₹ 5,607, then in the transaction, there will be
(1) a loss of 15%
(2) a gain of 10%
(3) a loss of 10%
(4) a gain of 15%
(SSC Data Entry Operator Exam. 31.08.2008)

42. The percentage of profit, when an article is sold for ₹ 78, is twice than when it is sold for ₹ 69. The cost price of the article is :
(1) ₹ 49 (2) ₹ 51
(3) ₹ 57 (4) ₹ 60
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

43. A cloth merchant sold half of his cloth at 40% profit, half of remaining at 40% loss and the rest was sold at the cost price. In the total transaction his gain or loss will be
(1) 20% gain (2) 25% loss
(3) 10% gain (4) 15% loss
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

44. A person sold an article at 20% profit on the selling price. Afterwards, when the cost price reduced by 10%, then he also reduced the selling price by 10%. His percentage of profit on cost price will be
(1) 30% (2) 25%
(3) 22.5% (4) 12.5%
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

45. A fruit seller makes a profit of 20% by selling mangoes at a certain price. If he charges ₹ 1 more for each mango, he can make a profit of 40%. Find the selling price of a mango in the first case.
(1) ₹ 6 (2) ₹ 5
(3) ₹ 5.50 (4) ₹ 7
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

46. Dinesh bought two radios for ₹ 1,920. He sold one at a profit of 20% and the other at a loss of $6\frac{2}{3}\%$. If the selling price of both radios are same, the cost prices of the two radios are
(1) ₹ 800 and ₹ 1,120
(2) ₹ 840 and ₹ 1,080
(3) ₹ 860 and ₹ 1,060
(4) ₹ 900 and ₹ 1,020
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

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47. Peter buys a table for ₹450 and spends ₹30 on its transportation. If he sells the table for ₹600 his gain percent will be
(1) 30% (2) 25%
(3) 28% (4) 24%
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

48. A loss of 19% gets converted into a profit of 17% when the selling price is increased by ₹ 162. The cost price of the article is
(1) ₹ 450 (2) ₹ 600
(3) ₹ 360 (4) ₹ 540
(SSC Graduate Level Tier-II Exam. 16.09.2012) & (SSC MTS Exam. 17.03.2013 (Kolkata

49. A trader purchases a watch and a wall clock for ₹ 390. He sells them making a profit of 10% on the watch and 15% on the wall clock. He earns a profit of ₹ 51.50. The difference between the original prices of the wall clock and the watch is equal to
(1) ₹ 80 (2) ₹ 120
(3) ₹ 110 (4) ₹100
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

50. A merchant fixed the selling price of his articles at ₹700 after adding 40% profit to the cost price. As the sale was very low at this price level, he decided to fix the selling price at 10% profit. Find the new selling price.
(1) ₹ 500 (2) ₹ 550
(3) ₹ 450 (4) ₹ 490
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

51. From 2008 to 2009, the sales of a book decreased by 80%. If the sales in 2010 were the same as in 2008, by what percent did it increase from 2009 to 2010 ?
(1) 120% (2) 400%
(3) 80% (4) 100%
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

52. A dishonest fruit vendor sells his goods at cost price but he uses a weight of 900 gm for a kg. weight. His gain per cent is:
(1) 12% (2) $11\frac{1}{9}\%$
(3) $10\frac{1}{9}\%$ (4) 10%
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

53. A shopkeeper bought 200 articles, each costing the same. He sold 30% of the articles at 20% profit and remaining at 10% profit. If the total profit made by him is ₹ 2600, find the cost price of one article.
(1) ₹ 200 (2) ₹ 1300
(3) ₹ 2600 (4) ₹ 100
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

54. A bought an article, paying 5% less than the original price. A sold it with 20% profit on the price he had paid. What percent of profit did A earn on the original price?
(1) 10% (2) 13%
(3) 14% (4) $\frac{17}{2}\%$
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

55. A dishonest grocer sells rice at a profit of 10% and also uses weights which are 20% less than the marked weight. The total gain earned by him will be
(1) 37.5% (2) 40%
(3) 30.5% (4) 35%
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

56. A trader sells two bullocks for ₹ 8,400 each, neither losing nor gaining in total. If he sold one of the bullocks at a gain of 20%, the other is sold at a loss of
(1) 20% (2) $18\frac{2}{9}\%$
(3) $14\frac{2}{7}\%$ (4) 21%
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

57. Arun marks up the computer he is selling by 20% profit and sells them at a discount of 15%. Arun's net gain percent is
(1) 4% (2) 2%
(3) 3.5% (4) 2.5%
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

58. A man buys 3 cows and 8 goats in ₹ 47,200. Instead if he would have bought 8 cows and 3 goats, he had to pay ₹ 53,000 more. Cost of one cow is:
(1) ₹ 11,000 (2) ₹ 12,000
(3) ₹ 13,000 (4) ₹ 10,000
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

59. A retailer purchased radiosets at the rate of ₹ 400 each from a wholesaler. He raised the price by 30% and then allowed a discount of 8% on each set. His profit will be
(1) 19% (2) 78.4%
(3) 22% (4) 19.6%
(SSC Graduate Level Tier-I Exam. 21.04.2013)

60. A dishonest dealer professes to sell his goods at the cost price but uses a false weight of 850 g instead of 1 kg. His gain percent is
(1) $17\frac{12}{17}\%$ (2) $17\frac{11}{17}\%$
(3) $71\frac{11}{17}\%$ (4) $11\frac{11}{17}\%$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

61. A tradesman sold an article at a loss of 20%. If the selling price had been increased by ₹ 100, there would have been a gain of 5%. The cost price of the article (in ₹) was
(1) 100 (2) 200
(3) 400 (4) 500
(SSC Graduate Level Tier-I Exam. 19.05.2013)

62. By selling 25 metres of cloth a trader gains the selling price of 5 metres of cloth. The gain percent of the trader in % is
(1) 25% (2) 20%
(3) 28% (4) 29%
(SSC Graduate Level Tier-II Exam. 29.09.2013)

63. Gita buys a plot of land for ₹ 96,000. She sells $\frac{2}{5}$ of it at a loss of 6%. She wants to make a profit of 10% on the whole transaction by selling the remaining land. The gain % on the remaining land is
(1) 20% (2) $20\frac{2}{3}\%$
(3) 14% (4) 7%
(SSC Graduate Level Tier-II Exam. 29.09.2013)

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64. The cost of a house was ₹ X lakhs in 2005. After 3 years, the owner of the house sold it for 25% more than she paid it. But she has to pay a tax of 50% of the gain. The tax amount she has to pay is.

(1) $\frac{X}{2}$ (2) $\frac{X}{8}$

(3) $\frac{X}{4}$ (4) $\frac{X}{24}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

65. A milkman mixes water with milk and sells the mixture at the cost price of pure milk. The volume of water in litres to be mixed with each litre of milk to get a 25% profit is

(1) $\frac{1}{4}$ (2) $\frac{1}{5}$

(3) $1\frac{1}{4}$

(4) cannot be calculated without knowing the cost price of milk

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

66. A merchant bought 200 eggs, out of which 38 eggs were broken. He sold the remaining eggs at the rate of Rs. 4.80 per dozen and thus gained 8%. His total investment is

(1) Rs. 80 (2) Rs. 60

(3) Rs. 45 (4) Rs. 120

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

67. A trader marks his goods 20% above cost price but allows his customers a discount of 10%, the cost price of a blackboard, which is sold for Rs. 216, is

(1) Rs. 196 (2) Rs. 180

(3) Rs. 200 (4) Rs. 108

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

68. A fruit seller buys 240 apples for Rs. 600. Some of these apples are bad and are thrown away. He sells the remaining apples at Rs. 3.50 each and makes a profit of Rs.198. The per cent of apples thrown away are

(1) 6% (2) 8%

(3) 5% (4) 7%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

69. Rohit sold his car at 10% below the cost price to Amit. Amit got the car repaired and spent Rs. 5,000. He then sold the car to Rajesh at 20% above the total cost, which is equal to Rs. 1,00,000. Find the original price of the car (nearest to hundred).

(1) Rs. 93,000 (2) Rs. 83,000

(3) Rs. 87,000 (4) Rs. 97,000

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

70. If the cost price of an item is $\frac{5}{9}$ of its marked price and the profit is 20%, then the percentage of discount is

(1) $70\frac{1}{3}\%$ (2) $63\frac{1}{3}\%$

(3) $33\frac{1}{3}\%$ (4) $66\frac{1}{3}\%$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

71. A shopkeeper bought 30 kg of rice at the rate of Rs. 70 per kg and 20 kg of rice at the rate of Rs. 70.75 per kg. If he mixed the two brands of rice and sold the mixture at Rs. 80.50 per kg, his gain is

(1) Rs. 450 (2) Rs. 510

(3) Rs. 525 (4) Rs. 485

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

72. The printed price of an article is 40% higher than its cost price. Then the rate of discount such that he gains 12% profit is

(1) 21% (2) 15%

(3) 20% (4) 18%

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

73. An article which is marked at Rs. 975 is sold for Rs. 897. The discount per cent is

(1) 10% (2) 12%

(3) 6% (4) 8%

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

74. A dealer marks his goods 20% above cost price and allows a discount of 10% to his customers. His gain percentage is

(1) 6% (2) 9%

(3) 7% (4) 8%

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

75. A house worth Rs. 1,50,000 is sold by X to Y at 5% profit. Y sells the house back to X at 2% loss. Then in the entire transaction :

(1) X gains Rs. 3150

(2) X loses Rs. 4350

(3) X loses Rs. 1350

(4) X gains Rs. 4350

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

76. A man sells an article at 5% above its cost price. If he had bought it at 5% less than what he had paid for it and sold it at Rs. 2 less, he would have gained 10%. The cost price of the article is

(1) Rs. 200 (2) Rs. 400

(3) Rs. 300 (4) Rs. 100

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

77. Simon purchased a bicycle for Rs. 6810. He had paid a VAT of 13.5%. The list price of the bicycle was

(1) Rs. 6000 (2) Rs. 6140

(3) Rs. 6696.50 (4) Rs. 5970.50

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	2. (4)	3. (1)	4. (4)
5. (1)	6. (4)	7. (2)	8. (4)
9. (3)	10. (3)	11. (4)	12. (2)
13. (4)	14. (1)	15. (3)	16. (3)
17. (1)	18. (3)	19. (3)	20. (1)
21. (4)	22. (4)	23. (2)	24. (2)
25. (1)	26. (4)	27. (1)	28. (1)
29. (1)	30. (2)	31. (4)	32. (3)
33. (1)	34. (1)	35. (3)	36. (2)

TYPE-II

1. (1)	2. (3)	3. (4)	4. (3)
5. (2)	6. (3)	7. (4)	8. (2)
9. (1)	10. (3)	11. (4)	12. (3)
13. (2)	14. (2)	15. (1)	16. (4)
17. (2)	18. (3)	19. (1)	20. (1)



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21. (4)	22. (2)	23. (4)	24. (3)
25. (3)	26. (3)	27. (4)	28. (2)
29. (2)	30. (3)	31. (3)	32. (2)
33. (2)	34. (1)	35. (1)	36. (3)
37. (1)	38. (1)	39. (3)	40. (4)
41. (4)	42. (4)	43. (1)	44. (3)
45. (1)	46. (4)	47. (1)	48. (1)
49. (4)	50. (1)		

TYPE-III

1. (4)	2. (2)	3. (1)	4. (3)
5. (1)	6. (4)	7. (3)	8. (4)
9. (4)	10. (4)	11. (3)	12. (2)
13. (2)	14. (3)	15. (4)	16. (3)
17. (2)	18. (2)	19. (1)	20. (3)
21. (3)	22. (2)	23. (3)	24. (3)
25. (3)	26. (1)	27. (4)	28. (1)
29. (1)	30. (3)	31. (3)	32. (4)
33. (4)	34. (2)	35. (2)	36. (1)
37. (1)	38. (4)	39. (4)	40. (2)
41. (3)	42. (2)	43. (4)	44. (2)
45. (4)	46. (2)	47. (1)	

TYPE-IV

1. (1)	2. (1)	3. (2)	4. (1)
5. (3)	6. (3)	7. (4)	8. (3)
9. (4)	10. (3)	11. (3)	12. (1)
13. (1)	14. (3)	15. (2)	16. (1)
17. (4)	18. (4)	19. (4)	20. (1)
21. (2)	22. (4)	23. (2)	24. (1)
25. (3)	26. (2)	27. (4)	28. (1)
29. (1)	30. (2)	31. (4)	32. (3)
33. (3)	34. (4)	35. (1)	36. (2)
37. (1)	38. (4)	39. (3)	40. (3)
41. (2)	42. (2)	43. (1)	44. (1)
45. (4)			

TYPE-V

1. (4)	2. (1)	3. (3)	4. (1)
5. (2)			

TYPE-VI

1. (4)	2. (3)	3. (4)	4. (4)
5. (3)	6. (1)	7. (2)	8. (2)
9. (4)	10. (3)	11. (1)	12. (1)
13. (2)	14. (4)	15. (4)	16. (3)
17. (1)	18. (1)	19. (4)	20. (4)
21. (4)	22. (4)	23. (3)	24. (1)
25. (1)	26. (3)	27. (4)	

TYPE-VII

1. (3)	2. (3)	3. (2)	4. (2)
5. (1)	6. (4)	7. (3)	8. (4)
9. (2)	10. (4)	11. (1)	12. (1)
13. (1)	14. (1)	15. (4)	16. (4)
17. (1)	18. (4)	19. (3)	20. (3)
21. (3)	22. (3)	23. (4)	24. (2)
25. (*)	26. (2)		

TYPE-VIII

1. (3)	2. (2)	3. (1)	4. (4)
5. (1)	6. (2)	7. (3)	8. (3)
9. (2)	10. (4)	11. (3)	

TYPE-IX

1. (1)	2. (2)	3. (3)	4. (1)
5. (3)	6. (4)	7. (3)	8. (3)
9. (3)	10. (4)	11. (2)	12. (2)
13. (1)	14. (3)	15. (3)	16. (3)
17. (1)	18. (2)	19. (3)	20. (1)
21. (4)	22. (2)	23. (1)	24. (4)
25. (2)	26. (4)	27. (3)	28. (4)
29. (4)	30. (1)	31. (1)	

TYPE-X

1. (4)	2. (1)	3. (3)	4. (3)
5. (2)	6. (1)	7. (1)	8. (3)
9. (3)	10. (4)	11. (4)	12. (4)
13. (3)	14. (3)		

TYPE-XI

1. (3)	2. (4)	3. (1)	4. (3)
5. (2)	6. (2)	7. (4)	8. (2)
9. (4)	10. (1)	11. (4)	12. (4)
13. (4)	14. (1)	15. (1)	16. (3)
17. (1)	18. (3)	19. (2)	20. (3)
21. (4)	22. (2)	23. (1)	24. (3)
25. (3)	26. (3)	27. (2)	28. (3)
29. (2)	30. (1)	31. (1)	32. (1)
33. (1)	34. (4)	35. (4)	36. (2)
37. (1)			

TYPE-XII

1. (4)	2. (2)	3. (2)	

TYPE-XIII

1. (2)	2. (2)	3. (2)	4. (3)
5. (1)	6. (2)	7. (4)	8. (2)
9. (1)	10. (3)	11. (2)	

TYPE-XIV

1. (1)	2. (4)	3. (2)	4. (3)
5. (1)	6. (4)	7. (4)	8. (3)
9. (2)	10. (3)	11. (2)	12. (4)
13. (3)	14. (2)	15. (2)	16. (3)
17. (3)	18. (4)	19. (2)	20. (3)
21. (4)	22. (1)	23. (3)	24. (3)
25. (1)	26. (3)	27. (2)	28. (3)
29. (2)	30. (3)	31. (1)	32. (3)
33. (1)	34. (2)	35. (3)	36. (4)
37. (4)	38. (3)	39. (2)	40. (2)
41. (3)	42. (4)	43. (3)	44. (2)
45. (1)	46. (2)	47. (2)	48. (1)
49. (3)	50. (2)	51. (2)	52. (2)
53. (4)	54. (3)	55. (1)	56. (3)
57. (2)	58. (2)	59. (4)	60. (2)
61. (3)	62. (1)	63. (2)	64. (2)
65. (2)	66. (2)	67. (3)	68. (3)
69. (3)	70. (3)	71. (2)	72. (3)
73. (4)	74. (4)	75. (1)	76. (2)
77. (1)			

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EXPLANATIONS

TYPE-I

1. (2) Selling price

$= 1400 \times \frac{100-15}{100}$

$= 1400 \times \frac{85}{100} = ₹\ 1190$

2. (4) Let the C.P. of article be 'x'

$\because (100-7)\%\ x = 651$

$\therefore x = \frac{651}{93} \times 100 = ₹\ 700$

3. (4) CP of 75 litres of mixture of milk and water = ₹ 630

SP of 75 litres of mixture of milk and water = $9 \times 75 = ₹\ 675$

Gain = 675 – 630 = ₹ 45

Gain per cent $= \frac{45}{630} \times 100$

$= \frac{50}{7} = 7\frac{1}{7}\%$

4. (4) Case I : Percentage Profit

$= \frac{17 \times 100}{36} = 47\%$

Case II : Percentage Profit

$= \frac{24 \times 100}{50} = 48\%$

Case III : Percentage Profit

$= \frac{19 \times 100}{40} = 47.5\%$

Case IV : Percentage Profit

$= \frac{29 \times 100}{60} = 48.3\%$

Obviously, (4) is the best transaction.

5. (1) Total cost of typewriter

= ₹ (1200 + 200) = ₹ 1400

S.P. = ₹ 1680

Profit = ₹ (1680 – 1400)

= ₹ 280

$\therefore$ Profit % $= \frac{280}{1400} \times 100 = 20\%$

6. (4) If the cost price be ₹ x, then

S.P. $= \frac{100}{95}x = ₹\frac{20}{19}x$

$\therefore$ Gain $= \frac{20x}{19} - x = ₹\frac{x}{19}$

$\therefore$ Gain percent $= \frac{\frac{x}{19}}{x} \times 100$

$= 5.26\%$

7. (2) S.P. – C.P. $= \frac{10\text{S.P.}}{100} = \frac{\text{S.P.}}{10}$

$\Rightarrow$ S.P. $- \frac{\text{S.P.}}{100} = \text{C.P.} = 27$

$\Rightarrow$ S.P. $= \frac{27 \times 10}{9} = ₹\ 30$

8. (4) S.P. = ₹ 100

C.P. = ₹ 80

$\therefore$ Gain = ₹ 20

$\therefore$ Gain per cent

$= \frac{20}{80} \times 100 = 25\%$

9. (3) Let the original price be ₹ x.

$= \frac{80}{100} \times x = ₹\frac{4x}{5}$

SP $= \frac{4x}{5} \times \frac{140}{100} = ₹\ \frac{28x}{25}$

Gain on original price

$= \frac{28x}{25} - x = \frac{3x}{25}$

$\therefore$ Gain % $= \frac{3x}{\frac{25}{x} \times 100} = 12\%$

10. (3) Let the CP = ₹ 100

Then, SP = ₹ 120

Let the marked price = ₹ x.

Then, 90% of x = ₹ 120

$\Rightarrow x$

$= \frac{120 \times 100}{90} = \frac{400}{3} = 133\frac{1}{3}\%$

Hence, the marked price is $33\frac{1}{3}\%$ above the cost price.

11. (4) If the S.P. of article be x, then

its CP $= x - \frac{x}{4} = ₹\ \frac{3x}{4}$

$\therefore$ Gain % $= \frac{\frac{x}{4}}{\frac{3x}{4}} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

12. (2) Tricky Approach

If the cost price is ₹ 100, then selling price = ₹120 and gain = ₹ 20

Required gain % $= \frac{20}{120} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

13. (4) Let the S.P. of the bedsheet be Rs. x.

$\therefore\ 450 + \frac{10 \times x}{100} = x$

$\Rightarrow\ x - \frac{x}{10} = 450$

$\Rightarrow \frac{9x}{10} = 450$

$\Rightarrow\ x = \frac{450 \times 10}{9} = ₹\ 500$

14. (1) C.P. of article

$= \frac{100}{100 - \text{loss per cent}} \times \text{S.P.}$

$= \frac{100}{96} \times 960 = ₹\ 1000$

15. (3) Cost price

$= \frac{791000 \times 100}{113} = ₹\ 700000$

$\therefore$ Gain = 791000 – 700000

= ₹ 91000

16. (3) Cost price $= \frac{64000 \times 100}{80}$

= ₹ 80000

17. (1) Actual C.P. = 225 + 15

= ₹ 240

Gain = 300 – 240 = ₹ 60

$\therefore$ Gain per cent

$= \frac{60}{240} \times 100 = 25\%$

18. (3) If the C.P. be x, then

$\frac{x \times 130}{100} = 1690$

$\Rightarrow x = \frac{1690 \times 100}{130} = ₹\ 1300$

19. (3) S.P. of the fan $= \frac{150 \times 80}{100}$

= ₹ 120

20. (1) Gain per cent

$= \frac{11}{33} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

21. (4) If the marked price of the product be ₹ 100, then

C.P. = ₹ 70

S.P. retailer = ₹ 100

$\therefore$ Gain per cent

$= \frac{30}{70} \times 100 = \frac{300}{7}$

$= 42\frac{6}{7}\%$

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22. (4) If the marked price of watch be x, then

$$x \times \frac{90}{100} = \frac{450 \times 120}{100}$$

$$\Rightarrow x = \frac{450 \times 120}{90} = ₹\ 600$$

23. (2) Actual C.P. of radio

$$= 600 + \frac{600 \times 5}{100} = ₹\ 630$$

$\therefore$ Required S.P.

$$= \frac{630 \times 115}{100} = ₹\ 724.50$$

24. (2) If the original cost of shirt be x, then

$$x \times \frac{80}{100} = 64$$

$$\Rightarrow x = \frac{64 \times 100}{80} = ₹\ 80$$

25. (1) C.P. of 1 bucket $= x$

C.P. of 1 mug $= y$

$\therefore 8x + 5y = 92$ .....(i)

$5x + 8y = 77$ .....(ii)

By using equation (i) $\times 5$ – equation (ii) $\times 8$,

$40x + 25y - 40x - 64y$

$= 460 - 616$

$\Rightarrow -39y = -156$

$\Rightarrow y = 4$

From equation (i),

$8x + 20 = 92$

$\Rightarrow 8x = 92 - 20 = 72$

$\Rightarrow x = 9$

$\therefore$ C.P. of 2 mugs and 3 buckets

$= 2 \times 4 + 3 \times 9$

$= 8 + 27 = ₹\ 35$

26. (4) Minimum cost price

$= 150 \times 15 = ₹\ 2250$

Maximum selling price

$= 350 \times 15 = ₹\ 5250$

Gain $= 5250 - 2250 = ₹\ 3000$

[150 being the lowest & 350 being the highest price]

27. (1) Cost price $= ₹\ x$

$$\text{S.P.} = \frac{120x}{100} = ₹\ \frac{6x}{5}$$

$$\text{Gain} = ₹\ \frac{x}{5}$$

$\therefore$ Required gain per cent

$$= \frac{\frac{x}{5}}{\frac{6x}{5}} \times 100$$

$$= \frac{100}{6} = \frac{50}{3}$$

$$= 16\frac{2}{3}\%$$

28. (1) Total oranges bought = 12 (let)

$\therefore$ Their cost price = 3 + 2

$= ₹\ 5$

For profit of 20%,

$$\text{S. P.} = \frac{5 \times 120}{100} = ₹\ 6$$

29. (1) C.P. of article $= ₹\ x$

$$\text{S.P.} = \frac{120x}{100} = ₹\ \frac{6x}{5}$$

$$\text{Gain} = \frac{6x}{5} - x = \frac{6x - 5x}{5}$$

$$= ₹\ \frac{x}{5}$$

$\therefore$ Gain per cent

$$= \frac{\text{Gain}}{\text{S.P.}} \times 100$$

$$= \frac{\frac{x}{5}}{\frac{6x}{5}} \times 100 = \frac{50}{3} = 16\frac{2}{3}\%$$

30. (2) C.P. of article = ₹ x (let)

$$\text{S.P. of article} = ₹\ \frac{4x}{3}$$

$$\text{Gain} = \frac{4x}{3} - x = \frac{4x - 3x}{3}$$

$$= ₹\ \frac{x}{3}$$

$$\therefore \text{Gain per cent} = \frac{\frac{x}{3}}{x} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

31. (4) S.P. of article

$$= \frac{(100 - \text{loss}\%)}{100} \times \text{C.P.}$$

$$= \frac{100 - 10}{100} \times 15 = \frac{90 \times 15}{100}$$

$$= ₹\ 13.50$$

32. (3) C.P. of watch = Rs. x (let)

$$\therefore \text{S.P.} = \frac{120x}{100} = \text{Rs. } \frac{6x}{5}$$

Case II,

$$\text{C.P.} = \text{Rs. } \frac{9x}{10}$$

$$\text{S.P.} = \text{Rs. } \left(\frac{6x}{5} - 30\right)$$

According to the question,

$$\frac{6x}{5} - 30 = \frac{9x}{10} \times \frac{120}{100} = \frac{27x}{25}$$

$$\Rightarrow \frac{6x}{5} - \frac{27x}{25} = 30$$

$$\Rightarrow \frac{30x - 27x}{25} = 30$$

$$\Rightarrow 3x = 30 \times 25$$

$$\Rightarrow x = \frac{30 \times 25}{3} = \text{Rs. } 250$$

33. (1) Original price of 1 mango = Rs. x (let).

$$\therefore \text{C.P. of 1 mango} = \frac{100x}{125}$$

$$= \text{Rs. } \frac{4x}{5}$$

Case II,

According to the question,

$$x + 1 = \frac{4x}{5} \times \frac{150}{100}$$

$$\Rightarrow x + 1 = \frac{6x}{5} \Rightarrow \frac{6x}{5} - x = 1$$

$$\Rightarrow \frac{x}{5} = 1 \Rightarrow x = \text{Rs. } 5$$

34. (1) C.P. of article = Rs. x (let).

According to the question,

$$\frac{x \times 90}{100} = 270$$

$$\Rightarrow x = \frac{270 \times 100}{90} = \text{Rs. } 300$$

35. (3) S.P. of 4 bananas

$$= \left(100 + \frac{100}{3}\right)\% \text{ of Re. } 1$$

$$= \text{Rs. } \frac{400}{300} = \text{Rs. } \frac{4}{3}$$

$\because$ Number of bananas sold for

Rs. $\frac{4}{3} = 4$

$\therefore$ Number of bananas sold for Re. 1

$$= \frac{4}{4} \times 3 = 3$$

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36. (2) C.P of article

$= \frac{100}{100-20} \times 450$

$= \frac{100 \times 450}{80}$ = Rs. 562.5

∴ To gain 20%

S.P. $= \frac{562.5 \times 120}{100}$ = Rs. 675

TYPE-II

1. (1) Required profit

$= \frac{36-30}{30} \times 100 = 20\%$

2. (3) Suppose the C.P. of each article is ₹ 1
Then C.P. of 10 articles = ₹ 10
S.P. of 10 articles = ₹ 15
∴ Profit = ₹ 5

% profit $= \frac{5 \times 100}{10} = 50\%$

3. (4) Let C.P. be ₹ 1
C.P. of 3 articles = ₹ 3
= S.P. of P. of 5 articles.

Loss% $= \frac{(5-3)}{5} \times 100$

= 2 x 20 = 40%

4. (3) Let the cost price of one table = x
∴ Cost price of 15 tables = 15x
and cost price of 20 tables = 20x
According to the question
Selling price of 20 tables = cost price of 15 tables = 15x
∴ Loss = 20x – 15x = 5x

∴ Loss% $= \frac{5x \times 100}{20x} = 25\%$

5. (2) Gain % $= \frac{18-15}{15} \times 100$

$= \frac{3}{15} \times 100 = 20\%$

6. (3) Loss per cent

$= \frac{400-320}{400} \times 100$

$= \frac{80}{400} \times 100 = 20\%$

7. (4) Let the C.P. of one orange = 1
∴ C.P. of 40 oranges = ₹ 40
and S.P. of 40 oranges = ₹ 50
∴ Profit = (50 – 40) = ₹ 10

∴ Profit % $= \frac{10}{40} \times 100 = 25\%$

8. (2) Let C.P. of each orange be ₹ 1
Then, C.P. of 10 oranges = ₹ 10
S.P. of 10 oranges = ₹ 12

Gain % $= \left(\frac{2}{10} \times 100\right)\% = 20\%$

9. (1) Required profit per cent

$= \frac{10-9}{9} \times 100$

$= \frac{1}{9} \times 100 = 11\frac{1}{9}\%$

10. (3) Gain per cent

$= \frac{400-320}{320} \times 100$

$= \frac{80}{320} \times 100 = 25\%$

11. (4) Let the CP of each pen be ₹ 1.
∴ CP of 8 pens = ₹ 8
SP of 8 pens = ₹ 12

∴ Gain % $= \frac{4}{8} \times 100 = 50\%$

12. (3) Let the CP of each article be ₹ 1
∴ CP of 9 articles = ₹ 9
∴ SP of 9 articles = ₹ 8
∴ Loss = ₹ 1

∴ Loss % $= \frac{1}{9} \times 100$

$= \frac{100}{9} = 11\frac{1}{9}\%$

13. (2) C.P. of article for A = Rs. 100

A's S.P. $= \frac{100 \times 120}{100}$

= Rs. 120

B's S.P. $= \frac{120 \times 85}{100}$

= Rs. 102
= C.P. for C
∴ Required profit percent = 2%

14. (2) Let C.P. of each article be ₹ 1
Then, C.P. of 7 articles = ₹ 7
S.P. of 7 articles = ₹ 10

∴ Gain % $= \frac{10-7}{7} \times 100 = \frac{300}{7}$

$= 42\frac{6}{7}\%$

15. (1) Let the original selling price of radio = ₹ 100
∴ C.P. of radio = ₹ 90
∴ New selling price = ₹ 108

∴ Gain per cent $= \frac{18}{90} \times 100$

= 20%

16. (4) Let CP of each coconut be ₹ 1.
∴ CP of 2500 coconuts = ₹. 2500
SP of 2500 coconuts = ₹ 2750

∴ Gain % $= \frac{2750-2500}{2500} \times 100$

= 10%

17. (2) If the CP of A articles be equal to SP of B articles, then

Loss percent $= \frac{B-A}{B} \times 100$

$= \frac{16-10}{16} \times 100 = \frac{6}{16} \times 100$

= 37.5%

18. (3) If the CP of each article be ₹ 1 then
CP of 4 articles = ₹ 4
SP of 4 articles = ₹ 5
∴ Profit percent

$= \frac{5-4}{4} \times 100 = 25\%$

19. (1) Let the CP of 1 orange = ₹ 1
∴ SP of 10 oranges = ₹ 13

∴ Gain percent $= \frac{13-10}{10} \times 100$

= 30%

20. (1) Let the C.P. of each article be ₹ 1.
∴ C.P. of 10 articles = ₹ 10
and S.P. of 10 articles = ₹ 11
∴ Profit percent

$= \frac{11-10}{10} \times 100 = 10\%$

21. (4) Profit percent

$= \frac{10-8}{8} \times 100 = 25\%$

22. (2) Percentage profit

$= \frac{25-20}{20} \times 100 = 25\%$

23. (4) Let the CP of 1 apple = ₹.1
∴ CP of 18 apples = ₹ 18
SP of 18 apples = ₹ 24

∴ Gain percent $= \frac{6}{18} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$



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24. (3) Profit percent

$$= \frac{400-320}{320} \times 100$$

$$= \frac{80}{320} \times 100 = 25\%$$

25. (3) Gain per cent

$$= \frac{20-16}{16} \times 100 = 25\%$$

26. (3) Gain per cent

$$= \frac{15-12}{12} \times 100 = 25\%$$

27. (4) Percentage profit

$$= \frac{18-16}{16} \times 100$$

$$= \frac{25}{2} = 12\frac{1}{2}\%$$

28. (2) Gain per cent

$$= \frac{40-25}{25} \times 100$$

$$= \frac{15}{25} \times 100 = 60\%$$

29. (2) S.P. of book

$$= \frac{150 \times 120}{100} = ₹\ 180$$

30. (3) S.P. of 33 metres of cloth = C.P. of 33 metres of cloth + S.P. of 11 metres of cloth

∴ S.P. of 22 metres of cloth = C.P. of 33 metres of cloth

∴ Gain per cent $= \frac{33-22}{22} \times 100$

$= 50\%$

31. (3) 20 items are broken out of 144 items.

∴ C.P. of 124 items

$$= ₹\left(\frac{144 \times 90}{100}\right) = ₹\ 129.60$$

Total S.P. = ₹ (1.20 × 124)

= ₹ 148.8

∴ Gain = ₹ (148.80 − 129.60)

= ₹ 19.20

∴ Gain per cent

$$= \frac{19.20}{129.60} \times 100 = 14.8\%$$

32. (2) Let the required gain % = x.

$$\therefore\ 150 \times \frac{90}{100} + 300 \times \frac{(100+x)}{100} = \frac{450 \times 120}{100}$$

$$\Rightarrow 135 + 3(100 + x) = 540$$

$$\Rightarrow 3(100 + x) = 540 - 135 = 405$$

$$\therefore\ 100 + x = \frac{405}{3} = 135$$

$$\Rightarrow x = 135 - 100 = 35\%$$

33. (2) C.P. of 50 pairs of shoes

= ₹ (50 × 189.50)

= ₹ 9475

Their S.P. = ₹ 10000

Gain = ₹ (10000 − 9475) = ₹ 525

34. (1) Loss per cent

$$= \frac{\text{Loss}}{\text{C.P.}} \times 100$$

$$= \frac{5750-4500}{5750} \times 100$$

$$= \frac{125000}{5750} = 21.74\%$$

35. (1) Actual C.P. of article

= Rs. (3550 + 50)

= Rs. 3600

Gain = 3816 − 3600 = Rs. 216

∴ Gain percent

$$= \frac{216}{3600} \times 100 = 6\%$$

36. (3) C.P. of each camera

= Rs. x (let)

S.P. of first camera

$$= \text{Rs. } \frac{118x}{100}$$

S.P. of second camera

$$= \frac{118x}{100} \times \frac{90}{100}$$

$$= \text{Rs. } \frac{1062x}{1000}$$

$$\text{Profit} = \frac{118x}{100} + \frac{1062x}{1000} - 2x$$

$$= \frac{1180x + 1062x - 2000x}{1000}$$

$$= \text{Rs. } \frac{242x}{1000}$$

∴ Gain per cent

$$= \frac{242x}{1000 \times 2x} \times 100 = 12.2\%$$

37. (1) Marked price of article = Rs. x and C.P. = Rs. 100 (let)

$$\therefore\ \frac{x}{2} = 80 \Rightarrow x = \text{Rs. } 160$$

Gain on selling at the marked price = 60%

38. (1) S.P. of 20 metre of cloth = C.P of 20 metre of cloth + S.P of 4 metre of cloth

⇒ S.P of (20 − 4 = 16) metre of cloth = C.P of 20 metre of cloth

$$\therefore\ \text{Gain\%} = \frac{20-16}{16} \times 100$$

$$= \frac{100}{4} = 25\%$$

39. (3) Let 40 articles (LCM of 8 and 10) be bought.

∴ C.P of 40 articles

$$= \frac{8 \times 40}{10} = \text{Rs. } 32$$

$$\text{Their S.P.} = \frac{10 \times 40}{8} = \text{Rs. } 50$$

$$\therefore\ \text{Profit percet} = \frac{50-32}{32} \times 100$$

$$= \frac{1800}{32} = 56.25\%$$

40. (4) ∵ C.P. of 1000 gm of cashew nut = Rs. 250

∴ C.P. of 50 gm of cashew nut

$$= \frac{250}{1000} \times 50 = \text{Rs. } 12.5$$

S.P. of 50 gm of cashew nut = Rs. 10

∴ Loss per cent

$$= \frac{12.5-10}{12.5} \times 100 = 20\%$$

41. (4) C.P. of each book = Re. 1

∴ C.P. of 60 books = Rs. 60

Their S.P. = Rs. 100

∴ Gain per cent

$$= \frac{100-60}{60} \times 100$$

$$= \frac{200}{3} = 66\frac{2}{3}\%$$

42. (4) Let C.P. of each article be Re. 1.

∴ C.P. of 9 articles = Rs. 9

∴ S.P. of 9 articles = Rs. 10

∴ Profit percent

$$= \frac{10-9}{9} \times 100 = \frac{100}{9} = 11\frac{1}{9}\%$$

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43. (1) C.P. of $2\frac{1}{2}$ dozen or 30 eggs

$= \frac{20}{12} \times 30 = \text{Rs. } 50$

Their S.P i.e. S.P. of 24 eggs

$= 22 \times 2 = \text{Rs. } 44$

$\therefore$ Loss = Rs. (50 – 44) = Rs. 6

$\therefore$ Loss % $= \frac{6}{50} \times 100 = 12\%$

44. (3) Here, selling prices are same, Profit-loss percent are same. In such transactions, there is always loss.

Loss percent $= \frac{10 \times 10}{100} = 1\%$

45. (1) Let the man buy in all 30 oranges.

$\therefore$ C.P. of 15 oranges at 3 for Rs. 40 $= \frac{40}{3} \times 15 = \text{Rs. } 200$

Again, C.P. of 15 oranges at 5 for Rs. 60 $= \frac{60}{5} \times 15 = \text{Rs. } 180$

$\therefore$ Total C.P. = Rs. (200 + 180) = Rs. 380

S.P. of 30 oranges

$= \frac{50}{3} \times 30 = \text{Rs. } 500$

$\therefore$ Profit = Rs. (500 – 380) = Rs. 120

$\therefore$ Profit % $= \frac{120}{380} \times 100$

$= 31.58\% = 32\%$

46. (4) C.P. of article = Rs. 100 (let).

$\therefore$ S.P. = Rs. 125

New S.P. = Rs. 250

$\therefore$ Profit percent

$= \frac{250-100}{100} \times 100 = 150\%$

47. (1) S.P. of article

$= \frac{1500 \times 125}{100} = \text{Rs. } 1875$

Net S.P. after paying tax

= Rs. (1875 – 75) = Rs. 1800

$\therefore$ Profit = 1800 – 1500 = Rs. 300

$\therefore$ Profit percent $= \frac{300}{1500} \times 100$

$= 20\%$

48. (1) C.P. of hand-cart

$= \frac{100}{75} \times 720 = \text{Rs. } 960$

For 25% profit

S.P. $= \frac{125}{100} \times 960$

$= \text{Rs. } 1200$

49. (4) Let the cost of each chair be Re. 1.

$\therefore$ C.P. of 30 chairs = Rs. 30.

Their S.P. = Rs. 25

$\therefore$ Loss per cent

$= \frac{30-25}{30} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

50. (1) Profit percent

$= \frac{12-10}{10} \times 100$

$= \frac{2 \times 100}{10} = 20\%$

TYPE-III

1. (4) Cost price of 1 orange = ₹$\frac{3}{7}$

$\therefore$ Cost price of 100 oranges

$= \frac{3}{7} \times 100 = \frac{300}{7}$

$\because 100\% = \frac{300}{7}$

$\therefore 133\% = \frac{300}{7} \times \frac{133}{100} = ₹ 57$

2. (2) C.P. = 12

S.P. = 12 × 1.25 = 15

Total Profit = 15 – 12 = 3

% gain $= \frac{3}{12} \times 100 = 25\%$

3. (1) Let the cost price of 1 book be x

$\therefore$ Cost price of 3 books = 3x

and, cost price of 12 books = 12x

Selling price of 12 books = 1800

$= 12x + 3x = 15x$

$\Rightarrow 15x = 1800$

$\therefore x = \frac{1800}{15} = 120$

The cost price of each book = ₹ 120

4. (3) C.P. of an article = ₹$\frac{10}{11}$

S.P. of an article = ₹$\frac{11}{10}$

$\therefore$ Profit $= \frac{11}{10} - \frac{10}{11}$

$= \frac{121-100}{110} = ₹\frac{21}{110}$

$\therefore$ Profit % $= \frac{\frac{21}{110} \times 100}{\frac{10}{11}}$

$= \frac{2100}{110} \times \frac{11}{10} = 21\%$

5. (1) C.P. of 5 pencils = ₹ 1.

S.P. of 5 pencils = ₹ $\frac{5}{3}$

Gain $= \frac{5}{3} - 1 = \frac{2}{3}$

$\therefore$ Gain % $= \frac{\frac{2}{3}}{1} \times 100 = 66\frac{2}{3}\%$

6. (4) C.P. of 100 oranges = ₹ 350

S.P. of 12 oranges = ₹ 48

$\therefore$ S.P. of 100 oranges

$= \frac{48}{12} \times 100 = ₹ 400$

Profit = ₹ (400 – 350) = ₹ 50

$\therefore$ Profit % $= \frac{50}{350} \times 100 = \frac{100}{7}$

$= 14\frac{2}{7}\%$

7. (3) Suppose the number of oranges bought = LCM of 10 and 9 = 90

C.P. of 90 oranges $= \frac{25}{10} \times 90$

= ₹ 225

S.P. of 90 oranges $= \frac{25}{9} \times 90$

= ₹ 250

Profit % $= \frac{25}{225} \times 100$

$= \frac{100}{9} = 11\frac{1}{9}\%$

8. (4) Total C.P. = ₹ 32

Total S.P. = ₹ (18+2) = ₹ 20

Loss = ₹ (32-20) = ₹ 12

$\therefore$ Loss per cent

$= \frac{12}{32} \times 100 = 37.5\%$

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9. (4) Let number of articles bought = 6 × 5 = 30
C.P. of 30 articles
$= ₹\left(\frac{5}{6}\times 30\right) = ₹\ 25$
S.P. of 30 articles
$= ₹\left(\frac{6}{5}\times 30\right) = ₹\ 36$
∴ Gain %
$= \frac{36-25}{25}\times 100 = 44\%$

10. (4) Total actual C.P.
= ₹ (500 × 10 + 2000) = ₹ 7000
And total S.P.
= ₹ (5 × 750 + 5× 550)
= ₹ (3750 + 2750) = ₹ 6500
Loss = 7000–6500 = ₹ 500
$\text{Loss percent} = \frac{500}{7000}\times 100$
$= \frac{50}{7} = 7\frac{1}{7}\%$

11. (3) Let the CP of each ball = x.
Then, clearly the cost price of (17 – 5) balls = ₹ 720
i.e., $12x = 720 \Rightarrow x = 60$ i.e. ₹ 60

12. (2) CP of 120 excercise books
= ₹ (120 × 3) = ₹ 360
SP of 40 at ₹ 4 each
= ₹ (40 × 4) = ₹ 160
SP of 60 at ₹ 5 each
= ₹ (60 × 5) = ₹ 300
SP of remaining 20 books
= ₹ (20 × 3) = ₹ 60
Total SP = ₹ (160 + 300 + 60)
= ₹ 520
Profit % = ₹ (520 – 360)
= ₹ 160
$\therefore \text{Profit\%} = \frac{160}{360}\times 100$
$= \frac{400}{9} = 44\frac{4}{9}\%$

3. (2) Let the person buy 10 articles.
$\text{Total CP} = ₹\left(1+\frac{5}{4}\right) = ₹\ \frac{9}{4}$
SP of 10 articles
$= ₹\ \frac{2}{9}\times 10 = ₹\ \frac{20}{9}$
$\therefore \text{Loss} = ₹\left(\frac{9}{4}-\frac{20}{9}\right)$
$= ₹\left(\frac{81-80}{36}\right) = ₹\ \frac{1}{36}$
Now, if loss is ₹ $\frac{1}{36}$, number of articles = 10
∴ If loss is ₹ 3, number of articles = 36 × 10 × 3 = 1080

14. (3) Let the number of pencils bought = LCM of 4, 6 = 12
CP of 6 pencils = ₹ 4
∴ CP of 12 pencils = ₹ 8
S.P. of 4 pencils = ₹ 6
∴ S.P. of 12 pencils = ₹ 18
Profit = Rs. (18 – 8) = ₹ 10
$\therefore \text{Profit \%} = \frac{10}{8}\times 100 = 125\%$

15. (4) Let Ravi buy 10 toffees.
∴ C.P. = ₹ 5
S.P. = ₹ 2
$\therefore \text{Loss \%} = \frac{5-2}{5}\times 100 = 60\%$

16. (3) Suppose, number of lemons bought
= LCM of 2, 5, 3 = 30
$\therefore \text{CP} = ₹\left(\frac{1}{2}\times 30\right) = ₹\ 15$
$\text{SP} = ₹\left(\frac{3}{5}\times 30\right) = ₹\ 18$
∴ Gain = ₹ 3
∴ Gain per cent
$= \frac{3}{15}\times 100 = 20\%$

17. (2) C.P. of the tape recorder
$= \frac{100}{95}\times 950 = ₹\ 1000$
Gain = 1040 – 1000
= ₹ 40
$\%\ \text{Gain} = \frac{40}{1000}\times 100 = 4\%$

18. (2) CP of 100 cups
= ₹ 100 × 10 = ₹ 1000
10 cups are broken.
∴ SP of 90 cups = ₹ (90 ×11)
= ₹ 990
Loss = ₹ (1000 – 990)
= ₹ 10
∴ Loss per cent
$= \frac{10}{1000}\times 100 = 1\%$

19. (1) Let the SP of 1 book = x
∴ SP of 25 books = $25x$
According to the question,
$25x - 2000 = 5x$
$\Rightarrow 20x = 2000$
$\Rightarrow x = \frac{2000}{20} = 100$
∴ SP of 1 book = ₹ 100

20. (3) S.P. of 7 pens $= \frac{10\times 140}{100}$
= ₹ 14
∴ S.P. of 1 pen = $\frac{14}{7}$ = ₹ 2
Clearly, 5 pens were sold for ₹ 10

21. (3) C.P. of 12 oranges
$= 60\times\frac{100}{75} = ₹\ 80$
For a gain of 25%,
S.P. of 12 oranges
$= \frac{80\times 125}{100} = ₹\ 100$
Hence, 12 Orange has to sell,
[You can also check through options]

22. (2) Let the man buy 60 oranges (LCM of 20 and 30) of each kind.
CP of the 60 oranges of the first kind = $\frac{60}{20}\times 60 = ₹180$
CP of 60 oranges of second kind
$\frac{60}{30}\times 60 = ₹120$
Total CP of 120 oranges
= (180 + 120) = ₹ 300
$\text{Their SP} = \frac{60}{25}\times 120 = ₹\ 288$
Loss = ₹ (300 – 288) = ₹ 12
∴ Loss Per cent
$= \frac{12}{300}\times 100 = 4\%$

23. (3) Let the vendor buy 20 (LCM of 5 and 4) bananas.
∴ CP of 20 bananas = ₹ 4
SP of 20 bananas = ₹ 5
$\therefore \text{Gain\%} = \frac{5-4}{4}\times 100 = 25\%$

24. (3) If the CP of 20 apples be ₹ x then
$\frac{x\times 120}{100} = 100$
$\Rightarrow x = \frac{100\times 100}{120} = ₹\ \frac{250}{3}$
$\because ₹\ \frac{250}{3} = 20$ apples
$\therefore ₹\ 100 = \frac{20\times 3\times 100}{250}$
= 24 apples

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25. (3) Let he buy 15 eggs.
[LCM of 5 & 3]
∴ CP of 15 eggs = ₹ 25
∴ SP of 15 eggs =₹ 36
∴ Gain = 36 – 25 = ₹ 11
∵ ₹ 11 = 15 eggs

$\therefore$ ₹ 143 = $\frac{15}{11}\times 143$

= 195 eggs

26. (1) Let the man buys 24 (LCM of 8 and 12) oranges.
∴ C.P. of 24 oranges

= $\frac{34}{8}\times 24$ = ₹ 102

S.P. of 24 oranges

= $\frac{57}{12}\times 24$ = ₹ 114

Gain = 114 – 102 = ₹ 12
∵ ₹ 12 = 24 oranges

$\therefore$ ₹ 45 = $\frac{24}{12}\times 45$ = 90 oranges

27. (4) C.P. of 50 pens = 50 × 50
= ₹ 2500
For profit of 10%,

S.P. = $\frac{2500\times 110}{100}$ = ₹ 2750

S.P. of 40 pens at a loss of 5%

= $\frac{40\times 50\times 95}{100}$ = ₹ 1900

∴ S.P. of remaining 10 pens
= 2750 – 1900 = ₹ 850
∴ Gain %

= $\frac{850-500}{500}\times 100 = 70\%$

8. (1) Loss = 5 – 4.50 = 0.50

$\therefore$ Loss percent = $\frac{0.50}{5}\times 100$

= 10%

9. (1) Let the CP of each watch be x.
∴ CP of 14 watches = $14x$
and SP of 14 watches = ₹ 6300
According to the question,
$6300 - 14x = 4x$
$\Rightarrow 18x = 6300$

$\Rightarrow x = \frac{6300}{18}$ = ₹ 350

(3) CP of each article

= ₹ $\frac{P}{12}$ and SP = ₹ $\frac{P}{8}$

Gain = $\frac{P}{8}-\frac{P}{12}=\frac{3P-2P}{24}=\frac{P}{24}$

∴ Gain per cent =

$\frac{\frac{P}{24}}{\frac{P}{12}}\times 100 = 50\%$

31. (3) C.P. of 5 lemons

= $\frac{100}{140}\times 14$ = ₹ 10

∴ C.P. of 12 lemons

= $\frac{10}{5}\times 21$ = ₹ 24

32. (4) If a articles are bought for ₹ x and b articles are sold for ₹ y, then

Gain per cent = $\left(\frac{ya-xb}{xb}\right)\times 100$

= $\frac{(11\times 110-10\times 100)}{10\times 100}\times 100$

= $\frac{1210-1000}{1000}\times 100 = 21\%$

33. (4) Cost price of sewing machine

= $1080\times\frac{100}{90}$

= ₹ 1200
∴ S.P. for a profit of 10%

= $\frac{1200\times 110}{100}$ = ₹ 1320

34. (2) Number of oranges bought = 100 (let)
C.P. = ₹100 (let)
S.P of 40 oranges = ₹ 100

∴ Gain percent = $\frac{100-40}{40}\times 100$

= 150 %
Remaining oranges = 60

Their 80 % = $\frac{60\times 80}{100}$ = 48

These are sold at a profit of 75 %

∴ Their S.P. = $\frac{48\times 175}{100}$ = ₹ 84

∴ Gain per cent = 84%

35. (2) First S.P. of article

= $\frac{200\times 90}{100}$ = ₹ 180

After decrease of 5%,

S.P. = $\frac{180\times 95}{100}$ = ₹ 171

36. (1) C.P. of article

= $\frac{100}{100-\text{loss per cent}}\times$ S.P.

= $\frac{100}{100-15}\times 102$ = ₹ 120

On selling at Rs. 134.40,
Gain = ₹ (134.4 – 120)
= ₹ 14.4
∴ Gain per cent

= $\frac{14.4}{120}\times 100$ = 12%

37. (1) C.P. of first toy = ₹ x
C.P. of second toy = ₹ y

$\therefore \frac{x\times 112}{100} = 504$

$\Rightarrow x = \frac{504\times 100}{112}$ = ₹ 450

Again, $y\times\frac{96}{100} = 504$

$\Rightarrow y = \frac{504\times 100}{96}$ = ₹ 525

Total C.P. = ₹ (450 + 525)
= ₹ 975
Total S.P. = 2 × 504
= ₹ 1008
Gain = 1008 – 975 = ₹ 33

∴ Profit per cent = $\frac{33\times 100}{975}$

= $\frac{44}{13}=3\frac{5}{13}\%$

38. (4) For A,

C.P. of horse = $4800\times\frac{100}{80}$

= ₹ 6000
For B,

S.P. = $\frac{6000\times 115}{100}$ = ₹ 6900

B's profit = Rs. (6900 – 4800)
= ₹ 2100

39. (4) C.P. of each apple = $\frac{100}{10}$

= ₹ 10
S.P. of each apple

= ₹ $\left(10\times\frac{125}{100}\right)$ = ₹ 12.50

∴ Number of apples sold for Rs.

100 = $\frac{100}{12.5}$ = 8

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40. (2) Cost price of table = ₹ x (let)
According to question,

$$\frac{113x}{100} + 25 = \frac{118x}{100}$$

[S. P. at R% profit

$$= \frac{(100+R)}{100} \times \text{C.P.}]$$

$$\Rightarrow \frac{118x}{100} - \frac{113x}{100} = 25$$

$$\Rightarrow \frac{5x}{100} = 25 \Rightarrow \frac{x}{20} = 25$$

$$\Rightarrow x = 25 \times 20 = ₹\ 500$$

41. (3) C.P. of watch = ₹ x (let)

$$\therefore \text{S.P. of watch} = \frac{x \times 95}{100}$$

$$= ₹\ \frac{19x}{20}$$

Case II,

$$\text{S.P.} = ₹\left(\frac{19x}{20} + 56.25\right)$$

Profit percent = 10 %

$$\therefore \frac{x \times 110}{100} = \frac{19x}{20} + 56.25$$

$$\Rightarrow \frac{11x}{10} - \frac{19x}{20} = 56.25$$

$$\Rightarrow \frac{22x - 19x}{20} = 56.25$$

$$\Rightarrow \frac{3x}{20} = 56.25$$

$$\Rightarrow 3x = 56.25 \times 20$$

$$\Rightarrow x = \frac{56.25 \times 20}{3} = ₹\ 375$$

42. (2) C.P. of cycle = ₹ 1650
Loss = 8%
∴ S.P. of cycle

$$= \left(\frac{100 - \text{loss}\%}{100}\right) \times \text{C.P.}$$

$$= \frac{100-8}{100} \times 1650$$

$$= \frac{92 \times 1650}{100} = ₹\ 1518$$

43. (4) C.P. of table = Rs. x (let)
According to question,

$$\frac{x \times 90}{100} = 1800$$

$$\Rightarrow x = \frac{1800 \times 100}{90} = \text{Rs. } 2000$$

For a profit of 15%,

$$\text{S.P.} = \frac{2000 \times 115}{100} = \text{Rs. } 2300$$

44. (2) Cost price for the manufacturer = Rs. x (let)

$$\therefore x \times \frac{118}{100} \times \frac{120}{100} \times \frac{125}{100}$$

$$= 15045$$

$$\Rightarrow x = \frac{15045 \times 1000000}{118 \times 120 \times 125}$$

$$= \text{Rs. } 8500$$

45. (4) Let C.P. of article be Rs. x.
According to the question,
108% of x – 105% of x = 240

$$\Rightarrow \frac{108x}{100} - \frac{105x}{100} = 240$$

$$\Rightarrow \frac{3x}{100} = 240$$

$$\Rightarrow x = \frac{24000}{3} = \text{Rs. } 8000$$

Note : In the original question it is Rs. 40, not Rs. 240.

46. (2) C.P. of radio = Rs. x (let)
According to the question,

$$\frac{130x}{100} - \frac{120x}{100} = 60$$

$$\Rightarrow \frac{10x}{100} = 60$$

$$\Rightarrow x = 60 \times 10 = \text{Rs. } 600$$

47. (1) C.P. of cycle = Rs. x (let)

$$\therefore \text{S.P.} = \frac{110x}{100} = \text{Rs. } \frac{11x}{10}$$

Case II,

$$\text{New C.P.} = \text{Rs. } \frac{9x}{10}$$

$$\therefore \frac{11x}{10} + 60 = \frac{9x}{10} \times \frac{125}{100}$$

$$= \text{Rs. } \frac{9x}{8}$$

$$\Rightarrow \frac{9x}{8} - \frac{11x}{10} = 60$$

$$\Rightarrow \frac{90x - 88x}{80} = 60$$

$$\Rightarrow \frac{2x}{80} = 60$$

$$\Rightarrow \frac{x}{40} = 60$$

$$\Rightarrow x = 60 \times 40$$

$$= \text{Rs. } 2400$$

TYPE-IV

1. (1) According to the question

$$\frac{\text{Cost price}}{\text{Selling price}} = \frac{5}{4}$$

$$\therefore \text{Selling price} = \frac{4}{5} \times \text{Cost price}$$

$$\text{Loss} = \text{Cost price} - \text{Selling price}$$

$$= \text{Cost price} - \frac{4}{5}\ \text{Cost price}$$

$$= \frac{1}{5}\ \text{Cost price}$$

$$\therefore \text{Loss \%} = \frac{\frac{1}{5}\text{Cost price} \times 100}{\text{Cost price}}$$

$$= \frac{100}{5} = 20\%$$

Method 2 : Tricky Approach
₹ 1 is loss on ₹ 5.

$$\therefore \text{loss \%} = \frac{1}{5} \times 100 = 20\%$$

2. (1) **Tricky Approach**

$$\text{Gain\%} = \frac{(21-20)}{20} \times 100$$

$$= \frac{1}{20} \times 100 = 5\%$$

3. (2) Let the C.P. be x
∴ (6 – 4)% of x = 3
⇒ 2% of x = 3

$$\Rightarrow x = \frac{300}{2} = 150$$

∴ S.P. at 4% gain

$$= \frac{150 \times 104}{100} = ₹\ 156$$

and S.P. at 6% gain

$$= \frac{150 \times 106}{100} = ₹\ 159$$

∴ The required ratio
= 156 : 159 = 52 : 53

4. (1) Let Milk : Water = K : 1
∴ S.P. = (K + 1) × 9
C.P. = 10K
Gain = 9 – K

$$\text{Gain \%} = \frac{9-K}{10K} \times 100$$

$$\Rightarrow \frac{9-K}{10K} \times 100 = 20$$

$$\Rightarrow 90 - 10K = 20K$$

$$\Rightarrow 30K = 90$$

$$\Rightarrow K = 3$$

∴ Ratio = 3 : 1

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5. (3) CP of refrigerator = ₹ $5x$
CP of television = ₹ $3x$
$\therefore 2x = 5500$

$$\Rightarrow x = \frac{5500}{2} = 2750$$

$\therefore$ CP of refrigerator = 5×2750
= ₹ 13750

6. (3) Gain per cent

$$\frac{210\times(5+3)-[180\times5+200\times3]}{180\times5+200\times3}\times100$$

$$= \frac{1680-1500}{1500}\times100$$

$$= \frac{180}{1500}\times100 = 12\%$$

7. (4) Let the first investment be $3x$
Then second investment be $5x$
Combined loss %

$$= \frac{3x\times\frac{15}{100}-5x\times\frac{10}{100}}{3x+5x}\times100$$

$$= \frac{\frac{45x}{100}-\frac{50x}{100}}{8x}\times100$$

$$= \frac{-5x}{8x\times100}\times100$$

$$= \frac{-5}{8} \text{ per cent or } \frac{5}{8}\% \text{loss}$$

[–ve sign shows loss].

8. (3) Let the CP = $8x$ and SP = $9x$
$\therefore$ Profit = $(9x - 8x) = x$
$\therefore$ Profit %

$$= \frac{x}{8x}\times100 = \frac{25}{2} = 12.5\%$$

9. (4) Let the printed price of the book be x.
$\therefore$ Selling price = 90% of x

$$= x\times\frac{90}{100} = \frac{9x}{10}$$

If the CP of the book be y, then

$$y\times\frac{112}{100} = \frac{9x}{10}$$

$$\frac{y}{x} = \frac{9}{10}\times\frac{100}{112} = \frac{45}{56} \text{ or } 45:56$$

10. (3) If C.P. = ₹ 100
S.P. = ₹ 300 [gain being 200%]
$\therefore$ Required ratio = 1 : 3

11. (3) Let C.P. be 100 then,
S.P. = 105 [gain being 5%]
Required ratio
= 105 : 100 = 21 : 20

12. (1) Let the cost price = $5x$ and the selling price = $6x$.

$$\text{Gain \%} = \frac{6x-5x}{5x}\times100 = 20\%$$

13. (1) Let Cost price = $10x$
Selling price = $11x$
$\therefore$ Gain per cent

$$= \frac{11x-10x}{10x}\times100$$

$$= \frac{x}{10x}\times100 = 10\%$$

14. (3) $b = a\times\frac{200}{100} = 2a$

$$\frac{b}{a} = 2 \Rightarrow \frac{b}{a}-1 = 2-1$$

$$\Rightarrow \frac{b-a}{a} = 1 \Rightarrow \frac{b-a}{a}\times100 = 100$$

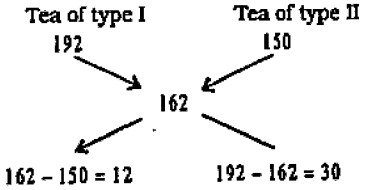
$\therefore$ Gain per cent = 100%

15. (2) B entered after x months.
Ratio of equivalent capitals for 1 month
= 64000 × 12 : 48000 (12 – x)
= 16 : (12 – x)

$$\therefore \frac{16}{12-x} = \frac{2}{1} \Rightarrow 24-2x = 16$$

$\Rightarrow 2x = 8 \Rightarrow x = 4$ months

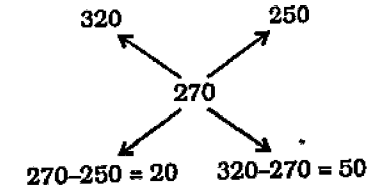
16. (1) By the rule of alligation, CP of mixed tea = $\frac{100}{120}\times194.40$
= ₹ 162 /kg



$\therefore$ Required ratio = $\frac{12}{30} = \frac{2}{5}$ or 2 : 5

17. (4) CP of the mixture

$$= \frac{324\times100}{120} = ₹\ 270$$

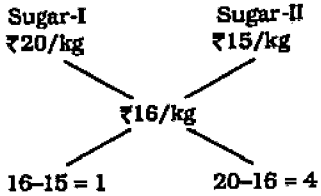


$\therefore$ Required ratio = 2 : 5

18. (4) Let x kg of sugar costing ₹ 20/kg and y kg of sugar costing ₹ 15/kg are mixed.
According to the question,
$20x + 15y = 16(x + y)$
$\Rightarrow 20x + 15y = 16x + 16y$
$\Rightarrow 20x - 16x = 16y - 15y$
$\Rightarrow 4x = y$

$$\therefore \frac{x}{y} = \frac{1}{4} \text{ or } 1:4$$

Method 2 :
By the rule of alligation,

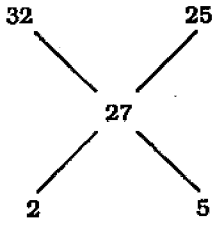


$\therefore$ Required ratio = 1 : 4

19. (4) If the C.P. of the mixture be ₹ x per kg, then

$$x\times\frac{120}{100} = 32.40$$

$$\Rightarrow x = \frac{32.40\times100}{120} = 27$$

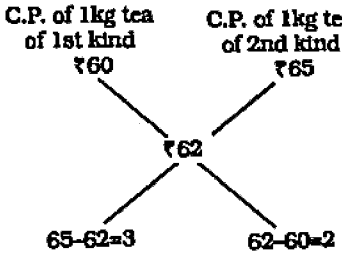


$\therefore$ Required ratio = 2 : 5

20. (1) S.P. of 1 kg mixture
= ₹ 68.20, Gain = 10%
$\therefore$ C.P. of 1 kg mixture

$$= ₹\left(68.20\times\frac{100}{110}\right) = ₹\ 62$$

By the rule of alligation,



$\therefore$ Required ratio = 3 : 2

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21. (2) Average price of blended tea

$= \frac{280\times7+240\times9}{16}$

$= \frac{1960+2160}{16}$

$= \frac{4120}{16} = ₹\ 257.50$ kg

22. (4) C.P. of 40kg of mixture
$= ₹\ (15 \times 29 + 25 \times 20)$
$= ₹\ (435 + 500) = ₹\ 935$
S.P. of 40kg of mixture
$= 27 \times 40 = ₹\ 1080$
$\therefore$ Gain $= 1080 - 935 = ₹\ 145$

23. (2) Let the profit be x
According to question,

$\left(1-\frac{1}{3}-\frac{1}{4}\right)x = ₹\ 5000$

or $\left(\frac{12-4-3}{12}\right)x = ₹\ 5000$

$\frac{5}{12}x = ₹\ 5000$

$\therefore x = \frac{5000\times12}{5}$

$\therefore \frac{1}{3} = \frac{5000\times12}{5\times3} = ₹\ 4000$

24. (1) Ratio of investment of A : B
$= 2560 : 2000 = 32 : 25$
Now, A gained $= ₹\ 320$
B gained $= ₹\ 250$
Total Profit $= ₹\ 110$
$\therefore$ C gained $= ₹\ 535$
According to question,

$\frac{250}{535} = \frac{2000}{\text{C's Capital}}$

Hence, C's capital

$= \frac{2000\times535}{250} = ₹4280$

25. (3) Let the total profit be ₹ x.

$\therefore$ A 's share in profit $= ₹\ \frac{3x}{5}$

B 's share in profit $= ₹\ \frac{x}{5}$

and C 's share in profit $= ₹\ \frac{x}{5}$

According to the question,

$\left(\frac{3x}{5}-\frac{x}{5}\right) = 400$

$\Rightarrow \frac{2x}{5} = 400$

$\Rightarrow x = \frac{400\times5}{2} = ₹\ 1000$

26. (2) $8A = B \times 12 = 6C$

$\Rightarrow \frac{8A}{24} = \frac{12B}{24} = \frac{6C}{24}$

$\Rightarrow \frac{A}{3} = \frac{B}{2} = \frac{C}{4}$

$\therefore$ A : B : C = 3 : 2 : 4
$\therefore$ B's share

$= \frac{2}{3+2+4}\times864$

$= \frac{2}{9}\times864 = ₹\ 192$

27. (4) Initially, A's capital $= ₹\ x$

B's capital $= ₹\ \frac{3x}{2}$

Ratio of the equivalent capitals of A and B for 1 month

$= \left(x\times10+\frac{3x}{4}\times2\right):\left(\frac{3x}{2}\times8+\frac{3x}{4}\times4\right)$

$= \left(10x+\frac{3x}{2}\right):(12x+3x)$

$= 23 : 30$

A' share $= \frac{23}{53}\times53000$

$= ₹\ 23000$

28. (1) Share of rent = (number of oxen × time)
A : B : C
$= (10 \times 7) : (12 \times 5) : (15 \times 30)$
A : B : C = 70 : 60 : 45
A : B : C = 14 : 12 : 9
C's share of rent

$= \frac{9}{14+12+9}\times175$

$= \frac{9}{35}\times175 = 45$

$\therefore$ C's share of rent is ₹ 45

29. (1) Ratio of profit sharing among A, B and C
= Ratio of equivalent capitals of A, B and C for 1 month
$= 320000 \times 4 : 510000 \times 3 : 270000 \times 5$
$= 32 \times 4 : 51 \times 3 : 27 \times 5$
$= 128 : 153 : 135$
Sum of ratios
$= 128 + 153 + 135 = 416$
Total profit $= ₹\ 124800$

$\therefore$ A's share $= \frac{128}{416}\times124800$

$= ₹\ 38400$

30. (2) Ratio of equivalent capitals of A and B for 1 month
$= 100000 \times 36 : 200000 \times 24$
$= 36 : 48 = 3 : 4$

Part of profit gained by A $= \frac{3}{7}$

Part of profit gained by B $= \frac{4}{7}$

$\therefore$ Required difference

$\left(\frac{4}{7}-\frac{3}{7}\right)\times84000 = ₹\ 12000$

31. (4) Ratio of equivalent capitals of A, B and C for 1 month
$= (40500 \times 6 + 45000 \times 6) : (45000 \times 12) : (60000 \times 6 + 45000 \times 6)$
$= (405 + 450) : (450 \times 2) : (600 + 450) = 855 : 900 : 1050$
$= 171 : 180 : 210$
$= 57 : 60 : 70$
Sum of the ratios $= 57 + 60 + 70 = 187$
Required difference

$= \frac{70-57}{187}\times56100$

$= \frac{13}{187}\times56100 = ₹\ 3900$

32. (3) A : B = 1 : 3
B : C = 1 : 3 = 3 : 9
C : D = 1 : 3 = 9 : 27
$\therefore$ A : B : C : D = 1 : 3 : 9 : 27
Sum of ratios = 1 + 3 + 9 + 27 = 40
$\therefore$ C's share in profit

$= \frac{9}{40}\times400000 = ₹\ 90,000$

33. (3) A's investment of ₹ 3500 is for 12 months
B's investment (let it be ₹ x) is for 7 months only.
At the end of the year the profit is divided in the ratio 2 : 3 and it must be equal to the ratio of the product, (Amount × time)

$\frac{12\times3500}{7x} = \frac{2}{3}$

or $x = \frac{12\times3500}{7}\times\frac{3}{2}$

or $x = 9000$

$\therefore$ B's investment is ₹ 9000.

34. (4) Let B remained in business for x months.
Ratio of equivalent capitals
$= 45000 \times 12 : 54000 \times x$
$= 10 : x$

$\therefore \frac{10}{x} = \frac{2}{1}$

$\Rightarrow 2x = 10 \Rightarrow x = 5$
Clearly, B joined after $(12 - 5) = 7$ months.

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35. (1) Initial investment :
A = ₹ $5x$
B = ₹ $4x$
C = ₹ $3x$
∴ Ratio of their equivalent capitals for 1 month
$= 5x \times 12 : (4x \times 4 + (4x + 1000) \times 8) : (3x \times 8 + (3x + 2000) \times 4)$
$= 15x : (12x + 2000) : (9x + 2000)$

$$\therefore \frac{15x}{12x+2000} = \frac{15}{14}$$

$\Rightarrow 14x = 12x + 2000$
$\Rightarrow 2x = 2000$
$\Rightarrow x =$ ₹ 1000
∴ C's investment = ₹ 3000

36. (2) Ratio of equivalent capitals of A, B and C for 1 month

$$= \left(x \times 6 + \frac{3x}{2} \times 6\right) : (2x \times 6 + 4x \times 6) : (4x \times 6 + 3x \times 6)$$

$= 15x : 36x : 42x$
$= 5 : 12 : 14$

37. (1) A : B = 5 : 4 = 10 : 8
B : C = 8 : 9
∴ A : B : C = 10 : 8 : 9
Sum of ratios = 10 + 8 + 9 = 27

$$\therefore \text{C's share} = \frac{9}{27} \times 3600$$

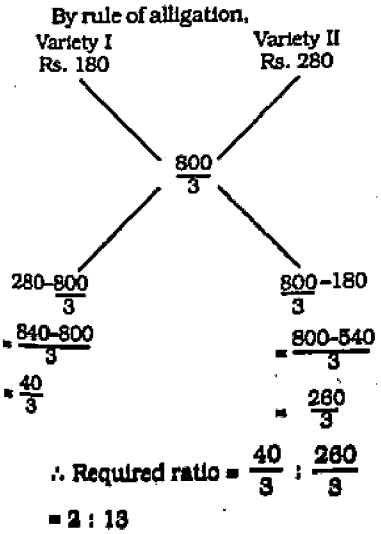
= ₹ 1200

38. (4) C.P. of mixture

$$= \frac{320 \times 100}{120}$$

$$= \text{Rs. } \frac{800}{3} \text{ per kg.}$$

By rule of alligation,



$$\therefore \text{Required ratio} = \frac{40}{3} : \frac{260}{3}$$

= 2 : 13

39. (3) C.P. of mobile = Rs. x (let)

$$\therefore \frac{x \times 112}{100} = P$$

and, $\frac{96x}{100} = Q$

$$\therefore Q : P = \frac{96x}{100} : \frac{112x}{100}$$

= 96 : 112 = 6 : 7

40. (3) Cost price = Rs. $10x$
S.P. = Rs. $11x$
∴ Gain per cent

$$= \frac{(11x - 10x)}{10x} \times 100$$

$$= \frac{100}{10} = 10\%$$

41. (2) Distribution among A, B and C :

Actual ratio $= \frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

$$= \left(\frac{1}{2} \times 12\right) : \left(\frac{1}{3} \times 12\right) : \left(\frac{1}{4} \times 12\right)$$

= 6 : 4 : 3
Wrong ratio = 2 : 3 : 4
Clearly, C gained.
Gain

$$= \text{Rs. } \left(\frac{4}{9} \times 1170 - \frac{3}{13} \times 1170\right)$$

= Rs. (520 − 270) = Rs. 250

42. (2) C.P. of first watch = Rs. $16x$
C.P. of second watch = Rs. $23x$
According to the question,
Ratio after corresponding increases,

$$= \frac{11}{20}$$

$$\Rightarrow \frac{16x \times 110}{100} = \frac{11}{20}$$

$$\Rightarrow \frac{1760x}{23x + 477} = \frac{11}{20}$$

$$\Rightarrow \frac{160x}{100(23x + 477)} = \frac{11}{20}$$

$$\Rightarrow \frac{160x}{5(23x + 477)} = 1$$

$\Rightarrow 160x = 115x + 2385$
$\Rightarrow 160x - 115x = 2385$.
$\Rightarrow 45x = 2385$

$$\Rightarrow x = \frac{2385}{45} = 53$$

∴ Original C.P of second watch
= Rs. $23x$
= Rs. (23 × 53)
= Rs. 1219

43. (1) Let 3 litres of liquid X and 2 litres of liquid Y be mixed together.
Cost of liquid Y = Rs. x /litre
Cost of liquid Y = Rs. $(x + 2)$/litre
According to the question,
Cost of the mixture
= Rs. $(3x + 6 + 2x)$ = Rs. $(5x + 6)$

$$\therefore (5x + 6) \times \frac{110}{100} = 11 \times 5$$

$$\Rightarrow 5x + 6 = \frac{11 \times 5 \times 10}{11} = 50$$

$\Rightarrow 5x = 50 - 6 = 44$

$$\Rightarrow x = \frac{44}{5} = \text{Rs. } 8.8$$

∴ Cost of liquid X = 8.8 + 2
= Rs. 10.8/litre

44. (1) If the cost of milk be Rs. 100, then S.P. = Rs. 120
∴ Required ratio = 20 : 100 = 1 : 5

45. (4) Let total profit be Rs. x.
Remaining profit after donations to charity

$$= \text{Rs. } \frac{95x}{100}$$

$$= \text{Rs. } \frac{19x}{20}$$

A : B = 3 : 2
Sum of the terms of the ratio
= 3 + 2 = 5

$$\therefore \text{A's share} = \frac{19x}{20} \times \frac{3}{5}$$

$$\therefore \frac{19x \times 3x}{100} = 8550$$

$$\Rightarrow x = \frac{8550 \times 100}{19 \times 3} = \text{Rs. } 15000$$

TYPE-V

1. (4) The S.P. after the first discount of 5% on ₹ 80 = ₹ $\left(80 - \frac{5 \times 80}{100}\right)$
= ₹ (80 − 4) = ₹ 76
Again, after 5% discount on ₹ 76,

$$\text{S.P.} = ₹ \left(76 - \frac{5 \times 76}{100}\right)$$

= ₹ (76 − 3.80) = ₹ 72.20

2. (1) C.P. of first buyer
= ₹ (840 + 10% of 840)
= ₹ (840 + 84) = ₹ 924
Now, this item is sold to the second buyer at 5% loss.
∴ Final selling price

$$= ₹ \left(\frac{95}{100} \times 924\right) = ₹ 877.80$$

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3. (3) For two consecutive gains of x% and y%,

Effective gain = $\left(x+y+\frac{xy}{100}\right)$%

His total gain per cent

$=\left(20+30+\frac{20\times30}{100}\right)=56\%$

4. (1) If the value of a number is first increased by x% and later decreased by x%, the net change is always a decrease which is equal to $\frac{x^2}{100}$%.

∴ Required decrease

$=\frac{20\times20}{100}=4\%$

5. (2) Gain per cent

$=\left(10+10+\frac{10\times10}{100}\right)\%=21\%$

TYPE-VI

1. (4) 90% of C.P. = ₹ 240

∴ C.P = ₹ $\frac{240\times100}{90}$

New S.P. = 120% of C.P.

$=₹\ 240\times\frac{100}{90}\times\frac{120}{100}=₹\ 320$

2. (3) According to question,
S.P. = ₹ 480
Loss% = 20%

∴ Cost price $=\frac{100}{80}\times480$

= ₹ 200

∴ Required price

$=\frac{120}{100}\times600=₹\ 720$

3. (4) C.P. of that article

$=72\times\frac{100}{100-10}$

$=\frac{72\times100}{90}=₹\ 80$

∴ S.P. of that article on 5% gain

$=80\times\frac{105}{100}=₹\ 84$

4. (4) 89% of the cost price
= ₹ 178

∴ 111% of the cost price

$=₹\ \frac{178}{89}\times111=₹\ 222$

5. (3) **Tricky Approach**
Let C.P. = 100x
(100 − 9)x = 105

(100 + 30)% $x=\frac{105}{91}\times130$

= ₹ 150

6. (1) CP of 200kg of sugar
= ₹ (80 × 13.50 + 120 × 16)
= ₹ (1080 + 1920) = ₹ 3000
∴ CP of 1 Kg of sugar

$=\frac{3000}{200}=₹\ 15$

∴ To gain 20% SP $=15\times\frac{120}{100}$

= ₹ 18 /kg.

7. (2) Let the quantity of water mixed be x kg.
Let the CP of 1 kg of pure milk = ₹ 1

∴ Gain percent= $\frac{x}{50}\times100$

$\Rightarrow 2x=10\Rightarrow x=5$ kg.

8. (2) SP of article = ₹ 69
Loss % = 8%

∴ CP = ₹ $\frac{100\times69}{92}$

= ₹ 75
New SP = ₹ 78
∴ Gain %

$=\frac{78-75}{75}\times100=4\%$

9. (4) 100% = 6

C.P. = 80% $=\frac{6}{100}\times80=\frac{24}{5}$

Now, 120% = $\frac{24}{5}$

100% $=\frac{24\times100}{5\times120}=4$

10. (3) C.P.

$=\frac{100}{100-\text{Loss}\%}\times\text{S.P.}$

$=\frac{100}{90}\times45000=₹\ 50000$

∴ S.P. = 115% of ₹ 50000

$=₹\ \frac{50000\times115}{100}=₹\ 57,500$

11. (1) C.P. of radio = $\frac{100}{110}\times990$

= ₹ 900
∴ Loss = 900 − 890 = ₹ 10

12. (1) C.P. of table

$=1140\times\frac{100}{95}=₹\ 1200$

S.P. at 5% gain

$=\frac{1200\times105}{100}=₹\ 1260$

13. (2) If C.P. of radio be ₹ x, then
10% of x = 100
$\Rightarrow x=1000$

For a gain of $12\frac{1}{2}$%

S.P. $=1000\times\frac{\left(100+\frac{25}{2}\right)}{100}$

$=\frac{1000\times225}{200}=₹\ 1125$

14. (4) C.P. of fan

$=₹\left(\frac{600\times100}{90}\right)$

∴ Required S.P.

$=\frac{600\times100}{90}\times\frac{120}{100}=₹\ 800$

15. (4) If the initial C.P. of car be Rs. x, then

∴ First S.P. = $\frac{9x}{10}$

∴ $\frac{9x}{10}\times\frac{120}{100}=54000$

$\Rightarrow x=\frac{54000\times1000}{9\times120}$

= ₹ 50000

16. (3) C.P. of article = $\frac{170\times100}{85}$

= ₹ 200

∴ Required S.P. = $\frac{200\times120}{100}$

= ₹ 240

17. (1) CP of chair

$=\frac{100}{75}\times720=₹\ 960$

To gain 25%, SP

$=\frac{125}{100}\times960=₹\ 1200$

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18. (1) Let CP of basket be ₹ x.
$\therefore$ 130% of x = 19.50,
$\Rightarrow \frac{130 \times x}{100} = 19.50$
$\Rightarrow x = \frac{19.50 \times 100}{130}$ = ₹ 15
For 40% gain,
SP = $\frac{140 \times 15}{100}$ = ₹ 21

19. (4) CP of 1 egg = $\frac{720}{20 \times 12}$ = ₹ 3
$\therefore$ Required SP of 1 egg
= 3 × $\frac{120}{100}$ = ₹ 3.60

20. (4) CP of the article
$\frac{100}{100 - \text{loss\%}} \times$ S.P.
= ₹ $\left(\frac{100}{95} \times 665\right)$ = ₹ 700
For the gain of 12%
SP of the article = 112% of 700
= $\frac{700 \times 112}{100}$ = ₹ 784

21. (4) C.P. of article
= $\frac{100}{100 - \text{Loss\%}} \times$ S.P.
= $\frac{100}{100 - 30} \times 700$ = ₹ 1000
S.P. for a profit of 30%
= 1000 × $\frac{130}{100}$ = ₹ 1300

22. (4) C.P. of wrist watch
= $\frac{720 \times 100}{75}$ = ₹ 960
$\therefore$ Required S.P.
= $\frac{960 \times 125}{100}$ = ₹ 1200

23. (3) C.P. of article = ₹ x
$\therefore$ S.P. = $\frac{112x}{100}$
New C.P. = $\frac{9x}{10}$
S.P. = $\frac{9x}{10} \times \frac{130}{100} = \frac{117x}{100}$
$\therefore \frac{117x}{100} - \frac{112x}{100} = 5.75$
$\Rightarrow \frac{5x}{100} = 5.75$
$\Rightarrow x = \frac{5.75 \times 100}{5}$ = ₹ 115
$\therefore$ Required S.P. = $\frac{115 \times 120}{100}$
= ₹ 138

24. (1) C.P. of 80 ball pens
= $140 \times \frac{100}{70}$ = ₹ 200
For a gain of 30%
S.P. = $\frac{200 \times 130}{100}$ = ₹ 260
$\because$ ₹ 260 = 80 ball pens
$\therefore$ ₹ 104 = $\frac{80}{260} \times 104 = 32$

25. (1) C.P. of 90 ball pens
= $\frac{100}{80} \times 160$ = ₹ 200
S.P. for a gain of 20%
= $\frac{200 \times 120}{100}$ = ₹ 240
$\because$ ₹ 240 = 90 ball pens
$\therefore$ ₹ 96 = $\frac{90}{240} \times 96 = 36$

26. (3) Total cost of rice
= ₹ (3 × 10 + 35 × 11)
= ₹ (300 + 385) = ₹ 685
Required S.P. = Rs. $\left(\frac{685 \times 130}{100}\right)$
Rate per kg = $\frac{685 \times 130}{65 \times 100}$
= ₹ 13.7

27. (4) Actual cost price of flat
= ₹ (925000 + 35000)
= ₹ 960000
S.P. = ₹ 1080000
Profit
= ₹ (1080000 − 960000)
= ₹ 120000
Profit percent
= $\frac{120000}{960000} \times 100 = 12.5\%$

TYPE-VII

1. (3) Difference in percentage of sales tax
= $\frac{7}{2} - \frac{10}{3} = \frac{21 - 20}{6} = \frac{1}{6}\%$
$\therefore$ Required difference
= $\frac{1}{6}\%$ of 8400
= $\frac{1}{6} \times \frac{1}{100} \times 8400$ = ₹ 14

2. (3) Suppose marked price = ₹ x
$\therefore$ S.P. = ₹ $\frac{2x}{3}$
CP = $\frac{2x}{3 \times 90} \times 100 = \frac{20x}{27}$
Profit at marked price
= $x - \frac{20x}{27} = \frac{7x}{27}$
$\therefore$ Per cent profit = $\frac{\frac{7x}{27}}{\frac{20x}{27}} \times 100$
= $\frac{7x}{27} \times \frac{27}{20x} \times 100 = 35\%$

3. (2) Let the CP of the article be ₹ 100.
$\therefore$ SP = Rs. 119
If the marked price be ₹ x, then,
$\frac{85}{100}$ of x = 119
$\Rightarrow \frac{85}{100} \times x = 119$
$\Rightarrow x = \frac{119 \times 100}{85} = 140$
Clearly, the marked price is 40% above the cost price.

4. (2) Let the marked price of the television be ₹ x.
CP for Rita = ₹ (16800 − 800)
= ₹ 16000
$\therefore$ 80% of x = 16000
$\Rightarrow x = \frac{16000 \times 100}{80}$
= ₹ 20000

5. (1) Let the marked price of the article be ₹ x.
$\therefore \frac{90x}{100} = \frac{800 \times 1125}{100}$

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$\Rightarrow \frac{9x}{10} = 900$

$\Rightarrow x = \frac{900 \times 10}{9} = ₹\ 1000$

6. (4) Let the advertised price be x.

$\Rightarrow$ S.P. $= \frac{77x}{100}$

$\Rightarrow$ C.P. $= \left(\frac{77x}{100} - 56\right)$

$\therefore \frac{77x-5600}{100} \times \frac{110}{100} = \frac{77x}{100}$

$\Rightarrow \frac{77x-5600}{100} = \frac{77x}{110} = \frac{7x}{10}$

$\Rightarrow 77x - 5600 = 70x$

$\Rightarrow 7x = 5600$

$\Rightarrow x = ₹\ 800$

7. (3) Let the CP be ₹ 100. Then, SP = ₹ 120.
Let the marked price be x.
Then, 90% of x = 120

$\Rightarrow x = \frac{120 \times 100}{90} = \frac{400}{3}$

$= 133\frac{1}{3}\%$

It means he should mark $33\frac{1}{3}\%$ higher than CP.

8. (4) Let the CP of article be 100.
$\therefore$ Marked price = ₹ 110
After 10% discount,
SP = 90% of ₹ 110 = ₹ 99
$\therefore$ Loss = ₹ 1 i.e. 1% of loss

9. (2) Let the original S.P. be x.
C.P. of the article

$= \frac{300 \times 100}{150} = ₹\ 200$

After corresponding increases

$\frac{x \times 120}{100} - 200 = 2(x - 200)$

$\Rightarrow \frac{6x}{5} - 200 = 2x - 400$

$\Rightarrow 6x - 1000 = 10x - 2000$

$\Rightarrow 4x = 1000 \Rightarrow x = ₹\ 250$

10. (4) Marked price of tape recorder

$= \frac{1500 \times 120}{100} = ₹\ 1800$

Gain $= \frac{1500 \times 8}{100} = ₹\ 120$

Discount = 1800 – (1500 + 120)
= ₹ 180

Let Discount per cent = x%, then

$\frac{1800 \times x}{100} = 180$

$\Rightarrow x = 10\%$

Method 2 :
If the discount be x%, then

$20 - x - \frac{20x}{100} = 8$

$\Rightarrow 20 - \frac{6x}{5} = 8$

$\Rightarrow \frac{6x}{5} = 20 - 8 = 12$

$\Rightarrow x = \frac{12 \times 5}{6} = 10\%$

11. (1) Let the C.P. be ₹ 100 and the marked price be ₹ x.

$\therefore x \times \frac{88}{100} = 132$

$\Rightarrow x = \frac{132 \times 100}{88}$

= 150 i.e., more by 50%

12. (1) If the marked price of the washing machine be ₹ x, then

$\frac{x \times 88}{100} = \frac{7660 \times 110}{100}$

$\Rightarrow x = \frac{7660 \times 110}{88} = ₹\ 9575$

13. (1) S.P. of each book $= \frac{75 \times 70}{100}$
= ₹ 52.50
Total S.P. = 1600 × 52.50
= ₹ 84000
Gain = 84000 – 70000 = ₹ 14000

$\therefore$ Gain% $= \frac{14000}{70000} \times 100 = 20\%$

14. (1) Let list price of article
= ₹ 100
$\therefore$ CP for Richa

$= 100 \times \frac{4}{5} = ₹\ 80$

$\therefore$ S.P. for Richa = ₹ 120
$\therefore$ Gain = 120 – 80 = ₹ 40

$\therefore$ Gain per cent $= \frac{40}{80} \times 100$

= 50%

15. (4) Let the cost price be 100 and marked price be ₹ x.

Then, $\frac{x \times 90}{100} = 108$

$\Rightarrow \frac{9x}{10} = 108$

$\Rightarrow x = \frac{108 \times 10}{9} = 120$

$\therefore$ Required percentage = 20%

16. (4) Let C.P. of each sari = ₹ x

Marked price $= \left(\frac{112x}{100}\right)$

$\therefore \frac{95}{100} \times \frac{112x}{100} = 266$

$\Rightarrow x = \frac{266 \times 100 \times 100}{95 \times 112} = ₹\ 25$

17. (1) Let Marked price = ₹ x

$\therefore$ C.P. $= \frac{7x}{10}$

S.P. $= \frac{7x}{10} \times \frac{140}{100} = \frac{98x}{100}$

$\therefore$ Loss $= x - \frac{98x}{100} = \frac{2x}{100}$

$\therefore$ Loss per cent

$= \frac{2x}{100 \times x} \times 100 = 2\%$

18. (4) If the marked price b
Rs. 100, then
C.P. = ₹ 75
S.P. = ₹ 100

$\therefore$ Gain per cent $= \frac{25}{75} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

19. (3) S.P. of article $= \frac{450 \times 90}{100}$
= ₹ 405

20. (3) C.P. of the article = ₹ 100 an
marked price = x

$\therefore x \times \frac{90}{100} = 117$

$\Rightarrow x = \frac{117 \times 100}{90}$

= 130 i.e. 30% above C.P.

21. (3) C.P. of article = ₹ 100
$\therefore$ Marked price = ₹ 130
Selling price

$= \frac{130 \times \left(100 - \frac{25}{4}\right)}{100}$

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$= \frac{130 \times 375}{400} = ₹\frac{975}{8}$

$= ₹\left(121\frac{7}{8}\right)$

$\therefore$ Gain $= 21\frac{7}{8}\%$

22. (3) C.P. of article = ₹100
Marked price = ₹ 125

S.P. $= \frac{125 \times 84}{100} =$ ₹ 105

Gain per cent = 5%
Method 2 :
Gain per cent

$= \left(25 - 16 - \frac{25 \times 16}{100}\right)\% = 5\%$

Gain % $= \frac{x - y - xy}{100}$

23. (4) Marked price = ₹ x

$\therefore$ C.P. $= \frac{70x}{100} = ₹\frac{7x}{10}$

$\therefore \frac{7x}{10} \times \frac{125}{100} = 8750$

$\Rightarrow x = \frac{8750 \times 1000}{7 \times 125} =$ ₹ 10000

24. (2) Marked price of article = ₹ x
$\therefore x \times (100 - 12)\% = 440$

$\Rightarrow x \times \frac{88}{100} = 440$

$\Rightarrow x = \frac{440 \times 100}{88} =$ ₹ 500

25. (*)Let the marked price of watch be Rs. x

$\therefore$ S.P $=$ Rs. $\frac{4x}{5}$ = C.P. of Pratap

S.P. for Pratap

$=$ Rs. $\frac{117 \times x}{100} =$ Rs. $\frac{117x}{100}$

$\therefore$ Gain $= \frac{117x}{100} - \frac{4x}{5}$

$= \frac{117x - 80x}{100}$

$=$ Rs. $\frac{37x}{100}$

$\therefore$ Gain percent $= \frac{\frac{37x}{100}}{\frac{4x}{5}} \times 100$

$= \frac{37 \times 5}{4} = 46.25\%$

26. (2) Let the marked price be Rs. 100.
Mohan's C.P. = Rs. 80

Mohan's S.P. $= \frac{80 \times 140}{100}$

= Rs. 112

$\therefore$ Required profit percent = 12%

TYPE-VIII

1. (3) Let the cost price of the commodity = ₹ x
According to the question,
$524 - x = x - 452$
or $2x = 524 + 452$
or $2x = 976$

or $x = \frac{976}{2} = 488$

The required price = ₹ 488

2. (2) Let the cost price be x.
$\therefore (100 + x)\%$ of $x = 144$
$\Rightarrow (100 + x)x = 14400$
$\Rightarrow x^2 + 100x - 14400 = 0$
$\Rightarrow x^2 + 180x - 80x - 14400 = 0$
$\Rightarrow x(x + 180) - 80(x + 180) = 0$
$\Rightarrow (x + 180)(x - 80) = 0$
$\Rightarrow x =$ ₹ 80 $[x \neq -180]$

3. (1) CP of 144 hens − SP of 144 hens = Loss = SP of 6 hens
$\therefore$ SP of 150 hens
= CP of 144 hens
Let CP of each hen = ₹ 1
CP of 150 hens = ₹ 150
SP of 150 hens = ₹ 144

$\therefore$ Loss% $= \frac{6}{150} \times 100 = 4\%$

4. (4) Let the CP of the article be x
Gain % = x%

$\therefore \frac{39 - x}{x} \times 100 = x$

$\Rightarrow 3900 - 100x = x^2$
$\Rightarrow x^2 + 100x - 3900 = 0$
$\Rightarrow x^2 + 130x - 30x - 3900 = 0$
$\Rightarrow x(x + 130) - 30(x + 130) = 0$
$\Rightarrow (x - 30)(x + 130) = 0$
$\Rightarrow x = 30$ as x cannot be negative

5. (1) SP of 12 ball pens = CP of 12 ball pens + SP of 4 ball pens.
$\Rightarrow$ SP of 8 ball pens = CP of 12 ball pens

$\therefore$ Gain per cent

$= \frac{4}{8} \times 100 = 50\%$

6. (2) Let the cost price of article be ₹ x

$\therefore \left(\frac{100 + x}{100}\right)$ of $x = 75$

$\Rightarrow x^2 + 100x - 7500 = 0$
$\Rightarrow x^2 + 150x - 50x - 7500 = 0$
$\Rightarrow x(x + 150) - 50(x + 150) = 0$
$\Rightarrow (x - 50)(x + 150) = 0$
$\Rightarrow x = 50$ as x can't be negative

7. (3) Let the C.P. of article be x, then, $425 - x = x - 355$
$\Rightarrow 2x = 425 + 355 = 780$

$\Rightarrow x = \frac{780}{2} =$ ₹ 390

8. (3) S.P. of 3 articles
= C.P. of 21 articles − S.P. of 21 articles
$\Rightarrow$ S.P. of 24 articles
= C.P. of 21 articles

$\therefore$ Loss percent $= \frac{24 - 21}{24} \times 100$

$= 12\frac{1}{2}\%$

9. (2) S.P. of 250 chairs − C.P. of 250 chairs
= S.P. of 50 chairs
$\Rightarrow$ S.P. of 200 chairs
= C.P. of 250 chairs
$\therefore$ profit%

$= \frac{250 - 200}{200} \times 100 = 25\%$

10. (4) Let C.P. of a ball = x
S.P. of 17 balls = ₹ 720
$\therefore 17x - 720 = 5x$
$\Rightarrow 12x = 720$
$\Rightarrow x =$ ₹ 60

11. (3) S.P. of 36 oranges = C.P. of 36 oranges − S.P. of 4 oranges
$\Rightarrow$ S.P. of 40 oranges
= C.P. of 36 oranges
$\therefore$ Loss per cent

$= \frac{4}{40} \times 100 = 10\%$

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TYPE-IX

1. (1) Let the cost price of the article = ₹ x
S.P. at 10% loss
$= x \times \frac{90}{100} = \frac{9x}{10}$
S.P. at $12\frac{1}{2}$% gain
$= x \times \frac{100+12\frac{1}{2}}{100} = \frac{225x}{200}$
According to the question
$\frac{9x}{10} + 9 = \frac{225x}{200}$
$\Rightarrow 180x + 1800 = 225x$
$\Rightarrow 225x - 180x = 1800$
$\Rightarrow 45x = 1800$
$\therefore x =$ ₹ 40

2. (2) **Tricky Approach**
80% x + 12 = 110%
Let x be the cost price
$\Rightarrow$ 30% x = 12
$= \frac{12}{30} \times 100 =$ ₹ 40

3. (3) The article is sold at 11% loss.
$\therefore$ 89% of CP = ₹ 178
$\Rightarrow$ CP = ₹ $\frac{178 \times 100}{89}$ = ₹ 200
To gain 11%,
S.P. = 111% of ₹ 200
= ₹ $\frac{111}{100} \times 200$ = ₹ 222

4. (1) Let the C.P be ₹ x.
First selling price
= 90% of x = ₹ $\frac{9x}{10}$
Second selling price
$= \left(\frac{9x}{10} + 10\right)$
$\therefore$ 110% of $x = \left(\frac{9x}{10} + 10\right)$
$\Rightarrow \frac{11x}{10} = \frac{9x}{10} + 10 \Rightarrow \frac{2x}{10} = 10$
$\Rightarrow x = \frac{10 \times 10}{2} = 50 =$ ₹ 50

5. (3) Let the CP of the book be ₹ x.
Initial SP = $\frac{110}{100} \times x = 1.1x$
New CP = 0.96 x
New SP
$= \left(100 + \frac{75}{4}\right)$% of $0.96x$
$= \frac{475}{400} \times 0.96x$
$= 1.14x$
Therefore,
$1.14x - 1.1x = 6$
$\Rightarrow 0.04x = 6$
$\Rightarrow x = \frac{6}{0.04} = \frac{600}{4} = 150$
$\therefore$ CP = ₹ 150

6. (4) Let the CP of the typewriter be ₹ x.
At 5% loss, SP = $\frac{95x}{100}$
Now, $\frac{95x}{100} + 80 = \frac{105x}{100}$
$\Rightarrow \frac{105x}{100} - \frac{95x}{100} = 80$
$\Rightarrow \frac{105x - 95x}{100} = 80$
$\Rightarrow x = \frac{8000}{10} =$ ₹ 800

7. (3) Let the first CP of the commodity be ₹ 100.
$\therefore$ First SP = ₹ 110
Second CP = ₹ 90
Gain% = $\frac{50}{3}$%
$\therefore$ Second SP
$= \left(100 + \frac{50}{3}\right)$% of 90
$= ₹\left(90 \times \frac{350}{300}\right) =$ ₹ 105
Difference of first and second S.P.
= ₹ (110–105) = ₹ 5
$\because$ If the difference is ₹ 5, the CP = ₹ 100.
$\because$ If the difference be ₹ 2, the
CP = $\frac{100}{5} \times 2$ = ₹ 40

8. (3) Let the CP of the cooker be ₹ x.
$\therefore$ Initial SP = $\frac{116x}{100}$
Again, SP = $\left(\frac{116x}{100} + 20\right)$
$\therefore \frac{116x}{100} + 20 = \frac{120x}{100}$
$\Rightarrow 116x + 2000 = 120x$
$\Rightarrow 4x = 2000$
$\Rightarrow x = \frac{2000}{4} =$ ₹ 500

9. (3) CP of the article
$= \left(\frac{100}{112} \times 2576\right) =$ ₹ 2300
New CP = ₹ 2200
$\therefore$ Gain per cent
$= \frac{2576 - 2200}{2200} \times 100 = 17\frac{1}{11}$

10. (4) Let the CP of the article be ₹ x
SP of the article at 20% loss
$= x \times \frac{80}{100} = \frac{4x}{5}$
In second case,
$\frac{4x}{5} + 50 = \frac{105x}{100}$
$\Rightarrow \frac{4x}{5} + 50 = \frac{21x}{20}$
$\Rightarrow \frac{21x}{20} - \frac{4x}{5} = 50$
$\Rightarrow \frac{21x - 16x}{20} = 50$
$\Rightarrow \frac{5x}{20} = 50$
$\Rightarrow x =$ ₹ 200

11. (2) Let the CP of the article be ₹ x.
$\therefore \frac{120x}{100} - \frac{80x}{100} = 60$
$\Rightarrow 40x = 60 \times 100$
$\Rightarrow x = \frac{60 \times 100}{40} =$ ₹ 150

12. (2) Let the CP of cycle be ₹ x.
S.P. = $\frac{108x}{100}$
$\frac{108x}{100} + 75 = \frac{114x}{100}$
$\Rightarrow 108x + 7500 = 114x$
$\Rightarrow 114x - 108x = 7500$
$\Rightarrow 6x = 7500$
$\Rightarrow x = \frac{7500}{6} =$ ₹ 1250

13. (1) If the cost price of the book be ₹ x, then
$\therefore \frac{x \times 80}{100} + 108 = \frac{x \times 130}{100}$
$\Rightarrow \frac{5x}{10} = 108 \Rightarrow x =$ ₹ 216

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14. (3) Let the C.P. be ₹ x

$x(5\% + 5\%) = 5$ [Being 5% gain]

$100\% = \frac{5}{10} \times 100 = ₹ 50$

15. (3) Let the C.P. of article be ₹x, then

$\frac{120x}{100} - \frac{115x}{100} = 27$

$\Rightarrow \frac{5x}{100} = 27$

$\Rightarrow x = \frac{27 \times 100}{5} = ₹ 540$

16. (3) C.P. of article be ₹x

S.P. at 15% gain

$= \frac{115x}{100} = \frac{23x}{20}$

New C.P. $= ₹ \frac{90x}{100}$

New S.P.

$= ₹ \frac{90x}{100} \times \frac{125}{100} = ₹ \frac{9x}{8}$

$\therefore \frac{23x}{20} - \frac{9x}{8} = 4$

$\Rightarrow \frac{46x - 45x}{40} = 4$

$\Rightarrow x = 40 \times 4 = ₹ 160$

17. (1) If the C.P. of article be ₹ x, then

$\frac{105x}{100} - \frac{90x}{100} = 90$

$\Rightarrow \frac{15x}{100} = 90 \Rightarrow x = \frac{90 \times 100}{15}$

$x = ₹ 600$

$\therefore$ Original S.P. $= \frac{600 \times 90}{100}$

$= ₹ 540$

18. (2) C.P. of article $= ₹ x$

$\therefore$ First S.P. $= \frac{80x}{100} = ₹ \frac{4x}{5}$

According to question,

$\frac{4x}{5} + 200 = \frac{105x}{100} = \frac{21x}{20}$

$\Rightarrow \frac{21x}{20} - \frac{4x}{5} = 200$

$\Rightarrow \frac{21x - 16x}{20} = 200$

$\Rightarrow \frac{5x}{20} = 200 \Rightarrow x = 4 \times 200$

$= ₹ 800$

19. (3) C.P. of the article be ₹ x

$\therefore$ First S.P. $= \frac{19x}{20}$

C.P. $= \frac{9x}{10}$

$\therefore \frac{19x}{20} + 33$

$\Rightarrow \frac{9x \times 130}{1000} = \frac{117}{100}x$

$\Rightarrow \frac{117x}{100} - \frac{19x}{20} = 33$

$\Rightarrow \frac{117x - 95x}{100} = 33$

$\Rightarrow 22x = 33 \times 100$

$\Rightarrow x = \frac{33 \times 100}{22} = ₹ 150$

20. (1) If the C.P. of article be ₹ x, then

$x \times \frac{116}{100} + 200 = \frac{x \times 120}{100}$

$\Rightarrow x \times \frac{4}{100} = 200$

$\Rightarrow x = \frac{200 \times 100}{4} = ₹ 5000$

21. (4) Required S.P. of 150 pens.

$= 150 \times 12 \times \frac{115}{100} = ₹ 2070$

S.P. of first 50 pens

$= \frac{50 \times 12 \times 110}{100} = ₹ 660$

$\therefore$ Required S.P. of 100 pens

$= 2070 - 660 = ₹ 1410$

C.P. of 100 pens = ₹ 1200

$\therefore$ Gain per cent $= \frac{210}{1200} \times 100$

$= \frac{35}{2} = 17\frac{1}{2}\%$

22. (2) C.P. of 1 article $= \frac{1}{4} \times \frac{100}{96}$

$= ₹ \frac{25}{96}$

$\therefore$ C.P. of 3 articles $= ₹ \frac{75}{96}$

$\therefore$ Gain $= 1 - \frac{75}{96} = \frac{96 - 75}{96}$

$= \frac{21}{96} = \frac{7}{32}$

$\therefore$ Gain per cent $= \frac{\frac{7}{32}}{\frac{75}{96}} \times 100$

$= \frac{7}{32} \times \frac{96}{75} \times 100 = 28\%$

23. (1) Let the C.P. of article be ₹ x

$\therefore$ S.P. $= \frac{175x}{200}$

New S.P.

$= ₹ \left(\frac{7x}{8} + 51.80\right)$

$\therefore \frac{175x}{200} + 51.8 = \frac{106}{100} \times x$

$\Rightarrow \frac{106x}{100} - \frac{175x}{200} = 51.8$

$\Rightarrow \frac{212x - 175x}{200} = 51.8$

$\Rightarrow 37x = 51.8 \times 200$

$\Rightarrow x = \frac{51.8 \times 200}{37} = ₹. 280$

24. (4) If the C.P. of watch be ₹ x, then

First S.P. $= \frac{9x}{10}$

$\therefore \frac{105x}{100} - \frac{9x}{10} = 45$

$\Rightarrow \frac{105x - 90x}{100} = 45$

$\Rightarrow \frac{15x}{100} = 45$

$\Rightarrow x = \frac{45 \times 100}{15} = ₹ 300$

$\therefore$ S. P. $= \frac{300 \times 9}{10} = ₹ 270$

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25. (2) C.P. of T.V. for Yogita
= ₹ x (let)
According to question,

$$x \times \frac{120}{100} \times \frac{110}{100} = 33000$$

$$\Rightarrow x = \frac{33000 \times 100 \times 100}{120 \times 110}$$

= ₹ 25000

26. (4) C.P. for A = Rs. x (let)
According to the question,

$$\frac{x \times 120}{100} \times \frac{75}{100} = P$$

$$\Rightarrow x = \frac{P \times 100 \times 100}{120 \times 75}$$

$$= \text{Rs. } \frac{10}{9}$$

27. (3) Let C.P. of article be Rs. x.
According of the question,
$625 - x = x - 545$
$\Rightarrow 2x = 625 + 545 = 1170$

$$\Rightarrow x = \frac{1170}{2} = \text{Rs. } 585$$

$\therefore$ Required S.P.
= Rs. (585 + 65)
= Rs. 650

28. (4) C.P. of rice per kg

$$= \frac{54 \times 100}{90} = \text{Rs. } 60$$

For 20% profit,
S.P. per kg.

$$= \frac{60 \times 120}{100} = \text{Rs. } 72$$

29. (4) Let the quantity of sugar at 8% profit be x kg.
$\therefore$ Quantity of sugar sold at 18% = $(100 - x)$ kg
According to the question,

$$x \times \frac{108}{100} + (1000 - x) \times \frac{118}{100}$$

$$= \frac{1000 \times 114}{100}$$

$\Rightarrow 108x + 118000 - 118x = 114000$
$\Rightarrow 10x = 118000 - 114000$
$\Rightarrow 10x = 4000 \Rightarrow x = 400$ kg

30. (1) C.P. of 12 kg of potatoes

$$= \text{Rs. } \left(\frac{63 \times 100}{105}\right)$$

= Rs. 60

$\therefore$ C.P. of 50 kg of potatoes

$$= \frac{60}{12} \times 50 = \text{Rs. } 250$$

Loss = Rs. (250 – 247.50)
= Rs. 2.5

$$\therefore \text{ Loss percent} = \frac{2.5}{250} \times 100$$

= 1%

31. (1) Let the C.P. of article be Rs. x.
According to the question,

$$\frac{x \times 105}{100} - \frac{x \times 80}{100} = 200$$

$\Rightarrow 105x - 80x = 20000$
$\Rightarrow 25x = 20000$

$$\Rightarrow x = \frac{20000}{25} = \text{Rs. } 800$$

TYPE-X

1. (4) Let the cost price of the bicycle for A be ₹ x
Cost price for B = selling price for A = $1.20x$
Cost price for C = selling price for B = $(1.25)(1.20x) = 1.5x$
But $1.5x = 225$

$$\therefore x = \frac{225}{1.5} = ₹\ 150$$

$\therefore$ The cost price of the bicycle for A = ₹ 150

2. (1) Let the actual C.P. be ₹ x

$$x \times \frac{125}{100} \times \frac{125}{100} \times \frac{125}{100} = 250$$

$\Rightarrow x =$ ₹ 128

3. (3) SP for Mr. X

$$= 150000 \times \frac{105}{100} = ₹\ 157500$$

CP for Mr. Y = ₹ 157500
Y sells the article to X at a loss of 2%,
$\therefore$ SP for Mr. Y

$$= 157500 \times \frac{98}{100} = ₹\ 154350$$

$\therefore$ CP for Mr. X = ₹ 154350
$\therefore$ Gain of Mr. X
= ₹ (157500 – 154350)
= ₹ 3150

4. (3) Let the required cost price be ₹ x, then

$$x \times \frac{110}{100} \times \frac{120}{100} \times \frac{85}{100} = 56100$$

$$\Rightarrow x \times \frac{11}{10} \times \frac{6}{5} \times \frac{17}{20} = 56100$$

$$\Rightarrow x = \frac{56100 \times 10 \times 5 \times 20}{11 \times 6 \times 17}$$

= ₹ 50000

5. (2) If the C.P. for A be ₹ x, then

$$x \times \left(1 + \frac{1}{5}\right) \times \frac{120}{100} \times \left(1 - \frac{1}{6}\right)$$

= 600

$$\Rightarrow x \times \frac{6}{5} \times \frac{6}{5} \times \frac{5}{6} = 600$$

$$\Rightarrow x = \frac{600 \times 5}{6} = ₹\ 500$$

6. (1) Let the C.P. for A be ₹ x, then

$$x \times \frac{105}{100} \times \frac{110}{100} = 2310$$

$$\Rightarrow x = \frac{2310 \times 100 \times 100}{105 \times 110}$$

= ₹ 2000

7. (1) Let the C.P. of A be ₹ x, then

$$x \times \frac{110}{100} \times \frac{120}{100} = 264$$

$$\Rightarrow x = \frac{264 \times 100 \times 100}{110 \times 120}$$

= ₹ 200

8. (3) Let the C.P. of A be ₹ x, then

$$\frac{x \times 125}{100} \times \frac{90}{100} = 675$$

$$\Rightarrow x = \frac{675 \times 100 \times 100}{125 \times 90} = ₹\ 600$$

9. (3) C.P. of tape recorder for A

$$= \frac{4860 \times 100}{(100 - 19)} = \frac{4860 \times 100}{81}$$

= ₹ 6000

$$\therefore \text{ S.P. for B} = \frac{6000 \times 117}{100}$$

= ₹ 7020
$\therefore$ B's gain = 7020 – 4860
= ₹ 2160
$\therefore$ Required profit percent

$$= \frac{2160}{4860} \times 100 = 44\frac{4}{9}\%$$

10. (4) Let the original cost of the land be ₹ x
According to the question,

$$345600 = P\left(1 + \frac{20}{100}\right)^3$$

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$\Rightarrow 345600 = P\left(\frac{6}{5}\right)^3 = \frac{216P}{125}$

$\Rightarrow P = \frac{345600 \times 125}{216} = ₹\,200000$

11. (4) Let the C.P. for A be ₹ x, then

$x \times \frac{110}{100} \times \frac{105}{100} = 462$

$\Rightarrow x = \frac{462 \times 100 \times 100}{110 \times 105} = ₹\,400$

12. (4) Price obtained by C

$= 3200 \times \frac{110}{100} \times \frac{215}{200} \times \frac{75}{100}$

$= ₹\,2838$

13. (3) Let C.P. for A be ₹ x

$\therefore x \times \frac{120}{100} \times \frac{110}{100} \times \frac{225}{200} = 29.70$

$\Rightarrow x = \frac{29.70 \times 100 \times 100 \times 200}{120 \times 110 \times 225}$

$= ₹\,20$

14. (3) Let the C.P. of the suitcase for A be ₹ x, then

$x \times \frac{110}{100} \times \frac{130}{100} = 2860$

$\Rightarrow x = \frac{2860 \times 100 \times 100}{110 \times 130}$

$= ₹\,2000$

TYPE-XI

1. (3) Total S.P. = ₹ 2 lakhs

C.P of house

$= ₹\left(\frac{100}{80} \times 1\right)$ lakh

$= ₹\,\frac{5}{4}$ lakhs

C.P. of shop

$= ₹\left(\frac{100}{120} \times 1\right)$ lakh

$= ₹\,\frac{5}{6}$ lakh

Total C.P.

$= ₹\left(\frac{5}{4} + \frac{5}{6}\right)$ lakhs

$= ₹\,\frac{25}{12}$ lakhs

$\therefore$ Loss $= ₹\left(\frac{25}{12} - 2\right)$ lakh

$= ₹\,\frac{1}{12}$ lakh

2. (4) If a man sells two articles at same price and makes a profit of x% on first and x% loss on second, there is always a loss of

$\frac{x^2}{100}\%$

$\therefore$ Loss% $= \frac{(20)^2}{100} = \frac{400}{100} = 4\%$

3. (1) Loss % = x% of x or $\frac{x^2}{100}$

Here, x = 10

$\therefore$ Loss% $= \frac{10 \times 10}{100} = 1\%$

4. (3) Required loss%

$= \frac{(20)^2}{100} = \frac{400}{100} = 4\%$

$\because (100 - 4)\% = 24$

$\therefore 4\% = \frac{24}{96} \times 4 =$ Loss of ₹1

5. (2) **Note :** When S.P. of each of two items is same, on one of them there is x% loss and on the other there is x% gain, then there is always a loss given by (x% of x)%

$= \frac{x^2}{100}\%$

$\therefore$ The required loss %

$= \frac{10 \times 10}{100} = 1\,\%$

6. (2) Here, the S.P. is same for both the machines. Hence, there will be always a loss in this situation. Required loss %

$= \frac{10 \times 10}{100} = 1\%$

7. (4) Here, S.P. is same. Hence there is always a loss.

Loss per cent $= \frac{20 \times 20}{100} = 4\%$

8. (2) CP of Television

$= \frac{12,000}{80} \times 100 = ₹\,15000$

CP of refrigerator

$= \frac{12,000}{120} \times 100 = ₹\,10,000$

Total C.P.

$= 15000 + 10,000 = ₹\,25000$

SP of both = ₹ 24,000

$\therefore$ Loss = 25,000 – 24,000

= ₹ 1000

9. (4) Let the amount of sugar sold at 7% profit be x kg. and let C.P. per kg be ₹1.

Total C.P. = ₹ 100

Total S.P. = 107% of x + 117% of $(100 - x)$

$= 1.07x + 1.17\,(100 - x)$

$= 1.07x + 117 - 1.17x$

$= 117 - 0.1x$

$\therefore 117 - 0.1x$

= 110% of 100

$\Rightarrow 0.1x = 117 - 110 = 7$

$\Rightarrow x = \frac{7}{0.1} = 7 \times 10$

= 70 kg.

10. (1) If x and y be the cost price of two goats, then,

80% of x = 144% of y

$\Rightarrow \frac{x}{y} = \frac{144}{80} = \frac{9}{5}$

i.e., $x : y = 9 : 5$

Sum of the ratios = 9 + 5 = 14

$\therefore$ Cost of first goat

$= ₹\left(\frac{9}{14} \times 1008\right) = ₹\,648$

11. (4) In such a situation, there is always a loss.

The selling price is immaterial.

Loss %

$= \left(\frac{\text{Common loss or gain\%}}{10}\right)^2$

$= \left(\frac{5}{10}\right)^2\% = 0.25\%$

12. (4) Required loss %

$= \frac{(20)^2}{100} = \frac{400}{100} = 4\%$

13. (4) Required per cent effect

$= \left(20 - 25 - \frac{20 \times 25}{100}\right)\%$

$= (-5 - 5)\% = -10\%$ (10% decrease)

Negative sign shows decrease

14. (1) Total CP = ₹ 100

Total SP

$= ₹\left(\frac{50 \times 120}{100} + \frac{25 \times 80}{100} + 25\right)$

$= ₹\,(60 + 20 + 25) = ₹105$

$\therefore$ Gain% = 5%

$\left[\frac{105 - 100}{100} \times 100\right]$

15. (1) Let the cost price of first watch which sold on 16 per cent be x.
Then cost price of second watch $= (840 - x)$
According to the question,

$$x \times \frac{116}{100} + (800 - x) \times \frac{88}{100} = 840$$

$$\Rightarrow \frac{116}{100} + \frac{73920 - 88x}{100} = 840$$

$$\Rightarrow 116x - 88x = 84000 - 73920$$

$$\Rightarrow 28x = 10080$$

$$\therefore x = \frac{10080}{28} = ₹\ 360$$

16. (3) Total SP = ₹ 240000
CP of car

$$= ₹\left(\frac{100}{80} \times 120000\right) = ₹\ 150000$$

$$\text{CP of Jeep} = ₹\left(\frac{100}{120} \times 120000\right)$$

$$= ₹\ 100000$$

Total CP = ₹ 250000
∴ Loss = ₹ (250000 – 240000)
= ₹ 10000

17. (1) Let the price of the sent items be x.
According to the question,

$$\frac{2x}{3} \times \frac{5}{100} - \frac{x}{3} \times \frac{2}{100} = 400$$

$$\Rightarrow \frac{10x}{3} - \frac{2x}{3} = 400 \times 100$$

$$\Rightarrow \frac{8x}{3} = 40000$$

$$\Rightarrow x = \frac{40000 \times 3}{8} = ₹\ 15000$$

18. (3) SP of total agricultural field

$$= ₹\left(360000 \times \frac{110}{100}\right) = ₹\ 396000$$

SP of one-third of the field

$$= \frac{1}{3} \times 360000 \times \frac{80}{100}$$

$$= ₹\ 96000$$

SP of $\frac{2}{5}$ th of the field

$$= \frac{2}{5} \times 360000 \times \frac{125}{100}$$

$$= ₹\ 180000$$

∴ SP of the remaining field
= ₹ (396000 – 96000 – 180000)
= ₹ 120000

19. (2) The sum of cost prices of two articles is x. One of them is sold at a loss of a% and other is sold at a gain of b% and their S.P. is same.
∴ C.P. of article sold at a loss of a%

$$= \frac{100 + b}{200 - a + b} \times x$$

$$= \frac{100 + 15}{200 - 20 + 15} \times 19500$$

$$= \frac{115}{195} \times 19500 = ₹\ 11500$$

⇒ C.P. of second article
= ₹ 8000

20. (3) Let the CP of article A be ₹ x
∴ CP of article B = ₹ $(5000 - x)$
According to the question,
120% of x + 90% of $(5000 - x)$
= 102% of 5000

$$\Rightarrow 120x + 450000 - 90x = 510000$$

$$\Rightarrow 30x = 510000 - 450000 = 60000$$

$$\Rightarrow x = \frac{60000}{30} = ₹\ 2000$$

21. (4) Here, both the articles are sold at the same price.
Hence, there is always loss.
∴ Loss per cent

$$= \frac{25 \times 25}{100} = \frac{25}{4} = 6\frac{1}{4}\%$$

22. (2) If the C.P. of horse be ₹ x, then C.P. of carriage = ₹ $(40000 - x)$
Then,

$$\frac{110 \times x}{100} + \frac{(40000 - x) \times 95}{100} = \frac{40000 \times 101}{100}$$

$$\Rightarrow 110x + 3800000 - 95x = 4040000$$

$$\Rightarrow 15x = 4040000 - 3800000$$

$$\Rightarrow 15x = 240000$$

$$\Rightarrow x = \frac{240000}{15} = ₹\ 16000$$

23. (1) If the C.P. of first cycle be ₹ x, then C.P. of second cycle = ₹ $(1600 - x)$. Then,

$$\frac{x \times 120}{100} + \frac{(1600 - x) \times 110}{100} - \frac{x \times 110}{100} - \frac{(1600 - x) \times 120}{100} = 5$$

$$\Rightarrow 12x + 17600 - 11x - 11x + 19200 + 12x = 50$$

$$\Rightarrow 2x = 50 + 19200 - 17600$$

$$\Rightarrow 2x = 1650 \Rightarrow x = 825$$

C.P. of second cycle
= 1600 – 825 = ₹ 775
Difference = 825 – 775 = ₹ 50

24. (3) C.P. of article be ₹ x
∴ (118 – 115)% of x = 18

$$\Rightarrow \frac{x \times 3}{100} = 18$$

$$\Rightarrow x = \frac{18 \times 100}{3} = ₹\ 600$$

25. (3) Check through option
10% of 3000

$$= \frac{3000 \times 10}{100} = ₹\ 300$$

15% of 2000

$$= \frac{2000 \times 15}{100} = ₹\ 300$$

26. (3) Let the merchant bought 100 metres of cloth for ₹ 100.
∴ Total S.P.

$$= ₹\left(\frac{50 \times 140}{100} + \frac{25 \times 60}{100} + 25\right)$$

= ₹ (70 + 15 + 25) = ₹ 110
∴ Gain per cent = 10%

27. (2) C.P. of first chair

$$= \frac{100}{125} \times 120 = ₹\ 96$$

C.P. of second chair

$$= \frac{100}{75} \times 120 = ₹\ 160$$

∴ Loss = 160 + 96 – 240
= ₹ 16

28. (3) Let the C.P. of fans be ₹ x and ₹ y respectively.

$$\frac{x \times 15}{100} = \frac{y \times 9}{100}$$

$$\Rightarrow \frac{x}{y} = \frac{9}{15} = \frac{3}{5}$$

C.P. of first fan $= \frac{3}{8} \times 2160$
= ₹ 810

& C.P. of second fan $= \frac{5}{8} \times 2160$
= ₹ 1350

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29. (2) S.P. of TV = $2000 \times \frac{120}{100}$
= ₹ 2400
S.P. of radio = $\frac{750 \times 95}{100}$
= ₹ 712.5
Total S.P. = 2400 + 712.5
= ₹ 3112.50
∴ Gain = 3112.5 – 2000 – 750
= ₹ 362.50

30. (1) For the sake of convenience, Let the number of toffees of each type bought be 99 (LCM 11 and 9).
CP of first kind of 99 toffees
= ₹ 90
CP of second kind of 99 toffees
= ₹ 110
∴ CP of 198 toffees = ₹ 200
∴ SP of 198 toffees = ₹ 198
Loss = ₹. 2
Loss % = $\frac{2}{200} \times 100 = 1\%$

31. (1) Let 20 apples of each type be bought.
C.P. of an apple of first type
= ₹ $\frac{10}{4}$
C.P. of an apple of second type
= ₹ $\frac{10}{5}$
C.P. of 40 apples
= ₹ $\left(20 \times \frac{10}{4} + 20 \times \frac{10}{5}\right)$ = ₹ 90
Total S.P. = $\frac{40 \times 20}{9}$ = ₹ $\frac{800}{9}$
Loss = $90 - \frac{800}{9} = \frac{10}{9}$
∴ Loss per cent = $\frac{\frac{10}{9}}{90} \times 100$
$= \frac{100}{81} = 1\frac{19}{81}\%$

32. (1) C.P. of 700 gm of tea at ₹18 per 100 gm
= 7 × 18 = ₹ 126
C.P. of 300 gm of tea at ₹ 13 per 100 gm
= 3 × 13 = ₹ 39
Total cost of 1000 gm
= 126 + 39 = ₹ 165
Total S.P. of 1000 gm
= 18.15 × 10 = ₹ 181.5
Gain = 181.5 – 165 = ₹ 16.5
Gain percent
$= \frac{16.5}{165} \times 100 = 10\%$

33. (1) Total CP of 70 kg of wheat
= ₹ (30 × 9.5 + 40 × 8.5)
= ₹ (285 + 340) = ₹ 625
Total S.P. of 70kg of wheat
= ₹ (8.90 × 70) = ₹ 623
∴ Loss = ₹ (625 – 623) = ₹ 2

34. (4) Let 10 articles of each kind be bought.
∴ Total cost
= ₹ (10 × 10 + 14 × 10) = ₹ 240
Total selling price
= 13 × 20 = ₹ 260
∴ Gain percent
$= \frac{260 - 240}{240} \times 100$
$= \frac{20 \times 100}{240} = 8\frac{1}{3}\%$

35. (4) C.P. of 40kg of mixture
= ₹ (15 × 29 + 25 × 20)
= ₹ (435 + 500) = ₹ 935
S.P. of 40kg of mixture
= 27 × 40 = ₹ 1080
∴ Gain = 1080 – 935 = ₹ 145

36. (2) Let total C.P. = ₹ 100 and number of articles = 100.
∴ Total S.P.
= ₹ $\left(\frac{75 \times 124}{100} + 25\right)$
= ₹ (93 + 25) = ₹ 118
∴ Gain per cent = 18%

37. (1) Profit per cent
$= \frac{30 - 25}{25} \times 100$
$= \frac{500}{25} = 20\%$

TYPE-XII

1. (4) Let the CP of the article be x
$\therefore \frac{115x}{100} - \frac{110x}{100} = 10$
$\Rightarrow \frac{5x}{100} = 10$
$\Rightarrow x = \frac{10 \times 100}{5}$ = ₹ 200

2. (2) $\frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}} \times 100 = 25$ [given]
$\Rightarrow \frac{210}{\text{C.P.}} \times 100 = 25$
$\Rightarrow$ CP = $\frac{100 \times 210}{25} = 840$
∴ S.P. = $\frac{125}{100}$ of 840
$= \frac{840 \times 125}{100}$ = ₹ 1050

3. (2) If the cost price of article be x, then
2% of x = 3
$\Rightarrow x = \frac{3 \times 100}{2}$ = ₹ 150

TYPE-XIII

1. (2) Selling price = 405 × 110%
= ₹ 445.50
Remaining apples = 10 – 1 = 9 kg
Therefore, the remaining apples (per kg) cost
$= \frac{445.50}{9}$ = ₹ 49.50

2. (2) Due to fall in price, there is a saving of 20% of ₹ 100 i.e., ₹ 20. With this amount the purchaser purchases 4 kg. of salt.
∴ Reduced price of salt per kg
$= \frac{20}{4}$ = ₹ 5

3. (2) Let the original price
= x per dozen
New price
= $(x - 4)$ per dozen
Original number of pins
= $\frac{48}{x}$ dozens
New number of pins
= $\frac{48}{x-4}$ dozens
According to the question,
$\frac{48}{x-4} - \frac{48}{x} = 1$
$\Rightarrow 48\left(\frac{x - x + 4}{x(x-4)}\right) = 1$
$\Rightarrow x(x-4) = 48 \times 4$
$\Rightarrow x^2 - 4x - 192 = 0$
$\Rightarrow x^2 - 16x + 12x - 192 = 0$
$\Rightarrow x(x-16) + 12(x-16) = 0$
$\Rightarrow (x-16)(x+12) = 0$
$\Rightarrow x = 16$, because the price of pins can not be negative.
$\therefore x \neq -12$
∴ New price = 16 – 4
= ₹ 12 per dozen

4. (3) Let the C.P. of article be x.
∴ 105% of x – 80% of x = 100
$\Rightarrow$ 25% of x = 100
$\Rightarrow x = \frac{100 \times 100}{25}$ = ₹ 400

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5. (1) Cost of 2 erasers
= 25% of 1

$= \frac{25}{100} \times 1 = ₹ \frac{1}{4}$

$\Rightarrow$ Cost of one eraser $= ₹ \frac{1}{8}$

$\therefore$ 8 erasers will be available for ₹ 1

6. (2) Let the original rate
= x per kg.
New rate = 85% of x

$= \frac{85x}{100} = \frac{17x}{20}$

Original quantity for ₹ 240

$= \frac{240}{x}$

New quantity $= 240 \times \frac{20}{17x} = \frac{4800}{17x}$

$\therefore \frac{4800}{17x} - \frac{240}{x} = 2$

$\Rightarrow \frac{4800 - 4080}{17x} = 2$

$\Rightarrow \frac{720}{17x} = 2 \Rightarrow x = \frac{720}{2 \times 17}$

$\therefore$ Original rate per kg $= ₹ \frac{720}{34}$

$\therefore$ Reduced rate $= ₹ \frac{17x}{20}$

$= ₹ \left(\frac{17}{20} \times \frac{720}{34}\right) = ₹ 18$

7. (4) Let the original price of 1 mango be x.
New rate = 120% of x

$= \frac{6x}{5}$

Number of mangoes bought in ₹ 40 $= \frac{40}{x}$

New quantity $= \frac{40 \times 5}{6x} = \frac{100}{3x}$

$\therefore \frac{40}{x} - \frac{100}{3x} = 4$

$\Rightarrow \frac{120 - 100}{3x} = 4 \Rightarrow \frac{20}{3x} = 4$

$\Rightarrow 3x = 5 \Rightarrow x = ₹ \frac{5}{3}$

$\therefore$ Price of 15 mangoes before increase $= \frac{5}{3} \times 15 = ₹ 25$

8. (2) If the C.P. of article be ₹ x, then

$x \times \left(105 - \frac{195}{2}\right)\% = 12$

$\Rightarrow x \times \frac{15}{200} = 12 \Rightarrow x = \frac{12 \times 200}{15}$

$= ₹ 160$

9. (1) Required profit percent

$= \left(x + y + \frac{xy}{100}\right)\%$

by Here, $x = 25\%$

$y = -\frac{25}{2}\%$

$= \left(25 - \frac{25}{2} - \frac{25 \times 25}{200}\right)\%$

$= \left(\frac{25}{2} - \frac{25}{8}\right)\%$

$= \left(\frac{100 - 25}{8}\right)\%$

$= \frac{75}{8}\% = 9\frac{3}{8}\%$

10. (3) Let the cost price of fan be Rs. x.
According to the question,
10% of x = 1250 – 1000

$\Rightarrow \frac{x \times 10}{100} = 250$

$\Rightarrow x = \frac{250 \times 100}{10}$ = Rs. 2500

Note : Here, increase in loss should be 10%.

11. (2) Cost of production of article = Rs. 100 (let)
$\therefore$ S.P. = Rs. 133
New cost of production = Rs. 112

$\therefore$ S.P. $= \frac{133 \times 110}{100}$

= Rs. 146.30
$\therefore$ Profit per cent

$= \left(\frac{146.3 - 112}{112}\right) \times 100$

$= \frac{34.3 \times 100}{112} = \frac{3430}{112}$

$= \frac{245}{8} = 30\frac{5}{8}\%$

TYPE-XIV

1. (1) Let the cost price of article be x.
$\therefore$ 80% of x = 480

$\therefore x = \left(\frac{480 \times 100}{80}\right) = ₹ 600$

$\therefore$ S.P. for 20% profit

$= ₹ \left(\frac{600 \times 120}{100}\right) = ₹ 720$

2. (4) Let the C.P. be ₹ 100

$\therefore$ C.P. – S.P. $= \frac{1}{5}$ S.P.

$\Rightarrow 100 = \left(1 + \frac{1}{5}\right)$ S.P.

$\Rightarrow 100 = \frac{6}{5} \times$ S.P.

$\Rightarrow$ S.P. $= \frac{100 \times 5}{6} = \frac{250}{3}$

$\therefore$ Loss % $= \frac{100 - \frac{250}{3}}{100} \times 100$

$= \frac{50}{3}\%$

3. (2) Let the cost price of each toy be x
$\therefore$ Cost price of 4 toys
= Selling price of 3 toys = $4x$
$\therefore$ Selling price of 4 toys

$= \frac{4}{3} \times 4x = \frac{16}{3}x$

% profit $= \frac{\frac{16}{3}x - 4x}{4x} \times 100$

$= \left(\frac{16}{3} - 4\right) \times 25\%$

$= \frac{4}{3} \times 25\% = \frac{100}{3}\% = 33\frac{1}{3}\%$

4. (3) Cost price of house for Y

$= \frac{105}{100} \times 150000 = ₹ 157500$

S.P. of house for Y

$= \frac{98}{100} \times$ Rs. 157500 $= ₹ 154350$

$\therefore$ Gain for X
= ₹ (157500 – 154350)
= ₹ 3150

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5. (1) Cost price of a book
$= \frac{12000}{200} = ₹ 60$
$\therefore$ Total profit $= ₹ 60 \times 20$
$= ₹ 1200$
$\therefore$ Profit per cent
$= \frac{1200}{12000} \times 100 = 10\%$

6. (4) Let the C.P. of table be x
$\therefore$ According to the question
$\left(\frac{x-350}{x} - \frac{x-400}{x}\right) \times 100 = 5$
$\Rightarrow \frac{x-350-x+400}{x} \times 100 = 5$
$\therefore x = \frac{50 \times 100}{5} = ₹ 1000$
$\because$ 5% of C.P. $= ₹ 50$
$\therefore$ C.P. $= \frac{50 \times 100}{50} = ₹ 1000$

7. (4) Let the C.P. be x
$\therefore$ S.P. $= \frac{8}{5}x$
$\therefore$ Gain $= \frac{8x-5x}{5} = \frac{3x}{5}$
Now, Gain % $= \frac{\frac{3x}{5}}{x} \times 100$
$= \frac{3}{5} \times 100 = 60\%$

8. (3) Let the C.P. of the jewel be ₹ 100
S.P. for the first person $= ₹ 120$
S.P. for the second person
$= ₹120 \times \frac{125}{100} = ₹ 150$
Now, let the profit earned by the third person be x%
$\therefore 150 \times \frac{100+x}{100} = 165$
$\Rightarrow 100 + x = \frac{165 \times 10}{15} = 110$
$\Rightarrow x = 110 - 100 = 10\%$

9. (2) Let the cost price be ₹ 100.
$\therefore$ Marked price $= ₹$ (100 + 15% of 100) $= ₹ 115$
The goods are sold at the discount of 12%.
$\therefore$ S.P. = (115 – 12% of 115)
$= ₹ (115 - 13.80) = ₹ 101.20$
Profit $= ₹ (101.20 - 100)$
$= ₹ 1.20$
$\therefore$ Profit % $= \frac{120}{100} \times 100 = 1.2\%$
$= 1\frac{2}{10} = 1\frac{1}{5}\%$

10. (3) Suppose CP of table be x
$SP = \frac{x \times 110}{100} = \frac{11x}{10}$
CP at 5% less
$= \frac{x \times 95}{100} = \frac{19x}{20}$
According to question
$\frac{19x}{20} \times \frac{120}{100} = \frac{11x}{10} + 80$
$\Rightarrow \frac{57x}{50} - \frac{11x}{10} = 80$
$\Rightarrow \frac{2x}{50} = 80$
$\Rightarrow x = \frac{80 \times 50}{2} = ₹ 2000$

11. (2) Required per cent increase
$= \frac{10}{90} \times 100 = 11\frac{1}{9}\%$

12. (4) Let 10 quintals of rice be bought.
$\therefore$ Actual C.P. of 8kg of rice
$= 650 \times 10 = ₹ 6500$
$\therefore$ Required S.P.
$= \frac{6500 \times 120}{100} = ₹ 7800$
$\therefore$ Rate of selling $= \frac{7800}{8} = ₹ 975$

13. (3) Let the cost price be x
$\therefore$ Gain % = x%
$\therefore$ S.P. = C.P. + x% of C.P.
$\Rightarrow 75 = x + \frac{x^2}{100}$
$\Rightarrow x^2 + 100x - 7500 = 0$
$\Rightarrow x^2 + 150x - 50x - 7500 = 0$
$\Rightarrow x(x + 150) - 50(x + 150) = 0$
$\Rightarrow (x + 150)(x - 50) = 0$
$\Rightarrow x = ₹ 50$
[as x cannot be negative]

14. (2) Let the cost price be x.
$\therefore$ 125% of x – 120% of x = 35
$\Rightarrow$ 5% of x = 35
$\therefore x = ₹ \frac{35 \times 100}{5} = ₹ 700$

15. (2) Let the CP be ₹ 100.
$\therefore$ SP $= ₹ 120$
New SP $= ₹ 240$
Profit $= ₹ (240 - 100) = ₹ 140$
$\therefore$ Profit % $= \frac{140}{100} \times 100 = 140\%$

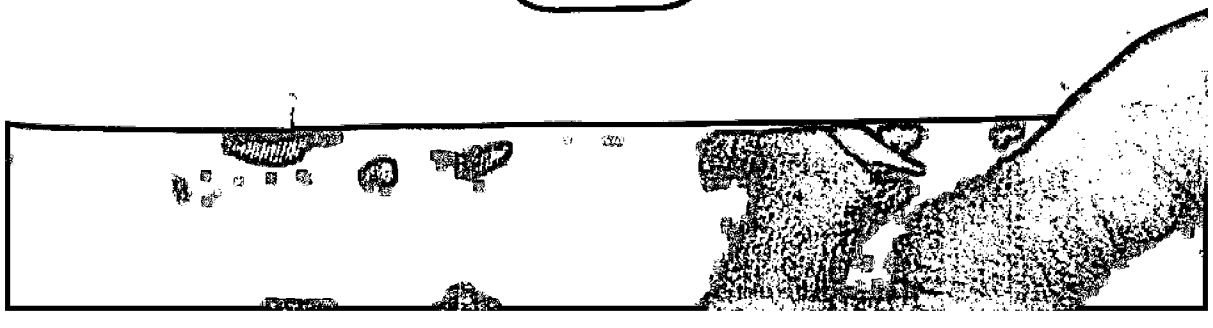
16. (3) Let the advertised price be ₹ 100.
$\therefore$ S.P. $= ₹ 90$, Profit = 20%
$\therefore$ C.P. $= ₹ \left(90 \times \frac{100}{120}\right) = ₹ 75$
Profit $= ₹ (90 - 75) = ₹ 15$
Since for a profit of ₹ 15, the advertised price $= ₹ 100$
$\therefore$ For a profit of ₹ 7500, the advertised price
$= ₹ \frac{100 \times 7500}{15} = ₹ 50000$

17. (3) Let the C.P. of article be x.
According to the question,
$\left(100 + \frac{25}{2}\right)\%$ of $x - \left(100 - \frac{25}{2}\right)\%$ of $x = 13$
$\Rightarrow \frac{x}{100}\left(100 + \frac{25}{2} - 100 + \frac{25}{2}\right) = 13$
$\Rightarrow \frac{x}{100} \times 25 = 13$
$\Rightarrow x = 13 \times 4 = ₹ 52$

18. (4) Difference of SP
$= ₹ (400 - 350) = ₹ 50$
Now, 50 = 5% of CP
$\Rightarrow$ CP $= \frac{50 \times 100}{5} = ₹ 1000$

19. (2) Let the C.P. be x
According to the question,
$\frac{x-50}{x} \times 100 = \frac{70-x}{x} \times 100$
$\Rightarrow x - 50 = 70 - x$
$\Rightarrow 2x = 120 \Rightarrow x = \frac{120}{2} = 60$
$\therefore$ Loss % $= \frac{60-50}{60} \times 100$
$= \frac{50}{3} = 16\frac{2}{3}\%$

20. (3) Let the C.P. of article = x
According to the question,
$\frac{105x}{100} - \frac{95x}{100} = 5$
$\Rightarrow 105x - 95x = 500$
$\Rightarrow 10x = 500$
$\Rightarrow x = \frac{500}{10} = ₹ 50$



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21. (4) Let marked price be x

$\therefore$ C.P. $= \frac{13}{15}x$

S.P. $= \frac{112x}{100}$

$\therefore$ Profit $= \left(\frac{112x}{100} - \frac{13x}{15}\right)$

$= \left(\frac{336x - 260x}{300}\right) = \frac{76x}{300}$

$\therefore$ Profit %

$= \frac{76x}{300} \times \frac{15}{13x} \times 100$

$= \frac{380}{13} = 29\frac{3}{13}\%$

22. (1) Let the profit per cent made by the second person be x.

$\therefore 38 = \left(x + 20 + \frac{20x}{100}\right)\%$

$\Rightarrow 38 = x + 20 + \frac{x}{5}$

$\Rightarrow \frac{6x}{5} = 38 - 20$

$\Rightarrow x = \frac{18 \times 5}{6} = 15\%$

23. (3) Production cost

$= 1265 \times \frac{100}{125} \times \frac{100}{115} \times \frac{100}{110}$

$=$ ₹ 800

24. (3) Gain percent

$= \left(\frac{110}{100} \times 110 - 100\right)\%$

$= (121 - 100)\% = 21$ per cent

25. (1) By selling 100 pencils, shopkeeper gains the SP of 20 pencils.
Clearly, CP of 100 pencils
= SP of 80 pencils
Let CP of each pencil = ₹ 1.
CP of 80 pencils = ₹ 80
SP of 80 pencils = ₹ 100
$\therefore$ Gain per cent

$= \frac{20}{80} \times 100 = 25\%$

26. (3) Let 100 articles be sold and the CP of each article be ₹ 1.
$\therefore$ SP. of 75 articles

$=$ ₹ $\left(\frac{120}{100} \times 75\right) =$ ₹ 90

Profit = ₹ (90 – 75) = ₹ 15

$\therefore$ Profit per cent $= \frac{15}{100} \times 100$

$= 15\%$

27. (2) 15% of CP of article = ₹ 3
$\therefore$ CP of the article

$= \frac{3 \times 100}{15} =$ ₹ 20

28. (3) For the first trader,
Let the CP of the article be 100
$\therefore$ SP = ₹ 120
For the second trader,
SP of the article = ₹ 120
Gain = 20%
Let the CP be x.

$\therefore \frac{120 - x}{120} \times 100 = 20$

$\Rightarrow 120 - x = 20 \times \frac{6}{5} = 24$

$\Rightarrow x = 120 - 24 =$ ₹ 96
$\therefore$ Gain = ₹ 24
Difference of Gain = 24 – 20
= ₹ 4
$\because$ If the difference of gains be ₹ 4, then SP = ₹. 120
$\therefore$ When the difference be ₹ 85,

SP $= \frac{120}{4} \times 85 =$ ₹ 2550

29. (2) Let the CP of the article for A be ₹ 100
$\therefore$ CP for B = ₹ 110
Again CP for A

$= 110 \times \frac{90}{100} =$ ₹ 99

Gain of A = 110 – 99 = ₹ 11
or 11%

30. (3) Let the CP of the article be Rs. 100 and its SP be x

$\frac{100 - x}{100} \times 100$

$= \frac{2x - 100}{100} \times 100$

$\Rightarrow 100 - x = 2x - 100$

$\Rightarrow 3x = 200 \Rightarrow x = \frac{200}{3}$

$\therefore$ Loss% $= 100 - \frac{200}{3}$

$= \frac{100}{3} = 33\frac{1}{3}\%$

[because CP of the article = ₹ 100]

31. (1) Loss% $= \frac{10 \times 10}{100} = 1\%$

32. (3) Let the CP of the article be x and SP be y.
According to the question,

$y - x = \frac{20y}{100}$

$\Rightarrow y - \frac{y}{5} = x$

$\Rightarrow 4y = 5x$ ... (i)

Actual profit % $= \frac{y - x}{x} \times 100$

$= \frac{4y - 4x}{4x} \times 100 = \frac{5x - 4x}{4x} \times 100$

$= 25\%$

33. (1) Let CP of each TV be x.
According to the question,
$2(x - 9400) = 10600 - x$
$\Rightarrow 2x - 18800 = 10600 - x$
$\Rightarrow 3x = 10600 + 18800$
$= 29400$

$\Rightarrow x = \frac{29400}{3} =$ ₹ 9800

34. (2) Tricky approach
C.P. of bicycle

$= \frac{100}{114} \times 2850 =$ ₹ 2500

S.P. for a profit of 8%

$= \frac{108}{100} \times 2500 =$ ₹ 2700

35. (3) $\frac{\text{S.P.} - \text{C.P.}}{\text{S.P.}} \times 100 = 20$

$\Rightarrow$ 5. S.P. – 5. C.P. = S.P.
$\Rightarrow$ 4. S.P. = 5. C.P.
$\therefore$ Required percentage

$= \frac{5 - 4}{4} \times 100 = 25\%$

36. (4) If cost price be x and selling price be y, then

Profit % $= \left(\frac{y - x}{x}\right) \times 100$

$= \left(\frac{y}{x} - 1\right) \times 100$

Selling price $= \frac{2y}{5}$

Loss $= \left(x - \frac{2y}{5}\right)$

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$\therefore \frac{x-\frac{2y}{5}}{x}\times 100 = 10$

$\Rightarrow 10x - 4y = x$

$\Rightarrow 9x = 4y$

$\Rightarrow \frac{y}{x} = \frac{9}{4}$

$\therefore$ Initial profit percent

$= \left(\frac{9}{4}-1\right)\times 100 = 125\%$

Method 2 :

Shorter way is to go through options

From the given alternatives (4),

Gain = 125%

If C.P. = ₹100 then

original S.P. = ₹ 225

New S.P. = ₹ 90

Loss% = 10

37. (4) S.P. of first article = ₹ 4,000

gain % of first article = 25%

$\therefore$ C.P. of first article

$= 4{,}000 \times \frac{100}{125} = ₹\ 3200$

$\therefore$ Loss on second article

= 4000 – 3200 = ₹ 800

Now C.P. of second article

= 4000 + 800 = ₹ 4800

& S.P. of second article = ₹ 4000

$\therefore$ Loss of second article

= 4800 – 400 = ₹ 800

$\therefore$ Loss % $= \frac{800\times 100}{4800} = \frac{50}{3}$

$= 16\frac{2}{3}\%$

38. (3) Actual gain percent

$= \left(5+5+\frac{5\times 5}{100}\right)\% = 10.25\%$

39. (2) CP of first article

$= 5000 \times \frac{100}{125} = ₹\ 4000$

$\therefore$ Loss on second article = ₹ 1000

$\therefore$ CP of second article = ₹ 6000

$\therefore$ If the loss percent be x%, then

$\frac{6000\times x}{100} = 1000$

$\Rightarrow x = \frac{50}{3} = 16\frac{2}{3}\%$

40. (2) Let the S.P. of 60 articles be x.

$\therefore$ S.P. of 15 articles $= \frac{x}{4}$

$\therefore$ C.P. of 60 articles

$= x - \frac{x}{4} = \frac{3x}{4}$

$\therefore$ Gain % $= \frac{x}{4}\times\frac{4}{3x}\times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

41. (3) CP of 73 articles = ₹ 5110

$\therefore$ CP of 89 articles

$= \frac{5110}{73}\times 89 = ₹\ 6230$

Total SP of 89 articles

= ₹ 5607

Loss = ₹ (6230 – 5607) = ₹ 623

$\therefore$ Loss percent

$= \frac{623}{6230}\times 100 = 10\%$

42. (4) Let the C.P. of article be x.

Then, $\left(\frac{78-x}{x}\right)\times 100$

$= 2\times\left(\frac{69-x}{x}\right)\times 100$

$\Rightarrow 78 - x = 2\times 69 - 2x$

$\Rightarrow 2x - x = 138 - 78$

$\Rightarrow x = ₹\ 60$

43. (3) Let the merchant bought 100 metres of cloth for ₹ 100.

$\therefore$ Total S.P.

$= ₹\left(\frac{50\times 140}{100}+\frac{25\times 60}{100}+25\right)$

= ₹ (70 + 15 + 25) = ₹ 110

$\therefore$ Gain per cent = 10%

44. (2) Gain per cent $= \frac{\text{Gain}}{\text{S.P.}}\times 100$

$\Rightarrow 20 = \frac{\text{S.P.}-\text{C.P.}}{\text{S.P.}}\times 100$

$\Rightarrow$ S.P. = 5 (S.P. – C.P.)

$\Rightarrow$ 5 C.P. = 5 S.P. – S.P. = 4 S.P.

$\Rightarrow$ S.P. $= \frac{5}{4}$ C.P. $= \left(1+\frac{1}{4}\right)$ C.P.

$\therefore$ Required gain per cent = 25%

45. (1) $\because$ (40 – 20)% = ₹ 1

$\therefore 120\% = \frac{1}{20}\times 120 = ₹\ 6$

46. (2) Let C.P. of radio sold on gain = x

C.P. of radio sold on loss = ₹ (1920 – x)

$\therefore x \times \frac{120}{100}$

$= (1920 - x)\times\frac{\left(100-\frac{20}{3}\right)}{100}$

$\Rightarrow x\times 120 = (1920 - x)\times\frac{280}{3}$

$\Rightarrow 3x = (1920 - x)\times\frac{7}{3}$

$\Rightarrow 9x + 7x = 1920 \times 7$

$\Rightarrow 16x = 1920 \times 7$

$\Rightarrow x = ₹\ 840$

$\therefore$ C.P. of second radio

= ₹ 1080

47. (2) Actual cost price

= 450 + 30 = ₹ 480

$\therefore$ Gain percent

$= \frac{600-480}{480}\times 100 = 25\%$

48. (1) If the C.P. of article be x, then

$\frac{117x}{100} - \frac{81x}{100} = 162$

$\Rightarrow \frac{36x}{100} = 162$

$\Rightarrow x = \frac{162\times 100}{36} = ₹\ 450$

49. (3) If the C.P. of wrist watch be x, then

C.P. of wall clock = ₹ (390 – x)

$\therefore \frac{x\times 10}{100}+\frac{(390-x)\times 15}{100}$

$= 51.50$

$\Rightarrow 10x + 5850 - 15x = 5150$

$\Rightarrow 5x = 5850 - 5150 = 700$

$\Rightarrow x = \frac{700}{5} = ₹\ 140$

$\therefore$ C.P. of wall clock

= 390 – 140 = ₹ 250

$\therefore$ Required difference

= 250 – 140 = ₹ 110

50. (2) C.P. of the article

$= \frac{700\times 100}{140} = ₹\ 500$

$\therefore$ New selling price

$= \frac{500\times 110}{100} = ₹\ 550$

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51. (2) Let number of books sold in 2008 = 100
Number of books sold in 2009 = 20
Number of books sold in 2010 = 100
∴ Required percentage increase
$= \frac{100-20}{20} \times 100 = 400\%$

52. (2) Gain percent $= \frac{100}{900} \times 100$
$= \frac{100}{9} = 11\frac{1}{9}\%$

53. (4) C.P. of each article = ₹ 1
∴ Total C.P. = ₹ 200
Total S.P.
$= \frac{60 \times 120}{100} + \frac{140 \times 110}{100}$
= 72 + 154 = ₹ 226
Gain = 226 – 200 = ₹ 26
When gain = ₹ 26, C.P. = ₹ 1
When gain = ₹ 2600,
C.P. = ₹ 100

54. (3) Profit per cent
$= \left(20 - 5 - \frac{20 \times 5}{100}\right)\% = 14\%$

Second Method

Let original price of article
= ₹ 100
C.P. = ₹ 95
S.P. $= \frac{95 \times 120}{100} =$ ₹ 114
∴ Required gain per cent = 14%

55. (1) Gain by false weight
$= \frac{200}{800} \times 100 = 25\%$
∴ Required gain
$= \left(25 + 10 + \frac{25 \times 10}{100}\right)\%$
= 37.5%

56. (3) C.P. of first bullock
$= \frac{100 \times 8400}{120} =$ ₹ 7000
∴ Gain = ₹ 1400
∴ Loss = ₹ 1400
∴ C.P. of second bullock
= 8400 + 1400 = ₹ 9800
If loss be x%, then
$\therefore 9800 \times \frac{x}{100} = 1400$
$\Rightarrow x = \frac{100}{7} = 14\frac{2}{7}\%$

57. (2) Net gain per cent
$= \left(20 - 15 - \frac{20 \times 15}{100}\right)\%$
= (20 – 18)% = 2%

58. (2) The C.P. of a cow = be x and that of a goat y.
$3x + 8y = 47200$ ....(i)
$8x + 3y = 100200$ ....(ii)
By equation (i) × 3 – (ii) × 8,
$9x + 24y - 64x - 24y$
$= 141600 - 801600$
$\Rightarrow 55x = 660000$
$\Rightarrow x = \frac{660000}{55} =$ ₹ 12000

59. (4) Marked price of a radio set
$= \frac{400 \times 130}{100} =$ ₹ 520
S.P. $= \frac{520 \times 92}{100} =$ ₹ 478.4
∴ Gain per cent $= \frac{78.4}{400} \times 100$
= 19.6%

60. (2) Profit percent
$= \frac{150}{1000 - 150} \times 100$
$\frac{150 \times 100}{850} = \frac{300}{17} = 17\frac{11}{17}\%$

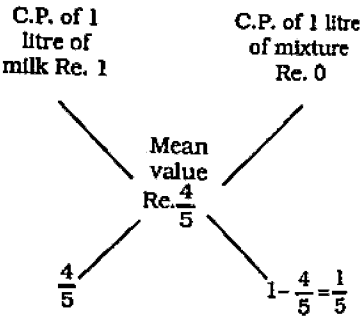
61. (3) C.P. of article be x
∴ First S.P. $= \frac{80x}{100} = ₹\frac{4x}{5}$
$\frac{4x}{5} + 100 = \frac{x \times 105}{100} = \frac{21x}{20}$
$\Rightarrow \frac{21x}{20} - \frac{4x}{5} = 100$
$\Rightarrow \frac{21x - 16x}{20} = 100$
$\Rightarrow 5x = 2000$
$\Rightarrow x = \frac{2000}{5} =$ ₹ 400

62. (1) S.P. of 25m of cloth – C.P. of 25m of cloth
= S.P. of 5m of cloth
∴ C.P. of 25m of cloth = S.P. of 20m of cloth
∴ C.P. = ₹ 20, S.P. = ₹ 25 (let)
∴ Gain per cent
$= \frac{5}{20} \times 100 = 25\%$

63. (2) Total expected S.P.
$= \frac{96000 \times 110}{100} =$ ₹ 105600
S.P. of first part
$= \frac{2}{5} \times 96000 \times \frac{94}{100} =$ ₹ 36096
S.P. of remaining part
= 105600 – 36096 = ₹ 69504
C.P. of remaining part
$= \frac{3}{5} \times 96000 =$ ₹ 57600
Gain = 69504 – 57600
= ₹ 11904
If the gain per cent be x, then
$\frac{57600 \times x}{100} = 11904$
$\Rightarrow x = \frac{11904 \times 100}{57600} = 20\frac{2}{3}\%$

64. (2) Gain $= X \times \frac{25}{100} = ₹\frac{X}{4}$
Taxes $= \frac{X}{4} \times \frac{1}{2} = ₹\frac{X}{8}$

65. (2) C.P. of 1 litre of milk = ₹ 1
S.P. of 1 litre of mixture = ₹ 1
∴ C.P. of 1 litre of mixture
$= \frac{100}{125} \times 1 = ₹\frac{4}{5}$



Milk : Water $= \frac{4}{5} : \frac{1}{5} = 4 : 1$
Volume of water mixed $= \frac{1}{5}$

66. (2) Let C.P. of 200 eggs be Rs. x
38 eggs are broken.
∴ S.P. of remaining 200 – 38
= 162 eggs
= Rs. $\frac{1}{12}$ (162 × 4.80)

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$= \text{Rs.}\left(\frac{777.6}{12}\right) = \text{Rs. } 64.8$

$\therefore$ 108% of $x = 64.8$

$\Rightarrow \frac{x \times 108}{100} = 64.8$

$\Rightarrow x = \frac{64.8 \times 100}{108} = \text{Rs. } 60$

67. (3) C.P. of article = Rs. 100 (let)
$\therefore$ Marked price = Rs. 120

$\therefore$ S.P. $= \frac{120 \times 90}{100} = \text{Rs. } 108$

$\because$ If S.P. = Rs. 108,
C.P. = Rs. 100
$\therefore$ If S.P. = Rs. 216,

$CP = \frac{100}{108} \times 216 = \text{Rs. } 200$

68. (3) C.P. of an apple

$= \frac{600}{240} = \text{Rs. } 2.5$

S.P. of an apple = Rs. 3.5
Total profit = Rs. 198
Total S.P. = Rs. (600 + 198)
= Rs. 798
$\therefore$ Number of apples sold

$= \frac{798}{3.5} = 228$

$\therefore$ Bad apples = 240 – 228 = 12
$\therefore$ Required per cent

$= \frac{12}{240} \times 100 = 5\%$

69. (3) Original price of car
= Rs. x (let)
C.P. of car for Amit

$= \frac{90 \times x}{100} = \text{Rs. } \frac{9x}{10}$

Actual C.P.

$= \text{Rs. } \left(\frac{9x}{10} + 5000\right)$

According to the question,

$\left(\frac{9x}{10} + 5000\right) \times \frac{120}{100} = 100000$

$\Rightarrow \frac{9x}{10} + 5000$

$= \frac{100000 \times 100}{120} = 83300$

$\Rightarrow \frac{9x}{10} = 83300 - 5000 = 78300$

$\Rightarrow x = \frac{78300 \times 10}{9}$

= Rs. 87000

70. (3) Marked price of article
= Rs. x (let)

$\therefore$ C.P. of article = Rs. $\frac{5x}{9}$

If the rate of discount be y%, then

$\therefore x \times (100 - y)\% = 120\ \%$ of $\frac{5x}{9}$

$\Rightarrow 100 - y = \frac{5}{9} \times 120$

$\Rightarrow 300 - 3y = 200$
$\Rightarrow 3y = 300 - 200 = 100$

$\Rightarrow y = \frac{100}{3} = 33\frac{1}{3}\%$

71. (2) C.P. of 50 kg of rice
= Rs. (30 × 70 + 20 × 70.75)
= Rs. (2100 + 1415)
= Rs. 3515
S.P. of 50 kg. of rice
= Rs. (50 × 80.50) = Rs. 4025
Profit = Rs. (4025 – 3515)
= Rs. 510

72. (3) C.P of article = Rs. 100 (let)
$\therefore$ Marked price = Rs. 140
At 12% gain, S.P. = Rs. 112
$\therefore$ Discount = 140 – 112
= Rs. 28
If the rate of discount be x%, then
$140 \times x\% = 28$

$\Rightarrow \frac{140 \times x}{100} = 28$

$\Rightarrow x = \frac{28 \times 100}{140} = 20\%$

73. (4) Discount percent = x% (let).
According to the question

$\frac{975 \times x}{100} = 975 - 897$

$\Rightarrow \frac{975x}{100} = 78$

$\Rightarrow x = \frac{78 \times 100}{975} = 8\%$

74. (4) Let the C.P. of article be Rs. 100.
$\therefore$ Marked price = Rs. 120
According to the question,
After a discount of 10%,

S.P. $= \frac{120 \times 90}{100} = \text{Rs. } 108$

$\therefore$ Profit = 108 – 100 = Rs. 8
$\therefore$ Profit per cent = 8

75. (1) C.P. for Y

$= \frac{150000 \times 105}{100} = \text{Rs. } 157500$

S.P. for Y

$= \frac{157500 \times 98}{100} = \text{Rs. } 154350$

$\therefore$ X's gain
= Rs. (157500 – 154350)
= Rs. 3150

76. (2) C.P. of article = Rs. x (let)
S.P. at 5% profit

$= \text{Rs. } \left(\frac{105x}{100}\right) = \text{Rs. } \frac{21x}{20}$

New C.P. of article $= \frac{95x}{100}$

$= \text{Rs. } \frac{19x}{20}$

S.P. $= \text{Rs. } \left(\frac{19x}{20} \times \frac{110}{100}\right)$

$= \text{Rs. } \left(\frac{209x}{200}\right)$

According to the question,

$\frac{21x}{20} - \frac{209x}{200} = 2$

$\Rightarrow \frac{210x - 209x}{200} = 2$

$\Rightarrow \frac{x}{200} = 2$

$\Rightarrow x = \text{Rs. } 400$

77. (1) Marked price of bicycle
= Rs. x (let).
According to the question,
$x \times 113.5\% = 6810$

$\Rightarrow \frac{x \times 113.5}{100} = 6810$

$\Rightarrow x = \frac{6810 \times 100}{113.5} = \text{Rs. } 6000$

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TEST YOURSELF

1. A salesman mixes two varieties of tea, whose costs are Rs. 60 and Rs. 45 per kg respectively. In what proportion the two varieties are to be mixed so as to make a profit of 25% if the sale price be Rs. 62.50 per kg ?
(1) 2 : 3 (2) 1 : 2
(3) 1 : 3 (4) 2 : 5

2. A publisher printed 3000 copies of a book for sale, the cost of each book being Rs. 7.00. He distributed 500 copies to different institutions free of cost. He allowed a book free of cost for each 24 books purchased. If the price of each book is fixed at Rs. 14.50. determine the rate of profit or loss of the publisher.
(1) 66% loss (2) 66% profit
(3) 60% profit (4) 60% loss

3. Bimalbabu sells two cars each of Rs. 99,000. He makes a profit of 10% on the first car, but incurs a loss of 10% on the second. What will be his percentage of profit or loss on the whole transaction ?
(1) 1% profit (2) 1% loss
(3) 4% profit (4) 4% loss

4. A man purchased some eggs at the rate of Rs. 10 per dozen and again purchased $\frac{3}{4}$ of them at the rate of Rs. 12 per dozen. Then he sold all eggs at the rate of Rs. 13 per dozen and made a profit of Rs. 30. Find the total number of eggs he purchased altogether.
(1) 8 dozens (2) 9 dozens
(3) 10 dozens (4) None of these

5. A soap manufacturer supplies soap to wholesaler at 15% profit, wholesaler supplies these to retailer at 20% profit and retailer sells it to the consumer at 25% profit. If for the consumer the price of soap be Rs. 17.25, what is the manufacturing cost of the soap ?
(1) Rs. 10 (2) Rs. 9
(3) Rs. 12 (4) Rs. 8

6. A man sold an article at a loss of 12%. If he had sold for Rs. 56 more he would have gained 4%. What was the cost price of the article?
(1) Rs. 320 (2) Rs. 330
(3) Rs. 340 (4) Rs. 350

7. A dishonest tradesman marks his goods at an advance of 5 per cent on the cost price, and uses a fraudulent balance whose beam is horizontal when the weight in one scale is one-fifth more than the weight in the other. What is his actual gain per cent ?
(1) 30.25 % (2) 32.25 %
(3) 33.25 % (4) 31.25%

8. A man sells a television set at a profit of 10%. If he had bought it for 10% less and sold it for Rs. 360 less, he would have gained 20%. Find the cost price of the television set.
(1) Rs. 18000 (2) Rs. 18500
(3) Rs. 17000 (4) Rs. 19000

9. The C.P. of two shirts taken together is ₹ 840. If by selling one at a profit of 16% and the other at a loss of 12%, there is no loss or gain in the whole transaction, then the C.P. of the two shirts are respectively :
(1) ₹360, ₹480 (2) ₹480, ₹360
(3) ₹380, ₹460 (4) None of these

10. If sweets are bought at 15 for a rupee, how many must be sold for a rupee to gain 25%?
(1) 10 (2) 11
(3) 12 (4) 8

11. A compact disc player when sold for ₹13,600 incurred a loss of 15 per cent. At what price should it have been sold to make a profit of 35 per cent on the cost?
(1) ₹ 21,600 (2) ₹ 20,400
(3) ₹ 19,600 (4) None of these

12. If the selling price of 20 articles is the same as the cost price of 23 articles, find the profit per cent.
(1) 15% (2) 16%
(3) 8% (4) 12%

13. Ramesh bought two boxes for ₹ 1300. He sold one box at a profit of 20% and the other box at a loss of 12%. If the selling price of both boxes is the same, find the cost price of each box.
(1) ₹ 650, ₹ 650 (2) ₹ 550, ₹ 750
(3) ₹ 450, ₹ 850 (4) None of these

14. A trader sells an article at a profit of 15%. If he had bought it for 15% less and had sold it for ₹ 7.80 less, he would have gained 20%. Find the cost price of the article.
(1) ₹ 65 (2) ₹ 80
(3) ₹ 60 (4) ₹ 70

15. Ram Kumar sold his motor cycle to Mohan at a loss of 28%. Mohan spent ₹ 1680 on its repairs and sold the motor cycle to Sohan for ₹. 35910, thereby, making a profit of 12.5%. Find the cost of the motor cycle for Ram Kumar.
(1) ₹ 38000 (2) ₹ 35000
(3) ₹ 40000 (4) ₹ 42000

16. A shopkeeper reduces the price of his goods by 50% at the time of sale. Initially the price was fixed to get a profit of 25% on selling price after allowing 10% cash discount. Find out his approximate percentage of profit or loss.
(1) 26% loss (2) 28% profit
(3) 30% loss (4) 26% profit

17. A wholesaler sells 20 pens at the marked price (printed on the article) of 16 pens to a retailer. The retailer in turn sells them at the marked price . Determine the gain or loss per cent to the retailer.
(1) 25% loss (2) 25% profit
(3) 20% loss (4) 20% profit

18. A defective briefcase costing ₹ 800 is being sold at a loss of 8%. If the price is further reduced by 5%, find its approximate selling price.
(1) ₹ 600 (2) ₹ 650
(3) ₹ 700 (4) ₹ 725

19. A shopkeeper buys 40 bicycles and marks them at 25% above the cost price. He allows a discount of 10% on the marked price for cash sales, and 5% for credit sales. If three-fourth of the stock is sold for cash and the rest for credit, and if the total profit be ₹ 20250, what is the cost price of a bicycle ?
(1) ₹ 4000 (2) ₹ 3500
(3) ₹ 3200 (4) ₹ 3600

20. A dealer sold two coolers at ₹ 2,970 each. On selling one cooler, he gained 10%, on selling the other he lost 10%. Find the dealer's gain or loss per cent.
(1) 1% loss (2) 1% gain
(3) 2% loss (4) 2% gain

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21. A man buys some quantity of wheat for ₹ 2400. He sells one-third of it at a profit of 5%. At what per cent gain should he sell the remaining two-third so as to make an overall profit of 10% on the whole transaction?
(1) 11.5% (2) 12.5%
(3) 13% (4) 13.5%

22. A man purchases some mangoes at the rate of 3 for ₹ 4 and the same quantity at 5 for ₹ 6. If he sells all the mangoes at the rate of 3 for ₹ 5, find his approximate gain or loss per cent.
(1) 35% loss (2) 32% loss
(3) 32% profit (4) 35% gain

23. What per cent above cost price should goods be marked for sale so that after allowing $12\frac{1}{2}\%$ trade discount and 5% cash discount, a net gain of 33% may be earned?
(1) 45% (2) 40%
(3) 50% (4) 60%

24. *A*, *B* and *C* invest ₹ 15000, ₹ 20000 and ₹ 25000 respectively in a business. The profit earned is ₹ 1200. Find the share of A in the profit.
(1) ₹ 300 (2) ₹ 400
(3) ₹ 500 (4) ₹ 600

25. ₹ 52000 is to be divided among the partners *A*, *B* and *C*. The ratio of their investments is $\frac{1}{12}:\frac{1}{18}:\frac{1}{24}$. Find the share of A.
(1) ₹ 16000 (2) ₹ 24000
(3) ₹ 12000 (4) ₹ 18000

26. *A*, *B* and *C* invest ₹ 1000, ₹ 4000 and ₹ 5000 respectively in a business. At the end of the year the balance sheet shows a loss of 20% of the total initial investment. Find the share of loss of B.
(1) ₹ 1000 (2) ₹ 200
(3) ₹ 800 (4) ₹ 1200

27. *A*, *B* and *C* enter into a partnership. *A* invests ₹ 2400 for 4 years, *B* ₹ 2800 for 8 years and *C* ₹ 2000 for 10 years. They earn ₹ 1170. Find the share of each.
(1) ₹ 420 (2) ₹ 540
(3) ₹ 108 (4) ₹ 216

28. *A* and *B* are partners in a firm. *A* invests ₹ 15000 and *B* ₹ 25000. *A* is the working partner and gets 20% of the profit for his contribution in the management of the firm. *B* is the sleeping partner. If the profit is ₹ 475, find the share of B.
(1) ₹ 237.5 (2) ₹ 257.5
(3) ₹ 247.5 (4) ₹ 238.5

29. *A* starts an industry with ₹ 20 lakhs. After 4 months he enters into a partnership with *B* who contributes ₹ 40 lakhs. *C* joins them after another 3 months with a capital of ₹ 60 lakhs. At the year end, the balance sheet shows a profit of ₹ 74000. Find the share of A in the profit.
(1) ₹ 32000 (2) ₹ 24000
(3) ₹ 18000 (4) ₹ 16000

30. Ravi and Shyam enter into a partnership and together start a business with contributions of Rs. 15000 and ₹ 20000. After 4 months Mohan also joins them with contribution of ₹ 22500. After 9 months Shyam withdraws his contribution. At the end of the year there is a profit of ₹ 9000. Find the share of each in the profit.
(1) ₹ 4000 (2) ₹ 3000
(3) ₹ 3500 (4) ₹ 3600

31. *A*, *B* and *C* invest their capital into a partnership business in the following manner; A invests one-half of the capital for three- fourth of the time, *B* invests one-third of the capital for one-half of the time and *C* invests the remaining capital for the whole time. If the profit earned is ₹ 510, how should A get?
(1) ₹ 260 (2) ₹ 250
(3) ₹ 270 (4) ₹ 280

32. Ravi starts a business with ₹ 45000. After a certain period of time he is joined by Mohan who invests ₹ 30000. At the end of the year they divide the profit in the ratio 9 : 4. When did Mohan join Ravi?
(1) After 3 months
(2) After 5 months
(3) After 6 months
(4) After 4 months

33. *A*, *B* and *C* enter into partnership with capital contribution of ₹ 25,000, ₹ 30,000 and ₹ 15,000 respectively. *A* is the working partner and he gets 30% of the profit for managing the business. The balance profit is distributed in proportion to the capital investment. At the year-end, *A* gets Rs. 200 more than *B* and *C* together. Find the total profit.
(1) ₹ 2500 (2) ₹ 2000
(3) ₹ 2200 (4) ₹ 2400

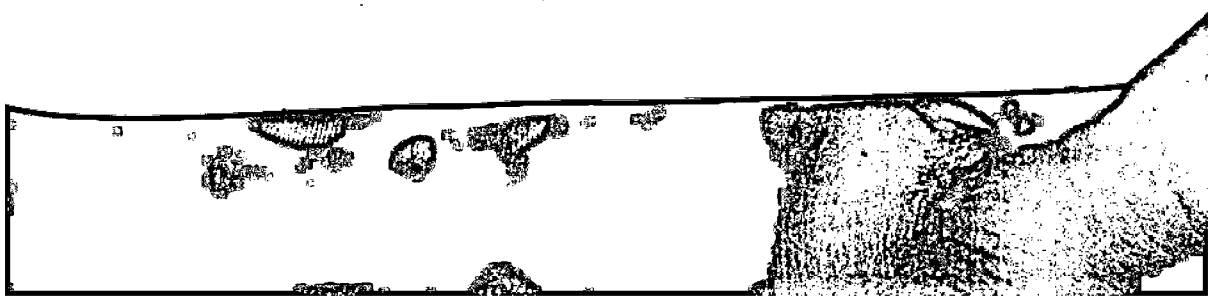
34. *A* and *B* enter into partnership with capital contribution of ₹ 5000 and ₹ 4000 respectively. After $\frac{1}{6}$th of the time *A* contributes additional ₹ 2000. Four months after the start *B* withdraws $\frac{1}{4}$th his capital, then *C* joins the business with a capital investment of ₹ 5000. At the end of the year the company's balance-sheet shows a profit of ₹ 2804. Find the share of *A* in the profit.
(1) ₹ 1402 (2) ₹ 701
(3) ₹ 1420 (4) ₹ 820

35. *A* and *B* enter into partnership and invest in stock market trading. Their investments initially were ₹ 50000 and ₹ 45000. After 4 months *A* withdraws half his capital. At the end of 8 months *B* withdraws half his capital and *C* joins them with a capital of ₹ 70000. What should be the ratio in which the profit will be divided at the year-end?
(1) 40 : 35 : 21 (2) 40 : 45 : 28
(3) 40 : 28 : 21 (4) None of these

36. *A*, *B* and *C* together hold a pasture for which they pay a rent at the rate of ₹ 160 per month. They put on it 70, 50 and 40 cows respectively. *A* sells $\frac{2}{7}$th of his stock to *B* after 4 months and further 3 months later *C* sells $\frac{2}{5}$th of his stock to *A*. How much of the rent should A pay in one year?
(1) ₹ 500 (2) ₹ 400
(3) ₹ 760 (4) ₹ 560

37. Ram and Shyam enter into a partnership by contributing capitals in the ratio 16 : 7. After 5 months Ram withdraws. If finally they share profit in the ratio of 5 : 7, find how long Shyam's capital was used?
(1) 15 months (2) 14 months
(3) 12 months (4) 16 months

38. *A*, *B* and *C* enter into a partnership and invest their capital in the ratio 4 : 8 : 9. Their period of investment are in the ratio 6 : 3 : 5. In what ratio would they distribute their profits?



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(1) 4 : 4 : 15 (2) 8 : 8 : 15
(3) 3 : 3 : 10 (4) 3 : 10 : 15

39. *A*, *B* and *C* enter into a partnership. Their capital contribution is in the ratio 21 : 18 : 14. At the end of the business term they share profits in the ratio 15 : 8 : 9. Find the ratio of time for which they invest their capitals.
(1) 37 : 38 : 72 (2) 39 : 38 : 72
(3) 90 : 56 : 81 (4) None of these

40. *A*, *B* and *C* enter into a partnership. Their contributions are Rs. 30 lakhs, Rs. 20 lakhs, and Rs. 10 lakhs respectively. *A* and *B* are working partners while *C* is a sleeping partner. *A* and *B* get 10% and 15% of gross profit respectively as salary for managing the business. If at the year end *C* receives ₹ 3.75 lakhs, as profit, find the share of *A*.
(1) ₹ 16 Lakhs (2) ₹ 12 Lakhs
(3) ₹ 18 Lakhs (4) ₹14.25 Lakhs

SHORT ANSWERS

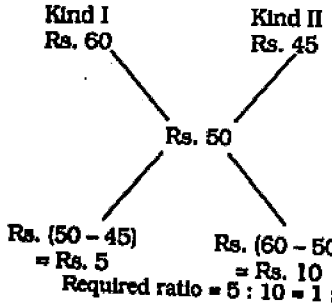
1. (2)	2. (2)	3. (2)	4. (1)
5. (1)	6. (4)	7. (4)	8. (1)
9. (1)	10. (3)	11. (1)	12. (1)
13. (2)	14. (3)	15. (4)	16. (1)
17. (2)	18. (3)	19. (4)	20. (1)
21. (2)	22. (3)	23. (4)	24. (1)
25. (2)	26. (3)	27. (4)	28. (1)
29. (2)	30. (2)	31. (3)	32. (4)
33. (2)	34. (1)	35. (2)	36. (3)
37. (4)	38. (2)	39. (3)	40. (4)

EXPLANATIONS

1. (2) C.P. of 1 kg of mixture

$$= \frac{100}{100+25} \times 62.50 = \text{Rs. } 50$$

By alligation rule,



Required ratio = 5 : 10 = 1 : 2

2. (2) Total cost of the books
= Rs. (3000 × 7) = Rs. 21000
500 books are given free of cost.
Selling price for 25 books
= 24 × 14.50 = Rs. 348
∴ Total selling price = Rs. 34800
∴ Gain = Rs. (34800 – 21000)
= Rs. 13800
∴ Gain%

$$= \frac{13800}{21000} \times 100 \approx 66\%$$

3. (2) C.P. of car sold at 10% profit

$$= \frac{100}{100+\text{gain}\%} \times \text{S.P.}$$

$$= \frac{100}{110} \times 99000 = \text{Rs. } 90000$$

C.P. of car sold at 10% loss

$$= \frac{100}{90} \times 99000 = \text{Rs. } 110000$$

Total C.P.
= Rs. (90000 + 110000)
= Rs. 200000
Total S.P. = Rs. 2 × 99000
= Rs. 198000
∴ Loss = Rs. 2000

$$\therefore \text{Loss}\% = \frac{2000}{200000} \times 100 = 1\%$$

Short-cut Method

If two things are sold at the same price and loss and gain per cent be same i.e. x% then there is always loss.

$$\text{and loss \%} = \frac{x^2}{100}\%$$

$$= \frac{10 \times 10}{100} = 1\%$$

4. (1) Let the total number of eggs be x dozens.
∴ Total C.P.

$$= \text{Rs. } \left(10x + \frac{3}{4}x \times 12\right)$$

$$= \text{Rs. } \left(\frac{40x+36x}{4}\right)$$

$$= \text{Rs. } \frac{76x}{4} = \text{Rs. } 19x$$

$$\text{Total S.P.} = \left(x + \frac{3}{4}x\right) \times 13$$

$$= \frac{7 \times 13x}{4} = \text{Rs. } \frac{91x}{4}$$

$$\therefore \frac{91x}{4} - 19x = 30$$

$$\Rightarrow 91x - 76x = 30 \times 4$$

$$\Rightarrow 15x = 30 \times 4$$

$$\Rightarrow x = \frac{30 \times 4}{15} = 8 \text{ dozens.}$$

5. (1) Manufacturing cost

$$= \frac{100}{115} \times \frac{100}{120} \times \frac{100}{125} \times 17.25$$

= Rs. 10

6. (4) Let the C.P. be Rs. x.

$$\text{S.P.} = \frac{88x}{100} = \text{Rs. } \frac{22x}{25}$$

$$\text{New S.P.} = \text{Rs. } \left(\frac{22x}{25} + 56\right)$$

$$\therefore \frac{22x}{25} + 56 = \frac{104x}{100} = \frac{26x}{25}$$

$$\Rightarrow \frac{4x}{25} = 56 \Rightarrow x = \frac{56 \times 25}{4}$$

= Rs. 350

7. (4) A packet of goods marked 1 kg
Actual weight = 800 gm.
C.P. at Re. 1/gm = Rs. 800
S.P. of this packet

$$= \frac{105}{100} \times 1000 = \text{Rs. } 1050$$

$$\text{Gain \%} = \frac{250}{800} \times 100$$

= 31.25

8. (1) Let the C.P. of television set be Rs. x.

$$\text{First S.P.} = \text{Rs. } \frac{110}{100}x$$

$$= \text{Rs. } \frac{11}{10}x$$

$$\text{New C.P.} = \text{Rs. } \frac{9x}{10}$$

$$\text{New S.P.} = \text{Rs. } \frac{9x}{10} \times \frac{120}{100}$$

$$= \text{Rs. } \frac{27x}{25}$$

$$\therefore \frac{11x}{10} - \frac{27x}{25} = 360$$

$$\Rightarrow \frac{55x - 54x}{50} = 360$$

$$\Rightarrow x = 360 \times 50 = \text{Rs. } 18000$$

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9. (1) Let the CP of shirt sold at 16% gain be Rs. x

$$\therefore x\times\frac{116}{100}+(840-x)\times\frac{88}{100}=840$$

$$\Rightarrow 116x+88\times840-88x=84000$$

$$\Rightarrow 28x=84000-88\times840=840\times12$$

$$\Rightarrow x=\frac{840\times12}{28}=\text{Rs. } 360$$

CP of second shirt = 840 – 360 = Rs. 480

Alternate Method

Let the CP of shirt sold at gain be Rs. x and that of shirt sold at loss be Rs. y.

$$\therefore x\times\frac{16}{100}=y\times\frac{12}{100}$$

$$\Rightarrow \frac{x}{y}=\frac{3}{4}$$

$$\Rightarrow x=\frac{3}{7}\times840=\text{Rs. } 360$$

$$y=\frac{4}{7}\times840=\text{Rs. } 480$$

10. (3) Required answer

$$=\frac{15\times100}{125}=12$$

11. (1) CP of a compact disc player

$$=13600\times\frac{100}{85}=\text{Rs. } 16000$$

SP for a gain of 35%

$$=\frac{16000\times135}{100}$$

= Rs. 21600

12. (1) Let the, SP of 20 articles be x.

then, SP of 1 articles = $\frac{x}{20}$

Also the cost price of 23 articles = x

Then, CP of 1 article = $\frac{x}{23}$

Profit = SP – CP

$$=\frac{x}{20}-\frac{x}{23}=\frac{23x-20x}{460}=\frac{3x}{460}$$

$$\text{Profit \%}=\frac{\text{Profit}}{\text{CP}}\times100$$

$$=\frac{\frac{3x}{460}}{\frac{x}{23}}\times100$$

$$=\frac{3x}{460}\times\frac{23}{x}\times100=15\%$$

13. (2) Total price of two boxes = ₹ 1300

Let CP of one box = x

Then CP of other box = $(1300-x)$

Profit on 1st box = 20%

∴ SP of 1st box

$$=x+\frac{20}{100}x$$

$$=\frac{100x+20x}{100}=\text{Rs.}\frac{120x}{100}$$

Loss on 2nd box = 12%

∴ SP of 2nd box = CP – Loss

$$=(1300-x)-\frac{12}{100}(1300-x)$$

$$=(1300-x)\left(1-\frac{12}{100}\right)$$

$$=(1300-x)\times\frac{88}{100}$$

$$=1144-\frac{88x}{100}$$

But SP of both boxes is same

$$\Rightarrow\frac{120x}{100}=1144-\frac{88x}{100}$$

$$\Rightarrow\frac{120x}{100}+\frac{88x}{100}=1144$$

$$\Rightarrow\frac{208x}{100}=1144$$

$$\Rightarrow x=\frac{1144\times100}{208}=550$$

∴ Cost price of 1st box = ₹ 550

and cost price of another box = ₹1300 – ₹ 550 = ₹ 750

14. (3) Let C.P. of the article = ₹ 100

∴ The first selling price = ₹ 100 + ₹ 15 = ₹ 115

Now, C.P. = 100 – 15 = ₹ 85

$$\text{S.P.}=₹\left(\frac{85\times120}{100}\right)=₹\ 102$$

Difference in S.P. = ₹ 115 – ₹ 102 = ₹ 13

∵ If difference is ₹ 13, then C.P. = ₹ 100

∴ If difference is ₹ $\frac{78}{10}$, the

C.P. $=\frac{100}{13}\times\frac{78}{10}=₹\ 60$

15. (4) Let CP of motor cycle for Ram Kumar be x

SP for Ram Kumar

$$=x-\frac{28}{100}x=\frac{72}{100}x$$

∴ Cost for Mohan = $\frac{72}{100}x$

Cost of repairing = ₹ 1680

∴ Total CP for Mohan

$$=₹\frac{72}{100}x+1680$$

Profit earned by Mohan = 12.5%

SP for Mohan = CP + Profit

$$=\frac{72}{100}x+1680+\frac{12.5}{100}\left(\frac{72}{100}x+1680\right)$$

$$\text{SP}=\left(\frac{72x}{100}+1680\right)\left(\frac{1125}{100}\right)$$

But, SP for Mohan is given = Rs. 35910

$$\therefore\left(\frac{72x}{100}+1680\right)\left(\frac{1125}{100}\right)$$

= ₹ 35910

$$\Rightarrow\left(\frac{72x}{100}+1680\right)=\frac{35910\times100}{1125}$$

$$\Rightarrow\frac{72x}{100}+1680=31920$$

$$\Rightarrow x=\frac{30240\times100}{72}$$

= ₹ 42000

So, the cost price of the motor cycle for Ram Kumar = ₹ 42,000

16. (1) Let initial S.P. = ₹ 100

profit = 25% of 100 = 25

∴ C.P. = 100 – 25 = ₹ 75

Now, when

Marked Price	Discount	S.P.
100	10	90
x	—	100

$$\therefore x=\frac{100\times100}{90}=₹\frac{1000}{9}$$

∴ New S.P. = 50% of

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$₹\frac{1000}{9}$, i.e., $\frac{1000}{9}\times\frac{50}{100}$

$=₹\frac{500}{9}=₹\ 55\frac{5}{9}$

∴ Loss = ₹ 75 (Old Price) − ₹ $55\frac{5}{9}$ (New S.P.) = ₹ $19\frac{4}{9}$

∴ When

S.P.	Loss per cent
75 ↑	$19\frac{4}{9}$ ↓
100	y

where y = loss per cent

$\therefore\ y=\frac{100}{75}\times\frac{175}{9}$

Loss per cent $=\frac{700}{27}=25\frac{25}{27}\%$

= 26% (approx)

17. (2) Let the marked price of 1 pen = ₹ 100

∴ MP of 20 pens = 20 × 100 = ₹ 2000

MP of 16 pens = 16 × 100 = ₹ 1600

CP of 20 pens for retailer = ₹ 1600

SP of 20 pens for retailer = ₹ 2000

∴ Profit = ₹ 400

$\text{Profit\%}=\frac{400}{1600}\times 100=25\%$

18. (3) C.P. = ₹ 800

Loss = 8%

$\Rightarrow \text{SP}=₹\ 800-\frac{8}{100}\times 800$

= ₹ 800 − 64 = ₹ 736

Reduction 5% $=\frac{5}{100}\times 736$

∴ Reduced SP

$=₹\ 736-736\times\frac{5}{100}$

= ₹ 736 − 36.80 = ₹ 699.20

∴ Selling price = ₹ 699.20 ≈ ₹ 700

19. (4) Number of bicycles = 40

Let C.P. of one bicycle be x

∴ Marked price of each bicycle

$=\frac{125}{100}x=1.25\,x$

Discount for cash sale = 10%

Discount for credit sale = 5%

∴ S.P. for cash sale

$=1.25\,x\times\frac{90}{100}$

$=(1.25\,x\times 0.9)=1.125\,x$

S.P. for credit sale

$=1.25\,x\times\frac{95}{100}$

$=(1.25\,x\times 0.95)=1.1875\,x$

Number of bicycles sold for cash = 30

Number of bicycles sold on credit = 10

∴ Total S.P. = [1.125 x × 30 + 1.1875x × 10]

$=45.625\,x$

∴ Profit $=(45.625-40)\,x$

$=5.625\,x$

But actual profit = ₹ 20250

∴ $5.625\,x=20250$

$\Rightarrow x=\frac{20250}{5.625}=₹\ 3600$

Hence, C.P. of a bicycle = ₹ 3600

20. (1) S P of one cooler = ₹ 2,970

Profit % = 10 %

Let C P of the cooler be x

Then, SP = CP + Profit

$\Rightarrow 2970=x+\frac{10}{100}x$

$\Rightarrow 2970=\frac{110}{100}x$

$\Rightarrow \frac{2970}{110}\times 100=x$

$\Rightarrow x=₹\ 2700$

For 2nd cooler,

S P = ₹ 2970

Loss = 10 %

Let CP = y, then

SP = CP − Loss = 2970

$=y-\frac{10}{100}y$

$\Rightarrow \frac{90y}{100}=2970\ \Rightarrow y=₹\ 3300$

∴ Total cost price for coolers = ₹ 2700 + 3300 = ₹ 6000

Total selling price for two coolers = ₹ 2970 + 2970 = ₹ 5940

Hence, Loss = ₹ 6000 − 5940 = ₹ 60

& Loss % $=\frac{60}{6000}\times 100=1\%$.

21. (2) C.P. of $\frac{1}{3}$rd of wheat

$=₹\ \frac{2400}{3}=₹\ 800$

S.P. of $\frac{1}{3}$rd of wheat

$=\frac{105}{100}\times 800=₹\ 840$

C.P. of total wheat = ₹ 2400

Required S.P. of total wheat

$=₹\left(\frac{110}{100}\times 2400\right)=₹\ 2640$

C.P. of remaining $\frac{2}{3}$rd of wheat

$=\frac{2}{3}\times 2400=₹\ 1600$

Required S.P. of remaining $\frac{2}{3}$rd wheat

= ₹ 2640 − 840 = ₹ 1800

$\text{Profit \%}=\frac{\text{S.P.}-\text{C.P.}}{\text{C.P.}}\times 100$

Therefore, required profit %

$=\frac{1800-1600}{1600}\times 100$

$=\frac{25}{2}\%=12\frac{1}{2}\%=12.5\%$

22. (3) Suppose the man purchases 1 mango in each case.

∵ C.P. of 3 mangoes = ₹ 4

∴ C.P. of 1 mango = ₹ $\frac{4}{3}$

Again,

∵ C.P. of 5 mangoes = ₹ 6

∴ C.P. of 1 mango = ₹ $\frac{6}{5}$

∴ C.P. of 2 (mixed) mangoes

$=\frac{4}{3}+\frac{6}{5}=\frac{20+18}{15}=₹\frac{38}{15}$

∴ C.P. of 1 mango

$=\frac{1}{2}\times\frac{38}{15}=₹\frac{19}{15}$

Now, ∵ S.P. of 3 mangoes = ₹ 5

∴ S.P. of 1 mango = ₹ $\frac{5}{3}$

∴ Profit $=\frac{5}{3}-\frac{19}{15}=₹\ \frac{6}{15}=₹\ \frac{2}{5}$

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$\because$ Profit on ₹ $\frac{19}{15}$ = ₹ $\frac{2}{5}$

$\therefore$ Profit on ₹ 1 = $\frac{2}{5}\times\frac{15}{19}$

$\therefore$ Profit on ₹ 100

= $\frac{2}{5}\times\frac{15}{19}\times100$ = ₹ $31\frac{11}{19}$

Hence, profit = $31\frac{11}{19}$% or ≈ 32%

23. (4) If the C.P. is ₹ 100, the cash selling price = ₹ 133.
Now, let invoice price (after allowing T.D.) be 100, cash discount = 5 %
$\therefore$ When,

Cash S.P.	Invoice price
100–5=95 ↑	100 ↓
133 ↑	y ↓

$\therefore y = \frac{133\times100}{95}$ = ₹ 140

Now, Trade discount = $12\frac{1}{2}$%

$\therefore$ Marked price 100 – $12\frac{1}{2}$ T.D.

= $87\frac{1}{2}$ (Invoice price)

When,

Invoice price	Marked price
$87\frac{1}{2}$ ↑	100 ↓
140 ↑	x ↓

$\therefore x = \frac{140\times100\times2}{175}$ = Rs. 160

Thus, marked price should be 60% = (160–100) above cost.

24. (1) This is a case of simple partnership
Ratio of investments,
A : B : C
= 15000 : 20000 : 25000
= 3 : 4 : 5
Sum of the ratios = 3 + 4 + 5 = 12
Share in the profit :

For A = $\frac{3}{12}\times1200$ = ₹ 300

25. (2) This is a case of simple partnership

$\frac{1}{12}:\frac{1}{18}:\frac{1}{24}=\frac{6}{72}:\frac{4}{72}:\frac{3}{72}$

(Here 72 is the LCM of 12, 18 and 24)
= 6 : 4 : 3
Sum of the ratios= 6+4+3 = 13

and, $\frac{52000}{13}$ = 4000

A's share = 6 × 4000 = Rs. 24000

26. (3) Total initial investment
= Rs.1000 + Rs. 4000 + Rs. 5000 = Rs. 10,000
Total loss = 20% of total initial investment

= $\frac{20}{100}\times10{,}000$ = Rs. 2000

(This is an example of simple partnership.)
$\therefore$ ₹ 2000 has to be divided among the partners in proportion to their investments. Ratio of investments are
A : B : C = ₹ 1000 : ₹ 4000 : ₹ 5000 = 1 : 4 : 5
Sum of the ratios = 1+4+5 = 10

$1 \Rightarrow \frac{\text{Rs. } 2000}{10}$ = ₹ 200

Share of loss for B
= 4 × ₹ 200 = ₹ 800

27. (4) This is a case of compound partnership.
₹ 2400 investment for 4 years earns as much as ₹ 2400 × 4 = ₹ 9600 in 1 year
Similarly, ₹ 2800 for 8 years is equivalent to ₹ 2800 × 8 = ₹ 22400 in 1 year
₹ 2000 for 10 years is equivalent to ₹ 2000 × 10
= ₹ 20,000 in 1 year
The profit is, therefore, divided in the ratio
₹ 9600 : ₹ 22400 : ₹ 20000
or, 12 : 28 : 25
Sum of the ratios =12 + 28 + 25 = 65

₹ $\frac{1170}{65}$ = Rs. 18

So, A's share =12 × ₹ 18 = ₹ 216

28. (1) First we have to deduct the payment to be made to A from the total profit for his contribution in the management of the firm.
20% of Rs. 475 = ₹ 95
Balance profit = ₹ (475 – 95)
= ₹ 380.
This has to be divided between A and B in the ratio of their investments i.e.,
₹ 15000: ₹ 25000 = 3 : 5
B's share

= ₹ 380 × $\frac{5}{8}$ = ₹ 273.5

29. (2) A's investment is ₹ 20 lakhs for the whole year i.e., 12 months which is equivalent to 20 × 12
= ₹ 240 lakhs for 1 month
B's investment is ₹ 40 lakhs for (12 – 4) = 8 months is equivalent to 40 × 8 = ₹ 320 lakhs for 1 month.
C's investment is ₹ 60 lakhs for 3 months is equivalent to 60 × 3
= ₹ 180 lakhs for 1 month
The share in the profit should be in the following ratio,
A : B : C = 240 : 320 : 180
= 12 : 16 : 9

$\frac{74000}{12+16+9}$ = ₹ 2000

= profit for 1 month
A's share = ₹ (12 × 2000)
= ₹ 24000

30. (2) Ravi : Shyam : Mohan
= (15000 × 12) : (20000 × 9) : (22500 × 8)
= 180000 : 180000 : 180000
= 1 : 1 : 1
Therefore, the share of each in the profit is

$\frac{9000}{3}$ = ₹ 3000

31. (3) C's share of the capital

= $1-\left(\frac{1}{2}+\frac{1}{3}\right)=\frac{1}{6}$

A : B : C = $\left(\frac{1}{2}\times\frac{3}{4}\right)$:

$\left(\frac{1}{3}\times\frac{1}{2}\right):\left(\frac{1}{6}\times1\right)$

= $\frac{3}{8}:\frac{1}{6}:\frac{1}{6}$

= $\frac{9}{24}:\frac{4}{24}:\frac{4}{24}$

= 9 : 4 : 4

$\frac{510}{9+4+4}$ = ₹ 30

Profit share of A = ₹ 30 × 9
= ₹ 270

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32. (4) Suppose Mohan joins Ravi after x months.
Then, during the year Mohan's investment was for $(12-x)$ months.

$$\therefore \frac{45000\times12}{30000\times(12-x)} = \frac{9}{4}$$

$$\Rightarrow \frac{12-x}{12} = \frac{45000}{30000}\times\frac{4}{9}$$

$$\Rightarrow \frac{12-x}{12} = \frac{2}{3} \Rightarrow 36-3x = 24$$

$\therefore x = 4$ months

33. (2) Let the total profit be ₹ 100
A's share for managing the business which is 30% of profit=₹ 30
Balance profit = ₹ (100-30)=₹ 70
Ratio of capital investment:
$A : B : C$ = ₹ 25000 : Rs. 30000 : ₹ 15000
= 5 : 6 : 3

Now, $\frac{70}{5+6+3}$ = ₹ 5
Share of profit A's = ₹ 5×5 = ₹ 25
B's = ₹ 5 × 6 = ₹ 30
C's = ₹ 5 × 3 = Rs. 15
A's total share of profit
= ₹ 30 + ₹ 25 = ₹ 55
Profit share of B and C put together
= ₹ 30 + ₹ 15 = ₹ 45
A's – (B's + C's) share
= ₹ 55 – ₹ 45 = ₹ 10
When the difference is ₹ 10, the total profit is ₹ 100
When the difference is ₹ 200 (i.e., 10 × 20) total profit is ₹ 100 × 20 = ₹ 2000

34. (1) Computing in terms of 1 month
A's investment = (5000 × 12) + (2000 × 10) = ₹ 80000
B's investment = (4000 × 4) + (3000 × 8) = ₹ 40000
C's investment = 5000 × 8
= ₹ 40000
$A : B : C$ = 80000 : 40000 : 40000
$A : B : C$ = 2 : 1 : 1

Now, $\frac{2804}{2+1+1} = 701$
A's share = 701 × 2 = ₹ 1402

35. (2) Investment ratio in terms of 1 month or of their equivalent capitals,
$A : B : C$

$$= \left\{(50000\times4)+\left(\frac{50000}{2}\times8\right)\right\} :$$

$$\left\{(45000\times8)+\left(\frac{45000}{2}\times4\right)\right\} :$$

(70000×4)
= 400,000 : 450,000 : 280,000
= 40 : 45 : 28
The profits will be distributed in the above ratio i.e., 40 : 45 : 28.

36. (3) Total rent to be paid for one year = 160 × 12 = ₹ 1920.
This is a case of compound partnership. So, the rent will be shared in proportion to the product of number of cows and time for each partner.
Computing in terms of 1 month.
For A :

$$(70\times4)+\left(70-\frac{2}{7}\times70\right)$$

$$\times3+\left(70-\frac{2}{7}\times70+\frac{2}{5}\times40\right)\times5$$

= (70 × 4) + (50 × 3) + (66 × 5)
= 280 + 150 + 330
For A = 760
For B :

$$\{50\times4\}+\left\{50+\frac{2}{7}\times70\right\}\times8$$

= 200 + 560
For B = 760
For C

$$\{40\times7\}+\left\{40-\frac{2}{5}\times40\right\}\times5$$

= 280 + 120
For C = 400
So, $A : B : C$ = 760 : 760 : 400
= 19 : 19 : 10

$$\frac{1920}{19+19+10} = \frac{1920}{48} = 40$$

Rent to be paid,
by A = 19 × 40 = ₹ 760

37. (4) Let us assume that Shyam's capital was used for x months.
Then we can write the ratio of their equivalent capital investment as

$$\text{Ram : Shyam} = \frac{16\times5}{7\times x} = \frac{5}{7}$$

or, $x = 16$
So, Shyam's capital was used for 16 months.

38. (2) Ratio of profit = Ratio of product of investment and time period.
Ratio of share of profits
$A : B : C$ = (4 × 6):(8 × 3):(9 × 5)
= 24 : 24 : 45
or $A : B : C$ = 8 : 8 : 15

39. (3) Ratio of profits = (Ratio of capital by time).
∴ Ratio of time = Ratio of profit divided by respective capitals.

$$= \frac{15}{21} : \frac{8}{18} : \frac{9}{14}$$

$$= \frac{5}{7} : \frac{4}{9} : \frac{9}{14}$$

$$= \frac{90}{126} : \frac{56}{126} : \frac{81}{126}$$

[126 is LCM of 7, 9 and 14]
$A : B : C$ = 90 : 56 : 81.

40. (4) Let the gross profit be x

$$A\text{'s salary} = \frac{10}{100}x = 0.10x$$

B's salary = $0.15x$
Net profit = $x - (0.10x + 0.15x)$
= $0.75x$
The net profit will be shared among three partners in proportion to their capital contributions.
∴ Ratio of capital contributions,
$A : B : C$ = 30 : 20 : 10
$A : B : C$ = 3 : 2 : 1
Sum of the ratios = 3 + 2 + 1 = 6
C's share in the net profit

$$= \frac{1}{6}\times0.75x$$

But, $\frac{0.75}{6}x = 3.75$

$$\text{or } x = 6\times\frac{3.75}{0.75}$$

or x = 30
So, Gross profit = x = ₹ 30 lakhs
Total share for A or B will be sum of their salary and share in the net profit.

$$A\text{'s share} = 0.10x + \frac{3}{6}\times0.75x$$

$= 0.10x + 0.375\ x = 0.475\ x$
[∵ Gross profit, x = 30 lakhs]
= 0.475 × 30 = 14.25 lakhs
& B's share

$$= 0.15\ x + \frac{2}{6}\times0.75x$$

$= 0.15x + 0.25\ x$
= 0.40 × 30 = 12 lakhs

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9 DISCOUNT

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE-I

1. Applied to a bill for ₹ 1,00,000 the difference between a discount of 40% and two successive discounts of 36% and 4% is :
(1) Nil (2) ₹1,440
(3) ₹ 2,500 (4) ₹ 4,000
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting & SSC Section officer (Audit) Exam : 16.11.2003))

2. Successive discounts of 10% and 30% are equivalent to a single discount of :
(1) 40% (2) 35%
(3) 38% (4) 37%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The marked price of a watch was ₹ 720/-. A man bought the same for ₹ 550.80, after getting two successive discounts, the first at 10%. What was the second discount rate?
(1) 12% (2) 14%
(3) 15% (4) 18%
(SSC CGL Prelim Exam. 27.02.2000 (Ist Sitting) & (SSC GL Tier-I Exam. 21.04.2013)

4. The marked price of a watch is ₹ 1000. A retailer buys it at ₹ 810 after getting two successive discounts of 10% and another rate which is illegible. What is the second discount rate?
(1) 15% (2) 10%
(3) 8% (4) 6.5%
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

5. Successive discounts of 10% and 20% are equivalent to a single discount of :
(1) 30% (2) 15%
(3) 28% (4) 12%
(SSC CGL Prelim Exam. 24.02.2002 (Ist & IInd Sitting) & (SSC CGL Exam. 08.02.2004 (Ist Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting)

6. The equivalent single discount for two successive discounts of 15% and 10% is
(1) 25% (2) 20%
(3) 23.5% (4) 20.5%
(SSC CGLPrelim Exam. 24.02.2002 (Middle Zone)

7. The marked price of an article is ₹ 500. It is sold at successive discounts of 20% and 10%. The selling price of the article (in rupees) is :
(1) 350 (2) 375
(3) 360 (4) 400
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. An item is marked for ₹ 240 for sale. If two successive discounts of 10% and 5% are allowed on the sale price, the selling price of the article will be
(1) ₹ 205.20 (2) ₹ 204
(3) ₹ 34.80 (4) ₹ 36
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. The price of an article is raised by 30% and then two successive discounts of 10% each are allowed. Ultimately the price of the article is
(1) increased by 10%
(2) increased by 5.3%
(3) decreased by 3%
(4) decreased by 5.3%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. A single discount equivalent to the successive discounts of 10%, 20% and 25% is
(1) 55% (2) 45%
(3) 46% (4) 60%
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003) & (SSC DEO Exam. 02.05.2009) & (SSC CISF ASI Exam. 29.08.2010)

11. List price of an article at a show room is ₹ 2,000 and it is being sold at successive discounts of 20% and 10%. Its net selling price will be :
(1) ₹ 1900 (2) ₹ 1700
(3) ₹ 1440 (4) ₹ 1400
(SSC CGLPrelim Exam. 08.02.2004 (Second Sitting)

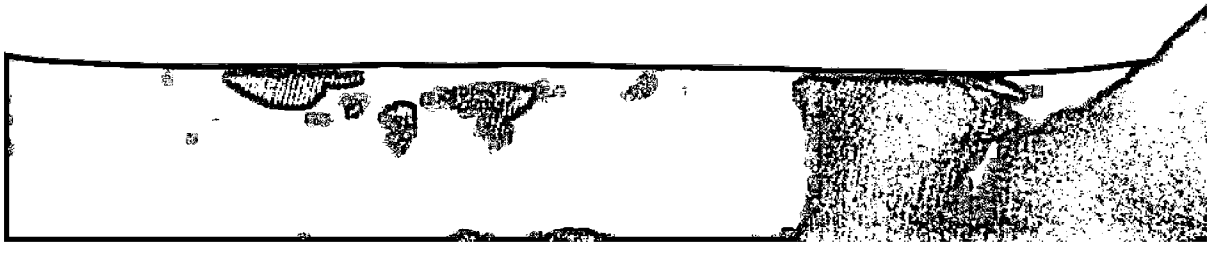
12. The difference between a single discount of 30% on ₹ 550 and two successive discounts of 20% and 10% on the same amount is
(1) Nil (2) ₹ 11
(3) ₹ 22 (4) ₹ 44
(SSC CPO S.I. Exam. 05.09.2004)

13. The marked price of a watch is ₹ 800. A shopkeeper gives two successive discounts and sells the watch at ₹ 612. If the first discount is 10%, the second discount is :
(1) 10% (2) 12%
(3) 15% (4) 20%
(SSC CPO S.I. Exam. 26.05.2005) & (SSC CGL Prelim Exam. 21.04.2013)

14. A person paid ₹ 17,000 for a motor-car after a single discount of 15%. If he is given successive discounts of 5% and 10% then how much he would pay ?
(1) ₹ 17,000 (2) ₹ 17,010
(3) ₹17,100 (4) ₹ 18,900
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

15. The list price of a clock is ₹ 160. A customer buys it for ₹ 122.40 after two successive discounts. If first discount is 10%, the second is
(1) 10% (2) 12%
(3) 15% (4) 18%
(SSC CGL Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (SSC GL Tier-I Exam. 19.05.2013))

16. A shopkeeper gives two successive discounts on an article marked ₹ 450. The first discount given is 10 per cent. If the customer pays ₹ 344.25 for the article, the second discount given is
(1) 14 per cent (2) 10 per cent
(3) 12 per cent (4) 15 per cent
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)



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17. A company offers three types of successive discounts : (i) 25% and 15%, (ii) 30% and 10%, (iii) 35% and 5%. Which offer is the best for a customer?
(1) First offer
(2) Second offer
(3) Third offer
(4) Any one; all are equally good
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

18. An article is listed at ₹ 900 and two successive discounts of 8% and 8% are given on it. How much would the seller gain or lose, if he gives a single discount of 16%, instead of two discounts ?
(1) Gain of ₹ 4.76
(2) Loss of ₹ 5.76
(3) Gain of ₹ 5.76
(4) Loss of ₹ 4.76
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

19. A dealer buys a car listed at ₹ 200000 at successive discounts of 5% and 10%. If he sells the car for 179550, then his profit is
(1) 10% (2) 9%
(3) 5% (4) 4%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

20. An article listed at ₹ 800 is sold at successive discounts of 25% and 15%. The buyer desires to sell it off at a profit of 20% after allowing a 10% discount. What would be his list price ?
(1) ₹ 620 (2) ₹ 600
(3) ₹ 640 (4) ₹ 680
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

21. The difference between a discount of 40% on ₹ 500 and two successive discounts of 36% and 4% on the same amount is
(1) zero (2) ₹ 1.93
(3) ₹ 2.00 (4) ₹ 7.20
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting) & (SSC CGL Tier-I Exam. 19.06.2011 (IInd Sitting)

22. An article is listed at ₹ 920. A customer pays ₹ 742.90 for it after getting two successive discounts. If the rate of first discount is 15%, the rate of 2nd discount is
(1) 3% (2) 5%
(3) 8% (4) 12%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

23. The marked price of watch was ₹ 820. A man bought the watch for ₹ 570.72 after getting two successive discounts, of which the first was 20%. The second discount was
(1) 18% (2) 15%
(3) 13% (4) 11%
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

24. A bicycle, marked at ₹ 2,000, is sold with two successive discount of 20% and 10%. An additional discount of 5% is offered for cash payment. The selling price of the bicycle at cash payment is
(1) ₹ 1,368 (2) ₹ 1,468
(3) ₹ 1,568 (4) ₹ 1,668
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

25. The difference between a discount of 40% on ₹ 500 and two successive discounts of 30% and 10% on the same amount is
(1) ₹ 15 (2) 0
(3) ₹ 20 (4) ₹ 10
(SSC CPO S.I. Exam. 09.11.2008)

26. The marked price of a T.V. is ₹ 16,000. After two successive discounts it is sold for ₹ 11,400. If the first discount is 5%, then the rate of second discount is
(1) 15% (2) 20%
(3) 30% (4) 25%
(SSC CPO S.I. Exam. 06.09.2009)

27. The difference between a discount of 30% on ₹ 2,000 and two successive discounts of 25% and 5% on the same amount is
(1) ₹ 30 (2) ₹ 35
(3) ₹ 25 (4) ₹ 40
(SSC CPO S.I. Exam. 06.09.2009)

28. If on a marked price, the difference of selling prices with a discount of 30% and two successive discounts of 20% and 10% is ₹ 72, then the marked price (in rupees) is
(1) 3,600 (2) 3,000
(3) 2,500 (4) 2,400
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

29. Successive discounts of 10%, 20% and 30% is equivalent to a single discount of
(1) 60% (2) 49.6%
(3) 40.5% (4) 36%
(SSC CPO SI Exam. 03.09.2006) & (SSC CGL Tier-I Exam.16.05.2010 (IInd Sitting) & (SSC CAPF's SI & CISF ASI Exam. 23.06.2013)

30. Two successive discounts of 20% and 20% is equivalent to a single discount of
(1) 42% (2) 40%
(3) 36% (4) 34%
(SSC (South Zone) Investigator Exam 12.09.2010)

31. Two successive discounts of 10% and 5% are equivalent to a single discount of
(1) 14% (2) 14.25%
(3) 14.50% (4) 15%
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

32. What single discount is equivalent to two successive discounts of 20% and 15%?
(1) 35% (2) 32%
(3) 34% (4) 30%
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting) & (SSC CHSL DEO Exam. 02.11.2014) (Ist Sitting)

33. The single discount equal to three consecutive discounts of 10%, 12% and 5% is
(1) 26.27% (2) 24.76%
(3) 9% (4) 11%
(SSC CGLTier-1 Exam 26.06.2011 (Second Sitting)

34. Two successive discounts of 5%, 10% are given for an article costing ₹850. Present cost of the article is (in ₹) :
(1) 725 (2) 726.75
(3) 700 (4) 650
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

35. A shopkeeper purchased a chair marked at ₹ 800, at two successive discounts of 10% and 15% respectively. He spent ₹ 28 on transportation and sold the chair for ₹ 800. His gain percent is :
(1) 40% (2) 30%
(3) 25% (4) 14%
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

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36. The discount series 10%, 20%, 40% is equivalent to a single discount of
(1) 50% (2) 56.8%
(3) 60% (4) 62.28%
(SSC CPO S.I. Exam. 07.09.2003) & (SSC DEO Exam. 31.06.2008) & (SSC CHSL DEO & LDC Exam. 04.12.2011) & (SSC GL Tier-II Exam. 16.09.2012)

37. The single discount, which is equivalent to successive discounts of 25% and10 %, is :
(1) 35 % (2) 34.5%
(3) 33 % (4) 32.5 %
(SSC CHSL DEO & LDC Exam. 28.11.2010 (1st Sitting)

38. The single discount equivalent to two successive discounts of 20% and 5% is
(1) 24% (2) 25%
(3) 22% (4) 23%
(SSC SAS Exam. 26.06.2010) & (SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

39. The difference between a discount of 35% and two successive discounts of 20% on a certain bill was ₹ 22. The amount of the bill was
(1) ₹ 200 (2) ₹ 220
(3) ₹1,100 (4) ₹ 2,200
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

40. The marked price of a watch is ₹ 1,600. The shopkeeper gives successive discounts of 10% and x% to the customer. If the customer pays ₹ 1,224 for the watch, the value of x is
(1) 5% (2) 10%
(3) 15% (4) 20%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011) & (SSC GL Tier-I Exam. 21.04.2013 (1st Sitting)

41. A single discount equivalent to discount series 20%, 20% and 10% is
(1) 50% (2) 48.4%
(3) 42.4% (4) 40.4%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

42. The price of a certain television set is discounted by 10% and the reduced price is then discounted by 10%. This series of successive discounts is equivalent to a single discount of
(1) 20% (2) 19%
(3) 18% (4) 11%
(SSC CHSL DEO & LDC Exam. 04.12.2011 & 28.10.2012 (1st Sitting (East Zone)

43. The single discount which is equivalent to successive discounts of 20%, 15% and 10% is
(1) 32·7% (2) 34·2%
(3) 36·9% (4) 38·8%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

44. The single discount equivalent to the discount series of 20%,10% and 5% is :
(1) 11.66% (2) 31.6%
(3) 35.66% (4) 32%
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone) & (SSC CHSL DEO & LDC Exam. 10.11.2013)

45. Successive discounts of p% and q% on the catalogue price of an article is equivalent to a single discount of :
(1) $\left(x-y-\frac{xy}{100}\right)\%$
(2) $\left(p-q-\frac{pq}{100}\right)\%$
(3) $\left(p+q-\frac{pq}{100}\right)\%$
(4) $\left(p+q+\frac{pq}{100}\right)\%$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (1st & IInd Sitting (East Zone) & (SSC Graduate Level Tier-II Exam.29.09.2013)

46. A chair listed at ₹350 is available at successive discounts of 25% and 10%. The selling price of the chair is
(1) ₹ 236.25 (2) ₹ 230.25
(3) ₹ 240.25 (4) ₹ 242.25
(SSC CHSL DEO & LDC Exam. 21.10.2012 (1st Sitting)

47. A trader allows two successive discounts of 30% and 15% on selling an article. If he gets ₹ 476 for that article, find its marked price.
(1) ₹ 700 (2) ₹ 400
(3) ₹ 900 (4) ₹ 800
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting) & (SSC MTS Exam. 10.03.2013)

48. In selling an article, the single discount equivalent to two successive discounts of 25% and 5% is
(1) 28.75% (2) 30%
(3) 27.5% (4) 26%
(SSC CHSL DEO & LDC Exam. 28.10.2012 (1st Sitting)

49. The marked price of a table is ₹800. A retailer bought it after two successive discounts of 10% and 15%. He spent ₹13 on transportation and sold it for ₹875. His profit was
(1) 40% (2) 37%
(3) 28% (4) 25%
(SSC CHSL DEO & LDC Exam. 28.10.2012 (1st Sitting)

50. Alex sold his goods after announcing two successive discounts of 30% each. The effective discount altogether is
(1) 52% (2) 49%
(3) 50% (4) 51%
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

51. A sofa-set listed at ₹ 800 is sold to a retailer at successive discounts of 25% and 15% by the wholesaler. Then the cost price of the sofa-set for retailer is
(1) ₹ 500 (2) ₹ 510
(3) ₹ 550 (4) ₹ 560
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

52. The printed price of a book is ₹ 320. A retailer pays ₹ 244.80 for it. He gets successive discounts of 10% and an another rate. His second rate is :
(1) 15% (2) 16%
(3) 14% (4) 12%
(SSC CHSL DEO & LDC Exam. 04.11.2012 (1st Sitting)

53. A single discount of 50% on an article costing ₹10000 is better than two successive discounts of 40% and 10% by
(1) ₹ 400 (2) ₹ 1000
(3) ₹ 500 (4) ₹ 600
(SSC Multi-Tasking Staff Exam. 10.03.2013, 1st Sitting : Patna)

54. Two successive discounts of 70% and 30% are equivalent to a single discount of
(1) 75% (2) 79%
(3) 100% (4) 89%
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

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55. A purchased a dining table, marked at ₹ 3,000 at a successive discounts of 10% and 15% respectively. He gave ₹ 105 as transportation charge and sold it at ₹ 3,200. What is his gain percentage?

(1) $22\frac{1}{3}\%$ (2) 25%

(3) $33\frac{1}{3}\%$ (4) $37\frac{17}{24}\%$

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

56. A dealer buys a table listed at ₹ 1,500 and gets successive discounts of 20% and 10%. He spends ₹ 20 on transportation and sells at a profit of 20%. Find the Selling Price of the table (in rupees).

(1) 1320 (2) 1080

(3) 1200 (4) 1230

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

57. A shopkeeper marks the price of an article at ₹ 80. What will be the selling price, if he allows two successive discounts of 5% each?

(1) ₹ 72.2 (2) ₹ 72

(3) ₹ 85 (4) ₹ 7.2

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

58. Which of the following successive discounts is better to a customer?

(a) 20%, 15%, 10% or

(b) 25%, 12%, 8% ?

(1) (a) is better

(2) (b) is better

(3) (a) or (b) (both are same)

(4) None of these

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

59. The cost price of an article is ₹ 100. A discount series of 5%, 10% successively reduces the price of a article by

(1) ₹ 4.5 (2) ₹ 14.5

(3) ₹ 24.5

(4) None of the above

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

60. An article is marked at ₹ 5,000. The shopkeeper allows successive discounts of $x\%$, $y\%$, $z\%$ on it. The net selling price is

(1) ₹ $\frac{(100-x)(100+y)(100+z)}{200}$

(2) ₹ $\frac{(100+x)(100+y)(100-z)}{200}$

(3) ₹ $\frac{(100-x)(100-y)(100-z)}{200}$

(4) ₹ $\frac{(100-x)(100+y)(100-z)}{200}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

61. A shopkeeper purchased a chair marked at ₹ 600 at two successive discounts of 15% and 20% respectively. He spent ₹ 28 on transportation and sold the chair for ₹ 545. His gain percent was

(1) 25% (2) 30%

(3) 35% (4) 20%

(SSC Graduate Level Tier-II Exam. 29.09.2013)

62. The marked price of a piano was ₹ 15,000. At the time of sale, there were successive discounts of 20%, 10% and 10% respectively on it. The sale price was

(1) ₹ 9,720 (2) ₹ 9,750

(3) ₹ 9,760 (4) ₹ 9,780

(SSC Graduate Level Tier-II Exam. 29.09.2013)

63. Successive discounts of 30% and 20% is equivalent to a single discount of

(1) 50% (2) 40%

(3) 44% (4) 10%

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

64. Two successive discounts of 10% and 5%, in this order, are given on a bill of ₹ 110. Find the net amount of money payable to clear the bill.
(answer to the nearest rupee)

(1) ₹ 94 (2) ₹ 95

(3) ₹ 96 (4) ₹ 97

(SSC CGL Tier-I Re-Exam. (2013)

65. A plate was sold for ₹ 6,300 after giving two successive discounts of $12\frac{1}{2}\%$ and 10%. Find the marked price.

(1) ₹ 7,300 (2) ₹ 7,700

(3) ₹ 8,000 (4) ₹ 7,250

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

66. A double bed is marked at ₹ 7,500. The shopkeeper allows successive discounts of 8%, 5% and 2% on it. What is the net selling price?

(1) ₹ 6, 500 (2) ₹ 6,000

(3) ₹ 6,423.90 (4) ₹ 6,500.50

(SSC CHSL DEO & LDC Exam. 16.11.2014)

67. Two successive discounts of 10% and 20%, equals a single discount of

(1) 30% (2) 25%

(3) 28% (4) 29%

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

68. The difference between a discount of 30% and two successive discounts of 20% and 10% on the marked price of an article is Rs. 144. The marked price of the article is

(1) Rs. 7,200 (2) Rs. 7,400

(3) Rs. 7,500 (4) Rs. 7,000

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

69. 10% discount and then 20% discount in succession is equivalent to total discount of

(1) 28% (2) 15%

(3) 30% (4) 24%

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443085)

70. Allowing 20% and 15% successive discounts, the selling price of an article becomes Rs. 3,060; then the marked price will be

(1) Rs. 4,000 (2) Rs. 4,400

(3) Rs. 5,000 (4) Rs. 4,500

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443085)

71. Find a simple discount equivalent to a discount series of 10%, 20% and 25%.

(1) 55% (2) 45%

(3) 52% (4) 46%

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

72. The difference between successive discounts of 40% followed by 30% and 45% followed by 20% on the marked price of an article is Rs. 12. The marked price of the article is :

(1) ₹ 800 (2) ₹ 400

(3) ₹ 200 (4) ₹ 600

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

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73. A dealer buys a table listed at Rs. 1,500 and gets successive discounts of 20% and 10%. He spends Rs. 20 on transportation and sells it at a profit of 20%. Find the selling price of the table.
(1) Rs. 1,420 (2) Rs. 1,300
(3) Rs. 1,320 (4) Rs. 1,380
(SSC CGL Tier-I Re-Exam, 30.08.2015)

74. If the cost of an article is Rs. P after two successive reductions of 20% and 25%, the original price of the article was
(1) Rs. $\frac{5P}{3}$ (2) Rs. $\frac{4P}{5}$
(3) Rs. $\frac{3P}{5}$ (4) Rs. $\frac{5P}{4}$
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

75. A scooter is sold at three successive discounts of 10%, 5% and 2%. If the marked price of the scooter is Rs. 18,000, find its net selling price.
(1) Rs. 15028.20
(2) Rs. 15082.00
(3) Rs. 15082.20
(4) Rs. 15080.00
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

76. A single discount equivalent to the series of discounts 20%, 10% and 5% is equal to :
(1) 32% (2) 30%
(3) 30.7% (4) 31.6%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

77. Successive discounts of 20% and 10% are equivalent to a single discount of :
(1) 15% (2) 28%
(3) 25% (4) 30%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

78. The list price of an electric fan is Rs. 300. If two successive discounts of 15% and 10% are allowed, its selling price would be
(1) Rs. 227.50 (2) Rs. 225
(3) Rs. 230 (4) Rs. 229.50
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE-II

1. A tradesman marks his goods 10% above his cost price. If he allows his customers 10% discount on the marked price, how much profit or loss does he make, if any?
(1) 1% gain
(2) 1%loss
(3) 5% gain
(4) No gain, no loss
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A trademan marks his goods at 20% above the cost price. He allows his customers a discount of 8% on marked price. Find out his profit per cent.
(1) 12% (2) 10.4%
(3) 8.6% (4) 8.2%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A shopkeeper marks his goods 20% above cost price, but allows 30% discount for cash. His net loss is :
(1) 6% (2) 10%
(3) 16% (4) 20%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A shopkeeper marks his sarees at 20% above the cost price and allows the purchaser a discount of 10% for cash buying. What profit percent does he make?
(1) 18% (2) 12%
(3) 10% (4) 8%
(SSC CGL Prelim Exam. 27.02.2000) (IInd Sitting) & (SSC Section Officer Exam. 25.09.2005) & (SSC CPO SI. Exam. 03.09.2006) & (SSC CPO SI. Exam.16.12.2007) & (SSC SAS Exam. 26.06.2010)

5. A trader marked the selling price of an article at 10% above the cost price. At the time of selling, he allows certain discount and suffers a loss of 1%. He allowed the discount of :
(1) 11% (2) 10%
(3) 9% (4) 10.5%
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting)

6. A shopkeeper marks his goods at 30% above the cost price but allows a discount of 10% at the time of sale. His gain is
(1) 21% (2) 20%
(3) 18% (4) 17%
(SSC CGL Exam. 11.05.2003 (IInd Sitting) & (SSC CGLPrelim Exam. 27.07.2008 (Ist Sitting)

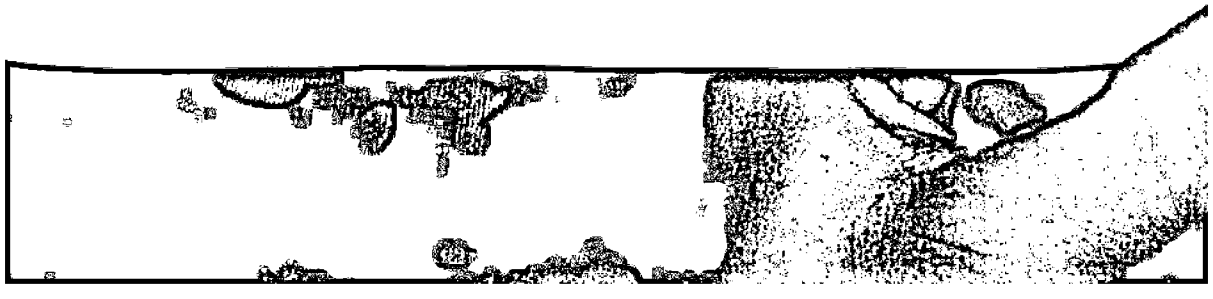
7. A shopkeeper marks the price of an item keeping 20% profit. If he offers a discount of $12\frac{1}{2}\%$ on the marked price, his gain percent will be
(1) 4.5% (2) 5%
(3) 7.5% (4) 8%
(SSC (South Zone) Investigator Exam 12.09.2010)

8. A seller marks his goods 30% above their cost price but allows 15% discount for cash payment. His percentage of profit when sold in cash is
(1) 10.5% (2) 15%
(3) 9% (4) 8.5%
(SSC (South Zone) Investigator Exam. 12.09.2010)

9. A tradesman marks his goods at 25% above its cost price and allows purchasers a discount of $12\frac{1}{2}\%$ for cash payment. The profit, he thus makes, is
(1) $9\frac{3}{8}\%$ (2) $9\frac{1}{2}\%$
(3) $8\frac{1}{2}\%$ (4) $8\frac{3}{8}\%$
(SSC Data Entry Operator Exam. 31.08.2008) & (SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

10. What price should a shopkeeper mark on an article costing him ₹ 200 to gain 35% after allowing a discount of 25% ?
(1) ₹ 270 (2) ₹ 300
(3) ₹ 330 (4) ₹ 360
(SSC CHSL DEO & LDC Exam. 27.11.2010)

11. A trader marks his goods 40% above cost price and allows a discount of 25 %. The profit he makes, is :
(1) 15% (2) 10 %
(3) 5 % (4) 2 %
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)



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12. A dealer marks his goods 20% above their cost price. He then allows some discount on marked price so that he makes a profit of 10%. The rate of discount is

(1) $10\frac{1}{3}\%$ (2) $9\frac{1}{3}\%$

(3) $8\frac{2}{3}\%$ (4) $8\frac{1}{3}\%$

(SSCCHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. In a shop, shirts are usually sold at 40% above the cost price. During a sale, the shopkeeper offers a discount of 10% off the usual selling price. If he manages to sell 72 shirts for ₹ 13,608, then his cost price per shirt, (in ₹) is

(1) 210 (2) 150

(3) 149 (4) 125

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

14. If a shopkeeper marks the price of goods 50% more than their cost price and allows a discount of 40%, what is his gain or loss percent ?

(1) Gain of 10% (2) Loss of 10%

(3) Gain of 20% (4) Loss of 20%

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

15. A dealer marks his goods at 40% above the cost price and allows a discount of 20% on the marked price. The dealer has a

(1) loss of 20% (2) gain of 25%

(3) loss of 12% (4) gain of 12%

(SSC CPO S.I. Exam. 26.05.2005) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

16. A trader marks his goods45% above the cost price and gives a discount of 20% on the marked price. The gain % on goods he makes is :

(1) 15% (2) 14%

(3) 29% (4) 16%

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

17. Maha Bazaar offers 20% discount on bags which have been marked 50% above the cost price. Amarnath pays ₹ 840 for a bag. Then the cost price of the bag is

(1) ₹ 672 (2) ₹ 700

(3) ₹ 790 (4) ₹ 810

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

18. A merchant marks his goods 40% above the cost price and sells them at a discount of 15%. Find his gain %.

(1) 25% (2) 22%

(3) 19% (4) 20%

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

19. A trader marks his goods at 20% above the cost price. If he allows a discount of 5% for cash down payment, his profit percent for such a transaction is

(1) 15% (2) 12%

(3) 14% (4) 17%

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting) & (SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting)

20. The marked price is 20% higher than cost price. A discount of 20% is given on the marked price. By this type of sale, there is

(1) 4% loss

(2) 2% loss

(3) no loss no gain

(4) 4% gain

(SSC DEO Exam. 02.08.2009) & (SSC (10+2) Level Data Entry Operator & LDC Exam. 21.10.2012 (Ist Sitting)

21. A dealer marks his goods at 25% above the cost price and allows a discount of 10% for cash payment. His profit % is :

(1) 17.5% (2) 15%

(3) 12.5% (4) 20%

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

22. To gain 8% after allowing a discount of 10%, by what per cent cost price should be hiked in the list price ?

(1) 9% (2) 11%

(3) 18% (4) 20%

(SSC CPO SI. Exam. 26.05.2005) & (SSC (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSCCHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

23. How much percent above the cost price should a shopkeeper mark his goods so as to earn a profit of 32% after allowing a discount of 12% on the marked price ?

(1) 50% (2) 40%

(3) 60% (4) 45%

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

24. A merchant allows a discount of 10% on marked price for the cash payment. To make a profit of 17%, he must mark his goods higher than their cost price by

(1) 33% (2) 40%

(3) 27% (4) 30%

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

25. A merchant purchases a wrist watch for ₹ 450 and fixes its list price in such a way that after allowing a discount of 10%, he earns a profit of 20%. Find the list price of the watch.

(1) ₹ 480 (2) ₹ 450

(3) ₹ 600 (4) ₹ 540

(SSC CGL Tier-I Exam. 26.06.2011) & (SSC Multi-Tasking Staff Exam. 17.03.2013 (Kolkata Region)

26. Anand marks up the price of an article by 50% and then allows a discount of 20% and sells it to Balaji. Balaji sells it for ₹ 20 more than what he purchased for, this S.P is 30% more than the original C.P of the article. Then Balaji's profit % is

(1) 7.5% (2) 6.66%

(3) 8.33% (4) 9%

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

27. Jasmine allows 4% discount on the marked price of her goods and still earns a profit of 20%. What is the cost price of a shirt if its marked price is ₹ 850?

(1) ₹ 650 (2) ₹ 720

(3) ₹ 700 (4) ₹ 680

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

28. The marked price of an article is ₹ 500. A shopkeeper gives a discount of 5% and still makes a profit of 25%. The cost price of the article is,

(1) ₹ 384 (2) ₹ 380

(3) ₹ 300 (4) ₹ 376

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

29. If the discount is equal to one fifth of the marked price and the loss is half the discount, then the percentage of loss is

(1) $10\frac{1}{9}\%$ (2) $11\frac{1}{9}\%$

(3) $12\frac{1}{9}\%$ (4) $13\frac{1}{9}\%$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

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30. A shopkeeper allows a discount of 10% on the marked price of an item but charges a sales tax of 8% on the discounted price. If the customer paya ₹ 3,402 as the price including the sales tax, then the marked price is
(1) ₹ 3,400 (2) ₹ 3,500
(3) ₹ 3,600 (4) ₹ 3,800
(SSC CGL Tier-I Exam. 19.10.2014)

31. The cost price of a table is ₹ 3,200. A merchant wants to make 25 % profit by selling it. At the the time of sale he declares a discount of 20 % on the marked price. The marked price (in ₹) is
(1) 5,000 (2) 6,000
(3) 4,000 (4) 4,500
(SSC CGL Tier-I Exam. 26.10.2014)

32. A shopkeeper allows a discount of 12.5 % on the marked price of a certain article and makes a profit of 20 %. If the article costs the shopkeeper ₹ 210, then the marked price of the article will be
(1) ₹ 387 (2) ₹ 350
(3) ₹ 386 (4) ₹ 288
(SSC CGL Tier-I Exam. 26.10.2014)

33. A businessman allows a discount of 10 % on the marked price. What percent above the cost price must he mark his goods to make a profit of 17 per cent ?
(1) 27 % (2) 18 %
(3) 30 % (4) 20 %
(SSC CGL Tier-I Exam. 26.10.2014)

34. Charging 30% above its production cost a radio maker puts a label of ₹ 286 on a radio as its price. But at the time of selling it, he allows 10% discount on the labelled price. What will his gain be ?
(1) ₹ 257 .40 (2) ₹ 254. 40
(3) ₹ 198 (4) ₹ 37. 40
(SSC CGL Tier-I Exam. 26.10.2014)

35. A cycle dealer offers a discount of 10% and still makes a profit of 26%. What does he pay for a cycle whose marked price is ₹ 840 ?
(1) ₹ 600 (2) ₹ 650
(3) ₹ 700 (4) ₹ 750
(SSC CGL Tier-II Exam. 21.09.2014)

36. The marked price of an article is 10% highter than the cost price. A discount of 10% is given on the marked price. In this kind of sale, the seller bears.
(1) no loss, no gain
(2) a loss of 5%
(3) a gain of 1%
(4) a loss of 1%
(SSC CHSL DEO Exam. 02.11.2014)
(1st Sitting)

37. A shopkeeper allows 10% discount on goods when he sells without credit. Cost price of his goods is 80% of his selling price. If he sells his goods by cash, then his profit is
(1) 50% (2) 70%
(3) 25% (4) 40%
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

38. A dealer of scientific instruments allows 20% discount on the marked price of the instruments and still makes a profit of 25%. If his gain over the sale of an instrument is ₹ 150, find the marked price of the instrument.
(1) ₹ 938.50 (2) ₹ 940
(3) ₹ 938 (4) ₹ 937.50
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

39. Ram bought a T.V. with 20% discount on the labelled price. Had he bought it with 30% discount he would have saved ₹ 800. The value of the T.V. set that he bought is
(1) ₹ 5,000 (2) ₹ 8,000
(3) ₹ 9,000 (4) ₹ 10,000
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

40. If a person marks a product 25% above the cost price but allows 10% discount, then the percentage of profit is
(1) 35 % (2) 15 %
(3) 17.5 % (4) 12.5 %
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. A tradesman marks his goods at 20% above the cost price. He allows his coustomers a discount of 8% on the marked price. Then his profit per cent is
(1) 10.4% (2) 11%
(3) 12.2% (4) 9.7%
(SSC CGL Tier-II Exam. 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

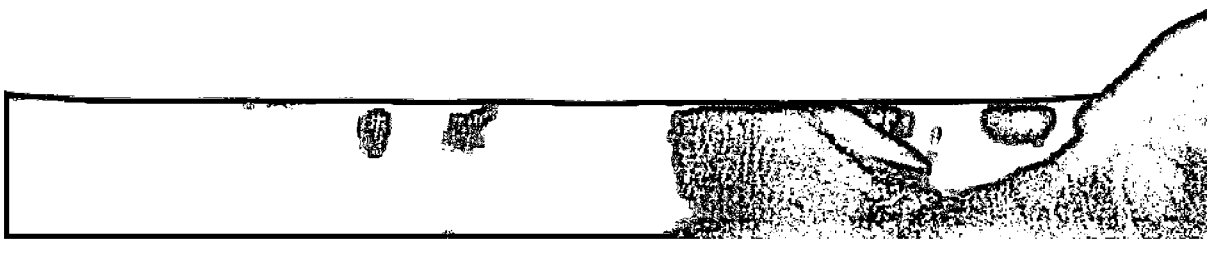
42. A shopkeeper gains 17% after allowing a discount of 10% on the marked price of an article. Find his profit percent if the articles are sold at marked price allowing no discount.
(1) 30% (2) 23%
(3) 27% (4) 37%
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

43. A shopkeeper allows a discount of 10% on the marked price of a camera. Marked price of the camera, which costs him ₹ 600, to make a profit of 20% should be
(1) ₹ 700 (2) ₹ 750
(3) ₹ 650 (4) ₹ 800
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

44. If the discount of 10% is given on the marked price of a radio, the gain is 20%. If the discount is increased to 20%, the gain per cent is :
(1) 5% (2) $6\frac{1}{4}\%$
(3) $6\frac{2}{3}\%$ (4) $7\frac{5}{8}\%$
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

45. 20% profit is made when a discount of 20% is given on the marked price. When the discount is 30% profit will be
(1) 4% (2) 5%
(3) 6% (4) 7.5%
(SSC CGL Tier-I Re-Exam, 30.08.2015)

46. A seller increases the cost price of an article by 30% and fixed the marked price as Rs. 286. But during sale he gave 10% discount to the purchaser. Percentage of profit will be
(1) 17 (2) 15
(3) 10 (4) 20
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)



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47. If a shopkeeper wants to give 20% discount on a toy, he has to sell it for Rs. 300. If he sells it at Rs. 405, then his gain percent is
(1) 5% (2) 4%
(3) 8% (4) 6%
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

48. A shopkeeper marks his goods 20% higher than the cost price and allows a discount of 5%. The percentage of his profit is:
(1) 15% (2) 20%
(3) 10% (4) 14%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

49. After allowing 15% discount, the selling price of a radio becomes Rs. 255. The marked price is
(1) Rs. 500 (2) Rs. 600
(3) Rs. 400 (4) Rs. 300
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE-III

1. A dealer offers a discount of 10% on the marked price of an article and still makes a profit of 20%. If its marked price is ₹ 800, then the cost price of the article is :
(1) ₹ 900 (2) ₹ 800
(3) ₹ 700 (4) ₹ 600
(SSC CGLPrelim Exam. 24.02.2002 (First Sitting)

2. The marked price of an article is ₹ 200. A discount of $12\frac{1}{2}\%$ is allowed on the marked price and a profit of 25% is made. The cost price of the article is :
(1) ₹ 200 (2) ₹ 175
(3) ₹ 120 (4) ₹ 140
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. A shopkeeper earns a profit of 10% after allowing a discount of 20% on the marked price. The cost price of the article whose marked price is ₹ 880, is
(1) ₹ 704 (2) ₹ 640
(3) ₹ 774 (4) ₹ 680
(SSC CGL Prelim Exam.24.02.2002 (Middle Zone)

4. By giving a discount of 10% on the marked price of ₹ 1100 of a cycle, a dealer gains 10%. The cost price of the cycle is :
(1) ₹ 1100 (2) ₹ 900
(3) ₹ 1089 (4) ₹ 891
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. The marked price of an electric iron is ₹ 690. The shopkeeper allows a discount of 10% and gains 8%. If no discount is allowed, his gain per cent would be
(1) 20% (2) 24%
(3) 25% (4) 28%
(SSC CPO S.I. Exam. 07.09.2003)

6. A trader wishes to gain 20% after allowing 10% discount on the marked price to his customers. At what per cent higher than the cost price must he marks his goods ?
(1) 30% (2) $33\frac{1}{3}\%$
(3) $34\frac{2}{3}\%$ (4) 35%
(SSC CGLPrelim Exam. 08.02.2004 (IInd Sitting) & (SSC CGL Prelim Exam. 04.02.2007) & (SSC MTS Exam. 17.03.2013 (Ist Sitting)

7. A shopkeeper buys an article for ₹ 180. He wishes to gain 20% after allowing a discount of 10% on the marked price to the customer. The marked price will be
(1) ₹ 210 (2) ₹ 240
(3) ₹ 270 (4) ₹ 300
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

8. The cost of manufacturing an article was ₹ 900. The trader wants to gain 25% after giving a discount of 10%. The marked price must be :
(1) ₹ 1500 (2) ₹ 1250
(3) ₹ 1200 (4) ₹ 1000
(SSC CGLPrelim Exam. 13.11.2005 (Ist Sitting) & (SSC GL Tier-I Exam. 21.04.2013)

9. A shopkeeper offers 10% discount on the marked price of his articles and still makes a profit of 20%. What is the actual cost of the article marked ₹ 500 for him ?
(1) ₹ 440 (2) ₹ 425
(3) ₹ 400 (4) ₹ 375
(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) (North Zone)

10. The marked price of an electric iron is ₹ 300. The shopkeeper allows a discount of 12% and still gains 10%. If no discount is allowed, his gain per cent would have been :
(1) 20% (2) 25%
(3) 27% (4) 30%
(SSC CPO S.I. Exam. 16.12.2007)

11. A manufacturer marked an article at ₹ 50 and sold it allowing 20% discount. If his profit was 25%, then the cost price of the article was
(1) ₹ 40 (2) ₹ 35
(3) ₹ 32 (4) ₹ 30
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

12. A shopkeeper earns a profit of 12% on selling a book at 10% discount on the printed price. The ratio of the cost price and the printed price of the book is
(1) 45 : 56 (2) 45 : 51
(3) 47 : 56 (4) 47 : 51
(SSC CGL Tier-I Exam.16.05.2010 (First Sitting)

13. The marked price of a radio is ₹ 480. The shopkeeper allows a discount of 10% and gains 8%. If no discount is allowed, his gain percent would be
(1) 18% (2) 18.5%
(3) 20.5% (4) 20%
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

14. Marked price of an article is ₹ 275. Shopkeeper allows a discount of 5% and he gets a profit of 4.5%. The actual cost of the article is
(1) ₹ 250 (2) ₹ 225
(3) ₹ 215 (4) ₹ 210
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

15. The price that Akbar should mark on a pair of shoes which costs him ₹ 1,200 to gain 12% after allowing a discount of 16% (in rupees) is
(1) 1,344 (2) 1,433
(3) 1,600 (4) 1,500
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

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16. In order to maintain the price line a trader allows a discount of 10% on the marked price of an article. However, he still makes a profit of 17% on the cost price. Had he sold the article at the marked price, he would have earned a profit per cent of
(1) 30% (2) 32%
(3) 33% (4) 35%
(SSC CPO S.I. Exam. 05.09.2004)

17. A trader sells his goods at a discount of 20%. He still makes a profit of 25%. If he sells the goods at the marked price only, his profit will be
(1) 56.25% (2) 25.56%
(3) 50.25% (4) 54.25%
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

18. After allowing a discount of 16%, there was still a gain of 5%. Then the percentage of marked price over the cost price is
(1) 15% (2) 18%
(3) 21% (4) 25%
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 Paper-I)

19. The marked price of a radio is ₹ 4,800. The shopkeeper allows a discount of 10% and gains 8%. If no discount is allowed, his gain per cent will be
(1) 18% (2) 20%
(3) 22% (4) 25%
(SSC Data Entry Operator Exam. 02.08.2009)

20. An article of cost price ₹ 8,000 is marked at ₹ 11,200. After allowing a discount of x% a profit of 12% is made. The value of x is
(1) 21% (2) 20%
(3) 22% (4) 23%
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

21. A trader allows a trade discount of 20% and a cash discount of $6\frac{1}{4}$ % on the marked price of the goods and gets a net gain of 20% of the cost. By how much above the cost should the goods be marked for the sale ?
(1) 40% (2) 50%
(3) 60% (4) 70%
(SSC Graduate Level Tier-II Exam.16.09.2012)

22. A tradesman marks his goods at such a price that after allowing a discount of 15%, he makes a profit of 20%. What is the marked price of an article whose cost price is ₹170 ?
(1) ₹240 (2) ₹260
(3) ₹220 (4) ₹200
(SSC CHSL DEO & LDC Exam. 31.10.2012, (Ist Sitting)

23. How much percent above the cost price should a shopkeeper mark his goods so as to earn a profit of 32% after allowing a discount of 12% on the marked price ?
(1) 50% (2) 40%
(3) 60% (4) 45%
(SSC CGL Tier-I Exam. 11.11.2012, Ist Sitting)

24. After allowing a discount of 12% on the marked price, a shopkeeper still gains 21%. The marked price is above the cost price by
(1) 25% (2) 30%
(3) 37.5% (4) 42.5%
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

25. A profit of 10% is made after giving a discount of 5% on a T. V. If the marked price of the TV is ₹ 2640.00, the cost price of the TV was :
(1) ₹ 2280 (2) ₹ 2296
(3) ₹ 2380 (4) ₹ 2396
(SSC Multi-Tasking Staff Exam. 10.03.2013)

26. A grinder was marked at ₹ 3,600. After given a discount of 10% the dealer made a profit of 8%. Calculate the cost price.
(1) ₹ 3,000 (2) ₹ 3,312
(3) ₹ 3,240 (4) ₹ 2,960
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

27. How much percent more than the cost price should a shopkeeper mark his goods so that after allowing a discount of 25% on the marked price, he gains 20% ?
(1) 70% (2) 50%
(3) 60% (4) 55%
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

28. A shopkeeper marks his goods 20% above his cost price and gives 15% discount on the marked price. His gain percent is
(1) 5% (2) 4%
(3) 2% (4) 1%
(SSC Graduate Level Tier-I Exam. 19.05.2013)

29. A shopkeeper marks his goods 40% above the cost price. He allows a discount of 5% for cash payment to his customers. He receives ₹1064 after paying the discount. His profit is
(1) ₹ 264 (2) ₹ 164
(3) ₹ 200 (4) ₹ 800
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

30. The true discount on ₹ 1, 860 due after a certain time at 5% is ₹ 60. Find the time after which it is due.
(1) 10 months (2) 8 months
(3) 9 months (4) 1 year
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

31. A shopkeeper sold an item for ₹1,510 after giving a discount of $24\frac{1}{2}$% and thereby incurred a loss of 10%. Had he sold the item without discount, his net profit would have been
(1) ₹ 641 (2) ₹ $322\frac{1}{9}$
(3) ₹ $422\frac{2}{9}$ (4) ₹ $322\frac{2}{9}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

32. A trader buys goods at 20% discount on marked price. If he wants to make a profit of 25% after allowing a discount of 20%, by what percent should his marked price be greater than the original marked price ?
(1) 15% (2) 65%
(3) 25% (4) 20%
(SSC CGL Tier-I Exam. 19.10.2014)

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33. A shopkeeper sold an item at 10% loss after giving a discount equal to half the marked price. Then the cost price is

(1) $\frac{1}{9}$ th of marked price

(2) $\frac{4}{9}$ th of marked price

(3) $\frac{5}{9}$ th of marked price

(4) $\frac{7}{9}$ th of marked price

(SSC CGL Tier-II Exam. 21.09.2014)

34. A person purchased a saree for ₹ 7710 after availing a net discount of ₹ 1285. The percentage of discount, the saree shop offers, is

(1) $14\frac{1}{7}\%$ (2) $14\frac{2}{7}\%$

(3) $14\frac{3}{7}\%$ (4) $14\frac{4}{7}\%$

(SSC CGL Tier-II Exam. 21.09.2014)

35. After allowing 10% discount, a dealer wishes to sell a machine for ₹ 2,700. At what price must the machine be marked?

(1) ₹ 270 (2) ₹ 3,000

(3) ₹ 2,970 (4) ₹ 2,430

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

36. The marked price of a saree is Rs. 200. After allowing a discount of 20% on the marked price, the shopkeeper makes a profit of Rs. 16. Find the gain percent.

(1) $11\frac{1}{9}\%$ (2) $9\frac{1}{11}\%$

(3) 11% (4) 8%

(SSC CHSL DEO & LDC Exam. 9.11.2014)

37. A merchant offers 8% discount on all his goods and still makes a profit of 15%. If an item is marked ₹ 250, then its cost price is

(1) ₹ 180 (2) ₹ 200

(3) ₹ 230 (4) ₹ 187

(SSC CHSL DEO Exam. 16.11.2014) (1st Sitting)

38. A store offers a variety of discounts that range between 20% and 25% inclusive. If a book is discounted to a price of ₹ 270, then its greatest possible original price was

(1) ₹ 345.5 (2) ₹ 324

(3) ₹ 360 (4) ₹ 337.5

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

39. A man allows a discount of 10% on a book whose marked price is Rs. 40. What is the cost price so that the profit is 20%?

(1) Rs. 35 (2) Rs. 40

(3) Rs. 30 (4) Rs. 45

(SSC Constable (GD) Exam. 04.10.2015, IInd Sitting)

TYPE-IV

1. A discount of 2½% is given to the customer on the marked price of an article. A man bought the article for ₹ 39. The marked price of the article is :

(1) ₹ 42 (2) ₹ 36.5

(3) ₹ 40 (4) ₹ 41.5

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting)

2. The printed price of an article is ₹ 900 but the retailer gets a discount of 40%. He sells the article for ₹ 900. Retailer's gain per cent is :

(1) 40% (2) 60%

(3) $66\frac{2}{3}\%$ (3) $68\frac{1}{3}\%$

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting)

3. A retailer buys 40 pens at the marked price of 36 pens from a wholesaler. If he sells these pens giving a discount of 1%, what is the profit percent?

(1) 9% (2) 10%

(3) $10\frac{1}{9}\%$ (4) 11%

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A fan is listed at ₹ 1,500 and a discount of 20% is offered on the list price. What additional discount must be offered to the customer now to bring the net price to ₹ 1,104?

(1) 8% (2) 10%

(3) 15% (4) 12%

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. A retailer gets a discount of 40% on the printing price of an article. The retailer sells it at the printing price. His gain per cent is

(1) 40% (2) 55%

(3) $66\frac{2}{3}\%$ (4) 75%

(SSC CPO S.I. Exam. 12.01.2003

6. A man buys an article for ₹ 80 and marks it at ₹ 120. He then allows a discount of 40%. What is the loss or gain per cent?

(1) 12% gain (2) 12% loss

(3) 10% gain (4) 10% loss

(SSC CPO S.I. Exam. 12.01.2003

7. A discount of 14% on the marked price of an article is allowed and then the article is sold for ₹ 387. The marked price of the article is

(1) ₹ 450 (2) ₹ 427

(3) ₹ 500 (4) ₹ 440

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. A shopkeeper sells his goods at 10% discount on the marked price. What price should he mark on an article that costs him ₹ 900 to gain 10%?

(1) ₹ 1275 (2) ₹ 1250

(3) ₹ 1175 (4) ₹ 1100

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. A tradesman gives 4% discount on the marked price and gives 1 article free for buying every 15 articles and thus gains 35%. The marked price is increased above the cost price by

(1) 40% (2) 39%

(3) 50% (4) 20%

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. A sells a scooter priced ₹ 36,000. He gives a discount of 8% on the first ₹ 20,000 and 5% on the next ₹ 10,000. How much discount can he offered on the remaining ₹ 6,000 if he is to get as much as when 7% discount is allowed on the total?

(1) 5% (2) 6%

(3) 7% (4) 8%

(SSC CPO S.I. Exam. 07.09.2003)

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11. A trader marked the price of his commodity so as to include a profit of 25%. He allowed discount of 16% on the marked price. His actual profit was :
(1) 5% (2) 9%
(3) 16% (4) 25%
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

12. If a discount of 20% on the marked price of a shirt saves a man Rs. 150, how much did he pay for the shirt ?
(1) ₹ 600 (2) ₹ 650
(3) ₹ 500 (4) ₹ 620
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

13. Ravi buys an article with a discount of 25% on its marked price. He makes a profit of 10% by selling it at ₹ 660. The marked price of the article was:
(1) ₹ 600 (2) ₹ 700
(3) ₹ 800 (4) ₹ 685
(SSC CPO S.I. Exam. 16.12.2007)

14. An article is sold at a discount of 20% and an additional discount of 30% is allowed on cash payment. If Vidya purchased the article by paying ₹ 2240 in cash, the marked price of the article was
(1) ₹ 4000 (2) ₹ 4368
(3) ₹ 4400 (4) ₹ 4480
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

15. While selling a cooler, a shopkeeper gives a discount of 10% on the marked price. If he gives a discount of 12% he earns ₹ 35 less as profit. The marked price of the cooler is
(1) ₹ 1,650 (2) ₹ 1,625
(3) ₹ 1,725 (4) ₹ 1,750
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

16. A trader gains 15% after selling an item at 10% discount on the printed price. The ratio of the cost price and printed price of the item is
(1) 18 : 23 (2) 17 : 18
(3) 17 : 23 (4) 18 : 25
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

17. While selling a shirt, a shopkeeper gives a discount of 7%. If he had given a discount of 9% he would have got ₹ 15 less as profit. The marked price of the shirt is
(1) ₹ 750 (2) ₹ 720
(3) ₹ 712.50 (4) ₹ 600
(SSC SAS Exam 26.06.2010 (Paper-1)

18. The selling price of an article is ₹ 1,920 and the discount given is 4%. The marked price of the article is
(1) ₹ 2,400 (2) ₹ 2,000
(3) ₹ 1,600 (4) ₹ 1,200
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

19. An article, which is marked ₹ 650, is sold for ₹572. The discount given is
(1) 12% (2) 13%
(3) 21% (4) 26%
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

20. The cost price of an article is 64% of the marked price. The gain percentage after allowing a discount of 12% on the marked price is
(1) 37.5% (2) 48%
(3) 50.5% (4) 52%
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

21. While selling a watch, a shopkeeper gives a discount of 5%. If he gives a discount of 6%, he earns ₹ 15 less as profit. What is the marked price of the watch?
(1) ₹ 1,250 (2) ₹ 1,400
(3) ₹ 1,500 (4) ₹ 750
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

22. A shop-keeper sells a badminton racket whose marked price is ₹ 30, at a discount of 15% and gives a shuttle cock costing ₹ 1.50 free with each racket. Even then he makes a profit of 20%. His cost price, per racket, is
(1) ₹ 21.00 (2) ₹ 21.25
(3) ₹ 20.00 (4) ₹ 19.75
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

23. A shopkeeper allows 4% discount on his marked price. If the cost price of an article is ₹ 100 and he has to make a profit of 20%, then his marked price must be
(1) ₹ 96 (2) ₹ 120
(3) ₹ 125 (4) ₹ 130
(SSC Data Entry Operator Exam. 31.08.2008)

24. A shopkeeper sells his goods at 15% discount. The marked price of an article whose selling price is ₹ 629 is :
(1) ₹ 740 (2) ₹ 704
(3) ₹ 700 (4) ₹ 614
(SSC CHSL DEO & LDC Exam. 27.11.2010)

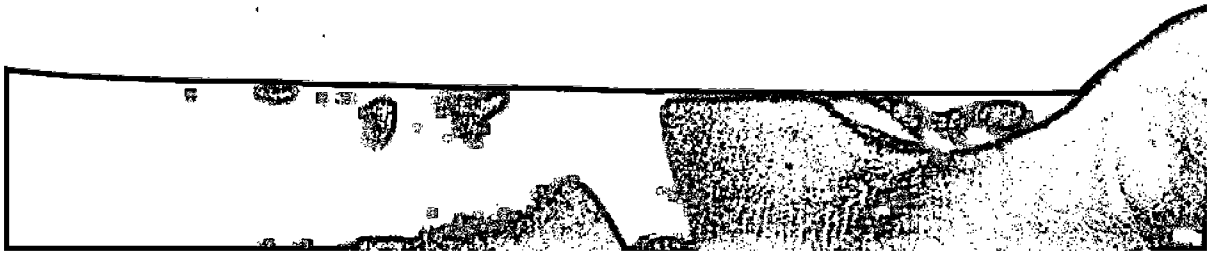
25. When a shopkeeper gives 10% discount on the list price of a toy, his gain is 20%. If he had given a discount of 20%, his percentage of gain would have been
(1) $6\frac{2}{3}\%$ (2) $8\frac{1}{3}\%$
(3) 10% (4) 15%
(SSC CPO S.I. Exam. 09.11.2008) & (SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

26. A discount of 24% on the marked price of an article is allowed and then the article is sold for ₹ 342. The marked price of the article is
(1) ₹ 500 (2) ₹ 490
(3) ₹ 450 (4) ₹ 430
(SSC CISF Constable (GD) Exam. 05.06.2011)

27. Rahim bought a T.V. with 20% discount on list price. Had he bought it with 25% discount he would have saved ₹ 500. At what price did he buy the T.V?
(1) ₹ 16,000 (2) ₹ 12,000
(3) ₹ 10,000 (4) ₹ 8,000
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone) & (SSC GL Tier-II Exam. 16.09.2012)

28. A shopkeeper gains ₹ 56 on a toy after allowing 23% discount on its marked price. If his gain is 10%, then the marked price of the toy is :
(1) ₹ 810 (2) ₹ 800
(3) ₹ 560 (4) ₹ 740
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

29. A discount of 16% on the marked price of a book enables a man to buy a pen that costs ₹ 80. How much did he pay for the book ?
(1) ₹ 500 (2) ₹ 480
(3) ₹ 420 (4) ₹ 340
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)



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30. After allowing a discount of 12% on the marked price of an article, it is sold for ₹ 880. Find its marked price.
(1) ₹ 1,100 (2) ₹ 2,000
(3) ₹ 1,000 (4) ₹ 2,100
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

31. A fan in a shop is offered at a discount of 10%. It is sold during clearance sale at 6% discount over the already discounted price at ₹ 846. The original marked price of the fan is
(1) ₹ 900 (2) ₹ 946
(3) ₹ 850 (4) ₹ 896
(SSC Graduate Level Tier-II Exam.16.09.2012)

32. Mr. A bought a refrigerator with $16\frac{2}{3}\%$ discount on the labelled price. Had he bought it with 25% discount, he would have saved ₹600. At what price did he buy the refrigerator?
(1) ₹ 6000 (2) ₹ 7200
(3) ₹ 7500 (4) ₹ 5000
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

33. The selling price of a video game is ₹ 740 and the discount allowed is 7.5%. The marked price of the video game is
(1) ₹ 600 (2) ₹ 700
(3) ₹ 800 (4) ₹ 900
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

34. A fan is listed at ₹150 and a discount of 20% is given. Then the selling price is
(1) ₹180 (2) ₹150
(3) ₹120 (4) ₹110
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

35. If a dining table with marked price ₹ 6,000 was sold to a customer for ₹5,500, then the rate of discount allowed on the table is
(1) 10% (2) 6%
(3) $8\frac{1}{3}\%$ (4) 9%
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

36. A washing machine is sold at a discount of 30%. If a man buys it for ₹ 6,580, its list price is
(1) ₹ 7,500 (2) ₹ 8,600
(3) ₹ 9,400 (4) ₹ 6,990
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

37. An article marked ₹ 800 is offered at ₹ 736 in the off season. The rate of discount offered is :
(1) 10% (2) 7%
(3) 7.5% (4) 8%
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

38. Discount on a pair of shoes marked at ₹ 475 and discounted at 15%, is
(1) ₹ 70 (2) ₹ 71.25
(3) ₹ 72 (4) ₹ 72.25
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

39. A machine is marked at ₹ 6,800 and available at a discount of 10%. The shopkeeper gives another off season discount to the buyer and sells the machine for ₹ 5,202. Find the off season discount.
(1) 10% (2) 12%
(3) 15% (4) 18%
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

40. A shopkeeper buys an article for ₹ 360. He wants to make a gain of 25% on it after a discount of 10%. The marked price is
(1) ₹ 486 (2) ₹ 450
(3) ₹ 500 (4) ₹ 460
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

41. A table with marked price ₹ 1200 was sold to a customer for ₹ 1100. Find the rate of discount allowed on the table.
(1) 9% (2) $8\frac{1}{3}\%$
(3) $9\frac{1}{3}\%$ (4) 10%
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

42. The marked price of an item is twice the cost price. For a gain of 15%, the discount should be
(1) 7.5% (2) 20.5%
(3) 32.5% (4) 42.5%
(SSC CHSL DEO & LDC Exam. 9.11.2014)

43. The listed price of a shirt is ₹ 270 and it is available at ₹ 237.60. The rate of discount is
(1) 10% (2) 12%
(3) 15% (4) 20%
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 GP 6)

44. A dealer allows his customers a discount of 25% and still gains 25%. If an article costs Rs. 1,440 to the dealer; then its marked price is
(1) Rs. 1,850 (2) Rs. 2,400
(3) Rs. 2,560 (4) Rs. 1,500
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

45. The marked price of a watch was Rs. 720. A man bought the same for Rs. 550.80 after getting two successive discounts, the first being 10%. The second discount rate is
(1) 18% (2) 12%
(3) 14% (4) 15%
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

46. An item was sold for Rs. 3600 at 25% discount. Its marked price was
(1) Rs. 2880 (2) Rs. 2700
(3) Rs. 4800 (4) Rs. 4500
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

47. A shopkeeper, in order to clear his old stock of T.V. sets, offers 12% discount on the T.V. sets. If the marked price of a T.V. set is Rs. 6500, the selling price of the T.V. set is:
(1) Rs. 5700 (2) Rs. 5720
(3) Rs. 5400 (4) Rs. 6000
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

48. A seller gains 20% profit even after allowing 10% discount. If the amount of profit on a TV set is Rs. 750, then the marked price of the TV set is
(1) Rs. 5200 (2) Rs. 5000
(3) Rs. 4800 (4) Rs. 5500
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

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49. Articles are marked at a price which gives a profit of 25%. After allowing a certain discount the profit reduces to $12\frac{1}{2}\%$. The discount percent is
(1) 11.1% (2) 10%
(3) $12\frac{1}{2}\%$ (4) 12%
(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099685)

50. After allowing a discount of 20%, a radio is available for Rs. 1200. Its marked price was :
(1) Rs. 1550 (2) Rs. 1500
(3) Rs. 1800 (4) Rs. 1400
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

51. The marked price of a CD is Rs. 250. It is sold for Rs. 225. The rate of discount is :
(1) 2.5% (2) 10%
(3) 25% (4) $11\frac{1}{9}\%$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

52. A shopkeeper fixes the price of an article at 30% higher than its actual cost. If the sells it at 10% discount on marked price then, the profit is :
(1) 18% (2) 19%
(3) 17% (4) 20%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE-V

1. A discount of 15% on one article is the same as discount of 20% on a second article. The costs of the two articles can be :
(1) ₹ 85, ₹ 60 (2) ₹ 60, ₹ 40
(3) ₹ 40, ₹ 20 (4) ₹ 80, ₹ 60
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A salesman is allowed $5\frac{1}{2}\%$ discount on the total sales made by him plus a bonus of $\frac{1}{2}\%$ on sales over ₹ 10,000. If his total earnings were ₹ 1,990, his total sales (in ₹) was
(1) 30,000 (2) 32,000
(3) 34,000 (4) 35,000
(SSC CPO S.I. Exam. 12.01.2003)

3. A housewife saved ₹ 2.50 in buying a dress on sale. If she spent ₹ 25 for the dress, **approximately** how much per cent she saved in the transaction?
(1) 8% (2) 9%
(3) 10% (4) 11%
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

4. A trader marked his goods at 20% above the cost price. He sold half the stock at the marked price, one quarter at a discount of 20% on the marked price and the rest at a discount of 40% on the marked price. His total gain is
(1) 2% (2) 4.5%
(3) 13.5% (4) 15%
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. A fan is listed at ₹ 1500 and a discount of 20% is offered on the list price. What additional discount must be offered to the customer to bring the net price to ₹ 1104 ?
(1) 8% (2) 10%
(3) 12% (4) 15%
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

6. A shopkeeper gives 12 per cent additional discount after giving an initial discount of 20 per cent on the marked price of a radio. If the sale price of the radio is ₹ 704, the marked price is
(1) ₹ 844.80 (2) ₹ 929.28
(3) ₹ 1,044.80 (4) ₹ 1,000
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

7. A dealer buys an article marked at ₹ 25,000 with 20% and 5% off. He spends ₹ 1,000 for its repair and sells it for ₹ 25,000. What is his gain or loss per cent?
(1) Loss of 25% (2) Gain of 25%
(3) Gain of 10% (4) Loss of 10%
(SSC CGLPrelim Exam. 04.02.2007 (First Sitting)

8. The marked price of a shirt and trousers are in the ratio 1 : 2. The shopkeeper gives 40% discount on the shirt. If the total discount on the set of the shirt and trousers is 30%, the discount offered on the trousers is
(1) 15% (2) 20%
(3) 25% (4) 30%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. A retailer purchases a grinder at a discount of 15% and sells it for ₹ 1955 at a profit of 15%. The amount of discount received by the retailer from the wholesaler was
(1) ₹ 270 (2) ₹ 290
(3) ₹ 300 (4) ₹ 330
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. A dozen pair of socks quoted at ₹ 80 are available at a discount of 10%. How many pairs of socks can be bought for ₹ 24 ?
(1) 4 (2) 5
(3) 3 (4) 6
(SSC CPO S.I. Exam. 06.09.2009)

11. If an electricity bill is paid before due date, one gets a reduction of 4% on the amount of the bill. By paying the bill before due date a person got a reduction of ₹ 13. The amount of his electricity bill was
(1) ₹ 125 (2) ₹ 225
(3) ₹ 325 (4) ₹ 425
(SSC CGLTier-I Exam. 16.05.2010 (Second Sitting)

12. The true discount on a sum of money due 2 years hence at 5% is ₹ 15. Find the sum.
(1) ₹ 150 (2) ₹ 165
(3) ₹ 170 (4) ₹ 160
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

13. A shopkeeper lists the price of an article as ₹500. But he gives a certain discount which allows the buyer to pay ₹500 for the article including 10% sales tax. The rate of discount is
(1) 10% (2) $10\frac{1}{11}\%$
(3) $9\frac{1}{11}\%$ (4) 11%
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)



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14. With a 5 % discount on the cost of sugar, a buyer could purchase 2 kg more sugar for ₹ 608. Selling price of sugar is :
(1) ₹15.50 (2) ₹ 15
(3) ₹16.50 (4) ₹ 16
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

15. During a month-long annual sale, a shopkeeper sells his goods at a discount of 50%. But in the last week, he offers an additional discount of 40%. If the original price of a shirt is ₹ x, then the price, (in rupees) during the last week of the sale will be
(1) 90% of x (2) 70% of x
(3) 30% of x (4) 10% of x
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

16. Ramesh bought 10 cycles for ₹500 each. He spent ₹2,000 on the repair of all cycles. He sold five of them for ₹750 each and the remaining for ₹550 each. Then the total gain or loss % is
(1) Gain of $8\frac{1}{3}$%
(2) Loss of $8\frac{1}{3}$%
(3) Gain of $7\frac{2}{3}$%
(4) Loss of $7\frac{1}{7}$%
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

17. A fan is listed at ₹ 1,400 and the discount offered is 10%. What additional discount must be given to bring the net selling price to ₹ 1,200 ?
(1) $16\frac{2}{3}$% (2) 5%
(3) $4\frac{16}{21}$% (4) 6%
(SSC CPO S.I. Exam. 16.12.2007)

18. The Banker's discount on a bill due 6 months hence at 16% per annum is ₹ 216. The true discount is :
(1) ₹ 212 (2) ₹ 180
(3) ₹ 210 (4) ₹ 200
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

19. The cost of manufacture of a tape recorder is ₹ 1,500. The manufacturer fixes the marked price 20% above the cost of manufacture and allows a discount in such a way as to get a profit of 8%. The rate of discount is
(1) 12% (2) 8%
(3) 20% (4) 10%
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

20. A shop offers 10% discount on every purchase of an article. It also offers an additional discount of 12%, if the payment is made in cash. If the original price of an item is ₹ 250, how much a customer will pay, if he wants to pay the price in cash?
(1) ₹ 180 (2) ₹ 192
(3) ₹ 198 (4) ₹ 195
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

21. The interest on a certain sum of money is ₹ 22 and the true discount on the same sum for the same time and at the same rate is ₹ 20. Find the sum.
(1) ₹ 220 (2) ₹ 200
(3) ₹ 210 (4) ₹ 212
(SSC Graduate Level Tier-I Exam. 21.04.2013)

22. A mobile phone is listed at ₹ 1,500 and a discount of 10% is offered on the list price. What additional discount must be offered to the customer now to bring the net price to ₹ 1,242?
(1) 10% (2) 8%
(3) 12% (4) 18%
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

23. A reduction of 20% in the price of rice enables a customer to purchase 12.5 kg more for ₹ 800. The original price of rice (per kg) is
(1) ₹ 14 (2) ₹16
(3) ₹ 12 (4) ₹ 15
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

24. A reduction of 10% in the price of a commodity enables a person to buy 25 kg more for ₹ 225. The original price of the commodity per kg was
(1) ₹ 2 (2) ₹ 1
(3) ₹ 2.50 (4) ₹ 1.50
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

25. For a certain article, if discount is 25% the profit is 25%. If the discount is 10%, then the profit is
(1) 50% (2) 40%
(3) 30% (4) $33\frac{1}{3}$%
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

26. A toy train is marked at ₹ 400 and sold at a discount of 8% during Ganesh puja. A shopkeeper announces a discount of 8%. The amount he will loose if he announces a single discount of 16% is
(1) ₹ 2.56 (2) ₹ 3.84
(3) ₹ 4.16 (4) ₹ 5.78
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

27. The marked price of a toy is ₹ 60 and at a discount that was sold for ₹ 45. Then rate of discount allowed is
(1) 30% (2) 35%
(3) 20% (4) 25%
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

28. A pen is listed for ₹ 12. A discount of 15% is given on it. A second discount is given bringing the price down to ₹ 8.16. The rate of second discount is
(1) 20% (2) 15%
(3) 18% (4) 25%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

29. A man saves ₹ 25 on the purchase of an article on which a discount of 20% is allowed. How much did the man pay ?
(1) ₹ 75 (2) ₹ 150
(3) ₹ 100 (4) ₹ 125
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

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30. A is to pay B, ₹ 600 in 4 years time. A offers to pay up B at present. What discount should B allow A?
(1) ₹ 96 (2) ₹ 100
(3) ₹ 120 (4) ₹ 110
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

31. To attract more visitors, Zoo authority announces 20% discount on every ticket which costs 25 paise. For this reason, sale of ticket increases by 28%. Find the percentage of increase in the number of visitors.
(1) 40% (2) 50%
(3) 60% (4) No change
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

32. The list price of a shirt is ₹ 440 and a customer pays ₹ 396 for it. The discount rate is
(1) 10% (2) $10\frac{1}{2}\%$
(3) 20% (4) 12%
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

33. A shopkeeper listed the price of goods at 30% above the cost price. He sells half the stock at this price, one fourth of the stock at a discount of 15% and the remaining at 30% discount. His overall profit is
(1) $15\frac{3}{8}\%$ (2) 15%
(3) $15\frac{3}{5}\%$ (4) $15\frac{2}{3}\%$
(SSC CGL Tier-I Exam. 19.10.2014)

34. The discount on a certain sum of money, due at the end of $2\frac{1}{4}$ years at $2\frac{2}{3}\%$ p.a. is ₹ 78. Find the sum.
(1) ₹ 1,278 (2) ₹ 1,300
(3) ₹ 1,378 (4) ₹ 1,400
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

35. X purchased an item at a discount of 10% and sold it to Y at 10% profit. The marked price and the price for which Y purchased the item are in ratio
(1) 1 : 1 (2) 10 : 99
(3) 20 : 99 (4) 100 : 99
(SSC CHSL DEO & LDC Exam. 16.11.2014)

36. If in a sale, the discount given on a saree is equal to one-fourth the marked price and the loss due to this discount is 15%, then the ratio of the cost price to the selling price is
(1) 3 : 4 (2) 4 : 3
(3) 10 : 17 (4) 20 : 17
(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

37. A trader who marks his goods up to 50% offered a discount of 20%. What % profit the trader makes after offering the payment?
(1) 30% (2) 70%
(3) 20% (4) 50%
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

38. A retailer buys a sewing machine at a discount of 15% and sells it for ₹ 1955. Thus he makes a profit of 15%. The discount is
(1) ₹ 270 (2) ₹ 290
(3) ₹ 300 (4) ₹ 310
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

39. After allowing a discount of 10% on marked price a trader makes a profit of 15%. The ratio of the marked price to the cost price is
(1) 23 : 9 (2) 23 : 10
(3) 23 : 18 (4) 23 : 19
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

40. Mr. x and Mr. y each bought the same motorcycle using a 10% off coupon. Mr. x's cashier took 10% off the price and then added 8.5% sales tax whereas Mr. y's cashier first added the sales tax and then took 10% off the total price. The amount Mr. x paid is
(1) less by ₹ 550 as the amount Mr. y paid
(2) same as the amount Mr. y paid
(3) greater by ₹ 85 as the amount Mr. y paid
(4) greater by ₹ 850 as the amount Mr. y paid
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. The price of an antique is reduced by 20% and then this price is again reduced by 10%. The total reduction of the price is
(1) 25 % (2) 30 %
(3) 23 % (4) 28 %
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

42. A builder purchases 25 windows at 25% off the total price of ₹ 1,20,000. If the builder receives an additional discount of ₹ 7500 for the purchase, then the cost of each window is
(1) ₹ 3300 (2) ₹ 3100
(3) ₹ 3400 (4) ₹ 3200
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

43. The list price of a book is Rs. 100. A dealer sells three such books for Rs. 274.50 after allowing discount at a certain rate. Find the rate of discount.
(1) 8.16% (2) 8.5%
(3) 8.34% (4) 8.33%
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

44. A dealer buys an article listed at Rs. 100 and gets successive discounts of 10% and 20%. He spends 10% of the cost price on transportation. At what price should he sell the article to earn a profit of 15%?
(1) Rs. 90.80 (2) Rs. 92.00
(3) Rs. 91.08 (4) Rs. 91.20
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

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15. A company showroom gives a discount of 20% on the second grade shoes and a further discount of 15% on shareholder's coupon. The total discount, a coupon holder will get is
(1) 32% (2) 36%
(3) 35% (4) 38%
(SSC CGL Tier-I Re-Exam, 30.08.2015)

16. Two blends of a commodity costing Rs. 35 and Rs. 40 per kg. respectively are mixed in the ratio 2 : 3 by weight. If one-fifth of the mixture is sold at Rs. 46 per kg and the remaining at the rate of Rs. 55 per kg. the profit percent is
(1) 50 (2) 30
(3) 40 (4) 20
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

17. The total discount on Rs. 1860 due after a certain time at 5% is Rs. 60. Find the time after which it is due
(1) 9 months (2) 8 months
(3) 7 months (4) 10 months
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

18. State electricity board gives 15% discount on electric bills if it is paid before due date. One person gets Rs. 54 as discount. The amount of actual bill was :
(1) Rs. 362 (2) Rs. 359
(3) Rs. 360 (4) Rs. 361
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

19. A house was sold for Rs. y by giving a discount of x%, then the list price was :
(1) $\frac{100y}{100-x}$ (2) $\frac{100y}{1-\frac{x}{100}}$
(3) $\frac{100x}{100-y}$ (4) $\frac{100\,y}{1-x}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

SHORT ANSWERS

TYPE-I

1. (2)	2. (4)	3. (3)	4. (2)
5. (3)	6. (3)	7. (3)	8. (1)
9. (2)	10. (3)	11. (3)	12. (2)
13. (3)	14. (3)	15. (3)	16. (4)
17. (3)	18. (2)	19. (3)	20. (4)
21. (4)	22. (2)	23. (3)	24. (1)
25. (1)	26. (4)	27. (3)	28. (1)
29. (2)	30. (3)	31. (3)	32. (2)
33. (2)	34. (2)	35. (3)	36. (2)
37. (4)	38. (1)	39. (4)	40. (3)
41. (3)	42. (2)	43. (4)	44. (2)
45. (3)	46. (1)	47. (4)	48. (1)
49. (1)	50. (4)	51. (2)	52. (1)
53. (1)	54. (2)	55. (3)	56. (1)
57. (1)	58. (2)	59. (2)	60. (3)
61. (1)	62. (1)	63. (3)	64. (1)
65. (3)	66. (3)	67. (3)	68. (1)
69. (1)	70. (4)	71. (4)	72. (4)
73. (3)	74. (1)	75. (3)	76. (4)
77. (2)	78. (4)		

TYPE-II

1. (2)	2. (2)	3. (3)	4. (4)
5. (2)	6. (4)	7. (2)	8. (1)
9. (1)	10. (4)	11. (3)	12. (4)
13. (2)	14. (2)	15. (4)	16. (4)
17. (2)	18. (3)	19. (3)	20. (1)
21. (3)	22. (4)	23. (1)	24. (4)
25. (3)	26. (3)	27. (4)	28. (2)
29. (2)	30. (2)	31. (1)	32. (4)
33. (3)	34. (4)	35. (1)	36. (4)
37. (3)	38. (4)	39. (2)	40. (4)
41. (1)	42. (1)	43. (4)	44. (3)
45. (2)	46. (1)	47. (3)	48. (4)
49. (4)			

TYPE-III

1. (4)	2. (4)	3. (2)	4. (2)
5. (1)	6. (2)	7. (2)	8. (2)
9. (4)	10. (2)	11. (3)	12. (1)
13. (4)	14. (1)	15. (3)	16. (1)
17. (1)	18. (4)	19. (2)	20. (2)
21. (3)	22. (1)	23. (1)	24. (3)
25. (1)	26. (1)	27. (3)	28. (3)
29. (4)	30. (2)	31. (4)	32. (3)
33. (3)	34. (2)	35. (2)	36. (1)
37. (2)	38. (3)	39. (3)	

TYPE-IV

1. (3)	2. (3)	3. (2)	4. (1)
5. (3)	6. (4)	7. (1)	8. (4)
9. (3)	10. (3)	11. (1)	12. (1)
13. (3)	14. (1)	15. (4)	16. (1)
17. (1)	18. (2)	19. (1)	20. (1)
21. (3)	22. (3)	23. (3)	24. (1)
25. (1)	26. (3)	27. (4)	28. (2)
29. (1)	30. (3)	31. (1)	32. (1)
33. (3)	34. (3)	35. (3)	36. (3)
37. (4)	38. (2)	39. (3)	40. (3)
41. (2)	42. (4)	43. (2)	44. (2)
45. (4)	46. (3)	47. (2)	48. (2)
49. (3)	50. (2)	51. (2)	52. (3)

TYPE-V

1. (4)	2. (3)	3. (2)	4. (1)
5. (1)	6. (4)	7. (2)	8. (3)
9. (3)	10. (1)	11. (3)	12. (2)
13. (3)	14. (4)	15. (3)	16. (4)
17. (3)	18. (4)	19. (4)	20. (3)
21. (1)	22. (2)	23. (2)	24. (2)
25. (1)	26. (1)	27. (4)	28. (1)
29. (3)	30. (*)	31. (3)	32. (1)
33. (1)	34. (2)	35. (4)	36. (4)
37. (3)	38. (3)	39. (3)	40. (2)
41. (4)	42. (1)	43. (2)	44. (3)
45. (1)	46. (3)	47. (2)	48. (3)
49. (1)			

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EXPLANATIONS

TYPE-I

1. (2) Successive discounts of 36% and 4% is overall equals to

$$=\left(36+4-\frac{36\times4}{100}\right)\%$$

$= 38.56\%$

$\therefore$ Percentage difference $= 40 - 38.56$

$= 1.44\%$

Difference between discount

$= 1.44\%$ of 100000

$$= \frac{1.44\times100000}{100} = ₹\ 1440$$

2. (4) Equivalent discount

$$= 30 + 10 - \frac{30\times10}{100} = 37\%$$

3. (3) Marked price = ₹ 720

Actual price = ₹ 550.80

First discount = 10%

Let the second discount be x%

Then, we can write

$720\ (1 - 0.10)\ (1-0.01x)$

$= 550.80$

$\Rightarrow 720 \times 0.9\ (1- 0.01x) = 550.8$

$\Rightarrow 648\ (1 - 0.01x) = 550.8$

$$\Rightarrow 1 - 0.01\,x = \frac{550.8}{648}$$

$$0.01\,x = 1 - \frac{550.8}{648}$$

$$x = \frac{1-0.85}{0.01}$$

$x = 0.15 \times 100$

$x = 15$

$\therefore$ Second discount = 15%

4. (2) Price after 10% first discount

$$= 1000 \times \frac{100-10}{100}$$

$$= 1000 \times \frac{90}{100} = ₹\ 900$$

Given :

Price after second discount

= ₹ 810

$\therefore$ Second discount

$= 900 - 810 =$ ₹ 90

$\therefore$ Percentage of second discount

$$= \frac{90\times100}{900} = 10\%$$

5. (3) Successive discounts of x% and y%

$$= \left(x+y-\frac{x\times y}{100}\right)\%$$

$\therefore$ Required discount

$$= \left(20+10-\frac{20\times10}{100}\right)\%$$

$= 30 - 2 = 28\%$

6. (3) **Trick :**

Equivalent discount

$$= \left(15+10-\frac{15\times10}{100}\right)\% = 23.5\%$$

7. (3) Equivalent discount of successive discounts of 20% and 10%

$$= \left(20+10-\frac{20\times10}{100}\right)\% = 28\%$$

$\therefore$ Selling Price = (100 – 28) % of ₹ 500 = 72 % of 500

$$= ₹\ \frac{500\times72}{100} = ₹\ 360$$

8. (1) A single discount equal to the two successive discounts

$$= \left(10+5-\frac{10\times5}{100}\right)\% = 14.5\%$$

$\therefore$ Selling price of the article

= 85.5% of ₹ 240

$$= ₹\ \frac{85.5\times240}{100} = ₹\ 205.20$$

9. (2) Let the original price be ₹ 100

$\therefore$ Increased price = ₹ 130

Equivalent discount

$$= \left(10+10-\frac{10\times10}{100}\right) = 19\%$$

$\therefore$ Ultimate price of the article = 81% of 130 = 105.3 i.e. increase by 5.3%.

10. (3) Single of discount for successive discounts 10% and 20%

$$= \left(20+10-\frac{20\times10}{100}\right)\% = 28\%$$

$\therefore$ Equivalent discount for discounts 28% and 25%

$$= \left(28+25-\frac{28\times25}{100}\right)\%$$

$= 53 - 7 = 46\%$

11. (3) Equivalent discount for successive discounts of 20% and 10%

$$= \left[20+10-\frac{20\times10}{100}\right]\%$$

$= 28\%$

$\therefore$ Net selling price = 72% of 2000

$$= ₹\ \frac{72\times2000}{100} = ₹\ 1440$$

12. (2) Case I : A single discount of 30%

Case. II : Two successive discounts of 20% and 10%

Single equivalent discount

$$= \left(20 + 10 - \frac{20\times10}{100}\right)\% = 28\%$$

Difference = (30 – 28)% = 2%

$\therefore$ Required difference

= 2% of 550

$$= ₹\ \frac{2\times550}{100} = ₹\ 11.$$

13. (3) Let the second discount be x%.

Then, 90 % of (100 – x) % of 800 = 612

$$\Rightarrow \frac{90}{100}\times\frac{100-x}{100}\times800 = 612$$

$$\Rightarrow 100 - x = \frac{612\times100}{90\times8} = 85$$

$\Rightarrow x = 100 - 85 = 15\%$

14. (3) Let 'x' be the marked price

Single Discount = 15%

$\Rightarrow 100 - 14 = 85$

85% of x = 17,000

$$\therefore\ x = \frac{17,000}{85}\times100$$

= ₹ 20,000

Required SP

$$= 20,000\times\frac{95}{100}\times\frac{90}{100}$$

$= 180 \times 95 =$ ₹ 17100

15. (3) Marked price = ₹ 160

After 10% discount

$$\text{S.P} = \frac{90}{100}\times160 = ₹\ 144$$

Let other discount = x%

$$\therefore\ \frac{(100-x)}{100}\times144 = ₹\ 122.40$$

$$\Rightarrow 100 - x = \frac{12240}{144}$$

$\Rightarrow 100 - x = 85$

$\Rightarrow x = 100 - 85 = 15\%$

16. (4) Let the second discount be x per cent.

According to the question,

$$450 \times \frac{100-10}{100}\times\frac{100-x}{100}$$

$= 344.25$

$\therefore\ 100 - x$

$$= \frac{344.25\times100\times100}{450\times90}$$

$\therefore\ 100 - x = 85$

$\therefore\ x = 100 - 85 = 15\%.$

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17. (3) (i) :
Equivalent discount
$= \left(25+15-\frac{25\times15}{100}\right)\%$
$= (40 - 3.75)\% = 36.25\%$
(ii) :
Equivalent discount
$= \left(30+10-\frac{30\times10}{100}\right)\%$
$= (40 - 3)\% = 37\%$
(iii) :
Equivalent discount
$= \left(35+5-\frac{35\times5}{100}\right)\%$
$= (40 - 1.75)\% = 38.25\%$
Clearly, third offer is best for a customer.

18. (2) Equivalent discount for two successive discounts of 8% and 8%
$= \left(8+8-\frac{8\times8}{100}\right)\%$
$= (16-0.64)\% = 15.36\%$
$\therefore$ SP = (100 – 15.36) % of 900
$= ₹\left(\frac{84.64\times900}{100}\right) = ₹\ 761.76$
For a single discount of 16%,
SP = 84% of 900
$= ₹\left(\frac{84\times900}{100}\right) = ₹\ 756$
Certainly seller will lose in this case.
$\therefore$ Loss = ₹ (761.76 – 756)
= ₹ 5.76

19. (3) Equivalent discount
$= 10+5-\frac{10\times5}{100} = 14.5\%$
$\therefore$ CP (for buyer)
= 85.5% of ₹ 200000
$= ₹\left(\frac{85.5\times200000}{100}\right) = ₹\ 171000$
SP = ₹ 179550
Gain = ₹ (179550 – 171000)
= ₹ 8550
$\therefore$ Gain %
$= \frac{8550}{171000}\times100 = 5\%$

20. (4) Effective discount
$= 25 + 15 - \frac{25\times15}{100}$
$= 40 - 3.75 = 36.25\%$
$\therefore$ CP for buyer
= (100 – 36.25) % of 800
$= \frac{63.75\times800}{100} = ₹\ 510$
$\therefore$ To gain 20%,
$SP = ₹\left(\frac{120\times510}{100}\right) = ₹\ 612$
Let the list price be ₹ x.
$\therefore$ 90% of x = ₹ 612
$\Rightarrow \frac{90x}{100} = 612 \Rightarrow x = \frac{61200}{90}$
= ₹ 680

21. (4) Single equivalent discount of two successive discounts of 36% and 4%
$= 36 + 4 - \frac{36\times4}{100}$
$= 40 - 1.44 = 38.56$
Percentage difference
$= 40 - 38.56 = 1.44$
$\therefore$ Required difference
$= 500 \times \frac{1.44}{100} = ₹\ 7.20$

22. (2) Total discount
= ₹ (920 – 742.90)
= ₹ 177.10
First discount = 15%
$\therefore$ Discount = 15% of 920
$= \frac{920\times15}{100} = ₹\ 138$
Price after this discount
= 920 – 138 = ₹ 782
Remaining discount
= 177.10 – 138 = ₹ 39.10
Let the second discount be x %.
$\therefore \frac{782\times x}{100} = 39.10$
$\Rightarrow x = \frac{39.10\times100}{782} = 5\%$

23. (3) Total discount
= ₹ (820 – 570.72) = ₹ 249.28
First discount = $820\times\frac{20}{100} = ₹164$
$\therefore$ Second discount
= ₹ (249.28 – 164) = ₹ 85.28
Price of the article after first discount = ₹ (820 – 164) = ₹ 656
If the second discount be x% , then
x% of 656 = 85.28
$\Rightarrow x = \frac{85.28\times100}{656} = 13\%$

24. (1) Single equivalent discount for two successive discounts of 20% and 10%
$= \left(20+10-\frac{20\times10}{100}\right)\% = 28\%$
Now , single discount for 28% and 5% $= \left(28+5-\frac{28\times5}{100}\right)\%$
$= (33 - 1.4)\% = 31.6\%$
$\therefore$ Required selling price of bicycle at cash payment
= (100 – 31.6) % of ₹ 2000
$= \frac{2000\times68.4}{100} = ₹1368$

25. (1) Single equivalent discount of two consecutive discount of 30% and 10%
$= 30 + 10 - \frac{30\times10}{100} = 37\%$
$\therefore$ Required difference = 40% of 500 – 37% of 500
= 3% of 500
$= 500\times\frac{3}{100} = ₹15$

26. (4) After a discount of 5%
$SP = \frac{95\times16000}{100} = ₹\ 15200$
Let the second discount be x%.
$\therefore$ x% of 15200
= (15200 – 11400)
$\Rightarrow \frac{x\times15200}{100} = 3800$
$\Rightarrow x = \frac{3800\times100}{15200} = 25$
$\therefore$ Second discount = 25%

27. (3) Case I,
$\text{Discount} = \frac{30\times2000}{100} = ₹\ 600$
Single equivalent discount for discounts of 25% and 5%.
$= \left(25+5-\frac{25\times5}{100}\right)\%$
$= (30 - 1.25)\% = 28.75\%$
$\therefore \text{Discount} = \frac{28.75\times2000}{100}$
= ₹ 575
$\therefore$ Difference = ₹ (600 – 575)
= ₹ 25

28. (1) Let the marked price be ₹ x.
$\therefore$ In case I, SP = ₹ $\frac{70x}{100}$
Single discount equivalent to successive discounts of 20% and 10%,

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$= \left(20+10-\frac{20\times10}{100}\right)\% = 28\%$

$\therefore$ S.P. in this case $= \frac{72x}{100}$

$\therefore \frac{72x}{100} - \frac{70x}{100} = 72$

$\Rightarrow \frac{2x}{100} = 72$

$\therefore x = \frac{72\times100}{2} = ₹\ 3600$

29. (2) Single equivalent discount for successive discounts of 10% and 20%.

$= \left(10+20-\frac{20\times100}{100}\right)\% = 28\%$

Single equivalent discount for 28% and 30%.

$= \left(28+30-\frac{28\times30}{100}\right)\% = 49.6\%$

30. (3) Equivalent single discount

$= \left(20+20-\frac{20\times20}{100}\right)\% = 36\%$

31. (3) Single equivalent discount

$= \left(10+5-\frac{10\times5}{100}\right)\%$

$= (15 - 0.5)\% = 14.5\%$

32. (2) Single equivalent discount

$= \left(x+y-\frac{xy}{100}\right)\%$

$= \left(20+15-\frac{20\times15}{100}\right)\% = 32\%$

33. (2) Single equivalent discount for 10% and 12%.

$= \left(12+10-\frac{12\times10}{100}\right)\% = 20.8\%$

Single equivalent discount for 20.8% and 5%.

$= \left(20.8+5-\frac{20.8\times5}{100}\right)\%$

$= 24.76\%$

34. (2) Single equivalent discount

$= \left(5+10-\frac{10\times5}{100}\right)\% = 14.5\%$

$\therefore$ Cost of article after discount

$= \frac{850\times(100-14.5)}{100} = ₹\ 726.75$

35. (3) Single equivalent discount

$= \left(15+10-\frac{15\times10}{100}\right) = 23.5\%$

$\therefore$ Cost price $= \frac{800\times76.5}{100}$

$= ₹\ 612$

Actual C.P. $= ₹\ (612 + 28)$

$= ₹\ 640$

$\therefore$ Gain % $= \frac{800-640}{640}\times100$

$= \frac{160\times100}{640} = 25\%$

36. (2) Single equivalent discount for 10% and 20%

$= 10 + 20 - \frac{20\times10}{100} = 28\%$

Single equivalent discount for 28% and 40%

$= \left(40+28-\frac{28\times40}{100}\right)\%$

$= (68 - 11.2)\% = 56.8\%$

37. (4) Single equivalent discount

$= \left(25+10-\frac{25\times10}{100}\right)\%$

$= 32.5\%$

38. (1) Equivalent single discount

$= \left(x+y-\frac{xy}{100}\right)\%$

$= \left(20+5-\frac{20\times5}{100}\right)\%$

$= (25 - 1)\% = 24\%$

39. (4) Single equivalent discount of two successive discounts of 20% each

$= \left(20+20-\frac{20\times20}{100}\right)\%$

$= 36\%$

If the amount of the bill be x, then

$\therefore (36 - 35)\%$ of $x = 22$

$\Rightarrow \frac{x}{100} = 22 \Rightarrow x = ₹\ 2200$

40. (3) S.P. after first discount

$= \frac{1600\times90}{100} = ₹\ 1440$

$\therefore$ Second discount

$= 1440 - 1224 = ₹\ 216$

$\therefore \frac{1440\times x}{100} = 216$

$\therefore x = \frac{216\times100}{1440} = 15\%$

41. (3) Single equivalent discount for 20% and 20%

$= \left(20+20-\frac{20\times20}{100}\right)\% = 36\%$

Single equivalent discount for 36% and 10%

$= \left(36+10-\frac{36\times10}{100}\right)\% = 42.4\%$

42. (2) Single equivalent discount

$= \left(10+10-\frac{10\times10}{100}\right)\% = 19\%$

43. (4) Single equivalent discount for 20% and 15%

$= \left(20+15-\frac{20\times15}{100}\right)\% = 32\%$

Single equivalent discount for 32% and 10%

$= \left(32+10-\frac{32\times10}{100}\right)\% = 38.8\%$

44. (2) Single equivalent discount for 20% and 10%

$= \left(20+10-\frac{20\times10}{100}\right)\% = 28\%$

Single equivalent discount for 28% and 5%

$= \left(28+5-\frac{28\times5}{100}\right)\% = 31.6\%$

45. (3) Single equivalent discount

$= \left(p+q-\frac{pq}{100}\right)\%$

46. (1) Single equivalent discount

$= \left(25+10-\frac{25\times10}{100}\right) = 32.5\%$

$\therefore$ S.P. of chair

$= \frac{350(100-32.5)}{100}$

$= \frac{350\times67.5}{100} = ₹\ 236.25$

47. (4) Single equivalent discount

$= \left(30+15-\frac{30\times15}{100}\right)\% = 40.5\%$

If the marked price be x, then

$x \times \frac{100-40.5}{100} = 476$

$\Rightarrow x = \frac{476\times100}{59.5} = ₹\ 800$

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48. (1) Single equivalent discount

$$=\left(25+5-\frac{25\times5}{100}\right)\%$$

$= (30 - 1.25)\% = 28.75\%$

49. (1) C.P. of the table

$$=800\times\frac{90}{100}\times\frac{85}{100}=₹\ 612$$

Actual C.P. = 612 + 13 = ₹ 625

Profit = 875 − 625 = ₹ 250

∴ Profit per cent

$$=\frac{250}{625}\times100=40\%$$

50. (4) Single equivalent discount

$$=\left(30+30-\frac{30\times30}{100}\right)\%=51\%$$

51. (2) Single equivalent discount

$$=\left(25+15-\frac{25\times15}{100}\right)$$

$= 40 - 3.75 = 36.25$

∴ C.P. for the retailer

$$=\frac{800\times(100-36.25)}{100}=₹\ 510$$

52. (1) First discount

$$=320\times\frac{10}{100}=₹\ 32$$

∴ Price after first discount

$= 320 - 32 = ₹\ 288$

If the second discount be x%, then

$$\therefore\ \frac{288\times x}{100}=288-244.80$$

$= 43.2$

$$\Rightarrow x=\frac{43.2\times100}{288}=15\%$$

53. (1) Single equivalent discount for 40% and 10%

$$=\left(40+10-\frac{40\times10}{100}\right)\%=46\%$$

Difference of percentage = 4%

∴ Savings = 4% of 10000

$$=\frac{10000\times4}{100}=₹\ 400$$

54. (2) Single equivalent discount

$$=\left(70+30-\frac{70\times30}{100}\right)\%$$

$= (100 - 21)\% = 79\%$

After a discount of 70%, remaining price is just 30. On this 30%, another discount of 30% is given which will be equal to 9 so, total discount = 70% + 9% = 79%.

55. (3) C.P. for A

$$=3000\times\frac{90}{100}\times\frac{85}{100}=₹\ 2295$$

Actual C.P. = 2295 + 105

$= ₹\ 2400$

$$\therefore\ \text{Gain per cent}=\frac{800}{2400}\times100$$

$$=\frac{100}{3}=33\frac{1}{3}\%$$

56. (1) Single equivalent discount

$$=\left(20+10-\frac{20\times10}{100}\right)=28\%$$

$$\therefore\ \text{C.P. of table}=\frac{1500\times72}{100}$$

$= ₹\ 1080$

Actual C.P. = 1080 + 20 = ₹ 1100

∴ Required S.P.

$$=1100\times\frac{120}{100}=₹\ 1320$$

57. (1) Single equivalent discount

$$=\left(5+5-\frac{25}{100}\right)\%$$

$$=9\frac{3}{4}=\frac{39}{4}\%$$

$$\therefore\ \text{S.P.}=80\times\frac{361}{400}=₹\ 72.2$$

58. (2) (a) Single equivalent discount for 20% and 15%

$$=\left(20+15-\frac{20\times15}{100}\right)\%=32\%$$

Single equivalent discount for 32% and 10%

$$=\left(32+10-\frac{32\times10}{100}\right)=38.8\%$$

(b) Single equivalent discount for 25% and 12%

$$=\left(25+12-\frac{25\times12}{100}\right)=34\%$$

Single equivalent discount for 34% and 8%

$$=\left(34+8-\frac{34\times8}{100}\right)\%$$

$= 42 - 2.72 = 39.28\%$

59. (2) Single equivalent discount

$$=\left(10+5-\frac{10\times5}{100}\right)=14.5\%$$

i.e. ₹ 14.50

60. (3) Required S.P.

$$=5000\times\frac{(100-x)}{100}\times\frac{(100-y)}{100}\times\frac{(100-z)}{100}$$

$$=₹\left(\frac{(100-x)(100-y)(100-z)}{200}\right)$$

61. (1) C.P. of chair

$$=\left(600-\frac{600\times15}{100}\right)\times\frac{80}{100}$$

$$=\frac{510\times80}{100}=₹\ 408$$

Actual C.P. = 408 + 28 = ₹ 436

Gain percent

$$=\frac{545-436}{436}\times100=25\%$$

62. (1) Single equivalent discount for 20% and 10%

$$=\left(20+10-\frac{20\times10}{100}\right)=28\%$$

Single equivalent discount for 28% and 10%

$$=\left(28+10-\frac{28\times10}{100}\right)=35.2\%$$

∴ S.P. of Piano

$$=\frac{15000\times(100-35.2)}{100}$$

$= ₹\ 9,720$

63. (3) Single equivalent discount

$$=\left(30+20-\frac{30\times20}{100}\right)\%$$

$= 50 - 6 = 44\%$

64. (1) Single equivalent discount

$$=\left(10+5-\frac{10\times5}{100}\right)\%$$

$= 14.5\ \%$

∴ Amount to be paid

$= (100 - 14.5)\%$ of 110

$$=\frac{110\times85.5}{100}=₹\ 94.05$$

$\approx ₹\ 94$

65. (3) Single equivalent discount for two successive discounts

$$=\left(x+y-\frac{xy}{100}\right)\%$$

$$=\left(\frac{25}{2}+10-\frac{25\times10}{200}\right)\%$$

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$= (12.5 + 10 - 1.25)\%$
$= 21.25\%$
If the marked price of the plate be ₹ x, then
$= (100 - 21.25)\%$ of $x = 6300$

$\Rightarrow x \times \frac{78.75}{100} = 6300$

$\Rightarrow x = \frac{6300 \times 100}{78.75} =$ ₹ 8000

66. (3) Single equivalent discount for 8% and 5%

$= \left(8 + 5 - \frac{8 \times 5}{100}\right)\%$

$= (13 - 0.4) = 12.6\%$
Single equivalent disconut for 12.6% and 2%

$= \left(12.6 + 2 - \frac{12.6 \times 2}{100}\right)\%$

$= 14.6 - 0.252 = 14.348\%$
∴ Net S.P.
$= (100 - 14.348)\%$ of 7500

$= \frac{7500 \times 85.652}{100} =$ ₹ 6423.90

67. (3) Single equivalent discount

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(10 + 20 - \frac{10 \times 20}{100}\right)\%$

$= 28\%$

68. (1) Let the marked price of article be Rs. x,
Single equivalent discount for 20% and 10%

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$

According to the question,
30% of x – 28% of x = 144

$\Rightarrow \frac{x \times 2}{100} = 144$

$\Rightarrow x = \frac{144 \times 100}{2}$

= Rs. 7200

69. (1) Single equivalent discount

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(10 + 20 - \frac{10 \times 20}{100}\right)\%$

$= (30 - 2)\% = 28\%$

70. (4) Marked price of article
= Rs. x (let)
According to the question,

$x \times \frac{80}{100} \times \frac{85}{100} = 3060$

$\Rightarrow x = \frac{3060 \times 100 \times 100}{80 \times 85}$

= Rs. 4500

71. (4) Single equivalent discount for discounts of 10% and 20%

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$

$= (30 - 2)\% = 28\%$
Single equivalent discounts for discounts of 28% and 25%

$= \left(28 + 25 - \frac{28 \times 25}{100}\right)\%$

$= (53 - 7)\% = 46\%$

72. (4) Single equivalent discount for 40% and 30%

$= \left(40 + 30 - \frac{40 \times 30}{100}\right)\%$

$= (70 - 12)\% = 58\%$
Single equivalent discount for 45% and 20%

$= \left(45 + 20 - \frac{45 \times 20}{100}\right)\%$

$= (65 - 9)\% = 56\%$
Let the marked price be Rs. x.
According to the question,
$x \times (58 - 56)\% = 12$

$\Rightarrow \frac{x \times 2}{100} = 12$

$\Rightarrow x = \frac{1200}{2} =$ Rs. 600

73. (3) Single equivalent discount for 20% and 10%

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\%$

$= 28\%$
∴ C.P. $= (100 - 28)\%$ of 1500

$= \frac{1500 \times 72}{100} =$ Rs. 1080

Actual C.P. = Rs. (1080 + 20)
= Rs. 1100
∴ S.P. on 20% profit

$= \frac{1100 \times 120}{100} =$ Rs. 1320

74. (1) Price of article = Rs. x (let)
According to the question,

$P = \frac{x(100 - 20)}{100} \times \frac{100 - 25}{100}$

$\Rightarrow P = x \times \frac{80}{100} \times \frac{75}{100}$

$\Rightarrow P = x \times \frac{4}{5} \times \frac{3}{4} = \frac{3x}{5}$

$\Rightarrow x =$ Rs. $\frac{5}{3}P$

75. (3) Net selling price of scooter.

$= \text{Rs.}\left(18000 \times \frac{90}{100} \times \frac{95}{100} \times \frac{98}{100}\right)$

= Rs. 15082.2

76. (4) Single equivalent discount for x% and y%.

$= \left(x + y - \frac{xy}{100}\right)\%$

∴ Single equivalent discount for 20% and 10%

$= \left(20 + 10 - \frac{20 \times 10}{100}\right)\% = 28\%$

Single equivalent discount for 28% and 5%

$= \left(28 + 5 - \frac{28 \times 5}{100}\right)\%$

$= \left(33 - \frac{140}{100}\right)\%$

$= (33 - 1.4)\%$
$= 31.6\%$

77. (2) Single equivalent discount

$= \left(20 + 10 - \frac{20 \times 10}{100}\right) = 28\%$

78. (4) Single equivalent discount for 15% and 10%.

$= \left(15 + 10 - \frac{15 \times 10}{100}\right)\%$

$= (25 - 1.5)\% = 23.5\%$
∴ Required S.P.
$= (100 - 23.5)\%$ of 300

$= \frac{300 \times 76.5}{100} =$ Rs. 229.5

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TYPE-II

1. (2) Required loss [As per Rule]

$=\left(\frac{10\times10}{100}\right)\% = 1\%$

2. (2) Suppose C.P. = 100
On 20% above S.P. = 120
On discount of 8%

$=120-120\times\frac{8}{100}$

$=120-\frac{48}{5}=120-9.6=110.4$

Gain = 110.4 – 100 = 10.4%

3. (3) Let the cost price be x
Mark Price

$=\left(1+\frac{20}{100}\right)x=1.2x$

Cash price $=\left(1-\frac{30}{100}\right)1.2x$

= 0.7 × 1.2x = 0.84x
Net Loss = x – 0.84x = 0.16x
∴ Net loss%

$=\frac{0.16x}{x}\times100=16\%$

4. (4) Gain % $=20-10-\frac{20\times10}{100}$

= 20 – 12 = 8%

5. (2) Let C.P. be 100
Marked price = 110
∴ x% of 110 = 11

$\Rightarrow x=\frac{11\times100}{110}=10\%$

6. (4) Let the CP of the article be 100.
According to the question,
The marked price = ₹ 130
Discount = 10%
∴ SP = 90% of 130

$=\frac{130\times90}{100}=₹\ 117$

∴ Gain = 117 – 100 = ₹ 17
∴ Gain per cent = 17% since the CP = ₹100

7. (2) Let the cost price be ₹ 100.
∴ Marked price = ₹ 120

SP = $87\frac{1}{2}\%$ of 120

$=\frac{175}{200}\times120=₹\ 105$

∴ Gain per cent = 5%

8. (1) Let the C.P. be ₹ 100
∴ Marked price = ₹ 130
S.P. = 85% of ₹ 130

$=₹\left(\frac{85\times130}{100}\right)=₹\ 110.5$

∴ Gain percent = 10.5%

9. (1) Let the cost price of article = ₹ 100
∴ Marked price = ₹ 125
SP of the article

$=\left(100-\frac{25}{2}\right)\%$ of 125

$=\frac{175}{2}\%$ of 125

$=\frac{125\times175}{2\times100}=\frac{875}{8}$

$=₹\ 109\frac{3}{8}$

∴ Gain percent

$=\left(109\frac{3}{8}-100\right)=9\frac{3}{8}\%$

10. (4) Let the marked price be x.

$\therefore\ \frac{x\times75}{100}=200\times\frac{135}{100}$

$\Rightarrow x=\frac{200\times135}{75}=₹\ 360$

11. (3) Let the cost price be ₹ 100.
Marked price = ₹ 140

S.P. $=\frac{75\times140}{100}=₹\ 105$

∴ Profit per cent = 5%

12. (4) Let cost price of article = ₹ 100
∴ Marked price of article

$=\frac{100\times120}{100}=₹\ 120$

S.P. of article = ₹ 110
∴ Discount = 120 – 110 = ₹ 10
∴ If discount = x%, then

$\frac{120\times x}{100}=10$

$\Rightarrow x=\frac{10\times100}{120}=\frac{25}{3}=8\frac{1}{3}\%$

13. (2) Let the CP of each shirt be ₹ 100, then SP = ₹ 140.

∴ New SP $=\frac{140\times90}{100}=₹\ 126$

∴ When S.P. is ₹ 126, CP. = ₹ 100

∴ When S.P. is ₹ $\frac{13608}{72}$, then C.P.

$=\frac{100}{126}\times\frac{13608}{72}=₹\ 150$

14. (2) C.P. of article = ₹ 100
Marked price = ₹ 150

S.P. $=\frac{150\times60}{100}=₹\ 90$

Loss = 100 – 90 = ₹ 10 i.e. 10%

15. (4) Let the CP of article be ₹ 100.
∴ Marked price = ₹ 140

S.P. $=\frac{140\times80}{100}=₹\ 112$

∴ Gain per cent = 12%

16. (4) Let the C.P. of article be ₹ 100
⇒ Marked price = ₹ 145

⇒ S.P. $=\frac{145\times80}{100}=₹\ 116$

⇒ Profit percent = 16%

17. (2) Let the cost price be ₹ 100.
∴ Marked price = ₹ 150

S.P. $=\frac{150\times80}{100}=₹\ 120$

when S.P. = 120, C.P. = 100
when S.P. = 840

C.P. $=\frac{100}{120}\times840=₹\ 700$

18. (3) Let the C.P. of each article be ₹ 100.
∴ Marked price = ₹ 140

∴ S.P. $=\frac{140\times85}{100}=₹\ 119$

∴ Gain per cent = 19%

19. (3) Let C.P. be ₹ 100.
Marked price = ₹ 120

S.P. $=\frac{120\times95}{100}=₹\ 114$

Gain per cent = 14%

20. (1) Let Cost price = ₹ 100
Marked price = ₹ 120

Selling price $=\frac{120\times80}{100}=₹\ 96$

∴ Loss = ₹ 4 and loss per cent = 4%

21. (3) Let Cost price of article = ₹ 100
Marked price = ₹ 125

∴ S.P. $=\frac{125\times90}{100}=₹\ 112.5$

∴ Gain = 112.5 – 100 = 12.5
⇒ Gain percent = 12.5%

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22. (4) Let the cost price be ₹ 100 and marked price be x.

$$\therefore \frac{x \times 90}{100} = 108$$

$$\Rightarrow \frac{9x}{10} = 108$$

$$\Rightarrow x = \frac{108 \times 10}{9} = 120$$

Required Percent = 20%

23. (1) Let the C.P. be ₹ 100 and the marked price be ₹ x.

$$\therefore x \times \frac{88}{100} = 132$$

$$\Rightarrow x = \frac{132 \times 100}{88}$$

= 150 i.e., more by 50%

∴ Required percentage = 50%

24. (4) C.P. of article = ₹ 100

Let marked price of article x.

$$\therefore x \times \frac{90}{100} = 117$$

$$\Rightarrow x = \frac{117 \times 100}{90}$$

= ₹ 130 or 30% above the cost price.

25. (3) Let marked price of the wrist watch be x

$$\therefore \frac{90x}{100} = \frac{450 \times 120}{100}$$

$$\Rightarrow 90x = 450 \times 120$$

$$\therefore x = \frac{450 \times 120}{90} = ₹ 600$$

26. (3) For Anand,

Cost price = ₹ x

Marked price = ₹ $\frac{3}{2}x$

Selling price = $\frac{3x}{2} \times \frac{80}{100}$

= ₹ $\frac{6x}{5}$

For Balaji,

Cost price = ₹ $\frac{6x}{5}$

Selling price = ₹ $\left(\frac{6x}{5} + 20\right)$

$$\therefore \frac{6x}{5} + 20 = \frac{x \times 130}{100}$$

$$\Rightarrow \frac{13x}{10} - \frac{6x}{5} = 20$$

$$\Rightarrow \frac{13x - 12x}{10} = 20$$

$$\Rightarrow \frac{x}{10} = 20$$

$$\Rightarrow x = ₹ 200$$

∴ Required gain percent

$$= \frac{20}{\frac{6x}{5}} \times 100$$

$$= \frac{20 \times 5 \times 100}{6 \times 200} = \frac{25}{3} = 8.33\%$$

27. (4) Cost price of the shirt = ₹ x

$$\therefore x \times \frac{120}{100} = \frac{850 \times 96}{100}$$

$$\Rightarrow x \times 120 = 850 \times 96$$

$$\Rightarrow x = \frac{850 \times 96}{120} = ₹ 680$$

28. (2) Cost price of the article = ₹ x

$$\therefore x \times \frac{125}{100} = \frac{500 \times 95}{100}$$

$$\Rightarrow x = \frac{500 \times 95}{125} = ₹ 380$$

29. (2) Marked price = ₹ x

Discount = ₹ $\frac{x}{5}$

S.P. = $x - \frac{x}{5}$ = ₹ $\frac{4x}{5}$

Loss = ₹ $\frac{x}{10}$

$$\therefore \text{C.P.} = \frac{4x}{5} + \frac{x}{10}$$

$$= \frac{8x + x}{10} = ₹ \frac{9x}{10}$$

$$\therefore \text{Loss per cent} = \frac{\frac{x}{10}}{\frac{9x}{10}} \times 100$$

$$= \frac{100}{9} = 11\frac{1}{9}\%$$

30. (2) Marked price of article = ₹ x (let)

∴ S.P. of article

$$= ₹ \left(x \times \frac{90}{100} \times \frac{108}{100}\right)$$

$$\therefore x \times \frac{90}{100} \times \frac{108}{100} = 3402$$

$$\Rightarrow x = \frac{3402 \times 100 \times 100}{90 \times 108}$$

= ₹ 3500

31. (1) Let the marked price of table be ₹ x.

$$\therefore \frac{x \times 60}{100} = \frac{3200 \times 125}{100}$$

$$\Rightarrow x \times 80 = 3200 \times 125$$

$$\Rightarrow x = \frac{3200 \times 125}{80} = ₹ 5000$$

32. (4) Marked price of article = ₹ x

$$\therefore \frac{x \times (100 - 12.5)}{100} = \frac{210 \times 120}{100}$$

$$\Rightarrow x \times 87.5 = 210 \times 120$$

$$\Rightarrow x = \frac{210 \times 120}{87.5} = ₹ 288$$

33. (3) C.P. of article = ₹ 100

and marked price of article = ₹ x (let)

$$\therefore x \times \frac{90}{100} = 117$$

$$\Rightarrow x = \frac{117 \times 100}{90} = ₹ 130$$

i.e. 30% above the cost price.

34. (4) Production cost of radio = ₹ x

$$\therefore \frac{x \times 130}{100} = 286$$

$$\Rightarrow x = \frac{286 \times 100}{130} = ₹ 220$$

∴ Selling price = 90% of 286

$$= \frac{286 \times 90}{100} = ₹ 257.40$$

Profit = ₹ (257.40 – 220)

= ₹ 37.40

35. (1) C.P. of cycle = Rs. x

$$\therefore 840 \times \frac{90}{100} = \frac{x \times 126}{100}$$

$$\Rightarrow x \times 126 = 840 \times 90$$

$$\Rightarrow x = \frac{840 \times 90}{126} = ₹ 600$$

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36. (4) C.P. of article = ₹100

Marked price = ₹ 110

$$\text{S.P.} = \frac{110\times 90}{100} = ₹\ 99$$

Loss = 100 – 99 = ₹ 1 = 1%

37. (3) Marked price of article = Rs. x

$$\therefore \text{S.P. of article} = \frac{90x}{100}$$

$$= \text{Rs. } \frac{9x}{10}$$

$$\therefore \text{C.P} = \frac{80\times 9x}{100\times 10} = \frac{36x}{50}$$

$$\therefore \text{Gain} = \frac{9x}{10} - \frac{36x}{50}$$

$$= \frac{45x-36x}{50} = \text{Rs. } \frac{9x}{50}$$

$$\therefore \text{Gain\%} = \frac{\frac{9x}{50}}{\frac{36x}{50}}\times 100 = 25\%$$

38. (4) Marked price of instrument = Rs. x (let)

$$\therefore \text{Its S.P.} = \text{Rs. } \frac{80x}{100}$$

$$= \text{Rs. } \frac{4x}{5}$$

$$\therefore \text{C.P.} = \text{Rs. } \left(\frac{4x}{5}-150\right)$$

$$\therefore \frac{4x}{5} = \left(\frac{4x}{5}-150\right)\times\frac{125}{100}$$

$$\Rightarrow \frac{4x}{5} = \left(\frac{4x}{5}-150\right)\times\frac{5}{4}$$

$$\Rightarrow \frac{4x}{5}\times\frac{4}{5} = \frac{4x}{5}-150$$

$$\Rightarrow \frac{4x}{5}-\frac{16x}{25} = 150$$

$$\Rightarrow \frac{20x-16x}{25} = 150$$

$$\Rightarrow \frac{4x}{25} = 150 \Rightarrow 4x = 150\times 25$$

$$\Rightarrow x = \frac{150\times 25}{4} = \text{Rs. } 937.5$$

39. (2) Marked price of TV = Rs. x (let)

According to question,

$$\frac{x\times 80}{100} - \frac{x\times 70}{100} = 800$$

$$\Rightarrow \frac{10x}{100} = 800$$

$$\Rightarrow x = \frac{800\times 100}{10} = \text{Rs. } 8000$$

40. (4) Profit per cent

$$= \left(x+y+\frac{xy}{100}\right)\%$$

$$= \left(25-10-\frac{25\times 10}{100}\right)\%$$

$$= (15-2.5)\% = 12.5\ \%$$

41. (1) Let the C.P. of article be Rs. 100,

According to the questions

Marked price of article = Rs. 120

After a discount of 8%,

$$\text{S. P.} = \left(\frac{120\times 92}{100}\right)$$

= Rs. 110.4 Gain

= Rs. (110.4 – 100) = Rs. 10.4

$\therefore$ Gain % = 10.4%

42. (1) C.P of article = Rs. 100 (let).

M.P. of article = Rs. x (let)

According to the question,

$$\frac{x\times 90}{100} = 117$$

$$\Rightarrow x = \frac{117\times 100}{90} = \text{Rs. } 130$$

= marked price

$\therefore$ On allowing no discount profit = 30%

43. (4) Let the marked price of the camera be Rs. x.

According to the question,

$$\frac{x\times 90}{100} = \frac{600\times 120}{100}$$

$$\Rightarrow x\times 90 = 600\times 120$$

$$\Rightarrow x = \frac{600\times 120}{90} = \text{Rs. } 800$$

44. (3) Let the C.P. of article be Rs. 100 and the marked price be Rs. x.

Case I

$$\frac{x\times 90}{100} = 120$$

$$\Rightarrow x = \frac{120\times 100}{90}$$

$$= \text{Rs. } \frac{400}{3}$$

Case II

$$\text{S.P.} = \frac{x\times 80}{100} = \text{Rs. } \frac{4x}{5}$$

$$= \text{Rs. } \left(\frac{4}{5}\times\frac{400}{3}\right) = \text{Rs. } \frac{320}{3}$$

$$\therefore \text{Profit} = \text{Rs. } \left(\frac{320}{3}-100\right)$$

$$= \text{Rs. } \left(\frac{320-300}{3}\right)$$

$$= \text{Rs. } \frac{20}{3}$$

$$\therefore \text{Profit percent} = \frac{20}{3}\%$$

$$= 6\frac{2}{3}\%$$

45. (2) Let the marked price of article be Rs. x and its C.P. be Rs. 100.

According to the question,

$$x\times\frac{80}{100} = \frac{100\times 120}{100}$$

$$\Rightarrow x = \frac{120\times 100}{80} = \text{Rs. } 150$$

S.P. after a discount of 30%

$$= \frac{150\times 70}{100}$$

= Rs. 105 i.e. gain = 5%

46. (1) C.P. of article

$$= \text{Rs. } \left(\frac{100}{130}\times 286\right) = \text{Rs. } 220$$

S.P. of article

$$= \frac{286\times 90}{100} = \text{Rs. } 257.40$$

$\therefore$ Profit

= Rs. (257.40 – 220)

= Rs. 37.40

$\therefore$ Profit percent

$$= \frac{37.40\times 100}{220} = 17\%$$

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47. (3) Marked price of toy = Rs. x
A discount of 20% is given.

$\therefore \frac{80x}{100} = 300$

$\Rightarrow x = \frac{300 \times 100}{80}$

= Rs. 375

$\therefore$ Profit percent

$= \left(\frac{405-375}{375}\right) \times 100 = 8\%$

48. (4) C.P. of article = Rs. 100
Its marked price = Rs. 120

$\therefore$ S.P. $= \frac{120 \times 95}{100}$

= Rs. 114

$\therefore$ Profit percent = 14%

49. (4) Let the marked price of radio be Rs. x.
According to the question,
85% of $x = 255$

$\Rightarrow \frac{x \times 85}{100} = 255$

$\Rightarrow x = \frac{255 \times 100}{85}$ = Rs. 300

TYPE-III

1. (4) S.P. of that article

$= 800 \times \frac{90}{100} =$ ₹ 720

He still makes 20% profit
$\therefore$ C.P. of the article

$= 720 \times \frac{100}{120} =$ ₹ 600

2. (4) Discount

$= 12\frac{1}{2}\% = \frac{25}{2}\%$

After discount S.P.
= ₹ 200 × 87.5) = ₹ 175
Gain % = 25%

Required C.P. = ₹ $\frac{100}{125} \times 175$

= ₹ 140

3. (2) SP of article
= (100 – 20)% of 880
= 80%of 880

$= 880 \times \frac{80}{100} =$ ₹ 704

Let CP be x

Again, 110% of $x = 704$

$x = \frac{704}{110} \times 100 =$ ₹ 640

$\therefore$ Original cost = ₹ 640

4. (2) Selling Price
= ₹ (1100 – 10% of 1100)
= ₹ (1100 – 110) = ₹ 990
Let the cost price = x
$\therefore$ x + 10% of x = 990

$\Rightarrow \frac{11x}{10} = 990$

$\Rightarrow x = \frac{990 \times 10}{11} =$ ₹ 900

5. (1) Marked price = ₹ 690
$\therefore$ Discount = 10%

SP = $\frac{690 \times 90}{100} =$ ₹ 621

Profit = 8%

$\therefore$ CP $= \frac{621}{108} \times 100 =$ ₹ 575

Profit without discount
= 690 – 575 = ₹ 115
Profit per cent

$= \frac{115}{575} \times 100 = 20\%$

6. (2) Let the CP be ₹ 100. Then SP = ₹ 120
Let the marked price be x.
Then, 90% of $x =$ ₹ 120

$\Rightarrow x = \frac{120 \times 100}{90} = \frac{400}{3}$

$= 133\frac{1}{3}$

It is $33\frac{1}{3}$ % higher than the CP.

7. (2) SP $= 180 \times \frac{120}{100} =$ ₹ 216

$\therefore$ 90% = 216

$100\% = \frac{216}{90} \times 100 =$ ₹ 240

8. (2) CP = ₹ 900
$\therefore$ S.P. = 125% of 900

$= \left(\frac{900 \times 125}{100}\right) =$ ₹ 1125

Let the marked price be x
$\therefore$ 90% of $x =$ ₹ 1125

$\Rightarrow x = \frac{1125 \times 100}{90} =$ ₹ 1250

9. (4) Let the cost price of article be x

$\therefore 500 \times \frac{90}{100} = \frac{120}{100} \times x$

$\Rightarrow 450 = \frac{6x}{5}$

$\Rightarrow x = \frac{450 \times 5}{6} =$ ₹ 375

10. (2) SP of electric iron
= 88% of 300

$= ₹ \frac{300 \times 88}{100} =$ ₹ 264

Profit = 10%
$\therefore$ CP of electric iron

$= \frac{100}{110} \times 264 =$ ₹ 240

After no discount,
Gain = 300 – 240 = ₹ 60

Gain per cent $= \frac{60}{240} \times 100 = 25\%$

11. (3) Marked price = ₹ 50
S.P. after discount = 80% of 50
= ₹ 40
If the CP of article be x, then

$\frac{125 \times x}{100} = 40$

$\Rightarrow x = \frac{40 \times 100}{125} =$ ₹ 32

12. (1) Let the CP be ₹ 100.
$\therefore$ SP = ₹ 112
If the marked price be x, then
90 % of $x = 112$

$\Rightarrow x = \frac{112 \times 100}{90} = ₹ \frac{1120}{9}$

$\therefore$ Required ratio $= 100 : \frac{1120}{9}$

= 900 : 1120 = 45 : 56

13. (4) If the CP of radio be x, then

$\frac{108}{100}$ of $x = \frac{480 \times 90}{100}$

$\Rightarrow \frac{x \times 108}{100} = 432$

$\Rightarrow x = \frac{432 \times 100}{108} =$ ₹ 400

Gain per cent (if no discount allowed) $= \frac{80}{400} \times 100 = 20\%$

14. (1) Let C.P. of article be x

$\therefore \frac{x \times 104.5}{100} = \frac{275 \times 95}{100}$

$\Rightarrow x \times 104.5 = 275 \times 95$

$\Rightarrow x = \frac{275 \times 95}{104.5} =$ ₹ 250

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15. (3) Let the marked price be x.

$$\therefore x \times \frac{84}{100} = \frac{1200 \times 112}{100}$$

$$\Rightarrow x \times \frac{84}{100} = 112 \times 12$$

$$\Rightarrow x = \frac{112 \times 1200}{84} = ₹\ 1600$$

16. (1) Let the marked price be ₹100.
$\therefore$ S.P. = 90% of 100 = ₹ 90
Profit = 17%

$$\text{C.P.} = ₹\ 90 \times \frac{100}{117}$$

$$= ₹\ \frac{1000}{13}$$

If no discount is allowed,
S.P. = ₹ 100

$$\text{Profit} = ₹\ \left(100 - \frac{1000}{13}\right)$$

$$= ₹\ \frac{300}{13}$$

$\therefore$ Profit %

$$= \frac{\frac{300}{13}}{1000/13} \times 100 = 30\%$$

17. (1) Let the marked price = ₹ 100
$\therefore$ S.P = ₹ 80
Profit = 25%

$$\therefore \text{CP} = ₹\ \left(\frac{100}{125} \times 80\right) = ₹\ 64$$

Profit after selling on marked price = 100 – 64 = ₹ 36

$$\therefore \text{Gain \%} = \frac{36}{64} \times 100 = 56.25\%$$

18. (4) Let the C.P. of article be ₹100 and its marked price be x.

$$\therefore x \times \frac{84}{100} = 105$$

$$\Rightarrow x = \frac{105 \times 100}{84} = 125$$

$\therefore$ Required percentage = 25%

19. (2) Let CP of radio be Rs. x.
According to the question,

$$\frac{108x}{100} = 4800 \times \frac{90}{100} = 4320$$

$$\Rightarrow x\ \frac{4320 \times 100}{108} = ₹\ 4000$$

If no discount is allowed,
Gain per cent

$$= \frac{800}{4000} \times 100 = 20\%$$

20. (2) S.P. for a profit of 12%

$$= \frac{8000 \times 112}{100} = ₹\ 8960$$

$\therefore$ Discount = 11200 – 8960
= ₹ 2240
If the discount per cent be x, then

$$\frac{11200 \times x}{100} = 2240$$

$$x = \frac{2240 \times 100}{11200} = 20\%$$

21. (3) Let C.P. of article = ₹ 100
Marked price = x
Single equivalent discount

$$= \left(20 + \frac{25}{4} - \frac{20 \times 25}{400}\right)\%$$

$$= 25\%$$

$$\therefore x \times \frac{75}{100} = 120$$

$$\Rightarrow x = \frac{120 \times 100}{75} = ₹\ 160$$

$\Rightarrow$ 160 – 100 = 60%

22. (1) If the marked price be x, then

$$x \times \frac{85}{100} = \frac{170 \times 120}{100}$$

$$\Rightarrow x \times 85 = 170 \times 120$$

$$\Rightarrow x = \frac{170 \times 120}{85} = ₹\ 240$$

23. (1) Let the C.P. be 100 and the marked price be x.

$$\therefore x \times \frac{88}{100} = 132$$

$$\Rightarrow x = \frac{132 \times 100}{88}$$

= 150 i.e., more by 50%

24. (3) C.P. of article = ₹ 100
Marked price be x

$$\therefore \frac{x \times 88}{100} = 121$$

$$\Rightarrow x = \frac{121 \times 100}{88} = ₹\ 137.5$$

i.e. 37.5% above C.P.

25. (1) Let the C.P. of TV be x, then

$$\frac{x \times 110}{100} = 2640 \times \frac{95}{100}$$

$$\Rightarrow x = \frac{2640 \times 95}{110} = ₹\ 2280$$

26. (1) If the C.P. of grinder be x, then

$$\frac{x \times 108}{100} = \frac{3600 \times 90}{100} = 3240$$

$$\Rightarrow x = \frac{3240 \times 100}{108} = ₹\ 3000$$

27. (3) Let C.P.of article = ₹ 100
If the marked price of article be x, then

$$x \times \frac{75}{100} = 120$$

$$\Rightarrow x = \frac{120 \times 100}{75} = 160$$

i.e. 60% above the cost price

28. (3) If the C.P. of goods be ₹ 100, then
Marked price = ₹ 120

$$\therefore \text{S.P.} = \frac{120 \times 85}{100} = ₹\ 102$$

Hence, Profit per cent = 2%

29. (4) Cost price of article = ₹ x

$$\therefore x \times \frac{140}{100} \times \frac{95}{100} = 1064$$

$$\Rightarrow x = \frac{1064 \times 100 \times 100}{140 \times 95}$$

= ₹ 800

30. (2) Present worth = 1860 – 60
= ₹ 1800

$$\text{Time} = \frac{100 \times \text{True Discount}}{\text{Present worth} \times \text{Rate}}$$

$$= \frac{100 \times 60}{1800 \times 5} = \frac{2}{3} \text{ year}$$

$$= \left(\frac{2}{3} \times 12\right) \text{ months} = 8 \text{ months}$$

31. (4) Marked price of the article = ₹ x

$$\text{Discount} = 24\frac{1}{2}\% = \frac{49}{2}\%$$

$$\therefore \left(100 - \frac{49}{2}\right)\% \text{ of } x = 1510$$

$$\Rightarrow x \times \left(\frac{200 - 49}{200}\right) = 1510$$

$$\Rightarrow x \times \frac{151}{200} = 1510$$

$$\Rightarrow x = \frac{1510 \times 200}{151} = ₹\ 2000$$

$\therefore$ C.P. of article = $\frac{1510 \times 100}{90}$

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$= ₹ \frac{15100}{9}$

$\therefore$ Gain $= 2000 - \frac{15100}{9}$

$= \frac{18000 - 15100}{9} = \frac{2900}{9}$

$= ₹ 322\frac{2}{9}$

32. (3) Original marked price of goods = ₹100

C.P $= \frac{100 \times 80}{100} = ₹ 80$

Case II.

If the marked price be ₹ x, then

$x \times \frac{80}{100}$

$= \frac{80 \times 125}{100}$

$\Rightarrow x = \frac{80 \times 125}{100} = ₹ 125$

Percent = 125 –100 = 25 %

33. (3) Marked price = ₹ x and cost price = ₹ y.

$\therefore$ 50% of x = 90% of y

$\Rightarrow \frac{x \times 50}{100} = \frac{y \times 90}{100}$

$\Rightarrow y = \frac{x \times 50}{90} = ₹ \frac{5}{9}x$

$= \frac{5}{9}$th of marked price.

34. (2) Marked price

= ₹ (7710 + 1285)

= ₹ 8995

If discount = x%, then

x% of 8995 = 1285

$\Rightarrow \frac{8995 \times x}{100} = 1285$

$\Rightarrow x = \frac{1285 \times 100}{8995} = \frac{100}{7} = 14\frac{2}{7}\%$

35. (2) Let the marked price be ₹ x.

$\therefore x \times \frac{90}{100} = 2700$

$\Rightarrow x = \frac{2700 \times 100}{90} = ₹ 3000$

36. (1) S.P. of saree

= (100 – 20)% of 200

$= \frac{200 \times 80}{100} = ₹ 160$

$\therefore$ C.P. of saree = 160 – 16

= ₹ 144

$\therefore$ Profit percent $= \frac{16}{144} \times 100$

$= \frac{100}{9} = 11\frac{1}{9}\%$

37. (2) C.P. of article = ₹ x

According to question,

92% of marked price

$= \frac{115}{100} \times$ C.P.

$\therefore \frac{250 \times 92}{100} = \frac{115x}{100}$

$\Rightarrow 115x = 250 \times 92$

$\Rightarrow x = \frac{250 \times 92}{115} = ₹ 200$

38. (3) Greatest possible original price will be when discount be maximum

If the price be Rs. x, then

$\frac{75}{100}$ of $x = 270$

$\Rightarrow x = \frac{270 \times 100}{75} =$ Rs. 360

39. (3) C.P. of article = Rs. x (let)

According to the question,

$x \times \frac{120}{100} = \frac{40 \times 90}{100}$

$\Rightarrow x = \frac{40 \times 90}{120} =$ Rs. 30

TYPE-IV

1. (3) Suppose printed price = ₹ 100

$\therefore$ S.P. = ₹ (100-2.5) = ₹ 97.5

$\therefore$ Marked Price $= \frac{100 \times 39}{97.5}$

= ₹ 40

2. (3) Printed price = ₹ 900

On 40% discount

$= 900 - \frac{900 \times 40}{100} = 900 - 360$

C.P. for retailer = 540

S.P. = 900

Profit = 900 – 540 = 360

Gain % $= \frac{360 \times 100}{540}$

$= \frac{200}{3} = 66\frac{2}{3}\%$

3. (2) Let the marked price of each pen be x

Total cost price of 40 pens = Total marked price of 36 pens = 36x

Selling price of 1 pen after 1% discount = (1–0.01)x = 0.99x

Selling price of 40 pens

= 40 × 0.99x = 39.6x

Profit $= \frac{39.6 - 36}{36} \times 100$

$= \frac{3.6}{36} \times 100 = 10\%$

4. (1) First discount = 20%

Price after first discount

$= ₹ \left(1500 - \frac{20}{100} \times 1500\right)$

= ₹ (1500 – 300) = ₹ 1200

Let the additional discount be x%

$\therefore \left(1200 - \frac{x \times 1200}{100}\right) = 1104$

$\Rightarrow 1200 - 12x = 1104$

$\Rightarrow 12x = 1200 - 1104 = 96$

$\Rightarrow x = \frac{96}{12} = 8\%$

5. (3) Let the printed price of the article be ₹ 100

Discount = 40%

C.P. = ₹ (100 – 40) = ₹ 60

S.P. = ₹ 100

$\therefore$ Gain % $= \frac{40}{60} \times 100$

$= \frac{200}{3} = 66\frac{2}{3}\%$

6. (4) Discount

$= 120 \times \frac{40}{100} = ₹ 48$

$\therefore$ S.P. = ₹ (120 – 48) = ₹ 72

Loss = 80 – 72 = ₹ 8

$\therefore$ Loss % $= \frac{8}{80} \times 100 = 10\%$

7. (1) Let the marked price be x

$\therefore$ 86% of x = 387

$\therefore x = \frac{387 \times 100}{86} = ₹ 450$

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8. (4) C.P. = ₹ 900
Gain = 10%

$\therefore$ S.P. = ₹ $\left(\frac{110}{100}\times 900\right)$ = ₹ 990

Let the marked price be x.

$\therefore \frac{90}{100}x = 990$

$\therefore x = \frac{990\times 100}{90}$ = ₹ 1100

9. (3) Let the C.P. of each article be ₹ 1
For 15 books, the tradesman gives 1 book free.
$\therefore$ C.P. of 15 books = ₹ 16
$\therefore$ S.P. of 15 books

$= 16\times\frac{135}{100} = ₹\ \frac{108}{5}$

$\therefore$ S.P. of 1 book $= \frac{108}{5\times 15}$

$= ₹\ \frac{36}{25}$

Now, 96% of marked price $= \frac{36}{25}$

$\therefore$ Marked price $= \frac{36\times 100}{25\times 96} = \frac{3}{2}$

= ₹ 1.5
$\therefore$ The required % increase

$= \frac{0.5}{1}\times 100 = 50\%$

10. (3) Discount on ₹ 36000

$= \frac{36000\times 7}{100}$ = ₹ 2520

Discount on first ₹ 20,000

$= \frac{20000\times 8}{100}$ = ₹ 1600

Discount on next ₹ 10,000

$= \frac{10{,}000\times 5}{100}$ = ₹ 500

$\therefore$ Discount on remaining ₹ 6,000
= 2520 − (1600 + 500) = ₹ 420
$\therefore$ Required percent

$= \frac{420\times 100}{6000} = 7\%$

11. (1) Let the C.P. be ₹ 100
$\therefore$ Marked price = ₹ 125
S.P. = 84% of 125

$= \frac{84\times 125}{100}$ = ₹ 105

$\therefore$ Profit = ₹ (105 − 100) = ₹ 5
$\therefore$ Profit % = 5%

12. (1) Let the marked price of the shirt be Rs. x.
According to the question,

$x\times\frac{20}{100} = 150$

$\Rightarrow x = \frac{150\times 100}{20} = 750$

$\therefore$ Price paid = ₹ (750 − 150)
= ₹ 600

13. (3) CP of the article for Ravi

$= 660\times\frac{100}{110}$ = ₹ 600

Ravi bought the article at the discount of 25%
$\therefore$ 75% of marked price = ₹ 600

Marked price $= \frac{600\times 100}{75}$ = ₹ 800

14. (1) Let the marked price of the article be x.
Equivalent discount for successive discounts of 30% and 20%

$= \left(30+20-\frac{30\times 20}{100}\right)\%$

= (50 − 6)% = 44%
$\Rightarrow$ (100 − 44)% of x = 2240

$\Rightarrow \frac{x\times 56}{100} = 2240$

$\Rightarrow x = \frac{2240\times 100}{56}$ = ₹ 4000

15. (4) Let the market price of the cooler be x.
According to the question,
(12 − 10)% of x = 35

$\Rightarrow \frac{x\times 2}{100} = 35$

$\Rightarrow x = \frac{3500}{2}$ = ₹ 1750

16. (1) Let the CP of article be x and its marked price be y.
According to the question,
90% of y = 115% of x

$\Rightarrow \frac{y\times 90}{100} = \frac{x\times 115}{100}$

$\Rightarrow \frac{x}{y} = \frac{90}{115} = \frac{18}{23} \Rightarrow 18:23$

17. (1) Let the marked price of the shirt be x.
Difference of discounts = 2%
$\therefore$ 2% of x = 15

$\Rightarrow \frac{x\times 2}{100} = 15$

$\Rightarrow x = \frac{15\times 100}{2}$ = ₹ 750

18. (2) If the marked price of the article be x, then
96% of x = 1920

$\Rightarrow \frac{x\times 96}{100} = 1920$

$\Rightarrow x = \frac{1920\times 100}{96}$ = ₹ 2000

19. (1) Discount = 650 − 572 = ₹ 78
If the discount be x% then

$\frac{650\times x}{100} = 78$

$\Rightarrow x = \frac{78\times 100}{650} = 12\%$

20. (1) Let marked price of article = ₹ 100
$\therefore$ C.P. of article = ₹ 64
$\therefore$ S.P. of article = ₹ 88
$\therefore$ Profit per cent

$= \frac{88-64}{64}\times 100 = 37.5\%$

21. (3) Let the marked price of watch be x.

$\therefore \frac{x\times 95}{100} - \frac{x\times 94}{100} = 15$

$\Rightarrow x = 15\times 100$ = ₹ 1500

22. (3) Discount = 15%
SP of racket = 85% of ₹ 30
= ₹ 25.50
One shuttle cock of ₹ 1.50 is free.
$\therefore$ Actual SP
= ₹ (25.50 − 1.50) = ₹ 24
He still gains 20%

$\therefore$ CP = $\frac{100}{120}\times 24$ = ₹ 20

23. (3) Let the marked price of the article be x
According to the question,
96% of x = 120% of 100

$\Rightarrow x\times\frac{96}{100} = \frac{100\times 120}{100}$

$\Rightarrow x = \frac{100\times 120}{100}$ = ₹ 125

24. (1) Let the marked price be x

$\therefore \frac{x\times 85}{100} = 629$

$\Rightarrow x = \frac{629\times 100}{85}$ = ₹ 740

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25. (1) Let the cost price of toy be ₹ 100 and the marked price be x.

$\therefore \frac{x \times 90}{100} = 120$

$\Rightarrow x = \frac{120 \times 100}{90} = ₹ \frac{400}{3}$

S.P. after a discount of 20%

$= 80\%$ of $\frac{400}{3}$

$= \frac{400 \times 80}{300} = \frac{320}{3} = 106\frac{2}{3}$

$\therefore$ Profit percent

$= 106\frac{2}{3} - 100 = 6\frac{2}{3}\%$

26. (3) If the marked price of article be x, then

$\frac{x \times 76}{100} = 342$

$\Rightarrow x = \frac{342 \times 100}{76} = ₹ 450$

27. (4) If the marked price of T.V. be x, then,

$\frac{x \times 5}{100} = 500$

$\Rightarrow x = \frac{500 \times 100}{5}$

$= ₹ 10000$

$\therefore$ Initial S.P. of T.V.

$= \frac{10000 \times 80}{100} = ₹ 8000$

28. (2) Let marked price of toy be x

$\therefore$ S.P. $= x \times \frac{77}{100} = \frac{77x}{100}$

C.P. $= x \times \frac{77}{100} \times \frac{100}{110} = \frac{7x}{10}$

$\therefore \frac{77x}{100} - \frac{7x}{10} = 56$

$\Rightarrow \frac{7x}{100} = 56$

$\Rightarrow x = \frac{100 \times 56}{7} = ₹ 800$

29. (1) Let the amount paid (s.p.) be x.

$\therefore 16\%$ of $x = 80$

$\Rightarrow x = \frac{80}{16} \times 100$

$\therefore x = ₹ 500$

30. (3) Marked price

$= \frac{100}{100 - 12} \times 880 = ₹ 1000$

31. (1) Marked price

$= \frac{846 \times 100}{94} = ₹ 900$

32. (1) Difference of discounts

$= \left(25 - \frac{50}{3}\right)\% = \frac{25}{3}\%$

Let the marked price be x, then

$x \times \frac{25}{300} = 600$

$\Rightarrow x = ₹ 7200$

$\therefore$ Required S.P.

$= 7200 \times \left(100 - \frac{50}{3}\right)\%$

$= \frac{7200 \times 250}{300} = ₹ 6000$

33. (3) Marked price

$= \frac{100}{(100 - 7.5)} \times 740$

$= \frac{740 \times 100}{92.5} = ₹ 800$

34. (3) S.P. of the fan $= \frac{150 \times 80}{100}$

$= ₹ 120$

35. (3) Discount $= 6000 - 5500$

$= ₹ 500$

If discount $= x\%$, then

$\frac{6000 \times x}{100} = 500$

$\Rightarrow x = \frac{500}{60} = \frac{25}{3} = 8\frac{1}{3}\%$

36. (3) Marked price

$= \frac{6580 \times 100}{70} = ₹ 9400$

37. (4) Discount $= 800 - 736 = ₹ 64$

$\therefore$ Discount percent

$= \frac{64}{800} \times 100 = 8\%$

38. (2) Required discount

$= \frac{475 \times 15}{100} = ₹ 71.25$

39. (3) Price after discount of 10%

$= \frac{6800 \times 90}{100} = ₹ 6120$

If the seasonal discount be $x\%$, then

$\frac{6120 \times x}{100} = 6120 - 5202 = 918$

$\Rightarrow x = \frac{918 \times 100}{6120} = 15\%$

40. (3) Marked price of the article = ₹ x.

$\therefore \frac{x \times 90}{100} = \frac{360 \times 125}{100}$

$\Rightarrow \frac{9x}{10} = 90 \times 5$

$\Rightarrow x = \frac{90 \times 5 \times 10}{9} = ₹ 500$

41. (2) Rate of discount $= x\%$

$\therefore 1200 \times \frac{x}{100} = 1200 - 1100$

$\Rightarrow 12x = 100$

$\Rightarrow x = \frac{100}{12} = \frac{25}{3} = 8\frac{1}{3}\%$

42. (4) C.P. of item = ₹ 100 (let)

$\therefore$ Marked price of item = ₹ 200

S.P. for a gain of 15% = ₹ 115

$\therefore$ Discount $= 200 - 115 = ₹ 85$

If discount percent be $x\%$, then

$\frac{200 \times x}{100} = 85$

$\Rightarrow 2x = 85 \Rightarrow x = \frac{85}{2} = 42.5\%$

43. (2) Discount $= 270 - 237.60$

$=$ Rs. 32.4

If the rate of discount be $x\%$, then

$270 \times \frac{x}{100} = 32.4$

$\Rightarrow x = \frac{32.4 \times 100}{270} = 12\%$

44. (2) Let the marked price of article be Rs. x

According to the question,

$\frac{x \times 75}{100} = \frac{1440 \times 125}{100}$

$\Rightarrow x = \frac{1440 \times 125}{75} =$ Rs. 2400

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45. (4) Marked price = Rs. 720
Discount = 10%
∴ After a discount of 10%,
S.P. = Rs. $\left(\frac{720\times 90}{100}\right)$
= Rs. 648
Final S.P. = Rs. 550.80
∴ Discount = Rs. (648 – 550.80)
= Rs. 97.2
If the second discount be x%, then
$\frac{648\times x}{100} = 97.2$
$\Rightarrow x = \frac{97.2\times 100}{648} = 15\%$

46. (3) C.P. of article = Rs. x (let).
According to the question,
$\frac{x\times 75}{100} = 3600$
$\Rightarrow x = \frac{3600\times 100}{75}$ = Rs. 4800

47. (2) Rate of discount = 12%
∴ S.P. of TV set
= 6500 × (100 – 12)%
= $\frac{6500\times 88}{100}$ = Rs.5720

48. (2) S.P. of TV set
= Rs. $\left(\frac{120}{20}\times 750\right)$
= Rs. 4500
If the marked price be Rs. x, then
$\frac{x\times 90}{100} = 4500$
$\Rightarrow x = \frac{4500\times 100}{90}$
= Rs. 5000

49. (3) Let the C.P. of each article be Rs. 100.
∴ Marked price = Rs. 125
On giving discount,
S.P. = Rs. 112.5
∴ Discount
= 125 – 112.5 = Rs. 12.5
i.e., $12\frac{1}{2}$%

50. (2) Let the marked price of radio be Rs. x.
According to the question,
80% of x = 1200
$\Rightarrow \frac{x\times 80}{100} = 1200$
$\Rightarrow x = \frac{1200\times 100}{80}$ = Rs.1500

51. (2) Marked price = Rs. 250
S.P. = Rs. 225
Discount = 250 – 225 = Rs. 25
If the rate of discount be x%, then
$\frac{250\times x}{100} = 25$
$\Rightarrow x = \frac{25\times 100}{250} = 10\%$

52. (3) Let the C.P. of article be Rs. 100.
∴ Marked price = Rs. 130
S.P. = $\frac{130\times 90}{100}$ = Rs. 117
∴ Profit% = 17%
OR
Required profit percent
= $\left(x+y+\frac{xy}{100}\right)\%$
= $\left(30-10-\frac{30\times 10}{100}\right)\% = 17\%$

TYPE-V

1. (4) Check through options
15% of 80 = $\frac{80\times 15}{100} = 12$
and 20% of 60 = $\frac{60\times 20}{100}$ = ₹ 12
Therefore, 15% of 80 and 20% of 60 are same. Hence the cost prices should be ₹ 80 and ₹ 60.

2. (3) Let the salesman's total sales be ₹ (10000 + x)
According to the question,
$10000\times\frac{11}{2}\% + x\times 6\% = 1990$
⇒ 5000 × 11% + 6x% = 1990
⇒ 5000 × 11 + 6x = 199000
⇒ 6x = 199000 – 55000
⇒ 6x = 144000
$\Rightarrow x = \frac{144000}{6} = 24000$
∴ The required sales
= 24000 + 10000 = ₹ 34,000

3. (2) The housewife spends ₹ 25 and saves ₹ 2.50.
i.e., She pays ₹ 25 for a dress of ₹ 27.50.
∴ % Saving
= $\frac{2.50}{27.50}\times 100 = 9\%$ (app.)

4. (1) Let the C.P. of total goods be ₹ 100.
∴ Marked price = ₹ 120
S.P. of $\frac{1}{2}$ stock = ₹ 60
Gain = ₹ 10
S.P. of $\frac{1}{4}$ stock = (80% of 120) $\times\frac{1}{4}$ = ₹ 24
∴ Loss = ₹ (25 – 24) = ₹ 1
S.P. of remaining $\frac{1}{4}$ stock
= (60% of 120) $\times\frac{1}{4}$ = ₹ 18
∴ Loss = ₹ (25 – 18) = ₹ 7
∴ Gain = 10 – 1 – 7
= ₹ 2 i.e., 2%

5. (1) After a discount of 20%,
Listed price = 80% of ₹1500
= ₹ $\left(1500\times\frac{80}{100}\right)$ = ₹ 1200
Difference
= ₹ (1200 – 1104) = ₹ 96
Let x % of 1200 = 96
$\Rightarrow x = \frac{96\times 100}{1200} = 8$
∴ Second discount = 8%

6. (4) Let the marked price of the radio be x.
According to the question,
$x\times\frac{80}{100}\times\frac{88}{100} = 704$
$\therefore x = \frac{704\times 100\times 100}{80\times 88}$ = ₹ 1000

7. (2) Equivalent discount
= $\left(20+5-\frac{20\times 5}{100}\right)\% = 24\%$
∴ CP of article
= ₹ $\left(25000\times\frac{76}{100}\right)$ = ₹ 19000
Repairs cost = ₹ 1000
∴Actual CP = 19000 +1000
= ₹ 20000
SP = ₹ 25000

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Profit = 25000 –20000 = ₹ 5000
∴ Gain%
$= \frac{5000}{20000} \times 100 = 25\%$

8. (3) Let the marked price of shirt be x and that of trousers be $2x$.
Let the discount on the trousers be y%. Then,

$$x \times \frac{40}{100} + 2x \times \frac{y}{100} = 3x \times \frac{30}{100}$$

$\Rightarrow 40x + 2xy = 90x$
$\Rightarrow 2y = 90 - 40$

$\Rightarrow y = \frac{50}{2} = 25\%$

9. (3) Let the marked price of the grinder be ₹100
SP after a discount of 15%
= ₹ 85

SP to gain 15% = $\frac{85 \times 115}{100}$

= ₹ 97.75
If ₹ 97.75 is the SP, the marked price = ₹ 100
∴ If ₹ 1955 is the SP, the marked

price = $\frac{100}{97.75} \times 1955$ = ₹ 2000

Amount of discount received by the retailer = 15% of 2000

$= \frac{2000 \times 15}{100}$ = ₹ 300

10. (1) SP of 12 pairs of socks
= 90% of 80

$= \frac{80 \times 90}{100}$ = Rs.72 = ₹ 72

∴ Number of pairs bought for ₹

$24 = \frac{12 \times 24}{72} = 4$

11. (3) Let the amount of the bill be x.

$\therefore \frac{4x}{100} = 13$

$\Rightarrow x = \frac{1300}{4}$ = ₹ 325

12. (2) True discount

$= \frac{\text{Amount} \times R \times T}{100 + (R \times T)}$

$\Rightarrow 15 = \frac{A \times 5 \times 2}{100 + 10}$

$\Rightarrow A = 11 \times 15$ = ₹ 165

13. (3) Let the S.P. be x (without tax).

$\therefore x + x \times \frac{10}{100} = 500$

$\Rightarrow \frac{11x}{10} = 500 \Rightarrow x = ₹ \frac{5000}{11}$

$\therefore$ Discount $= 500 - \frac{5000}{11}$

$= \frac{500}{11}$

Discount per cent

$= \frac{500}{11 \times 500} \times 100$

$= \frac{100}{11}\%$ or $9\frac{1}{11}\%$

14. (4) Let the original S.P. of sugar be x per kg.
S.P. after discount

= ₹ $\frac{95x}{100}$ per kg

= ₹ $\frac{19x}{20}$ per kg

$\therefore \frac{608}{\frac{19x}{20}} - \frac{608}{x} = 2$

$\Rightarrow 608\left(\frac{20}{19x} - \frac{1}{x}\right) = 2$

$\Rightarrow \frac{608}{19x} = 2 \Rightarrow x = \frac{608}{19 \times 2}$ = ₹ 16

15. (3) Single equivalent discount

$= \left(50 + 40 - \frac{50 \times 40}{100}\right)\%$

= 70%
∴ Required price of shirt
= 30% of x

16. (4) Total actual C.P.
= ₹ (500 × 10 + 2000) = ₹ 7000
Total S.P.
= ₹ (5 × 750 + 5× 550)
= ₹ (3750 + 2750) = ₹ 6500
Loss = 7000 – 6500 = ₹ 500
Loss percent

$= \frac{500}{7000} \times 100 = \frac{50}{7} = 7\frac{1}{7}\%$

17. (3) Marked price of the fan
= ₹ 1400
SP after allowing a discount of 10% = 90% of 1400

$= \frac{1400 \times 90}{100}$ = ₹ 1260

Second discount
= ₹ (1260 – 1200) = ₹ 60
Let the second discount be x%.
∴ x% of 1260 = 60

$\Rightarrow x = \frac{60 \times 100}{1260} = \frac{100}{21} = 4\frac{16}{21}\%$

18. (4) True discount

$= \frac{\text{Banker's discount} \times 100}{100 + \text{Rate} \times \text{Time}}$

$= \frac{216 \times 100}{100 + 16 \times \frac{6}{12}}$

$= \frac{216 \times 100}{108}$ = ₹ 200

19. (4) Marked price of tape recorder

$= \frac{1500 \times 120}{100}$ = ₹ 1800

Gain = $\frac{1500 \times 8}{100}$ = ₹120

Discount = 1800 – (1500 + 120)
= ₹ 180
Let Discount per cent = x%, then

$\frac{1800 \times x}{100} = 180 \Rightarrow x = 10\%$

Method 2 :

Quicker Method

If the discount be x%, then

$20 - x - \frac{20x}{100} = 8$

$\Rightarrow 20 - \frac{6x}{5} = 8$

$\Rightarrow \frac{6x}{5} = 20 - 8 = 12$

$\Rightarrow x = \frac{12 \times 5}{6} = 10\%$

20. (3) Required S.P.

$= 250 \times \frac{90}{100} \times \frac{88}{100}$ = ₹ 198

21. (1) Sum

$= \frac{\text{S.I.} \times \text{True discount}}{\text{S.I.} - \text{True discount}}$

$= \frac{22 \times 20}{22 - 20}$ = ₹ 220

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22. (2) Price after discount of 10%

$= \frac{1500 \times 90}{100} = ₹\ 1350$

Second discount

$= 1350 - 1242 = ₹\ 108$

If the rate of second discount be x% then,

$\frac{1350 \times x}{100} = 108$

$\Rightarrow x = \frac{108 \times 100}{1350} = 8\%$

23. (2) Let original price of rice $= x$ /kg

New price $= \frac{4x}{5}$ per kg

$\therefore \frac{800}{\frac{4x}{5}} - \frac{800}{x} = 12.5$

$\Rightarrow 800\left(\frac{5}{4x} - \frac{1}{x}\right) = 12.5$

$\Rightarrow 800\left(\frac{5-4}{4x}\right) = 12.5$

$\Rightarrow \frac{800}{4x} = 12.5$

$\Rightarrow x = \frac{200}{12.5} = ₹\ 16$/kg.

24. (2) Original price of article be x/kg.

New price $= \frac{9x}{10}$ /kg.

$\therefore \frac{225}{\frac{9x}{10}} - \frac{225}{x} = 25$

$\Rightarrow \frac{225 \times 10}{9x} - \frac{225}{x} = 25$

$\Rightarrow \frac{250}{x} - \frac{225}{x} = 25$

$\Rightarrow \frac{25}{x} = 25 \Rightarrow x = ₹\ 1$/kg.

25. (1) Let the marked price be x and cost price be ₹ 100, then

$\frac{x \times 75}{100} = 125$

$\Rightarrow x = \frac{125 \times 100}{75} = ₹\ \frac{500}{3}$

S.P. after a discount of 10%

$= \frac{500}{3} \times \frac{90}{100} = ₹\ 150$

$\therefore$ Gain per cent $= 50\%$

26. (1) Single equivalent discount for successive discounts of 8% and 8%

$= \left(8 + 8 - \frac{8 \times 8}{100}\right)\%$

$= (16 - 0.64)\%$

$\therefore$ Difference $= 0.64\%$

$\therefore$ Loss $= 400 \times 0.64\%$

Amount he will losse

$= \frac{400 \times 64}{100 \times 100} = ₹\ 2.56$

27. (4) If the rate of discount be x%, then

$\frac{60 \times x}{100} = 60 - 45 = 15$

$\Rightarrow x = \frac{15 \times 100}{60} = 25\%$

28. (1) Let the rate of second discount be x %

After 15% discount,

Price of pen $= \frac{85}{100} \times 12 = ₹\ 10.20$

Now, $10.20 - 8.16 = ₹\ 2.04$

It is second discount.

$\therefore \frac{x}{100} \times 10.20 = 2.04$

$\Rightarrow 10.2x = 204$

$\Rightarrow x = \frac{204}{10.2} = 20\%$

29. (3) $\because$ 20% = ₹ 25

$\therefore 80\% = \frac{80}{20} \times 25 = ₹\ 100$

30. (*) If the rate = 5% p.a.; then Present worth

$= \frac{\text{Amount} \times 100}{100 + (R \times T)}$

$= \frac{600 \times 100}{100 + (5 \times 4)} = \frac{600 \times 100}{120}$

$= ₹\ 500$

Discount $= 600 - 500 = ₹\ 100$

Note : No rate is mentioned in the question.

31. (3) Original number of visitors = 100

Total revenue $= 100 \times 25$

$= 2500$ paise

$= ₹\ 25$

Case II,

Cost of each ticket $= \frac{25 \times 80}{100}$

$= 20$ paise $= ₹\ 0.2$

Total revenue $= \frac{25 \times 128}{100} = ₹ 32$

If the number of visitors be x, then

$x \times 0.2 = 32$

$\Rightarrow x = \frac{32}{0.2} = \frac{320}{2} = 160$

$\therefore$ Required percentage $= 60$

32. (1) Discount $= 440 - 396 = ₹\ 44$

If the rate of discount be x %, then

$\frac{440 \times x}{100} = 44$

$\Rightarrow x = \frac{44 \times 100}{440} = 10\%$

33. (1) C.P. of articles = ₹ 100 (let)

Marked price of articles

$= \frac{100 \times 130}{100} = ₹\ 130$

S.P. of half of articles

$= \frac{130}{2} = ₹\ 65$

S.P. of one-fourth of articles at 15% discount $= \frac{65}{2} \times \frac{85}{100}$

$= ₹\ 27.625$

S.P. of remaining articles

$= \frac{65}{2} \times \frac{70}{100} = ₹\ 22.75$

Total S.P.

$= ₹\ (65 + 27.625 + 22.75)$

$= ₹\ 115.375$

$\therefore$ Profit % $= 15.375\% = 15\frac{3}{8}\%$

34. (2) Sum $= \frac{\text{discount} \times 100}{\text{time} \times \text{rate}}$

$= \frac{78 \times 100}{\frac{9}{4} \times \frac{8}{3}} = \frac{78 \times 100}{6}$

$= ₹\ 1300$

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35. (4) Marked price of article = ₹ x

C.P. for X = $\frac{90x}{100}$ = ₹ $\frac{9x}{10}$

C.P. for Y = $\frac{9x \times 110}{100}$ = ₹ $\frac{99x}{100}$

∴ Required ratio = $x : \frac{99x}{100}$

= 100 : 99

36. (4) Let C.P. of article be = ₹ x

∴ S.P. = ₹ $\frac{85x}{100}$

∴ Required ratio = $x : \frac{85x}{100}$

= 100 : 85 = 20 : 17

37. (3) Required discount

$= \left(50 - 20 - \frac{50 \times 20}{100}\right)\%$

= 20%

Detailed Method

C.P. of article = Rs. 100

Marked price = Rs. 150

S.P. = $\frac{150 \times 80}{100}$ = Rs. 120

Gain per cent = 20%

38. (3) Marked price of sewing machine = Rs. x

C.P. for the retailer

$= \frac{1955 \times 100}{115}$

= Rs. 1700

∴ $x \times \frac{85}{100} = 1700$

⇒ $x = \frac{1700 \times 100}{85}$ = Rs. 2000

∴ Discount = 2000 – 1700

= Rs. 300

39. (3) Marked price = Rs. x and cost price = Rs. y (let)

According to question,

$\frac{x \times 90}{100} = \frac{y \times 115}{100}$

⇒ $\frac{x}{y} = \frac{115}{90} = \frac{23}{18} = 23 : 18$

40. (2) Price of motor cycle = Rs. a (let)

For Mr. x

C.P. of motor cycle

= Rs. $\left(\frac{90a}{100} \times \frac{108.5}{100}\right)$

For Mr y

C.P. of motor cycle

= Rs. $\left(\frac{108.5a}{100} \times \frac{90}{100}\right)$

41. (4) Percentage decrease

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(-20 - 10 + \frac{20 \times 10}{100}\right)\%$

= –28%

42. (1) C.P. of 25 windows

= $\frac{120000 \times 75}{100}$ = Rs. 90,000

After additional discount,

C.P. for builder

= Rs. (90000 – 7500)

= Rs. 82500

∴ Cost of each window

= $\frac{82500}{25}$ = Rs. 3300

43. (2) Total marked price of three books = Rs. 300

Their S.P. = Rs. 244.50

Discount = Rs. (300 – 274.50)

= Rs. 25.50

If the rate of discount be x%, then

$\frac{300 \times x}{100} = 25.50$

⇒ $300x = 25.50 \times 100$

⇒ $x = \frac{25.50 \times 100}{300} = 8.5\%$

44. (3) Single equivalent discount =

$\left(10 + 20 - \frac{10 \times 20}{100}\right)\%$

= (30 – 2)% = 28%

∴ C.P. of article = 100 – 28

= Rs. 72

Actual cost price of article

= $\frac{72 \times 110}{100}$ = Rs. 79.2

∴ For a profit of 15%.

Required S.P. = $\frac{79.2 \times 115}{100}$

= Rs. 91.08

45. (1) Required single discount

$= \left(x + y - \frac{xy}{100}\right)\%$

$= \left(20 + 15 - \frac{20 \times 15}{100}\right)\%$

= (35 – 3)% = 32%

46. (3) Let 5 kg of mixture be prepared.

∴ C.P. of 5 kg of mixture

= Rs. (2 × 35 + 3 × 40)

= Rs. (70 + 120)

= Rs. 190

Total S.P. of this mixture

= Rs. (46 + 4 × 55)

= Rs. (46 + 220) = Rs. 266

∴ Profit per cent

$= \left(\frac{266 - 190}{190}\right) \times 100$

= $\frac{7600}{190}$ = 40% = 1

47. (2) Required time

= $\frac{60 \times 100}{1800 \times 5} = \frac{2}{3}$ year

= $\left(\frac{2}{3} \times 12\right)$ months

= 8 months

48. (3) Let the amount of actual bill be Rs. x.

According to the question,

$\frac{x \times 15}{100} = 54$

⇒ $x = \frac{54 \times 100}{15}$ = Rs. 360

49. (1) Let the marked price of building be Rs. z.

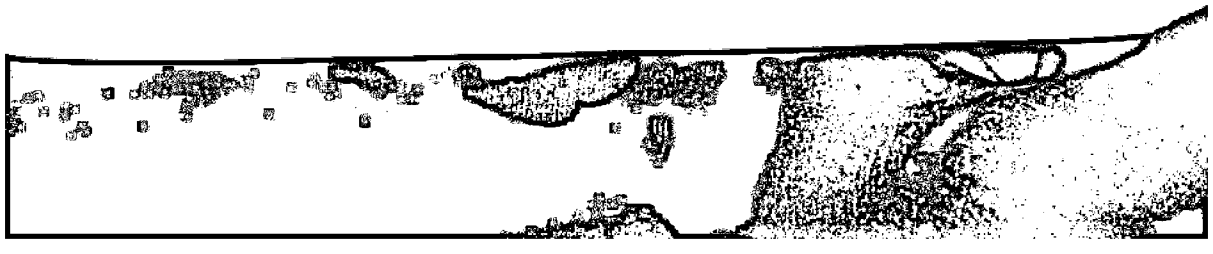
∴ According to the question,

$z \times (100 - x)\% = y$

⇒ $z \times \frac{100 - x}{100} = y$

⇒ z = Rs. $\frac{100y}{100 - x}$

□□□



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TEST YOURSELF

1. A merchant allows 5% discount on the marked price of an article to his customers. What price should he mark on an article the cost price of which is 712.50, so as to make a clear profit of $33\frac{1}{3}\%$ on his outlay ?
(1) ₹ 1000 (2) ₹ 1200
(3) ₹ 980 (4) ₹ 960

2. Sunder purchased an office bag with a price tag of ₹ 600 in a sale where 25% discount was being offered on the tag price. He was given a further discount of 10% on the amount arrived at after giving usual 25% discount. What was the final amount paid by Sunder ?
(1) ₹ 210 (2) ₹ 540
(3) ₹ 405 (4) ₹ 450

3. A bicycle originally costs ₹ 100 and was discounted 10%. After three months, it was sold after being discounted 15%. How much was the bicycle sold for ?
(1) ₹ 55.5 (2) ₹ 95.25
(3) ₹ 76.5 (4) None of these

4. A shopkeeper sold a TV set for ₹ 17940, with a discount of 8% and gained 19.6%. If no discount is allowed, then what will be his gain per cent ?
(1) 25% (2) 26.4 %
(3) 24.8% (4) 30%

5. A cash payment that will settle a bill for 250 chairs at ₹ 50 per chair less 20% and 15% with a further discount of 5% on cash payment is :
(1) ₹ 8075 (2) ₹ 7025
(3) ₹ 8500 (4) ₹ 7125

6. A shopkeeper marks the prices of his goods at 25% higher than the original price. After that, he allows a discount of 12% discount. What profit or loss did he get ?
(1) 15% profit (2) 10% profit
(3) 10% loss (4) 15% loss

7. A shopkeepers announce the same price of ₹ 700 for a shirt. The first offers successive discounts of 30% and 6% while the second offers successive discounts of 20% and 16%. The shopkeeper that offers better discount is more of
(1) ₹ 22.40 (2) ₹ 16.80
(3) ₹ 9.80 (4) ₹ 36.40

8. A tradesman gives 4% discount on the marked price and 1 article free with every 15 articles bought and still gains 35%. The marked price is more than the cost price by —
(1) 40% (2) 39%
(3) 20% (4) 50%

9. What is the maximum percentage discount that a merchant can offer on her marked price so that she ends up selling at no profit or loss, if she had initially marked her goods up by 50% ?
(1) 16.67% (2) 20%
(3) 50% (4) 33.33%

10. An article is listed at ₹ 65. A customer bought this article for ₹ 56.16 with two successive discounts of which one is 10%. The other discount of this discount scheme that was allowed by the shopkeeper is
(1) 4% (2) 3%
(3) 6% (4) 2.5%

SHORT ANSWERS

1. (1)	2. (3)	3. (3)	4. (4)
5. (1)	6. (2)	7. (3)	8. (4)
9. (4)	10. (1)		

EXPLANATIONS

1. (1) Let the marked price be ₹ x.

$$\therefore \frac{95x}{100} = 712.50 \times \frac{400}{300}$$

$$\Rightarrow \frac{95x}{100} = \frac{712.5 \times 4}{3}$$

$$\Rightarrow x = \frac{712.5 \times 4 \times 100}{3 \times 95} = ₹\ 1000$$

2. (3) Final amount after giving successive discounts of 25% and 10%
$= 600 \times 0.75 \times 0.9 = ₹\ 405$

3. (3) According to question, SP of bicycle $= 100 \times 0.9 \times 0.85 = ₹\ 76.50$

4. (4) SP = 17940, Discount = 8%

$$\therefore \text{MP} = \frac{17940}{0.92} = ₹\ 19500$$

$\therefore$ Gain = 19.6% (given)

$$\therefore \text{CP} = \frac{17940}{1.196} = ₹\ 15000$$

New SP without discount $= ₹\ 19500$
Gain = (19500 – 15000)
$= ₹\ 4500$

$$\therefore \text{Gain per cent} = \frac{4500}{15000} \times 100 = 30\%$$

5. (1) By question, original price of 250 chairs
$= 250 \times 50 = ₹\ 12500$
Price after discount

$$= 12500 \times \frac{80}{100} \times \frac{85}{100} \times \frac{95}{100}$$
$$= ₹\ 8075$$

6. (2) By question, Profit per cent or loss per cent.

$$= +25 - 12 - \frac{25 \times 12}{100} = +10\%$$

As the sign is +ve so, there is a profit of 10%.

7. (3) According to question, selling price of first shopkeeper.

$$= 700 \times \frac{70}{100} \times \frac{94}{100} = ₹\ 460.60$$

Selling price of second shopkeeper

$$= 700 \times \frac{80}{100} \times \frac{84}{100} = ₹\ 470.40$$

Required difference
$= 470.40 - 460.60 = ₹\ 9.80$

8. (4) According to question, Discount on articles

$$\frac{1}{16} \times 100 = 6.25\%$$

Overall discount

$$= -4 - 6.25 + \frac{4 \times 6.25}{100} = -10\%$$

Let cost price = ₹ 100, then selling price = ₹ 135
So, 90% of marked price = 135

$$\text{Marked price} = \frac{135 \times 100}{90} = ₹\ 150$$

Marked price is increased by

$$= \frac{150 - 100}{90} \times 100 = 50\%$$

9. (4) Let cost price = ₹100
Marked price = ₹150
$\therefore$ Discount per cent

$$= \frac{50}{150} \times 100 = 33.33\%$$

10. (1) Let the other discount be x%.

$$65 \times \frac{90}{100} \times \frac{(100 - x)}{100} = 56.16$$

$$\Rightarrow 100 - x = \frac{56.16 \times 100 \times 100}{65 \times 90}$$

$$\Rightarrow 100 - x = 96$$

$$\Rightarrow x = 4\%$$

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10 SIMPLE INTEREST

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. What sum of money must be given as simple interest for six months at 4% per annum in order to earn ₹ 150 interest?
(1) ₹ 5000 (2) ₹ 7500
(3) ₹10000 (4) ₹ 15000
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A sum of ₹ 1600 gives a simple interest of ₹ 252 in 2 years and 3 months. The rate of interest per annum is:
(1) $5\frac{1}{2}\%$ (2) 8%
(3) 7% (4) 6%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. A sum of money lent at simple interest amounts to ₹ 880 in 2 years and to ₹ 920 in 3 years. The sum of money (in rupees) is
(1) 700 (2) 760
(3) 784 (4) 800
(SSC CISF ASI Exam. 29.08.2010 (Paper-I)

4. At some rate of simple interest, A lent ₹ 6,000 to B for 2 years and ₹ 1,500 to C for 4 years and received ₹ 9,00 as interest from both of them together. The rate of interest per annum was
(1) 5% (2) 6%
(3) 8% (4) 10%
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

5. A lent ₹ 5000 to B for 2 years and ₹ 3000 to C for 4 years on simple interest at the same rate of interest and received ₹ 2200 in all from both as interest. The rate of interest per annum is
(1) 7% (2) 5%
(3) $7\frac{1}{8}\%$ (4) 10%
(SSC CPO S.I. Exam. 12.01.2003) & (SSC SAS Exam. 26.06.2010 (Paper-I)

6. What sum of money will amount to ₹ 520 in 5 years and to ₹ 568 in 7 years at simple interest ?
(1) ₹ 400 (2) ₹ 120
(3) ₹ 510 (4) ₹ 220
(SSC CGL Prelim Exam.11.05.2003 (First Sitting)

7. ₹ 500 was invested at 12% per annum simple interest and a certain sum of money invested at 10% per annum simple interest. If the sum of the interest on both the sum after 4 years is ₹ 480, the latter sum of money is :
(1) ₹ 450 (2) ₹ 750
(3) ₹ 600 (4) ₹ 550
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. A money lender finds that due to fall in the annual rate of interest 8% to $7\frac{3}{4}\%$, his yearly income diminishes by ₹ 61.50. His capital is
(1) ₹ 22400 (2) ₹ 23800
(3) ₹ 24600 (4) ₹ 26000
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

9. A lends ₹ 2500 to B and a certain sum to C at the same time at 7% annual simple interest. If after 4 years, A altogether receives ₹ 1120 as interest from B and C, the sum lent to C is
(1) ₹ 700 (2) ₹ 6500
(3) ₹ 4000 (4) ₹ 1500
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

10. A certain sum of money amounts to ₹ 756 in 2 years and to ₹ 873 in $3\frac{1}{2}$ years at a certain rate of simple interest. The rate of interest per annum is
(1) 10% (2) 11%
(3) 12% (4) 13%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

11. What sum will amount to ₹ 7000 in 5 years at $3\frac{1}{3}\%$ simple interest ?
(1) ₹ 6300 (2) ₹ 6500
(3) ₹ 6000 (4) ₹ 5000
(SSC CPO S.I. Exam. 07.09.2003)

12. A man took a loan from a bank at the rate of 12% per annum at simple interest. After 3 years he had to pay ₹ 5,400 as interest only for the period. The principal amount borrowed by him was :
(1) ₹ 2,000 (2) ₹ 10,000
(3) ₹ 20,000 (4) ₹ 15,000
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

13. A sum of money at simple interest amounts to ₹ 1,012 in $2\frac{1}{2}$ years and to ₹ 1,067.20 in 4 years. The rate of interest per annum is :
(1) 2.5% (2) 3%
(3) 4% (4) 5%
(SSC CGL Prelim Exam.08.02.2004 (Ist Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I) & (SSC CHSL DEO & LDC Exam. 28.10.2012)

14. A sum of money lent out at simple interest amounts to ₹ 720 after 2 years and to ₹1020 after a further period of 5 years. The sum is :
(1) ₹ 500 (2) ₹ 600
(3) ₹ 700 (4) ₹ 710
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

15. The sum of money, that will give ₹ 1 as interest per day at the rate of 5% per annum simple interest is
(1) ₹ 3650 (2) ₹ 36500
(3) ₹ 730 (4) ₹ 7300
(SSC CPO S.I. Exam. 05.09.2004)

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16. If the simple interest on a certain sum of money for 15 months at $7\frac{1}{2}$% per annum exceeds the simple interest on the same sum for 8 months at $12\frac{1}{2}$% per annum by ₹ 32.50, then the sum of money (in ₹) is :
(1) 312 (2) 312.50
(3) 3120 (4) 3120.50
(SSC CPO S.I. Exam. 26.05.2005)

17. What annual instalment will discharge a debt of ₹ 6450 due in 4 years at 5% simple interest ?
(1) ₹ 1500 (2) ₹ 1835
(3) ₹ 1935 (4) ₹ 1950
(SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & (SSC CGL Tier-I Exam. 16.05.2016)

18. In what time will ₹ 72 become ₹ 81 at $6\frac{1}{4}$% per annum simple interest ?
(1) 2 years
(2) 3 years
(3) 2 years 6 months
(4) None of these
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

19. The simple interest on ₹ 7,300 from 11 May, 1987 to 10 September, 1987 (both days included) at 5% per annum is
(1) ₹ 123 (2) ₹ 103
(3) ₹ 200 (4) ₹ 223
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

0. A person borrows ₹ 5,000 for 2 years at 4% per annum simple interest. He immediately lends it to another person at $6\frac{1}{4}$% per annum simple interest for 2 years. His gain in the transaction is
(1) ₹ 112.50 (2) ₹ 450
(3) ₹ 225 (4) ₹ 150
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting

A man had ₹ 16,000, part of which he lent at 4% and the rest at 5% per annum simple interest. If the total interest received was ₹ 700 in one year, the money lent at 4% per annum was
(1) ₹ 12,000 (2) ₹ 8,000
(3) ₹ 10,000 (4) ₹ 6,000
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting

22. ₹ 1,000 is invested at 5% per annum simple interest. If the interest is added to the principal after every 10 years, the amount will become ₹ 2,000 after
(1) 15 years (2) 18 years
(3) 20 years (4) $16\frac{2}{3}$ years
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

23. A sum of money amounts to ₹ 5,200 in 5 years and to ₹ 5,680 in 7 years at simple interest. The rate of interest per annum is
(1) 3% (2) 4%
(3) 5% (4) 6%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

24. ₹ 800 becomes ₹ 956 in 3 years at a certain rate of simple interest. If the rate of interest is increased by 4%, what amount will ₹ 800 become in 3 years ?
(1) ₹ 1020.80 (2) ₹ 1025
(3) ₹ 1052 (4) ₹ 1050
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

25. A person deposited ₹ 400 for 2 years, ₹ 550 for 4 years and ₹ 1,200 for 6 years. He received the total simple interest of ₹ 1,020. The rate of interest per annum is
(1) 10% (2) 5%
(3) 15% (4) 20%
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

26. Manoj deposited ₹ 29400 for 6 years at a simple interest. He got ₹ 4200 as interest after 6 years. The annual rate of interest was
(1) $2\frac{8}{21}$% (2) $2\frac{7}{20}$%
(3) $3\frac{8}{21}$% (4) $4\frac{8}{21}$%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

27. A man lent ₹ 60,000, partly at 5% and the rest at 4% simple interest. If the total annual interest is ₹ 2560, the money lent at 4% was
(1) ₹ 40000 (2) ₹ 44000
(3) ₹ 30000 (4) ₹ 45000
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

28. A sum of money at some rate of simple interest amounts to ₹ 2,900 in 8 years and to ₹ 3,000 in 10 years. The rate of interest per annum is
(1) 4% (2) $2\frac{1}{2}$%
(3) 3% (4) 2%
(SSC CPO S.I. Exam. 09.11.2008)

29. In how many years will a sum of ₹ 3,000 yield a simple interest of ₹ 1,080 at 12% per annum ?
(1) 3 years (2) $2\frac{1}{2}$ years
(3) 2 years (4) $3\frac{1}{2}$ years
(SSC Data Entry Operator Exam. 02.08.2009)

30. A sum of money amounts to ₹ 850 in 3 years and to ₹ 925 in 4 years at some rate of simple interest. The sum is :
(1) ₹ 550 (2) ₹ 600
(3) ₹ 625 (4) ₹ 700
(SSC CHSL DEO & LDC Exam. 27.11.2010)

31. In what time will ₹ 1,860 amount to 2,641.20 at simple interest 12% per annum ?
(1) 3 years (2) $3\frac{1}{2}$ years
(3) 4 years (4) $4\frac{1}{2}$ years
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

32. The population of a village decreases at the rate of 20% per annum. If its population 2 years ago was 10,000, the present population is
(1) 4600 (2) 6400
(3) 7600 (4) 6000
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)



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33. The sum lent at 5% per annum (i.e. 365 days) simple interest, that produces interest, of ₹ 2.00 a day, is
(1) ₹ 1,400 (2) ₹ 14,700
(3) ₹ 14,600 (4) ₹ 7,300
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

34. A certain sum of money lent out at simple interest amounts to ₹ 1380 in 3 years and ₹ 1500 in 5 years. Find the rate per cent per annum.
(1) 3% (2) 3.5%
(3) 4% (4) 5%
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

35. If a sum of money amounts to ₹ 12,900 and ₹ 14,250 at the end of 4th year and 5th year respectively at a certain rate of simple interest, then the rate of interest is
(1) 10% (2) 12%
(3) 18% (4) 20%
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

36. In what time will ₹ 8,000, at 3% per annum, produce the same interest as ₹ 6, 000 does in 5 years at 4 % simple interest ?
(1) 5 years (2) 6 years
(3) 3 years (4) 4 years
(SSC CGL Tier-I Exam. 26.10.2014)

37. The principal which gives ₹ 1 interest per day at a rate of 5% simple interest per annum is
(1) ₹ 5000 (2) ₹ 7300
(3) ₹ 36500 (4) ₹ 3650
(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

38. A sum of money lent out at simple interest amounts to Rs. 720 after 2 years and Rs. 1020 after a further period of 5 years. Find the principal.
(1) Rs. 600 (2) Rs. 1740
(3) Rs. 6000 (4) Rs. 120
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

39. The simple interest on Rs. 36,000 for the period from 5th January to 31st May, 2013 at 9.5% per annum is
(1) Rs. 1,338 (2) Rs. 1,425
(3) Rs. 1,400 (4) Rs. 1,368
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–II

1. A sum of money becomes $\frac{7}{6}$ of itself in 3 years at a certain rate of simple interest. The rate per annum is :
(1) $5\frac{5}{9}\%$ (2) $6\frac{5}{9}\%$
(3) 18% (4) 25%
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A sum of money becomes $\frac{41}{40}$ of itself in $\frac{1}{4}$ years at a certain rate of simple interest. The rate of interest per annum is
(1) 10% (2) 1%
(3) 2.5% (4) 5%
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. A certain sum of money becomes three times of itself in 20 years at simple interest. In how many years does it become double of itself at the same rate of simple interest ?
(1) 8 years (2) 10 years
(3) 12 years (4) 14 years
(SSC CPO S.I. Exam. 26.05.2005)

4. At what rate per cent per annum will the simple interest on a sum of money be $\frac{2}{5}$ of the amount in 10 years ?
(1) 4% (2) 6%
(3) $5\frac{2}{3}\%$ (4) $6\frac{2}{3}\%$
(SSC CGL Prelim Exam. 24.02.2002) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

5. ₹ 6,000 becomes ₹ 7,200 in 4 years at a certain rate of simple interest. If the rate becomes 1.5 times of itself, the amount of the same principal in 5 years will be
(1) ₹ 8,000 (2) ₹ 8,250
(3) ₹ 9,250 (4) ₹ 9,000
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. A sum of money at simple interest trebles itself in 15 years. It will become 5 times of itself in
(1) 40 years (2) 36 years
(3) 30 years (4) 25 years
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

7. If a sum of money at simple interest doubles in 12 years, the rate of interest per annum is
(1) $16\frac{2}{3}\%$ (2) 7.5%
(3) $8\frac{1}{3}\%$ (4) 10%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. At what rate of simple interest per annum will a sum become $\frac{7}{4}$ of itself in 4 years ?
(1) 18% (2) $18\frac{1}{4}\%$
(3) $18\frac{3}{4}\%$ (4) $18\frac{1}{2}\%$
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. A sum of money at a certain rate per annum of simple interest doubles in the 5 years and at a different rate becomes three times in 12 years. The lower rate of interest per annum is
(1) 15% (2) 20%
(3) $15\frac{3}{4}\%$ (4) $16\frac{2}{3}\%$
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

10. In how many years will a sum of money double itself at $6\frac{1}{4}\%$ simple interest per annum ?
(1) 24 years (2) 20 years
(3) 16 years (4) 12 years
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

11. At a certain rate of simple interest, a certain sum of money becomes double of itself in 10 years. It will become treble of itself in
(1) 15 years (2) 18 years
(3) 20 years (4) 30 years
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

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12. In how much time, will a sum of money become double of itself at 15% per annum simple interest?

(1) $6\frac{1}{4}$ years (2) $6\frac{1}{2}$ years

(3) $6\frac{1}{3}$ years (4) $6\frac{2}{3}$ years

(SSC Data Entry Operator Exam. 31.08.2008)

13. In how many years will a sum of money double itself at 12% per annum?

(1) 8 yrs. 6 months
(2) 6 yrs. 9 months
(3) 8 yrs. 4 months
(4) 7 yrs. 6 months

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

14. A sum amounts to double in 8 years by simple interest. Then the rate of simple interest per annum is

(1) 10% (2) 12.5%
(3) 15% (4) 20%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

15. A sum doubles itself in 16 years, then in how many years will it treble itself; rate of interest being simple

(1) 25 years (2) 24 years
(3) 48 years (4) 64 years

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

16. In certain years a sum of money is doubled to itself at $6\frac{1}{4}\%$ simple interest per annum, then the required time will be

(1) 16 years (2) $12\frac{1}{2}$ years

(3) 8 years (4) $10\frac{2}{3}$ years

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

17. The simple interest on a sum of money is $\frac{8}{25}$ of the sum. If the number of years is numerically half the rate percent per annum, then the rate percent per annum is

(1) 5 (2) 8

(3) $6\frac{1}{4}$ (4) 4

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–III

1. In what time will the simple interest be $\frac{2}{5}$ of the principal at 8 per cent per annum?

(1) 8 years (2) 7 years
(3) 5 years (4) 6 years

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. The simple interest on a sum after 4 years is $\frac{1}{5}$ of the sum. The rate of interest per annum is

(1) 4% (2) 5%
(3) 6% (4) 8%

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. Simple interest on a certain sum for 6 years is $\frac{9}{25}$ of the sum. The rate of interest is

(1) 6% (2) $6\frac{1}{2}\%$

(3) 8% (4) $8\frac{1}{2}\%$

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

4. The simple interest on a sum for 5 years is one fourth of the sum. The rate of interest per annum is

(1) 5% (2) 6%
(3) 4% (4) 8%

(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

5. On a certain sum, the simple interest at the end of $6\frac{1}{4}$ years becomes $\frac{3}{8}$ of the sum. The rate of interest is

(1) 5% (2) 6%
(3) 7% (4) 8%

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

6. The present worth of a bill due 7 months hence is ₹ 1200 and if the bill were due at the end of $2\frac{1}{2}$ years its present worth would be ₹ 1016. The rate per cent is

(1) 5% (2) 10%
(3) 15% (4) 20%

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

7. At the rate of simple interest per annum, the interest on a certain sum of money for 10 years will be $\frac{2}{5}$ th part of the amount, then the rate of simple interest is

(1) 5% (2) $6\frac{2}{3}\%$

(3) 7% (4) $4\frac{1}{2}\%$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

8. A and B borrowed Rs. 3000 and Rs. 3200 respectively at the same rate of interest for $2\frac{1}{2}$ years. If B paid Rs. 40 more interest than A, find the rate of interest.

(1) 5% (2) 7%
(3) 8% (4) 6%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

TYPE–IV

1. The simple interest on a certain sum at 5% per annum for 3 years and 4 years differ by ₹ 42. The sum is :

(1) ₹ 210 (2) ₹ 280
(3) ₹ 750 (4) ₹ 840

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The difference between the simple interest received from two different sources on ₹ 1500 for 3 years is ₹ 13.50. The difference between their rates of interest is:

(1) 0.1% (2) 0.2%
(3) 0.3% (4) 0.4%

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The simple interest on a sum of money is $\frac{4}{9}$ of the principal and the number of years is equal to the rate percent per annum. The rate per annum is :

(1) 5% (2) $6\frac{2}{3}\%$

(3) 6% (4) $7\frac{1}{5}\%$

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

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4. The simple interest on a certain sum for 8 months at 4% per annum is ₹ 129 less than the simple interest on the same sum for 15 months at 5% per annum. The sum is :
(1) ₹ 2,580 (2) ₹ 2400
(3) ₹ 2529 (4) ₹ 3600
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. Mohan lent some amount of money at 9% simple interest and an equal amount of money at 10% simple interest each for two years. If his total interest was Rs. 760, what amount was lent in each case ?
(1) ₹ 1700 (2) ₹ 1800
(3) ₹ 1900 (4) ₹ 2000
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. Simple interest on a certain sum at a certain annual rate of interest is $\frac{16}{25}$ of the sum. If the number representing rate per cent and time in years be equal, then the rate of interest is
(1) 8% (2) $11\frac{1}{2}\%$
(3) $12\frac{1}{2}\%$ (4) $12\frac{1}{4}\%$
(SSC CGL Prelim Exam. 08.02.2004 (IInd Sitting) & (SSC CGL Tier-I Exam. 26.06.2011) (IInd Sitting)

7. A sum of ₹ 1500 is lent out in two parts in such a way that the simple interest on one part at 10% per annum for 5 years is equal to that on another part at 12.5% per annum for 4 years. The sum lent out at 12.5% is :
(1) ₹ 500 (2) ₹ 1000
(3) ₹ 750 (4) ₹ 1250
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

8. If the simple interest for 6 years be equal to 30% of the principal, it will be equal to the principal after
(1) 20 years (2) 30 years
(3) 10 years (4) 22 years
(SSC CPO S.I. Exam. 03.09.2006)

9. Simple interest on ₹ 500 for 4 years at 6.25% per annum is equal to the simple interest on ₹ 400 at 5% per annum for a certain period of time. The period of time is
(1) 4 years (2) 5 years
(3) $6\frac{1}{4}$ years (4) $8\frac{2}{3}$ years
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

10. The simple interest on a sum of money is $\frac{1}{16}$ of the principal and the number of years is equal to the rate per cent per annum. The rate per annum is
(1) $1\frac{1}{2}\%$ (2) $2\frac{1}{2}\%$
(3) $3\frac{1}{2}\%$ (4) $4\frac{1}{2}\%$
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 27.10.2013)

11. If ₹ 12,000 is divided into two parts such that the simple interest on the first part for 3 years at 12% per annum is equal to the simple interest on the second part for $4\frac{1}{2}$ years at 16% per annum, the greater part is
(1) ₹ 8,000 (2) ₹ 6,000
(3) ₹ 7,000 (4) ₹ 7,500
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

12. The simple interest on a sum of money is $\frac{1}{4}$th of the principal and the number of years is equal to rate per cent per annum. The rate per cent is
(1) 2.5% (2) 5%
(3) 7.5% (4) 10%
(SSC CPO S.I. Exam. 06.09.2009)

13. Equal sum of money are lent to X and Y at 7.5% per annum for a period of 4 years and 5 years respectively. If the difference in interest, paid by them was ₹ 150, the sum lent to each was
(1) ₹ 500 (2) ₹ 1000
(3) ₹ 2000 (4) ₹ 3000
(SSC CPO S.I. Exam. 06.09.2009)

14. A sum of ₹ 1750 is divided into two parts such that the interests on the first part at 8% simple interest per annum and that on the other part at 6% simple interest per annum are equal. The interest on each part (in rupees) is
(1) 60 (2) 65
(3) 70 (4) 40
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

15. A borrows ₹ 800 at the rate of 12% per annum simple interest and B borrows ₹ 910 at the rate of 10% per annum, simple interest. In how many years will their amounts of debt be equal ?
(1) 18 years (2) 20 years
(3) 22 years (4) 24 years
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

16. The simple interest on a sum of money is $\frac{1}{9}$ of the principal and the number of years is equal to rate per cent per annum. The rate per annum is
(1) 3% (2) $\frac{1}{3}\%$
(3) $3\frac{1}{3}\%$ (4) $\frac{3}{10}\%$
(SSC CPO SI. Exam. 12.12.2010) & (SSC CGL Tier-1 Exam. 19.06.2011) (First Sitting)

17. A person deposited ₹ 500 for 4 years and ₹ 600 for 3 years at the same rate of simple interest in a bank. Altogether he received ₹ 190 as interest. The rate of simple interest per annum was
(1) 4% (2) 5%
(3) 2% (4) 3%
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

18. The difference between the simple interest received from two different banks on ₹ 500 for 2 years is ₹ 2.50. The difference between their (per annum) rate of interest is :
(1) 0.10% (2) 0.25%
(3) 0.50% (4) 1.00%
(SSC CHSL DEO CHSL DEO & LDC Exam. 27.11.2010) & (SSC CHSL DEO & LDC Exam. 04.11.2012)

19. In how many years will the simple interest on a sum of money be equal to the principal at the rate of $16\frac{2}{3}\%$ per annum ?
(1) 4 years (2) 5 years
(3) 6 years (4) 8 years
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

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20. The rate of interest per annum at which the total simple interest of a certain capital for 1 year is equal to the total simple interest of the same capital at the rate of 5% per annum for 2 years, is

(1) $\frac{5}{2}\%$ (2) 10%

(3) 25% (4) 12.5%

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

21. The simple interest on ₹ 4,000 in 3 years at the rate of x% per annum equals the simple interest on ₹ 5,000 at the rate of 12% per annum in 2 years. The value of x is

(1) 10% (2) 6%

(3) 8% (4) 9%

(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)

22. If x, y, z are three sum of money such that y is the simple interest on x and z is the simple interset on y for the same time and at the same rate of interest, then we have

(1) $z^2 = xy$ (2) $xyz = 1$

(3) $x^2 = yz$ (4) $y^2 = zx$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

23. Prakash lends a part of ₹ 20,000 at 8% simple interest and remaining at $\frac{4}{3}\%$ simple interest.

His total income after a year was ₹ 800. Find the sum lent at 8%.

(1) ₹ 8,000 (2) ₹ 12,000

(3) ₹ 6,000 (4) ₹ 10,000

(SSC CGL Tier-II Exam. 21.09.2014)

24. Ram deposited a certain sum of money in a company at 12% per annum simple interest for 4 years and deposited equal amount in fixed deposit in a bank for 5 years at 15% per annum simple interest. If the difference in the interest from two sources is ₹ 1350, then the sum deposited in each case is :

(1) ₹ 3000 (2) ₹ 4000

(3) ₹ 5000 (4) ₹ 6500

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

25. The difference between simple interest and the true discount on Rs. 2400 due 4 years hence at 5% per annum simple interest is

(1) Rs. 30 (2) Rs. 70

(3) Rs. 80 (4) Rs. 50

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

TYPE–V

1. A sum of ₹1550 was lent partly at 5% and partly at 8% simple interest. The total interest received after 3 years is ₹ 300. The ratio of money lent at 5% to that at 8% is :

(1) 5 : 8 (2) 8 : 5

(3) 31 : 6 (4) 16 : 15

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. A person lent ₹ 5,000 partly at the rate of 4 per cent and partly at the rate of 5 per cent per annum simple interest. The total interest after 2 years is ₹ 440. To find the sum of money lent at each of the above rates, ₹ 5,000 is to be divided in the ratio :

(1) 4 : 5 (2) 3 : 2

(3) 5 : 4 (4) 2 : 3

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

3. A person borrows some money for 5 years and loan amount : total interest amount is 5 : 2. The ratio of loan amount : interest rate is equal to :

(1) 2 : 25 (2) 2 : 1

(3) 5 : 2 (4) 25 : 2

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

4. A person invests money in three different schemes for 6 years, 10 years and 12 years at 10 per cent, 12 per cent and 15 per cent simple interest respectively. At the completion of each scheme, he gets the same interest. The ratio of his investment is

(1) 6 : 3 : 2 (2) 2 : 3 : 4

(3) 3 : 4 : 6 (4) 3 : 4 : 2

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

5. With a given rate of simple inerest, the ratio of principal and amount for a certain period of time is 4 : 5. After 3 years, with the same rate of interest, the ratio of the principal and amount becomes 5 : 7. The rate of interest is

(1) 4% (2) 6%

(3) 5% (4) 7%

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

6. Ratio of the principal and the amount after 1 year is 10:12. Then the rate of interest per annum is :

(1) 12% (2) 16%

(3) 18% (4) 20%

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

7. In a certain time, the ratio of a certain principal and the simple interest obtained from it are in the ratio 10 : 3 at 10% interest per annum. The number of years the money was invested is

(1) 1 year (2) 3 years

(3) 5 years (4) 7 years

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

8. ₹12,000 is divided into two parts so that the simple interest on the first part for 3 years at 12% per annum may be equal to the simple interest on the second part for $4\frac{1}{2}$ years at 16% per annum.

The ratio of the first part to the second part is

(1) 2 : 1 (2) 1 : 2

(3) 2 : 3 (4) 3 : 2

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

9. If ratio of principal and simple interest for 1 year is 25 : 1, then the rate of interest is

(1) 4% (2) 25%

(3) 5% (4) 20%

(SSC CGL Tier-I Re-Exam, 30.08.2015)

10. If the ratio of principal and the simple interest for 5 years is 10 : 3, then the rate of interest is :

(1) 5% (2) 6%

(3) 8% (4) 3%

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

TYPE–VI

1. A sum of ₹ 400 amounts to ₹ 480 in 4 years. What will it amount to if the rate of interest is increased by 2%?

(1) ₹ 484 (2) ₹ 560

(3) ₹ 512 (4) None of these

(SSC CGL Prelim Exam. 27.02.200 (First Sitting)

2. A man loses ₹ 55.50 yearly when the annual rate of interest falls from 11.5% to 10%. His capital (in rupees) is

(1) 3700 (2) 7400

(3) 8325 (4) 11100

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

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3. If the annual rate of simple interest increases from 10% to $12\frac{1}{2}\%$, a man's yearly income increases by ₹ 1250. His principal (in rupees) is
(1) 50,000 (2) 45,000
(3) 60,000 (4) 65,000
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

4. A sum was invested on simple interest at a certain rate for 2 years. Had it been put at 3% higher rate, it would have fetched ₹ 72 more. The sum is
(1) ₹ 1,200 (2) ₹ 1,500
(3) ₹ 1,600 (4) ₹ 1,800
(SSC CPO S.I. Exam. 06.09.2009)

5. A sum of money was lent at simple interest at a certain rate for 3 years. Had it been lent at 2.5% per annum higher rate, it would have fetched ₹ 540 more. The money lent was :
(1) ₹ 6400 (2) ₹ 6472
(3) ₹ 6840 (4) ₹ 7200
(SSC CHSL DEO & LDC Exam. 27.11.2010)

6. A sum of money was invested at a certain rate of simple interest for 2 years . Had it been invested at 1% higher rate, it would have fetched ₹ 24 more interest. The sum of money is :
(1) ₹ 1200 (2) ₹ 1050
(3) ₹ 1000 (4) ₹ 9600
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

7. A person who pays income tax at the rate of 4 paise per rupee, find that a fall of interest rate from 4% to 3.75% diminishes his net yearly income by ₹ 48. What is his capital?
(1) ₹ 24,000 (2) ₹ 25,000
(3) ₹ 20,000 (4) ₹ 18,000
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

8. A sum was lent at simple interest at a certain rate for 2 years. Had it been lent at 3% higher rate, it would have fetched ₹ 300 more. The original sum of money was :
(1) ₹ 5000 (2) ₹ 6000
(3) ₹ 7000 (4) ₹ 4000
(SSC Multi-Tasking Staff Exam. 10.03.2013)

9. A sum of ₹2,400 amounts to ₹3,264 in 4 years at a certain rate of simple interest. If the rate of interest is increased by 1%, the same sum in the same time would amount to
(1) ₹ 3,288 (2) ₹ 3,312
(3) ₹ 3,340 (4) ₹ 3,360
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

10. ₹ 800 amounts to ₹ 920 in 3 years at simple interest. If the interest rate is increased by 3%, it would amount to
(1) ₹ 1,056 (2) ₹ 1,112
(3) ₹ 1,182 (4) ₹ 992
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

11. A sum of Rs. 800 amounts to Rs. 920 in 3 years at the simple interest rate. If the rate is increased by 3% p.a., what will be the sum amount to in the same period ?
(1) ₹ 992 (2) ₹ 962
(3) ₹ 942 (4) ₹ 982
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

12. The amount ₹ 2,100 became ₹ 2,352 in 2 years at simple interest. If the interest rate is decreased by 1%, what is the new interest ?
(1) ₹ 210 (2) ₹ 220
(3) ₹ 242 (4) ₹ 252
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

13. A sum of Rs. 800 becomes Rs. 956 in 3 years at a certain rate of simple interest. If the rate of interest is increased by 4%, what amount will the same sum become in 3 years ?
(1) Rs. 1025 (2) RS. 1042
(3) Rs. 1052 (4) Rs. 1024
(SSC Constable (GD) Exam. 04.10.2015, Ist Sitting)

14. The rate of simple interest per annum of bank being decreased from 5% to $3\frac{1}{2}\%$, the annual income of a person from interest was less by Rs. 105. The sum deposited at the bank was
(1) Rs. 6,000 (2) Rs. 7,200
(3) Rs. 6,800 (4) Rs. 7,000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9592918)

TYPE–VII

1. A sum of ₹ 10,000 is lent partly at 8% and remaining at 10% per annum. If the yearly interest on the average is 9.2%, the two parts are :
(1) ₹ 4000, ₹ 6000
(2) ₹ 4500, ₹ 5500
(3) ₹ 5000, ₹ 5000
(4) ₹ 5500, ₹ 4500
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A sum of ₹ 1000 is lent out partly at 8% and the remaining at 10% per annum. If the yearly income on the average is 9.2%, the two parts respectively are
(1) ₹ 400, ₹ 600 (2) ₹ 450, ₹ 550
(3) ₹ 500, ₹ 500 (4) ₹ 550, ₹ 450
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

3. An old article is available for ₹ 12,000 at cash payment or is available for ₹ 7,000 cash payment and a monthly instalment of ₹ 630 for 8 months. The rate per cent per annum is
(1) 2.1 per cent (2) 3 per cent
(3) 3.25 per cent (4) 3.3 per cent
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

4. The effective annual rate of interest, corresponding to a nominal rate of 6% per annum payable half yearly, is :
(1) 6.06% (2) 6.07%
(3) 6.08% (4) 6.09%
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

5. A person lends 40% of his sum of money at 15% per annum, 50% of rest at 10% per annum and the rest at 18% per annum rate of interest. What would be the annual rate of interest, if the interest is calculated on the whole sum ?
(1) 13.4% (2) 14.33%
(3) 14.4% (4) 13.33%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

6. Ramesh deposited ₹ 15600 in a fixed deposit at the rate of 10% per annum simple interest. After every second year, he adds his interest earnings to the principal. The interest at the end of fourth year is
(1) ₹ 1716 (2) ₹ 1560
(3) ₹ 3432 (4) ₹ 1872
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

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7. A part of ₹ 1500 was lent at 10% per annum and the rest at 7% per annum simple interest. The total interest earned in three years was ₹ 396. The sum lent at 10% was
(1) ₹ 900 (2) ₹ 800
(3) ₹ 700 (4) ₹ 600
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

8. What equal instalment of annual payment will discharge a debt which is due as ₹ 848 at the end of 4 years at 4% per annum simple interest ?
(1) ₹ 212 (2) ₹ 200
(3) ₹ 250 (4) ₹ 225
(SSC CPO S.I. Exam. 16.12.2007)

9. Out of ₹ 50,000, that a man has, he lends ₹ 8000 at $5\frac{1}{2}\%$ per annum simple interest and Rs. 24,000 at 6 % per annum simple interest. He lends the remaining money at a certain rate of interest so that he gets total annual interest of ₹ 3680. The rate of interest per annum, at which the remaining money is lent, is
(1) 5% (2) 7%
(3) 10% (4) 12%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. A man invests half his capital at the rate of 10% per annum, one-third at 9% and the rest at 12% per annum. The average rate of interest per annum, which he gets, is
(1) 9% (2) 10%
(3) 10.5% (4) 12%
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

11. John invested a sum of money at an annual simple interest rate of 10%. At the end of four years the amount invested plus interest earned was ₹ 770. The amount invested was
(1) ₹ 650 (2) ₹ 350
(3) ₹ 550 (4) ₹ 500
(SSC CISF Constable (GD) Exam. 05.06.2011)

12. Arun lends ₹ 20,000 to two of his friends. He gives ₹ 12,000 to the first at 8% p.a. simple interest. Arun wants to make a profit of 10% on the whole. The simple interest rate at which he should lend the remaining sum of money to the second friend is
(1) 8% (2) 16%
(3) 12% (4) 13%
(SSC Graduate Level Tier-II Exam.16.09.2012)

13. A person invests ₹12,000 as fixed deposit at a bank at the rate of 10% per annum simple interest. But due to some pressing needs he has to withdraw the entire money after 3 years, for which the bank allowed him a lower rate of interest. If he gets ₹3,320 less than what he would have got at the end of 5 years, the rate of interest allowed by the bank is
(1) $7\frac{5}{9}\%$ (2) $7\frac{4}{9}\%$
(3) $7\frac{8}{9}\%$ (4) $8\frac{7}{9}\%$
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

14. A certain scheme of investment in simple interest declares that it trebles the investment in 8 years. If you want to quadruple your money through that scheme, you have to invest it for :
(1) 11 years 6 months
(2) 10 years 8 months
(3) 10 years (4) 12 years
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

15. If a man receives on one-fourth of his capital 3% interest, on two third 5% and on the remainder 11%, the percentage he receives on the whole is
(1) 4.5% (2) 5%
(3) 5.5% (4) 5.2%
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

16. At the same rate of simple interest sum of the interest of ₹ 300 for 4 years and the interest of ₹ 400 for 3 years is ₹ 120. The rate of interest is
(1) 5 % (2) 4%
(3) 6% (4) 10%
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

17. Nitin borrowed some money at the rate of 6% p.a. for the first three years, 9% p.a. for the next five years and 13% p.a. for the period beyond eight years. If the total interest paid by him at the end of eleven years is ₹ 8,160, the money borrowed by him (in ₹) was
(1) 12,000 (2) 6,000
(3) 8,000 (4) 10,000
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

18. Two equal sums were lent out at 7% and 5% S.I. respectively. The interest earned on the two loans add up to ₹ 960 for 4 years. The total sum lent out in
(1) ₹ 3500 (2) ₹ 2500
(3) ₹ 2000 (4) ₹ 3000
(SSC Constable (GD) Exam. 12.05.2013)

19. Mohan lends Rs. 500 to John and a certain sum to Tom at the same time at a simple interest of 8% per annum. If in 4 years, he altogether receives Rs. 210 as interest from the two, then the sum of money he lent to Tom was
(1) Rs. 144.75 (2) Rs. 148
(3) Rs. 156.25 (4) Rs. 165.50
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

20. What should be the least number of years in which the simple interest on Rs. 2600 at $6\frac{2}{3}\%$ will be an exact number of rupees ?
(1) 3 (2) 2
(3) 5 (4) 4
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

21. Ram bought a bike for Rs. 60,000. He paid Rs. 10000 cash down and the rest at the end of 2 years at 15% simple interest. How much more did he pay as simple interest ?
(1) Rs. 15,000 (2) Rs. 25,000
(3) Rs. 35,000 (4) Rs. 50,000
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

22. A sum of Rs. 7,930 is divided into three parts and given on loan at 5% simple interest to A, B and C for 2, 3 and 4 years respectively. If the amounts of all three are equal after their respective periods of loan, then A received a loan of
(1) Rs. 3,050 (2) Rs. 2,760
(3) Rs. 2,750 (4) Rs. 2,800
(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099685)

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23. A man buys a TV priced at Rs. 16000. He pays Rs. 4000 at once and the rest after 15 months on which he is charged a simple interest at the rate of 12% per year. The total amount he pays for the TV is
(1) Rs. 18,200 (2) Rs. 17,800
(3) Rs. 16,800 (4) Rs. 17,200
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

24. If Rahim deposited the same amount of Rs. x in a bank at the beginning of successive 3 years and the bank pays simple interest of 5% per annum, then the amount at his credit at the end of 3rd year will be :
(1) Rs. $\frac{861x}{400}$ (2) Rs. $\frac{1261x}{400}$
(3) Rs. $\frac{21x}{20}$ (4) Rs. $\frac{26481x}{8000}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

25. A boy aged 12 years is left with Rs. 100,000 which is under a trust. The trustees invest the money at 6% per annum and pay the minor boy a sum of Rs. 2500, for his pocket money at the end of each year. The expenses of trust come out to be Rs. 500 per annum. Find the amount that will be handed over to the minor boy after he attains the age of 18 years.
(1) Rs. 120000 (2) Rs. 150000
(3) Rs. 118000 (4) Rs. 125000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

SHORT ANSWERS

TYPE-I

1. (2)	2. (3)	3. (4)	4. (1)
5. (4)	6. (1)	7. (3)	8. (3)
9. (4)	10. (4)	11. (3)	12. (4)
13. (3)	14. (2)	15. (4)	16. (3)
17. (1)	18. (1)	19. (1)	20. (3)
21. (3)	22. (4)	23. (4)	24. (3)
25. (1)	26. (1)	27. (2)	28. (4)
29. (1)	30. (3)	31. (2)	32. (2)
33. (3)	34. (4)	35. (3)	36. (1)
37. (2)	38. (1)	39. (4)	

TYPE-II

1. (1)	2. (1)	3. (2)	4. (4)
5. (2)	6. (3)	7. (3)	8. (3)
9. (4)	10. (3)	11. (3)	12. (4)
13. (3)	14. (2)	15. (*)	16. (1)
17. (2)			

TYPE-III

1. (3)	2. (2)	3. (1)	4. (1)
5. (2)	6. (2)	7. (2)	8. (3)

TYPE-IV

1. (4)	2. (3)	3. (2)	4. (4)
5. (4)	6. (1)	7. (3)	8. (1)
9. (3)	10. (2)	11. (1)	12. (2)
13. (3)	14. (1)	15. (3)	16. (3)
17. (2)	18. (2)	19. (3)	20. (2)
21. (1)	22. (4)	23. (1)	24. (3)
25. (3)			

TYPE-V

1. (4)	2. (2)	3. (4)	4. (1)
5. (3)	6. (4)	7. (2)	8. (1)
9. (1)	10. (2)		

TYPE-VI

1. (3)	2. (1)	3. (1)	4. (1)
5. (4)	6. (1)	7. (3)	8. (1)
9. (4)	10. (4)	11. (1)	12. (1)
13. (3)	14. (4)		

TYPE-VII

1. (1)	2. (1)	3. (1)	4. (4)
5. (3)	6. (4)	7. (1)	8. (2)
9. (3)	10. (2)	11. (3)	12. (4)
13. (2)	14. (4)	15. (2)	16. (1)
17. (3)	18. (3)	19. (3)	20. (1)
21. (1)	22. (2)	23. (2)	24. (*)
25. (3)			

EXPLANATIONS

TYPE-I

1. (2) $P = \frac{150 \times 100}{4} \times \frac{2}{1}$

$= ₹ 7500$

2. (3) Principal (P) = ₹ 1600

T = 2 years 3 months

$= \left(2 + \frac{3}{12}\right)\text{yrs.} = \left(2 + \frac{1}{4}\right)\text{yrs.} = \frac{9}{4}\text{yr}$

S.I = ₹ 252

R = % rate of interest per annur

$\Rightarrow R = \frac{100 \times S.I.}{P \times t}$

$= \frac{100 \times 252}{1600 \times \frac{9}{4}}$

Rate of interest = 7% per annur

3. (4) If the principal be x and ra of interest be r% per annur then

SI after 1 year = 920 − 880

= ₹ 40

∴ SI after 2 years = ₹ 80

$\Rightarrow 880 = x + 80$

$\Rightarrow x =$ ₹ (880 − 80) = ₹ 800

4. (1) If rate of interest be R% p. then,

$SI = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$\therefore \frac{6000 \times 2 \times R}{100} + \frac{1500 \times 4 \times I}{100}$

= 900

$\Rightarrow$ 120 R + 60R = 900

$\Rightarrow$ 180R = 900

$\Rightarrow R = \frac{900}{180} = 5\%$

5. (4) Let the rate of interest per num be r%

According to the question,

$\frac{5000 \times 2 \times r}{100} + \frac{3000 \times 4 \times r}{100} = 2$

$\Rightarrow$ 100r + 120r = 2200

$\Rightarrow$ 220 r = 2200

$\Rightarrow r = \frac{2200}{220} = 10\%$

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6. (1) Simple interest for 2 years
$= ₹ (568 - 520) = ₹ 48$
$\therefore$ Interest for 5 years

$= ₹ \frac{48}{2} \times 5 = ₹ 120$

Principal $= ₹ (520 - 120) = ₹ 400$

7. (3) Simple interest gained from ₹ 500

$= \frac{500 \times 12 \times 4}{100} = ₹ 240$

Let the other Principal be x.
S.I. gained $= ₹ (480 - 240)$
$= ₹ 240$

$\therefore \frac{x \times 10 \times 4}{100} = 240$

$\Rightarrow x = \frac{240 \times 100}{40} = ₹ 600$

8. (3) Difference in rate

$= \left(8 - 7\frac{3}{4}\right)\% = \frac{1}{4}\%$

Let the capital be ₹ x.

$\therefore \frac{1}{4}\%$ of $x = 61.50$

$\Rightarrow x = 61.50 \times 100 \times 4$
$= ₹ 24600$

9. (4) Let the sum lent to C be x
According to the question,

$$\frac{2500 \times 7 \times 4}{100} + \frac{x \times 7 \times 4}{100} = 1120$$

or $2500 \times 28 + 28x = 112000$
or $2500 + x = 4000$
or $x = 4000 - 2500 = 1500$

10. (4) S.I. for $1\frac{1}{2}$ years
$= ₹ (873 - 756) = ₹ 117$
S.I. for 2 years

$= ₹ \left(117 \times \frac{2}{3} \times 2\right) = ₹ 156$

$\therefore$ Principal $= 756 - 156 = ₹ 600$
Now, P = 600, T = 2,
S.I. = 156

$\therefore R = \frac{100 \times S.I.}{P \times T}$

$= \frac{100 \times 156}{600 \times 2} = 13\%$

11. (3) $P = \frac{A \times 100}{100 + r \times t}$

$= \frac{7000 \times 100}{100 + \frac{10}{3} \times 5}$

$= \frac{7000 \times 100 \times 3}{350} = ₹ 6000$

12. (4) Let the principal be x.

S.I. $= \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$

$\Rightarrow 5400 = \frac{x \times 12 \times 3}{100}$

$\Rightarrow x = \frac{5400 \times 100}{12 \times 3} = ₹ 15000$

13. (3) Principal + S.I. for $\frac{5}{2}$ years
$= ₹ 1012$ ...(i)
Principal + S.I. for 4 years
$= ₹ 1067.20$ ...(ii)
Subtracting equation (i) from (ii)

S.I. for $\frac{3}{2}$ years $= ₹ 55.20$

$\therefore$ S.I. for $\frac{5}{2}$ years

$= 55.20 \times \frac{2}{3} \times \frac{5}{2} = ₹ 92$

$\therefore$ Principal
$= ₹ (1012 - 92) = ₹ 920$

$\therefore$ Rate $= \frac{92 \times 100}{920 \times \frac{5}{2}}$

$= \frac{2 \times 92 \times 100}{920 \times 5} = 4\%$

14. (2) Principal + SI for 2 years
$= ₹ 720$ .... (i)
Principal + SI for 7 years
$= ₹ 1020$ .....(ii)
Subtracting equation (i) from (ii) get,
SI for 5 years
$= ₹ (1020 - 720) = ₹ 300$
$\therefore$ SI for 2 years

$= ₹ 300 \times \frac{2}{5} = ₹ 120$

$\therefore$ Principal
$= ₹ (720 - 120) = ₹ 600$

15. (4) The sum of money will give ₹ 365 as simple interest in a year.

$\Rightarrow$ S.I. $= \frac{PRT}{100}$

$\Rightarrow 365 = \frac{P \times 5 \times 1}{100}$

$\Rightarrow P = \frac{365 \times 100}{5} = ₹ 7300$

16. (3) Let the sum be x.

Using formula, $I = \frac{PRT}{100}$ we have

$$\frac{x \times \frac{15}{12} \times \frac{15}{2}}{100} - \frac{x \times \frac{8}{12} \times \frac{25}{2}}{100}$$

$= 32.50$

$\Rightarrow \frac{25x}{2400} = 32.50$

$\Rightarrow x = \frac{32.50 \times 2400}{25} = 3120$

$\therefore$ Required sum $= ₹ 3120$

17. (1) Let each instalment be x
Then,

$$\left(x + \frac{x \times 5 \times 1}{100}\right) + \left(x + \frac{x \times 5 \times 2}{100}\right)$$

$$+ \left(x + \frac{x \times 5 \times 3}{100}\right) + x = 6450$$

$$\Rightarrow \left(x + \frac{x}{20}\right) + \left(x + \frac{x}{10}\right) + \left(x + \frac{3x}{20}\right) + x = 6450$$

$$\Rightarrow \frac{21x}{20} + \frac{11x}{10} + \frac{23x}{20} + x = 6450$$

$$\Rightarrow \frac{21x + 22x + 23x + 20x}{20} = 6450$$

$$\Rightarrow \frac{86x}{20} = 6450$$

$\Rightarrow x = \frac{6450 \times 20}{86} = ₹ 1500$

18. (1) Interest $= ₹ (81 - 72) = ₹ 9$
Let the time be t years.

Then, $9 = \frac{72 \times 25 \times t}{4 \times 100}$

$\Rightarrow t = \frac{9 \times 400}{72 \times 25} = 2$ years.

19. (1) Time from 11 May to 10 September, 1987
$= 21 + 30 + 31 + 31 + 10$
$= 123$ days

$\therefore$ Time $= 123$ days $= \frac{123}{365}$ year

$\therefore$ S.I. $= \frac{7300 \times 123 \times 5}{365 \times 100} = ₹ 123$

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20. (3) **Case I :**

$$\text{S.I.} = \frac{5000\times2\times4}{100} = ₹\ 400$$

Case II :

$$\text{S.I.} = \frac{5000\times25\times2}{100\times4} = ₹\ 625$$

$\therefore$ Gain = ₹ (625 – 400) = ₹ 225

21. (3) Let the sum lent at 4% = Rs.x

$\therefore$ Amount at 5% = $(16000 - x)$

According to the question,

$$\frac{x\times4\times1}{100} + \frac{(16000-x)\times5\times1}{100} = 700$$

$\Rightarrow 4x + 80000 - 5x = 70000$

$\Rightarrow x = 80000 - 70000$

= ₹ 10000

22. (4) After 10 years,

$$\text{SI} = \frac{1000\times5\times10}{100} = ₹\ 500$$

Principal for 11th year

= 1000 + 500 = ₹ 1500

SI = ₹ (2000 – 1500) = ₹ 500

$$\therefore T = \frac{\text{SI}\times100}{\text{P}\times\text{R}} = \frac{500\times100}{1500\times5}$$

$$= \frac{20}{3} \text{ years} = 6\frac{2}{3} \text{ years}$$

$$\therefore \text{Total time} = 10 + 6\frac{2}{3}$$

$$= 16\frac{2}{3} \text{ years}$$

23. (4)

P + S.I. for 5 years = 5200 ...(i)

P + SI for 7 years = 5680 ...(ii)

On subtracting equation (i) from (ii),

SI for 2 years = 480

$\therefore$ SI for 1 year = ₹ 240

$\therefore$ From equation (i),

P + 5 × 240 = 5200

$\Rightarrow$ P = 5200 – 1200 = ₹ 4000

$$\therefore R = \frac{\text{SI}\times100}{\text{T}\times\text{P}}$$

$$= \frac{240\times100}{1\times4000} = 6\%$$

24. (3) S.I. = 956 – 800 = Rs. 156

$$\therefore \text{Rate} = \frac{\text{S.I.}\times100}{\text{Principal}\times\text{Time}}$$

$$= \frac{156\times100}{800\times3} = 6.5\% \text{ per annum}$$

$\therefore$ New rate = 10.5%

$$\therefore \text{S.I.} = \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$$

$$= \frac{800\times3\times10.5}{100} = ₹\ 252$$

$\therefore$ Amount = 800 + 252 = ₹ 1052

25. (1) Let the rate of interest be R per cent per annum.

$$\therefore \frac{400\times2\times R}{100} + \frac{550\times4\times R}{100} + \frac{1200\times6\times R}{100} = 1020$$

$\Rightarrow 8R + 22R + 72R = 1020$

$\Rightarrow 102R = 1020$

$$\Rightarrow R = \frac{1020}{102} = 10\%$$

26. (1) $$4200 = \frac{29400\times6\times R}{100}$$

$$\Rightarrow R = \frac{4200}{294\times6} = \frac{50}{21} = 2\frac{8}{21}\%$$

27. (2) Let the amount lent at 4% be x

$\therefore$ Amount lent at 5% = $(60000 - x)$

According to the question,

$$\frac{(60000-x)\times5\times1}{100} + \frac{x\times4\times1}{100} = 2560$$

$\Rightarrow 300000 - 5x + 4x = 256000$

$\Rightarrow x = 300000 - 256000$

= ₹ 44000

28. (4) Principal + interest for 8 years = ₹ 2900... (i)

Principal + interest for 10 years = ₹ 3000 ... (ii)

Subtracting equation (i) from (ii)

Interest for 2 years = ₹ 100

$\therefore$ Interest for 8 years

$$= \frac{100}{2}\times8 = ₹\ 400$$

From equation (i),

Principal = ₹ (2900 – 400)

= ₹ 2500

$$\therefore \text{Rate} = \frac{\text{S.I}\times100}{\text{Time}\times\text{Principal}}$$

$$= \frac{400\times100}{8\times2500} = 2\%$$

29. (1) $$\text{Time} = \frac{\text{SI}\times100}{\text{Principal}\times\text{Rate}}$$

$$= \frac{1080\times100}{3000\times12} = 3 \text{ years}$$

30. (3) Interest for 1 year

= ₹ (925 – 850) = ₹ 75

$\therefore$ If a sum becomes a_1 in t_1 years and a_2 in t_2 years then rate of interest $= \frac{100(a_2 - a_1)}{(a_1t_2 - a_2t_1)}\%$

$$= \frac{100(925-850)}{850\times4 - 3\times925} = \frac{7500}{625} = 12\%$$

$$\therefore \text{Principal} = \frac{\text{SI}\times100}{\text{Time}\times\text{Rate}}$$

$$= \frac{75\times100}{1\times12} = ₹\ 625$$

31. (2) S.I. = 2641.20 – 1860

= ₹ 781.2

$$\text{Time} = \frac{\text{S.I}\times100}{\text{Principal}\times\text{Rate}}$$

$$= \frac{781.2\times100}{1860\times12} = 3.5 = 3\frac{1}{2} \text{ years}$$

32. (2) Present population

$$= 10000\left(1 - \frac{20}{100}\right)^2$$

$$= 10000 \times \frac{4}{5} \times \frac{4}{5} = 6400$$

33. (3) Annual interest

= 365 × 2 = ₹ 730

$$\text{Principal} = \frac{\text{S.I}\times100}{\text{Time}\times\text{Rate}}$$

$$= \frac{730\times100}{1\times5} = ₹\ 14600$$

34. (4) If principal = x and rate = r% per annum, then

$$1380 = x + \frac{x\times3\times r}{100} \quad \text{.....(i)}$$

$$1500 = x + \frac{x\times5\times r}{100} \quad \text{.....(ii)}$$

S.I. for two years = 1500 – 1380

= ₹ 120

$$\therefore \frac{x\times2\times r}{100} = 120$$

$$\therefore \frac{xr}{100} = 60 \quad \text{.....(iii)}$$

$\therefore$ From equation (i)

$1380 = x + 60 \times 3$

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$\Rightarrow x = 1380 - 180 = ₹\ 1200$

From equation (iii)

$$\frac{1200 \times r}{100} = 60$$

$$\Rightarrow r = \frac{6000}{1200} = 5\% \text{ per annum}$$

35. (3) S.I. for 1 year
$= 14250 - 12900 = \text{Rs. } 1350$
S.I. for 4 years $= 1350 \times 4$
$= ₹\ 5400$
$\therefore$ Principal $= 12900 - 5400$
$= ₹\ 7500$

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{5400 \times 100}{7500 \times 4}$$

$= 18\%$ per annum

36. (1) Required time $= t$ years

$$\text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\therefore \frac{6000 \times 4 \times 5}{100} = \frac{8000 \times 3 \times t}{100}$$

$\Rightarrow 6000 \times 4 \times 5 = 8000 \times 3 \times t$

$$\therefore t = \frac{6000 \times 4 \times 5}{8000 \times 3} = 5 \text{ years}$$

37. (2) $\text{Principal} = \dfrac{\text{S.I.} \times 100}{\text{Time} \times \text{Rate}}$

$$= \frac{1 \times 100}{\frac{1}{365} \times 5} = \frac{365 \times 100}{5}$$

$= \text{Rs. } 7300$

38. (1) S.I. for 5 years
$= \text{Rs. } (1020 - 720) = \text{Rs. } 300$
$\therefore$ S.I. for 2 years

$$= \frac{300}{5} \times 2 = \text{Rs. } 120$$

$\therefore$ Principal $= \text{Rs. } (720 - 120)$
$= \text{Rs. } 600$

39. (4) Number of days from 5th January to 31st May $= 26 + 28 + 31 + 30 + 31 = 146$
$\therefore$ S.I.

$$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$= \frac{36000 \times 146 \times 9.5}{365 \times 100}$$

$= \text{Rs. } 1368$

TYPE-II

1. (1) Principal $= P$

$$\text{Amount} = \frac{7p}{6}$$

$$\text{S.I.} = \frac{7p}{6} - P = \frac{P}{6}$$

$$\therefore R = \frac{S.I \times 100}{P \times T} = \frac{P \times 100}{6 \times p \times 3}$$

$$= \frac{50}{9} = 5\frac{5}{9}\%$$

2. (1) Let the principal be Re.1

$$\therefore \text{S.I.} = \frac{41}{40} - 1 = \frac{1}{40}$$

$$\text{Now, rate} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{\frac{1}{40} \times 100}{1 \times \frac{1}{4}} = \frac{100 \times 4}{40} = 10\%$$

3. (2) **Case-I**
Let the principal be x
Amount $= 3x$
$\therefore$ Interest $= 2x$
Time $= 20$ years

$$\therefore I = \frac{PRT}{100} \Rightarrow 2x = \frac{x \times R \times 20}{100}$$

$\Rightarrow R = 10\%$

Case-II
$I = x$
$P = x$
$R = 10$
$T = ?$

$$\therefore I = \frac{PRT}{100} \Rightarrow x = \frac{x \times 10 \times T}{100}$$

$\therefore T = 10$ years.

4. (4) Let P be the principal and R% rate of interest.

$$\therefore \text{S.I.} = \frac{PR \times 10}{100} = \frac{PR}{10}$$

According to the question,

$$\frac{PR}{10} = \left(P + \frac{PR}{10}\right) \times \frac{2}{5}$$

$$\Rightarrow \frac{R}{10} = \left(1 + \frac{R}{10}\right) \times \frac{2}{5}$$

$$\Rightarrow \frac{R}{10} = \frac{2}{5} + \frac{R}{25}$$

$$\Rightarrow \frac{R}{10} - \frac{R}{25} = \frac{2}{5}$$

$$\Rightarrow \frac{5R - 2R}{50} = \frac{2}{5}$$

$$\Rightarrow \frac{3R}{50} = \frac{2}{5}$$

$$\Rightarrow R = \frac{50 \times 2}{3 \times 5} = \frac{20}{3} = 6\frac{2}{3}\%$$

5. (2) SI $= ₹\ (7200 - 6000)$
$= ₹\ 1200$

$$\therefore \text{SI} = \frac{PRT}{100}$$

$$\Rightarrow 1200 = \frac{6000 \times R \times 4}{100}$$

$$\Rightarrow R = \frac{1200 \times 100}{6000 \times 4} = 5\%$$

New rate of R $= 5 \times 1.5 = 7.5\%$

$$\text{Then, SI} = \frac{6000 \times 7.5 \times 5}{100}$$

$= ₹\ 2250$
$\therefore$ Amount $= ₹\ (6000 + 2250)$
$= ₹\ 8250$

6. (3) Let the principal be x.
Case-I

$$2x = \frac{x \times R \times 15}{100}$$

$$\Rightarrow R = \frac{2 \times 100}{15} = \frac{40}{3}\%$$

Case-II
SI $= 4x$

$$\therefore 4x = \frac{x \times 40 \times T}{300}$$

$$\Rightarrow T = \frac{4 \times 300}{40} = 30 \text{ years}$$

7. (3) Let the principal be x.
$\therefore$ Amount $= 2x$
$\therefore$ Interest $= (2x - x) = x$

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{x \times 100}{x \times 12} = \frac{25}{3} = 8\frac{1}{3}\%$$

8. (3) Let the principal be x

$$\therefore \text{Principal} + \text{SI} = \frac{7x}{4}$$

$$\therefore \text{SI} = \frac{7x}{4} - x = \frac{3x}{4}$$

$$\text{Rate} = \frac{\text{SI} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{3x \times 100}{4 \times x \times 4} = 18\frac{3}{4}\%$$

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9. (4) The sum gets doubled in 5 years and trebled in 12 years. Clearly rate of interest for 12 years will be lower.
Let Principal be x.

then, Rate $= \frac{SI \times 100}{Principal \times Time}$

$= \frac{2x \times 100}{x \times 12} = \frac{50}{3} = 16\frac{2}{3}\%$

10. (3) Time $= \frac{SI \times 100}{Principal \times Rate}$

$= \frac{x \times 100}{x \times \frac{25}{4}} = 16$ years

11. (3) If principal be x, interest $= x$ and rate $= r\%$ p.a. then

Rate $= \frac{SI \times 100}{Principal \times Time}$

$= \frac{x \times 100}{x \times 10} = 10\%$

Now, $p = x$, interest $= 2x$

Then, time $= \frac{SI \times 100}{Principal \times Rate}$

$= \frac{2x \times 100}{x \times 10} = 20$ years

12. (4) If the principal be x, the amount $= 2x$

$\therefore$ SI $= x$

$\therefore$ Time $= \frac{SI \times 100}{Principal \times Rate}$

$= \frac{x \times 100}{x \times 15} = \frac{20}{3} = 6\frac{2}{3}$ years

13. (3) If the principal be ₹ 100 then S.I. = ₹ 100.

$\therefore$ Time $= \frac{S.I. \times 100}{Principal \times Rate}$

$= \frac{100 \times 100}{100 \times 12} = \frac{25}{3}$ years

= 8 years 4 months

14. (2) Principal = Rs. x

Amount = Rs. $2x$

$\therefore$ Interest $= 2x - x$

= Rs. x

$\therefore$ Rate $= \frac{S.I. \times 100}{Principal \times Time}$

$= \frac{x \times 100}{x \times 8} = \frac{25}{2}$

= 12.5 % per annum

15. (*) Principal = Rs. x

Interest = Rs. x

Rate $= \frac{S.I \times 100}{Principal \times Time}$

$= \frac{x \times 100}{x \times 16} = \frac{25}{4}$ % per annum

Case II,

Interest = Rs. $2x$

$\therefore$ Time $= \frac{S.I \times 100}{Principal \times Rate}$

$= \frac{2x \times 100 \times 4}{x \times 25} = 32$ years

16. (1) According to the question,
If principal be Rs. x, then
S.I. = Rs. x

$\therefore$ Time $= \frac{S.I. \times 100}{Principal \times Rate}$

$= \frac{x \times 100}{x \times \frac{25}{4}} = \frac{400}{25} = 16$ years

17. (2) Rate = R% per annum

$\therefore$ Time $= \frac{R}{2}$ years

$\therefore$ Rate $= \frac{S.I. \times 100}{Principal \times Time}$

$\Rightarrow R = \frac{8}{25} \times \frac{100}{\frac{R}{2}}$

$\Rightarrow R^2 = \frac{8 \times 200}{25} = 64$

$\Rightarrow R = \sqrt{64} = 8\%$ per annum

TYPE-III

1. (3) Let the principal be x

$\therefore$ Interest $= \frac{2}{5}x$

Rate = 8% per annum

$\therefore$ Time $= \frac{Interest \times 100}{Principal \times Rate}$

$= \frac{\frac{2}{5}x \times 100}{x \times 8} = \frac{40}{8} = 5$ years

2. (2) Let Principal = ₹ 100

S.I. $= 100 \times \frac{1}{5} =$ ₹ 20

Rate $= \frac{20 \times 100}{100 \times 4} = 5\%$

3. (1) Rate $= \frac{SI \times 100}{Principal \times Time}$

$= \frac{9}{25} \times \frac{100}{6} = 6\%$ per annum

4. (1) $\frac{Simple\ interest}{Principal} = \frac{1}{4}$

$\therefore$ Rate $= \frac{S.I. \times 100}{Principal \times Time}$

$= \frac{1 \times 100}{4 \times 5} = 5\%$ per annum

5. (2) $\frac{Interest}{Principal} = \frac{3}{8}$

$\therefore$ Rate $= \frac{S.I. \times 100}{Principal \times Time}$

$= \frac{3}{8} \times \frac{100}{\frac{25}{4}}$

$= \frac{3}{8} \times \frac{400}{25} = 6\%$ per annum

6. (2) S.I.

$= \frac{Principal \times Time \times Rate}{100}$

$\therefore 1200 + \frac{1200 \times 7 \times r}{12 \times 100}$

= Amount (A)

$\Rightarrow 1200 + 7r = A$ .....(i)

and, $1016 + \frac{1016 \times 5 \times r}{2 \times 100} = A$

$\therefore 1016 + 25.4r = A$ ...(ii)

$\therefore 1016 + 25.4r = 1200 + 7r$

$\Rightarrow 25.4r - 7r = 1200 - 1016$

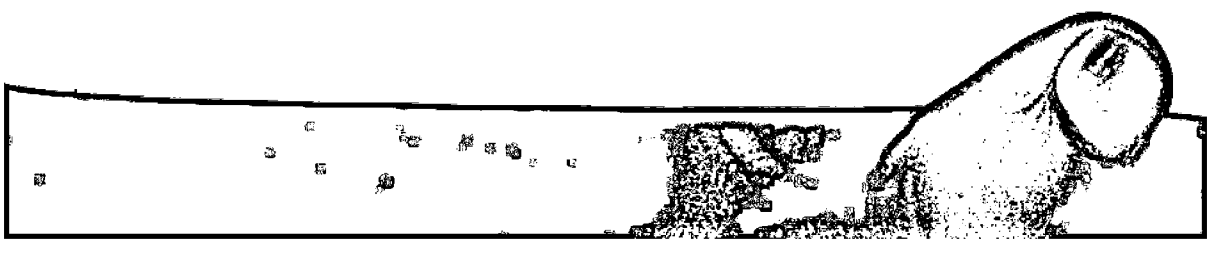
$\Rightarrow 18.4r = 184 \Rightarrow r = \frac{184}{18.4}$

= 10% per annum

7. (2) Amount after 10 years

$= P\left(1 + \frac{RT}{100}\right) = P\left(1 + \frac{R \times 10}{100}\right)$

$= \text{Rs. } P\left(1 + \frac{R}{10}\right)$



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$\therefore$ Interest = Rs. $P\left(1+\frac{R}{10}\right)\times\frac{2}{5}$

$\therefore$ Rate= $\frac{S.I\times100}{Principal\times Time}$

$\Rightarrow R=\frac{P\left(1+\frac{R}{10}\right)\times\frac{2}{5}\times100}{P\times10}$

$\Rightarrow R=4\left(1+\frac{R}{10}\right)$

$\Rightarrow \frac{R}{4}=1+\frac{R}{10}$

$\Rightarrow \frac{R}{4}-\frac{R}{10}=1$

$\Rightarrow \frac{5R-2R}{20}=1$

$\Rightarrow 3R=20$

$\Rightarrow R=\frac{20}{3}=6\frac{2}{3}\%$

8. (3) Rate of interest = r % per annum

S.I. = $\frac{Principal\times Time\times Rate}{100}$

According to the question,

$\frac{3200\times5\times r}{100\times2}-\frac{3000\times5\times r}{200}=40$

$\Rightarrow 80r-75r=40$

$\Rightarrow 5r=40\Rightarrow r=\frac{40}{5}$

= 8% per annum

TYPE-IV

1. (4) According to question,
Interest of one year = ₹ 42
Rate = 5% and Time = 1 year

$\therefore$ Principal = $\frac{Interest\times100}{Rate\times Time}$

$=\frac{42\times100}{5\times1}=₹840$

2. (3) Let r_1, and r_2 be the required rate of interest
Then,

$13.50=\frac{1500\times3\times r_1}{100}-\frac{1500\times3\times r_2}{100}$

$=\frac{4500}{100}(r_1-r_2)$

$r_1-r_2=\frac{135}{450}=\frac{27}{90}$

$=\frac{3}{10}=0.3\%$

3. (2) We know that

S.I. = $\frac{PRT}{100}$

According to question,

S.I. = $\frac{4}{9}P$

& R = T (numerically)

$\therefore \frac{4}{9}P=\frac{P\times R\times R}{100}$

$\therefore R^2=\frac{400}{9}$

$R=\sqrt{\frac{400}{9}}=\frac{20}{3}=6\frac{2}{3}\%$

4. (4) Let the sum be x

$\frac{x\times5\times15}{100\times12}-\frac{x\times4\times8}{100\times12}=129$

$\Rightarrow \frac{x}{100\times12}(75-32)=129$

$\Rightarrow x=\frac{129\times1200}{43}=₹3600$

5. (4) Let the sum lent in each case be x.
Then,

$\frac{x\times9\times2}{100}+\frac{x\times10\times2}{100}=760$

$\frac{x\times2}{100}(9+10)=760$

$\Rightarrow \frac{2\times19x}{100}=760$

$\Rightarrow x=\frac{760\times100}{2\times19}=₹2000$

6. (1) Let the rate of interest be r% and principal be P.
According to the question,

$\frac{16P}{25}=\frac{P\times r\times r}{100}$

[$\because$ r = t numerically]

$\Rightarrow r^2=\frac{1600}{25}$

$\Rightarrow r=\frac{40}{5}=8\%$

7. (3) Let the sum lent out at 12.5% be x
$\therefore$ Sum lent out at 10%
= 1500 − x

Now, $\frac{(1500-x)\times10\times5}{100}$

$=\frac{x\times12.5\times4}{100}$

$\Rightarrow 50(1500-x)=50x$

$\Rightarrow 2x=1500$

$\Rightarrow x=\frac{1500}{2}=₹750$

8. (1) Let the principal be P and rate of interest be r %
According to the question,

$\frac{30P}{100}=\frac{P\times R\times6}{100}$

$\Rightarrow 30=6R$

$\Rightarrow R=5$

Now, let interest be equal to principal in T years.

$\therefore P=\frac{P\times5\times T}{100}$

$\Rightarrow T=\frac{100}{5}=20$ years.

9. (3) Let the period of time be T years. Then,

$\frac{400\times5\times T}{100}=\frac{500\times4\times6.25}{100}$

$\Rightarrow T=\frac{500\times4\times6.25}{400\times5}=\frac{25}{4}$

$=6\frac{1}{4}$ years

10. (2) Let the annual rate of interest = r%
Time = r years
Let the principal be x.

$\therefore$ Interest = $\frac{x}{16}$

According to the question,

$\frac{x}{16}=\frac{x\times r\times r}{100}$ [$\because$ r = t]

$\Rightarrow 16r^2=100$

$\Rightarrow r^2=\frac{100}{16}=\frac{25}{4}$

$\therefore r=\sqrt{\frac{25}{4}}=\frac{5}{2}=2\frac{1}{2}\%$

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11. (1) Let the larger part of the sum be x

$\therefore$ Smaller part = ₹ $(12000 - x)$

According to the queation,

$$\frac{x \times 3 \times 12}{100} = \frac{(12000-x) \times 9 \times 16}{2 \times 100}$$

$\Rightarrow 36x = (12000 - x)\,72$

$\Rightarrow x = (12000 - x) \times 2$

$\Rightarrow x + 2x = 24000$

$\Rightarrow 3x = 24000$

$$\Rightarrow x = \frac{24000}{3} = ₹\,8000$$

12. (2) Let the principal be x and rate be y% per annum.

According to the question,

$$\therefore \text{SI} = \frac{P \times R \times T}{100}$$

$$\Rightarrow \frac{x}{4} = \frac{x \times y \times y}{100}$$

$$\Rightarrow y^2 = \frac{100}{4} = 25$$

$\Rightarrow y = \sqrt{25} = 5\%$ per annum

13. (3) Let the sum lent be x.

$$\therefore \frac{x \times 7.5 \times 5}{100} - \frac{x \times 7.5 \times 4}{100} = 150$$

$$\Rightarrow \frac{x \times 7.5 \times 1}{100} = 150$$

$$\Rightarrow x = \frac{150 \times 100}{7.5} = ₹\,2000$$

14. (1) Let first part be x and second part be$(1750 - x)$

According to the question,

$$x \times \frac{8}{100} = (1750 - x) \times \frac{6}{100}$$

$\Rightarrow 8x + 6x = 1750 \times 6$

$\Rightarrow 14x = 1750 \times 6$

$$\Rightarrow x = \frac{1750 \times 6}{14} = ₹\,750$$

$\therefore$ Interest = 8% of 750

$$= 750 \times \frac{8}{100} = ₹\,60$$

15. (3) Let the period of time be T years.

$$\therefore 800 + \frac{800 \times 12 \times T}{100}$$

$$= 910 + \frac{910 \times 10 \times T}{100}$$

$\Rightarrow 800 + 96\,T = 910 + 91T$

$\Rightarrow 96\,T - 91\,T = 910 - 800$

$\Rightarrow 5T = 110$

$$\Rightarrow T = \frac{110}{5} = 22 \text{ years.}$$

16. (3) $\dfrac{\text{Simple interest}}{\text{Principal}} = \dfrac{1}{9}$

If the annual rate of interest be r%, then

$$\text{Rate} = \frac{\text{S.I} \times 100}{\text{Principal} \times \text{Time}}$$

$$\Rightarrow r = \frac{1}{9} \times \frac{100}{r}$$

$$\Rightarrow r^2 = \frac{100}{9}$$

$$\Rightarrow r = \sqrt{\frac{100}{9}} = \frac{10}{3} = 3\frac{1}{3}\%$$

17. (2) Let 'r' be the rate of interest

$$190 = \frac{500 \times 4 \times r}{100} + \frac{600 \times 3 \times r}{100}$$

$\Rightarrow 20r + 18r = 190$

$\Rightarrow 38r = 190$

$$\Rightarrow r = \frac{190}{38} = 5\%$$

18. (2) $\dfrac{500 \times 2 \times R_1}{100} - \dfrac{500 \times 2 \times R_2}{100}$

$= 2.5$, where R & R_2 are rate% of both banks

$\Rightarrow 10\,(R_1 - R_2) = 2.5$

$$\Rightarrow R_1 - R_2 = \frac{2.5}{10}$$

$= 0.25$ % per annum

19. (3) Let the principal be x.

$$\text{Time} = \frac{\text{SI} \times 100}{\text{Principal} \times \text{Rate}}$$

$$= \frac{x \times 100 \times 3}{x \times 50} = 6 \text{ years}$$

20. (2) $\dfrac{P \times r \times 1}{100} = \dfrac{P \times 5 \times 2}{100}$

[$\because$ Capital is same in both cases]

$r \times 1 = 5 \times 2$

$\Rightarrow r = 10\%$

21. (1) S.I.

$$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$$

$$\therefore \frac{4000 \times 3 \times x}{100}$$

$$= \frac{5000 \times 2 \times 12}{100}$$

$$\Rightarrow x = \frac{5 \times 2 \times 12}{4 \times 3}$$

$= 10\%$ per annum

22. (4) S.I. $= \dfrac{P \times R \times T}{100}$

$$\therefore y = \frac{x \times T \times R}{100}$$

and $z = \dfrac{y \times T \times R}{100}$

So, $\dfrac{y}{z} = \dfrac{x}{y} \Rightarrow y^2 = zx$

23. (1) Amount lent at 8% rate of interest = ₹ x

$\therefore$ Amount lent at $\frac{4}{3}\%$ rate of interest = ₹ $(20,000 - x)$

$$\therefore \text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\therefore \frac{x \times 8 \times 1}{100} + \frac{(20,000 - x) \times \frac{4}{3} \times 1}{100}$$

$= 800$

$$\Rightarrow \frac{2x}{25} + \frac{20,000 - x}{75} = 800$$

$$\Rightarrow \frac{6x + 20,000 - x}{75} = 800$$

$\Rightarrow 5x + 20,000 = 75 \times 800$

$= 60,000$

$\Rightarrow 5x = 60,000\text{-}20,000 = 40,000$

$$\Rightarrow x = \frac{40,000}{5} = ₹\,8000$$

24. (3) Let amount invested in each company be Rs. x.

$$\text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

According to the question,

$$\frac{x \times 15 \times 5}{100} - \frac{x \times 12 \times 4}{100}$$

$= 1350$

$$\Rightarrow \frac{75x}{100} - \frac{48x}{100} = 1350$$

$$\Rightarrow \frac{27x}{100} = 1350$$

$$\Rightarrow x = \frac{1350 \times 100}{27} = \text{Rs. } 5000$$

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25. (3) True discount

$$= \frac{\text{Amount} \times \text{Rate} \times \text{Time}}{100 + (\text{Rate} \times \text{Time})}$$

$$= \frac{2400 \times 5 \times 4}{100 + (5 \times 4)}$$

$$= \frac{2400 \times 5 \times 4}{120} = \text{Rs. } 400$$

$$\text{S.I.} = \frac{2400 \times 5 \times 4}{100} = \text{Rs. } 480$$

Required difference
= Rs. (480 – 400) = Rs. 80

TYPE-V

1. (4) Let the sum lent at the rate of interest 5% per annum is x and at the rate of interest 8% per annum is (1550 – x)
According to the question,

$$\frac{x \times 5 \times 3}{100} + \frac{(1550 - x) \times 8 \times 3}{100} = 300$$

$$\Rightarrow \frac{15x}{100} + \frac{37200 - 24x}{100} = 300$$

$\Rightarrow 15x + 37200 - 24x = 300 \times 100$
$\Rightarrow 9x = 7200$
$\therefore x = ₹\ 800$ and,
$1550 - x = 1550 - 800 = ₹\ 750$
∴ Ratio of money lent at 5% to that at 8% = 800 : 750 = 16 : 15

2. (2) Let the sum of x be lent at the rate of 4% and (5000 – x) at the rate of 5%

$$\therefore \frac{x \times 4 \times 2}{100} + \frac{(5000 - x) \times 5 \times 2}{100} = 440$$

$\Rightarrow 8x + 50000 - 10x = 44000$
$\Rightarrow 2x = 50000 - 44000 = 6000$
$\Rightarrow x = ₹\ 3000$
$\therefore ₹\ (5000 - x)$
$= ₹\ (5000 - 3000) = ₹\ 2000$
Now, Required ratio
= 3000 : 2000 = 3 : 2

3. (4) Required ratio = $5 : \frac{2}{5} = 25 : 2$

$$\frac{\text{loan amount}}{\text{Interest amount}} = \frac{5}{2}$$

$$\Rightarrow \text{Interest rate} = \frac{2}{5}$$

$$\left[\because \frac{P+I}{I} = \frac{5}{2} \Rightarrow \frac{P}{I} + 1 = \frac{5}{2}\right.$$

$$\left.\Rightarrow \frac{P}{I} = \frac{3}{2}, \text{then } I = \frac{2}{5}\right]$$

$$\frac{\text{loan amount}}{\text{Interest rate}} = \frac{5}{2/5}$$

$$= \frac{25}{2} \text{ or } 25:2$$

4. (1) $P_1 : P_2 : P_3 = \frac{1}{r_1 t_1} : \frac{1}{r_2 t_2} : \frac{1}{r_3 t_3}$

$$= \frac{1}{6 \times 10} : \frac{1}{10 \times 12} : \frac{1}{12 \times 15}$$

$$= \frac{1}{60} : \frac{1}{120} : \frac{1}{180}$$

= 6 : 3 : 2

5. (3) **Case-I.**
Interest = 5x – 4x = x

$$\therefore x = \frac{4x \times R \times T}{100}$$

$$\Rightarrow T = \frac{25}{R} \text{ years}$$

Case-II.

$$T = \frac{25}{R} + 3 = \left(\frac{25 + 3R}{R}\right) \text{years}$$

SI = 7y – 5y = 2y

$$\therefore 2y = \frac{5y \times R \times (25 + 3R)}{R \times 100}$$

$\Rightarrow 40 = 25 + 3R$
$\Rightarrow 3R = 40 - 25 = 15\ \%$

$$\Rightarrow R = \frac{15}{3} = 5\%$$

6. (4) $\frac{\text{Principal}}{\text{Amount}} = \frac{10}{12}$

$$\frac{\text{Amount}}{\text{Principal}} = \frac{\text{Principal} + \text{interest}}{\text{Principal}}$$

$$= \frac{12}{10}$$

$$\Rightarrow 1 + \frac{\text{Interest}}{\text{Principal}} = \frac{12}{10}$$

$$\Rightarrow \frac{\text{Interest}}{\text{Principal}} = \frac{2}{10} = \frac{1}{5}$$

$$\therefore \text{Rate} = \frac{1}{5} \times 100 = 20\%$$

7. (2) $\text{Time} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Rate}}$

$$= \frac{3}{10} \times \frac{100}{10} = 3 \text{ years}$$

8. (1) First part = Rs. x and second part = (12000 – x)

$$\therefore \frac{x \times 3 \times 12}{100}$$

$$= \frac{(12000 - x) \times 9 \times 16}{200}$$

$$\Rightarrow \frac{x}{12000 - x}$$

$$= \frac{9 \times 16 \times 100}{3 \times 12 \times 200} = \frac{2}{1} = 2:1$$

9. (1) Principal : Interest = 25 : 1
$\Rightarrow$ Interest : Principal = 1 : 25

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{1}{25} \times 100 = 4\% \text{ per annum}$$

10. (2) $\frac{\text{Principal}}{\text{Interest}} = \frac{10}{3}$

$$\Rightarrow \frac{\text{Interest}}{\text{Principal}} = \frac{3}{10}$$

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{3}{10} \times \frac{100}{5} = 6\% \text{ per annum}$$

TYPE-VI

1. (3) Interest = ₹. (480–400) = ₹ 80

$$\therefore 80 = \frac{400 \times r \times 4}{100} \Rightarrow r = 5$$

Now, r = 7% (2% increase)

$$\therefore \text{S.I.} = \frac{400 \times 7 \times 4}{100} = 112$$

∴ Amount = ₹ (400+112) = ₹ 512

2. (1) Let his capital be x.
According to the question,

$$\frac{x \times 11.5}{100} - \frac{x \times 10}{100} = 55.50$$

or $(11.5 - 10)x = 5550$
or $1.5x = 5550$

$$\text{or } x = \frac{5550}{1.5} = ₹\ 3700$$

3. (1) Change in SI

$$= \left(\frac{25}{2} - 10\right)\% = \frac{5}{2}\%$$

$$\therefore \frac{5}{2}\% \text{ of principal} = ₹\ 1250$$

∴ Principal

$$= ₹\ \frac{1250 \times 2 \times 100}{5} = ₹\ 50000$$

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4. (1) Let the sum = P and original rate = R% per annum.
Then,

$$\frac{P\times(R+3)\times 2}{100}-\frac{P\times R\times 2}{100}=72$$

$$\Rightarrow \frac{P\times 3\times 2}{100}=72$$

$$\Rightarrow P=\frac{72\times 100}{3\times 2}=₹\ 1200$$

5. (4) If the sum lent be Rs. x, then

$$\frac{x\times 25\times 3}{100}=540$$

$$\Rightarrow x=\frac{540\times 100}{25\times 3}=₹\ 7200$$

6. (1) $\frac{P\times 1\times 2}{100}=24$

$$\Rightarrow P=\frac{2400}{2}=₹\ 1200$$

7. (3) If the capital after tax deduction be x, then

$x\times(4-3.75)\%=48$

$$\Rightarrow\frac{x\times 0.25}{100}=48$$

$$\Rightarrow\frac{x\times 25}{10000}=48$$

$$\Rightarrow\frac{x}{400}=48$$

$\Rightarrow x=48\times 400=₹\ 19200$

$\therefore$ Required capital

$$=\frac{19200\times 100}{96}=₹\ 20000$$

8. (1) If the principal be x, then

$$\frac{x\times 3\times 2}{100}=300$$

$$\Rightarrow x=\frac{300\times 100}{3\times 2}=₹\ 5000$$

9. (4) S.I. = 3264 − 2400 = ₹ 864

$$\text{Rate}=\frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Time}}$$

$$=\frac{864\times 100}{2400\times 4}=9\%\text{ per annum}$$

New rate = 10% per annum

$$\therefore \text{S.I.}=\frac{2400\times 10\times 4}{100}=₹\ 960$$

$\therefore$ Amount = 2400 + 960
= ₹ 3360

10. (4) S.I. = ₹ (920 − 800)
= ₹ 120

$$\therefore \text{Rate}=\frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Time}}$$

$$=\frac{120\times 100}{800\times 3}$$

= 5% per annum
New rate = 8% per annum

$$\therefore \text{S.I.}=\frac{800\times 3\times 8}{100}=₹\ 192$$

$\therefore$ Amount = (800 + 192)
= ₹ 992

11. (1) Case I,
S.I. = 920 − 800 = ₹ 120

$$\text{Rate}=\frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Time}}$$

$$=\frac{120\times 100}{800\times 3}=5\%\text{ per annum}$$

Case II,
Rate = 8% per annum

$$\text{S.I.}=\frac{800\times 8\times 3}{100}=₹\ 192$$

$\therefore$ Amount = Principal + S.I.
= (800 + 192) = ₹ 992

12. (1) S.I. = 2352 − 2100 = ₹ 252

$$\text{Rate}=\frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Time}}$$

$$=\frac{252\times 100}{2100\times 2}$$

= 6% per annum
New rate = 5%

$$\therefore \text{S.I.}=\frac{252\times 5}{6}=₹\ 210$$

13. (3) S.I. = 956 − 800 = Rs. 156

$$\therefore \text{Rate}=\frac{\text{S.I.}\times 100}{\text{Principal}\times\text{Time}}$$

$$=\frac{156\times 100}{800\times 3}=6.5\%$$

New rate = (6.5 + 4)%
= 10.5%

$$\therefore \text{S.I.}=\frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$$

$$=\frac{800\times 3\times 10.5}{100}=\text{Rs. }252$$

$\therefore$ Amount = Rs.(800 + 252)
= Rs.1052

14. (4) Amount deposited in bank = Rs. x (let)

Difference of rates $= 5-\frac{7}{2}$

$$=\frac{3}{2}\%\text{ per annum}$$

$\therefore$ S.I.

$$=\frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$$

$$\Rightarrow\frac{x\times 1\times 3}{100\times 2}=105$$

$$\Rightarrow x=\frac{105\times 200}{3}=\text{Rs. }7000$$

TYPE-VII

1. (1) Let x be lent at 8%, then (10000 − x) is lent at 10%.
Accordingly,

$$\frac{10000\times 9.2\times t}{100}=\frac{x\times 8\times t}{100}+\frac{(10000-x)\times 10\times t}{100}$$

$$\Rightarrow\frac{92000t}{100}=\frac{8xt}{100}+\frac{(10000-x)10t}{100}$$

$\Rightarrow 92000t = 8xt + (10000 - x)\,10t$
$\Rightarrow 92000 = 8x + 100000 - 10x$
$\Rightarrow 2x = 8000$
$\Rightarrow x = 4000$
$\therefore$ First part = ₹ 4000
Second part = ₹. 6000

2. (1) Let x be lent on 8%.
$\therefore (1000 - x)$ is lent on 10%.
Interest = 9.2% of 1000 = ₹ 92

$$\therefore 92=\frac{x\times 8}{100}+\left(\frac{1000-x}{100}\right)\times 10$$

$\Rightarrow 8x + 10000 - 10x = 9200$
$\Rightarrow -2x = 9200 - 10000$

$$\Rightarrow x=\frac{800}{2}=₹\ 400=\text{first part}$$

$\therefore$ Second part = ₹ 600

3. (1) Interest
= (7000 + 630 × 8) − 12000
= (7000 + 5040) − 12000
= 12040 − 12000 = ₹ 40
Total Principal
= 5000 + 4370 + 3740 + 3110 + 2480 + 1850 + 1220 + 590
= ₹ 22360

$$\text{Rate}=\frac{40\times 100\times 12}{22360\times 1}=2.1\text{ per cent}$$

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4. (4) Let the sum be ₹ 100.
For initial six months, Interest

$= 100 \times \frac{6}{100} \times \frac{6}{12} = 3\%$

Now, sum = 100 + 3 = ₹ 103
For another six months,
Interest

$= 103 \times \frac{6}{100} \times \frac{6}{12} = 3.09$

∴ Rate of interest per annum
= 3 + 3.09 = 6.09%

5. (3) Let the person have ₹ 100.
Then SI for 1 year

$= ₹\left(\frac{40\times15\times1}{100} + \frac{30\times10\times1}{100} + \frac{30\times18\times1}{100}\right)$

= ₹ (6 + 3 + 5.4) = ₹ 14.4
∴ Rate of interest on whole sum
= 14.4%

6. (4) SI earned after two years

$= \frac{15600\times10\times2}{100} = ₹\ 3120$

∴ Principal for next two years
= ₹ (15600 + 3120)
= ₹ 18720
SI earned at the end of fourth year $= \frac{18720\times10\times1}{100} = ₹\ 1872$

7. (1) Let x be lent at 10% per annum.
∴ (1500 − x) is lent at 7% per annum.
Now,

$\frac{x\times10\times3}{100} + \frac{(1500-x)\times7\times3}{100} = 396$

$\Rightarrow 30x + 31500 - 21x = 39600$

$\Rightarrow 9x = 39600 - 31500$

$\Rightarrow x = \frac{8100}{9} = ₹\ 900$

8. (2) Let each instalment be x.
Then,

$\left(x + \frac{x\times4\times1}{100}\right) + \left(x + \frac{x\times4\times2}{100}\right) + \left(x + \frac{x\times4\times3}{100}\right) + x = 848$

$\Rightarrow \left(x + \frac{x}{25}\right) + \left(x + \frac{2x}{25}\right) + \left(x + \frac{3x}{25}\right) + x = 848$

$\Rightarrow \frac{26x}{25} + \frac{27x}{25} + \frac{28x}{25} + x = 848$

$\Rightarrow \frac{26x + 27x + 28x + 25x}{25} = 848$

$\Rightarrow 106x = 848 \times 25$

$\Rightarrow x = \frac{848\times25}{106} = ₹\ 200$

9. (3) Remaining amount
= ₹ (50000 − (8000 + 24000))
= ₹18000
Let ₹ 18000 be lent at the rate of r% p.a.
According to the question,

$\frac{8000\times11\times1}{2\times100} + \frac{24000\times6\times1}{100} + \frac{18000\times r\times1}{100} = 3680$

$\Rightarrow 440 + 1440 + 180r = 3680$
$\Rightarrow 1880 + 180r = 3680$
$\Rightarrow 180r = 3680 - 1880 = 1800$

$\Rightarrow r = \frac{1800}{180} = 10\%$

10. (2) Let the principal be x.

$\therefore I_1 = \frac{x\times10\times1}{2\times100} = \frac{x}{20}$

$I_2 = \frac{x\times9\times1}{3\times100} = \frac{3x}{20}$

$I_3 = \frac{x}{6} \times \frac{12\times1}{100} = \frac{x}{50}$

$\therefore I_1 + I_2 + I_3$

$= \left(\frac{x}{20} + \frac{3x}{100} + \frac{x}{50}\right)$

$= \left(\frac{5x + 3x + 2x}{100}\right) = \frac{x}{10}$

∴ Average annual rate = 10%

11. (3) If the principal be x, then
Simple interest = (770 − x)

$\therefore$ Principal $= \frac{\text{S.I}\times100}{\text{Time}\times\text{Rate}}$

$\Rightarrow x = \frac{(770-x)\times100}{4\times10}$

$\Rightarrow 2x = (770 - x) \times 5$
$\Rightarrow 2x + 5x = 770 \times 5$
$\Rightarrow 7x = 770 \times 5$

$\therefore x = \frac{770\times5}{7} = ₹\ 550$

12. (4) S.I. on ₹ 12000

$= \frac{12000\times8\times1}{100} = ₹\ 960$

Desired gain on ₹ 20000

$= 20000 \times \frac{10}{100} = ₹\ 2000$

∴ S.I. on ₹ 8000 = 2000 − 960
= ₹ 1040

$\therefore$ Rate $= \frac{\text{S.I}\times100}{\text{Principal}\times\text{Time}}$

$= \frac{1040\times100}{8000}$

= 13% per annum

13. (2) S.I. after five years

$= \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$

$= \frac{12000\times5\times10}{100} = ₹\ 6000$

Interest earned
= ₹— (6000 − 3320) = ₹ 2680

$\therefore$ Rate $= \frac{\text{S.I}\times100}{\text{Principal}\times\text{Time}}$

$= \frac{2680\times100}{12000\times3} = \frac{67}{9} = 7\frac{4}{9}\%$

14. (4) **Case I**
Let principal be x then Amount
= 3x
S.I. = 2x

$\therefore$ Rate $= \frac{\text{S.I}\times100}{\text{Principal}\times\text{Time}}$

$= \frac{2x\times100}{x\times8} = 25\%$

Case II

Time $= \frac{\text{S.I}\times100}{\text{Principle}\times\text{Rate}}$

$= \frac{3x\times100}{x\times25} = 12$ years

15. (2) Required percent

$= \frac{1}{4}\times3 + \frac{2}{3}\times5 + \left(1 - \frac{1}{4} - \frac{2}{3}\right)\times11$

$= \frac{3}{4} + \frac{10}{3} + \frac{11}{12} = \frac{9+40+11}{12} = 5\%$



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16. (1) $120 = \frac{300\times4\times r}{100} + \frac{400\times3\times r}{100}$

$\Rightarrow 24r = 120$

$\Rightarrow r = \frac{120}{24} = 5\%$ per annum

17. (3) If the sum of money be x, then

$\frac{x\times6\times3}{100} + \frac{x\times5\times9}{100} + \frac{x\times3\times13}{100}$

$= 8160$

$\Rightarrow 18x + 45x + 39x = 816000$

$\Rightarrow 102x = 816000$

$\Rightarrow x = \frac{816000}{102} = ₹\ 8000$

18. (3) If each amount lent be x, then

$\frac{x\times7\times4}{100} + \frac{x\times5\times4}{100} = 960$

$\Rightarrow \frac{48x}{100} = 960$

$\Rightarrow x = \frac{960\times100}{48} = ₹\ 2000$

19. (3) Let the money lent to Tom be Rs. x.

Simple interest

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$\therefore \frac{500\times8\times4}{100} + \frac{x\times8\times4}{100}$

$= 210$

$\Rightarrow 160 + \frac{32x}{100} = 210$

$\Rightarrow \frac{32x}{100} = 210 - 160 = 50$

$\Rightarrow x = \frac{50\times100}{32} =$ Rs. 156.25

20. (1) Rate $= \frac{20}{3}\%$ per annum

$\therefore$ S.I.

$= \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$

$= \frac{2600\times20\times T}{3\times100}$

$\therefore$ Required Time = 3 years

21. (1) Principal = Rs. (60000 – 10000)

= Rs. 50000

$\therefore$ S.I. $= \frac{50000\times15\times2}{100}$

= Rs. 15000

22. (2) Let the loans taken by A, B and C be Rs. x, Rs. y and Rs. z respectively.

$\therefore x + y + z =$ Rs. 7930

S.I. $= \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$

According to the question,

$x + \frac{x\times2\times5}{100} = y + \frac{y\times3\times5}{100}$

$= z + \frac{z\times4\times5}{100}$

$\Rightarrow \frac{100x + 10x}{100}$

$= \frac{100y + 15y}{100} = \frac{100z + 20z}{100}$

$\Rightarrow 110x = 115y = 120z$

$\Rightarrow 22x = 23y = 24z$

$\Rightarrow \frac{22x}{6072} = \frac{23y}{6072} = \frac{24z}{6072}$

[LCM of 22, 23 and 24 = 6072]

$\Rightarrow \frac{x}{276} = \frac{y}{264} = \frac{z}{253}$

$\therefore x : y : z = 276 : 264 : 253$

Sum of terms of ratio

$= 276 + 264 + 253 = 793$

$\therefore$ A's loan $= \frac{276}{793} \times 7930$

= Rs. 2760

23. (2) Remaining amount

= Rs. (16000 – 4000)

= Rs. 12000

$\therefore$ S.I.

$= \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$

$= \frac{12000\times15\times12}{12\times100} =$ Rs. 1800

$\therefore$ Total amount paid

= Rs. (16000 + 1800)

= Rs. 17800

24. (1) S.I. after 1 year

$= \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$

$= \frac{x\times5}{100} =$ Rs. $\frac{x}{20}$

Principal for 2nd year

$=$ Rs. $\left(2x + \frac{x}{20}\right) =$ Rs. $\frac{41x}{20}$

S.I. after second year

$=$ Rs. $\left(\frac{41x}{20}\times\frac{5}{100}\right)$

$=$ Rs. $\frac{41x}{400}$

Principal for third year

$=$ Rs. $\left(3x + \frac{41x}{400}\right)$

$=$ Rs. $\left(\frac{1200x + 41x}{400}\right)$

$=$ Rs. $\frac{1241x}{400}$

$\therefore$ S.I. after 3rd year

$=$ Rs. $\left(\frac{1241x}{400}\times\frac{5}{100}\right)$

$=$ Rs. $\frac{1241x}{8000}$

$\therefore$ Required amount

$=$ Rs. $\left(3x + \frac{1241x}{8000}\right)$

$=$ Rs. $\left(\frac{24000x + 1241x}{8000}\right)$

$=$ Rs. $\left(\frac{25241x}{8000}\right)$

25. (3) S.I.

$= \frac{\text{Principal}\times\text{Time}\times\text{Rate}}{100}$

$= \frac{100000\times6\times6}{100} =$ Rs. 36000

Total pocket money

$= 6 \times 2500 =$ Rs. 15000

Total expenses of trust

$= 6 \times 500 =$ Rs. 3000

Total expenses

= Rs. (15000 + 3000)

= Rs. 18000

$\therefore$ Amount to be received by the boy

= Rs. (100000 + 36000 – 18000)

= Rs. 118000

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TEST YOURSELF

1. A Co-operative Bank gives H.B. loans under the condition that if the loan be cleared with interest in five years, the rate of simple interest per year is 5%, otherwise it will be 7%. Mr. Rahim and Mr. Ram take the same amount of H.B. loan and clear the loan with interest in 5 and 8 years respectively. If Ram pays Rs. 62,000 more, what is the amount of loan taken by each of them ?
(1) Rs. 200000 (2) Rs. 180000
(3) Rs. 190000 (4) Rs. 210000

2. A person on retirement gets Rs. 3,20,000 from his gratuity and P.F. He wants to invest this amount in Post Office and Bank in such a way that he earns a total interest of Rs. 27,600 every year. If the annual rate of interest in Post Office and Bank be respectively 9% and 8%, What are the amounts invested in Post Office and Bank respectively ?
(1) Rs. 200000, Rs. 120000
(2) Rs. 180000 and Rs. 140000
(3) Rs. 185000, Rs. 135000
(4) None of these

3. Rahim lent a sum to Anil at a simple interest of 10% per annum, and at the same time lent to Sunil a sum, which was Rs. 2000 more than the amount lent to Anil at the simple interest of 12% per annum. At the end of 3 years, both Anil and Sunil returned the principal and interest to Rahim. If Rahim got Rs. 1020 more interest from Sunil than that from Anil, how much did each borrow from Rahim ?
(1) Rs. 2500, Rs. 4500
(2) Rs. 4000, Rs. 6000
(3) Rs. 5000, Rs. 7000
(4) Rs. 6000, Rs. 8000

4. A person made a fixed deposit of Rs. 30,000 in a bank for 5 years at 10% simple interest per annum. He had to withdraw the whole amount after 3 years to meet the expenses of his daughter's marriage and he received Rs. 7800 less than what he would have got after 5 years. What is the rate of simple interest per annum paid by the bank for this premature encashment ?
(1) 6% (2) 7%
(3) 8% (4) 9%

5. In 4 years, ₹ 6000 amounts to ₹ 8,000. In what time at the same rate will ₹ 525 amount to ₹ 700 ?
(1) 5 years (2) 3 years
(3) 4 years (4) None of these

6. Find the interest on ₹ 1460 at 10% from 5th February, 1992 to 25th April, 1992.
(1) ₹ 32 (2) ₹ 36
(3) ₹ 40 (4) ₹ 34

7. Find the amount Ram will get after 2 years when he invests ₹ 15000 at 15% interest.
(1) ₹ 18500 (2) ₹ 19500
(3) ₹ 17500 (4) ₹ 16500

8. At what rate per annum will a sum of ₹ 5000 amount to ₹ 6000 in 4 years?
(1) 6% Percent Per annum
(2) 4% Percent Per annum
(3) 5% Percent Per annum
(4) 4.5% Percent Per annum

9. Ram lent ₹ 1200 to Shyam for 5 years and ₹ 1500 to Mohan for 2 years received altogether ₹ 900 as interest. Find the rate per annum.
(1) 8.5% (2) 8%
(3) 9% (4) 10%

10. A certain sum of money amounts to Rs. 1680 in 3 years and to ₹ 1800 in 5 years. Find the sum and the rate of interest.
(1) ₹ 1500; 4% (2) ₹ 1200; 4%
(3) ₹ 1600; 5% (4) ₹ 1800; 5%

11. In how many years will a sum of money double itself at 5% rate of interest?
(1) 18 years (2) 20 years
(3) 22 years (4) 15 years

12. A man lends a certain sum of money and gets an interest equal to $\frac{1}{16}$th of the principal. The time for which money was lent is equal to the rate of interest. Find the rate of interest per annum.
(1) 4% (2) 3.5%
(3) 3% (4) 2.5%

13. A man borrowed ₹ 16000 from two persons. He paid 6% interest to one and 10% per annum to the other. In one year he paid total interest ₹1120. How much did he borrow at each rate?
(1) ₹ 10000 ; ₹ 6000
(2) ₹ 12000 ; ₹ 4000
(3) ₹ 11000 ; ₹ 5000
(4) ₹ 12500 ; ₹ 3500

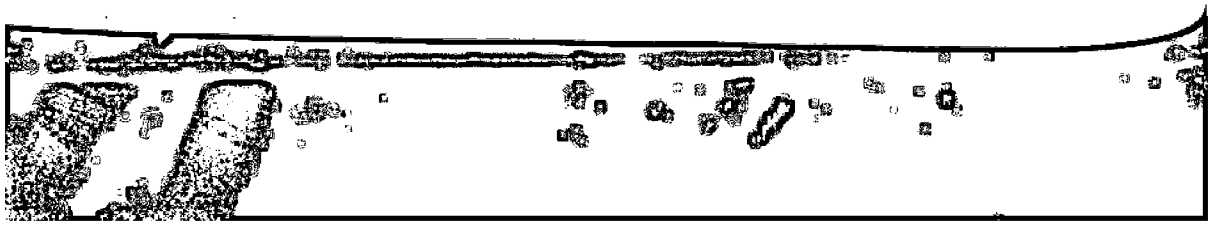
14. A borrowed ₹ 1500 at 4% per annum and ₹1400 at 5% per annum for the same period. He paid ₹ 390 as total interest. Find the time for which he borrowed the sum.
(1) 3.5 years (2) 2.5 years
(3) 3 years (4) 4 years

15. Find the annual instalment that will discharge a debt of ₹12900 due in 4 years at 5% per annum simple interest.
(1) ₹ 2750 (2) ₹ 2150
(3) ₹ 2500 (4) ₹ 3000

16. A certain sum of money amounts to ₹ 6780 in 2 years and to ₹ 7360.50 in $3\frac{1}{2}$ years. Find the sum and the rate of interest.
(1) ₹ 6006 ; 6.4 Percent Per annum
(2) ₹ 8006 ; 6.4 Percent Per annum
(3) ₹ 5006 ; 5 Percent Per annum
(4) ₹ 5506 ; 5 Percent Per annum

17. If ₹ 5600 amounts to ₹ 6678 in $3\frac{1}{2}$ years, what will ₹ 9600 amount to in $5\frac{1}{4}$ years at the same rate of interest ?
(1) ₹ 12732 (2) ₹ 12372
(3) ₹ 12722 (4) ₹ 12237

18. A man promises to his wife a birthday present, given her each year a number of rupees equal to the number of years in her age. If her birthday falls on August 8, what sum must be placed at simple interest at 7% on January 1 before she is 63 (non leap year) in order to raise the required sum ?
(1) ₹ 1600 (2) ₹ 1550
(3) ₹ 1500 (4) ₹ 1450



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19. It is decided that a loan of ₹ 10,000 will be paid off at the rate of ₹ 800 per month in 15 equal instalments. Find out the rate of return on investment.
(1) 17% P.a. (2) 18% P.a.
(3) 15% P.a. (4) 16% P.a.

20. A person takes loan of ₹ 4,000 on the condition that he would pay it in the monthly instalment of ₹ 500. He has to pay interest @ 6% on the outstanding balances, then find out the average rate of interest received by the creditor.
(1) $3\frac{3}{8}$% Percent Per annum
(2) $2\frac{3}{8}$% Percent Per annum
(3) $4\frac{3}{8}$% Percent Per annum
(4) $3\frac{1}{8}$% Percent Per annum

21. Divide ₹ 6800 into two parts so that S.I. on the first part for $3\frac{1}{3}$ years at 6% may be equal to the interest on the second part for $3\frac{1}{2}$ years at 4% Percent Per annum
(1) ₹ 2600 : ₹ 4200
(2) ₹ 2800 : ₹ 4000
(3) ₹ 2500 : ₹ 4300
(4) ₹ 2700 : ₹ 4100

SHORT ANSWERS

1. (1)	2. (1)	3. (3)	4. (3)
5. (3)	6. (1)	7. (2)	8. (3)
9. (4)	10. (1)	11. (2)	12. (4)
13. (2)	14. (3)	15. (4)	16. (1)
17. (2)	18. (3)	19. (4)	20. (1)
21. (2)			

EXPLANATIONS

1. (1) Let amount of loan per head be Rs. x.

$$\text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\therefore \frac{x \times 7 \times 8}{100} - \frac{x \times 5 \times 5}{100} = 62000$$

$$\Rightarrow \frac{56x}{100} - \frac{25x}{100} = 62000$$

$$\Rightarrow 31x = 6200000$$

$$\Rightarrow x = \text{Rs. } 200000$$

2. (1) Let the amount in Post office be Rs. x.
∴ Amount in Bank
= Rs. (320000 – x)

$$\text{S.I.} = \frac{P \times R \times T}{100}$$

$$\therefore \frac{x \times 9}{100} + \frac{(320000 - x) \times 8}{100} = 27600$$

$$\Rightarrow 9x + 2560000 - 8x = 2760000$$

$$\Rightarrow x = 2760000 - 2560000$$

= Rs. 200000
∴ Amount in bank
= Rs. (320000 – 200000)
= Rs. 120000

3. (3) Sum given to Anil = Rs. x
Sum given to Sunil = Rs. $(x + 2000)$

$$\text{S.I.} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\Rightarrow \frac{(x + 2000) \times 12 \times 3}{100} - \frac{x \times 10 \times 3}{100} = 1020$$

$$\Rightarrow 36x + 72000 - 30x = 102000$$

$$\Rightarrow 6x = 102000 - 72000 = 30000$$

$$\Rightarrow x = \text{Rs. } 5000$$

∴ Sum given to Sunil
= Rs. 7000

4. (3) $\text{S.I.} = \frac{P \times R \times T}{100}$
Let the required rate of interest be R% per annum.

$$\therefore \frac{30000 \times 5 \times 10}{100} - \frac{30000 \times 3 \times R}{100} = 7800$$

$$\Rightarrow 15000 - 900R = 7800$$

$$\Rightarrow 900R = 15000 - 7800 = 7200$$

$$\Rightarrow R = \frac{7200}{900} = 8\% \text{ per annum.}$$

5. (3) Case-I,
Interest = 8000 – 6000
= Rs. 2000

$$\text{Rate} = \frac{\text{Interest} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{2000 \times 100}{6000 \times 4} = \frac{25}{3}\%$$

∴ Case-II,

$$\text{Time} = \frac{175 \times 100}{525 \times \frac{25}{3}} = 4 \text{ years}$$

6. (1) P = ₹ 1460
R = 10%
1992 is a leap year
∴ T = (24 + 31 + 25) days = 80 days.

$$I = \frac{PRD}{36500}$$

$$I = \frac{1460 \times 10 \times 80}{36500}$$

I = ₹ 32.
Note : We have excluded 5th February but included 25th

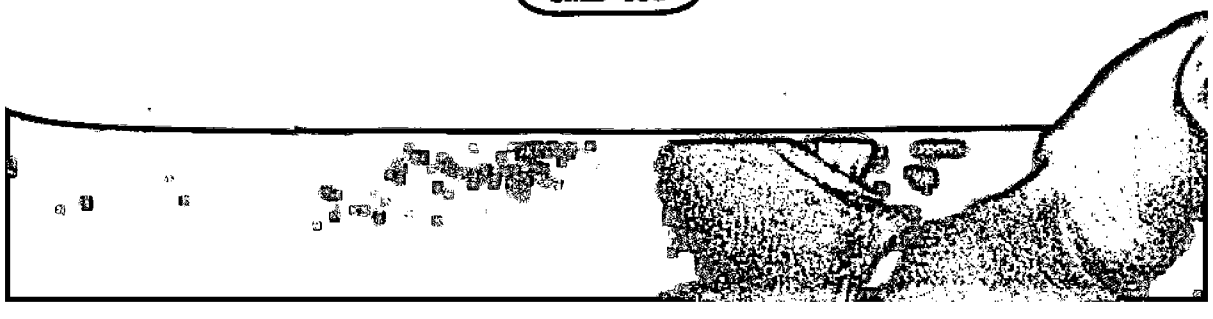
7. (2) Here, P = ₹ 15000
R = 15%
T = 2 years

$$A = P\left(\frac{100 + RT}{100}\right)$$

$$= 15000\left(\frac{100 + 15 \times 2}{100}\right)$$

$$= 15000 \times \frac{130}{100}$$

A = ₹19500.



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8. (3) Here, $P = ₹\ 5000$
$A = ₹\ 6000$
$T = 4$ years
So, $I = A - P$
$= ₹\ (6000 - 5000) = ₹\ 1000$

$$R = \frac{100I}{PT}$$

$$R = \frac{100 \times 1000}{5000 \times 4}$$

$R = 5\%$.

9. (4) $I = I_1 + I_2$

$$I = \frac{P_1RT_1}{100} + \frac{P_1RT_2}{100}$$

$$I = \frac{R}{100}(P_1T_1 + P_2T_2)$$

or, $\boxed{R = \frac{100I}{P_1T_1 + P_2T_2}}$

Here, $I = ₹\ 900$
$P_1 = ₹\ 1200$
$T_1 = 5$ years
$P_2 = ₹\ 1500$
$T_2 = 2$ years

$$R = \frac{100 \times 900}{(1200 \times 5) + (1500 \times 2)}$$

$$R = \frac{90{,}000}{9{,}000}$$

$R = 10\%$.

Note : In case of more than two investment, sum the products of principal and time of each case.

10. (1) $A = P + I$
So, P remains same in both cases.
Only amount of interest is different in two cases because the time period are different.
P + Interest for 5 years = ₹ 1800
and P + Interest for 3 years
= ₹ 1680
On subtraction we get,
Interest for 2 years = ₹ 120
Now, we solve for the case of 3 years.
Interest for 3 years

$$= ₹120 \times \frac{3}{2} = ₹\ 180$$

And amount after 3 years
= ₹1680
Principal (P) = $A - I$
= ₹ (1680 – 180) = ₹ 1500.

$$R = \frac{100I}{PT}$$

$$\Rightarrow R = \frac{100 \times 180}{1500 \times 3} \Rightarrow R = 4\%.$$

Note : Alternatively, we could have solved for 5 years too and got the same answer.

11. (2) A sum doubles itself when amount of interest becomes equal to the principal.
So, $I = P$
Given, $R = 5\%$

$$T = \frac{100I}{PR}$$

On substitution we get,

$$T = \frac{100 \times P}{P \times 5}$$

$T = 20$ years.

12. (4) $I = \frac{PRT}{100}$

Given : $I = \frac{P}{16}$

and $T = R$
So, on substitution we get

$$\frac{P}{16} = \frac{P \times R \times R}{100}$$

$$\Rightarrow R^2 = \frac{100}{16}$$

$$\Rightarrow R = \frac{10}{4}\% = \frac{5}{2}\% = 2\frac{1}{2}\%.$$

13. (2) Let the sum borrowed at 6% be ₹ $x = P_1$
Then the sum borrowed at 10%
= ₹ (16000 – x) = P_2
Time is one year in both cases
$R_1 = 6\%$
$R_2 = 10\%$
$I = I_1 + I_2$

$$I = \frac{P_1R_1T}{100} + \frac{P_2R_2T}{100}$$

$$I = \frac{T}{100}(P_1R_1 + P_2R_2)$$

$$\text{or } P_1R_1 + P_2R_2 = \frac{100I}{T}$$

On substitution we get,
$(x \times 6) + (16000 - x)10$

$$= \frac{100 \times 1120}{1}$$

$\Rightarrow 160000 - 4x = 112000$
$\Rightarrow 4x = 48000$
$\Rightarrow x = ₹\ 12000$
and $16000 - x = ₹\ 4000$.

14. (3) $I = I_1 + I_2$

$$I = \frac{P_1R_1T}{100} + \frac{P_2R_2T}{100}$$

$$\text{or } T = \frac{100I}{P_1R_1 + P_2R_2}$$

$$= \frac{100 \times 390}{(1500 \times 4) + (1400 \times 5)}$$

$$= \frac{39000}{13000}$$

$T = 3$ years.

15. (4) Let each equal annual instalment be x.
First instalment is paid after 1 year and hence will remain with the lender for the remaining (4 – 1) = 3 years.
Similarly, second instalment will remain with the lender for 2 years, third instalment for 1 year and the final fourth instalment remain x as such.
$A = A_1 + A_2 + A_3 + A_4$

$$A = P\left(\frac{100 + RT}{100}\right)$$

$\Rightarrow A$

$$= x\left[\frac{100 + 5 \times 3}{100} + \frac{100 + 5 \times 2}{100} + \frac{100 + 5 \times 1}{100} + \frac{100 + 5 \times 0}{100}\right]$$

$\Rightarrow 12900$

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$= x\left[\frac{115+110+105+100}{100}\right]$

$\Rightarrow 12900 = \frac{430}{100}x$

$\Rightarrow x = \frac{12900\times100}{430}$

$\Rightarrow x = ₹\ 3000$

16. (1) Principal + S.I. for $3\frac{1}{2}$ years
= ₹ 7360.50 ..... (i)
Principal + S.I. for 2 years
= ₹ 6780 ..... (ii)
On subtracting equation (ii) from (i).

S.I. for $1\frac{1}{2}$ years = ₹ 580.50

∴ S.I. for 2 years

$= ₹\left(\frac{580.50\times2\times2}{3}\right) = ₹\ 774$

∴ Principal = ₹ (6780 – 774)
= ₹ 6006
And, rate of interest

$= \frac{774\times100}{6006\times2} = 6.4\%$ per annum.

17. (2) Interest = ₹ (6678 – 5600)
= ₹ 1078

$\text{Rate} = \frac{\text{Interest}\times100}{\text{Principal}\times\text{Time}}$

$= \frac{1078\times100\times2}{5600\times7}$

$= 5\frac{1}{2}\%$ per annum

∴ S.I. on ₹ 9600 for $5\frac{1}{4}$ years

$= ₹\left(\frac{9600}{100}\times\frac{21}{4}\times\frac{11}{2}\right) = ₹\ 2772$

∴ Amount = ₹ (9600 + 2772)
= ₹ 12372

18. (3) Let the sum be ₹ 100.
Number of days from January 1 to August 8 = 31 + 28 + 31 + 30 + 31 + 30 + 31 + 7 = 219 days

$= \frac{219}{365}$ year $= \frac{3}{5}$ year

S.I. on ₹ 100 for $\frac{3}{5}$ year at 7%

$= ₹\left(\frac{100\times3\times7}{100\times5}\right) = ₹\ \frac{21}{5}$

If required money is ₹ $\frac{21}{5}$, sum
= ₹ 100
If required money is Rs. 63, sum

$= ₹\left(100\times\frac{5}{21}\times63\right)$

= ₹ 1500

19. (4) Number of monthly instalments = 15
Monthly instalment = ₹ 800

Time (T) = $\frac{15}{12} = 1\frac{1}{4}$

∴ Total amount paid
= ₹ (800 × 15) = ₹ 12,000
Interest = ₹ (12,000 – 10,000)
= ₹ 2,000
When

Investment	Interest	Years
10,000 ↑	2000 ↑	$1\frac{1}{4}$ ↓
100	?	1

∴ Rate of return

$= \frac{100\times2,000\times1\times4}{10,000\times5} = 16\%$

20. (1) Monthly instalment = ₹ 500
Total loan = ₹ 4000
∴ Number of instalments

$= \frac{4,000}{500} = 8$

Once the payment starts, outstanding balances will go on diminishing.
Hence, from point of view of interest, principal = 4000 + 3500 + 3000 + 2,500 + 2000 + 1500 + 1,000 + 500 = ₹ 18,000
∴ Interest on ₹ 18,000 for 1 month at 6% P.a.

$= \frac{18000\times6\times1}{100\times12} = ₹\ 90$

Average rate of interest

$= \frac{I\times100}{P\times T}$

$\boxed{T = 8\text{ months} = \frac{8}{12}}$ year

$= \frac{90\times100\times12}{4000\times8}$

$= \frac{27}{8}\% = 3\frac{3}{8}\%$

21. (2) Let the first part be x. Then second part = (6800 – x)

Interest on first part for $3\frac{1}{3}$ years at 6%

$= \frac{x\times6\times\frac{10}{3}}{100} = \frac{x}{5}$

Interest on second part for $3\frac{1}{2}$ years at 4%

$= \frac{(6800-x)\times4\times\frac{7}{2}}{100}$

$= ₹\frac{(6800-x)7}{50}$

According to the problem,

$\frac{x}{5} = \frac{(6800-x)7}{50}$

$\Rightarrow 10x = (6800 - x)7$
$\Rightarrow 10x = 47600 - 7x$
$\Rightarrow 17x = 47600$
$\Rightarrow x = 2800$
Hence, first part = ₹ 2800
and second part
= ₹ (6800 – 2800) = ₹ 4000.

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11 COMPOUND INTEREST

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. At what percent per annum will ₹ 3000/- amounts to ₹ 3993/- in 3 years if the interest is compounded annually?
(1) 9% (2) 10%
(3) 11% (4) 13%
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I)

2. The compound interest on ₹ 10,000 in 2 years at 4% per annum, the interest being compounded half-yearly, is :
(1) ₹ 636.80 (2) ₹ 824.32
(3) ₹ 912. 86 (4) ₹ 828. 82
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. In how many years will ₹ 2,000 amounts to ₹ 2,420 at 10% per annum compound interest?
(1) 3 years (2) $2\frac{1}{2}$ years
(3) 2 years (4) $1\frac{1}{2}$ years
(SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

4. In what time will ₹ 1000 becomes ₹ 1331 at 10% per annum compounded annually?
(1) 3 years (2) $2\frac{1}{2}$ years
(3) 2 years (4) $3\frac{1}{2}$ years
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting) & (SSC MTS Exam-. 24.03.2013 (1st Sitting)

5. The principal, which will amount to ₹ 270.40 in 2 years at the rate of 4% per annum compound interest, is
(1) ₹ 200 (2) ₹ 225
(3) ₹ 250 (4) ₹ 220
(SSC CPO S.I. Exam. 05.09.2004)

6. A sum of money on compound interest amounts to ₹ 10648 in 3 years and ₹ 9680 in 2 years. The rate of interest per annum is :
(1) 5% (2) 10%
(3) 15% (4) 20%
(SSC CPO S.I. Exam. 26.05.2005)

7. At what rate per cent per annum will ₹ 2304 amount to ₹ 2500 in 2 years at compound interest ?
(1) $4\frac{1}{2}\%$ (2) $4\frac{1}{5}\%$
(3) $4\frac{1}{6}\%$ (4) $4\frac{1}{3}\%$
(SSC CPO S.I. Exam. 05.09.2004) & (SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

8. A sum becomes ₹ 1,352 in 2 years at 4% per annum compound interest. The sum is
(1) ₹ 1,225 (2) ₹ 1,270
(3) ₹ 1,245 (4) ₹ 1,250
(SSC CGL Prelim Exam. 11.05.2003 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (SSC CISF ASI Exam. 29.08.2010)

9. The compound interest on ₹ 16,000 for 9 months at 20% per annum, interest being compounded quarterly, is
(1) ₹ 2,520 (2) ₹ 2,524
(3) ₹ 2,522 (4) ₹ 2,518
(SSC CPO S.I. Exam. 03.09.2006)

10. If the rate of interest be 4% per annum for first year, 5% per annum for second year and 6% per annum for third year, then the compound interest of ₹ 10,000 for 3 years will be
(1) ₹ 1,600 (2) ₹ 1,625.80
(3) ₹ 1,575.20 (4) ₹ 2,000
(SSC CPO S.I. Exam. 03.09.2006)

11. The compound interest on ₹ 2000 in 2 years if the rate of interest is 4% per annum for the first year and 3% per annum for the second year, will be
(1) ₹ 142.40 (2) ₹ 140.40
(3) ₹ 141.40 (4) ₹ 143.40
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

12. At what rate per annum will ₹ 32000 yield a compound interest of ₹ 5044 in 9 months interest being compounded quarterly?
(1) 20% (2) 32%
(3) 50% (4) 80%
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

13. The compound interest on ₹ 8,000 at 15% per annum for 2 years 4 months, compounded annually is:
(1) ₹ 2980 (2) ₹ 3091
(3) ₹ 3109 (4) ₹ 3100
(SSC CPO S.I. Exam. 16.12.2007)

14. In what time will ₹ 10,000 amount to ₹ 13310 at 20% per annum compounded half yearly?
(1) $1\frac{1}{2}$ years (2) 2 years
(3) $2\frac{1}{2}$ years (4) 3 years
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

15. A certain sum of money yields ₹ 1261 as compound interest for 3 years at 5% per annum. The sum is
(1) ₹ 9000 (2) ₹ 8400
(3) ₹ 7500 (4) ₹ 8000
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

16. A certain sum, invested at 4% per annum compound interest, compounded halfyearly, amounts to ₹ 7,803 at the end of one year. The sum is
(1) ₹ 7,000 (2) ₹ 7,200
(3) ₹ 7,500 (4) ₹ 7,700
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting)

17. A certain sum amounts to ₹ 5,832 in 2 years at 8% per annum compound interest, the sum is
(1) ₹ 5,000 (2) ₹ 5,200
(3) ₹ 5,280 (4) ₹ 5,400
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

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18. The compound interest on ₹ 6,000 at 10% per annum for $1\frac{1}{2}$ years, when the interest being compounded annually, is
(1) ₹ 910 (2) ₹ 870
(3) ₹ 930 (4) ₹ 900
(SSC CPO S.I. Exam. 09.11.2008)

19 In what time ₹ 8,000 will amount to ₹ 9,261 at 10% per annum compound interest, when the interest is compounded half yearly ?
(1) $3\frac{1}{2}$ years (2) $1\frac{1}{2}$ years
(3) $2\frac{1}{2}$ years (4) 2 years
(SSC CPO S.I. Exam. 09.11.2008)

20. At what rate per cent per annum will a sum of ₹ 1,000 amounts to ₹ 1,102.50 in 2 years at compound interest ?
(1) 5% (2) 5.5%
(3) 6% (4) 6.5%
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

21. In how many years will a sum of ₹ 800 at 10% per annum compound interest, compounded semi-annually becomes ₹ 926.10 ?
(1) $1\frac{1}{2}$ years (2) $1\frac{2}{3}$ years
(3) $2\frac{1}{3}$ years (4) $2\frac{1}{2}$ years
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

22. An amount of ₹ 6,000 lent at 5% per annum compound interest for 2 years will become
(1) ₹ 600 (2) ₹ 6,600
(3) ₹ 6,610 (4) ₹ 6,615
(SSC (South Zone) Investigator Exam. 12.09.2010)

23. In what time will ₹ 1000 amounts to ₹ 1331 at 20% per annum, compounded half yearly ?
(1) $1\frac{1}{2}$ years (2) 2 years
(3) 1 year (4) $2\frac{1}{2}$ years
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

24. The compound interest on ₹30,000 at 7% per annum for a certain time is ₹4,347. The time is
(1) 3 years (2) 4 years
(3) 2 years (4) 2.5 years
(SSC Sub-Inspector & LDC Exam. 21.10.2012 (Ist Sitting)

25. A sum of ₹ 8000 will amount to ₹ 8820 in 2 years if the interest is calculated every year. The rate of compound interest is
(1) 6% (2) 7%
(3) 3% (4) 5%
(SSC Sub-Inspector & LDC Exam. 28.10.2012, Ist Sitting)

26. A principal of ₹ 10,000, after 2 years compounded annually, the rate of interest being 10% per annum during the first year and 12% per annum during the second year (in rupees) will amount to :
(1) ₹ 12,000 (2) ₹ 12,320
(3) ₹ 12,500 (4) ₹ 11,320
(SSC Sub-Inspector & LDC Exam. 04.11.2012, Ist Sitting)

27. The sum of money that yields a compound interest of ₹420 during the second year at 5% p.a is
(1) ₹4,000 (2) ₹42,000
(3) ₹8,000 (4) ₹21,000
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

28. A man saves ₹ 2000 at the end of each year and invests the money at 5% compound interest. At the end of 3 years he will have :
(1) ₹ 4305 (2) ₹ 6305
(3) ₹ 4205 (4) ₹ 2205
(SSC Multi-Tasking Staff Exam. 10.03.2013)

29. The time in which ₹ 80,000 amounts to ₹ 92,610 at 10% p.a. compound interest, interest being compounded semi annually is :
(1) $1\frac{1}{2}$ years (2) 2 years
(3) $2\frac{1}{2}$ years (4) 3 years
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

30. A man borrows ₹ 21000 at 10% compound interest. How much he has to pay annually at the end of each year, to settle his loan in two years ?
(1) ₹ 12000 (2) ₹ 12100
(3) ₹ 12200 (4) ₹ 12300
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

31. ₹ 800 at 5% per annum compounded annually will amount to ₹ 882 in
(1) 1 year (2) 2 years
(3) 3 years (4) 4 years
(SSC Constable (GD) Exam. 12.05.2013)

32. The compound interest on ₹ 5,000 for 3 years at 10% p. a. will amount to
(1) ₹ 1,654 (2) ₹ 1,655
(3) ₹ 1,600 (4) ₹ 1,565
(SSC Graduate Level Tier-II Exam. 29.09.2013)

33. A sum of ₹ 3,200 invested at 10% p.a. compounded quarterly amounts to ₹ 3,362. Compute the time period.
(1) $\frac{1}{2}$ year (2) 1 year
(3) 2 years (4) $\frac{3}{4}$ year
(SSC Graduate Level Tier-II Exam. 29.09.2013)

34. The compound interest on a certain sum of money for 2 years at 5% is ₹ 328, then the sum is
(1) ₹ 3000 (2) ₹ 3600
(3) ₹ 3200 (4) ₹ 3400
(SSC CGL Tier-II Exam. 21.09.2014)

35. Two years ago, the value of my motorbike was ₹ 62500. If the value depreciates by 4% every year, now its value is
(1) ₹ 56700 (2) ₹ 57600
(3) ₹ 57500 (4) ₹ 55700
(SSC CGL Tier-II Exam. 21.09.2014)

36. The compound interest on a sum of money for 2 years is ₹ 615 and the simple interest for the same period is ₹ 600. Find the principal.
(1) ₹ 6,500 (2) ₹ 6,000
(3) ₹ 8,000 (4) ₹ 9,500
(SSC CHSL DEO Exam. 16.11.2014) (Ist Sitting)

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37. Rekha invested a sum of ₹ 12000 at 5% per annum compound interest. She received an amount of ₹ 13230 after n years. Find n.
(1) 2.8 years (2) 3.0 years
(3) 2.5 years (4) 2.0 years
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

38. When principal = ₹ S, rate of interest = 2r % p.a, then a person will get after 3 years at compound interest
(1) ₹ $\frac{6Sr}{100}$
(2) ₹ $S\left(1+\frac{r}{100}\right)^3$
(3) ₹ $S\left(1+\frac{r}{50}\right)^3$
(4) ₹ $3S\left(1+\frac{r}{100}\right)^3$
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

39. The sum of money which becomes ₹ 2420 at 10 % rate of compound interest after two years is
(1) ₹ 2000 (2) ₹ 1000
(3) ₹ 2500 (4) ₹ 1500
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

40. On a certain principal the compound interest compounded annually for the second year at 10% per annum is ₹ 132. The principal is
(1) ₹ 1250 (2) ₹ 1000
(3) ₹ 1200 (4) ₹ 1320
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. The principal that yields a compound interest of Rs. 420 during the second year at 5% per annum is
(1) Rs. 7,000 (2) Rs. 5,000
(3) Rs. 8,000 (4) Rs. 6,000
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

42. In what time will Rs. 64,000 amount to Rs. 68,921 at 5% per annum, interest being compounded half yearly ?
(1) 3 years (2) $2\frac{1}{2}$ years
(3) 2 years (4) $1\frac{1}{2}$ years
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

43. A certain sum will amount to ₹ 12,100 in 2 years at 10% per annum of compound interest, interest being compounded annually. The sum is
(1) ₹ 8000 (2) ₹ 6000
(3) ₹ 12000 (4) ₹ 10000
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

44. At what rate of compound interest per annum will a sum of Rs. 1200 become Rs. 1348.32 in 2 years?
(1) 7.5% (2) 6.5%
(3) 7% (4) 6%
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

45. The compound interest on Rs. 12000 for 9 months at 20% per annum, interest being compounded quarterly is :
(1) Rs. 1750 (2) Rs. 2089.70
(3) Rs. 1891.50 (4) Rs. 2136.40
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–II

1. If the compound interest on a certain sum for 2 years at 3% per annum is ₹ 101.50, then the simple interest on the same sum at the same rate and for the same time will be
(1) ₹ 90.00 (2) ₹ 95.50
(3) ₹ 100.00 (4) ₹ 98.25
(SSC CPO S.I. Exam. 12.01.2003

2. If the compound interest on a sum of money for 3 years at the rate of 5% per annum is ₹ 252.20, the simple interest on the same sum at the same rate and for the same time is
(1) ₹ 220 (2) ₹ 240
(3) ₹ 245 (4) ₹ 250
(SSC CPO S.I. Exam. 07.09.2003)

3. On a certain sum of money the compound interest for 2 years is ₹ 282.15 and the simple interest for the same period of time is ₹ 270. The rate of interest per annum is
(1) 6.07% (2) 10%
(3) 9% (4) 12.15%
(SSC CPO S.I. Exam. 07.09.2003)

4. If the compound interest on a sum for 2 years at $12\frac{1}{2}$% per annum is ₹ 510, the simple interest on the same sum at the same rate for the same period of time is :
(1) ₹ 400 (2) ₹ 480
(3) ₹ 450 (4) ₹ 460
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. The compound interest on a certain sum of money at a certain rate for 2 years is ₹ 40.80 and the simple interest on the same sum is ₹ 40 at the same rate and for the same time. The rate of interest is
(1) 2% per annum
(2) 3% per annum
(3) 4% per annum
(4) 5% per annum
(SSC CPO S.I. Exam. 05.09.2004)

6. The compound interest on a certain sum of money invested for 2 years at 5% per annum is ₹ 328. The simple interest on the sum, at the same rate and for the same period will be
(1) ₹ 320 (2) ₹ 308
(3) ₹ 300 (4) ₹ 287
(SSC CPO S.I. Exam. 05.09.2004) & (SSC CPO S.I. Exam. 26.05.2005)

7. Compound interest on a sum of money for 2 years at 4 per cent per annum is ₹ 2, 448. Simple interest of the same sum of money at the same rate of interest for 2 years will be
(1) ₹ 2,500 (2) ₹ 2,400
(3) ₹ 2,360 (4) ₹ 2,250
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

8. At a certain rate per annum, the simple interest on a sum of money for one year is ₹ 260 and the compound interest on the same sum for two years is ₹ 540.80. The rate of interest per annum is
(1) 4% (2) 6%
(3) 8% (4) 10%
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

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9. The simple interest on a sum of money at 4% per annum for 2 years is ₹ 80. The compound interest in the same sum for the same period is
(1) ₹ 82.60 (2) ₹ 82.20
(3) ₹ 81.80 (4) ₹ 81.60
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. The compound interest on a certain sum of money at 5% per annum for 2 years is ₹ 246. The simple interest on the same sum for 3 years at 6% per annum is
(1) ₹ 435 (2) ₹ 450
(3) ₹ 430 (4) ₹ 432
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

11. The simple interest and compound interest (compounded annually) on a certain sum of money with a given rate for a period of 2 years are ₹ 900 and ₹ 954 respectively. The sum of money is
(1) ₹ 3700 (2) ₹ 3650
(3) ₹ 3850 (4) ₹ 3750
(SSC CPO S.I. Exam. 09.11.2008)

12. The compound interest on a certain sum of money for 2 years at 10% per annum is ₹420. The simple interest on the same sum at the same rate and for the same time will be
(1) ₹350 (2) ₹375
(3) ₹380 (4) ₹400
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

13. If the compound interest on a certain sum for 2 years at 4% p.a. is ₹ 102, the simple interest at the same rate of interest for two years would be
(1) ₹ 200 (2) ₹ 50
(3) ₹ 150 (4) ₹ 100
(SSC CGL Exam. 04.07.1999 (Ist Sitting) & (SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

14. There is 100% increase to an amount in 8 years, at simple interest. Find the compound interest of ₹ 8000 after 2 years at the same rate of interest.
(1) ₹ 2500 (2) ₹ 2000
(3) ₹ 2250 (4) ₹ 2125
(SSC Graduate Level Tier-I Exam. 21.04.2013)

15. If the compound interest on a certain sum for two years at 12% per annum is ₹ 2,544, the simple interest on it at the same rate for 2 years will be
(1) ₹ 2,400 (2) ₹ 2,500
(3) ₹ 2,480 (4) ₹ 2,440
(SSC Graduate Level Tier-I Exam. 19.05.2013)

16. A sum becomes ₹ 2,916 in 2 years at 8% per annum compound interest. The simple interest at 9% per annum for 3 years on the same amount will be
(1) ₹ 600 (2) ₹ 675
(3) ₹ 650 (4) ₹ 625
(SSC Sub-Inspector & LDC Exam. 20.10.2013)

17. The compound interest on a certain sum of money at a certain rate per annum for two years is ₹ 2,050, and the simple interest on the same amount of money at the same rate for 3 years is ₹ 3, 000. Then the sum of money is
(1) ₹ 20,000 (2) ₹ 18,000
(3) ₹ 21,000 (4) ₹ 25, 000
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

18. The compound interest on a certain sum of money for 2 years at 5% per annum is ₹ 410. The simple interest on the same sum at the same rate and for the same time is
(1) ₹ 400 (2) ₹ 300
(3) ₹ 350 (4) ₹ 405
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

19. If the compound interest on a sum for 2 years at $12\frac{1}{2}$ p.a is ₹ 510, the simple interest on the same sum at the same rate for the same period of time is
(1) ₹ 400 (2) ₹ 450
(3) ₹ 460 (4) ₹ 480
(SSC CGL Tier-II Exam. 21.09.2014)

20. A man borrowed some money from a private organisation at 5% simple interest per annum. He lended 50% of this money to another person at 10% compound interest per annum and thereby the man made a profit of Rs. 3,205 in 4 years. The man borrowed.
(1) Rs. 80,000
(2) Rs. 1,00,000
(3) Rs. 1,20,000
(4) Rs. 1,50,000
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

21. A certain amount of money earns Rs. 540 as Simple Interest in 3 years. If it earns a Compound Interest of Rs. 376.20 at the same rate of interest in 2 years, find the amount (in Rupees).
(1) 1600 (2) 1800
(3) 2000 (4) 2100
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

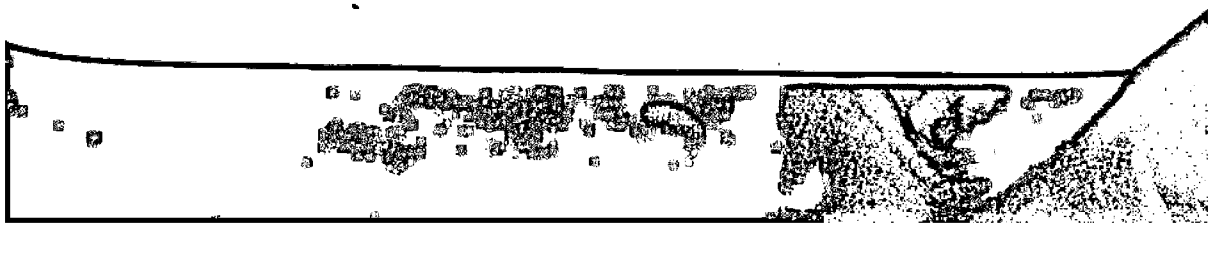
TYPE–III

1. If the difference between the compound interest, compounded every six months, and the simple interest on a certain sum of money at the rate of 12% per annum for one year is ₹ 36, the sum is :
(1) ₹ 10,000 (2) ₹ 12,000
(3) ₹ 15,000 (4) ₹ 9,000
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. What is the difference between compound interest on ₹ 5,000 for $1\frac{1}{2}$ years at 4% per annum according as th inte st is compounded yearly or half-yearly?
(1) ₹ 2.04 (2) ₹ 3.06
(3) ₹ 8.30 (4) ₹ 4.80
(SSC CGL Prelim Exam. : .02.2000 (Seco Sitting)

3. The difference between the simple and compound interest on a certain sum of money at 5% rate of interest per annum for 2 years is ₹ 15. Then the su is :
(1) ₹ 6,500 (2) ₹ 5,500
(3) ₹ 6,000 (4) ₹ 7,000
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. If the difference between the compound interest and simple interest on a sum at 5% rate of interest per annum for three years is ₹ 36.60, then the sum is
(1) ₹ 8000 (2) ₹ 8400
(3) ₹ 4400 (4) ₹ 4800
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)



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5. The difference between compound interest and simple interest on ₹ 2500 for 2 years at 4% per annum is
(1) ₹ 40 (2) ₹ 45
(3) ₹ 14 (4) ₹ 4
(SSC CPO S.I. Exam. 12.01.2003

6. The difference between simple and compound interest (compounded annually) on a sum of money for 2 years at 10% per annum is ₹ 65. The sum is
(1) ₹ 65650 (2) ₹ 65065
(3) ₹ 6565 (4) ₹ 6500
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

7. The difference between the compound interest (compounded annually) and the simple interest on a sum of ₹ 1000 at a certain rate of interest for 2 years is ₹ 10. The rate of interest per annum is :
(1) 5% (2) 6%
(3) 10% (4) 12%
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. If the difference between the simple and compound interests on a sum of money for 2 years at 4% per annum is ₹ 80, the sum is :
(1) ₹ 5000 (2) ₹ 50000
(3) ₹ 10000 (4) ₹ 1000
(SSC CPO S.I. Exam. 26.05.2005

9. The difference between simple and compound interest on a certain sum of money for 2 years at 4 per cent per annum is ₹ 1. The sum of money is :
(1) ₹ 600 (2) ₹ 625
(3) ₹ 560 (4) ₹ 650
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting) Exam. 26.05.2005)

10. The difference between the simple and compound interest on a certain sum of money for 2 years at 4% per annum is ₹ 4. The sum is
(1) ₹ 2500 (2) ₹ 2,400
(3) ₹ 2,600 (4) ₹ 2,000
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. If the difference between the compound and simple interests on a certain sum of money for 3 years at 5% per annum is ₹ 15.25, then the sum is
(1) ₹ 2,000 (2) ₹ 1,000
(3) ₹ 1,500 (4) ₹ 2,500
(SSC CPO S.I. Exam. 03.09.2006)

12. The difference between compound interest and simple interest of a sum for 2 years at 8 per cent is ₹ 768. The sum is
(1) ₹ 1,00,000 (2) ₹ 1,10,000
(3) ₹ 1,20,000 (4) ₹ 1,70,000
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

13. The difference between the compound and the simple interest on a sum for 2 years at 10% per annum, when the interest is compounded annually, is ₹ 28. If the interest were compounded half-yearly, the difference in the two interests will be
(1) ₹ 44 (2) ₹ 28.35
(3) ₹ 43.41 (4) ₹ 43.29
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

14. A sum of ₹ 6,000 is deposited for 3 years at 5% per annum compound interest (compounded annually). The difference of interests for 3 and 2 years will be
(1) ₹ 75.00 (2) ₹ 30.75
(3) ₹ 330.75 (4) ₹ 375.00
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

15. The difference between compound interest (compounded annually) and simple interest on a certain sum of money at 10% per annum for 2 years is ₹ 40. The sum is ;
(1) ₹ 4000 (2) ₹ 3600
(3) ₹ 4200 (4) ₹ 3200
(SSC CPO S.I. Exam. 16.12.2007)

16. The difference between compound and simple interest on a certain sum for 3 years at 5% per annum is Rs. 122. The sum is
(1) ₹ 16,000 (2) ₹ 15,000
(3) ₹ 12,000 (4) ₹ 10,000
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

17. The difference between simple interest and compound interest of a certain sum of money at 20% per annum for 2 years is ₹ 48. Then the sum is
(1) ₹ 1,000 (2) ₹ 1, 200
(3) ₹ 1, 500 (4) ₹ 2, 000
(SSC CGL Tier-I Exam. 19.06.2011 (First Sitting)

18. The difference between the compound interest and simple interest on ₹ 10,000 for 2 years is ₹ 25. The rate of interest per annum is
(1) 5% (2) 7%
(3) 10% (4) 12%
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

19. If the difference between S.I. and C.I. for 2 years on a sum of money lent at 5% is ₹ 6, then the sum is
(1) ₹ 2200 (2) ₹ 2400
(3) ₹ 2600 (4) ₹ 2000
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

20. On a certain sum of money lent out at 16% p.a. the difference between the compound interest for 1 year, payable half yearly, and the simple interest for 1 year is ₹ 56. The sum is
(1) ₹ 1080 (2) ₹ 7805
(3) ₹ 8750 (4) ₹ 5780
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

21. On what sum does the difference between the compound interest and the simple interest for 3 years at 10% is ₹ 31 ?
(1) ₹ 1500 (2) ₹ 1200
(3) ₹ 1100 (4) ₹ 1000
(SSC CGL Prelim Exam. 27.02.200 (First Sitting)

22. The difference between simple and compound interests on a sum of money at 4% per annum for 2 years is ₹ 8. The sum is
(1) ₹ 400 (2) ₹ 800
(3) ₹ 4,000 (4) ₹ 5,000
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

23. On a certain sum of money, the difference between the compound interest for a year, payable half-yearly, and the simple interest for a year is ₹ 180. If the rate of interest in both the cases is 10%, then the sum is
(1) ₹ 60,000 (2) ₹ 72,000
(3) ₹ 62,000 (4) ₹ 54,000
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

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24. The difference between the compound interest and the simple interest on a certain sum at 5% per annum for 2 years is ₹ 1.50. The sum is
(1) ₹ 600 (2) ₹ 500
(3) ₹ 400 (4) ₹ 300
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

25. What sum will give ₹ 244 as the difference between simple interest and compound interest at 10% in $1\frac{1}{2}$ years compounded half yearly ?
(1) ₹ 40,000 (2) ₹ 36,000
(3) ₹ 32,000 (4) ₹ 28,000
(SSC Graduate Level Tier-II Exam. 29.09.2013

26. The difference between simple and compound interest compounded annually, on a certain sum of money for 2 years at 4% per annum is ₹ 1. The sum (in ₹) is :
(1) 650 (2) 630
(3) 625 (4) 640
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

27. The difference between the compound interest and simple interest for the amount ₹ 5,000 in 2 years is ₹ 32. The rate of interest is
(1) 5% (2) 8%
(3) 10% (4) 12%
(SSC CGL Tier-I Exam. 19.06.2011 (Second Sitting)

28. On what sum of money will the difference between S.I and C.I for 2 years at 5% per annum be equal to ₹ 25 ?
(1) ₹ 10,000 (2) ₹ 10,500
(3) ₹ 9,500 (4) ₹ 9000
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

29. The difference between the compound interest and simple interest on a certain sum for 2 years at 10% per annum is ₹ 300. Find the sum.
(1) ₹ 31,000 (2) ₹ 31,500
(3) ₹ 30,000 (4) ₹ 30,500
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

30. Find the difference between the compound interest and the simple interest on ₹ 32,000 at 10% p.a. for 4 years.
(1) ₹ 2051.20 (2) ₹ 2052.50
(3) ₹ 2025.20 (4) ₹ 2501.20
(SSC CHSL DEO & LDC Exam. 16.11.2014)

31. On what sum of money will the difference between simple interest and compound interest for 2 years at 5% per annum be equal to Rs. 63?
(1) Rs. 24,600 (2) Rs. 24,800
(3) Rs. 25,200 (4) Rs. 25,500
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 01.11.2015, IInd Sitting)

TYPE–IV

1. If the amount is 2.25 times of the sum after 2 years at compound interest (compound annually), the rate of interest per annum is :
(1) 25% (2) 30%
(3) 45% (4) 50%
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A sum of money doubles itself in 4 years at compound interest. It will amount to 8 times itself at the same rate of interest in :
(1) 18 years (2) 12 years
(3) 16 years (4) 24 years
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting) & (SSC CPO S.I. Exam. 16.12.2007)

3. A sum borrowed under compound interest doubles itself in 10 years. When will it become fourfold of itself at the same rate of interest ?
(1) 15 years (2) 20 years
(3) 24 years (4) 40 years
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A sum of money becomes eight times of itself in 3 years at compound interest. The rate of interest per annum is
(1) 100% (2) 80%
(3) 20% (4) 10%
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. A sum of money invested at compound interest doubles itself in 6 years. At the same rate of interest it will amount to eight times of itself in :
(1) 15 years (2) 12 years
(3) 18 years (4) 10 years
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

6. A sum of money placed at compound interest doubles itself in 5 years. In how many years, it would amount to eight times of itself at the same rate of interest ?
(1) 10 years (2) 15 years
(3) 7 years (4) 20 years
(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (SSC CPO S.I. Exam. 06.09.2009) & (SSC CAPs S.I. & CISF ASI Exam. 23.06.2013)

7. A sum of money at compound interest doubles itself in 15 years. It will become eight times of itself in
(1) 45 years (2) 48 years
(3) 54 years (4) 60 years
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

8. A sum of ₹ 12,000, deposited at compound interest becomes double after 5 years How much will it be after 20 years ?
(1) ₹ 1,44,000 (2) ₹ 1,20,000
(3) ₹ 1,50,000 (4) ₹ 1,92,000
(SSC CGL Tier-I Exam. 16.05.2010 (IInd Sitting) & (SSC CGL Tier-I 19.06.2011 (IInd Sitting)

9. At what rate percent per annum of compound interest, will a sum of money become four times of itself in two years ?
(1) 100% (2) 75%
(3) 50% (4) 20%
(SSC (South Zone) Investigator Exam. 12.09.2010)

10. A sum of money becomes double in 3 years at compound interest compounded annually. At the same rate, in how many years will it become four times of itself ?
(1) 4 years (2) 6 years
(3) 6.4 years (4) 7.5 years
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

11. A sum of money becomes eight times in 3 years, if the rate is compounded annually. In how much time will the same amount at the same compound rate become sixteen times?
(1) 6 years (2) 4 years
(3) 8 years (4) 5 years
(SSC CGL Tier-I Exam. 19.06.2011 (First Sitting)

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12. A sum of money placed at compound interest doubles itself in 4 years. In how many years will it amount to four times itself?
(1) 12 years (2) 13 years
(3) 8 years (4) 16 years
(SSC CGL Tier-I Exam. 26.06.2011 (First Sitting)

13. A sum of money at compound interest amounts to thrice itself in 3 years. In how many years will it be 9 times itself?
(1) 9 years (2) 27 years
(3) 6 years (4) 3 years
(SSC Graduate Level Tier-II Exam.16.09.2012)

14. A sum of money becomes 1.331 times in 3 years as compound interest. The rate of interest is
(1) 8% (2) 7.5%
(3) 10% (4) 50%
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

15. If a sum of money compounded annually becomes 1.44 times of itself in 2 years, then the rate of interest per annum is
(1) 25% (2) 22%
(3) 21% (4) 20%
(SSC Graduate Level Tier-II Exam. 29.09.2013

16. If the amount is $3\frac{3}{8}$ times the sum after 3 years at compound interest compounded annually, then the rate of interest per annum is
(1) 25% (2) 50%
(3) $16\frac{2}{3}\%$ (4) $33\frac{1}{3}\%$
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

TYPE–V

1. A sum of money amounts to ₹ 4,840 in 2 years and to ₹ 5,324 in 3 years at compound interest compounded annually. The rate of interest per annum is
(1) 10% (2) 9%
(3) 11% (4) 5%
(SSC CPO S.I. Exam. 16.12.2007)

2. A certain sum of money amounts to ₹ 2,420 in 2 years and ₹ 2,662 in 3 years at some rate of compound interest, compounded annually. The rate of interest per annum is
(1) 8% (2) 6%
(3) 9% (4) 10%
(SSC CPO S.I. Exam. 09.11.2008)

3. An amount of money at compound interest grows up to ₹ 3,840 in 4 years and up to ₹ 3,936 in 5 years. Find the rate of interest.
(1) 2.5% (2) 2%
(3) 3.5% (4) 2.05%
(SSC Graduate Level Tier-II Exam.16.09.2012)

4. A certain amount of money at r%, compounded annually after two and three years becomes ₹1440 and ₹ 1728 respectively. r is
(1) 5 (2) 10
(3) 15 (4) 20
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

5. The compound interest on a certain sum for two successive years are ₹ 225 and ₹ 238.50. The rate of interest per annum is :
(1) $7\frac{1}{2}\%$ (2) 5%
(3) 10% (4) 6%
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

6. An amount of money appreciates to ₹ 7,000 after 4 years and to ₹ 10,000 after 8 years at a certain compound interest compounded annually. The initial amount of money was
(1) ₹ 4,700 (2) ₹ 4,900
(3) ₹ 4,100 (4) ₹ 4,300
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

7. A sum of money invested at compound interest amounts to ₹ 650 at the end of first year and ₹ 676 at the end of second year. The sum of money is :
(1) ₹ 600 (2) ₹ 540
(3) ₹ 625 (4) ₹ 560
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CPO S.I. Exam. 07.09.2003)

8. A sum of money invested at compound interest amounts in 3 years to ₹ 2,400 and in 4 years to ₹ 2,520. The interest rate per annum is :
(1) 5% (2) 6%
(3) 10% (4) 12%
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

9. A sum becomes ₹ 4500 after two years and ₹ 6750 after four years at compound interest. The sum is
(1) ₹ 4000 (2) ₹ 2500
(3) ₹ 3000 (4) ₹ 3050
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Exam. 13.11.2005)

10. A sum of money at compound interest will amount to ₹ 650 at the end of the first year and ₹ 676 at the end of the second year. The amount of money is
(1) ₹ 1,300 (2) ₹ 650
(3) ₹ 1,250 (4) ₹ 625
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

TYPE–VI

1. A builder borrows ₹ 2550 to be paid back with compound interest at the rate of 4% per annum by the end of 2 years in two equal yearly instalments. How much will each instalment be?
(1) ₹ 1352 (2) ₹ 1377
(3) ₹ 1275 (4) ₹ 1283
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A man buys a scooter on making a cash down payment of ₹ 16224 and promises to pay two more yearly instalments of equivalent amount in next two years. If the rate of interest is 4% per annum, compounded yearly, the cash value of the scooter, is
(1) ₹ 40000 (2) ₹ 46824
(3) ₹ 46000 (4) ₹ 50000
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

3. Kamal took ₹ 6800 as a loan which along with interest is to be repaid in two equal annual instalments. If the rate of interest is $12\frac{1}{2}\%$, compounded annually, then the value of each instalment is
(1) ₹ 8100 (2) ₹ 4150
(3) ₹ 4050 (4) ₹ 4000
(SSC CGL Prelim Exam. 27.07.2003 (First Sitting)

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4. A loan of ₹ 12,300 at 5% per annum compound interest, is to be repaid in two equal annual instalments at the end of every year. Find the amount of each instalment.
(1) ₹ 6,651 (2) ₹ 6,615
(3) ₹ 6,516 (4) ₹ 6,156
(SSC CPO S.I. Exam. 06.09.2009)

5. A sum of ₹ 210 was taken as a loan. This is to be paid back in two equal instalments. If the rate of interest be 10% compounded annually, then the value of each instalment is
(1) ₹ 127 (2) ₹ 121
(3) ₹ 210 (4) ₹ 225
(SSC CHSL DEO & LDC Exam. 9.11.2014)

6. Rs. 16,820 is divided between two brothers of age 27 years and 25 years. They invested their money at 5% per annum compound interest in such a way that both will receive equal money at the age of 40 years. The share (in Rs.) of elder brother is
(1) 8,280 (2) 8,410
(3) 8,820 (4) 8,000
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

7. A sum of money is paid back in two annual instalments of Rs. 17, 640 each, allowing 5% compound interest compounded annually. The sum borrowed was
(1) Rs. 32,800 (2) Rs. 32,200
(3) Rs. 32,000 (4) Rs. 32,400
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

8. Mr. Dutta desired to deposit his retirement benefit of Rs. 3 lacs partly to a post office and partly to a bank at 10% and 6% interests respectively. If his monthly interest income was Rs. 2000, then the difference of his deposits in the post office and in the bank was :
(1) Rs. 50,000 (2) Rs. 40,000
(3) Nil (4) Rs.1,00,000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

9. The income of a company increases 20% per year. If the income is Rs. 26,64,000 in the year 2012, then its income in the year 2010 was :
(1) Rs. 28,55,000
(2) Rs. 18,50,000
(3) Rs. 28,20,000
(4) Rs. 21,20,000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–VII

1. A person deposited a sum of ₹ 6,000 in a bank at 5% per annum simple interest. Another person deposited ₹ 5,000 at 8% per annum compound interest. After two years, the difference of their interests will be
(1) ₹ 230 (2) ₹ 232
(3) ₹ 832 (4) ₹ 600
(SSC CPO S.I. Exam. 03.09.2006)

2. A money-lender borrows money at 4% per annum and pays the interest at the end of the year. He lends it at 6% per annum compound interest compounded half yearly and receives the interest at the end of the year. In this way, he gains ₹ 104.50 a year. The amount of money he borrows, is
(1) ₹ 6,000 (2) ₹ 5,500
(3) ₹ 5,000 (4) ₹ 4,500
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. A sum of ₹ 13,360 was borrowed at $8\frac{3}{4}$% per annum compound interest and paid back in two years in two equal annual instalments. What was the amount of each instalment ?
(1) ₹ 5,769 (2) ₹ 7,569
(3) ₹ 7,009 (4) ₹ 7,500
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

4. Sita deposited ₹ 5,000 at 10% simple interest for 2 years. How much more money will Sita have in her account at the end of two years, if it is compounded semi-annually.
(1) ₹ 50 (2) ₹ 40
(3) ₹ 77.50 (4) ₹ 85.50
(SSC Graduate Level Tier-II Exam.16.09.2012)

5. What does ₹ 250 amounts to in 2 years with compound interest at the rate of 4% in the 1st year and 8% in the second year ?
(1) ₹ 280 (2) ₹ 280.80
(3) ₹ 468 (4) ₹ 290.80
(SSC Constable (GD) Exam. 12.05.2013 1st Sitting)

6. A man gave 50% of his savings of ₹ 84,100 to his wife and divided the remaining sum among his two sons A and B of 15 and 13 years of age respectively. He divided it in such a way that each of his sons, when they attain the age of 18 years, would receive the same amount at 5% compound interest per annum. The share of B was
(1) ₹ 20,000 (2) ₹ 20,050
(3) ₹ 22,000 (4) ₹ 22,050
(SSC CGL Tier-I Exam. 19.10.2014)

7. Find the rate percent per annum, if Rs. 2000 amounts to Rs. 2,315.25 in a year and a half, interest being compounded half yearly.
(1) 11.5% (2) 10%
(3) 5% (4) 20%
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

8. A sum of money placed at compound interest doubles itself in 5 years. It will amount to eight times of itself at the same rate of interest in
(1) 20 years (2) 10 years
(3) 12 years (4) 15 years
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

9. The sum of money which when given on compound interest at 18% per annum would fetch Rs. 960 more when the interest is payable half yearly than when it was payable annually for 2 years is :
(1) Rs.60,000 (2) Rs. 30,000
(3) Rs. 40,000 (4) Rs. 50,000
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

10. The amount on Rs. 25,000 in 2 years at annual compound interest, if the rates for the successive years be 4% and 5% per annum respectively is :
(1) Rs. 30,000 (2) Rs. 26,800
(3) Rs. 27,300 (4) Rs. 28,500
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

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SHORT ANSWERS

TYPE-I

1. (2)	2. (2)	3. (3)	4. (1)
5. (3)	6. (2)	7. (3)	8. (4)
9. (3)	10. (3)	11. (1)	12. (1)
13. (3)	14. (1)	15. (4)	16. (3)
17. (1)	18. (3)	19. (2)	20. (1)
21. (1)	22. (4)	23. (1)	24. (3)
25. (4)	26. (2)	27. (3)	28. (2)
29. (1)	30. (2)	31. (2)	32. (2)
33. (1)	34. (3)	35. (2)	36. (2)
37. (4)	38. (3)	39. (1)	40. (3)
41. (3)	42. (4)	43. (4)	44. (4)
45. (3)			

TYPE-II

1. (3)	2. (2)	3. (3)	4. (2)
5. (3)	6. (1)	7. (2)	8. (3)
9. (4)	10. (4)	11. (4)	12. (4)
13. (4)	14. (4)	15. (1)	16. (2)
17. (1)	18. (1)	19. (4)	20. (2)
21. (3)			

TYPE-III

1. (1)	2. (2)	3. (3)	4. (4)
5. (4)	6. (4)	7. (3)	8. (2)
9. (2)	10. (1)	11. (1)	12. (3)
13. (3)	14. (3)	15. (1)	16. (1)
17. (2)	18. (1)	19. (2)	20. (3)
21. (4)	22. (4)	23. (2)	24. (1)
25. (3)	26. (3)	27. (2)	28. (1)
29. (3)	30. (1)	31. (3)	

TYPE-IV

1. (4)	2. (2)	3. (2)	4. (1)
5. (3)	6. (2)	7. (1)	8. (4)
9. (1)	10. (2)	11. (2)	12. (3)
13. (3)	14. (3)	15. (4)	16. (2)

TYPE-V

1. (1)	2. (4)	3. (1)	4. (4)
5. (4)	6. (2)	7. (3)	8. (1)
9. (3)	10. (4)		

TYPE-VI

1. (1)	2. (2)	3. (3)	4. (2)
5. (2)	6. (3)	7. (1)	8. (3)
9. (2)			

TYPE-VII

1. (2)	2. (3)	3. (2)	4. (3)
5. (2)	6. (1)	7. (2)	8. (4)
9. (4)	10. (3)		

EXPLANATIONS

TYPE-I

1. (2) P = ₹ 3000, A = ₹ 3993, n = 3 years

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$\therefore \left(1+\frac{r}{100}\right)^n = \frac{A}{P}$$

$$\left(1+\frac{r}{100}\right)^3 = \frac{3993}{3000} = \frac{1331}{1000}$$

$$\left(1+\frac{r}{100}\right)^3 = \left(\frac{11}{10}\right)^3$$

$$\Rightarrow 1+\frac{r}{100} = \frac{11}{10}$$

$$\Rightarrow \frac{r}{100} = \frac{11}{10} - 1$$

$$\Rightarrow \frac{r}{100} = \frac{1}{10} \Rightarrow r = \frac{100}{10}$$

$\therefore r = 10\%$

2. (2) $A = 10{,}000\left(1+\frac{2}{100}\right)^4$

$= 10{,}000\left(\frac{51}{50}\right)^4 = 10824.3216$

$\therefore$ Interest
= 10,824.3216 − 10,000
= ₹ 824.32

3. (3) According to question,

$$2420 = 2000\left(1+\frac{10}{100}\right)^t$$

$$\frac{2420}{2000} = \left(\frac{11}{10}\right)^t$$

$$\text{or, } \left(\frac{11}{10}\right)^t = \frac{121}{100}$$

$$\text{or, } \left(\frac{11}{10}\right)^t = \left(\frac{11}{10}\right)^2$$

$\therefore t = 2$ years

4. (1) Let the required time be n years. Then,

$$1331 = 1000\left(1+\frac{10}{100}\right)^n$$

$$\left[\because P_1 = P\left(1+\frac{r}{100}\right)^n\right]$$

$$\Rightarrow \frac{1331}{1000} = \left(\frac{10+1}{10}\right)^n$$

$$\Rightarrow \left(\frac{11}{10}\right)^n = \left(\frac{11}{10}\right)^3$$

$\Rightarrow n = 3$

5. (3) Let the principal be ₹ P.

$$\therefore 270.40 = P\left(1+\frac{4}{100}\right)^2$$

$$\Rightarrow 270.40 = P(1+0.04)^2$$

$$\Rightarrow P = \frac{270.40}{1.04\times 1.04} = ₹\ 250$$

6. (2) Let the sum be ₹ P and rate of interest be R% per annum. Then,

$$P\left(1+\frac{R}{100}\right)^2 = 9680 \quad \text{...(i)}$$

$$P\left(1+\frac{R}{100}\right)^3 = 10648 \quad \text{...(ii)}$$

On dividing equation (ii) by (i)

$$1+\frac{R}{100} = \frac{10648}{9680}$$

$$\Rightarrow \frac{R}{100} = \frac{10648}{9680} - 1$$

$$= \frac{10648-9680}{9680}$$

$$\Rightarrow \frac{R}{100} = \frac{968}{9680} = \frac{1}{10}$$

$$\Rightarrow R = \frac{1}{10}\times 100 = 10\%$$

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7. (3) Let the rate per cent per annum be r. Then,

$$2500 = 2304\left(1+\frac{r}{100}\right)^2$$

$$\Rightarrow \left(1+\frac{r}{100}\right)^2 = \frac{2500}{2304} = \left(\frac{50}{48}\right)^2$$

$$\Rightarrow 1+\frac{r}{100} = \frac{50}{48} = \frac{25}{24}$$

$$\Rightarrow \frac{r}{100} = \frac{25}{24} - 1 = \frac{1}{24}$$

$$\Rightarrow r = \frac{100}{24} = \frac{25}{6} = 4\frac{1}{6}\%$$

8. (4) Let the sum be ₹ x.

$$\therefore 1352 = x\left(1+\frac{4}{100}\right)^2$$

$$\Rightarrow 1352 = x\left(1+\frac{1}{25}\right)^2$$

$$\Rightarrow 1352 = x\left(\frac{26}{25}\right)^2$$

$$\Rightarrow x = \frac{1352\times 25\times 25}{26\times 26}$$

$$= ₹\ 1250$$

9. (3) The interest is compounded quarterly.

$$\therefore R = \frac{20}{4} = 5\%$$

Time = 3 quarters

$$\therefore \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= 16000\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$$

$$= 16000\left[\left(\frac{21}{20}\right)^3 - 1\right]$$

$$= 16000\left(\frac{9261-8000}{8000}\right)$$

$$= 16000\times\frac{1261}{8000} = ₹\ 2522$$

10. (3) Amount

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)\left(1+\frac{R_3}{100}\right)$$

$$= 10000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)\left(1+\frac{6}{100}\right)$$

$$= 10000\times\frac{26}{25}\times\frac{21}{20}\times\frac{53}{50}$$

$$A = ₹\ 11575.2$$

$$\therefore \text{C.I.} = ₹\ (11575.2-10000)$$

$$= ₹\ 1575.2$$

11. (1) Amount

$$= 2000\left(1+\frac{4}{100}\right)\left(1+\frac{3}{100}\right)$$

$$= 2000\times 1.04\times 1.03$$

$$= ₹\ 2142.40$$

$$\therefore \text{CI} = ₹\ (2142.40 - 2000)$$

$$= ₹\ 142.40$$

12. (1) Let the rate of CI be R per cent per annum.

$$\therefore \text{CI} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 5044 = 32000\left[\left(1+\frac{R}{400}\right)^3 - 1\right]$$

[$\because$ Interest is compounded quarterly]

$$\Rightarrow \frac{5044}{32000} = \left(1+\frac{R}{400}\right)^3 - 1$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 - 1 = \frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = 1+\frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = \frac{9261}{8000} = \left(\frac{21}{20}\right)^3$$

$$\Rightarrow 1+\frac{R}{400} = \frac{21}{20} \Rightarrow \frac{R}{400} = \frac{21}{20} - 1 = \frac{1}{20}$$

$$\Rightarrow R = \frac{400}{20} = 20$$

13. (3) Amount $= P\left(1+\frac{R}{100}\right)^t$

$$= 8000\left(1+\frac{15}{100}\right)^{2\frac{1}{3}}$$

$$= 8000\left(1+\frac{3}{20}\right)^2\left(1+\frac{3}{20\times 3}\right)$$

$$= 8000\times\frac{23}{20}\times\frac{23}{20}\times\frac{21}{20}$$

$$= ₹\ 11109$$

$\therefore$ Compound Interest

$$= ₹\ (11109 - 8000) = ₹\ 3109.$$

14. (1) The rate of interest is compounded half yearly,

$\therefore r = 10\%$ per half year

Let time $= \frac{T}{2}$ years = half years

According to the question,

$$\text{Amount} = P\left(1+\frac{R}{100}\right)^t$$

$$\Rightarrow 13310 = 10000\left(1+\frac{10}{100}\right)^T$$

$$\Rightarrow \frac{13310}{10000} = \left(\frac{11}{10}\right)^T$$

$$\Rightarrow \left(\frac{11}{10}\right)^T = \frac{1331}{1000} = \left(\frac{11}{10}\right)^3$$

$$\Rightarrow T = 3 \text{ half years} = 1\frac{1}{2} \text{ years}$$

15. (4) Let the principal be ₹ x. Now,

$$\text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 1261 = x\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$$

$$\Rightarrow 1261 = x\left(\frac{9261}{8000} - 1\right)$$

$$\Rightarrow 1261 = x\left(\frac{9261-8000}{8000}\right)$$

$$= \frac{1261x}{8000}$$

$$\Rightarrow x = \frac{1261\times 8000}{1261} = ₹\ 8000$$

16. (3) Let the sum be P.

As, the interest is compounded half-yearly,

$\therefore R = 2\%$, $T = 2$ half years

$$\therefore A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 7803 = P\left(1+\frac{2}{100}\right)^2$$

$$\Rightarrow 7803 = P\left(1+\frac{1}{50}\right)^2$$

$$\Rightarrow 7803 = P\times\frac{51}{50}\times\frac{51}{50}$$

$$\Rightarrow P = \frac{7803\times 50\times 50}{51\times 51} = ₹\ 7500$$

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17. (1) $5832 = P\left(1+\frac{8}{100}\right)^2$

$\Rightarrow 5832 = P\left(1+\frac{2}{25}\right)^2$

$\Rightarrow 5832 = P\times\frac{27}{25}\times\frac{27}{25}$

$\Rightarrow P=\frac{5832\times25\times25}{27\times27} = ₹\ 5000$

18. (3) Amount

$=6000\left(1+\frac{10}{100}\right)\times\left(1+\frac{\frac{1}{2}\times10}{100}\right)$

$= 6000\times\frac{11}{10}\times\frac{21}{20} = ₹\ 6930$

$\therefore$ CI = ₹ (6930 – 6000) = ₹ 930

19. (2) Interest is compounded half yearly.

$\therefore$ Rate of interest = 5%

Time = $\frac{n}{2}$ years (let)

or n half-years

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 9261 = 8000\left(1+\frac{5}{100}\right)^n$

$\Rightarrow \frac{9261}{8000}=\left(\frac{21}{20}\right)^n$

$\Rightarrow \left(\frac{21}{20}\right)^3=\left(\frac{21}{20}\right)^n$

$\Rightarrow n = 3$ half years

$= \frac{3}{2}$ years $= 1\frac{1}{2}$ years

20. (1) $A = P\left(1+\frac{R}{100}\right)^T$

Let rate be 'r'

$\Rightarrow \frac{1102.50}{1000}=\left(1+\frac{r}{100}\right)^2$

$\Rightarrow \frac{11025}{10000}=\left(1+\frac{r}{100}\right)^2$

$\Rightarrow \left(\frac{105}{100}\right)^2=\left(1+\frac{r}{100}\right)^2$

$\Rightarrow 1+\frac{r}{100}=\frac{105}{100}$

$\Rightarrow \frac{r}{100}=\frac{5}{100}$

$\Rightarrow r = 5\%$

21. (1) Rate = 10% per annum = 5% half yearly

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 926.10 = 800\left(1+\frac{5}{100}\right)^T$

$\Rightarrow \frac{9261}{8000} = \left(\frac{21}{20}\right)^T$

$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^T$

$\therefore$ Time = 3 half years

$= 1\frac{1}{2}$ years

22. (4) $A = P\left(1+\frac{R}{100}\right)^T$

$= 6000\left(1+\frac{5}{100}\right)^2$

$= 6000\times\frac{21}{20}\times\frac{21}{20} = ₹\ 6615$

23. (1) Let the required time be t years.

Interest is compounded half yearly.

$\therefore$ Time = $2t$ half years

and rate = $\frac{20}{2} = 10\%$

$\therefore\ 1000\left(1+\frac{10}{100}\right)^{2t} = 1331$

$\Rightarrow \left(\frac{11}{10}\right)^{2t} = \frac{1331}{1000}$

$\Rightarrow \left(\frac{11}{10}\right)^{2t} = \left(\frac{11}{10}\right)^3 \Rightarrow 2t = 3$

$\therefore\ t = \frac{3}{2}$ years or $1\frac{1}{2}$ years

24. (3) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 30000 + 4347$

$= 30000\left(1+\frac{7}{100}\right)^T$

$\Rightarrow \frac{34347}{30000} = \left(\frac{107}{100}\right)^T$

$\Rightarrow \frac{11449}{10000} = \left(\frac{107}{100}\right)^2 = \left(\frac{107}{100}\right)^T$

$\Rightarrow$ Time = 2 years

25. (4) If the rate of C.I. be $r\%$ per annum, then

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 8820 = 8000\left(1+\frac{r}{100}\right)^2$

$\Rightarrow \frac{8820}{8000} = \left(1+\frac{r}{100}\right)^2$

$\Rightarrow \frac{441}{400} = \left(\frac{21}{20}\right)^2 = \left(1+\frac{r}{100}\right)^2$

$\Rightarrow 1+\frac{r}{100} = \frac{21}{20}$

$\Rightarrow \frac{r}{100} = \frac{21}{20} - 1 = \frac{1}{20}$

$\Rightarrow r = \frac{1}{20}\times100$

$\therefore r = 5\%$ per annum

26. (2) $A = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)$

$= 10000\left(1+\frac{10}{100}\right)\left(1+\frac{12}{100}\right)$

$= 10000\times\frac{11}{10}\times\frac{28}{25}$

$= ₹\ 12320$

27. (3) $CI = P\left[\left(1+\frac{R}{100}\right)^T - 1\right] - \frac{PR}{100}$

$\Rightarrow 420 = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right] - \frac{P\times5}{100}$

$\Rightarrow 420 = P\left[\left(\frac{21}{20}\right)^2 - 1\right] - \frac{5P}{100}$

$\Rightarrow 420 = \frac{41P}{400} - \frac{5P}{100} = \frac{21P}{400}$

$\Rightarrow P = \frac{420\times400}{21} = ₹\ 8000$

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28. (2) Amount

$= 2000\left(1+\frac{5}{100}\right)^2 + 2000\left(1+\frac{5}{100}\right)$

$= 2000\times\left(\frac{21}{20}\right)^2 + 2000\left(\frac{21}{20}\right)$

$= 2000\times\frac{21}{20}\times\frac{41}{20} = ₹\ 4305$

$\therefore$ Required amount

$= 4305 + 2000 = ₹\ 6305$

29. (1) Time = t half year and R = 5% per half year

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow \frac{92610}{80000} = \left(1+\frac{5}{100}\right)^T$

$\Rightarrow \frac{9261}{8000} = \left(\frac{21}{20}\right)^T$

$\Rightarrow T = 3$ half years or $1\frac{1}{2}$ years

$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^T$

30. (2) If each instalment be x, then

Present worth of first instalment

$= \frac{x}{1+\frac{10}{100}} = \frac{10x}{11}$

Present worth of second instalment

$= \frac{x}{\left(1+\frac{10}{100}\right)^2} = \frac{100}{121}x$

$\therefore \frac{10}{11}x + \frac{100}{121}x = 21000$

$\Rightarrow \frac{110x+100x}{121} = 21000$

$\Rightarrow 210x = 21000\times 121$

$\Rightarrow x = \frac{21000\times 121}{210}$ $x = ₹\ 12100$

31. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 882 = 800\left(1+\frac{5}{100}\right)^T$

$\Rightarrow \frac{882}{800} = \left(\frac{21}{20}\right)^T$

$\Rightarrow \frac{441}{400} = \left(\frac{21}{20}\right)^2 = \left(\frac{21}{20}\right)^T$

$\therefore T = 2$ years

32. (2) C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= 5000\left[\left(1+\frac{10}{100}\right)^3 - 1\right]$

$= 5000\left[\left(\frac{11}{10}\right)^3 - 1\right]$

C.I. $= \frac{5000\times 331}{1000} = ₹\ 1655$

33. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow \frac{3362}{3200} = \left(1+\frac{10}{400}\right)^{4t}$

$\Rightarrow \frac{1681}{1600} = \left(\frac{41}{40}\right)^{4t}$

$\Rightarrow \left(\frac{41}{40}\right)^2 = \left(\frac{41}{40}\right)^{4t}$

$\Rightarrow 4t = 2 \Rightarrow t = \frac{1}{2}$ year

34. (3) Let the principal be Rs. P

$\therefore$ C.I. $= P\left[\left(1+\frac{R}{100}\right)^2 - 1\right]$

$\Rightarrow 328 = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$\Rightarrow 328 = P\left[\left(\frac{21}{20}\right)^2 - 1\right]$

$\Rightarrow 328 = P\left(\frac{441}{400} - 1\right)$

$\Rightarrow 328 = P\left(\frac{441-400}{400}\right)$

$\Rightarrow 328 = \frac{41P}{400}$

$\Rightarrow P = \frac{328\times 400}{41} = ₹\ 3200$

35. (2) Present worth of bike

$= P\left(1-\frac{R}{100}\right)^T$

$= 62500\left(1-\frac{4}{100}\right)^2$

$= 62500\left(1-\frac{1}{25}\right)^2$

$= 62500\left(\frac{25-1}{25}\right)^2$

$= \frac{62500\times 24\times 24}{25\times 25}$

$= ₹\ 57600$

36. (2) C.I. – S.I.

$= 615 - 600 = ₹\ 15$

S.I. for 1 year $= \frac{600}{2} = ₹\ 300$

$\therefore$ S.I. for 1 year on ₹ 300 $= ₹\ 15$

$\therefore$ Rate $= \frac{15\times 100}{300\times 1} = 5\%$

$\therefore \frac{PRT}{100} = 600$

$\Rightarrow P\times\frac{5\times 2}{100} = 600$

$\Rightarrow P = 600\times 10 = ₹\ 6000$

37. (4) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 13230 = 12000\left(1+\frac{5}{100}\right)^n$

$\Rightarrow \frac{13230}{12000} = \left(1+\frac{1}{20}\right)^n$

$\Rightarrow \frac{441}{400} = \left(\frac{21}{20}\right)^n$

$\Rightarrow \left(\frac{21}{20}\right)^n = \left(\frac{21}{20}\right)^2$

$\Rightarrow n = 2$ years

38. (3) Principal (P) = Rs. S

Rate (R) = 2r% per annum

$\therefore$ Amount $= P\left(1+\frac{R}{100}\right)^T$

$= S\left(1+\frac{2r}{100}\right)^3 = S\left(1+\frac{r}{50}\right)^3$

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39. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 2420 = P\left(1+\frac{10}{100}\right)^2$

$\Rightarrow 2420 = P\left(1+\frac{1}{10}\right)^2 = P\left(\frac{11}{10}\right)^2$

$\Rightarrow P = \frac{2420\times10\times10}{11\times11}$ = Rs. 2000

40. (3) Let principal be Rs. P.

Interest in 1 year = $\frac{PRT}{100}$

$= \frac{P\times10}{100}$ = Rs. $\frac{P}{10}$

According to question,

$\therefore P\left[\left(1+\frac{R}{100}\right)^2-1\right]-\frac{P}{10}$

= 132

$\Rightarrow P\left[\left(1+\frac{10}{100}\right)^2-1\right]-\frac{P}{10}$

= 132

$\Rightarrow P\left[\left(\frac{11}{10}\right)^2-1\right]-\frac{P}{10}=132$

$\Rightarrow P\left(\frac{121}{100}-1\right)-\frac{P}{10}=132$

$\Rightarrow \frac{21P}{100}-\frac{P}{10}=132$

$\Rightarrow \frac{21P-10P}{100}=132$

$\Rightarrow \frac{11P}{100}=132$

$\Rightarrow P = \frac{132\times100}{11}$ = Rs 1200

41. (3) Let the principal be Rs. P.

According to the question,

$P\left(1+\frac{R}{100}\right)^2 - P\left(1+\frac{R}{100}\right) = 420$

$\Rightarrow P\left(1+\frac{R}{100}\right)\left(1+\frac{R}{100}-1\right)=420$

$\Rightarrow P\left(1+\frac{R}{100}\right)\times\frac{R}{100}=420$

$\Rightarrow P\left(1+\frac{5}{100}\right)\times\frac{5}{100}=420$

$\Rightarrow P\left(1+\frac{1}{20}\right)=420\times20$

$\Rightarrow P\times\frac{21}{20}=420\times20$

$\Rightarrow P = \frac{420\times20\times20}{21}$ = Rs. 8000

42. (4) Time = T half-years

Rate = $\frac{5}{2}$% per half year

$A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 68921 = 64000\left(1+\frac{5}{200}\right)^T$

$\Rightarrow \frac{68921}{64000} = \left(1+\frac{1}{40}\right)^T$

$\Rightarrow \frac{68921}{64000} = \left(\frac{41}{40}\right)^T$

$\Rightarrow \left(\frac{41}{40}\right)^3 = \left(\frac{41}{40}\right)^T$

$\Rightarrow$ T = 3 half years

$= \frac{3}{2} = 1\frac{1}{2}$ years

43. (4) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 12100 = P\left(1+\frac{10}{100}\right)^2$

$\Rightarrow 12100 = P\left(\frac{11}{10}\right)^2$

$\Rightarrow 12100 = P\times\frac{121}{100}$

$\Rightarrow P = \frac{12100\times100}{121}$ = Rs. 10000

44. (4) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 1348.32 = 1200\left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{1348.32}{1200} = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{134832}{120000} = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{11236}{10000} = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \left(\frac{106}{100}\right)^2 = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow \frac{106}{100} = 1+\frac{R}{100}$

$\Rightarrow 1+\frac{6}{100} = 1+\frac{R}{100}$

$\Rightarrow$ R = 6% per annum.

45. (3) Rate of interest

$= \frac{20}{4}$ = 5% per quarter

Time = 3 quarters

$\therefore$ C.I. $= P\left[\left(1+\frac{R}{100}\right)^T-1\right]$

$= 12000\left[\left(1+\frac{5}{100}\right)^3-1\right]$

$= 12000\left[\left(1+\frac{1}{20}\right)^3-1\right]$

$= 12000\left[\left(\frac{21}{20}\right)^3-1\right]$

$= 12000\left(\frac{9261}{8000}-1\right)$

$= \frac{12000\times1261}{8000}$ = Rs. 1891.5

TYPE-II

1. (3) Let the sum be P.

$\therefore 101.50 = P\left[\left(1+\frac{3}{100}\right)^2-1\right]$

$\left[\because \text{C.I.} = P\left[\left(1+\frac{r}{100}\right)^n-1\right]\right]$

$\Rightarrow 101.50 = P\left[\left(\frac{103}{100}\right)^2-1\right]$

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$= P\left(\frac{10609-10000}{10000}\right)$

$\Rightarrow P = ₹\frac{10150\times10000}{609}$

$= ₹\frac{1015000}{609}$

$\therefore S.I. = \frac{1015000\times2\times3}{609\times100} = ₹100$

2. (2) Suppose principal be x

$\Rightarrow x\left\{\left(1+\frac{5}{100}\right)^3-1\right\} = 252.20$

$\Rightarrow x\left\{\left(\frac{21}{20}\right)^3-1\right\} = 252.20$

$\Rightarrow x\left\{\frac{21\times21\times21-20\times20\times20}{20\times20\times20}\right\} = 252.20$

$\Rightarrow x\frac{1261}{8000} = 252.20$

$\therefore x = \frac{252\cdot20\times8000}{1261} = 1600$

$\Rightarrow SI = \frac{1600\times5\times3}{100} = ₹240$

3. (3) If SI on a certain sum for two years is x and CI is y, then

$y = x\left(1+\frac{r}{200}\right)$

$\Rightarrow 282.15 = 270\left(1+\frac{r}{100}\right)$

$\Rightarrow 1+\frac{r}{200} = \frac{282.15}{270}$

$\Rightarrow \frac{r}{200} = \frac{282.15}{270}-1$

$\Rightarrow \frac{r}{200} = \frac{12.15}{270}$

$\Rightarrow r = \frac{12.15\times200}{270} = 9\%$

4. (2) $C.I. = P\left[\left(1+\frac{R}{100}\right)^T-1\right]$

$\Rightarrow 510 = P\left[\left(1+\frac{25}{200}\right)^2-1\right]$

$\Rightarrow 510 = P\left(\frac{81}{64}-1\right)$

$\Rightarrow P = \frac{510\times64}{17} = 1920$

$\therefore S.I. = \frac{1920\times2\times25}{100\times2} = ₹480$

5. (3) Let the principal be P and rate of interest be r per cent per annum. Then,

$C.I = P\left[\left(1+\frac{r}{100}\right)^2-1\right]$

$\Rightarrow 40.80 = P\left[\left(1+\frac{r}{100}\right)^2-1\right]$ ....(i)

$S.I. = \frac{P.r.t}{100} \Rightarrow 40 = \frac{Pr\times2}{100}$ ...(ii)

$\therefore \frac{40.80}{40} = \frac{P\left[\left(1+\frac{r}{100}\right)^2-1\right]}{\frac{2Pr}{100}}$

$\Rightarrow 1.02$

$= \frac{100}{2r}\left[1+\frac{r^2}{10000}+\frac{2r}{100}-1\right]$

$\Rightarrow 1.02 = \frac{r}{200}+1$

$\Rightarrow \frac{r}{200} = 1.02-1$

$\Rightarrow r = 0.02\times200$

$\therefore r = 4\%$ per annum.

6. (1) Let the principal be P.

$\therefore C.I. = P\left[\left(1+\frac{R}{100}\right)^T-1\right]$

$\Rightarrow 328 = P\left[\left(1+\frac{5}{100}\right)^2-1\right]$

$\Rightarrow 328 = P\left[\frac{441}{400}-1\right]$

$\Rightarrow 328 = P\left[\frac{441-400}{400}\right]$

$\Rightarrow P = \frac{328\times400}{41} = ₹3200$

$\therefore S.I.$

$= \frac{PRT}{100} = \frac{3200\times5\times2}{100} = ₹320$

7. (2) $C.I. = P\left(1+\frac{r}{100}\right)^t - P$ ...

$2448 = P\left[\left(1+\frac{r}{100}\right)^t-1\right]$

or $2448 = P\left[\left(1+\frac{4}{100}\right)^2-1\right]$

$\Rightarrow 2448 = P\left[\frac{676}{625}-1\right]$

$2448 = P\left[\frac{51}{625}\right]$

$\therefore P = \frac{2448\times625}{51}$

$P = ₹30,000$

$\therefore S.I. = \frac{30000\times4\times2}{100} = ₹2400.$

8. (3) Let the principal be x and rate of interest be r% per annum. Now,

$S.I. = \frac{Principal\times Time\times Rate}{100}$

$260 = \frac{x\times r}{100}$ ....(i)

$C.I. = P\left[\left(1+\frac{R}{100}\right)^T-1\right]$

$540.80 = x\left[\left(1+\frac{r}{100}\right)^2-1\right]$

$\Rightarrow 540.80 = x\left[1+\frac{2r}{100}+\frac{r^2}{10000}-1\right]$

$\Rightarrow 540.80 = \frac{2xr}{100}+\frac{xr^2}{10000}$

$\Rightarrow 540.80 = 2\times260+\frac{260.r}{100}$

$\Rightarrow 260r = 54080-52000$

$\Rightarrow 260r = 2080$

$\Rightarrow r = \frac{2080}{260} = 8\%$

9. (4) $Principal = \frac{S.I.\times100}{Time\times Rate}$

$= \frac{80\times100}{2\times4} = ₹1000$

$\therefore C.I. = P\left[\left(1+\frac{R}{100}\right)^T-1\right]$

$= 1000\left[\left(1+\frac{4}{100}\right)^2-1\right]$

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$= 1000\left[\left(\frac{26}{25}\right)^2 - 1\right]$

$= 1000\left(\frac{676}{625} - 1\right)$

$= 1000\left(\frac{676-625}{625}\right)$

$= \frac{1000\times 51}{625} = ₹\ 81.60$

10. (4) C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$246 = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$\Rightarrow 246 = P\left[\left(\frac{21}{20}\right)^2 - 1\right]$

$\Rightarrow 246 = P\left(\frac{441-400}{400}\right)$

$\Rightarrow 246 = \frac{41P}{400} \Rightarrow P = \frac{246\times 400}{41}$

$= ₹\ 2400$

$\therefore SI = \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{2400\times 3\times 6}{100} = ₹\ 432$

11. (4) Difference of CI and SI for two years

$= ₹\ (954 - 900) = ₹\ 54$

$\therefore$ Sum = Difference in CI and SI $\times \left(\frac{100}{\text{Rate}}\right)^2$

$\text{Rate} = \frac{2\times \text{Difference}\times 100}{\text{Simple Interest}}$

$= \frac{2\times 5400}{900} = 12\%$

$\therefore \text{Sum} = 54\times\left(\frac{100}{12}\right)^2$

$= 54\times\frac{25}{3}\times\frac{25}{3} = ₹\ 3750$

12. (4) If the principal be P then

C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 420 = P\left[\left(1+\frac{10}{100}\right)^2 - 1\right]$

$\Rightarrow 420 = P\left(\frac{121-100}{100}\right)$

$\Rightarrow 420 = \frac{P\times 21}{100}$

$\Rightarrow P = \frac{420\times 100}{21} = ₹\ 2000$

$\therefore S.I. = \frac{PRT}{100}$

$= \frac{2000\times 10\times 2}{100} = ₹\ 400$

13. (4) If the sum be P, then

C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 102 = P\left[\left(1+\frac{4}{100}\right)^2 - 1\right]$

$\Rightarrow 102 = P\left[\left(\frac{26}{25}\right)^2 - 1\right]$

$\Rightarrow 102 = P\left(\frac{676}{625} - 1\right)$

$\Rightarrow 102 = P\left(\frac{676-625}{625}\right)$

$\Rightarrow 102 = P\times\frac{51}{625}$

$\Rightarrow P = \frac{102\times 625}{51} = ₹\ 1250$

$\therefore S.I. = \frac{1250\times 2\times 4}{100} = ₹\ 100$

14. (4) Let S.I. = ₹ 100, & Principal = ₹ 100

$\therefore \text{Rate} = \frac{S.I\times 100}{\text{Principal}\times\text{Time}}$

$= \frac{100\times 100}{100\times 8} = \frac{25}{2}\%$

$\therefore$ C.I. $= P\left[\left(1+\frac{r}{100}\right)^T - 1\right]$

$= 8000\left[\left(1+\frac{25}{200}\right)^2 - 1\right]$

$= 8000\left(\frac{81}{64} - 1\right) = \frac{8000\times 17}{64}$

$= ₹\ 2125$

15. (1) C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 2544 = P\left[\left(1+\frac{12}{100}\right)^2 - 1\right]$

$\Rightarrow 2544 = P\left[\left(\frac{28}{25}\right)^2 - 1\right]$

$\Rightarrow 2544 = P\left(\frac{784}{625} - 1\right)$

$\Rightarrow 2544 = P\left(\frac{784-625}{625}\right)$

$2544 = \frac{P\times 159}{625}$

$\Rightarrow P = \frac{2544\times 625}{159} = ₹\ 10000$

$\therefore S.I. = \frac{P\times R\times T}{100}$

$= \frac{10000\times 2\times 12}{100} = ₹\ 2400$

16. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 2916 = x\left(1+\frac{8}{100}\right)^2$

$\Rightarrow 2916 = x\left(\frac{27}{25}\right)^2$

$\Rightarrow x = \frac{2916\times 25\times 25}{27\times 27}$

$= ₹\ 2500$

$\therefore S.I. = \frac{P\times R\times T}{100}$

$= \frac{2500\times 9\times 3}{100} = ₹\ 675$

17. (1) S.I. for 3 years = ₹ 3000

S.I. for 2 years $= \frac{3000}{3}\times 2$

$= ₹\ 2000$

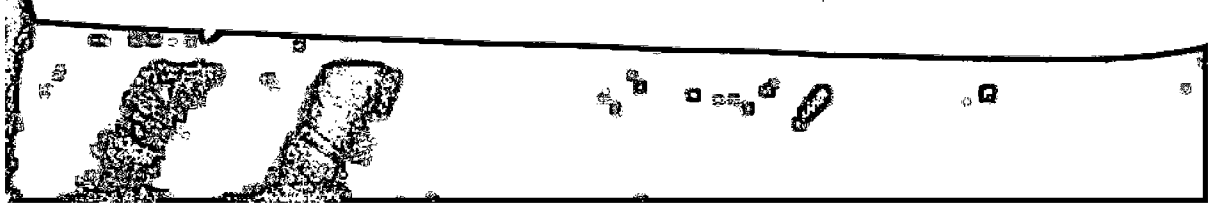
C.I. − S.I.

$= 2050 - 2000 = ₹\ 50$

$S.I. = \frac{PR\times 3}{100}$

$\Rightarrow PR = \frac{3000\times 100}{3}$

$= ₹\ 100000$



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$\therefore$ Difference $= \frac{P \times R^2}{10000}$

$\Rightarrow 50 = \frac{P \times (100000)^2}{10000 \times P^2}$

$\Rightarrow P = \frac{1000000}{50} = ₹\ 20000$

18. (1) Compound interest

$= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 410 = P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$\Rightarrow 410 = P\left[\left(1+\frac{1}{20}\right)^2 - 1\right]$

$\Rightarrow 410 = P\left[\left(\frac{21}{20}\right)^2 - 1\right]$

$\Rightarrow 410 = P\left(\frac{441}{400} - 1\right)$

$\Rightarrow 410 = P\left(\frac{41}{400}\right)$

$\Rightarrow P = \frac{410 \times 400}{41} = ₹\ 4000$

$\therefore$ S.I.

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{4000 \times 2 \times 5}{100} = ₹\ 400$

19. (4) Principal = ₹ P (let)

$\therefore$ C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$\Rightarrow 510 = P\left[\left(1+\frac{25}{200}\right)^2 - 1\right]$

$\Rightarrow 510 = P\left[\left(1+\frac{1}{8}\right)^2 - 1\right]$

$\Rightarrow 510 = P\left[\left(\frac{9}{8}\right)^2 - 1\right]$

$\Rightarrow 510 = P\left(\frac{81}{64} - 1\right)$

$\Rightarrow 510 = P\left(\frac{81-64}{64}\right)$

$\Rightarrow 510 = \frac{17P}{64}$

$\Rightarrow P = \frac{510 \times 64}{17} = ₹\ 1920$

$\therefore$ S.I.

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{1920 \times 2 \times 25}{100 \times 2} = ₹\ 480$

20. (2) Sum borrowed = Rs. x

$\therefore$ Simple interest after 4 years

$= \frac{x \times 4 \times 5}{100} = \text{Rs. } \frac{x}{5}$

Amount lent of on compound interest

$= \text{Rs. } \frac{x}{2}$

$\therefore$ C.I. $= P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$

$= \frac{x}{2}\left[\left(1+\frac{10}{100}\right)^4 - 1\right]$

$= \frac{x}{2}\left[(1.1)^4 - 1\right]$

$= \frac{x}{2}(1.4641 - 1)$

$= \text{Rs. } \frac{0.4641x}{2}$

$\therefore \frac{0.4641x}{2} - \frac{x}{5} = 3205$

$\Rightarrow \frac{2.3205x - 2x}{10} = 3205$

$\Rightarrow 0.3205x = 32050$

$\Rightarrow x = \frac{32050}{0.3205} = \text{Rs. } 100000$

21. (3) S.I. for 2 years

$= \frac{2}{3} \times 540 = \text{Rs. } 360$

C.I. – S.I.

= 376.20 – 360 = Rs. 16.20

$\therefore$ Rate of interest

$= \frac{16.20}{180} \times 100$

= 9% per annum

$\therefore$ Principal $= \frac{\text{S.I} \times 100}{\text{Time} \times \text{Rate}}$

$= \frac{180 \times 100}{1 \times 9} = \text{Rs. } 2000$

TYPE-III

1. (1) **TRICK**

As the interest was compounded half-yearly, we changed r to $\frac{r}{2}$ and t to 2t.

$\therefore$ T = 1 year & R 6%

Sum

$= \frac{36 \times 100 \times 100}{6 \times 6}$

= ₹10000

2. (2) Compound Interest (when compounded yearly)

$= 5000\left(1+\frac{4}{100}\right)^{1.5} - 5000$

$= 5000\left(\frac{26}{25}\right)^{1.5} - 5000$

= 5302.9805 – 5000 = ₹ 302.9805

C.I. (When compounded half-yearly).

$= 5000\left(1+\frac{2}{100}\right)^3 - 50000$

= 5306.04 – 5000 = ₹ 306.04

Required difference

= ₹ (306.04 – 302.9805)

= ₹ 3.059 = ₹ 3.06

3. (3) Let the sum ₹ x. Then,

C.I. $= x\left(1+\frac{5}{100}\right)^2 - x$

$= \frac{441x}{400} - x = \frac{441x - 400x}{400}$

$= \frac{41}{400}x$

Now,

S.I. $= \frac{x \times 5 \times 2}{100} = \frac{x}{10}$

$\therefore$ (C.I.) – (S.I.) $= \frac{41x}{400} - \frac{x}{10}$

$= \frac{41x - 40x}{400} = \frac{x}{400}$

$\therefore \frac{x}{400} = 15$

$\Rightarrow x = 15 \times 400 = 6000$

Hence, the sum is ₹ 6000

4. (4) **Tricky Approach**

Difference of SI and CI for 3 years

$= \frac{PR(300 + R)}{100^3}$

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$\because \frac{P\times 25\times 305}{100\times 100\times 100} = 36.60$

$\Rightarrow P = \frac{36.60\times 100\times 100\times 100}{25\times 305}$

$= ₹\ 4800$

5. (4) S.I. $= ₹\ \frac{2500\times 2\times 4}{100} = ₹\ 200$

C.I. $= ₹\ 2500\left[\left(1+\frac{4}{100}\right)^2 - 1\right]$

$= ₹\ 2500\left[\left(\frac{26}{25}\right)^2 - 1\right]$

$= ₹\ \frac{(676-625)}{625}\times 2500$

$= ₹\ \frac{51}{625}\times 2500 = ₹\ 204$

∴ The required difference
= C.I. – S.I. = ₹ (204 – 200) = ₹ 4

6. (4) Let the sum be x. Then,

C.I. $= x\left(1+\frac{10}{100}\right)^2 - x = \frac{21x}{100}$

S.I. $= \frac{x\times 10\times 2}{100} = \frac{x}{5}$

∴ C.I. – S.I. $= \frac{21x}{100} - \frac{x}{5} = \frac{x}{100}$

Given that, $\frac{x}{100} = 65$

$\therefore x = 6500$

Hence, the sum is ₹ 6500.

7. (3) When difference between the compound interest and simple interest on a certain sum of money for 2 years at r% rate is x, then

$x = \text{Sum}\left(\frac{r}{100}\right)^2$

$\Rightarrow 10 = 1000\left(\frac{r}{100}\right)^2$

$\Rightarrow \left(\frac{r}{100}\right)^2 = \frac{10}{1000}$

$\Rightarrow \frac{r}{100} = \sqrt{\frac{1}{100}} = \frac{1}{10}$

$\Rightarrow r = \frac{100}{10} = 10\%$

8. (2) When difference between the compound interest and simple interest on a certain sum of money for 2 years at r % rate is x, then the sum is given by

$x\left(\frac{100}{r}\right)^2$ Here $x = ₹\ 80$,

$r = 40\%$

$\therefore$ Required sum $= 80\left(\frac{100}{4}\right)^2$

$= 80 \times 25 \times 25 = ₹\ 50000$

9. (2) When difference between the CI and SI on a certain sum of money for 2 years at r% rate is x, then

Sum $= x \times \left(\frac{100}{r}\right)^2$

$= 1 \times \left(\frac{100}{4}\right)^2 = ₹\ 625$

10. (1) Sum = Difference $\left(\frac{100}{r}\right)^2$

$= 4 \times \left(\frac{100}{4}\right)^2 = ₹\ 2500$

11. (1) Difference between C.I. and S.I for 3 years

$= \frac{PR^2}{(100)^2}\left(\frac{R}{100}+3\right)$

$\Rightarrow 15.25 = \frac{P\times 25}{10000}\left(\frac{5}{100}+3\right)$

$\Rightarrow 15.25 = \frac{P\times 305}{400\times 100}$

$\Rightarrow P = \frac{15.25\times 400\times 100}{305}$

$= ₹\ 2000$

12. (3) **Tricky Approach**

Sum = (CI – SI) $\left(\frac{100}{r}\right)^2$

$= 768 \times \left(\frac{100}{8}\right)^2 = ₹\ 1,20,000$

13. (3) If the difference between compound interest and simple interest at the rate of r% per annum for 2 years be x, then

Principal $= x\left(\frac{100}{r}\right)^2$

$= 28\left(\frac{100}{10}\right)^2 = ₹\ 2800$

If the interest is compounded half yearly, then

$r = \frac{10}{2} = 5\%$,

Time = 4 half years

Simple interest $= \frac{2800\times 5\times 4}{100}$

$= ₹\ 560$

Compound interest

$= 2800\left[\left(1+\frac{5}{100}\right)^4 - 1\right]$

$= 2800\ [1.2155 - 1]$
$= 2800 \times 0.2155 = 603.41$
$\therefore$ Difference = ₹ (603.41–560)
= ₹ 43.41

14. (3) C.I. after 3 years

$= 6000\left[\left(1+\frac{5}{100}\right)^3 - 1\right]$

$= 6000\left(\frac{9261-8000}{8000}\right)$

$= 6000 \times \frac{1261}{8000} = ₹\ 945.75$

CI after 2 years

$= 6000\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$

$= 6000\left(\frac{441-400}{400}\right)$

$= 6000 \times \frac{41}{400} = ₹\ 615$

Required difference
= ₹ (945.75 – 615) = ₹ 330.75

15. (1) Let the principal be x.
Compound interest

$= P\left[\left(1+\frac{R}{100}\right)^t - 1\right]$

$= x\left[\left(1+\frac{10}{100}\right)^2 - 1\right]$

$= x\ [(1.1)^2 - 1]$
$= x\ (1.21 - 1) = 0.21x$

SI $= \frac{x\times 2\times 10}{100} = \frac{x}{5} = 0.2x$

According to the question.
$0.21x - 0.2x = 40$
$\Rightarrow 0.01x = 40$.

$\Rightarrow x = \frac{40}{0.01} = ₹\ 4000$

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16. (1) Let the difference between CI and SI on a certain sum for 3 years at r% be x,
then the sum

$$= \frac{\text{Difference} \times (100)^3}{r^2(300+r)}$$

$$= \frac{122 \times 100^3}{25(300+5)}$$

$$= \frac{122000000}{25 \times 305} = ₹16000$$

17. (2) Difference of two years

$$= P\left(\frac{r^2}{10000}\right)$$

$$\Rightarrow 48 = P\left(\frac{400}{10000}\right)$$

$$\Rightarrow 48 = \frac{P}{25}$$

$$\Rightarrow P = 48 \times 25 = ₹\ 1200$$

18. (1) Difference $= \frac{PR^2}{10000}$

$$\Rightarrow 25 = \frac{10000 \times R^2}{10000}$$

$$\Rightarrow R = 5\%$$

19. (2) Difference $= \frac{Pr^2}{10000}$

$$\Rightarrow 6 = \frac{P \times 5 \times 5}{10000}$$

$$\Rightarrow P = 6 \times 400 = ₹\ 2400$$

20. (3) Rate of interest = 8% per half-year
Time = 2 half years

$$\text{Difference of interests} = \frac{PR^2}{100}$$

$$\Rightarrow 56 = \frac{P \times (8)^2}{(100)^2}$$

$$\Rightarrow P = \frac{56 \times 10000}{64} = ₹\ 8750$$

21. (4) Let the sum be x
r = 10%, n = 3 years

$$\text{S.I.} = \frac{x \times r \times n}{100}$$

$$\text{S.I.} = \frac{x \times 10 \times 3}{100} = \frac{3}{10}x$$

$$\text{C.I.} = \left[\left(1+\frac{r}{100}\right)^n - 1\right]x$$

$$= \left[\left(1+\frac{10}{100}\right)^3 - 1\right]x$$

$$= \left[\left(\frac{11}{10}\right)^3 - 1\right]x$$

$$= \left(\frac{1331}{1000} - 1\right)x = \frac{331}{1000}x$$

$$\frac{331}{1000}x - \frac{3}{10}x = 31$$

$$\text{or } \frac{(331-300)}{1000}x = 31$$

$$\text{or } \frac{31}{1000}x = 31$$

$$\text{or } x = 1000$$

$$\therefore \text{Sum} = ₹\ 1000$$

22. (4) Let the sum be x.
When difference between the compound interest and simple interest on a certain sum of money for 2 years at r% rate is x, then the sum is given by:

$$\text{Sum} = \text{Difference} \times \left(\frac{100}{\text{Rate}}\right)^2$$

$$= ₹\ 8 \times \left(\frac{100}{4}\right)^2$$

$$= ₹\ 8 \times 25 \times 25 = ₹\ 5000$$

23. (2) If the interest is compounded half yearly,

$$\text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= P\left[\left(1+\frac{5}{100}\right)^2 - 1\right]$$

$$= P\left[\left(\frac{21}{20}\right)^2 - 1\right] = \frac{41P}{400}$$

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{P \times 10}{100} = \frac{P}{10}$$

$$\therefore \frac{41P}{400} - \frac{P}{10} = 180$$

$$\Rightarrow \frac{41P - 40P}{400} = 180$$

$$\Rightarrow \frac{P}{400} = 180$$

$$\Rightarrow P = ₹\ 72000$$

24. (1) Difference $= \frac{PR^2}{(100)^2}$

$$\Rightarrow 1.50 = \frac{P \times 5 \times 5}{(100)^2}$$

$$\Rightarrow P = 400 \times 1.5 = ₹\ 600$$

25. (3) Time $= \frac{3}{2} \times 2 = 3$ half years

$$\text{Rate} = \frac{10}{2} = 5\% \text{ per half year}$$

[$\because$ when $r \to r/2$, then $t \to 2t$]
Difference

$$= P\left(\frac{r^3}{1000000} + \frac{3r^2}{10000}\right)$$

$$\Rightarrow 244 = P\left(\frac{125}{1000000} + \frac{75}{10000}\right)$$

$$\Rightarrow 244 = P\left(\frac{7625}{1000000}\right)$$

$$\Rightarrow P = \frac{244 \times 1000000}{7625}$$

$$= ₹\ 32000$$

26. (3) The difference between compound interest and simple interest for two years

$$= \frac{\text{Principal} \times (\text{Rate})^2}{100 \times 100}$$

$$\therefore \quad 1 = \frac{\text{Principal} \times (4)^2}{10000}$$

$$\Rightarrow \text{Principal} = \frac{10000}{16} = ₹\ 625$$

27. (2) Difference of 2 years

$$= \frac{p \times r^2}{10000}$$

$$\Rightarrow 32 = \frac{5000 \times r^2}{10000}$$

$$\Rightarrow r^2 = \frac{32 \times 10000}{5000} = 64$$

$$\Rightarrow r = \sqrt{64} = 8\%$$

28. (1) Difference $= \frac{PR^2}{10000}$

$$\Rightarrow 25 = \frac{P \times 5 \times 5}{10000}$$

$$\Rightarrow P = ₹\ 10000$$

29. (3) Difference $= \frac{PR^2}{10000}$

$$\Rightarrow 300 = \frac{P \times 10 \times 10}{10000}$$

$$\Rightarrow P = 300 \times 100 = ₹\ 30000$$



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30. (1) S.I.

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{32000 \times 4 \times 10}{100} = ₹\ 12800$

C.I. $= P\left[\left(1+\frac{R}{100}\right)^4 - 1\right]$

$= 32000\left[\left(1+\frac{10}{100}\right)^4 - 1\right]$

$= 32000\ [(1.1)^4 - 1]$

$= 32000\ (1.4641 - 1)$

$= 32000 \times 0.4641 = ₹\ 14851.2$

$\therefore$ Required difference

$= 14851.2 - 12800 = ₹\ 2051.2$

31. (3) Difference $= \frac{PR^2}{10000}$

$\Rightarrow 63 = \frac{P \times 5 \times 5}{10000}$

$\Rightarrow P = 400 \times 63 = Rs.\ 25200$

TYPE-IV

1. (4) Suppose P = ₹ 100 and amount A = ₹ 225

$A = P\left(1+\frac{r}{100}\right)^1$

or $225 = 100\left(1+\frac{r}{100}\right)^2$

or $\frac{225}{100} = \left[1+\frac{r}{100}\right]^2$

or $1+\frac{r}{100} = \frac{15}{10}$

or $\frac{100+r}{100} = \frac{15}{10}$

or $100 + r = 150$

or $r = 50\%$

2. (2) A sum of ₹ x becomes ₹ 2x in 4 years.

Similarly, ₹ 2x will become $2 \times 2x$ = ₹ 4x in next 4 years and ₹ 4x will become $2 \times 4x$ = ₹ 8x in yet another 4 years. So, the total time = 4 + 4 + 4 = 12 years

Note : If a sum of money becomes n times in t years, it will become $t^1 = n^x$ times at the same rate of interest in t^1 years given by,

$\boxed{t^1 = xt}$

3. (2) Let the sum be x which becomes 2x in 10 years. Hence, 4x in 20 years

Method 2 :

Unitary Method can also be used.

4. (1) Let the principal be x and the rate of compound interest be r% per annum. Then,

$8x = x\left(1+\frac{r}{100}\right)^3$

$\Rightarrow 8 = \left(1+\frac{r}{100}\right)^3 \Rightarrow 2^3 = \left(1+\frac{r}{100}\right)^3$

$\Rightarrow 2 = 1+\frac{r}{100}$

$\Rightarrow \frac{r}{100} = 1 \Rightarrow r = 100\%$

5. (3) Let the sum be x.

Then,

$2x = x\left(1+\frac{r}{100}\right)^6$

$\Rightarrow 2 = \left(1+\frac{r}{100}\right)^6$

Cubing both sides,

$8 = \left\{\left(1+\frac{r}{100}\right)^6\right\}^3$

$\Rightarrow 8 = \left(1+\frac{r}{100}\right)^{18}$

$\Rightarrow 8x = x\left(1+\frac{r}{100}\right)^{18}$

$\therefore$ The sum will be 8 times in 18 years. i.e., Time = 18 years

6. (2) Let the Principal be P and rate of interest be r%.

$\therefore 2P = P\left(1+\frac{r}{100}\right)^2$

$\Rightarrow 2 = \left(1+\frac{r}{100}\right)^5$ ...(i)

On cubing both sides,

$8 = \left(1+\frac{r}{100}\right)^{15}$

$\therefore$ Time = 15 years

7. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$2 = 1\left(1+\frac{R}{100}\right)^{15}$

Cubing on both sides, we have

$8 = 1\left(1+\frac{R}{100}\right)^{45}$

Required time = 45 years

8. (4) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 24000 = 12000\left(1+\frac{R}{100}\right)^5$

$\Rightarrow 2 = \left(1+\frac{R}{100}\right)^5$

$\Rightarrow 2^4 = \left(1+\frac{R}{100}\right)^{20}$

i.e. The sum amounts to ₹ 192000 after 20 years.

9. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 4 = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow 1 + \frac{R}{100} = 2$

$\Rightarrow \frac{R}{100} = 1$

$\Rightarrow R = 100\%$

10. (2) $A = P\left(1+\frac{R}{100}\right)^T$

Let P. ₹, A = ₹ 2

$\Rightarrow 2 = 1\left(1+\frac{R}{100}\right)^3$

On squaring both sides.

$4 = 1\left(1+\frac{R}{100}\right)^6$

$\therefore$ Time = 6 years

11. (2) Let the principal be ₹ 1.

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 8 = 1\left(1+\frac{R}{100}\right)^3$

$\Rightarrow 2^3 = \left(1+\frac{R}{100}\right)^3$

$\Rightarrow 2 = \left(1+\frac{R}{100}\right)^1$

$\Rightarrow 2^4 = \left(1+\frac{R}{100}\right)^4$

$\therefore$ Time = 4 years



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12. (3) $A = P\left(1+\frac{R}{100}\right)^T$

Let P be ₹ 1, then A = ₹ 2

$\Rightarrow 2 = 1\left(1+\frac{R}{100}\right)^4$

$\Rightarrow 2^2 = \left(1+\frac{R}{100}\right)^8$

$\therefore$ Time = 8 years

13. (3) $A = P\left(1+\frac{R}{100}\right)^T$

Let P = ₹ 1, then A = ₹ 3

$\Rightarrow 3 = 1\left(1+\frac{R}{100}\right)^3$

On squaring both sides,

$9 = 1\left(1+\frac{R}{100}\right)^6$

$\therefore$ Time = 6 years

14. (3) If principal = ₹ 1000, amount = ₹ 1331

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow \frac{1331}{1000} = \left(1+\frac{R}{100}\right)^3$

$\Rightarrow \left(\frac{11}{10}\right)^3 = \left(1+\frac{R}{100}\right)^3$

$\Rightarrow 1+\frac{R}{100} = \frac{11}{10}$

$\Rightarrow \frac{R}{100} = \frac{1}{10}$

$\Rightarrow R = \frac{1}{10}\times 100 = 10\%$

15. (4) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 1.44P = P\left(1+\frac{R}{100}\right)^2$

$\Rightarrow (1.2)^2 = \left(1+\frac{R}{100}\right)^2$

$\Rightarrow 1+\frac{R}{100} = 1.2$

$\Rightarrow R = 0.2 \times 100 = 20\%$

16. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow \frac{27}{8}x = x\left(1+\frac{R}{100}\right)^3$

$\Rightarrow \left(\frac{3}{2}\right)^3 = \left(1+\frac{R}{100}\right)^3$

$\Rightarrow 1+\frac{R}{100} = \frac{3}{2}$

$\Rightarrow \frac{R}{100} = \frac{3}{2} - 1 = \frac{1}{2}$

$\Rightarrow R = \frac{1}{2}\times 100$

$\therefore R = 50\%$

TYPE-V

1. (1) Let the rate of interest be r% per annum,
According to the question,

$4840 = P\left(1+\frac{r}{100}\right)^2$ ..... (i)

and $5324 = P\left(1+\frac{r}{100}\right)^3$ ....(ii)

On dividing equation (ii) by equation (i), we have,

$1+\frac{r}{100} = \frac{5324}{4840} = 1+\frac{484}{4840}$

$\Rightarrow \frac{r}{100} = \frac{484}{4840}$

$\Rightarrow r = 10\%$

2. (4) Let the rate of interest = R% per annum.
We know that

$A = P\left(1+\frac{R}{100}\right)^T$

$2420 = P\left(1+\frac{R}{100}\right)^2$ ....(i)

$2662 = P\left(1+\frac{R}{100}\right)^3$ ...(ii)

Dividing equation (ii) by (i).

$1+\frac{R}{100} = \frac{2662}{2420}$

$\Rightarrow \frac{R}{100} = \frac{2662}{2420} - 1$

$\Rightarrow \frac{R}{100} = \frac{2662-2420}{2420} = \frac{242}{2420} = \frac{1}{10}$

$\Rightarrow R = \frac{1}{10}\times 100 = 10\%$

3. (1) $A = P\left(1+\frac{R}{100}\right)^T$

$\therefore 3840 = P\left(1+\frac{R}{100}\right)^4$ ....(i)

$3936 = P\left(1+\frac{R}{100}\right)^5$ ...(ii)

Dividing equation (ii) by equation (i).

$\frac{3936}{3840} = 1+\frac{R}{100}$

$\Rightarrow \frac{R}{100} = \frac{3936}{3840} - 1$

$= \frac{3936-3840}{3840} = \frac{96}{3840}$

$\Rightarrow R = \frac{96}{3840}\times 100 = 2.5\%$

4. (4) If the principal be ₹ P, then

$A = P\left(1+\frac{r}{100}\right)^T$

$\Rightarrow 1440 = P\left(1+\frac{r}{100}\right)^2$ ...(i)

and $1728 = P\left(1+\frac{r}{100}\right)^3$ ...(ii)

On dividing equation (ii) by (i),

$\frac{1728}{1440} = 1+\frac{r}{100}$

$\therefore \frac{r}{100} = \frac{1728}{1440} - 1$

$= \frac{1728-1440}{1440} = \frac{288}{1440}$

$\Rightarrow r = \frac{288\times 100}{1440}$

$\therefore r = 20\%$ per annum

5. (4) Difference = 238.50 – 225
= ₹ 13.50
= S.I. on ₹ 225 for 1 year

$\therefore$ Rate = $\frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$

$= \frac{13.50\times 100}{225\times 1} = 6\%$ per annum

6. (2) $A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 7000 = P\left(1+\frac{R}{100}\right)^4$ ....(i)

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$10000 = P\left(1+\frac{R}{100}\right)^8$ .....(ii)

Dividing equation (ii) by (i)

$\frac{10000}{7000} = \left(1+\frac{R}{100}\right)^4$

$\Rightarrow \frac{10}{7} = \left(1+\frac{R}{100}\right)^4$

From equation (i),

$7000 = P \times \frac{10}{7}$

$\Rightarrow P = ₹ 4900$

7. (3) Interest on ₹ 650 for 1 year
$= 676 - 650 = ₹ 26$

So, $r = \frac{26}{650} \times 100$

$\Rightarrow r = 4\%$ per annum

$P = \frac{A}{\left[1+\frac{r}{100}\right]^t} = \frac{650}{\left[1+\frac{4}{100}\right]^1}$

$= \frac{650}{\frac{26}{25}} = 650 \times \frac{25}{26} = ₹ 625$

Note : A sum at a rate of interest compounded yearly becomes ₹ A, in n years and ₹ A_2 in (n + 1) years,

then $P = A_1\left(\frac{A_1}{A_2}\right)^n$

8. (1) S.I. on ₹ 2400 for 1 year
$= ₹ (2, 520 - 2, 400) = ₹ 120$

$\therefore$ Rate $= \frac{S.I \times 100}{\text{Principal} \times \text{Time}}\%$

$= \frac{120 \times 100}{2400 \times 1} = 5\%$

9. (3) $P\left(1+\frac{r}{100}\right)^2 = 4500$ ...(i)

$P\left(1+\frac{r}{100}\right)^4 = 6750$ .....(ii)

On dividing equation (ii) by equation (i), we get

$\left(1+\frac{r}{100}\right)^2 = \frac{6750}{4500}$

From equation (i),

$P \times \frac{6750}{4500} = 4500$

$\Rightarrow P = \frac{4500 \times 4500}{6750}$

$= ₹ 3,000$

10. (4) Principal = ₹ P (let)
Rate = R% per annum

$\therefore A = P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 650 = P\left(1+\frac{R}{100}\right)$

$\Rightarrow \frac{650}{P} = \left(1+\frac{R}{100}\right)$ ...(i)

Again, $676 = P\left(1+\frac{R}{100}\right)^2$

$\Rightarrow 676 = P\left(\frac{650}{P}\right)^2$

$= \frac{P \times 650 \times 650}{P^2}$

$\Rightarrow P = \frac{650 \times 650}{676} = ₹ 625$

TYPE-VI

1. (1) A = ₹ 2550
R = 4% per annum
n = 2 years
Let each of the two equal instalments be x
Present worth

$= \frac{\text{Instalment}}{\left(1+\frac{r}{100}\right)^n}$

$P_1 = \frac{x}{\left(1+\frac{4}{100}\right)^1} = \frac{x}{1+\frac{1}{25}} = \frac{x}{\frac{26}{25}}$

or $P_1 = \frac{25}{26}x$

Similarly,

$P_2 = \left(\frac{25}{26}\right)^2 x = \frac{625}{676}x$

$P_1 + P_2 = A$

$\therefore \frac{25}{26}x + \frac{625}{676}x = 2550$

$\Rightarrow \frac{(650+625)x}{676} = 2550$

$\Rightarrow \frac{1275}{676}x = 2550$

$\Rightarrow x = 2550 \times \frac{676}{1275}$

$x = ₹ 1352$

2. (2) Let principal (present worth for first year be P_1 and that for two years be P_2.

$\therefore 16224 = P_1\left(1+\frac{4}{100}\right)$

$\Rightarrow 16224 = P_1\left(1+\frac{1}{25}\right) = \frac{26P_1}{25}$

$\Rightarrow P_1 = \frac{16224 \times 25}{26} = ₹ 15600$

Again,

$16224 = P_2\left(1+\frac{4}{100}\right)^2$

$\Rightarrow 16224 = P_2\left(\frac{26}{25}\right)^2 = \frac{676P_2}{625}$

$\Rightarrow P_2 = \frac{16224 \times 625}{676} = ₹ 15000$

$\therefore$ Cash value of the scooter
$= ₹ (16224 + 15600 + 15000)$
$= ₹ 46824$

3. (3) Let the annual instalment be x

$A = P\left(1+\frac{R}{T}\right)^T$

$x = P_1\left(1+\frac{25}{200}\right)$

$\Rightarrow x = P_1 \times \frac{9}{8}$

$\Rightarrow P_1 = \frac{8}{9}x$

Similarly, $P_2 = \frac{64}{81}x$

$P_1 + P_2 = 6800$

$\Rightarrow \frac{8}{9}x + \frac{64}{81}x = 6800$

$\Rightarrow \frac{72x + 64x}{81} = 6800$

$\Rightarrow \frac{136x}{81} = 6800$

$\Rightarrow x = \frac{6800 \times 81}{136} = ₹ 4050$

4. (2) Let each instalment be x.

$\therefore \frac{x}{\left(1+\frac{5}{100}\right)} + \frac{x}{\left(1+\frac{5}{100}\right)^2} = 12300$

$\Rightarrow \frac{20x}{21} + \left(\frac{20}{21}\right)^2 x = 12300$

$\Rightarrow \frac{20x}{21}\left(1+\frac{20}{21}\right) = 12300$

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$\Rightarrow \frac{20x}{21} \times \frac{41}{21} \times x = 12300$

$\Rightarrow x = \frac{12300 \times 21 \times 21}{20 \times 41}$

$\therefore x = ₹\ 6615$

5. (2) Let the value of each instalment be ₹ x

$\therefore$ Principal = Present worth of ₹ x due 1 year hence, present worth of Rs. x due 2 years hence

$$\Rightarrow 210 = \frac{x}{\left(1+\frac{R}{100}\right)} + \frac{x}{\left(1+\frac{R}{100}\right)^2}$$

$$\Rightarrow 210 = \frac{x}{\left(1+\frac{10}{100}\right)} + \frac{x}{\left(1+\frac{10}{100}\right)^2}$$

$$\Rightarrow 210 = \frac{x}{1+\frac{1}{10}} + \frac{x}{\left(1+\frac{1}{10}\right)^2}$$

$$\Rightarrow 210 = \frac{x}{\frac{11}{10}} + \frac{x}{\left(\frac{11}{10}\right)^2}$$

$$\Rightarrow 210 = \frac{10x}{11} + \frac{100x}{121}$$

$$\Rightarrow 210 = \frac{110x + 100x}{121}$$

$\Rightarrow 210 \times 121 = 210x$

$\Rightarrow x = \frac{210 \times 121}{210} = ₹\ 121$

6. (3) Share of elder brother = Rs. x (let)

$\therefore$ Share of younger brother = Rs. $(16820 - x)$

$$A = P\left(1+\frac{R}{100}\right)^T$$

According to the question,

$$x\left(1+\frac{5}{100}\right)^{13} = (16820 - x)\left(1+\frac{5}{100}\right)^{15}$$

$$\Rightarrow x = (16820 - x)\left(1+\frac{1}{20}\right)^2$$

$$\Rightarrow x = (16820 - x)\left(\frac{21}{20}\right)^2$$

$$\Rightarrow \left(\frac{20}{21}\right)^2 x = 16820 - x$$

$$\Rightarrow \frac{400x}{441} + x = 16820$$

$$\Rightarrow \frac{400x + 441x}{441} = 16820$$

$\Rightarrow 841x = 16820 \times 441$

$\Rightarrow x = \frac{16820 \times 441}{841} = $ Rs. 8820

7. (1) Sum borrowed = Present worth of Rs. 17640 due 1 year hence + Present worth of Rs. 17640 due 2 years hence

$$= \text{Rs.}\left(\frac{17640}{\left(1+\frac{5}{100}\right)} + \frac{17640}{\left(1+\frac{5}{100}\right)^2}\right)$$

$$= \text{Rs.}\left(17640 \times \frac{20}{21} + 17640 \times \frac{20}{21} \times \frac{20}{21}\right)$$

= Rs. (16800 + 16000)

= Rs. 32800

8. (3) Let the amount deposited in Post Office be Rs. x lakhs.

$\therefore$ Amount deposited in bank = Rs. $(3 - x)$ lakhs

According to the question,

$$\frac{x \times 10 \times 1}{100 \times 12} + \frac{(3-x) \times 6 \times 1}{100 \times 12} = \frac{2000}{100000} = \frac{1}{50}$$

$$\Rightarrow 10x + 18 - 6x = \frac{1}{50} \times 1200 = 24$$

$\Rightarrow 4x = 24 - 18 = 6$

$\Rightarrow x = \frac{6}{4} = \text{Rs. } \frac{3}{2}$ lakhs

$\therefore$ Required difference = 0

9. (2) Let the income of company in 2010 be Rs. P

According to the question,

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow 2664000 = P\left(1+\frac{20}{100}\right)^2$$

$$\Rightarrow 2664000 = P\left(1+\frac{1}{5}\right)^2$$

$$\Rightarrow 2664000 = P \times \left(\frac{6}{5}\right)^2$$

$$\Rightarrow P = \frac{2664000 \times 5 \times 5}{6 \times 6}$$

= Rs. 1850000

TYPE-VII

1. (2) S.I. $= \frac{6000 \times 5 \times 2}{100} = ₹\ 600$

$$\text{C.I.} = 5000\left[\left(1+\frac{8}{100}\right)^2 - 1\right]$$

$$= 5000\left[\left(\frac{27}{25}\right)^2 - 1\right]$$

$$= 5000\left[\left(\frac{729 - 625}{625}\right)\right]$$

$= 5000 \times \frac{104}{625} = ₹\ 832$

$\therefore$ Required difference = ₹ (832–600) = ₹ 232

2. (3) Let the borrowed amount be x

According to the question,

$$x\left[\left(1+\frac{3}{100}\right)^2 - 1\right] - \frac{x \times 4 \times 1}{100} = 104.50$$

[$\because$ Interest is compounded half yearly]

$\Rightarrow x\{(1.03)^2 - 1\} - 0.04x = 104.50$

$\Rightarrow 0.0609x - 0.04x = 104.50$

$\Rightarrow 0.0209x = 104.5$

$\Rightarrow x = \frac{104.5}{0.0209} = ₹\ 5000$

3. (2) Let each instalment be x.

$$\frac{x}{\left(1+\frac{35}{400}\right)^2} + \frac{x}{\left(1+\frac{35}{400}\right)} = 13360$$

$$\Rightarrow \frac{x}{\left(1+\frac{7}{80}\right)^2} + \frac{x}{\left(1+\frac{7}{80}\right)} = 13360$$

$$\Rightarrow \frac{6400x}{7569} + \frac{80x}{87} = 13360$$

$$\Rightarrow \frac{6400x + 6960x}{7569} = 13360$$

$\Rightarrow 13360x = 13360 \times 7569$

$\Rightarrow x = ₹\ 7569$

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4. (3) Rate = 5%, Time = 4 half years
P = ₹ 5000

$$\therefore \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= 5000\left[\left(1+\frac{5}{100}\right)^4 - 1\right]$$

$$= 5000\left(\frac{194481}{160000} - 1\right)$$

$$= \frac{5000 \times 34481}{160000} = ₹\ 1077.5$$

$$\text{S.I.} = \frac{5000 \times 10 \times 2}{100} = ₹\ 1000$$

Difference = 1077.5 – 1000
= ₹ 77.5

5. (2) $A = P\left(1+\frac{R_1}{100}\right)^{T_1}\left(1+\frac{R_2}{100}\right)^{T_2}$

$$= 250\left(1+\frac{4}{100}\right)\left(1+\frac{8}{100}\right)$$

$$= 250 \times \frac{104}{100} \times \frac{108}{100}$$

$\therefore A = ₹\ 280.80$

6. (1) Amount given to sons

$$= 84100 \times \frac{1}{2} = ₹\ 42050$$

Amount given to B = ₹ x (let)
∴ Amount given to A
= ₹ $(42050 - x)$

$$A = P\left(1+\frac{R}{100}\right)^T$$

$$\Rightarrow (42050 - x)\left(1+\frac{R}{100}\right)^3$$

$$= x\left(1+\frac{R}{100}\right)^5$$

$$\Rightarrow (42050 - x) = x\left(1+\frac{R}{100}\right)^2$$

$$\Rightarrow (42050 - x) = x\left(1+\frac{5}{100}\right)^2$$

$$\Rightarrow (42050 - x) = x\left(1+\frac{1}{20}\right)^2$$

$$\Rightarrow 42050 - x = x\left(\frac{21}{20}\right)^2$$

$$\Rightarrow 42050 - x = \frac{441x}{400}$$

$$\Rightarrow 42050 = \frac{441x}{400} + x$$

$$\Rightarrow 42050 = \frac{441x + 400x}{400}$$

$$= \frac{841x}{400}$$

$$\Rightarrow 841x = 42050 \times 400$$

$$\Rightarrow x = \frac{42050 \times 400}{841}$$

= ₹ 20,000

7. (2) Time = $\frac{3}{2}$ years

= 3 half years
Rate = 2R% per annum
= R% per half year
∴ Amount

$$= \text{Principal} - \left(1+\frac{\text{Rate}}{100}\right)^{\text{Time}}$$

$$\Rightarrow 2315.25 = 2000\left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \frac{231525}{200000} = \left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \frac{9261}{8000} = \left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \left(\frac{21}{20}\right)^3 = \left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow \left(1+\frac{1}{20}\right)^3 = \left(1+\frac{R}{100}\right)^3$$

$$\Rightarrow 1 + \frac{1}{20} = 1 + \frac{R}{100}$$

$$\Rightarrow \frac{R}{100} = \frac{1}{20}$$

$$\Rightarrow R = \frac{100}{20}$$

= 5% per half year
∴ Required rate
= 10% per annum

8. (4) $A = P\left(1+\frac{R}{100}\right)^n$

$$\Rightarrow 2P = P\left(1+\frac{R}{100}\right)^8$$

On cubing both sides,

$$2^3 = \left(1+\frac{R}{100}\right)^{5\times 3}$$

$$\Rightarrow 8 = 1\left(1+\frac{R}{100}\right)^{15}$$

∴ Required time = 15 years

9. (4) When the interest is payable half yearly,
= 9% per half annum
Time = 4 half years
Let the principal be Rs. P.

$$\therefore \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= P\left[\left(1+\frac{9}{100}\right)^4 - 1\right]$$

$$= P\left[(1.09)^4 - 1\right]$$

= P [1.4116 – 1] = Rs. 0.4116 P
According to the question,

$$= P\left[\left(1+\frac{18}{100}\right)^2 - 1\right]$$

$$= P\left[(1.18)^2 - 1\right]$$

= P (1.3924 – 1) = Rs. 0.3924 P
According to the question,
0.4116P – 0.3924P = 960
$\Rightarrow$ 0.0192P = 960

$$\Rightarrow P = \frac{960}{0.0192}$$

$$= \frac{960 \times 10000}{192}$$

= Rs. 50000

10. (3) Amount

$$= P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)$$

$$= 25000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)$$

$$= 25000 \times \frac{104}{100} \times \frac{105}{100}$$

= Rs. 27300

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TEST YOURSELF

1. At what rate per annum will ₹32000 yield a compound interest of ₹ 5044 in 9 months interest being compounded quarterly?
(1) 20% (2) 32%
(3) 50% (4) 80%

2. If the difference between simple and compound interest on some principal amount at 20% per annum for three years is ₹48, then the principal amount is:
(1) ₹450 (2) ₹375
(3) ₹390 (4) None of these

3. Find compound interest on ₹ 5000 for 2 years at 10% per annum, compounded half-yearly.
(1) ₹ 1077.5 (2) ₹ 1072.5
(3) ₹ 1000 (4) ₹ 1100

4. Find compound interest on ₹ 10,000 for $3\frac{1}{2}$ years at 10% per annum, compounded yearly.
(1) ₹ 3675.50 (2) ₹ 3775.50
(3) ₹ 3875. 50 (4) ₹ 3975.50

5. Find the present worth of ₹ 9261 due 3 years hence at 5% per annum compounded yearly.
(1) ₹ 8000 (2) ₹ 8200
(3) ₹ 8500 (4) ₹ 8700

6. Find the ratio of simple interest to compound interest for 2 years at 4% per annum, compounded yearly in case of compound interest.
(1) 50 : 53 (2) 50 : 51
(3) 49 : 50 (4) 48 : 53

7. In what time will ₹15625 amount to ₹17576 at 4% per annum, compounded yearly?
(1) 4 years (2) 2.5 years
(3) 3 years (4) 3.5 years

8. If SI on a certain sum of money at 4% per annum for 2 years be ₹ 125, what would be the interest if it was to be compounded annually at the same rate and for the same time period?
(1) ₹ 127.50 (2) ₹ 125.50
(3) ₹ 135.50 (4) ₹ 138

9. The compound interest on a sum of money at 5% per annum for 3 years is ₹ 2522. What would be the simple interest on this sum at the same rate and for the same period?
(1) ₹ 2500 (2) ₹ 2400
(3) ₹ 2450 (4) ₹ 2350

10. The simple interest on a certain sum for 2 years is ₹ 50 and the compound interest is ₹ 55. Find the rate of interest per annum and the sum.
(1) 16% P.a, ; ₹ 200
(2) 15% P.a. ; ₹ 150
(3) 20% P.a. ; ₹ 125
(4) 18% P.a. ; ₹ 175

11. If the difference between CI and SI on a certain sum at r% per annum for 2 years is ₹ x, find the expression for principal sum. If the difference between CI and SI on a certain sum at 4% per annum for 2 years is ₹ 25, find the sum.
(1) ₹ 18625 (2) ₹ 16625
(3) ₹ 14625 (4) ₹ 15625

12. If the difference between *CI* and *SI* on a certain sum at r% per annum for 3 years is Rs x, find the expression for the principal sum. If the difference between *CI* and *SI* on a certain sum at 4% for 3 years is Rs. 608. Find the sum.
(1) ₹ 125000 (2) ₹ 120000
(3) ₹ 130000 (4) ₹ 122250

13. A sum amounts to ₹ 9680 in 2 years and to ₹ 10648 in 3 years compounded annually. Find the principal and the rate of interest per annum.
(1) 12% ; ₹ 7500
(2) 10% ; ₹ 8000
(3) 11% : ₹ 11000
(4) None of these

14. Divide ₹ 10230 into two parts such that the first part after 10 years is equal to the second part after 7 years, compound interest being 20% per annum compounded yearly.
(1) ₹ 4150 ; ₹ 6080
(2) ₹ 3950 ; ₹ 6280
(3) ₹ 3750 ; ₹ 6480
(4) ₹ 3550 ; ₹ 6680

15. A sum of ₹1682 is to be divided between *A* and *B* who are respectively 20 years and 22 years old. They invest their shares at 5% per annum, compounded annually. At the age of 25 years both receive equal amounts. Find the share of each.
(1) ₹ 730 ; ₹ 952
(2) ₹ 750 ; ₹ 932
(3) ₹ 700 ; ₹ 982
(4) ₹ 800 ; ₹ 882

16. A sum of money was lent at 10% per annum, compounded annually, for 2 years. If the interest was compounded half-yearly, he would have received ₹ 220.25 more. Find the sum.
(1) ₹ 40000 (2) ₹ 45000
(3) ₹ 48000 (4) ₹ 50000

17. Ram invests ₹ 5000 in a bond which gives interest at 4% per annum during the first year, 5% during the second year and 10% during the third year. How much does he get at the end of third year?
(1) ₹ 7000 (2) ₹ 5006
(3) ₹ 6006 (4) ₹ 5506

SHORT ANSWERS

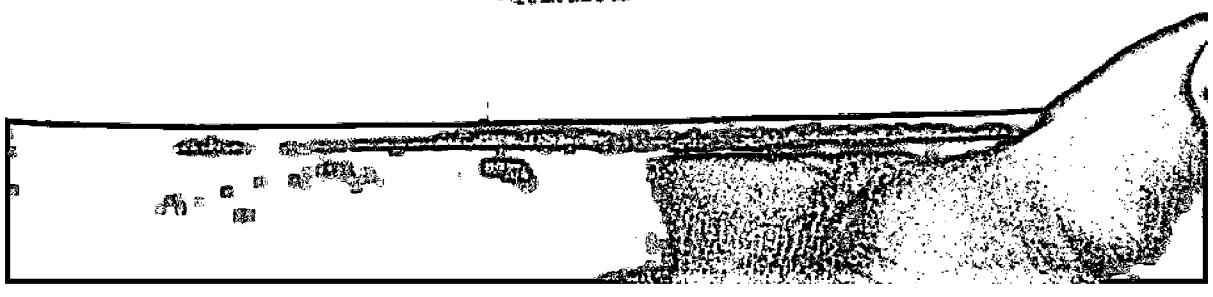
1. (1)	2. (2)	3. (1)	4. (4)
5. (1)	6. (2)	7. (3)	8. (1)
9. (2)	10. (3)	11. (4)	12. (1)
13. (2)	14. (3)	15. (4)	16. (1)
17. (3)			

EXPLANATIONS

1. (1) Let the rate of CI be R per cent per annum.

$$\therefore CI = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$\Rightarrow 5044 = 32000\left[\left(1+\frac{R}{400}\right)^3 - 1\right]$$



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[∵ Interest is compounded quarterly]

$$\Rightarrow \frac{5044}{32000} = \left(1+\frac{R}{400}\right)^3 - 1$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 - 1 = \frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = 1+\frac{1261}{8000}$$

$$\Rightarrow \left(1+\frac{R}{400}\right)^3 = \frac{9261}{8000} = \left(\frac{21}{20}\right)^3$$

$$\Rightarrow 1+\frac{R}{400} = \frac{21}{20} \Rightarrow \frac{R}{400} = \frac{21}{20} - 1 = \frac{1}{20}$$

$$\Rightarrow R = \frac{400}{20} = 20\% \text{ per annum}$$

2. (2) $P = \dfrac{D \times 100^3}{r^2(r+300)}$

$$= \frac{48 \times 100^3}{400(20+300)} = \text{Rs. } 375$$

3. (1) $A = P\left(1+\dfrac{r}{200}\right)^{2t}$

Here, $P = ₹\ 5000$
$r = 10\%$ per annum
$t = 2$ years

So, $A = 5000\left(1+\dfrac{10}{200}\right)^4$

$$= 5000\left(1+\frac{5}{100}\right)^4$$

$$= 5000 \times \frac{194481}{160000} = \frac{194481}{32}$$

$A = ₹\ 6077.5$
$CI = ₹\ (6077.5 - 5000)$
$= ₹\ 1077.5.$

(4) $A = P\left(1+\dfrac{r}{100}\right)^3\left(1+\dfrac{\frac{r}{2}}{100}\right)$

$$= 10{,}000\left(1+\frac{10}{100}\right)^3\left(1+\frac{5}{100}\right)$$

$$= 10{,}000 \times \frac{1331}{1000} \times \frac{21}{20}$$

$A = ₹\ 13975.5$
$CI = ₹\ (13975.5 - 10{,}000)$
$CI = ₹\ 3975.5.$

5. (1) $P = \dfrac{A}{\left(1+\frac{r}{100}\right)^t}$

Here, $A = ₹\ 9261$
$r = 5\%$ per annum
$t = 3$ years

$$P = \frac{9261}{\left(1+\frac{5}{100}\right)^3} = \frac{9261}{\frac{9261}{8000}}$$

$P = ₹\ 8000.$

6. (2) $\dfrac{SI}{CI} = \dfrac{rt}{100\left[\left(1+\frac{r}{100}\right)^t - 1\right]}$

$$= \frac{4 \times 2}{100\left[\left(1+\frac{4}{100}\right)^2 - 1\right]}$$

$$= \frac{2}{25\left(\frac{676}{625} - 1\right)} = \frac{2 \times 625}{25 \times 51}$$

$$\frac{SI}{CI} = \frac{50}{51} = 50 : 51$$

7. (3) $A = ₹\ 17576$
$P = ₹\ 15625$
$r = 4\%$ per annum

$$A = P\left(1+\frac{r}{100}\right)^t$$

$$\left(1+\frac{r}{100}\right)^t = \frac{A}{P}$$

$$\left(1+\frac{4}{100}\right)^t = \frac{17576}{15625}$$

$$\left(\frac{26}{25}\right)^t = \frac{17576}{15625} = \left(\frac{26}{25}\right)^3$$

$\therefore t = 3$ years.

8. (1) $\dfrac{CI}{SI} = \dfrac{100\left[\left(1+\frac{r}{100}\right)^t - 1\right]}{rt}$

$$= \frac{100\left[\left(1+\frac{4}{100}\right)^2 - 1\right]}{4 \times 2}$$

$$= \frac{100 \times \left(\frac{676}{625} - 1\right)}{4 \times 2}$$

$$\frac{CI}{125} = \frac{100 \times 51}{4 \times 2 \times 625}$$

$$CI = \frac{100 \times 51 \times 125}{4 \times 2 \times 625}$$

$CI = ₹\ 127.5.$

9. (2)

$$SI = CI \times \frac{rt}{100\left[\left(1+\frac{r}{100}\right)^t - 1\right]}$$

$$= \frac{2522 \times 5 \times 3}{100\left[\left(1+\frac{5}{100}\right)^3 - 1\right]}$$

$$SI = \frac{2522 \times 5 \times 3}{100\left[\frac{9261}{8000} - 1\right]}$$

$$= \frac{2522 \times 5 \times 3}{100 \times 1261} \times 8000$$

$SI = ₹\ 2400.$

10. (3) The difference between CI and SI for 2 years period is because CI also includes interest for the second year on the first year's interest.

$CI - SI = ₹\ (55 - 50) = ₹\ 5$

First year's $SI = \dfrac{50}{2} = ₹\ 25$

So, ₹ 5 is the interest on ₹ 25 for 1 year.

$$r = \frac{100I}{pt}$$

Here, $I = ₹\ 5$
$P = ₹\ 25$
$t = 1$ year

$$\therefore r = \frac{100 \times 5}{25 \times 1}$$

$r = 20\%$ per annum.

Now, $P = \dfrac{100I}{rt}$

Here, $I = ₹\ 50$
$r = 20\%$ per annum
$t = 2$ years.

$$P = \frac{100 \times 50}{20 \times 2}$$

$P = ₹\ 125.$

Note : **Derivation** for 2 years problems :

$$\text{Rate} = \frac{2 \times (CI - SI)}{SI} \times 100$$

$$\text{Sum} = \frac{SI \times 100}{\text{Rate} \times 2}$$

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COMPOUND INTEREST

11. (4) Let the sum be ₹ P

$$SI = \frac{Pr\times 2}{100} = \frac{2Pr}{100}$$

$$CI = P\left[\left(1+\frac{r}{100}\right)^2 - 1\right]$$

$$= P\left[1+\frac{r^2}{(100)^2}+\frac{2r}{100}-1\right]$$

$$CI = P\left[\frac{r^2}{100^2}+\frac{2r}{100}\right]$$

$$CI - SI = P\left[\frac{r^2}{100^2}+\frac{2r}{100}\right]-\frac{2Pr}{100}$$

Let, CI – SI = x

$$x = \frac{Pr^2}{100^2}P = x\left(\frac{100}{r}\right)^2$$

Here, x = ₹ 25
r = 4% per annum

$$P = 25\left(\frac{100}{4}\right)^2$$

$P = 25\times 625$
P = ₹15625.

12. (1) Let the sum be ₹ P

$$SI = \frac{Pr\times 3}{100} = \frac{3Pr}{100}$$

$$CI = P\left[\left(1+\frac{r}{100}\right)^3 - 1\right]$$

$$CI = P\left[1+\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}-1\right]$$

$$CI = P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}\right]$$

$\Rightarrow CI - SI(x) =$

$$= P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}+\frac{3r}{100}\right]-\frac{3Pr}{100}$$

$$x = P\left[\frac{r^3}{100^3}+\frac{3r^2}{100^2}\right]$$

$$x = P\left(\frac{r^2}{100^3}\right)[r+300]$$

$$\boxed{P = \frac{x(100)^3}{r^2(r+300)}}$$

Here, x = ₹ 608 (given) and
r = 4% per annum

$$P = \frac{608\times 100\times 100\times 100}{4\times 4\times(4+300)}$$

P = Rs. 1,25,000.

13. (2) Let P = x
r = r% p.a.
A_1 = ₹ 9680
t_1 = 2 years
A_2 = ₹ 10648
t_2 = 3 years
Interest on ₹ 9680 for 1 year
= 10648 – 9680 = ₹ 968

$$\therefore r = \frac{968\times 100}{9680} = 10\%$$

Using $A = P\left(1+\frac{r}{100}\right)^t$ we get

$$9680 = x\left(1+\frac{10}{100}\right)^2 = x\left(\frac{11}{10}\right)^2$$

$$\Rightarrow x = 9680\times\frac{10}{11}\times\frac{10}{11} = 8000$$

$\therefore$ Principal = ₹ 8000.

14. (3) Let the first part be x and the second part y.
The first part after 10 years

$$= x\left[1+\frac{20}{100}\right]^{10}$$

The second part after 7 years

$$= y\left[1+\frac{20}{100}\right]^7$$

As given in the problem these two amounts are equal.
So,

$$y\left(1+\frac{20}{100}\right)^7 = x\left(1+\frac{20}{100}\right)^{10}$$

$$\text{or } \frac{y}{x} = \left(1+\frac{20}{100}\right)^3$$

$$\text{or } \frac{y}{x} = \frac{216}{125}$$

and we have $y + x$ = ₹ 10230
Using the ratio formula

$$y = \frac{216}{216+125}\times 10230 = ₹\ 6480$$

$$x = \frac{125}{216+125}\times 10230 = ₹\ 3750$$

15. (4) For A, time = 5 years
For B, time = 3 years
r = 5% per annum

$$A\left(1+\frac{5}{100}\right)^5 = B\left(1+\frac{5}{100}\right)^3$$

$$\frac{B}{A} = \left(1+\frac{5}{100}\right)^2$$

$$\frac{B}{A} = \frac{441}{400}$$

As given, $A + B$ = ₹ 1682

$$\text{So, } A = \frac{400}{400+441}\times 1682$$

= ₹ 800

$$\text{and } B = \frac{441}{400+441}\times 1682$$

= ₹ 882

16. (1) Let the sum be ₹ P.
When compounded yearly, amount

$$= P\left[1+\frac{10}{100}\right]^2 = \frac{121}{100}P$$

When compounded half-yearly, amount

$$= P\left[1+\frac{5}{100}\right]^4 = \frac{194481}{160000}P$$

$$\text{So, } \left[\frac{194481}{160000}-\frac{121}{100}\right]P = 220.25$$

(Given difference)

$$\text{or } \frac{194481-193600}{160000}P = 220.25$$

$$\text{or } \frac{881}{160000}P = 220.25$$

$$\text{or } P = \frac{160000}{881}\times 220.25$$

or P = ₹ 40,000.

17. (3)

$$A = P\left(1+\frac{r_1}{100}\right)\left(1+\frac{r_2}{100}\right)\left(1+\frac{r_3}{100}\right)$$

Here, P = ₹ 5000
$r_1 7$ = 4%
r_2 = 5%
r_3 = 10%

$$A = 5000\left(1+\frac{4}{100}\right)\left(1+\frac{5}{100}\right)\left(1+\frac{10}{100}\right)$$

$$= 5000\times\frac{26}{25}\times\frac{21}{20}\times\frac{11}{10}$$

A = ₹ 6006.

□□□

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12 TIME AND WORK

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE-I

1. A and B can do a work in 12 days, B and C in 15 days and C and A in 20 days. If A, B and C work together, they will complete the work in :

(1) 5 days (2) $7\frac{5}{6}$ days

(3) 10 days (4) $15\frac{2}{3}$ days

(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CPO S.I. Exam. 07.09.2003 & 03.09.2006) & (SSC CGL Prelim Exam. 19.06.2011) (Ist Sitting) & (SSC GL Tier-I Exam. 19.05.2013) (Ist Sitting)

2. A and B can do a piece of work in 72 days. B and C can do it in 120 days, A and C can do it in 90 days. In how many days all the three together can do the work ?

(1) 80 days (2) 100 days
(3) 60 days (4) 150 days

(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC MTS (Non-Technical) Exam. 27.02.2011)

3. A particular job can be completed by a team of 10 men in 12 days. The same job can be completed by a team of 10 women in 6 days. How many days are needed to complete the job if the two teams work together?

(1) 4 days (2) 6 days
(3) 9 days (4) 18 days

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. A can do a work in 6 days and B in 9 days. How many days will both take together to complete the work?

(1) 7.5 days (2) 5.4 days
(3) 3.6 days (4) 3 days

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. A and B can do a piece of work in 10 days, B and C in 15 days and C and A in 20 days. C alone can do the work in :

(1) 60 days (2) 120 days
(3) 80 days (4) 30 days

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

6. A can do a piece of work in 4 hours; B and C can do it in 3 hours. A and C can do it in 2 hours. How long will B alone take to do it ?

(1) 10 hours (2) 12 hours
(3) 8 hours (4) 24 hours

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

7. A, B and C can complete a piece of work in 24, 6 and 12 days respectively. Working together, they will complete the same work in

(1) $\frac{1}{4}$ day (2) $\frac{7}{24}$ day

(3) $3\frac{3}{7}$ days (4) 4 days

(SSC CPO S.I. Exam. 12.01.2003)

8. A and B together can do a piece of work in 10 days. A alone can do it in 30 days. The time in which B alone can do it is

(1) 10 days (2) 12 days
(3) 15 days (4) 20 days

(SSC CPO S.I. Exam. 05.09.2004)

9. A and B together can complete a piece of work in 72 days, B and C together can complete it in 120 days, and A and C together in 90 days. In what time can A alone complete the work ?

(1) 80 days (2) 100 days
(3) 120 days (4) 150 days

(SSC CPO S.I. Exam. 26.05.2006)

10. A and B together can do a work in 8 days, B and C together in 6 days while C and A together in 10 days, if they all work together, the work will be completed in :

(1) $3\frac{3}{4}$ days (2) $3\frac{3}{7}$ days

(3) $5\frac{5}{47}$ days (4) $4\frac{4}{9}$ days

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

11. A and B can do a piece of work in 12 days, B and C in 8 days and C and A in 6 days. How long would B take to do the same work alone ?

(1) 24 days (2) 32 days
(3) 40 days (4) 48 days

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

12. *A* and *B* can complete a piece of work in 30 days, *B* and *C* in 20 days, while *C* and *A* in 15 days. If all of them work together, the time taken in completing the work will be

(1) 10 days (2) 12 days

(3) $12\frac{2}{3}$ days (4) $13\frac{1}{3}$ days

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

13. A and B together can complete a work in 8 days and B and C together in 12 days. All of the three together can complete the work in 6 days. In how much time will A and C together complete the work ?

(1) 8 days (2) 10 days
(3) 12 days (4) 20 days

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011) (Delhi)

14. A alone can complete a work in 12 days. A and B together can complete it in 8 days. How long will B alone take to complete the work ?

(1) 24 days (2) 18 days
(3) 16 days (4) 20 days

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

15. If A and B together can complete a work in 18 days, A and C together in 12 days and B and C together in 9 days, then B alone can do the work in

(1) 18 days (2) 24 days
(3) 30 days (4) 40 days

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting)

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16. While working 7 hours a day, A alone can complete a piece of work in 6 days and B alone in 8 days. In what time would they complete it together, working 8 hours a day ?
(1) 3 days (2) 4 days
(3) 2.5 days (4) 3.6 days
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

17. A and B can do a piece of work in 10 days. B and C can do it in 12 days. C and A in 15 days. In how many days will C finish it alone ?
(1) 24 days (2) 30 days
(3) 40 days (4) 60 days
(SSC CPO S.I. Exam. 06.09.2009)

18. If A and B together can complete a piece of work in 15 days and B alone in 20 days, in how many days can A alone complete the work ?
(1) 60 days (2) 45 days
(3) 40 days (4) 30 days
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

19. If A and B together can complete a work in 12 days, B and C together in 15 days and C and A together in 20 days, then B alone can complete the work in
(1) 30 days (2) 25 days
(3) 24 days (4) 20 days
(SSC (South Zone) Investigator Exam 12.09.2010)

20. A work can be completed by P and Q in 12 days, Q and R in 15 days, R and P in 20 days. In how many days P alone can finish the work?
(1) 10 days (2) 20 days
(3) 30 days (4) 60 days
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting) & (SSC GL Tier-I Exam. 19.05.2013)

21. A and B can complete a piece of work in 8 days, B and C can do it in 12 days, C and A can do it in 8 days. A, B and C together can complete it in
(1) 4 days (2) 5 days
(3) 6 days (4) 7 days
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

22. A and B together can do a work in 10 days. B and C together can do the same work in 6 days. A and C together can do the work in 12 days. Then A, B and C together can do the work in
(1) 28 days (2) 14 days
(3) $5\frac{5}{7}$ days (4) $8\frac{2}{7}$ days
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

23. A and B working together; can do a piece of work in $4\frac{1}{2}$ hours. B and C working together can do it in 3 hours. C and A working together can do it in $2\frac{1}{4}$ hours. All of them begin the work at the same time. Find how much time they will take to finish the piece of work.
(1) 3 hours (2) 2 hours
(3) 2·5 hours (4) 3·25 hours
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

24. A and B together can complete a piece of work in 18 days, B and C in 24 days and A and C in 36 days. In how many days, will all of them together complete the work ?
(1) 16 days (2) 15 days
(3) 12 days (4) 10 days
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

25. A and B together can do a piece of work in 5 days and A alone can do it in 8 days. B alone can do the same piece of work in
(1) $11\frac{1}{3}$ days (2) $12\frac{3}{5}$ days
(3) $13\frac{1}{3}$ days (4) $16\frac{4}{5}$ days
(SSC Data Entry Operator Exam. 31.08.2008)

26. A, B and C together can complete a piece of work in 30 minutes. A and B together can complete the same work in 50 minutes. C alone can complete the work in
(1) 60 minutes (2) 75 minutes
(3) 80 minutes (4) 150 minutes
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

27. A and B can do a piece of work in 8 days, B and C can do it in 24 days, while C and A can do it in $8\frac{4}{7}$ days. In how many days can C do it alone?
(1) 60 days (2) 40 days
(3) 30 days (4) 10 days
(SSC Multi-Tasking (Non-Technical) Staff Exam, 20.02.2011)

28. A and B can do a piece of work in 10 days. B and C can do it in 12 days. A and C can do it in 15 days. How long will A take to do it alone ?
(1) 24 days (2) 20 days
(3) 40 days (4) 30 days
(SSC CHSL DEO & LDC Exam. 04.12.2011(IInd Sitting (North Zone)

29. If A and B together can finish a piece of work in 20 days, B and C in 10 days and C and A in 12 days, then A, B, C jointly can finish the same work in
(1) $4\frac{2}{7}$ days (2) 30 days
(3) $8\frac{4}{7}$ days (4) $\frac{7}{60}$ days
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

30. A, B and C individually can do a work in 10 days, 12 days and 15 days respectively. If they start working together, then the number of days required to finish the work is
(1) 16 days (2) 8 days
(3) 4 days (4) 2 days
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

31. A and B together can do a piece of work in 12 days, while B alone can finish it in 30 days. A alone can finish the work in
(1) 20 days (2) 25 days
(3) 15 days (4) 18 days
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

32. A, B and C can complete a piece of work in 12, 24 and 36 days respectively. In how many days will they together complete the same work ?
(1) $5\frac{6}{11}$ days (2) 4 days
(3) $6\frac{6}{11}$ days (4) 6 days
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

33. A and B can separately do a piece of work in 6 days and 12 days respectively. How long will they together take to do the work ?
(1) 9 days (2) 18 days
(3) 6 days (4) 4 days
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

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34. A and B can do a piece of work in 36 days, B and C can do it in 60 days, A and C can do it in 45 days. C alone can do it in
(1) 90 days (2) 180 days
(3) 120 days (4) 150 days
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

35. Ronald and Elan are working on an Assignment. Ronald takes 6 hours to type 32 pages on a computer, while Elan takes 5 hours to type 40 pages. How much time will they take working together on two different computers to type an assignment of 110 pages ?
(1) 7 hrs. 30 min.
(2) 8 hrs.
(3) 8 hrs. 15 min.
(4) 8 hrs. 25 min.
(SSC Graduate Level Tier-I Exam. 21.04.2013)

36. A can do a piece of work in 20 days and B can do the same piece of work in 30 days. Find in how many days both can do the work ?
(1) 16 days (2) 14 days
(3) 10 days (4) 12 days
(SSC Constable (GD) Exam. 12.05.2013) & (SSCCHSL DEO & LDC Exam. 20.10.2013)

37. A can do as much work as B and C together can do. A and B can together do a piece of work in 9 hours 36 minutes and C can do it in 48 hours. The time (in hours) that B needs to do the work alone, is :
(1) 18 hrs (2) 24 hrs
(3) 30 hrs (4) 12 hrs
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

38. A can do a piece of work in 12 days and B in 15 days. They work together for 5 days and then B left. The days taken by A to finish the remaining work is
(1) 3 (2) 5
(3) 10 (4) 121
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

39. A and B together can dig a trench in 12 days, which A alone can dig in 28 days; B alone can dig it in
(1) 20 days (2) 21 days
(3) 22 days (4) 23 days
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

40. A can complete a work in 'm' days and B can complete it in 'n' days. How many days will it take to complete the work if both A and B work together ?
(1) $(m + n)$ days
(2) $\left(\frac{1}{m} \times \frac{1}{n}\right)$ days
(3) $\left(\frac{m+n}{mn}\right)$ days
(4) $\left(\frac{mn}{m+n}\right)$ days
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

41. Three men A, B and C working together can do a job in 6 hours less time than A alone, in 1 hour less time than B alone and in one half the time needed by C when working alone. Then A and B together can do the job in
(1) $\frac{2}{3}$ hour (2) $\frac{3}{4}$ hour
(3) $\frac{3}{2}$ hour (4) $\frac{4}{3}$ hour
(SSC CGL Tier-I Exam. 19.10.2014)

42. A takes three times as long as B and C together to do a job. B takes four times as long as A and C together to do the work. If all the three, working together can complete the job in 24 days, then the number of days, A alone will take to finish the job is
(1) 100 (2) 96
(3) 95 (4) 90
(SSC CGL Tier-I Exam. 19.10.2014)

43. A can do a piece of work in 4 days and B can do it in 12 days. In how many days will they finish the work, both working together ?
(1) 4 days (2) 6 days
(3) 2 days (4) 3 days
(SSC CGL Tier-I Exam. 26.10.2014)

44. A can do $\frac{1}{4}$ of a work in 10 days. B can do $\frac{1}{3}$ of the work in 20 days. In how many days can both A and B together do the work ?
(1) 30 days (2) 32 days
(3) 24 days (4) 25 days
(SSC CGL Tier-I Exam. 26.10.2014)

45. 15 men take 20 days to complete a job working 8 hours a day. The number of hours a day should 20 men take to complete the job in 12 days
(1) 5 hours (2) 10 hours
(3) 15 hours (4) 18 hours
(SSC CGL Tier-II Exam. 21.09.2014)

46. Raj and Ram working together do a piece of work in 10 days. Raj alone can do it in 12 days. Ram alone will do the work in
(1) 20 days (2) 40 days
(3) 50 days (4) 60 days
(SSC CGL Tier-II Exam. 21.09.2014)

47. A and B working separately can do a piece of work in 9 and 15 days respectively. If they work for a day alternately, with A beginning, then the work will be completed in
(1) 10 days (2) 11 days
(3) 9 days (4) 12 days
(SSC CHSL DEO & LDC Exam. 9.11.2014)

48. How many men need to be employed to complete a job in 5 days, if 15 men can complete $\frac{1}{3}$ of the job in 7 days ?
(1) 20 (2) 21
(3) 45 (4) 63
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

49. If x can finish a job in 4 hours and y can finish the same job in 8 hours independently, then they together will finish the job in
(1) 140 minutes
(2) 160 minutes
(3) 120 minutes
(4) 150 minutes
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

50. x can copy 80 pages in 20 hours, x and y together can copy 135 pages in 27 hours. Then y can copy 20 pages in
(1) 20 hours (2) 3 hours
(3) 24 hours (4) 12 hours
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

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51. A and B can do a piece of work in 15 days. B and C can do a similar work in 12 days and C and A in 10 days. How many days will A take to do the work by himself ?

(1) 13 (2) 24

(3) 40 (4) 8

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

52. A can do a piece of work in 25 days and B can do the same work in 30 days. They work together for 5 days, how much of work is left ?

(1) $\frac{11}{30}$ (2) $\frac{15}{30}$

(3) $\frac{19}{30}$ (4) $\frac{12}{30}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

53. A and B together can do a piece of work in 6 days. If A can alone do the work in 18 days, then the number of days required for B to finish the work is

(1) 10 (2) 12

(3) 9 (4) 15

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

54. A's 2 days' work is equal to B's 3 days' work. If A can complete the work in 8 days then to complete the work B will take

(1) 14 days (2) 12 days

(3) 15 days (4) 16 days

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

55. 16 men are able to complete a piece of work in 12 days working 14 hours a day. How long will 28 men, working 12 hours a day, take to complete the work ?

(1) 10 days (2) 7 days

(3) 8 days (4) 6 days

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

56. A and B can do a given piece of work in 8 days, B and C can do the same work in 12 days and A, B, C complete it in 6 days. Number of days required to finish the work by A and C is

(1) 16 (2) 8

(3) 12 (4) 24

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

57. If 90 men can do a certain job in 16 days, working 12 hours per day, then the part of that work which can be completed by 70 men in 24 days, working 8 hours per day is

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$

(3) $\frac{7}{9}$ (4) $\frac{5}{8}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

58. A, B and C can do a work separately in 16, 32 and 48 days respectively. They started the work together but B left off 8 days and C six days before the completion of the work. In what time is the work finished?

(1) 10 days (2) 9 days

(3) 12 days (4) 14 days

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

59. A and B can do a piece of work in 15 days. B and C can do the same work in 10 days and A and C can do the same in 12 days. Time taken by A, B and C together to do the job is

(1) 4 days (2) 9 days

(3) 8 days (4) 5 days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

60. A, B and C can complete a work in 10, 12 and 15 days respectively. A left the work 5 days before the work was completed and B left 2 days after A had left. Number of days required to complete the whole work is :

(1) $8\frac{2}{3}$ (2) $6\frac{2}{3}$

(3) 7 (4) 6

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636836)

61. A, B and C can complete a piece of work in 24, 5 an 12 days respectively. Working together, they will complete the same work in :

(1) $\frac{7}{24}$ days (2) $3\frac{1}{13}$ days

(3) 4 days (4) $\frac{1}{24}$ days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

62. If 20 women can lay a road of length 100m in 10 days. Then 10 women can lay the same road of length 50m in

(1) 20 days (2) 15 days

(3) 5 days (4) 10 days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE-II

1. A and B can do a work in 18 and 24 days respectively. They worked together for 8 days and then A left. The remaining work was finished by B in :

(1) 5 days (2) $5\frac{1}{3}$ days

(3) 8 days (4) 10 days

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A can do a piece of work in 12 days and B can do it in 18 days. They work together for 2 days and then A leaves. How long will B take to finish the remaining work ?

(1) 6 days (2) 8 days

(3) 10 days (4) 13 days

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A and B can do a job in 6 and 12 days respectively. They began the work together but A leaves after 3 days. Then the total number of days needed for the completion of the work is :

(1) 4 days (2) 5 days

(3) 6 days (4) 9 days

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

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4. A and B can do a piece of work in 30 days while B and C can do the same work in 24 days and C and A in 20 days. They all work together for 10 days when B and C leave. How many days more will A take to finish the work ?
(1) 18 days (2) 24 days
(3) 30 days (4) 36 days
(SSC CPO S.I. Exam. 12.01.2003)

5. A and B can together finish a work in 30 days. They worked together for 20 days and then B left. After another 20 days, A finished the remaining work. In how many days A alone can finish the job ?
(1) 50 days (2) 60 days
(3) 48 days (4) 54 days
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting) & (SSC DEO & LDC Exam. 10.11.2013)

6. 8 men can do a work in 12 days. After 6 days of work, 4 more men were engaged to finish the work. In how many days would the remaining work be completed?
(1) 2 (2) 3
(3) 4 (4) 5
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

7. A can finish a work in 24 days, B in 9 days and C in 12 days. B and C start the work but are forced to leave after 3 days. The remaining work was done by A in :
(1) 5 days (2) 6 days
(3) 10 days (4) $10\frac{1}{2}$ days
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. A certain number of persons can complete a piece of work in 55 days. If there were 6 persons more, the work could be finished in 11 days less. How many persons were originally there ?
(1) 17 (2) 24
(3) 30 (4) 22
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. A and B working separately can do a piece of work in 10 days and 15 days respectively. If they work on alternate days beginning with A, in how many days will the work be completed ?
(1) 18 days (2) 13 days
(3) 12 days (4) 6 days
(SSC CPO S.I. Exam. 07.09.2003)

10. A and B can do a piece of work in 28 and 35 days respectively. They began to work together but A leaves after sometime and B completed remaining work in 17 days. After how many days did A leave ?
(1) $14\frac{2}{5}$ days (2) 9 days
(3) 8 days (4) $7\frac{5}{9}$ days
(SSC CPO S.I. Exam. 07.09.2003)

11. A and B can complete a work in 15 days and 10 days respectively. They started doing the work together but after 2 days, B had to leave and A alone completed the remaining work. The whole work was completed in :
(1) 10 days (2) 8 days
(3) 12 days (4) 15 days
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

12. A and B can do a piece of work in 20 days and 12 days respectively. A started the work alone and then after 4 days B joined him till the completion of the work. How long did the work last ?
(1) 10 days (2) 20 days
(3) 15 days (4) 6 days
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

13. A and B can do a work in 45 days and 40 days respectively. They began the work together but A left after some time and B completed the remaining work in 23 days. After how many days of the start of the work did A leave ?
(1) 10 days (2) 9 days
(3) 8 days (4) 5 days
(SSC CPO S.I. Exam. 05.09.2004)

14. A man and a boy can complete a work together in 24 days. If for the last six days man alone does the work then it is completed in 26 days. How long the boy will take to complete the work alone ?
(1) 72 days (2) 20 days
(3) 24 days (4) 36 days
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

15. A and B together can complete a work in 8 days. B alone can complete that work in 12 days. B alone worked for four days. After that how long will A alone take to complete the work ?
(1) 15 days (2) 18 days
(3) 16 days (4) 20 days
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

16. A and B can complete a piece of work in 12 and 18 days respectively. A begins to do the work and they work alternatively one at a time for one day each. The whole work will be completed in
(1) $14\frac{1}{3}$ days (2) $15\frac{2}{3}$ days
(3) $16\frac{1}{3}$ days (4) $18\frac{2}{3}$ days
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

17. A, B and C can complete a work in 10, 12 and 15 days respectively. They started the work together. But A left the work before 5 days of its completion. B also left the work 2 days after A left. In how many days was the work completed?
(1) 4 days (2) 5 days
(3) 7 days (4) 8 days
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC MTS Exam. 17.03.2013 (IInd Sitting)

18. A can complete a piece of work in 10 days, B in 15 days and C in 20 days. A and C worked together for two days and then A was replaced by B. In how many days, altogether, was the work completed ?
(1) 12 days (2) 10 days
(3) 6 days (4) 8 days
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

19. 40 men can complete a work in 40 days. They started the work together. But at the end of each 10th day, 5 men left the job. The work would have been completed in
(1) $56\frac{2}{3}$ days (2) $53\frac{1}{3}$ days
(3) 52 days (4) 50 days
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

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20. A can do a piece of work in 18 days and B in 12 days. They began the work together, but B left the work 3 days before its completion. In how many days, in all, was the work completed?
(1) 12 days (2) 10 days
(3) 9.6 days (4) 9 days
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

21. A and B can separately complete a piece of work in 20 days and 30 days respectively. They worked together for some time, then B left the work. If A completed the rest of the work in 10 days, then B worked for
(1) 6 days (2) 8 days
(3) 12 days (4) 16 days
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

22. A and B alone can complete work in 9 days and 18 days respectively. They worked together; however 3 days before the completion of the work A left. In how many days was the work completed ?
(1) 13 days (2) 8 days
(3) 6 days (4) 5 days
(SSC CPO S.I. Exam. 09.11.2008)

23. A can complete a piece of work in 18 days, B in 20 days and C in 30 days. B and C together start the work and are forced to leave after 2 days. The time taken by A alone to complete the remaining work is
(1) 10 days (2) 12 days
(3) 15 days (4) 16 days
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

24. A alone can complete a work in 18 days and B alone in 15 days. B alone worked at it for 10 days and then left the work. In how many more days, will A alone complete the remaining work ?
(1) 5 days (2) $5\frac{1}{2}$ days
(3) 6 days (4) 8 days
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

25. A and B working separately can do a piece of work in 9 and 12 days respectively. If they work for a day alternately with A beginning, the work would be completed in
(1) $10\frac{2}{3}$ days (2) $10\frac{1}{2}$ days
(3) $10\frac{1}{4}$ days (4) $10\frac{1}{3}$ days
(SSC SAS Exam. 26.06.2010) & SSC CGL Tier-I Exam 26.06.2011 (Second Sitting)

26. A and B together can complete a work in 12 days. A alone can complete in 20 days. If B does the work only half a day daily, then in how many days A and B together will complete the work ?
(1) 10 days (2) 20 days
(3) 11 days (4) 15 days
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

27. A and B can do a piece of work in 12 days and 15 days respectively. They began to work together but A left after 4 days. In how many more days would B alone complete the remaining work ?
(1) $\frac{20}{3}$ days (2) $\frac{25}{3}$ days
(3) 6 days (4) 5 days
(SSC Data Entry Operator Exam. 02.08.2009)

28. X alone can complete a piece of work in 40 days. He worked for 8 days and left. Y alone completed the remaining work in 16 days. How long would X and Y together take to complete the work ?
(1) $13\frac{1}{3}$ days (2) 14 days
(3) 15 days (4) $16\frac{2}{3}$ days
(SSC CHSL DEO & LDC Exam. 27.11.2010)

29. A, B and C can do a piece of work in 30, 20 and 10 days respectively. A is assisted by B on one day and by C on the next day, alternately. How long would the work take to finish ?
(1) $9\frac{3}{8}$ days (2) $4\frac{8}{8}$ days
(3) $8\frac{4}{13}$ days (4) $3\frac{9}{13}$ days
(SSC Graduate Level Tier-II Exam.16.09.2012)

30. A can do a piece of work in 20 days which B can do in 12 days. B worked at it for 9 days. A can finish the remaining work in
(1) 5 days (2) 7 days
(3) 11 days (4) 3 days
(SSC CHSL DEO & LDC Exam. 04.11.2012 (Ist Sitting)

31. A can do a piece of work in 8 days which B can destroy in 3 days. A has worked for 6 days, during the last 2 of which B has been destroying; how many days must A now work alone to complete the work ?
(1) 7 days (2) $7\frac{1}{3}$ days
(3) $7\frac{2}{3}$ days (4) 8 days
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

32. A can finish a work in 18 days and B can do the same work in 5 days. B worked for 10 days and left the job. In how many days, A alone can finish the remaining work?
(1) 6 days (2) $5\frac{1}{2}$ days
(3) 5 days (4) 8 days
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

33. A and B together can do a piece of work in 12 days which B and C together can do in 16 days. After A has been working at it for 5 days and B for 7 days, C finishes it in 13 days. In how many days B could finish the work ?
(1) 48 days (2) 24 days
(3) 16 days (4) 12 days
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

34. A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day ?
(1) 10 days (2) 12 days
(3) 15 days (4) 20 days
(SSC CPO S.I. Exam. 09.11.2008) & (SSC Graduate Level Tier-I Exam.19.05.2013 (Ist Sitting)

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35. A and B together can complete a work in 3 days. They start together. But, after 2 days, B left the work. If the work is completed after 2 more days, B alone could do the work in

(1) 10 days (2) 4 days

(3) 6 days (4) 8 days

(SSC CGL Prelim Exam. 04.02.2007 (Ist Sitting) & (SSC Graduate Level Tier-I Exam.19.05.2013 (Ist Sitting)

36. A can do a piece of work in 20 days and B in 30 days. They work together for 7 days and then both leave the work. Then C alone finishes the remaining work in 10 days. In how many days will C finish the full work ?

(1) 25 days (2) 30 days

(3) 24 days (4) 20 days

(SSC Graduate Level Tier-II Exam. 29.09.2013)

37. 45 men can complete a work in 16 days. Four days after they started working, 36 more men joined them. How many days will they now take to complete the remaining work ?

(1) 6 days (2) 8 days

(3) $6\frac{2}{3}$ days (4) $7\frac{3}{4}$ days

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

38. A and B together can complete a job in 8 days. Both B and C, working alone can finish the same job in 12 days. A and B commence work on the job, and work for 4 days, where upon A leaves. B continues for 2 more days, and then he leaves too. C now starts working, and finishes the job. How many days did C require ?

(1) 5 (2) 8

(3) 3 (4) 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

39. A and B can together finish a work in 30 days. They worked at it for 20 days and then B left. The remaining work was done by A alone in 20 more days.A alone can finish the work in

(1) 60 days (2) 54 days

(3) 48 days (4) 50 days

(SSC CGL Tier-I Exam. 26.10.2014)

40. A, B and C can do a job in 6 days, 12 days and 15 days respectively. After $\frac{1}{8}$ of the work is completed, C leaves the job. Rest of the work is done by A and B together. Time taken to finish the work is

(1) $5\frac{5}{6}$ days (2) $5\frac{1}{4}$ days

(3) $3\frac{1}{2}$ days (4) $3\frac{3}{4}$ days

(SSC CGL Tier-II Exam. 21.09.2014)

41. 16 women take 12 days to complete a work which can be completed by 12 men in 8 days. 16 men started working and after 3 days 10 men left and 4 women joined them. How many days will it take them to complete the remaining work ?

(1) 4 (2) 6

(3) 8 (4) 10

(SSC CHSL GL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

42. 40 men can complete a work in 18 days. Eight days after they started working together, 10 more men joined them. How many days will they now take to complete the remaining work ?

(1) 6 (2) 8

(3) 10 (4) 12

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

43. If 12 men or 24 boys can do a work in 66 days, the number of days in which 15 men and 6 boys can do it is

(1) 44 (2) 33

(3) 55 (4) 66

(SSC CHSL DEO & LDC Exam. 16.11.2014)

44. A, B and C together can do a piece of work in 40 days. After working with B and C for 16 days, A leaves and then B and C complete the remaining work in 40 days more. A alone could do the work in

(1) 80 days (2) 90 days

(3) 100 days (4) 120 days

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

45. A certain number of men complete a piece of work in 60 days. If there were 8 men more, the work could be finished in 10 days less. The number of men originally was

(1) 30 (2) 40

(3) 32 (4) 36

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

46. Some staff promised to do a job in 18 days, but 6 of them went on leave. So the remaining men took 20 days to complete the job. How many men were there originally ?

(1) 55 (2) 62

(3) 56 (4) 60

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

47. A certain number of men can do a piece of work in 40 days. If there were 45 men more the work could have been finished in 25 days. Find the original number of men employed in the work.

(1) 70 (2) 85

(3) 65 (4) 75

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 8)

48. A and B can do a piece of work in 45 and 40 days repectively. They began the work together but A left after some days and B finished the remaining work in 23 days. A left after

(1) 6 days (2) 9 days

(3) 12 days (4) 5 days

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

49. 20 men can do a piece of work in 18 days, They worked together for 3 days, then 5 men joined them. In how many more days is the work completed ?

(1) 15 (2) 12

(3) 14 (4) 13

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

50. A, B and C can do a piece of work in 24, 30 and 40 days respectively. They began the work together but C left 4 days before completion of the work. In how many days was the work done ?

(1) 13 (2) 12

(3) 14 (4) 11

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

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51. Raja can do a piece of work in 20 days while Ramesh can finish it in 25 days. Ramesh started working and Raja joined him after 10 days. The whole work is completed in

(1) 18 days (2) $16\frac{2}{3}$ days

(3) 20 days (4) 15 days

(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

52. A certain number of men can do a work in 40 days. If there were 8 men more, it could be finished in 10 days less. How many men were there initially?

(1) 20 (2) 24

(3) 30 (4) 16

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

53. X can do a piece of work in 24 days. When he had worked for 4 days, Y joined him. If complete work was finished in 16 days, Y can alone finish that work in:

(1) 18 days (2) 27 days

(3) 36 days (4) 42 days

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

TYPE-III

1. If 6 men and 8 boys can do a piece of work in 10 days and 26 men and 48 boys can do the same in 2 days, then the time taken by 15 men and 20 boys to do the same type of work will be :

(1) 5 days (2) 4 days

(3) 6 days (4) 7 days

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. 5 men can do a piece of work in 6 days while 10 women can do it in 5 days. In how many days can 5 women and 3 men do it ?

(1) 4 days (2) 5 days

(3) 6 days (4) 8 days

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If 3 men or 6 women can do a piece of work in 16 days, in how many days can 12 men and 8 women do the same piece of work?

(1) 4 days (2) 5 days

(3) 3 days (4) 2 days

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A man, a woman and a boy can complete a job in 3, 4 and 12 days respectively. How many boys must assist 1 man and 1 woman to complete the job in $\frac{1}{4}$ of a day?

(1) 1 (2) 4

(3) 19 (4) 41

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

5. If 16 men or 20 women can do a piece of work in 25 days. In what time will 28 men and 15 women do it?

(1) $14\frac{2}{7}$ days (2) $33\frac{1}{3}$ days

(3) $18\frac{3}{4}$ days (4) 10 days

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. If 5 men or 8 women can do a piece of work in 12 days, how many days will be taken by 2 men and 4 women to do the same work?

(1) 15 days (2) $13\frac{1}{2}$ days

(3) $13\frac{1}{3}$ days (4) 10 days

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

7. If 3 men or 4 women can plough a field in 43 days, how long will 7 men and 5 women take to plough it ?

(1) 10 days (2) 11 days

(3) 9 days (4) 12 days

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

8. 6 men or 12 women can do a piece of work in 20 days. In how many days can 8 men and 16 women do twice as big as this work ?

(1) 2 days (2) 5 days

(3) 15 days (4) 10 days

(SSC CGL Prelim Exam. 09.02.2004 (Second Sitting)

9. A man, a woman and a boy can together complete a piece of work in 3 days. If a man alone can do it in 6 days and a boy alone in 18 days, how long will a woman alone take to complete the work?

(1) 9 days (2) 21 days

(3) 24 days (4) 27 days

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

10. 3 men or 5 women can do a work in 12 days. How long will 6 men and 5 women take to finish the work?

(1) 20 days (2) 10 days

(3) 4 days (4) 15 days

(SSC CPO S.I. Exam. 03.09.2006) & (SSC GL Tier-I Exam. 19.05.2013)

11. If 10 men or 20 boys can make 260 mats in 20 days, then how many mats will be made by 8 men and 4 boys in 20 days?

(1) 260 (2) 240

(3) 280 (4) 520

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

12. Three men can complete a piece of work in 6 days. Two days after they started the work, 3 more men joined them. How many days will they take to complete the remaining work ?

(1) 1 days (2) 2 days

(3) 3 days (4) 4 days

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

13. One man and one woman together can complete a piece of work in 8 days. A man alone can complete the work in 10 days. In how many days can one woman alone complete the work ?

(1) $\frac{140}{9}$ days (2) 30 days

(3) 40 days (4) 42 days

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

14. 4 men and 6 women can complete a work in 8 days, while 3 men and 7 women can complete it in 10 days. In how many days will 10 women complete it ?

(1) 50 days (2) 45 days

(3) 40 days (4) 35 days

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

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15. A man, a woman and a boy can complete a work in 20 days, 30 days and 60 days respectively. How many boys must assist 2 men and 8 women so as to complete the work in 2 days ?
(1) 8 (2) 12
(3) 4 (4) 6
(SSC Data Entry Operator Exam. 02.08.2009)

16. If 1 man or 2 women or 3 boys can complete a piece of work in 88 days, then 1 man, 1 woman and 1 boy together will complete it in
(1) 36 days (2) 42 days
(3) 48 days (4) 54 days
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

17. 6 men and 8 women can do a work in 10 days. Then 3 men and 4 women can do the same work in
(1) 24 days (2) 20 days
(3) 12 days (4) 18 days
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

18. 3 men and 4 boys can complete a piece of work in 12 days. 4 men and 3 boys can do the same work in 10 days. Then 2 men and 3 boys can finish the work in
(1) $17\frac{1}{2}$ days (2) $5\frac{5}{11}$ days
(3) 8 days (4) 22 days
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

19. If 10 men or 20 women or 40 children can do a piece of work in 7 months, then 5 men, 5 women and 5 children together can do half of the work in :
(1) 6 months (2) 4 months
(3) 5 months (4) 8 months
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

20. If 8 men or 12 boys can do a piece of work in 16 days, the number of days required to complete the work by 20 men and 6 boys is
(1) $5\frac{1}{3}$ days (2) $6\frac{1}{3}$ days
(3) $8\frac{1}{3}$ days (4) $7\frac{1}{3}$ days
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

21. 2 men and 3 boys can do a piece of work in 10 days while 3 men and 2 boys can do the same work in 8 days. In how many days can 2 men and 1 boy do the work ?
(1) 8 days (2) 7 days
(3) $12\frac{1}{2}$ days (4) 2 days
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

22. 2 men and 3 women can do a piece of work in 10 days while 3 men and 2 women can do the same work in 8 days. Then, 2 men and 1 woman can do the same work in
(1) 12 days (2) $12\frac{1}{2}$ days.
(3) 13 days (4) $13\frac{1}{2}$ days
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

23. 3 men and 4 boys can complete a piece of work in 12 days. 4 men and 3 boys can do the same work in 10 days. Then 2 men and 3 boys can finish the work in number of days is
(1) $17\frac{1}{2}$ days (2) $5\frac{5}{11}$ days
(3) 8 days (4) 22 days
(SSC, Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

24. If 4 men or 6 women can do a piece of work in 12 days working 7 hours a day; how many days will it take to complete a work twice as large with 10 men and 3 women working together 8 hours a day?
(1) 6 days (2) 7 days
(3) 8 days (4) 10 days
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

25. A man, a woman and a boy together finish a piece of work in 6 days. If a man and a woman can do the work in 10 and 24 days respectively. The days taken by a boy to finish the work is
(1) 30 (2) 35
(3) 40 (4) 45
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

26. If 40 men or 60 women or 80 children can do a piece of work in 6 months, then 10 men, 10 women and 10 children together do half of the work in
(1) $5\frac{6}{13}$ months
(2) 6 months
(3) $5\frac{7}{13}$ months
(4) $11\frac{1}{13}$ months
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

27. A man is twice as fast as a woman and a woman is twice as fast as a boy in doing a work. If all of them, a man, a woman and a boy can finish the work in 7 days, in how many days a boy will do it alone ?
(1) 49 (2) 7
(3) 6 (4) 42
(SSC CGL Tier-II Exam. 21.09.2014)

28. One man or two women or three boys can do a piece of work in 88 days. One man, one woman and one boy will do it in
(1) 44 days (2) 24 days
(3) 48 days (4) 20 days
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

29. 3 men or 7 women can do a piece of work in 32 days. The number of days required by 7 men and 5 women to do a piece of work twice as large is
(1) 19 (2) 21
(3) 27 (4) 36
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

30. If 1 man or 2 women or 3 boys can do a piece of work in 44 days, then the same piece of work will be done by 1 man, 1 woman and 1 boy in
(1) 21 days (2) 24 days
(3) 26 days (4) 33 days
(SSC CGL Tier-I Re-Exam. 30.08.2015)

31. 8 children and 12 men complete a certain piece of work in 9 days. Each child takes twice the time taken by a man to finish the work. In how many days will 12 men finish the same work ?
(1) 9 days (2) 13 days
(3) 12 days (4) 15 days
(SSC Constable (GD) Exam. 04.10.2015, IInd Sitting)

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TYPE-IV

1. A can do a work in 15 days and B in 20 days.If they together work on it for 4 days, then the fraction of the work that is left is:

(1) $\frac{8}{15}$ (2) $\frac{7}{15}$

(3) $\frac{1}{4}$ (4) $\frac{1}{10}$

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A can cultivate $\frac{2}{5}$ th of a land in 6 days and B can cultivate $\frac{1}{3}$ rd of the same land in 10 days. Working together A and B can cultivate $\frac{4}{5}$ th of the land in:

(1) 4 days (2) 5 days

(3) 8 days (4) 10 days

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. A does $\frac{4}{5}$ of a piece of work in 20 days; He then calls in B and they finish the remaining work in 3 days. How long B alone will take to do whole work ?

(1) $37\frac{1}{2}$ days (2) 37 days

(3) 40 days (4) 23 days

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. A can finish a work in 18 days and B can do the same work in half the time taken by A. Then working together what part of the same work they can finish in a day ?

(1) $\frac{1}{6}$ (2) $\frac{2}{5}$

(3) $\frac{1}{9}$ (4) $\frac{2}{7}$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. A does $\frac{7}{10}$ part of work in 15 days. After that he completes the remaining work in 4 days with the help of B. In how many days will A and B together do the same work ?

(1) $10\frac{1}{3}$ days (2) $12\frac{2}{3}$ days

(3) $13\frac{1}{3}$ days (4) $8\frac{1}{4}$ days

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (1st Sitting)

6. A can complete a work in 6 days while B can complete the same work in 12 days. If they work together and complete it, the portion of the work done by A is

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$

(3) $\frac{1}{4}$ (4) $\frac{1}{2}$

(SSC CPO S.I. Exam. 07.09.2003)

7. A can do $\frac{1}{2}$ of a piece of work in 5 days, B can do $\frac{3}{5}$ of the same work in 9 days and C can do $\frac{2}{3}$ of that work in 8 days. In how many days can three of them together do the work ?

(1) 3 days (2) 5 days

(3) $4\frac{1}{2}$ days (4) 4 days

(SSC CPO, S.I. Exam. 26.05.2005)

8. If 28 men complete $\frac{7}{8}$ of a piece of work in a week, then the number of men, who must be engaged to get the remaining work completed in another week, is

(1) 5 (2) 6

(3) 4 (4) 3

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. A can complete $\frac{1}{3}$ of a work in 5 days and B, $\frac{2}{5}$ of the work in 10 days. In how many days both A and B together can complete the work ?

(1) 10 days (2) $9\frac{3}{8}$ days

(3) $8\frac{4}{5}$ days (4) $7\frac{1}{2}$ days

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

10. A can complete $\frac{2}{3}$ of a work in 4 days and B can complete $\frac{3}{5}$ of the work in 6 days. In how many days can both A and B together complete the work ?

(1) 3 (2) 2

(3) $3\frac{3}{4}$ (4) $2\frac{7}{8}$

(SSC CISF ASI Exam 29.08.2010 (Paper-1)

11. A contractor undertook to complete a project in 90 days and employed 60 men on it. After 60 days, he found that $\frac{3}{4}$ of the work has already been completed. How many men can he discharge so that the project may be completed exactly on time ?

(1) 40 (2) 20

(3) 30 (4) 15

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

12. P can complete $\frac{1}{4}$ of a work in 10 days, Q can complete 40% of the same work in 15 days, R, completes $\frac{1}{3}$ of the work in 13 days and S, $\frac{1}{6}$ of the work in 7 days. Who will be able to complete the work first ?

(1) P (2) Q

(3) R (4) S

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. A and B can do a piece of work in 72 days, B and C can do it in 120 days, and A and C can do it in 90 days. When A, B and C work together, how much work is finished by them in 3 days.

(1) $\frac{1}{40}$ (2) $\frac{1}{30}$

(3) $\frac{1}{20}$ (4) $\frac{1}{10}$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

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14. A can do $\frac{1}{6}$ of a work in 5 days and B can do $\frac{2}{5}$ of the work in 8 days. In how many days, can both A and B together do the work?

(1) 12 days (2) 13 days

(3) 15 days (4) 20 days

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

15. A can do a work in 20 days and B in 40 days. If they work on it together for 5 days, then the fraction of the work that is left is :

(1) $\frac{5}{8}$ (2) $\frac{8}{15}$

(3) $\frac{7}{15}$ (4) $\frac{1}{10}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

16. A alone can do a piece of work in 20 days and B alone in 30 days. They begin to work together. They will finish half of the work in :

(1) 8 days (2) 9 days

(3) 12 days (4) 6 days

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

17. A does half as much work as B in three- fourth of the time. If together they take 18 days to complete a work, how much time shall B take to do it alone?

(1) 30 days (2) 35 days

(3) 40 days (4) 45 days

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

18. A does half as much work as B in one-third of the time taken by B. If together they take 10 days to complete a work, then the time taken by B alone to do it would have been

(1) 30 days (2) 25 days

(3) 6 days (4) 12 days

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

19. A can do one and a half as much of a work which B can do in one day. B alone can do a piece of work in 18 days. They together can finish that work in

(1) $10\frac{1}{5}$ days (2) $11\frac{1}{5}$ days

(3) $5\frac{1}{5}$ days (4) $7\frac{1}{5}$ days

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

20. A can do $\frac{7}{8}$ of work in 28 days, B can do $\frac{5}{6}$ of the same work in 20 days. The number of days they will take to complete if they do it together is

(1) $15\frac{3}{7}$ days (2) $17\frac{3}{5}$ days

(3) $14\frac{5}{7}$ days (4) $13\frac{5}{7}$ days

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

21. Two workers A and B are engaged to do a piece of work. A working alone would take 8 hours more to complete the work than when work together. If B worked alone, would take $4\frac{1}{2}$ hours more than when work together. The time required to finish the work together is

(1) 5 hours (2) 4 hours

(3) 8 hours (4) 6 hours

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

22. A company employed 200 workers to complete a certain work in 150 days. If only one-fourth of the work has been done in 50 days, then in order to complete the whole work in time, the number of additional workers to be employed was

(1) 100 (2) 300

(3) 600 (4) 200

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

23. x does $\frac{1}{4}$ of a job in 6 days. y completes rest of the job in 12 days. Then x and y could complete the job together in

(1) 9 days (2) $9\frac{3}{5}$ days

(3) $8\frac{1}{8}$ days (4) $7\frac{1}{3}$ days

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

24. A does half as much work as B in three fourth of the time. If together they take 18 days to complete the work, how much time will B alone take to do it?

(1) 40 days (2) 45 days

(3) 50 days (4) 30 days

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

25. A, B and C are employed to do a piece of work for Rs. 5,290. A and B together are supposed to do $\frac{19}{23}$ of the work and B and C together $\frac{8}{23}$ of the work. Then A should be paid

(1) Rs. 4,250 (2) Rs. 3,450

(3) Rs. 1,950 (4) Rs. 2,290

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

26. A can do a work in 10 days and B in 20 days. If they together work on it for 5 days, then the fraction of the work that is left is

(1) $\frac{3}{4}$ (2) $\frac{4}{3}$

(3) $\frac{3}{20}$ (4) $\frac{1}{4}$

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

27. 4 men and 6 women complete a work in 8 days. 2 men and 9 women also complete in 8 days in which. The number of days in which 18 women complete the work is :

(1) $4\frac{1}{3}$ days (2) $5\frac{1}{3}$ days

(3) $4\frac{2}{3}$ days (4) $5\frac{2}{3}$ days

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

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28. A can do in one day three times the work done by B in one day. They together finish $\frac{2}{5}$ of the work in 9 days. The number of days by which B can do the work alone is :
(1) 90 days (2) 120 days
(3) 100 days (4) 30 days
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

29. If 12 men working 8 hours a day complete the work in 10 days, how long would 16 men working $7\frac{1}{2}$ hours a day take to complete the same work?
(1) 7 (2) 6
(3) 10 (4) 8
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

30. A contractor was engaged to construct a road in 16 days. After working for 12 days with 20 labours it was found that only $\frac{5}{8}$ th of the road had been constructed. To complete the work in stipulated time the number of extra labours required is :
(1) 18 (2) 10
(3) 12 (4) 16
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

31. Janardan completes $\frac{2}{3}$ of his work in 10 days. Time he will take to complete $\frac{3}{5}$ of the same work, is
(1) 8 days (2) 6 days
(3) 9 days (4) 4 days
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE-V

1. A does half as much work as B in one sixth of the time. If together they take 10 days to complete a work, how much time shall B take to do it alone?
(1) 70 days (2) 30 days
(3) 40 days (4) 50 days
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

2. Babu and Asha can do a job together in 7 days. Asha is $1\frac{3}{4}$ times as efficient as Babu. The same job can be done by Asha alone in
(1) $\frac{49}{4}$ days (2) $\frac{49}{3}$ days
(3) 11 days (4) $\frac{28}{3}$ days
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

3. Jyothi can do $\frac{3}{4}$ of a job in 12 days. Mala is twice as efficient as Jyothi. In how many days will Mala finish the job ?
(1) 6 days (2) 8 days
(3) 12 days (4) 16 days
(SSC CPO S.I. Exam. 06.09.2009)

4. A can do a piece of work in 70 days and B is 40% more efficient than A. The number of days taken by B to do the same work is
(1) 40 days (2) 60 days
(3) 50 days (4) 45 days
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

5. A 10 hectare field is reaped by 2 men, 3 women and 4 children together in 10 days. If working capabilities of a man, a woman and a child are in the ratio 5 : 4 : 2, then a 16 hectare field will be reaped by 6 men, 4 women and 7 children in
(1) 5 days (2) 6 days
(3) 7 days (4) 8 days
(SSC CPO S.I. Exam. 09.11.2008)

6. To complete a work, A takes 50% more time than B. If together they take 18 days to complete the work, how much time shall B take to do it ?
(1) 30 days (2) 35 days
(3) 40 days (4) 45 days
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

7. A is twice as good a workman as B and B is twice as good a workman as C. If A and B can together finish a piece of work in 4 days, then C can do it by himself in
(1) 6 days (2) 8 days
(3) 24 days (4) 12 days
(SSC CPO S.I. Exam. 06.09.2009)

8. A and B together can complete a work in 15 days. A is 50% more efficient worker than B. How long will A take to complete the work alone ?
(1) 20 days (2) 21 days
(3) 21.4 days (4) 22.5 days
(SSC SAS Exam 26.06.2010 (Paper-1)

9. Tapas works twice as fast as Mihir. If both of them together complete a work in 12 days, Tapas alone can complete it in
(1) 15 days (2) 18 days
(3) 20 days (4) 24 days
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

10. A and B together can do a work in 12 days. B and C together do it in 15 days. If A's efficiency is twice that of C, then the days required for B alone to finish the work is
(1) 60 days (2) 30 days
(3) 20 days (4) 15 days
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

11. A is 50% as efficient as B. C does half of the work done by A and B together. If C alone does the work in 20 days, then A, B and C together can do the work in
(1) $5\frac{2}{3}$ days (2) $6\frac{2}{3}$ days
(3) 6 days (4) 7 days
(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

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12. A is thrice as good a workman as B and is, therefore, able to finish a piece of work in 60 days less than B. The time (in days) in which they can do it working together is

(1) 22 days (2) $22\frac{1}{2}$ days

(3) 23 days (4) $23\frac{1}{4}$ days

(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CPO S.I. Exam. 28.05.2006) & (SSC CGL Tier-1 Exam. 19.06.2011 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 04.11.2012)

13. A does 20% less work than B. If A can complete a piece of work in $7\frac{1}{2}$ hours, then B can do it in

(1) $6\frac{1}{2}$ hours (2) 6 hours

(3) $5\frac{1}{2}$ hours (4) 5 hours

(SSC CPO S.I. Exam. 03.09.2006) & (SSC CL Tier-I Exam. 19.05.2013 (Ist Sitting)

14. Kamal can do a work in 15 days. Bimal is 50 per cent more efficient than Kamal in doing the work. In how many days will Bimal do that work?

(1) 14 days (2) 12 days

(3) 10 days (4) $10\frac{1}{2}$ days

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CPO S.I. Exam.03.09.2006)

15. A takes twice as much time as B and thrice as much as C to complete a piece of work. They together complete the work in1 day. In what time, will A alone complete the work.

(1) 9 days (2) 5 days

(3) 6 days (4) 4 days

(SSC Data Entry Operator Exam. 31.08.2008)

16. A is thrice as good a workman as B and therefore is able to finish a job in 40 days less than B. Working together, they can do it in

(1) 14 days (2) 13 days

(3) 20 days (4) 15 days

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011) & (SSC CGL Tier-I Exam. 26.06.2011 (Ist Sitting)

17. A is twice as good a workman as B and together they finish a piece of work in 14 days. The number of days taken by A alone to finish the work is

(1) 11 days (2) 21 days

(3) 28 days (4) 42 days

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

18. A can do a work in 21 days. B is 40% more efficient than A. The number of days required for B to finish the same work alone is

(1) 10 days (2) 12 days

(3) 15 days (4) 18 days

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

19. A can do a work in 5 days less than the time taken by B to do it. If both of them together take $11\frac{1}{9}$ days, then the time taken by 'B' alone to do the same work (in days) is

(1) 15 (2) 20

(3) 25 (4) 30

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

20. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B can do it in 12 days, then the time taken by B alone to finish the work is

(1) 30 days (2) 27 days

(3) 20 days (4) 25 days

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

21. A can do a work in 9 days, if B is 50% more efficient than A, then in how many days can B do the same work?

(1) 13.5 days (2) 4.5 days

(3) 6 days (4) 3 days

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

22. A is 30% more efficient than B, and can alone do a work in 23 days. The number of days, in which A and B, working together can finish the job is

(1) 11 days (2) 13 days

(3) 20 days (4) 21 days

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

23. 5 men and 2 women working together can do four times as much work per hour as a man and a woman together. The work done by a man and a woman should be in the ratio :

(1) 1 : 2 (2) 2 : 1

(3) 1 : 3 (4) 4 : 1

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. A can do a certain job in 12 days. B is 60% more efficient than A. To do the same job B alone would take :

(1) $7\frac{1}{2}$ days (2) 8 days

(3) 10 days (4) 7 days

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

25. A can do a certain work in 12 days. B is 60% more efficient than A. How many days will B and A together take to do the same job?

(1) $\frac{80}{13}$ days (2) $\frac{70}{13}$ days

(3) $\frac{75}{13}$ days (4) $\frac{60}{13}$ days

(SSC Graduate Level Tier-II Exam.16.09.2012)

26. A and B can do a job together in 12 days. A is 2 times as efficient as B. In how many days can B alone complete the work ?

(1) 18 days (2) 9 days

(3) 36 days (4) 12 days

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting) & (SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting)

27. P is thrice as good a workman as Q and therefore able to finish a job in 48 days less than Q. Working together, they can do it in :

(1) 18 days (2) 24 days

(3) 30 days (4) 12 days

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

28. To do a certain work, B would take time thrice as long as A and C together and C twice as long as A and B together. The three men together complete the work in 10 days. The time taken by A to complete the work separately is

(1) 22 days (2) 24 days

(3) 30 days (4) 20 days

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

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29. A can do a piece of work in 6 days. B is 25% more efficient than A. How long would B alone take to finish this work?

(1) $4\frac{4}{5}$ days (2) $3\frac{1}{3}$ days

(3) $5\frac{1}{4}$ days (4) $2\frac{2}{3}$ days

(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)

30. Two workers A and B working together completed a job in 5 days. If A worked twice as efficiently as he actually did and B worked $\frac{1}{3}$ as efficiently as he actually did, the work would have been completed in 3 days. To complete the job alone, A would require

(1) $5\frac{1}{5}$ days (2) $6\frac{1}{4}$ days

(3) $7\frac{1}{2}$ days (4) $8\frac{3}{4}$ days

(SSC Graduate Level Tier-II Exam. 29.09.2013

31. Sunil completes a work in 4 days, whereas Dinesh completes the work in 6 days. Ramesh works $1\frac{1}{2}$ times as fast as Sunil. The three together can complete the work in

(1) $1\frac{5}{12}$ days (2) $1\frac{5}{7}$ days

(3) $1\frac{3}{8}$ days (4) $1\frac{5}{19}$ days

(SSC Graduate Level Tier-II Exam. 29.09.2013

32. Pratibha is thrices as efficient as Sonia and is therefore able to finish a piece of work in 60 days less than Sonia. Pratibha and Sonia can individually complete the work respectively in

(1) 30 days, 60 days
(2) 60 days, 90 days
(3) 30 days, 90 days
(4) 40 days, 120 days

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

33. If A, B and C can complete a work in 6 days. If A can work twice faster than B and thrice faster than C, then the number of days C alone can complete the work is :

(1) 33 days (2) 44 days
(3) 22 days (4) 11 days

(SSC CGL Tier-I Exam. 16.08.2015 (IInd Sitting) TF No. 2176783)

TYPE-VI

1. 39 persons can repair a road in 12 days working 5 hours a day. In how many days will 30 persons working 6 hours a day complete the work ?

(1) 10 days (2) 13 days
(3) 14 days (4) 15 days

(SSC CPO S.I. Exam. 12.01.2003)

2. If 72 men can build a wall of 280 m length in 21 days, how many men could take 18 days to build a similar type of wall of length 100 m?

(1) 30 (2) 10
(3) 18 (4) 28

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

3. A wall of 100 metres can be built by 7 men or 10 women in 10 days. How many days will 14 men and 20 women take to build a wall of 600 metres ?

(1) 15 (2) 20
(3) 25 (4) 30

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. 5 persons can prepare an admission list in 8 days working 7 hours a day. If 2 persons join them so as to complete the work in 4 days, they need to work per day for :

(1) 10 hours (2) 9 hours
(3) 12 hours (4) 8 hours

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

5. 4 mat-weavers can weave 4 mats in 4 days. At the same rate how many mats would be woven by 8 mat-weavers in 8 days ?

(1) 4 (2) 8
(3) 12 (4) 16

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

6. 10 men working 6 hours a day can complete a work in 18 days. How many hours a day must 15 men work to complete the same work in 12 days ?

(1) 6 days (2) 10 days
(3) 12 days (4) 15 days

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

7. Two persons can complete a piece of work in 9 days. How many more persons are needed to complete double the work in 12 days?

(1) 3 (2) 2
(3) 4 (4) 1

(SSC CPO S.I. Exam. 03.09.2006)

8. If p men working p hours per day for p days produce p units of work, then the units of work produced by n men working n hours a day for n days is

(1) $\frac{p^2}{n^2}$ (2) $\frac{p^3}{n^2}$

(3) $\frac{n^2}{p^2}$ (4) $\frac{n^3}{p^2}$

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

9. If 10 men can do a piece of work in 12 days, the time taken by 12 men to do the same piece of work will be

(1) 12 days (2) 10 days
(3) 9 days (4) 8 days

(SSC CPO S.I. Exam. 09.11.2008)

10. 7 men can complete a piece of work in 12 days. How many additional men will be required to complete double the work in 8 days ?

(1) 28 (2) 21
(3) 14 (4) 7

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

11. 'x' number of men can finish a piece of work in 30 days. If there were 6 men more, the work could be finished in 10 days less. The original number of men is

(1) 6 (2) 10
(3) 12 (4) 15

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

12. Some carpenters promised to do a job in 9 days but 5 of them were absent and remaining men did the job in 12 days. The original number of carpenters was

(1) 24 (2) 20
(3) 16 (4) 18

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (1st Sitting)



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13. 2 men and 3 women together or 4 men together can complete a piece of work in 20 days.3 men and 3 women will complete the same work in :
(1) 12 days (2) 16 days
(3) 18 days (4) 19 days
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

14. Working 8 hours a day, Anu can copy a book in 18 days. How many hours a day should she work so as to finish the work in 12 days ?
(1) 12 hours (2) 10 hours
(3) 11 hours (4) 13 hours
(SSC CISF Constable (GD) Exam. 05.06.2011)

15. Some persons can do a piece of work in 12 days. Two times the number of such persons will do half of the work in
(1) 9 days (2) 6 days
(3) 5 days (4) 3 days
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

16. If the work done by $(x-1)$ men in $(x+1)$ days is to the work done by $(x+2)$ men in $(x-1)$ days are in the ratio 9 : 10, then the value of x is equal to :
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

17. If 80 persons can finish a work within 16 days by working 6 hours a day, the number of hours a day, should 64 persons work to finish that very job within 15 days is :
(1) 5 hrs. (2) 7 hrs.
(3) 8 hrs. (4) 6 hrs.
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

18. 18 boys can do a piece of work in 24 days. In how many days can 27 boys do the same work ?
(1) 16 days (2) 32 days
(3) 23 days (4) 48 days
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

19. One man, 3 women and 4 boys can do a piece of work in 96 hours. 2 men and 8 boys can do it in 80 hours, 2 men and 3 women can do it in 120 hours. 5 men and 12 boys can do it in
(1) $39\frac{1}{11}$ hours
(2) $42\frac{7}{11}$ hours
(3) $43\frac{7}{11}$ hours
(4) 44 hours
(SSC Graduate Level Tier-I Exam. 21.04.2013)

20. If x men can do a piece of work in x days, then the number of days in which y men can do the same work is
(1) xy days (2) $\frac{y^2}{x}$ days
(3) $\frac{x^2}{y}$ days (4) x^2y days
(SSC Graduate Level Tier-II Exam. 29.09.2013

21. 30 men can repair a road in 18 days. They are joined by 6 more workers. Now the road can be repaired in
(1) 14 days (2) 15 days
(3) 16 days (4) 17 days
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

22. 20 men or 24 women can complete a piece of work in 20 days. If 30 men and 12 women undertake to complete the work, the work will be completed in
(1) 10 days (2) 12 days
(3) 15 days (4) 16 days
(SSC (South Zone) Investigator Exam 12.09.2010)

23. Either 8 men or 17 women can paint a house in 33 days. The number of days required to paint three such houses by 12 men and 24 women working at the same rate is :
(1) 44 days (2) 43 days
(3) 34 days (4) 66 days
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

24. 3 men and 7 women can do a job in 5 days, while 4 men and 6 women can do it in 4 days. The number of days required for a group of 10 women working together, at the same rate as before, to finish the same job is :
(1) 30 days (2) 36 days
(3) 40 days (4) 20 days
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

25. A contractor undertook to finish a work in 92 days and employed 110 men. After 48 days, he found that he had already done $\frac{3}{5}$ part of the work, the number of men he can withdraw so that the work may still be finished in time is :
(1) 45 (2) 40
(3) 35 (4) 30
(SSC Multi-Tasking Staff Exam. 10.03.2013)

26. A man undertakes to do a certain work in 150 days. He employs 200 men. He finds that only a quarter of the work is done in 50 days. The number of additional men that should be appointed so that the whole work will be finished in time is :
(1) 75 (2) 100
(3) 125 (4) 50
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

27. A contractor undertook to finish a certain work in 124 days and employed 120 men. After 64 days, he found that he had already done $\frac{2}{3}$ of the work. How many men can be discharged now so that the work may finish in time ?
(1) 48 (2) 56
(3) 40 (4) 50
(SSC Graduate Level Tier-I Exam. 21.04.2013)

28. If 7 men working 7 hrs a day for each of 7 days produce 7 units of work, then the units of work produced by 5 men working 5 hrs a day for each of 5 days is
(1) $\frac{25}{343}$ (2) $\frac{125}{49}$
(3) $\frac{49}{125}$ (4) $\frac{343}{25}$
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

29. Seventy-five men are employed to lay down a railway line in 3 months. Due to certain emergency conditions, the work was to be finished in 18 days. How many more men should be employed to complete the work in the desired time ?
(1) 300 (2) 325
(3) 350 (4) 375
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

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30. If 4 men or 8 women can do a piece of work in 15 days, in how many days can 6 men and 12 women do the same piece of work?
(1) 20 days (2) 45 days
(3) 15 days (4) 30 days
(SSC CGL Tier-I Exam. 16.08.2015 (1st Sitting) TF No. 3196279)

TYPE : VII

1. Suman can do a work in 3 days. Sumati can do the same work in 2 days. Both of them finish the work together and get ₹ 150. What is the share of Suman?
(1) ₹ 30 (2) ₹ 60
(3) ₹ 70 (4) ₹ 75
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. The average wage of 500 workers was found to be ₹ 200. Later on, it was discovered that the wages of two workers were misread as 180 and 20 instead of 80 and 220. The correct average wage is :
(1) ₹ 200.10 (2) ₹ 200.20
(3) ₹ 200.50 (4) ₹ 201.00
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. A and B undertook to do a piece of work for ₹ 4500. A alone could do it in 8 days and B alone in 12 days. With the assistance of C they finished the work in 4 days. Then C's share of the money is
(1) ₹ 2250 (2) ₹ 1500
(3) ₹ 750 (4) ₹ 375
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. If 6 persons working 8 hours a day earn ₹ 8400 per week, then 9 persons working 6 hours a day will earn per week
(1) ₹ 8400 (2) ₹ 16800
(3) ₹ 9450 (4) ₹ 16200
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

5. A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for ₹ 3200. With the help of C they completed the work in 3 days. How much is to be paid to C?
(1) ₹ 375 (2) ₹ 400
(3) ₹ 600 (4) ₹ 800
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. A and B can complete a piece of work in 15 days and 10 days respectively. They contracted to complete the work for ₹ 30,000. The share of A in the contracted money will be :
(1) ₹ 18,000 (2) ₹ 16,500
(3) ₹ 12,500 (4) ₹ 12,000
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

7. A man and a boy received ₹ 800 as wages for 5 days for the work they did together. The man's efficiency in the work was three times that of the boy. What are the daily wages of the boy?
(1) ₹ 76 (2) ₹ 56
(3) ₹ 44 (4) ₹ 40
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

8. A daily-wage labourer was engaged for a certain number of days for ₹ 5,750; but being absent on some of those days he was paid only ₹ 5,000. What was his maximum possible daily wage?
(1) ₹ 125 (2) ₹ 250
(3) ₹ 375 (4) ₹ 500
(SSC CPO S.I. Exam. 03.09.2006)

9. A, B and C completed a work costing ₹ 1,800. A worked for 6 days, B for 4 days and C for 9 days. If their daily wages are in the ratio of 5 : 6 : 4; how much amount will be received by A?
(1) ₹ 800 (2) ₹ 600
(3) ₹ 900 (4) ₹ 750
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

10. A labourer was appointed by a contractor on the condition that he would be paid ₹ 75 for each day of his work but would be fined at the rate of ₹ 15 per day for his absence, apart from losing his wages, After 20 days, the contractor paid the labourer ₹ 1140. The number of days the labourer abstained from work was
(1) 3 (2) 5
(3) 4 (4) 2
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

11. Two men undertook to do a job for ₹ 1400. One of them can do it alone in 7 days, and the other in 8 days. With the assistance of a boy they together completed the work in 3 days. How much money will the boy get?
(1) ₹ 300 (2) ₹ 325
(3) ₹ 275 (4) ₹ 250
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

12. If 5 men or 7 women can earn ₹ 5,250 per day, how much would 7 men and 13 women earn per day?
(1) ₹ 11,600 (2) ₹ 11,700
(3) ₹ 16,100 (4) ₹ 17,100
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

13. 2 men and 1 woman together can complete a piece of work in 14 days, while 4 women and 2 men together can do it in 8 days. If a man gets ₹ 600 per day, how much should a woman get per day?
(1) ₹ 400 (2) ₹ 450
(3) ₹ 480 (4) ₹ 360
(SSC Data Entry Operator Exam. 31.08.2008)

14. Two men undertake a job for ₹ 960. They can complete it in 16 days and 24 days respectively. They work along with a third man and take 8 days to complete it. Then the share of the third man should be
(1) ₹ 155 (2) ₹ 165
(3) ₹ 160 (4) ₹ 150
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

15. If there is a reduction in the number of workers in a factory in the ratio 15 : 11 and an increment in their wages in the ratio 22 : 25, then the ratio by which the total wages of the workers should be decreased is
(1) 6 : 5 (2) 5 : 6
(3) 3 : 7 (4) 3 :5
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

16. Stanie and Paul take a piece of work for ₹ 28,800. One alone could do it in 36 days, the other in 48 days. With the assistance of an expert, they finish it in 12 days. How much remuneration the expert should get?
(1) ₹ 10000 (2) ₹ 18000
(3) ₹ 16900 (4) ₹ 12000
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

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17. A and B were assigned to do a job for an amount of ₹ 1,200. A alone can do it in 15 days, while B can do it in 12 days. With the help of C, they can finish in 5 days. The share of amount that C earns is
(1) ₹ 300 (2) ₹ 400
(3) ₹ 500 (4) ₹ 600
(SSC Multi-Tasking Staff Exam. 24.03.2013, 1st Sitting)

18. A sum of money is sufficient to pay A' s wages for 21 days and B's wages for 28 days. The same money is sufficient to pay the wages of both for :
(1) $12\frac{1}{4}$ days (2) 14 days
(3) $24\frac{1}{2}$ days (4) 12 days
(SSC Graduate Level Tier-I Exam. 21.04.2013)

19. A can do a piece of work in 12 days while B alone can do it in 15 days. With the help of C they can finish it in 5 days. If they are paid ₹ 960 for the whole work how much money A gets ?
(1) ₹ 480 (2) ₹ 240
(3) ₹ 320 (4) ₹ 400
(SSC Graduate Level Tier-I Exam. 21.04.2013)

20. A, B and C together earn ₹ 150 per day while A and C together earn ₹ 94 and B and C together earn ₹ 76. The daily earning of 'C' is
(1) ₹ 56 (2) ₹ 20
(3) ₹ 34 (4) ₹ 75
(SSC Constable (GD) Exam. 12.05.2013)

21. Three persons undertake to complete a piece of work for ₹ 1,200. The first person can complete the work in 8 days, second person in 12 days and third person in 16 days. They complete the work with the help of a fourth person in 3 days. What does the fourth person get?
(1) ₹ 180 (2) ₹ 200
(3) ₹ 225 (4) ₹ 250
(SSC Graduate Level Tier-II Exam. 29.09.2013)

22. A can do a piece of work in 16 days and B in 24 days. They take the help of C and three together finish the work in 6 days. If the total remuneration for the work is ₹ 400. The amount (in rupees) each will receive, in proportion, to do the work is
(1) A : 150, B : 100, C : 150
(2) A : 100, B : 150, C : 150
(3) A : 150, B : 150, C : 100
(4) A : 100, B : 150, C : 100
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

23. A skilled, a half skilled and an unskilled labourer work for 7, 8 and 10 days respectively and they together get ₹ 369 for their work. If the ratio of their each day's work is $\frac{1}{3} : \frac{1}{4} : \frac{1}{6}$, then how much does the trained labourer get (in rupees) ?
(1) 164 (2) 102.50
(3) 201.50 (4) 143.50
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (1st Sitting)

24. A, B and C are employed to do a piece of work for ₹ 575. A and C are supposed to finish $\frac{19}{23}$ of the work together. Amount shall be paid to B is
(1) ₹ 210 (2) ₹ 100
(3) ₹ 200 (4) ₹ 475
(SSC CGL Tier-II Exam. 21.09.2014)

25. If a man earns ₹ 2000 for his first 50 hours of work in a week and is then paid one and a half times his regular hourly rate for any additional hours, then the hours must he work to make ₹ 2300 in a week is
(1) 6 hours (2) 4 hours
(3) 7 hours (4) 5 hours
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

26. 2 men and 1 woman can complete a piece of work in 14 days while 4 women and 2 men can do the same work in 8 days. If a man gets Rs. 180 per day, then a woman will get per day
(1) Rs. 150 (2) Rs. 140
(3) Rs. 120 (4) Rs. 160
(SSC CGL Tier-II Exam. 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

TYPE-VIII

1. A certain number of men can complete a job in 30 days. If there were 5 men more, it could be completed in 10 days less. How many men were in the beginning?
(1) 10 (2) 15
(3) 20 (4) 25
(SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting)

2. If the expenditure of gas on burning 6 burners for 6 hours a day for 8 days is ₹ 450, then how many burners can be used for 10 days at 5 hours a day for ₹ 625 ?
(1) 12 (2) 16
(3) 4 (4) 8
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. A can do a piece of work in 60 days. He works for 15 days and then B alone finishes the remaining work in 30 days. The two together can finish the work in
(1) 24 days (2) 25 days
(3) 30 days (4) 32 days
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

4. A can do a certain work in the same time in which B and C together can do it. If A and B together could do it in 10 days and C alone in 50 days, then B alone could do the work in
(1) 15 days (2) 20 days
(3) 25 days (4) 30 days
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

5. A man can do a piece of work in 5 days, but with the help of his son, he can do it in 3 days. In what time can the son do it alone ?
(1) 7 days (2) 8 days
(3) $7\frac{1}{2}$ days (4) $6\frac{1}{2}$ days
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

6. A certain number of men can do a work in 60 days. If there were eight more men, it could be completed in 10 days less. How many men were there in the beginning?
(1) 70 (2) 55
(3) 45 (4) 40
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

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7. 12 persons can do a piece of work in 4 days. How many persons are required to complete 8 times the work in half the time ?
(1) 192 (2) 190
(3) 180 (4) 144
(SSC CPO S.I. Exam. 05.09.2004)

8. A work could be completed in 100 days by some workers. However, due to the absence of 10 workers, it was completed in 110 days. The original number of workers was :
(1) 100 (2) 110
(3) 55 (4) 50
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

9. A job can be completed by 12 men in 12 days. How many extra days will be needed to complete the job if 6 men leave after working for 6 days ?
(1) 3 days (2) 6 days
(3) 12 days (4) 24 days
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

10. 60 men could complete a work in 250 days. They worked together for 200 days. After that the work had to be stopped for 10 days due to bad weather. How many more men should be engaged to complete the work in time ?
(1) 10 (2) 15
(3) 18 (4) 20
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

11. Working 5 hours a day, A can complete a work in 8 days and working 6 hours a day, B can complete the same work in 10 days. Working 8 hours a day, they can jointly complete the work in
(1) 3 days (2) 4 days
(3) 4.5 days (4) 5.4 days
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

12. If two persons, with equal abilities, can do two jobs in two days, then 100 persons with equal abilities can do 100 similar jobs in
(1) 100 days (2) 10 days
(3) 5 days (4) 2 days
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

13. Ganga and Saraswati, working separately can mow a field in 8 and 12 hours respectively. If they work in stretches of one hour alternately, Ganga beginning at 9 a.m., when will the moving be completed ?
(1) 6 p.m. (2) 6.30 p.m.
(3) 5 p.m. (4) 5.30 p.m.
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

14. A road of 5 km length will be constructed in 100 days. So 280 workers were employed. But after 80 days it was found that only $3\frac{1}{2}$ km road was completed. Now how many more people were needed to finish the work in the specified time ?
(1) 480 (2) 80
(3) 200 (4) 100
(SSC CPO S.I. Exam. 06.09.2009)

15. A can do a work in 12 days. When he had worked for 3 days, B joined him. If they complete the work in 3 more days, in how many days can B alone finish the work?
(1) 6 days (2) 12 days
(3) 4 days (4) 8 days
(SSC CGL Tier-I Exam 26.06.2011 (First Sitting)

16. Working efficiencies of P and Q for completing a piece of work are in the ratio 3 : 4. The number of days to be taken by them to complete the work will be in the ratio
(1) 3 : 2 (2) 2 : 3
(3) 3 : 4 (4) 4 : 3
(SSC CISF ASI Exam 29.08.2010 (Paper-1)

17. A contractor undertakes to make a road in 40 days and employs 25 men. After 24 days, he finds that only one-third of the road is made. How many extra men should he employ so that he is able to complete the work 4 days earlier?
(1) 100 (2) 60
(3) 75 (4) None of these
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

18. Twenty women together can complete a work in 16 days. 16 men together can complete the same work in 15 days. The ratio of the working capacity of a man to that of a woman is :
(1) 3 : 4 (2) 4 : 3
(3) 5 : 3 (4) 4 : 5
(SSC CHSL DEO & LDC Exam. 27.11.2010)

19. A man and a woman working together can do a certain work in 18 days. Their skills in doing the work are in the ratio 3 : 2. How many days will the woman take to finish the work alone?
(1) 45 days (2) 36 days
(3) 27 days (4) 30 days
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

20. Two men can do a piece of work in x days. But y women can do that in 3 days. Then the ratio of the work done by 1 man and 1 woman is
(1) $3y : 2x$ (2) $2x : 3y$
(3) $x : y$ (4) $2y : 3x$
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

21. A farmer can plough a field working 6 hours per day in 18 days. The worker has to work how many hours per day to finish the same work in 12 days ?
(1) 7 hrs (2) 9 hrs
(3) 11 hrs (4) 13 hrs
(SSC Graduate Level Tier-II Exam. 29.09.2013

22. If 12 carpenters working 6 hours a day can make 460 chairs in 240 days, then the number of chairs made by 18 carpenters in 36 days each working 8 hours a day is
(1) 92 (2) 132
(3) 138 (4) 126
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

23. 8 workers can build a wall 18 m long, 2 m broad and 12 m high in 10 days, working 9 hours a day. Find how many workers will be able to build a wall 32 m long, 3 m broad and 9 m high in 8 days working 6 hours a day ?
(1) 16 (2) 20
(3) 30 (4) 10
(SSC CGL Tier-I Re-Exam, 30.08.2015)

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24. P and Q together can do a job in 6 days. Q and R can finish the same job in $\frac{60}{7}$ days. P started the work and worked for 3 days. Q and R continued for 6 days. Then the difference of days in which R and P can complete the job is

(1) 15 (2) 10

(3) 8 (4) 12

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

25. 150 workers were engaged to finish a piece of work in a certain number of days. Four workers dropped on the second day, four more workers dropped on third day and so on. It takes 8 more days to finish the work now. Find the number of days in which the work was completed?

(1) 28 (2) 24

(3) 25 (4) 30

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

26. Work done by $(x+4)$ men in $(x+5)$ days is equal to the work done by $(x-5)$ men in $(x+20)$ days. Then the value of x is

(1) 20 (2) 25

(3) 30 (4) 15

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

SHORT ANSWERS

TYPE-I

1. (3)	2. (3)	3. (1)	4. (3)
5. (2)	6. (2)	7. (3)	8. (3)
9. (3)	10. (3)	11. (4)	12. (4)
13. (1)	14. (1)	15. (2)	16. (1)
17. (3)	18. (1)	19. (4)	20. (3)
21. (3)	22. (3)	23. (2)	24. (1)
25. (3)	26. (2)	27. (1)	28. (1)
29. (3)	30. (3)	31. (1)	32. (3)
33. (4)	34. (2)	35. (3)	36. (4)
37. (2)	38. (1)	39. (2)	40. (4)
41. (4)	42. (2)	43. (4)	44. (3)
45. (2)	46. (4)	47. (2)	48. (4)
49. (2)	50. (1)	51. (2)	52. (3)
53. (3)	54. (2)	55. (3)	56. (2)
57. (3)	58. (3)	59. (3)	60. (3)
61. (*)	62. (4)		

TYPE-II

1. (2)	2. (4)	3. (3)	4. (1)
5. (2)	6. (3)	7. (3)	8. (2)
9. (3)	10. (3)	11. (3)	12. (1)
13. (2)	14. (1)	15. (3)	16. (1)
17. (3)	18. (4)	19. (1)	20. (4)
21. (1)	22. (2)	23. (3)	24. (3)
25. (3)	26. (4)	27. (3)	28. (1)
29. (1)	30. (1)	31. (2)	32. (1)
33. (1)	34. (3)	35. (3)	36. (3)
37. (3)	38. (4)	39. (1)	40. (3)
41. (2)	42. (2)	43. (1)	44. (3)
45. (2)	46. (4)	47. (4)	48. (2)
49. (2)	50. (4)	51. (2)	52. (2)
53. (3)			

TYPE-III

1. (2)	2. (2)	3. (3)	4. (4)
5. (4)	6. (3)	7. (4)	8. (3)
9. (1)	10. (3)	11. (1)	12. (2)
13. (3)	14. (3)	15. (1)	16. (3)
17. (2)	18. (1)	19. (4)	20. (1)
21. (3)	22. (2)	23. (1)	24. (2)
25. (3)	26. (3)	27. (1)	28. (3)
29. (2)	30. (2)	31. (3)	

TYPE-IV

1. (1)	2. (3)	3. (1)	4. (1)
5. (3)	6. (2)	7. (4)	8. (3)
9. (2)	10. (3)	11. (2)	12. (2)
13. (3)	14. (1)	15. (1)	16. (4)
17. (1)	18. (2)	19. (4)	20. (4)
21. (4)	22. (1)	23. (2)	24. (4)
25. (2)	26. (4)	27. (2)	28. (1)
29. (4)	30. (4)	31. (3)	

TYPE-V

1. (3)	2. (3)	3. (2)	4. (3)
5. (4)	6. (1)	7. (3)	8. (*)
9. (2)	10. (3)	11. (2)	12. (2)
13. (2)	14. (3)	15. (3)	16. (4)
17. (2)	18. (3)	19. (3)	20. (1)
21. (3)	22. (2)	23. (2)	24. (1)
25. (4)	26. (3)	27. (1)	28. (2)
29. (1)	30. (2)	31. (4)	32. (3)
33. (1)			

TYPE-VI

1. (2)	2. (1)	3. (1)	4. (1)
5. (4)	6. (1)	7. (1)	8. (4)
9. (2)	10. (3)	11. (3)	12. (2)
13. (2)	14. (1)	15. (4)	16. (4)
17. (3)	18. (1)	19. (3)	20. (3)
21. (2)	22. (1)	23. (3)	24. (4)
25. (4)	26. (2)	27. (2)	28. (2)
29. (1)	30. (*)		

TYPE-VII

1. (2)	2. (2)	3. (3)	4. (3)
5. (2)	6. (4)	7. (4)	8. (2)
9. (2)	10. (3)	11. (3)	12. (4)
13. (1)	14. (3)	15. (1)	16. (4)
17. (1)	18. (4)	19. (4)	20. (2)
21. (3)	22. (1)	23. (4)	24. (2)
25. (4)	26. (3)		

TYPE-VIII

1. (1)	2. (4)	3. (1)	4. (3)
5. (3)	6. (4)	7. (1)	8. (2)
9. (3)	10. (2)	11. (1)	12. (4)
13. (2)	14. (3)	15. (1)	16. (4)
17. (3)	18. (2)	19. (1)	20. (1)
21. (2)	22. (3)	23. (3)	24. (2)
25. (3)	26. (1)		

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EXPLANATIONS

TYPE-I

1. (3) According to question,
A and B can do a work in 12 days

$\therefore$ (A + B)'s one day's work $= \frac{1}{12}$

Similarly,

(B + C)'s one day's work $= \frac{1}{15}$

and (C + A)'s one day's work $= \frac{1}{20}$

On adding all three,
$\therefore$ 2 (A + B + C)'s one days's work

$= \frac{1}{12} + \frac{1}{15} + \frac{1}{20} = \frac{10+8+6}{120} = \frac{1}{5}$

$\Rightarrow$ (A + B + C)'s one days's work

$= \frac{1}{10}$

$\therefore$ A, B and C together can finish the whole work in 10 days.

2. (3) (A+B)'s 1 day's work

$= \frac{1}{72}$

(B+C)'s 1 day's work $= \frac{1}{120}$

(C+A)'s 1 day's work $= \frac{1}{90}$

On adding all three
2 (A + B + C)'s 1 days work =

$= \frac{1}{72} + \frac{1}{120} + \frac{1}{90}$

$= \frac{5+3+4}{360} = \frac{1}{30}$

$\therefore$ (A+B+C)'s 1 day's work $= \frac{1}{60}$

$\therefore$ (A+B+C) will do the work in 60 days.

3. (1) According to question,

10 men's one day's work $= \frac{1}{12}$

$\therefore$ 1 man one day's work

$= \frac{1}{12 \times 10} = \frac{1}{120}$

Similarly,
1 woman one day's work

$= \frac{1}{6 \times 10} = \frac{1}{60}$

$\therefore$ (1 man + 1 woman)'s one day's work $= \frac{1}{120} + \frac{1}{60}$

$= \frac{1+2}{120} = \frac{3}{120} = \frac{1}{40}$

$\therefore$ (10 men + 10 women)'s one day's work $= \frac{10}{40} = \frac{1}{4}$

Therefore, both the teams can finish the whole work in 4 days.

4. (3) According to question,
A can finish the whole work in 6 days.

$\therefore$ A's one day's work $= \frac{1}{6}$

Similarly,

B's one day's work $= \frac{1}{9}$

(A + B)'s one day's work

$= \left(\frac{1}{6} + \frac{1}{9}\right) = \left(\frac{3+2}{18}\right) = \frac{5}{18}$

Therefore, (A + B)'s can finish the whole work in $\frac{18}{5}$ days i.e., 3.6 days.

5. (2) According to the question
Work done by A and B together in one day $= \frac{1}{10}$ part

Work done by B and C together in one day $= \frac{1}{15}$ part

Work done by C and A together in one day $= \frac{1}{20}$ part

So,

$A + B = \frac{1}{10}$ ....(I)

$B + C = \frac{1}{15}$ ...(II)

$C + A = \frac{1}{20}$ ....(III)

Adding I, II, III, we get

$2(A + B + C) = \frac{1}{10} + \frac{1}{15} + \frac{1}{20}$

$2(A + B + C) = \frac{6+4+3}{60} = \frac{13}{60}$

$A + B + C = \frac{13}{120}$ ....(IV)

Putting the value of eqn. (I) in eqn. (IV)

$\frac{1}{10} + C = \frac{13}{120}$

$C = \frac{13}{120} - \frac{1}{10} = \frac{13-12}{120} = \frac{1}{120}$

$\therefore$ Work done in 1 day by C is $\frac{1}{120}$ part

Hence, C will finish the whole work in 120 days

6. (2) A's 1 hour's work $= \frac{1}{4}$

(B + C)'s 1 hour's work $= \frac{1}{3}$

(A + C)'s 1 hour's work $= \frac{1}{2}$

$\therefore$ C's 1 hour's work

$= \frac{1}{2} - \frac{1}{4} = \frac{2-1}{4} = \frac{1}{4}$

and B's 1 hour's work

$= \frac{1}{3} - \frac{1}{4} = \frac{4-3}{12} = \frac{1}{12}$

Hence, B alone can do the work in 12 hours.

7. (3) A's 1 day's work $= \frac{1}{24}$

B's 1 day's work $= \frac{1}{6}$

C's 1 day's work $= \frac{1}{12}$

(A + B + C)'s 1 day's work

$= \frac{1}{24} + \frac{1}{6} + \frac{1}{12} = \frac{1+4+2}{24} = \frac{7}{24}$

$\therefore$ The work will be completed by them in $\frac{24}{7}$ i.e., $3\frac{3}{7}$ days

8. (3) (A + B)'s 1 day's work $= \frac{1}{10}$

A's 1 day's work $= \frac{1}{30}$

$\therefore$ B's 1 day's work $= \frac{1}{10} - \frac{1}{30}$

$= \frac{3-1}{30} = \frac{2}{30} = \frac{1}{15}$

Hence, B, alone can complete the work in 15 days.

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9. (3) (A + B)'s 1 day's work

$= \frac{1}{72}$

(B + C)'s 1 day's work $= \frac{1}{120}$

(C + A)'s 1 day's work $= \frac{1}{90}$

Adding all three,

2(A + B + C)'s 1 day's work

$= \frac{1}{72} + \frac{1}{120} + \frac{1}{90}$

$= \frac{5+3+4}{360} = \frac{12}{360} = \frac{1}{30}$

∴ (A + B + C)'s 1 day's work

$= \frac{1}{60}$

Now, A's 1 day's work = (A + B + C)'s 1 day's work − (B + C)'s 1 day's work

$= \frac{1}{60} - \frac{1}{120} = \frac{2-1}{120} = \frac{1}{120}$

∴ A alone can complete the work in 120 days.

10. (3) (A + B)'s 1 day's work

$= \frac{1}{8}$ ...(i)

(B + C)'s 1 day's work

$= \frac{1}{6}$ ...(ii)

(C + A)'s 1 day's work

$= \frac{1}{10}$ ...(iii)

On adding,

2(A + B + C)'s 1 day's work

$= \frac{1}{8} + \frac{1}{6} + \frac{1}{10}$

$= \frac{15+20+12}{120} = \frac{47}{120}$

⇒ (A + B + C)'s 1 day's work

$= \frac{47}{240}$

∴ (A + B + C) together will complete the work in

$\frac{240}{47} = 5\frac{5}{47}$ days.

11. (4) (A + B)'s 1 day's work

$= \frac{1}{12}$ ...(i)

(B + C)'s 1 day's work

$= \frac{1}{8}$ ...(ii)

(C + A)'s 1 day's work

$= \frac{1}{6}$ ...(iii)

On adding,

2(A + B + C)'s 1 day's work

$= \frac{1}{12} + \frac{1}{8} + \frac{1}{6}$

$= \frac{2+3+4}{24} = \frac{9}{24}$

∴ (A+ B + C)'s 1 day's work

$= \frac{9}{24 \times 2} = \frac{9}{48}$ ...(iv)

On, subtracting (iii) from (iv),

B's 1 day's work $= \frac{9}{48} - \frac{1}{6}$

$= \frac{9-8}{48} = \frac{1}{48}$

∴ B can complete the work in 48 days.

12. (4) Work done by (A + B) in 1 day

$= \frac{1}{30}$

Work done by (B + C) in 1 day = $\frac{1}{20}$

Work done by (C + A) in 1 day = $\frac{1}{15}$

On adding,

Work done by 2 (A +B + C) in 1 day $= \frac{1}{30} + \frac{1}{20} + \frac{1}{15}$

$= \frac{2+3+4}{60}$

$= \frac{9}{60} = \frac{3}{20}$

∴ Work done by (A + B + C) in 1 day $= \frac{3}{40}$

∴ (A + B + C) will do the work in $\frac{40}{3} = 13\frac{1}{3}$ days

13. (1) Let A and C complete the work in x days

(A + B)'s 1 day's work $= \frac{1}{8}$

(B + C)'s 1 day's work $= \frac{1}{12}$

(C + A)'s 1 day's work $= \frac{1}{x}$

Then (A + B + B + C + C + A)'s 1 day's work $= \frac{1}{8} + \frac{1}{12} + \frac{1}{x}$

2(A + B + C)'s 1 day's work

$= \frac{3x + 2x + 24}{24x}$

(A + B + C)'s 1 day's work

$= \frac{5x + 24}{24x \times 2}$

According to the question,

(A + B + C)'s 1 day's work $= \frac{1}{6}$

$\frac{1}{6} = \frac{5x + 24}{48x}$

⇒ $30x + 144 = 48x$

∴ $x = \frac{144}{18} = 8$ days.

14. (1) A's 1 day's work $= \frac{1}{12}$

(A+B)'s 1 day's work $= \frac{1}{8}$

∴ B's 1 day's work

$= \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$

∴ B alone can do the work in 24 days.

15. (2) (A + B)'s 1 day's work $= \frac{1}{18}$

(B + C)'s 1 day's work $= \frac{1}{9}$

(A + C)'s 1 day's work $= \frac{1}{12}$

Adding all the above three,

2 (A + B + C)'s 1 day's work

$= \frac{1}{18} + \frac{1}{9} + \frac{1}{12}$

$= \frac{2+4+3}{36} = \frac{9}{36} = \frac{1}{4}$

∴ (A + B + C)'s 1 day's work $= \frac{1}{8}$

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$\therefore$ B's 1 day's work = (A + B + C)'s 1 day's work − (A + C)'s 1 day's work

$= \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$

Hence, B alone can do the work in 24 days.

16. (1) A alone can complete the work in 42 days working 1 hour daily. Similarly, B will take 56 days working 1 hour daily.

A 's 1 day's work = $\frac{1}{42}$

B 's 1 day's work = $\frac{1}{56}$

(A + B) 's 1 day's work

$= \frac{1}{42} + \frac{1}{56} = \frac{4+3}{168} = \frac{7}{168}$

$\therefore$ Time taken by (A + B) working 8 hours daily = $\frac{168}{7 \times 8} = 3$ days

17. (3) (A + B)'s 1 day's work

$= \frac{1}{10}$ ..... (i)

(B + C)'s 1 day's work

$= \frac{1}{12}$ ..... (ii)

(C + A)'s 1 day's work

$= \frac{1}{15}$ ..... (iii)

On adding all these,
2(A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{12} + \frac{1}{15}$

$= \frac{6+5+4}{60} = \frac{1}{4}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{8}$ ..... (iv)

$\therefore$ C's 1 day's work

$= \frac{1}{8} - \frac{1}{10} = \frac{5-4}{40} = \frac{1}{40}$

$\therefore$ C will finish the work in 40 days.

18. (1) (A + B)'s 1 day's work = $\frac{1}{15}$

B's 1 day's work = $\frac{1}{20}$

$\therefore$ A's 1 day's work

$= \frac{1}{15} - \frac{1}{20} = \frac{4-3}{60} = \frac{1}{60}$

$\therefore$ A alone will do the work in 60 days.

19. (4) (A + B)'s 1 day's work = $\frac{1}{12}$

(B + C)'s 1 day's work = $\frac{1}{15}$

(C + A)'s 1 day's work = $\frac{1}{20}$

On adding,
2 (A + B + C)'s 1 day's work

$= \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$

$= \frac{5+4+3}{60} = \frac{1}{5}$

$\therefore$ (A+B+C)'s 1 day's work = $\frac{1}{10}$

$\therefore$ B's 1 day's work

$= \frac{1}{10} - \frac{1}{20} = \frac{2-1}{20} = \frac{1}{20}$

$\therefore$ B alone can do the work in 20 days.

20. (3) (P + Q)'s 1 day's work

$= \frac{1}{12}$ ...(i)

(Q + R)'s 1 day's work = $\frac{1}{15}$ ...(ii)

(R + P)'s 1 day's work = $\frac{1}{20}$ ...(iii)

Adding all three equations,
2 (P + Q + R)'s 1 day's work

$= \frac{1}{12} + \frac{1}{15} + \frac{1}{20} = \frac{5+4+3}{60}$

$= \frac{12}{60} = \frac{1}{5}$

$\therefore$ (P + Q + R)'s 1 day's work

$= \frac{1}{10}$ ...(iv)

$\therefore$ P's 1 day's work

$= \frac{1}{10} - \frac{1}{15} = \frac{3-2}{30} = \frac{1}{30}$

$\therefore$ P alone will complete the work in 30 days.

21. (3) (A + B)'s 1 day's work = $\frac{1}{8}$

(B + C)'s 1 day's work = $\frac{1}{12}$

(C + A)'s 1 day's work = $\frac{1}{8}$

On adding,
2 (A + B + C)'s 1 day's work

$= \frac{1}{8} + \frac{1}{12} + \frac{1}{8} = \frac{3+2+3}{24}$

$= \frac{8}{24} = \frac{1}{3}$

$\therefore$ (A + B + C)'s 1 day's work = $\frac{1}{6}$

Hence, the work will be completed in 6 days.

Method 2 :

Quicker Approach

Time = $\frac{2xyz}{xy + yz + zx}$

(Here, $x = 8$, $y = 12$; $z = 8$)

$= \frac{2 \times 8 \times 12 \times 8}{96 + 96 + 64} = \frac{2 \times 8 \times 12 \times 8}{256}$

= 6 days.

22. (3) (A + B)'s 1 day's work = $\frac{1}{10}$

(B + C)'s 1 day's work = $\frac{1}{6}$

(C + A)'s 1 day's work = $\frac{1}{12}$

Adding all three
2 (A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{6} + \frac{1}{12} = \frac{6+10+5}{60}$

$= \frac{21}{60} = \frac{7}{20}$

$\therefore$ (A + B + C)'s 1 day's work = $\frac{7}{40}$

$\therefore$ All three together will complete the work in $\frac{40}{7} = 5\frac{5}{7}$ days

23. (2) (A + B)'s 1 hour's work

$= \frac{2}{9}$ .....(i)

(B + C)'s 1 hour's work = $\frac{1}{3}$

.....(ii)

(C + A)'s 1 hour's work

$= \frac{4}{9}$ .....(iii)

Adding all three equations,
2 (A + B + C)'s 1 hour's work

$= \frac{2}{9} + \frac{1}{3} + \frac{4}{9} = \frac{2+3+4}{9} = 1$

$\therefore$ A, B and C together will complete the work in 2 hours.

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24. (1) (A + B)'s 1 day's work = $\frac{1}{18}$

(B + C)'s 1 day's work = $\frac{1}{24}$

(A + C)'s 1 day's work = $\frac{1}{36}$

Adding all three,
2 (A + B + C)'s 1 day's work

$= \frac{1}{18} + \frac{1}{24} + \frac{1}{36}$

$= \frac{4+3+2}{72} = \frac{1}{8}$

$\therefore$ (A + B + C)' 1 day's work = $\frac{1}{16}$

$\therefore$ A, B and C together will complete the work in 16 days.

25. (3) (A + B)'s 1 day's work = $\frac{1}{5}$

A's 1 day's work = $\frac{1}{8}$

$\therefore$ B's 1 day's work = $\frac{1}{5} - \frac{1}{8}$

$= \frac{8-5}{40} = \frac{3}{40}$

$\therefore$ B alone will complete the work in $\frac{40}{3} = 13\frac{1}{3}$ days.

26. (2) Work done by (A + B + C) in 1 minute = $\frac{1}{30}$

Work done by (A + B) in 1 minute

$= \frac{1}{50}$

$\therefore$ Work done by C alone in 1 minute

$= \frac{1}{30} - \frac{1}{50}$

$= \frac{5-3}{150} = \frac{2}{150} = \frac{1}{75}$

$\therefore$ C alone will complete the work in 75 minutes.

27. (1) (A + B)'s 1 day's work = $\frac{1}{8}$

(B + C)'s 1 day's work = $\frac{1}{24}$

(C + A)'s 1 day's work = $\frac{7}{60}$

On adding all three,
2 (A + B + C)'s 1 day's work

$= \frac{1}{8} + \frac{1}{24} + \frac{7}{60}$

$= \frac{15+5+14}{120} = \frac{34}{120}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{17}{120}$

$\therefore$ C's 1 day's work

$= \frac{17}{120} - \frac{1}{8} = \frac{17-15}{120} = \frac{1}{60}$

$\therefore$ C alone will complete the work in 60 days.

28. (1) (A+B)'s 1 day's work = $\frac{1}{10}$

(B + C)'s 1 day's work = $\frac{1}{12}$

(C + A)'s 1 day's work = $\frac{1}{15}$

On adding all three,
2(A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{12} + \frac{1}{15}$

$= \frac{6+5+4}{60} = \frac{15}{60} = \frac{1}{4}$

$\therefore$ (A+B+C)'s 1 day's work = $\frac{1}{8}$

$\therefore$ A's 1 day's work = $= \frac{1}{8} - \frac{1}{12}$

$= \frac{3-2}{24} = \frac{1}{24}$

$\therefore$ A will complete the work in 24 days.

29. (3) (A + B)'s 1 day's work = $\frac{1}{20}$

(B + C)'s 1 day's work = $\frac{1}{10}$

(C + A)'s 1 day's work = $\frac{1}{12}$

On adding all three,
2 (A + B + C)'s 1 day's work

$= \frac{1}{20} + \frac{1}{10} + \frac{1}{12}$

$= \frac{3+6+5}{60} = \frac{14}{60} = \frac{7}{30}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{7}{60}$

$\therefore$ Hence, the work will be completed in $\frac{60}{7} = 8\frac{4}{7}$ days.

30. (3) Work done by A, B and C in 1 day

$= \frac{1}{10} + \frac{1}{12} + \frac{1}{15} = \frac{6+5+4}{60}$

$= \frac{15}{60} = \frac{1}{4}$

$\therefore$ Required time = 4 days

31. (1) A's 1 day's work

$= \frac{1}{12} - \frac{1}{30} = \frac{5-2}{60} = \frac{3}{60} = \frac{1}{20}$

Hence, A alone will complete the work in 20 days.

32. (3) (A + B + C)'s 1 day's work

$= \frac{1}{12} + \frac{1}{24} + \frac{1}{36}$

$= \frac{6+3+2}{72} = \frac{11}{72}$

$\therefore$ (A + B + C) together will complete the work in $\frac{72}{11}$ days

$= 6\frac{6}{11}$ days.

33. (4) (A + B)'s 1 day's work

$= \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} = \frac{1}{4}$

$\therefore$ A and B together will complete the work in 4 days.

34. (2) (A + B)'s 1 day's work = $\frac{1}{36}$

(B + C)'s 1 day's work = $\frac{1}{60}$

(C + A)'s 1 day's work = $\frac{1}{45}$

Adding all three,
2(A + B + C)'s 1 day's work

$= \frac{1}{36} + \frac{1}{60} + \frac{1}{45} = \frac{5+3+4}{180} = \frac{1}{15}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{30}$

$\therefore$ C's 1 day's work = $\frac{1}{30} - \frac{1}{36}$

$= \frac{6-5}{180} = \frac{1}{180}$

Hence, C alone will finish the work in 180 days.

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35. (3) Ronald's 1 hour's work

$= \frac{32}{6} = \frac{16}{3}$ pages

[Pages typed in 6 hrs. = 32

$\therefore$ pages typed in 1 hr = $\frac{32}{6}$]

Elan's 1 hour's work = 8 pages

1 hour's work of the both

$= \frac{16}{3} + 8 = \frac{40}{3}$ pages

$\therefore$ Required time

$= \frac{110 \times 3}{40} = \frac{33}{4}$ hours

= 8 hours 15 minutes

36. (4) A 's 1day's work = $\frac{1}{20}$

B 's 1day's work = $\frac{1}{30}$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{20} + \frac{1}{30} = \frac{3+2}{60} = \frac{1}{12}$

Hence, the work will be completed in 12 days. When worked together.

37. (2) 9 hours 36 minutes

$= 9 + \frac{36}{60} = 9\frac{3}{5}$ hours

$= \frac{48}{5}$ hours

(A + B)'s 1 hour's work = $\frac{5}{48}$

C's 1 hour's work = $\frac{1}{48}$

(A + B + C)'s 1 hour's work

$= \frac{5}{48} + \frac{1}{48} = \frac{1}{8}$ .....(i)

A's 1 hours work = (B + C)'s 1 hour's work .....(ii)

From equations (i) and (ii),

2 × (A's 1 hour's work) = $\frac{1}{8}$

A's 1 hour's work = $\frac{1}{16}$

$\therefore$ B's 1 hour's work = $\frac{5}{48} - \frac{1}{16}$

$= \frac{5-3}{48} = \frac{1}{24}$

$\therefore$ B alone will finish the work in 24 hours

38. (1) Work done by A and B in 5 days

$= 5\left(\frac{1}{12} + \frac{1}{15}\right) = 5\left(\frac{5+4}{60}\right)$

$= 5 \times \frac{9}{60} = \frac{9}{12} = \frac{3}{4}$

Remaining work = $1 - \frac{3}{4} = \frac{1}{4}$

$\therefore$ Time taken by A

$= \frac{1}{4} \times 12 = 3$ days

39. (2) B's 1 day's work = (A + B)'s 1 day's work – A's 1 day's work

$= \frac{1}{12} - \frac{1}{28} = \frac{7-3}{84}$

$= \frac{4}{84} = \frac{1}{21}$

$\therefore$ Required time = 21 days

40. (4) A's 1 day's work = $\frac{1}{m}$

B's 1 day's work = $\frac{1}{n}$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{m} + \frac{1}{n}$

$= \frac{n+m}{mn} = \frac{m+n}{mn}$

$\therefore$ Required time = $\frac{mn}{m+n}$

41. (4) Let A, B and C together do the work in x hours.

$\therefore$ Time taken by A

= $(x + 6)$ hours

Time taken by B = $(x + 1)$ hours

Time taken by C = $2x$ hours

$\therefore \frac{1}{x+6} + \frac{1}{x+1} + \frac{1}{2x} = \frac{1}{x}$

$\Rightarrow \frac{1}{x+6} + \frac{1}{x+1} = \frac{1}{x} - \frac{1}{2x}$

$= \frac{1}{2x}$

$\Rightarrow \frac{1}{x+6} = \frac{1}{2x} - \frac{1}{x+1}$

$= \frac{x+1-2x}{2x(x+1)}$

$\Rightarrow \frac{1}{x+6} = \frac{1-x}{2x^2+2x}$

$\Rightarrow 2x^2 + 2x = x + 6 - x^2 - 6x$

$\Rightarrow 3x^2 + 7x - 6 = 0$

$\Rightarrow 3x^2 + 9x - 2x - 6 = 0$

$\Rightarrow 3x(x + 3) - 2(x + 3) = 0$

$\Rightarrow (3x - 2)(x + 3) = 0$

$\Rightarrow 3x - 2 = 0$ as $x + 3 \neq 0$

$\Rightarrow x = \frac{2}{3}$

$\therefore$ Time taken by A = $6 + \frac{2}{3}$

$= \frac{18+2}{3} = \frac{20}{3}$ hours

Time taken by B = $1 + \frac{2}{3}$

$= \frac{5}{3}$ hours

$\therefore$ (A +B)'s 1 hour's work

$= \frac{3}{20} + \frac{3}{5} = \frac{3+12}{20}$

$= \frac{15}{20} = \frac{3}{4}$

$\therefore$ Required time = $\frac{4}{3}$ hours

42. (2) Time taken by B and C = x days (let)

$\therefore$ Time taken by A = $3x$ days

$\therefore$ Part of work done by A, B and C in 1 day

$= \frac{1}{x} + \frac{1}{3x} = \frac{3+1}{3x} = \frac{4}{3x}$

$\therefore \frac{4}{3x} = \frac{1}{24} \Rightarrow 3x = 4 \times 24$

$\Rightarrow x = \frac{4 \times 24}{3} = 32$ days

$\therefore$ Time taken by A = 32×3 = 96 days

43. (4) A's 1 day's work = $\frac{1}{4}$

B's 1 day's work = $\frac{1}{12}$

(A + B)'s 1 day's work

$= \frac{1}{4} + \frac{1}{12}$

$= \frac{3+1}{12} = \frac{4}{12} = \frac{1}{3}$

$\therefore$ Required time = 3 days

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44. (3) A does $\frac{1}{4}$ work in 10 days

$\therefore$ A will do 1 work in $10 \times 4 = 40$ days

Similarly, B will do the same work in $20 \times 3 = 60$ days

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{40} + \frac{1}{60}$

$= \frac{3+2}{120} = \frac{5}{120} = \frac{1}{24}$

$\therefore$ Required time = 24 days

45. (2) $M_1 D_1 T_1 = M_2 D_2 T_2$

$\Rightarrow 15 \times 20 \times 8 = 20 \times 12 \times T_2$

$\Rightarrow T_2 = \frac{15 \times 20 \times 8}{20 \times 12} = 10$ hours

46. (4) (Raj + Ram)'s 1 day's work

$= \frac{1}{10}$

Raj's 1 day's work $= \frac{1}{12}$

$\therefore$ Ram's 1 day's work

$= \frac{1}{10} - \frac{1}{12} = \frac{6-5}{60} = \frac{1}{60}$

$\therefore$ Required time = 60 days

47. (2) A's 1 day's work $= \frac{1}{9}$

B's 1 day's work $= \frac{1}{15}$

Work done in first 2 days = A's 1 day's work + B's 1 day's work

$= \frac{1}{9} + \frac{1}{15} = \frac{5+3}{45} = \frac{8}{45}$

$\therefore$ Work done in first 10 days

$= \frac{8 \times 5}{45} = \frac{8}{9}$

Remaining work $= 1 - \frac{8}{9} = \frac{1}{9}$

Now, it is turn of 'A' for the eleventh day.

$\therefore$ Time taken by 'A' in doing $\frac{1}{9}$ work $= \frac{1}{9} \times 9 = 1$ day

$\therefore$ Required time = 10 + 1 = 11 days

48. (4) 15 men complete $\frac{1}{3}$ work in 7 days.

$\therefore$ Time taken in doing 1 work $= 3 \times 7 = 21$ days

$\therefore M_1 D_1 = M_2 D_2$

$\Rightarrow 15 \times 21 = M_2 \times 5$

$\Rightarrow M_2 = \frac{15 \times 21}{5} = 63$ days

49. (2) (x and y)'s 1 hour work

$= \frac{1}{4} + \frac{1}{8} = \frac{2+1}{8} = \frac{3}{8}$

$\therefore$ Required time $= \frac{8}{3}$ hours

$= \left(\frac{8}{3} \times 60\right)$ minutes

= 160 minutes

50. (1) Number of pages copied by x in hour $= \frac{80}{20} = 4$

Number of pages copied by x and y in 1 hour $= \frac{135}{27} = 5$

$\therefore$ Number of pages copied by y in 1 hour = 5 − 4 = 1

$\therefore$ Required time = 20 hours.

51. (2) (A + B)'s 1 day's work

$= \frac{1}{15}$ ....(i)

(B + C)'s 1 day's work

$= \frac{1}{12}$ .... (ii)

(C + A)'s 1 day's work

$= \frac{1}{10}$ .... (iii)

On adding all three equations,

2 (A + B + C)'s 1 day's work

$= \frac{1}{15} + \frac{1}{12} + \frac{1}{10}$

$= \frac{4+5+6}{60} = \frac{15}{60} = \frac{1}{4}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{8}$ ....(iv)

By equation (iv) − (ii),

A's 1 day's work

$= \frac{1}{8} - \frac{1}{12}$

$= \frac{3-2}{24} = \frac{1}{24}$

$\therefore$ Required time = 24 days

52. (3) (A + B)'s 1 day's work

$= \frac{1}{25} + \frac{1}{30} = \frac{6+5}{150} = \frac{11}{150}$

$\therefore$ (A + B)'s 5 days' work

$= \frac{5 \times 11}{150} = \frac{11}{30}$

$\therefore$ Remaining work

$= 1 - \frac{11}{30} = \frac{30-11}{30} = \frac{19}{30}$

53. (3) (A + B)'s 1 day's work $= \frac{1}{6}$

A's 1 day's work $= \frac{1}{18}$

$\therefore$ B's 1 day's work $= \frac{1}{6} - \frac{1}{18}$

$= \frac{3-1}{18} = \frac{2}{18} = \frac{1}{9}$

$\therefore$ Required time = 9 days

54. (2) A's 2 days' work = B's 3 days' work

$\therefore$ Time taken by A = 8 days

$\therefore$ Time taken by B $= \frac{8}{2} \times 3$

= 12 days

55. (3)

Men	Working hours	Days
16 ↑	14 ↑	12 ↓
28	12	x

$\therefore \left.\begin{matrix} 28:16 \\ 12:14 \end{matrix}\right\} :: 12 : x$

$\Rightarrow 28 \times 12 \times x = 16 \times 14 \times 12$

$\Rightarrow x = \frac{16 \times 14 \times 12}{28 \times 12} = 8$ days

56. (2) (A + B)'s 1 day's work $= \frac{1}{8}$

(B + C)'s 1 day's work $= \frac{1}{12}$

(A + B + C)'s 1 day's work $= \frac{1}{6}$

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$\therefore$ C's 1 day's work $= \frac{1}{6} - \frac{1}{8}$

$= \frac{4-3}{24} = \frac{1}{24}$

A's 1 day's work

$= \frac{1}{6} - \frac{1}{12} = \frac{2-1}{12} = \frac{1}{12}$

$\therefore$ (A + C)'s 1 day's work

$= \frac{1}{12} + \frac{1}{24} = \frac{2+1}{24} = \frac{1}{8}$

$\therefore$ Required time = 8 days

57. (3) $\frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$

$\Rightarrow \frac{90\times16\times12}{1} = \frac{70\times24\times8}{W_2}$

$\Rightarrow W_2 = \frac{70\times24\times8}{90\times16\times12} = \frac{7}{9}$ parts

58. (3) Let the work be completed in x days.

According to the question,

$\frac{x}{16} + \frac{x-8}{32} + \frac{x-6}{48} = 1$

$\Rightarrow \frac{6x+3x-24+2x-12}{96} = 1$

$\Rightarrow 11x - 36 = 96$

$\Rightarrow 11x = 96 + 36 = 132$

$\Rightarrow x = \frac{132}{11} = 12$ days

59. (3) (A+B)'s 1 day's work $= \frac{1}{15}$

(B+C)'s 1 day's work $= \frac{1}{10}$

(A+C)'s 1 day's work $= \frac{1}{12}$

On adding all three,

2(A+B+C)'s 1 day's work

$= \frac{1}{15} + \frac{1}{10} + \frac{1}{12} = \frac{4+6+5}{60}$

$= \frac{15}{60} = \frac{1}{4}$

$\therefore$ (A + B + C)'s 1 day's work $= \frac{1}{8}$

$\therefore$ Required time = 8 days

60. (3) Let the whole work be completed in x days

A's 1 day's work $= \frac{1}{10}$

B's 1 day's work $= \frac{1}{12}$

C's 1 day's work $= \frac{1}{15}$

According to the question,

A's $(x-5)$ days' work + B's $(x-3)$ days' work + C's x days' work = 1

$\Rightarrow \frac{x-5}{10} + \frac{x-3}{12} + \frac{x}{15} = 1$

$\Rightarrow \frac{6(x-5)+5(x-3)+4x}{60} = 1$

$\Rightarrow 6x - 30 + 5x - 15 + 4x = 60$

$\Rightarrow 15x - 45 = 60$

$\Rightarrow 15x = 60 + 45 = 105$

$\Rightarrow x = \frac{105}{15} = 7$ days

61. (*) A's 1 day's work $= \frac{1}{24}$

B's 1 day's work $= \frac{1}{5}$

C's 1 day's work $= \frac{1}{12}$

$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{24} + \frac{1}{5} + \frac{1}{12}$

$= \frac{5+24+10}{120}$

$= \frac{39}{120} = \frac{13}{40}$

$\therefore$ Required time

$= \frac{40}{13} = 3\frac{1}{13}$ days

62. (4)

Women	Length	Days
20 ↑	100	10
10	50 ↓	x ↓

$\therefore \left.\begin{matrix}10:20\\100:50\end{matrix}\right\} :: 10 : x$

$\Rightarrow 10\times100\times x = 20\times50\times10$

$\Rightarrow x = \frac{20\times50\times10}{1000} = 10$ days

TYPE-II

1. (2) $\because$ A can finish the work in 18 days.

$\therefore$ A's one day's work $= \frac{1}{18}$

Similarly, B's one day's work

$= \frac{1}{24}$

$\therefore$ (A + B)'s 8 days' work

$= \left(\frac{1}{18} + \frac{1}{24}\right)\times8 = \frac{7}{72}\times8 = \frac{7}{9}$

$\therefore$ Remaining work $= 1 - \frac{7}{9} = \frac{2}{9}$

$\therefore$ Time taken to finish the remaining work by B is $\frac{2}{9}\times24$

$= \frac{16}{3} = 5\frac{1}{3}$ days

2. (4) (A+B)'s 2 days' work

$= 2\left(\frac{1}{12} + \frac{1}{18}\right) = \frac{10}{36}$

Remaining work

$= 1 - \frac{10}{36} = \frac{26}{36}$

Time taken by B to complete $\frac{26}{36}$ part of work

$= \frac{26}{36}\times18 = 13$ days

3. (3) A's one day's work $= \frac{1}{6}$

B's one day's work $= \frac{1}{12}$

(A + B)'s one day's work

$= \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} = \frac{1}{4}$

(A + B)'s three day's work $= \frac{3}{4}$

Remaining work $= 1 - \frac{3}{4} = \frac{1}{4}$

$\therefore$ Total required number of days

$= \frac{1}{4}\times\frac{12}{1} + 3 = 3 + 3 = 6$ days

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4. (1) (A + B)'s day's work $= \frac{1}{30}$

(B + C)'s 1 day's work $= \frac{1}{24}$

(C + A)'s 1 day's work $= \frac{1}{20}$

∴ 2 (A + B + C)'s 1 day's work

$= \frac{1}{30} + \frac{1}{24} + \frac{1}{20}$

$= \frac{4+5+6}{120} = \frac{15}{120} = \frac{1}{8}$

∴ (A + B + C)'s 1 day's work

$= \frac{1}{16}$

∴ (A + B + C)'s 10 days' work

$= \frac{10}{16} = \frac{5}{8}$

∴ Remaining work $= 1 - \frac{5}{8} = \frac{3}{8}$

This part of work is done by A alone.

Now A's 1 day's work $= \frac{1}{16} - \frac{1}{24}$

$= \frac{3-2}{48} = \frac{1}{48}$

∴ The required no. of days

$= \frac{3}{8} \times 48 = 18$ days

5. (2) (A+B)'s 1 day's work $= \frac{1}{30}$

(A + B)'s 20 day's work $= \frac{20}{30} = \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

Now, $\frac{1}{3}$ part of work is done by A in 20 days.

∴ Whole work will be done by A alone in $20 \times 3 = 60$ days.

6. (3) Work done by 8 men in 6 days

$= \frac{6}{12} = \frac{1}{2}$

Remaining work $= 1 - \frac{1}{2} = \frac{1}{2}$

4 more men are engaged.

∴ Total number of men

$= 8 + 4 = 12$

By work and time formula

$\frac{W_1}{M_1 D_1} = \frac{W_2}{M_2 D_2}$, we have

$\frac{1}{8 \times 12} = \frac{\frac{1}{2}}{12 \times D_2}$

$\Rightarrow D_2 = \frac{1}{2} \times \frac{8 \times 12}{12} = 4$ days.

7. (3) Work done by (B + C) in 3 days. $= 3 \times \left(\frac{1}{9} + \frac{1}{12}\right)$

$= \frac{1}{3} + \frac{1}{4} = \frac{4+3}{12} = \frac{7}{12}$

Remaining work $= 1 - \frac{7}{12} = \frac{5}{12}$

This part of work is done by *A* alone.

Now, $\frac{1}{24}$ part of work is done by A in 1 day.

∴ $\frac{5}{12}$ part of work will be done by

A in $= 24 \times \frac{5}{12} = 10$ days.

8. (2) Originally, let there be x men

Now, more men; less days

$(x + 6) : x :: 55 : 44$

So, $\frac{x+6}{x} = \frac{55}{44} = \frac{5}{4}$

or $5x = 4x + 24$

or $x = 24$

9. (3) Work done by 2 (A + B) in one day

$= \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$

∴ Work done by (A + B) in one day $= \frac{1}{12}$

∴ (A + B) can complete the work in 12 days

10. (3) Let A worked for x days.

According to question

$\frac{x}{28} + \frac{(x+17)}{35} = 1$

$\Rightarrow \frac{5x + 4(x+17)}{140} = 1$

$\Rightarrow 5x + 4x + 68 = 140$

$\Rightarrow 9x = 140 - 68 = 72$

$\Rightarrow x = 8$

∴ A worked for 8 days

11. (3) Work done by (A + B) in 1 day

$= \frac{1}{15} + \frac{1}{10} = \frac{2+3}{30} = \frac{5}{30} = \frac{1}{6}$

∴ (A + B)'s 2 days' work $= \frac{2}{6} = \frac{1}{3}$

Remaining work

$= 1 - \frac{1}{3} = \frac{2}{3}$

This part is done by A alone.

∵ one work is done by A in 15 days.

∴ $\frac{2}{3}$ work is done in $15 \times \frac{2}{3}$

$= 10$ days.

∴ Total number of days

$= 10 + 2 = 12$ days

12. (1) A's 1 day's work $= \frac{1}{20}$

A's 4 days' work $= \frac{4}{20} = \frac{1}{5}$

Remaining work $= 1 - \frac{1}{5} = \frac{4}{5}$

This part is completed by A and B together.

Now, (A + B)'s 1 day's work

$= \frac{1}{20} + \frac{1}{12}$

$= \frac{3+5}{60} = \frac{8}{60} = \frac{2}{15}$

Now, $\frac{2}{15}$ work is done by (A + B) in 1 day.

∴ $\frac{4}{5}$ work is done in

$= \frac{15}{2} \times \frac{4}{5} = 6$ days.

Hence, the work lasted for $4 + 6 = 10$ days.

13. (2) (A + B)'s 1 day's work

$= \left(\frac{1}{45} + \frac{1}{40}\right) = \frac{8+9}{360} = \frac{17}{360}$

Work done by B in 23 days

$= \frac{1}{40} \times 23 = \frac{23}{40}$

Remaining work $= 1 - \frac{23}{40} = \frac{17}{40}$

Now, $\frac{17}{360}$ work was done by (A + B) in 1 day

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$\therefore$ $\frac{17}{40}$ work was done by (A + B) in $1 \times \frac{360}{17} \times \frac{17}{40} = 9$ days.

Hence, A left after 9 days.

14. (1) Suppose a man can complete the work in x days and that boys in y days.

According to question

$$\frac{24}{x} + \frac{24}{y} = 1 \quad \ldots (i) \times 13$$

$$\frac{26}{x} + \frac{20}{y} = 1 \quad \ldots (ii) \times 12$$

$$\frac{312}{x} + \frac{312}{y} = 13$$

$$\frac{312}{x} + \frac{240}{y} = 12$$

$$\Rightarrow \frac{72}{y} = 1 \Rightarrow y = 72 \text{ days}$$

$\therefore$ Boys alone can complete the work in 72 days

15. (3) Time taken by A

$$= \frac{8 \times 12}{128} = \frac{8 \times 12}{4} = 24 \text{ days}$$

Work done of by B $= \frac{4}{12} = \frac{1}{3}$

Remaining work

$$= 1 - \frac{1}{3} = \frac{2}{3}$$

$\because$ A can complete a work in 24 days

$\therefore$ A can complete $\frac{2}{3}$ part of work in $24 \times \frac{2}{3} = 16$ days

3. (1) A's 1 day's work $= \frac{1}{12}$

B's 1 day's work $= \frac{1}{18}$

Part of work done by A and B in first two days

$$= \frac{1}{12} + \frac{1}{18} = \frac{3+2}{36} = \frac{5}{36}$$

Part of work done by A and B in 14 days $= \frac{35}{36}$

[14 days to be taken randomly]

Remaining work $= 1 - \frac{35}{36} = \frac{1}{36}$

Now A will work for 15th day.

A will do the $\frac{1}{36}$ work in $\frac{1}{36} \times 12$

$= \frac{1}{3}$ day.

$\therefore$ Total Work will be done in $14\frac{1}{3}$ days.

17. (3) Let the work be completed in x days.

According to the question,

$$\frac{x-5}{10} + \frac{x-3}{12} + \frac{x}{15} = 1$$

$$\Rightarrow \frac{6x - 30 + 5x - 15 + 4x}{60} = 1$$

$$\Rightarrow 15x - 45 = 60$$

$$\Rightarrow 15x = 105 \Rightarrow x = \frac{105}{15} = 7$$

Hence, the work will be completed in 7 days.

18. (4) Work done by (A + C) in 2 days

$$= 2\left(\frac{1}{10} + \frac{1}{20}\right)$$

$$= 2\left(\frac{2+1}{20}\right) = \frac{6}{20} = \frac{3}{10}$$

Remaining work $= 1 - \frac{3}{10} = \frac{7}{10}$

(B + C)'s 1 day's work

$$= \frac{1}{15} + \frac{1}{20} = \frac{4+3}{60} = \frac{7}{60}$$

$\therefore$ Time taken by (B + C) to finish $\frac{7}{10}$ part of the work

$$= \frac{60}{7} \times \frac{7}{10} = 6 \text{ days}$$

$\therefore$ Total time = 2 + 6 = 8 days

19. (1) For the first 10 days 40 men worked.

Now, 40 men can complete the work in 40 days

$\therefore$ 1 man will complete the same work in 1600 days

$\therefore$ 1 man's 1 day's work $= \frac{1}{1600}$

$\therefore$ Part of work done in first 10 days $= \frac{1}{4}$

For the next 10 days 35 men worked.

Part of the work done

$$= \frac{1 \times 35 \times 10}{1600} = \frac{7}{32}$$

For the next 10 days, 30 men worked

Part of the work done

$$= \frac{30 \times 10}{1600} = \frac{3}{16}$$

For the next 10 days, 25 men worked. Part of the workdone

$$= \frac{25 \times 10}{1600} = \frac{5}{32}$$

Similarly, part of the work done by 20 men in next 10 days

$$= \frac{20 \times 10}{1600} = \frac{1}{8}$$

Work done in 50 days

$$= \frac{1}{4} + \frac{7}{32} + \frac{3}{16} + \frac{5}{32} + \frac{1}{8}$$

$$= \frac{8+7+6+5+4}{32} = \frac{30}{32} = \frac{15}{16}$$

$\therefore$ Remaining work

$$= 1 - \frac{15}{16} = \frac{1}{16}$$

Now 15 men remain to work

15 men's 1 day's work $= \frac{15}{1600}$

$\therefore$ Time taken to complete $\frac{1}{16}$ part of work

$$= \frac{1600}{15} \times \frac{1}{16} = \frac{20}{3} = 6\frac{2}{3} \text{ days}$$

$\therefore$ Total time $= 50 + 6\frac{2}{3}$

$= 56\frac{2}{3}$ days

20. (4) Let the work be finished in x days.

According to the question,

A worked for x days while B worked for $(x - 3)$ days

$$\therefore \frac{x}{18} + \frac{x-3}{12} = 1$$

$$\Rightarrow \frac{2x + 3x - 9}{36} = 1$$

$$\Rightarrow 5x - 9 = 36$$

$$\Rightarrow 5x = 45$$

$$\Rightarrow x = \frac{45}{5} = 9$$

Hence, the work was completed in 9 days.

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21. (1) Let A and B worked together for x days

According to the question,

Part of work done by A for $(x + 10)$ days + part of work done by B for x days = 1

$$\Rightarrow \frac{x+10}{20}+\frac{x}{30}=1$$

$$\Rightarrow \frac{3x+30+2x}{60}=1$$

$$\Rightarrow 5x+30=60$$

$$\Rightarrow 5x=30$$

$$\Rightarrow x=\frac{30}{5}=6 \text{ days}$$

22. (2) Let the work be completed in x days.

According to the question,

A worked for $(x-3)$ days, while B worked for x days.

$$\therefore \frac{x-3}{9}+\frac{x}{18}=1$$

$$\Rightarrow \frac{2x-6+x}{18}=1 \Rightarrow 3x-6=18$$

$$\Rightarrow 3x=18+6=24$$

$$\because x=\frac{24}{3}=8 \text{ days}$$

23. (3) (B + C)'s 2 days' work

$$=2\left(\frac{1}{20}+\frac{1}{30}\right)=2\left(\frac{3+2}{60}\right)$$

$$=\frac{1}{6} \text{ part}$$

Remaining work

$$=1-\frac{1}{6}=\frac{5}{6} \text{ part}$$

$\therefore$ Time taken by A to complete this part of work

$$=\frac{5}{6}\times 18=15 \text{ days}$$

24. (3) Part of work done by B in 10 days $= 10 \times \frac{1}{15}=\frac{2}{3}$

Remaining work $= 1-\frac{2}{3}=\frac{1}{3}$

$\therefore$ Time taken by A $= \frac{1}{3}\times 18$

$= 6$ days

(3) Part of work done by A and B in first two days

$$=\frac{1}{9}+\frac{1}{12}=\frac{4+3}{36}=\frac{7}{36}$$

Part of work done in first 10 days

$$=\frac{35}{36}$$

Remaining work $=1-\frac{35}{36}=\frac{1}{36}$

Now it is the turn of A.

$\therefore$ Time taken by A

$$=\frac{1}{36}\times 9=\frac{1}{4} \text{ day}$$

$\therefore$ Total time $=10+\frac{1}{4}=10\frac{1}{4}$ days

26. (4) B's 1 day's work

$$=\frac{1}{12}-\frac{1}{20}=\frac{5-3}{60}=\frac{1}{30}$$

$\therefore$ B's $\frac{1}{2}$ day's work $=\frac{1}{60}$

$\therefore$ (A + B)'s 1 day's work

$$=\frac{1}{20}+\frac{1}{60}=\frac{3+1}{60}=\frac{1}{15}$$

[$\because$ B works for half day daily]

Hence, the work will be completed in 15 days.

27. (3) Part of the work done by A and B in 4 days

$$=4\left(\frac{1}{12}+\frac{1}{15}\right)=4\left(\frac{5+4}{60}\right)$$

$$=4\times\frac{9}{60}=\frac{3}{5}$$

Remaining work $=1-\frac{3}{5}=\frac{2}{5}$

$\therefore$ Time taken by B to complete the remaining work

$$=\frac{2}{5}\times 15=6 \text{ days}$$

28. (1) Part of the work done by X in 8 days.

$$=\frac{8}{40}=\frac{1}{5}$$

$$\left[\because \text{work done in 1 day}=\frac{1}{40}\right]$$

$\therefore$ Remaining work $=1-\frac{1}{5}=\frac{4}{5}$

This part of work is done by Y in 16 days.

$\therefore$ Time taken by Y in doing 1 work

$$=\frac{16\times 5}{4}=20 \text{ days}$$

$\therefore$ Work done by X and Y in 1 day

$$=\frac{1}{40}+\frac{1}{20}=\frac{1+2}{40}=\frac{3}{40}$$

$\therefore$ Hence, both together will complete the work in $\frac{40}{3}$

i.e. $13\frac{1}{3}$ days.

29. (1) Work done in first two days

$$=\frac{2}{30}+\frac{1}{20}+\frac{1}{10}=\frac{1}{15}+\frac{1}{20}+\frac{1}{10}$$

$$=\frac{4+3+6}{60}=\frac{13}{60}$$

Work done in first 8 days $=\frac{52}{60}$

Remaining work

$$=1-\frac{52}{60}=\frac{8}{60}=\frac{2}{15}$$

(A + B)'s 1 day's work

$$=\frac{1}{30}+\frac{1}{20}=\frac{2+3}{60}=\frac{1}{12}$$

$\therefore$ Remaining work $=\frac{2}{15}-\frac{1}{12}$

$$=\frac{8-5}{60}=\frac{3}{60}=\frac{1}{20}$$

(A + C)'s 1 day's work

$$=\frac{1}{30}+\frac{1}{10}=\frac{1+3}{30}=\frac{2}{15}$$

$\therefore$ Time taken $=\frac{1}{20}\times\frac{15}{2}$

$$=\frac{3}{8} \text{ day}$$

Total time $=9+\frac{3}{8}=9\frac{3}{8}$ days

30. (1) Work done by B in 9 days

$$=\frac{9}{12}=\frac{3}{4} \text{ part}$$

Remaining work

$=1-\frac{3}{4}=\frac{1}{4}$ which is done by A

$\therefore$ Time taken by A $=\frac{1}{4}\times 20$

$= 5$ days

31. (2) Work done by A in 6 days

$$=\frac{6}{8}=\frac{3}{4} \text{ part}$$

Work destroyed by B in 2 days

$$=\frac{2}{3} \text{ part}$$

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Remaining work after destruction

$= \frac{3}{4} - \frac{2}{3} = \frac{9-8}{12} = \frac{1}{12}$

Now, time taken by A in doing $\frac{11}{12}$ parts

$= \frac{11}{12} \times 8 = \frac{22}{3} = 7\frac{1}{3}$ days

32. (1) Work done by B in 10 days

$= \frac{10}{15} = \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

∴ Time taken by A to complete the work $= \frac{1}{3} \times 18 = 6$ days

33. (1) Let the work done by each one of A, B and C per day be x, y, and z respectively.

$\therefore x + y = \frac{1}{12}$

$\Rightarrow x = \frac{1}{12} - y$ .....(i)

$y + z = \frac{1}{16} \Rightarrow z = \frac{1}{16} - y$ ...(ii)

Again, $5x + 7y + 13z = 1$

$\Rightarrow 5\left(\frac{1}{12} - y\right) + 7y + 13\left(\frac{1}{16} - y\right) = 1$

$\Rightarrow \frac{5}{12} - 5y + 7y + \frac{13}{16} - 13y = 1$

$\Rightarrow 11y = \frac{5}{12} + \frac{13}{16} - 1$

$= \frac{20 + 39 - 48}{48} = \frac{11}{48}$

$\Rightarrow y = \frac{1}{48}$

∴ B alone will complete the work in 48 days.

34. (3) (A + B + C)'s 1 day's work

$= \frac{1}{20} + \frac{1}{30} + \frac{1}{60} = \frac{3+2+1}{60}$

$= \frac{1}{10}$

A's 2 days' work $= \frac{2}{20} = \frac{1}{10}$

Work done in first three days

$= \frac{1}{10} + \frac{1}{10} = \frac{2}{10} = \frac{1}{5}$

[A's work for 2 days + (A + B + C) work on 3rd day]

Hence, the work will be finished in 15 days.

35. (3) (A + B)'s 2 days' work $= \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

Time taken by A in doing $\frac{1}{3}$ work

= 2 days

∴ Time taken by A in completing the work = 6 days

∴ B's 1 day's work $= \frac{1}{3} - \frac{1}{6}$

$= \frac{2-1}{6} = \frac{1}{6}$

∴ B alone will complete the work in 6 days.

36. (3) Work done by A and B in 7 days

$= \frac{7}{20} + \frac{7}{30} = \frac{21+14}{60} = \frac{35}{60} = \frac{7}{12}$

So, Remaining work

$= 1 - \frac{7}{12} = \frac{5}{12}$

∴ Time taken by C

$= \frac{12}{5} \times 10 = 24$ days

37. (3) 45 men's 4 days' work $= \frac{1}{4}$

Remaining work

$= 1 - \frac{1}{4} = \frac{3}{4}$

$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{45 \times 16}{1} = \frac{81 \times D_2}{\frac{3}{4}}$

$\Rightarrow D_2 = \frac{45 \times 16}{27 \times 4} = 6\frac{2}{3}$ days

38. (4) Work done by A and B in first 6 days

= (A + B)'s 4 days' work + B's 2 days' work

$= 4 \times \frac{1}{8} + \frac{2}{12}$

$= \frac{1}{2} + \frac{1}{6} = \frac{3+1}{6} = \frac{4}{6} = \frac{2}{3}$

Remaining work

$= 1 - \frac{2}{3} = \frac{1}{3}$

∴ Time taken by C

$= \frac{1}{3} \times 12 = 4$ days

39. (1) (A + B) together do the work in 30 days.

∴ (A + B)'s 1 day's work $= \frac{1}{30}$

∴ (A + B)'s 20 days' work

$= \frac{20}{30} = \frac{2}{3}$

Remaining work $= 1 - \frac{2}{3} = \frac{1}{3}$

∵ Time taken by A in doing $\frac{1}{3}$ work = 20 days

∴ Time taken in doing 1 work

= 20 × 3 = 60 days.

40. (3) Remaining work

$= 1 - \frac{1}{8} = \frac{7}{8}$

(A + B)'s 1 day's work

$= \frac{1}{6} + \frac{1}{12} = \frac{2+1}{12} = \frac{3}{12} = \frac{1}{4}$

∴ Time taken in doing $\frac{7}{8}$ part of work $= \frac{7}{8} \times 4 = \frac{7}{2}$

$= 3\frac{1}{2}$ days

41. (2) Work done by 12 men in 8 days = Work done by 16 women in 12 days.

$\Rightarrow$ 12 × 8 men = 16 × 12 women

$\Rightarrow$ 1 man = 2 women

Now, work done by 12 men in 1 day $= \frac{1}{8}$

1 man's 1 day's work

$= \frac{1}{12 \times 8} = \frac{1}{96}$

∴ 16 men's 3 day's work

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$= \frac{16 \times 3}{96} = \frac{1}{2}$

Remaining work $= 1 - \frac{1}{2} = \frac{1}{2}$

Now, $\frac{1}{2}$ work is done by 6 men and 4 women.

$\therefore$ 6 men + 4 women
$= (6 + 2)$ men $= 8$ men

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{12 \times 8}{1} = \frac{8 \times D_2}{\frac{1}{2}}$

$\Rightarrow D_2 = \frac{12 \times 8}{2 \times 8} = 6$ days

42. (2) 40 men complete the work in 18 days.

$\therefore$ Their 1 day's work $= \frac{1}{18}$

$\therefore$ Their 8 days' work $= \frac{8}{18} = \frac{4}{9}$

Remaining work $= 1 - \frac{4}{9} = \frac{5}{9}$

New number of men $= 40 + 10 = 50$

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{40 \times 18}{1} = \frac{50 \times D_2}{\frac{5}{9}}$

$\Rightarrow 40 \times 18 = 90 \times D_2$

$\Rightarrow D_2 = \frac{40 \times 18}{90} = 8$ days

43. (1) $\because$ 12 men $= 24$ boys
$\therefore$ 1 man $= 2$ boys
$\therefore$ 15 men + 6 boys
$= 30$ boys + 6 boys $= 36$ boys
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 24 \times 66 = 36 \times D_2$

$\Rightarrow D_2 = \frac{24 \times 66}{36} = 44$ days

44. (3) A, B and C together complete the work in 40 days.
$\therefore$ (A + B + C)'s 1 day's work

$= \frac{1}{40}$

$\therefore$ (A + B + C)'s 16 days work

$= \frac{16}{40} = \frac{2}{5}$

Remaining work $= 1 - \frac{2}{5} = \frac{3}{5}$

This part of work is done by B and C in 40 days.

$\therefore$ Time taken in doing $\frac{3}{5}$ work
$= 40$ days.

$\therefore$ Time taken in doing in 1 work

$= \frac{40 \times 5}{3} = \frac{200}{3}$ days

$\therefore$ A's day's work = (A + B + C)'s 1 day's work $-$ (B + C)'s 1 day's work

$= \frac{1}{40} - \frac{3}{200} = \frac{5-3}{200} = \frac{2}{200}$

$= \frac{1}{100}$

$\therefore$ Required time $= 100$ days.

45. (2) Number of men originally $= x$ (let)
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow x \times 60 = (x + 8) \times 50$
$\Rightarrow 6x = 5x + 40$
$\Rightarrow 6x - 5x = 40$
$\Rightarrow x = 40$ men

46. (4) Number of men originally $= x$ (let)
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow x \times 18 = (x - 6) \times 20$
$\Rightarrow x \times 9 = (x - 6) \times 10$
$= 10x - 60$
$\Rightarrow 10x - 9x = 60$
$\Rightarrow x = 60$ men

47. (4) Original number of men $= x$ (let)
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow x \times 40 = (x + 45) \times 25$
$\Rightarrow 8x = (x + 45) \times 5$
$\Rightarrow 8x = 5x + 225$
$\Rightarrow 8x - 5x = 225$
$\Rightarrow 3x = 225$

$\Rightarrow x = \frac{225}{3} = 75$ men

48. (2) Let A left the work after x days.
According to the question,
Work done by A in x days + work done by B in $(23 + x)$ days $= 1$

$\Rightarrow \frac{x}{45} + \frac{23 + x}{40} = 1$

$\Rightarrow \frac{8x + 207 + 9x}{360} = 1$

$\Rightarrow 17x + 207 = 360$
$\Rightarrow 17x = 360 - 207 = 153$

$\Rightarrow x = \frac{153}{17} = 9$ days

49. (2) Work done by 20 men in 3 days

$= \frac{3}{18} = \frac{1}{6}$ part

Remaining work

$= 1 - \frac{1}{6} = \frac{5}{6}$ part

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{20 \times 18}{1} = \frac{25 \times D_2}{\frac{5}{6}}$

$\Rightarrow 6 \times 25 \times D_2 = 5 \times 20 \times 18$

$\Rightarrow D_2 = \frac{5 \times 20 \times 18}{6 \times 25} = 12$ days

50. (4) Let the work be completed in x days.
According to the question,
C worked for $(x - 4)$ days.

$\therefore \frac{x}{24} + \frac{x}{30} + \frac{x-4}{40} = 1$

$\Rightarrow \frac{5x + 4x + 3(x-4)}{120} = 1$

$\Rightarrow \frac{12x - 12}{120} = 1$

$\Rightarrow \frac{12(x-1)}{120} = 1$

$\Rightarrow \frac{x-1}{10} = 1 \Rightarrow x - 1 = 10$

$\Rightarrow x = 10 + 1 = 11$ days

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51. (2) Work done by Raja and Ramesh in 1 day

$= \frac{1}{20}+\frac{1}{25}=\frac{5+4}{100}=\frac{9}{100}$

Work done by Ramesh in 10 days

$= \frac{10}{25}=\frac{2}{5}$

Remaining work $= 1-\frac{2}{5}=\frac{3}{5}$

∴ This part is done by Raja and Ramesh.

∴ Time taken

$= \frac{3}{5}\times\frac{100}{9}=\frac{20}{3}=6\frac{2}{3}$ days

∴ Required time

$= 10+6\frac{2}{3}=16\frac{2}{3}$ days

52. (2) Number of men initially $= x$ (let)

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow x\times 40=(x+8)\times 30$

$\Rightarrow 4x=3x+24$

$\Rightarrow 4x-3x=24$

$\Rightarrow x=24$ men

53. (3) Let Y alone complete the work in x days.

According to the question,

X's 16 days' work + Y's 12 days' work = 1

$\Rightarrow \frac{16}{24}+\frac{12}{x}=1$

$\Rightarrow \frac{2}{3}+\frac{12}{x}=1$

$\Rightarrow \frac{12}{x}=1-\frac{2}{3}=\frac{1}{3}$

$\Rightarrow x=12\times 3=36$ days

TYPE-III

1. (2) According to question,

$(6M+8B)\times 10=(26M+48B)\times 2$

$\therefore 60M+80B=52M+96B$

or, $1M=2B$

$\therefore 15M+20B=(30+20)B$

= 50 boys and 6M + 8B

= (12 + 8) boys = 20 boys

∵ 20 boys can finish the work in 10 days

∴ 50 boys can finish the work in

$\frac{20\times 10}{50}$ days

= 4 days

2. (2) 5 × 6 men = 10 × 5 women

⇒ 3 men = 5 women

∴ 5 women + 3 men = 6 men

∵ 5 men complete the work in 6 days

∴ 6 men will complete the work in

$\frac{5\times 6}{6}=5$ days

3. (3) 3m = 6w

∴ 1m = 2w

12m + 8w = (12 × 2w) + 8w

= 32w

∴ 6 women can do the work in 16 days.

∴ 32 women can do the work in

$\frac{16\times 6}{32}=3$ days

4. (4) 1 man's 1 day's work $= \frac{1}{3}$

1 woman's 1 day's work $= \frac{1}{4}$

1 boy's 1 day's work $= \frac{1}{12}$

(1 man + 1 woman)'s $\frac{1}{4}$ day's work $= \frac{1}{4}\left(\frac{1}{3}+\frac{1}{4}\right)=\frac{7}{48}$

Remaining work

$= 1-\frac{7}{48}=\frac{41}{48}$

Now,

1 boy's $\frac{1}{4}$ day's work $= \frac{1}{4}\times\frac{1}{12}$

$= \frac{1}{48}$

∴ $\frac{41}{48}$ work will be done by

$\frac{41}{48}\times 48 = 41$ boys.

5. (4) 16 men = 20 women

4 men = 5 women.

Now, according to question,

16 men complete the work in 25 days.

∴ 1 man one day's work

$= \frac{1}{25\times 16}$

∴ 4 men one day's work

$= \frac{4}{25\times 16}=\frac{1}{100}$

Similarly,

1 woman one day's work

$= \frac{1}{25\times 20}$

∴ 5 women one day's work

$= \frac{5}{25\times 20}=\frac{1}{100}$

∴ 28 men

$= \frac{28}{4}\times 5 = 35$ women

(28 men + 15 women)

∴ 50 women one day's work

$= \frac{50}{25\times 20}=\frac{1}{10}$

Therefore, 28 men and 15 women can complete the whole work in 10 days.

6. (3) According to the question

5 men = 8 women

∴ 2 men $= \frac{8}{5}\times 2=\frac{16}{5}$ women

∴ Total women $= \frac{16}{5}+4$

$= \frac{36}{5}$ women

∴ No. of days to do the same work

$= \frac{8\times 12}{\frac{36}{5}}=\frac{8\times 12\times 5}{36}$

$= \frac{40}{3}=13\frac{1}{3}$ days

7. (4) ∵ 3 men = 4 women

∴ 1 man $= \frac{4}{3}$ women

∴ 7 men $= \frac{7\times 4}{3}=\frac{28}{3}$ women

∴ 7 men + 5 women $= \frac{28}{3}+5$

$= \frac{28+15}{3}=\frac{43}{3}$ Women

Now, $M_1D_1 = M_2D_2$

$\Rightarrow 4\times 43=\frac{43}{3}\times D_2$,

where D_2 = number of days

$\Rightarrow D_2 = \frac{4\times 3\times 43}{43}=12$ days.

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8. (3) 6 men = 12 women
$\therefore$ 1 man = 2 women
Now, 8 men + 16 women
= (8 × 2 + 16) women
= 32 women
$\because$ 12 women can do a work in 20 days.
$\therefore$ 1 woman can do the work in 20 × 12 days.
$\therefore$ 32 women can do the twice work in

$$= \frac{20 \times 12 \times 2}{32} = 15 \text{ days.}$$

9. (1) Work done by 1 woman in 1 day $= \frac{1}{3} - \frac{1}{6} - \frac{1}{18}$

$$= \frac{6-3-1}{18} = \frac{1}{9}$$

$\therefore$ Woman will do the work in 9 days.

10. (3) 3 men's work = 5 women's work

1 man's work $= \frac{5}{3}$ women's work

$\therefore$ 6 men's work $= \frac{5}{3} \times 6$
=10 women's work
$\therefore$ 6 men + 5 women
= 15 women
$\therefore$ 5 women can do work in 12 days.
Hence, 15 women can do it in

$$\frac{5 \times 12}{15} = 4 \text{ days}$$

11. (1) 10 men = 20 boys
$\therefore$ 1 man = 2 boys
$\therefore$ 8 men + 4 boys
= (16 + 4) boys = 20 boys
Hence, 8 men and 5 boys will make 260 mats in 20 days.

12. (2) Work done in two days $= \frac{1}{6} \times 2$

$= \frac{1}{3}$, remaining work $= \frac{2}{3}$

$$\Rightarrow \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$$

$$\Rightarrow \frac{3 \times 2}{\frac{1}{3}} = \frac{6 \times D_2}{\frac{2}{3}}$$

$$\Rightarrow D_2 = \frac{3 \times 2 \times 2}{6} = 2 \text{ days}$$

13. (3) Work done by 1 woman in 1 day

$$= \frac{1}{8} - \frac{1}{10} = \frac{5-4}{40} = \frac{1}{40}$$

$\therefore$ One woman will complete the work in 40 days.

14. (3) Let 1 man's 1 day's work = x and
1 woman's 1 day's work = y

Then, $4x + 6y = \frac{1}{8}$ and

$$3x + 7y = \frac{1}{10}$$

From both equations,

we get $y = \frac{1}{400}$

$\therefore$ 10 women's 1 day's work

$$= \frac{10}{400} = \frac{1}{40}$$

$\therefore$ 10 women will finish the work in 40 days.

15. (1) Part of work done by 2 men and 2 women in 2 days.

$$= 2\left(\frac{2}{20} + \frac{8}{30}\right)$$

$$= 2\left(\frac{1}{10} + \frac{8}{30}\right) = 2\left(\frac{3+8}{30}\right)$$

$$= \frac{22}{30} = \frac{11}{15}$$

Remaining work $= 1 - \frac{11}{15} = \frac{4}{15}$
Work done by 1 boy in 2 days

$$= \frac{2}{60} = \frac{1}{30}$$

$\therefore$ Number of boys required to assist $= \frac{4}{15} \times 30 = 8$

16. (3) 1 man = 2 women = 3 boys
1 man + 1 woman + 1 boy

$$= \left(3 + \frac{3}{2} + 1\right) \text{boys} = \frac{11}{2} \text{boys}$$

$\therefore M_1D_1 = M_2D_2$

$$\Rightarrow 3 \times 88 = \frac{11}{2} \times D_2$$

$$\Rightarrow D_2 = \frac{2 \times 3 \times 88}{11} = 48 \text{ days}$$

17. (2) $6m + 8w = 10$ days
$\Rightarrow 2(3m + 4w) = 10$ days
$\Rightarrow 3m + 4w = 20$ days
[Since the workforce has become half of the original force, so number of days must be double].

18. (1) 12 (3 men + 4 boys)
= 10 (4 men + 3 boys)
$\Rightarrow$ 36 men + 48 boys
= 40 men + 30 boys
$\Rightarrow$ 4 men = 18 boys
$\Rightarrow$ 2 men = 9 boys
$\therefore$ 4 men + 3 boys
= 21 boys, who do the work in 10 days and
2 men + 3 boys = 12 boys
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 21 \times 10 = 12 \times D_2$

$$\Rightarrow D_2 = \frac{21 \times 10}{12} = \frac{35}{2} = 17\frac{1}{2} \text{ days}$$

19. (4) 10 men = 20 women
1 man = 2 women = 5 children
1 woman = 2 children
$\therefore$ 5 men + 5 women + 5 children
= 20 + 10 + 5 = 35 children
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 40 \times 7 = 35 \times D_2$

$$\Rightarrow D_2 = \frac{40 \times 7}{35} = 8 \text{ months}$$

$\therefore$ 5 men, 5 women and 5 children can do half of the work in 8 months
Required time = 4 months.

20. (1) $\because$ 8 men = 12 boys
$\therefore$ 4 men = 6 boys
$\Rightarrow$ 20 men = 30 boys
$\Rightarrow$ 20 men + 6 boys = 36 boys
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 12 \times 16 = 36 \times D_2$

$$\Rightarrow D_2 = \frac{12 \times 16}{36} = \frac{16}{3} = 5\frac{1}{3} \text{ days}$$

21. (3) According to the question,
20 men + 30 boys = 24 men + 16 boys
$\therefore$ 4 men = 14 boys
$\Rightarrow$ 2 men = 7 boys
$\Rightarrow$ 2 men + 1 boy = 8 boys
$\Rightarrow$ 2 men + 3 boys = 10 boys
By $M_1D_1 = M_2D_2$
$\Rightarrow 10 \times 10 = 8 \times D_2$

$$\Rightarrow D_2 = \frac{10 \times 10}{8} = \frac{25}{2}$$

$$= 12\frac{1}{2} \text{ days}$$

22. (2) 2 × 10 men + 3 × 10 women
= 3 × 8 men + 2 × 8 women
$\Rightarrow$ 20 men + 30 women
= 24 men + 16 women
$\Rightarrow$ 4 men = 14 women
or 2 men = 7 women

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$\therefore$ 2 men + 3 women = 10 women
$\therefore$ 2 men + 1 woman = 8 women
$\therefore$ $M_1D_1 = M_2D_2$
$\Rightarrow 10 \times 10 = 8 \times D_2$

$\Rightarrow D_2 = \frac{25}{2} = 12\frac{1}{2}$ days

23. (1) 12 (3 men + 4 boys)
= 10 (4 men + 3 boys)
$\Rightarrow$ 36 men + 48 boys
= 40 men + 30 boys
$\Rightarrow$ 4 men = 18 boys
or 2 men = 9 boys
$\therefore$ 4 men + 3 boys
= 21 boys who do the work in 10 days
and, 2 men + 3 boys = 12 boys
$\therefore$ $M_1D_1 = M_2D_2$
$\Rightarrow 21 \times 10 = 12 \times D_2$
$\Rightarrow D_2$

$= \frac{21 \times 10}{12} = \frac{35}{2} = 17\frac{1}{2}$ days

24. (2) 4 men = 6 women

1 men $= \frac{6}{4} = \frac{3}{2}$ women

10 men + 3 women

$= 10 \times \frac{3}{2} + 3 = 18$ women

$\therefore \frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$

$\Rightarrow \frac{6 \times 12 \times 7}{1} = \frac{18 \times D_2 \times 8}{W_2}$

$\Rightarrow D_2 = \frac{6 \times 12 \times 7 \times 2}{18 \times 8} = 7$ days

25. (3) Time taken by boy = x days

$\therefore \frac{1}{10} + \frac{1}{24} + \frac{1}{x} = \frac{1}{6}$

$\Rightarrow \frac{1}{x} = \frac{1}{6} - \frac{1}{10} - \frac{1}{24}$

$= \frac{20 - 12 - 5}{120} = \frac{3}{120} = \frac{1}{40}$

$\Rightarrow x = 40$ days

26. (3) 40 men = 60 women = 80 children

$\therefore$ 10 men $= \frac{80}{40} \times 10$

= 20 children

$\therefore$ 10 women $= \frac{80}{60} \times 10$

$= \frac{40}{3}$ children

$\therefore$ 10 men + 10 women + 10 children

$= \left(20 + \frac{40}{3} + 10\right)$ children

$= \left(\frac{60 + 40 + 30}{3}\right)$ children

$= \frac{130}{3}$ children

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$D_2 = \frac{80 \times 6 \times 13}{130} = \frac{144}{13}$ months

$\therefore$ Half of the work can do

$= \frac{144}{13} \times \frac{1}{2} = \frac{72}{13} = 5\frac{7}{13}$ months

27. (1) According to the question,
1 man = 2 women = 4 boys
$\therefore$ 1 man + 1 woman + 1 boy
= (4 + 2 +1) boys = 7 boys
$\therefore$ $M_1D_1 = M_2D_2$
$\Rightarrow 7 \times 7 = 1 \times D_2$
$\Rightarrow D_2 = 49$ days

28. (3) 1 man = 2 women = 3 boys
$\therefore$ 1 man + 1 woman + 1 boy

$= \left(3 + \frac{3}{2} + 1\right)$ boys

$= \left(\frac{6 + 3 + 2}{2}\right)$ boys

$= \frac{11}{2}$ boys

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 3 \times 88 = \frac{11}{2} \times D_2$

$\Rightarrow D_2 = \frac{3 \times 2 \times 88}{11} = 48$ days

29. (2) $\because$ 3 men = 7 women

$\therefore$ 7 men $= \frac{7 \times 7}{3}$

$= \frac{49}{3}$ women

$\therefore$ 7 men + 5 women

$= \left(\frac{49}{3} + 5\right)$ women

$= \left(\frac{49 + 15}{3}\right)$ women

$= \frac{64}{3}$ women

$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{7 \times 32}{1} = \frac{64 \times D_2}{3 \times 2}$

$\Rightarrow D_2 = \frac{7 \times 32 \times 3 \times 2}{64}$

= 21 days

30. (2) 1 man = 2 women = 3 boys
$\therefore$ 1 man + 1 woman + 1 boy

= 3 boys + $\frac{3}{2}$ boys + 1 boy

$= \left(3 + \frac{3}{2} + 1\right)$ boys $= \frac{11}{2}$ boys

$\therefore$ By $M_1D_1 = M_2D_2$,

$3 \times 44 = \frac{11}{2} \times D_2$

$\Rightarrow D_2 = \frac{2 \times 3 \times 44}{11} = 24$ days

31. (3) 2 children = 1 man
$\therefore$ 8 children + 12 men = 16 men
$\therefore$ $M_1D_1 = M_2D_2$
$\Rightarrow 16 \times 9 = 12 \times D_2$

$\Rightarrow D_2 = \frac{16 \times 9}{12} = 12$ days.

TYPE-IV

1. (1) A's work per day $= \frac{1}{15}$

B's work per day $= \frac{1}{20}$

(A+ B)'s work per day

$= \frac{1}{15} + \frac{1}{20} = \frac{4 + 3}{60} = \frac{7}{60}$

$\therefore$ (A + B)'s work in 4 days

$= 4 \times \frac{7}{60} = \frac{7}{15}$

Left work $= 1 - \frac{7}{15} = \frac{15 - 7}{15} = \frac{8}{15}$

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2. (3) The part of field cultivated by A in 1 day

$= \frac{2}{5\times6} = \frac{1}{15}$

The part of field cultivated by B in 1 day

$= \frac{1}{3\times10} = \frac{1}{30}$

∴ The part of field cultivated by A and B together

$= \frac{1}{15} + \frac{1}{30} = \frac{3}{30} = \frac{1}{10}$

$\therefore \frac{4}{5}$ part of field cultivated by A and B together in

$= \frac{\frac{4}{5}}{\frac{1}{10}}$ days $= \frac{4\times10}{5} = 8$ days

3. (1) A can do the whole work in $\frac{20\times5}{4} = 25$ days

Remaining work $= 1 - \frac{4}{5} = \frac{1}{5}$

∴ (A + B)'s 1 day's work $= \frac{1}{15}$

and A's 1 day's work $= \frac{1}{25}$

∴ B's 1 day's work

$= \frac{1}{15} - \frac{1}{25} \quad = \frac{5-3}{75} = \frac{2}{75}$

∴ B can finish the work in $\frac{75}{2}$ days i.e., $37\frac{1}{2}$ days

4. (1) A's 1 day's work $= \frac{1}{18}$

B's 1 day's work $= \frac{1}{9}$

∴ (A + B)'s 1 day's work

$= \frac{1}{18} + \frac{1}{9} = \frac{1+2}{18} = \frac{3}{18} = \frac{1}{6}$

5. (3) Remaining work

$= 1 - \frac{7}{10} = \frac{3}{10}$

∵ (A + B) take 4 days to do $\frac{3}{10}$ work

∴ (A + B) will do the work in

$4 \times \frac{10}{3}$ days

$= \frac{40}{3} = 13\frac{1}{3}$ days

6. (2) Time taken by A and B

$= \frac{6\times12}{6+12} = \frac{6\times12}{18} = 4$

∴ Work done by A in 4 days

$= \frac{4}{6} = \frac{2}{3}$

7. (4) A can do $\frac{1}{2}$ work in 5 days.

∴ A can do 1 work in 10 days

Similarly,

B can do 1 work in $\frac{5}{3} \times 9$

= 15 days.

C can do 1 work in $8 \times \frac{3}{2}$

= 12 days.

Now,

A's 1 day's work $= \frac{1}{10}$

B's 1 day's work $= \frac{1}{15}$

C's 1 day's work $= \frac{1}{12}$

∴ (A + B + C)'s 1 day's work

$= \frac{1}{10} + \frac{1}{15} + \frac{1}{12}$

$= \frac{6+4+5}{60} = \frac{15}{60} = \frac{1}{4}$

Hence, (A + B + C) together can complete the work in 4 days.

8. (3)

Work	Days	Men
$\frac{7}{8}$ ↓	7 ↓	28 ↓
$\frac{1}{8}$ ↓	7 ↓	x ↓

$\therefore \frac{7}{8} : \frac{1}{8} :: 28 : x$

where x is no. of men

$\Rightarrow \frac{7}{8} \times x = \frac{1}{8} \times 28$

$\Rightarrow x = \frac{28\times8}{7\times8} = 4$

9. (2) Time taken by A alone in doing the work = 15 days

Time taken by B alone in doing the work $= \frac{10\times5}{2} = 25$ days

∴ (A + B)'s 1 day's work

$= \frac{1}{15} + \frac{1}{25} = \frac{5+3}{75} = \frac{8}{75}$

∴ Hence, the work will be completed in $\frac{75}{8} = 9\frac{3}{8}$ days.

10. (3) Time taken by A to complete the work $= \frac{4\times3}{2} = 6$ days

Time taken by B to complete the work $= \frac{6\times5}{3} = 10$ days

∴ (A + B)'s 1 day's work

$= \frac{1}{6} + \frac{1}{10} = \frac{5+3}{30} = \frac{8}{30} = \frac{4}{15}$

∴ A and B together will complete the work in $\frac{15}{4} = 3\frac{3}{4}$ days.

11. (2)

Days	Work	Men
60 ↑	$\frac{3}{4}$ ↓	60 ↓
30	$\frac{1}{4}$	x

$\left.\begin{matrix} 30 : 60 \\ \therefore \frac{3}{4} : \frac{1}{4} \end{matrix}\right\} :: 60 : x$

$\Rightarrow 30 \times \frac{3}{4} \times x = 60 \times \frac{1}{4} \times 60$

$\Rightarrow x = \frac{60\times60}{30\times3} = 40$

∴ 20 men should be discharged.

12. (2) Time taken by P in completing 1 work = 10 × 4 = 40 days

Time taken by Q in completing 1 work $= \frac{15\times5}{2} = \frac{75}{2}$ days

Time taken by R in completing 1 work = 13 × 3 = 39 days

Time taken by S in completing 1 work = 7 × 6 = 42 days

Clearly, Q took the least time i.e. $\frac{75}{2}$ or $37\frac{1}{2}$ days.

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13. (3) (A + B)'s 1 day's work = $\frac{1}{72}$

(B + C)'s 1 day's work = $\frac{1}{120}$

(C + A)'s 1 day's work = $\frac{1}{90}$

On adding all three,
2 (A + B + C)'s 1 day's work
$= \frac{1}{72}+\frac{1}{120}+\frac{1}{90} = \frac{5+3+4}{360} = \frac{1}{30}$
∴ (A + B + C)'s 1 day's work
$= \frac{1}{60}$
∴ (A + B + C)'s 3 days' work
$= \frac{3}{60} = \frac{1}{20}$

14. (1) Time taken by A to finish the work = 5 × 6 = 30 days
Time taken by B to complete the work = $\frac{8\times5}{2}$ = 20 days
∴ (A + B)'s 1 day's work
$= \frac{1}{30}+\frac{1}{20} = \frac{2+3}{60} = \frac{1}{12}$
∴ Required time = 12 days

15. (1) (A + B)'s 5 days' work
$= 5\left(\frac{1}{20}+\frac{1}{40}\right)$
$= 5\left(\frac{2+1}{40}\right) = \frac{15}{40} = \frac{3}{8}$
∴ Remaining work = $1-\frac{3}{8} = \frac{5}{8}$

16. (4) (A+B)'s 1 day's work
$= \frac{1}{20}+\frac{1}{30} = \frac{3+2}{60} = \frac{1}{12}$
∴ Work done in 6 days
$= \frac{6}{12} = \frac{1}{2}$

17. (1) Let B completes the work in x days.
∴ Work done by A in $\frac{3x}{4}$ days
$= \frac{1}{2}$
⇒ Time taken by A in completing the work = $2\times\frac{3x}{4} = \frac{3x}{2}$ days
∴ (A + B)'s 1 day's work
$= \frac{1}{x}+\frac{2}{3x} = \frac{3+2}{3x} = \frac{5}{3x}$
∴ $\frac{5}{3x} = \frac{1}{18} \Rightarrow 3x = 90$
⇒ $x = 30$
Hence, time taken by B in completing the work = 30 days

18. (2) If B completes a work in x days, A will complete the same in $\frac{2x}{3}$ days.
∴ $\frac{1}{x}+\frac{3}{2x} = \frac{1}{10}$
⇒ $\frac{2+3}{2x} = \frac{1}{10} \Rightarrow 2x = 50$
⇒ $x = 25$ days

19. (4) Ratio of efficiency of A and B = 3 : 2
Ratio of time taken = 2 : 3
∴ Time taken by A
$= \frac{2}{3}\times18 = 12$ days
∴ (A + B)'s 1 day's work
$= \frac{1}{12}+\frac{1}{18} = \frac{3+2}{36} = \frac{5}{36}$
∴ Required time
$= \frac{36}{5} = 7\frac{1}{5}$ days

20. (4) A does $\frac{7}{8}$ work in 28 days.
∴ A will complete the work in $28\times\frac{8}{7} = 32$ days.
B does $\frac{5}{6}$ work in 20 days.
∴ B will complete the work in $\frac{20\times6}{5}$ = 24 days
∴ (A + B)'s 1 day's work
$= \frac{1}{32}+\frac{1}{24} = \frac{3+4}{96} = \frac{7}{96}$
∴ Required time
$= \frac{96}{7} = 13\frac{5}{7}$ days

21. (4) Time taken by A and B = x hours (let).
∴ According to the question,
Time taken by A alone
= $(x + 8)$ hours.
Time taken by B alone
$= \left(x+\frac{9}{2}\right)$ hours.
∴ $\frac{1}{x+8}+\frac{1}{x+\frac{9}{2}} = \frac{1}{x}$
$\Rightarrow \frac{1}{x+8}+\frac{2}{2x+9} = \frac{1}{x}$
$\Rightarrow \frac{2x+9+2x+16}{(x+8)(2x+9)} = \frac{1}{x}$
$\Rightarrow \frac{4x+25}{2x^2+16x+9x+72} = \frac{1}{x}$
$\Rightarrow 4x^2+25x = 2x^2+25x+72$
$\Rightarrow 2x^2 = 72 \Rightarrow x^2 = \frac{72}{2} = 36$
$\Rightarrow x = \sqrt{36} = 6$ hours

22. (1) 200 workers do $\frac{1}{4}$ work in 50 days.
How many workers will do $\frac{3}{4}$ work in 100 days ?
Number of additional workers = x (let)
∴ $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
$\Rightarrow \frac{200\times50}{\frac{1}{4}} = \frac{(200+x)\times100}{\frac{3}{4}}$
⇒ $(200 + x)\,100 = 3 \times 200 \times 50$
⇒ $200 + x = 300$
⇒ $x = 300 - 200 = 100$

23. (2) x does $\frac{1}{4}$ work in 6 days
∴ x does 1 work in 24 days
Similarly,
y does $\frac{3}{4}$ work in 12 days
∴ y does 1 work in $\frac{12\times4}{3}$ = 16 days
$(x + y)$'s 1 day's work
$= \frac{1}{24}+\frac{1}{16} = \frac{2+3}{48} = \frac{5}{48}$
∴ Required time = $\frac{48}{5}$
$= 9\frac{3}{5}$ days

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24. (4) Let the time taken by B in doing the work alone = x days
According to the question,
Time taken by A
$= 2 \times \frac{3x}{4} = \frac{3x}{2}$ days
$\therefore \frac{1}{x} + \frac{1}{\frac{3x}{2}} = \frac{1}{18}$
$\Rightarrow \frac{1}{x} + \frac{2}{3x} = \frac{1}{18}$
$\Rightarrow \frac{3+2}{3x} = \frac{1}{18}$
$\Rightarrow 3x = 18 \times 5$
$\Rightarrow x = \frac{18 \times 5}{3} = 30$ days

25. (2) Part of work done by A and B $= \frac{19}{23}$
$\therefore$ Part of work done by C
$= 1 - \frac{19}{23} = \frac{4}{23}$
Part of work done by B and C
$= \frac{8}{23}$
$\therefore$ Part of work done by B
$= \frac{8}{23} - \frac{4}{23} = \frac{4}{23}$
$\therefore$ Part of work done by A
$= \frac{19}{23} - \frac{4}{23} = \frac{15}{23}$
$\therefore$ Ratio of the shares of wages of A, B and C
$= \frac{15}{23} : \frac{4}{23} : \frac{4}{23} = 15 : 4 : 4$
$\therefore$ A's share
$= \frac{15}{23} \times 5290 =$ Rs. 3450

26. (4) Work done by A and B in 1 day
$= \frac{1}{10} + \frac{1}{20} = \frac{2+1}{20} = \frac{3}{20}$
$\therefore$ (A + B)'s 5 days' work
$= \frac{5 \times 3}{20} = \frac{3}{4}$
$\therefore$ Remaining work
$= 1 - \frac{3}{4} = \frac{1}{4}$

27. (2) According to the question,
(4×8) men + (6×8) women = (2×8) men + (9×8) women
$\Rightarrow$ 4 men + 6 women = 2 men + 9 women
$\Rightarrow (4 - 2)$ men = $(9 - 6)$ women
$\Rightarrow$ 2 men = 3 women
$\therefore$ 4 men + 6 women = 12 women
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 12 \times 8 = 18 \times D_2$
$\Rightarrow D_2 = \frac{12 \times 8}{18} = \frac{16}{3} = \frac{9x}{10}$ days

28. (1) Let time taken by A alone in doing work be x days.
$\therefore$ Time taken by B alone
$= 3x$ days
$\because$ A and B together finish $\frac{2}{5}$ work in 9 days.
$\therefore$ Time taken by A and B in doing whole work
$= \frac{9 \times 5}{2} = \frac{45}{2}$ days
$\therefore \frac{1}{x} + \frac{1}{3x} = \frac{2}{45}$
$\Rightarrow \frac{3+1}{3x} = \frac{2}{45}$
$\Rightarrow \frac{4}{3x} = \frac{2}{45} \Rightarrow 2 \times 3x = 4 \times 45$
$\Rightarrow x = \frac{4 \times 45}{2 \times 3} = 30$ days
$\therefore$ Time taken by B = $3x$ days
$= 3 \times 30 = 90$ days

29. (4)

Men	Working hours	Days
12 ↑	8	10 ↓
16	$7\frac{1}{2}$ ↑	x

$\therefore$ 16 : 12
$\frac{15}{2}$: 8 :: 10 : x
$\Rightarrow 16 \times \frac{15}{2} \times x = 12 \times 8 \times 10$
$\Rightarrow 8 \times 15 \times x = 12 \times 8 \times 10$
$\Rightarrow x = \frac{12 \times 8 \times 10}{8 \times 15} = 8$ days

30. (4) Remaining work
$= 1 - \frac{5}{8} = \frac{3}{8}$;
Remaining time = 4 days
$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
$\Rightarrow \frac{20 \times 12}{\frac{5}{8}} = \frac{M_2 \times 4}{\frac{3}{8}}$
$\Rightarrow \frac{20 \times 12}{5} = \frac{M_2 \times 4}{3}$
$\Rightarrow 4 \times 12 = \frac{M_2 \times 4}{3}$
$\Rightarrow M_2 = 12 \times 3 = 36$
$\therefore$ Number of additional workers
$= 36 - 20 = 16$

31. (3) $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
$\Rightarrow \frac{10}{\frac{2}{3}} = \frac{D_2}{\frac{3}{5}}$
$\Rightarrow \frac{30}{2} = \frac{5D_2}{3}$
$\Rightarrow D_2 = \frac{30}{2} \times \frac{3}{5} = 9$ days

TYPE-V

1. (3) Let B does the whole work in x days
$\therefore$ Work done by B in 1 day $= \frac{1}{x}$
According to question
A does the $\frac{1}{2}$ work in $\frac{x}{6}$ days
$\therefore$ A does the whole work in $\frac{2x}{6}$
or $= \frac{x}{3}$ days
$\therefore$ Work done by A in one day $= \frac{3}{x}$
$\therefore$ Work done by A and B together in one day
$= \frac{1}{x} + \frac{3}{x} = \frac{4}{x}$

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$\therefore$ Time taken to complete the whole work by A and B together

$= \frac{1}{\frac{1}{4}+\frac{1}{x}} = \frac{x}{4}$ days

Again, given that

$\frac{x}{4} = 10$

$\therefore x = 40$ days

2. (3) Ratio of efficiency of Babu and Asha $= 1 : \frac{7}{4} = 4 : 7$.

As the time taken is inversely proportional to efficiency, therefore, if Babu takes $7x$ days to complete work, Asha will take $4x$ days.

$\therefore \frac{1}{7x}+\frac{1}{4x} = \frac{1}{7} \Rightarrow \frac{4+7}{28x} = \frac{1}{7}$

$\Rightarrow 28x = 11 \times 7$

$\Rightarrow x = \frac{11\times 7}{28} = \frac{11}{4}$

$\therefore$ Asha will complete the work in $4x = 4 \times \frac{11}{4} = 11$ days.

3. (2) $\because$ Jyothi can do $\frac{3}{4}$ th of a job in 12 days.

$\therefore$ Jyothi can do 1 job in $\frac{12\times 4}{3} = 16$ days.

As Mala is twice as efficient as Jyothi,

$\therefore$ Mala will finish the job in 8 days.

4. (3) $A : B = D_2 : D_1$

$\Rightarrow 100 : 140 = D_2 : 70$

$\Rightarrow 100 \times 70 = 140 \times D_2$

$\Rightarrow D_2 = \frac{100\times 70}{140} = 50$ days.

5. (4) Ratio of the working capabilities of a man, a woman and a child $= 5 : 4 : 2$

$\therefore$ Ratio of man, woman and child equivalence $= \frac{1}{5} : \frac{1}{4} : \frac{1}{2}$

$= \frac{1}{5}\times 20 : \frac{1}{4}\times 20 : \frac{1}{2}\times 20$

$= 4 : 5 : 10$

or 4 men = 5 women = 10 children

4 men = 10 children

$\therefore$ 2 men = 5 children and 6 men = 15 children

5 women = 10 children

$\therefore$ 3 women = 6 children

4 women = 8 children

$\therefore$ 2 men + 3 women + 4 Children = 15 children

6 men + 4 women + 7 children = 30 children

Children		Field		Days
15	↑	10	↓	10
30		16		x

$\Rightarrow \left.\begin{matrix}30:15\\10:16\end{matrix}\right\} :: 10 : x$

where, x is no. of days

$\Rightarrow 30 \times 10 \times x = 15 \times 16 \times 10$

$\Rightarrow x = \frac{15\times 16\times 10}{30\times 10} = 8$ days

6. (1) Let B alone can do the work in x days.

$\therefore$ A can do the work in $\frac{3x}{2}$ days.

According to the question,

$\frac{1}{x}+\frac{2}{3x} = \frac{1}{18} \Rightarrow \frac{3+2}{3x} = \frac{1}{18}$

$\Rightarrow \frac{5}{3x} = \frac{1}{18} \Rightarrow 3x = 18\times 5$

$\Rightarrow x = \frac{18\times 5}{3} = 30$ days

7. (3) According to the question,

If A takes x days to complete the work, B will take $2x$ days and C will take $4x$ days,

Now, (A + B)'s 1 day's work

$= \frac{1}{4}$

$\Rightarrow \frac{1}{x}+\frac{1}{2x} = \frac{1}{4} \Rightarrow \frac{2+1}{2x} = \frac{1}{4}$

$\Rightarrow 2x = 12 \Rightarrow x = 6$

$\therefore$ C will complete the work in $4x$ i.e. 24 days.

8. (*) Ratio of the work of A and B done in 1 day = 3 : 2

[$\because$ B's work doen = x (let), then

A's work done $= \frac{x+50}{100}x = \frac{3}{2}x$

So, (A : B)'s work done $= \frac{3}{2}x : x$

or 3 : 2]

$\because$ Work done by A and B together in 1 day $= \frac{1}{15}$

$\therefore$ A's 1 day's work $= \frac{1}{15}\times\frac{3}{5}$

$= \frac{1}{25}$

Hence, A alone will finish the work in 25 days.

9. (2) If Tapas alone takes x days to complete the work, then

$\frac{1}{x}+\frac{1}{2x} = \frac{1}{12}$

$\Rightarrow \frac{2+1}{2x} = \frac{1}{12}$

$\Rightarrow 2x = 36$

$\Rightarrow x = 18$ days

10. (3) (A + B)'s 1 day's work

$= \frac{1}{12}$ ..... (i)

(B + C)'s 1 day's work

$= \frac{1}{15}$ ..... (ii)

$\therefore$ Difference between A and C's 1 day's work

$= \frac{1}{12}-\frac{1}{15} = \frac{5-4}{60} = \frac{1}{60}$

If A alone completes the work in x days, C will do the same in $2x$ days.

$\therefore \frac{1}{x}-\frac{1}{2x} = \frac{1}{60}$

$\Rightarrow \frac{2-1}{2x} = \frac{1}{60} \Rightarrow \frac{1}{2x} = \frac{1}{60}$

$\Rightarrow x = 30$

$\therefore$ B's 1 day's work

$= \frac{1}{12}-\frac{1}{30}$ [From equation (i)]

$= \frac{5-2}{60} = \frac{3}{60} = \frac{1}{20}$

Hence, B alone will complete the work in 20 days.

11. (2) If B alone completes the work in x days, A will do the same in $2x$ days.

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{x}+\frac{1}{2x} = \frac{2+1}{2x} = \frac{3}{2x}$

and C's 1 day's work $= \frac{3}{4x}$

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$\therefore \frac{3}{4x} = \frac{1}{20}$

$\Rightarrow 4x = 3 \times 20$

$\Rightarrow x = \frac{3 \times 20}{4} = 15$

$\therefore$ (A + B + C)'s 1day's work

$= \frac{1}{2x} + \frac{1}{x} + \frac{3}{4x} = \frac{1}{30} + \frac{1}{15} + \frac{1}{20}$

$= \frac{2+4+3}{60} = \frac{9}{60} = \frac{3}{20}$

Hence, all three together will complete the work in

$\frac{20}{3}$ or $6\frac{2}{3}$ days.

12. (2) If A completes the work in x days, B will do the same in $3x$ days.

$\therefore 3x - x = 60$

$\Rightarrow 2x = 60$

$\Rightarrow x = 30$ and $3x = 90$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{30} + \frac{1}{90} = \frac{3+1}{90}$

$= \frac{4}{90} = \frac{2}{45}$

$\therefore$ A and B together will do the work in $\frac{45}{2}$ or $22\frac{1}{2}$ days.

13. (2) A does 20% less work than B.

$\therefore$ Ratio of time taken = 5 : 4

A completes a work in $\frac{15}{2}$ hours

$\therefore$ Time taken by B to do the same work

$= \frac{15}{2} \times \frac{4}{5} = 6$ hours.

14. (3) Efficiency and time taken are inversely proportional Bimal : Kamal = 150 : 100 (work)

$\Rightarrow$ 100 : 150 (Time) = 2 : 3

$\because$ 3 units $\Rightarrow$ 15 days.

$\therefore$ 2 units $\Rightarrow \frac{15}{3} \times 2 = 10$

Hence, Bimal complete the work in 10 days

15. (3) Let time taken by C to complete the work = x days

$\therefore$ Time taken by A to complete the work = $3x$ days

and time taken by B to complete the work = $\frac{3x}{2}$ days

According to the question,

$\frac{1}{3x} + \frac{1}{\frac{3x}{2}} + \frac{1}{x} = 1$

$\Rightarrow \frac{1}{3x} + \frac{2}{3x} + \frac{1}{x} = 1$

$\Rightarrow \frac{1+2+3}{3x} = 1$

$\Rightarrow \frac{6}{3x} = 1 \Rightarrow \frac{2}{x} = 1$

$\Rightarrow x = 2$

$\therefore$ Time taken by A

$= 3x = 3 \times 2 = 6$ days

16. (4) Time taken by A to complete the work = x days

$\therefore$ Time taken by B to complete the work = $3x$ days

So, $3x - x = 2x = 40$

$\Rightarrow x = 20$ and $3x = 60$

$\therefore$ (A + B)'s 1 day's work

$= \frac{1}{20} + \frac{1}{60} = \frac{3+1}{60}$

$= \frac{4}{60} = \frac{1}{15}$

$\therefore$ A and B together will complete the work in 15 days.

17. (2) If A completes the work in x days, B will take $2x$ days.

$\therefore \frac{1}{x} + \frac{1}{2x} = \frac{1}{14} \Rightarrow \frac{2+1}{2x} = \frac{1}{14}$

$\Rightarrow 2x = 42 \Rightarrow x = 21$ days

18. (3) Time taken by B

$= \frac{21 \times 100}{140} = 15$ days

19. (3) If the time taken by B to complete the work be x days, then time taken by A = $(x - 5)$ days

$\therefore \frac{1}{x} + \frac{1}{x-5} = \frac{9}{100}$

$\Rightarrow \frac{x-5+x}{x(x-5)} = \frac{9}{100}$

$\Rightarrow 9x^2 - 45x = 200x - 500$

$\Rightarrow 9x^2 - 245x + 500 = 0$

$\Rightarrow 9x^2 - 225x - 20x + 500 = 0$

$\Rightarrow 9x(x - 25) - 20(x - 25) = 0$

$\Rightarrow (x - 25)(9x - 20) = 0$

$\Rightarrow x = 25$ because $x \neq \frac{20}{9}$

20. (1) Let time taken by B in completing the work = x days

$\therefore$ Time taken by A = $(x - 10)$ days

$\therefore \frac{1}{x} + \frac{1}{x-10} = \frac{1}{12}$

$\Rightarrow \frac{x-10+x}{x(x-10)} = \frac{1}{12}$

$\Rightarrow 24x - 120 = x^2 - 10x$

$\Rightarrow x^2 - 34x + 120 = 0$

$\Rightarrow x^2 - 30x - 4x + 120 = 0$

$\Rightarrow x(x - 30) - 4(x - 30) = 0$

$\Rightarrow (x - 4)(x - 30) = 0$

$\Rightarrow x = 30$ because $x \neq 4$

21. (3) Time taken by

$B = 9 \times \frac{100}{150}$

$= 6$ days

22. (2) Time taken by B

$= \frac{130}{100} \times 23 = \frac{299}{10}$ days

(A + B)'s 1 day's work

$= \frac{1}{23} + \frac{10}{299}$

$= \frac{13+10}{\cdot 299} = \frac{23}{299} = \frac{1}{13}$

$\therefore$ Time taken by (A + B) = 13 days

23. (2) $5m + 2w = 4m + 4w$

$\Rightarrow m = 2w$

$\therefore$ Required ratio = 2 : 1

24. (1) Time taken by B

$= 12 \times \frac{100}{160} = \frac{15}{2} = 7\frac{1}{2}$ days

25. (4) Time taken by B in completing the work

$= 12 \times \frac{100}{160} = \frac{15}{2}$ days

$\therefore$ (A+B)'s 1 day's work

$= \frac{1}{12} + \frac{2}{15} = \frac{5+8}{60} = \frac{13}{60}$

Hence, the work will be completed in $\frac{60}{13}$ days

26. (3) If A alone completes the work in x days, B will complete the same in $2x$ days.

$\therefore \frac{1}{x} + \frac{1}{2x} = \frac{1}{12}$

$\Rightarrow \frac{2+1}{2x} = \frac{1}{12}$

$\Rightarrow 2x = 36$

$\therefore$ B alone will complete the work in 36 days (i.e. $2x$).

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27. (1) Let time taken by P = x days
Then, time taken by Q = $3x$ days
$\therefore 3x - x = 48 \Rightarrow x = 24$
$\therefore$ (P + Q)'s 1 day's work

$$= \frac{1}{24} + \frac{1}{72} = \frac{3+1}{72} = \frac{1}{18}$$

$\therefore$ Required time = 18 days

28. (2) If B does the work in $3x$ days, (A + C) will do the same work in x days.
If C does that work in $2y$ days. (A + B) will do it in y days.

$$\therefore \frac{1}{x} + \frac{1}{3x} = \frac{1}{10}$$

$$\Rightarrow \frac{4}{3x} = \frac{1}{10}$$

$$\Rightarrow 3x = 40$$

$$\Rightarrow x = \frac{40}{3}$$

Again, $\frac{1}{y} + \frac{1}{2y} = \frac{1}{10}$

$$\Rightarrow \frac{3}{2y} = \frac{1}{10} \Rightarrow y = 15$$

$\therefore$ (A + B + C)'s 1 day's work $= \frac{1}{10}$

$$\Rightarrow \frac{1}{A} + \frac{1}{40} + \frac{1}{30} = \frac{1}{10}$$

$$\Rightarrow \frac{1}{A} = \frac{1}{10} - \frac{1}{40} - \frac{1}{30}$$

$$= \frac{12-3-4}{120} = \frac{5}{120} = \frac{1}{24}$$

$\therefore$ A alone will complete the work in 24 days.

29. (1) Ratio of A's and B's efficiency = 4 : 5
Ratio of time taken = 5 : 4

$$\therefore \text{Time taken by B} = \frac{6 \times 4}{5}$$

$$= \frac{24}{5} = 4\frac{4}{5} \text{ days}$$

30. (2) If A alone does the work in x days and B alone does the work in y days, then

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{5} \quad \text{.....(i)}$$

Again, $\frac{2}{x} + \frac{1}{3y} = \frac{1}{3}$ ....(ii)

By equation (ii) × 3 – (i),

$$\frac{6}{x} + \frac{1}{y} - \frac{1}{x} - \frac{1}{y} = 1 - \frac{1}{5}$$

$$\Rightarrow \frac{6}{x} - \frac{1}{x} = \frac{4}{5}$$

$$\Rightarrow \frac{6-1}{x} = \frac{4}{5}$$

$$\Rightarrow x = \frac{25}{4} = 6\frac{1}{4} \text{ days}$$

31. (4) Time taken by Ramesh

$$= 4 \times \frac{2}{3} = \frac{8}{3} \text{ days}$$

Work done by all three in 1 day

$$= \frac{1}{4} + \frac{1}{6} + \frac{3}{8} = \frac{6+4+9}{24} = \frac{19}{24}$$

$\therefore$ Required time

$$= \frac{24}{19} = 1\frac{5}{19} \text{ days}$$

32. (3) Time taken by Sonia
= $3x$ days (let)
$\therefore$ Time taken by Pratibha
= x days
$\therefore 3x - x = 60 \Rightarrow 2x = 60$
$\Rightarrow x = 30$ days
$\therefore$ Time taken by Sonia
= $3x$ days = 3 × 30 = 90 days.

33. (1) Let time taken by A = x days
$\therefore$ Time taken by B = $2x$ days
Time taken by C = $3x$ days
According to the question,

$$\frac{1}{x} + \frac{1}{2x} + \frac{1}{3x} = \frac{1}{6}$$

$$\Rightarrow \frac{6+3+2}{6x} = \frac{1}{6}$$

$$\Rightarrow \frac{11}{6x} = \frac{1}{6}$$

$$\Rightarrow 6x = 6 \times 11$$

$$\Rightarrow x = \frac{6 \times 11}{6} = 11$$

$\therefore$ Time taken by C alone = $3x$
= 3 × 11 = 33 days

TYPE-VI

1. (2) Less persons, more days (Indirect)
More working hours/day, less days (Indirect)
Let required no. of days be x.

Persons	Working hours/day	Days
39 ↑	5 ↑	12 ↓
30 ↓	6 ↓	x ↓

$$\therefore \begin{matrix} 30 & : & 39 \\ 6 & : & 5 \end{matrix} \Big\} :: 12 : x$$

$$\Rightarrow 30 \times 6 \times x = 39 \times 5 \times 12$$

$$\Rightarrow x = \frac{39 \times 5 \times 12}{30 \times 6} = 13 \text{ days}$$

2. (1) We know that

$$\frac{W_1}{M_1 D_1} = \frac{W_2}{M_2 D_2}$$

$$\Rightarrow \frac{280}{72 \times 21} = \frac{100}{x \times 18}$$

Where x = number of men
$\Rightarrow x \times 18 \times 280 = 100 \times 72 \times 21$

$$\Rightarrow x = \frac{100 \times 72 \times 21}{18 \times 280} = 30$$

3. (1) 7 men = 10 women

$$\text{or 1 man} = \frac{10}{7} \text{ women}$$

14 men + 20 women

$$= \left(\frac{10 \times 14}{7} + 20\right) \text{ women}$$

= 40 women
Now, more work, more days
More women, less days

$$\begin{matrix} \text{Work} & 1 & : & 6 \\ \text{Women} & 40 & : & 10 \end{matrix} \Big\} :: 10 : x$$

Where x = number of days
$\Rightarrow 1 \times 40 \times x = 6 \times 10 \times 10$

$$\text{or } x = \frac{600}{40} = 15$$

4. (1) More persons, less working hours/day
Less days, more working hours/day

$$\begin{matrix} \text{Persons} & 7 & : & 5 \\ \text{Days} & 4 & : & 8 \end{matrix} \Big\} :: 7 : x$$

where, x is hours/days
$\therefore 7 \times 4 \times x = 5 \times 8 \times 7$

$$\therefore x = \frac{5 \times 8 \times 7}{7 \times 4} = 10 \text{ hours}$$

5. (4)

Weaver	Days	Mats
4 ↓	4 ↓	4 ↓
8 ↓	8 ↓	x ↓

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$\left.\begin{matrix}4 & : & 8\\ 4 & : & 8\end{matrix}\right\} :: 4 : x$

where, x is no. of mats

$\Rightarrow 4 \times 4 \times x = 8 \times 8 \times 4$

$\therefore x = \frac{8 \times 8 \times 4}{4 \times 4} = 16$

6. (1)

Men		Days		Working hours	
10	↑	18	↑	6	↓
15		12		x	

where, x is working hrs/days

$\therefore \left.\begin{matrix}15 : 10\\ 12 : 18\end{matrix}\right\} :: 6 : x$

$\Rightarrow 15 \times 12 \times x = 10 \times 18 \times 6$

$\Rightarrow x = \frac{10 \times 18 \times 6}{15 \times 12} = 6$ hours

7. (1)

Work		Days		Persons	
1	↓	9	↑	2	↓
2		12		x	

where x = number of persons

$\left.\begin{matrix}1 : 2\\ 12 : 9\end{matrix}\right\} :: 2 : x$

$\Rightarrow 1 \times 12 \times x = 2 \times 9 \times 2$

$\Rightarrow x = \frac{2 \times 9 \times 2}{12} = 3$

8. (4) $\because$ P men working P hours/day for P days produce P units of work.

$\therefore$ 1 man working 1 hour/day for 1 day produce

$\frac{P}{P^3} = \frac{1}{P^2}$ units of work

$\therefore$ n men working n hours a da for n day's produce $\frac{n^3}{p^2}$ units of work

9 (2)

Men		Days	
10	↑	12	↓
12		x	

Where x = number of days

$\Rightarrow 12 : 10 :: 12 : x$

$\Rightarrow 12 \times x = 10 \times 12$

$\Rightarrow x = \frac{10 \times 12}{12} = 10$ days

10. (3)

Work		Days		Men	
1	↓	12	↑	7	↓
2		8		x	

$\therefore \left.\begin{matrix}1 : 2\\ 8 : 12\end{matrix}\right\} :: 7 : x$

where, x is no. of men

$\Rightarrow 1 \times 8 \times x = 2 \times 12 \times 7$

$\Rightarrow x = \frac{2 \times 12 \times 7}{8} = 21$

$\therefore$ Number of additional men $= 21 - 7 = 14$

Metod 2 :

$M_1D_1W_2 = M_2D_2W_1$

$\Rightarrow 7 \times 12 \times 2 = M_2 \times 8 \times 1$

$\Rightarrow M_2 = \frac{7 \times 12 \times 2}{8} = 21$

$\therefore$ No. of additional men $= 21 - 7 = 14$

11. (3)

Men		Days	
x	↑	30	↓
$x+6$		20	

$x + 6 : x :: 30 : 20$

$\Rightarrow \frac{x+6}{x} = \frac{30}{20} = \frac{3}{2}$

$\Rightarrow 2x + 12 = 3x$

$\Rightarrow 3x - 2x = 12$

$\Rightarrow x = 12$

12. (2) Let the original number of carpenters be x.

$M_1D_1 = M_2D_2$

$\Rightarrow x \times 9 = (x - 5) \times 12$

$\Rightarrow 9x = 12x - 60$

$\Rightarrow 3x = 60 \Rightarrow x = 20$

13. (2) 2 men + 3 women = 4 men

$\Rightarrow$ 2 men = 3 women

$\therefore$ 3 men + 3 women = 5 men

$\therefore M_1D_1 = M_2D_2$

$\Rightarrow 4 \times 20 = 5 \times D_2$

$\Rightarrow D_2 = \frac{4 \times 20}{5} = 16$ days

14. (1)

Days		working hours/day	
18	↑	8	↓
12		x	

$\Rightarrow \frac{12}{18} = \frac{8}{x}$

where x is hours/days

$\Rightarrow 12x = 18 \times 8$

$\Rightarrow x = \frac{18 \times 8}{12} = 12$ hours

15. (4) $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\Rightarrow \frac{M \times 12}{W} = \frac{2M \times D_2}{\frac{W}{2}}$

$\Rightarrow \frac{M \times 12}{W} = \frac{4MD_2}{W}$

$\Rightarrow D_2 = 3$ days

16. (4) $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$

$\therefore \frac{W_1}{W_2} = \frac{M_1D_1}{M_2D_2}$

$\therefore \frac{9}{10} = \frac{(x-1)(x+1)}{(x+2)(x-1)} = \frac{x+1}{x+2}$

$\Rightarrow 10x + 10 = 9x + 18$

$\Rightarrow x = 18 - 10 = 8$

17. (3) $M_1D_1T_1 = M_2D_2T_2$

$\Rightarrow 80 \times 16 \times 6 = 64 \times 15 \times T_2$

$\Rightarrow T_2 = \frac{80 \times 16 \times 6}{64 \times 15} = 8$ hours

18. (1) $M_1D_1 = M_2D_2$

$\Rightarrow 18 \times 24 = 27 \times D_2$

$\Rightarrow D_2 = \frac{18 \times 24}{27} = 16$ days

19. (3) 1 hour's work of 1 man and 4 boys $= \frac{1}{160}$

[$\because$ 2 men and 8 boys can do the work in 80 hrs.]

1 hour's work of 1 man 3 women and 4 boys $= \frac{1}{96}$

1 hour's work of 3 women

$= \frac{1}{96} - \frac{1}{160} = \frac{10-6}{960} = \frac{1}{240}$

1 hour's work of 2 men

$= \frac{1}{120} - \frac{1}{240} = \frac{1}{240}$

1 hour's work of 4 boys

$= \frac{1}{160} - \frac{1}{480}$

$= \frac{3-1}{480} = \frac{1}{240}$

$\therefore$ 2 men = 3 women = 4 boys

$\therefore$ 2 men + 8 boys = 12 boys

5 men + 12 boys = 22 boys

$\therefore$ By $M_1D_1 = M_2D_2$

$\Rightarrow 12 \times 80 = 22 \times D_2$

$\Rightarrow D_2 = \frac{12 \times 80}{22}$

$= \frac{480}{11} = 43\frac{7}{11}$ hours

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20. (3) $M_1D_1 = M_2D_2$
$\Rightarrow x \cdot x = y \cdot D_2$
$\Rightarrow D_2 = \frac{x^2}{y}$ days

21. (2) $M_1D_1 = M_2D_2$
$\Rightarrow 30 \times 18 = 36 \times D_2$
$\Rightarrow D_2 = \frac{30 \times 18}{36} = 15$ days

22. (1) 20 men = 24 women
$\Rightarrow$ 5 men = 6 women
$\therefore$ 30 men + 12 women
= 40 men
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 20 \times 20 = 40 \times D_2$
$\Rightarrow D_2 = \frac{20 \times 20}{40} = 10$ days

23. (3) 8 men = 17 women
$\Rightarrow$ 12 men = $\frac{17}{8} \times 12$
$= \frac{51}{2}$ women
$\therefore$ 12 men + 24 women
$= \frac{51}{2} + 24 = \frac{99}{2}$ women
By $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
$\frac{17 \times 33}{1} = \frac{99 \times D_2}{2 \times 3}$
$\Rightarrow D_2 = \frac{17 \times 33 \times 6}{99} = 34$ days

24. (4) 3 × 5 men + 7 × 5 women
= 4 × 4 men + 6 × 4 women
$\Rightarrow$ 16 men – 15 men = 35 women – 24 women
$\therefore$ 1 man = 11 women
$\Rightarrow$ 3 men + 7 women = 40 women
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 40 \times 5 = 10 \times D_2$
$\Rightarrow D_2 = 20$ days

25. (4) $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
$\Rightarrow \frac{110 \times 48}{\frac{3}{5}} = \frac{M_2 \times 44}{\frac{2}{5}}$
$\Rightarrow M_2 \times 44 \times 3 = 110 \times 48 \times 2$
$\Rightarrow M_2 = \frac{110 \times 48 \times 2}{44 \times 3} = 80$
$\therefore$ Number of men can be withdrawn
= 110 – 80 = 30

26. (2) 200 men do $\frac{1}{4}$ work in 50 days.
$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
$\Rightarrow \frac{200 \times 50}{\frac{1}{4}} = \frac{M_2 \times 100}{\frac{3}{4}}$
$\Rightarrow M_2 \times 100$
$= 200 \times 50 \times 3$
$\Rightarrow M_2 = 300$
$\therefore$ Additional men = 100

27. (2) Remaining work
$= 1 - \frac{2}{3} = \frac{1}{3}$;
Remaining days = 124–64= 60
$\therefore \frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$
$\Rightarrow \frac{120 \times 64}{\frac{2}{3}} = \frac{M_2 \times 60}{\frac{1}{3}}$
$\Rightarrow M_2 = \frac{120 \times 64}{2 \times 60} = 64$
$\therefore$ No. of men can be discharged
= 120 – 64 = 56 men

28. (2) $\frac{M_1D_1T_1}{W_1} = \frac{M_2D_2T_2}{W_2}$
$\Rightarrow \frac{7 \times 7 \times 7}{7} = \frac{5 \times 5 \times 5}{W_2}$
$\Rightarrow 49 \times W_2 = 125$
$\Rightarrow W_2 = \frac{125}{49}$

29. (1) $M_1D_1 = M_2D_2$
$\Rightarrow 75 \times 90 = M_2 \times 18$
$\Rightarrow M_2 = \frac{75 \times 90}{18} = 375$
$\therefore$ Number of additional men
= 375 – 75 = 300

30. (*) 4 men = 8 women
$\Rightarrow$ 1 man = 2 women
$\therefore$ 6 men + 12 women
= 12 women + 12 women
= 24 women
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 8 \times 15 = 24 \times D_2$
$\Rightarrow D_2 = \frac{8 \times 15}{24} = 5$ days

TYPE-VII

1. (2) Ratio of Suman's and Sumati's 1 day's work = $\frac{1}{3} : \frac{1}{2} = 2 : 3$
Sum of the ratios = 2 + 3 = 5
Suman's share = $\frac{2}{5} \times 150 = ₹60$

2. (2) Total wages of 500 workers
= 500 × 200 = ₹ 100000
Now, according to question,
Correct Average
$= \frac{(100000 - 180 - 20 + 80 + 220)}{500}$
$= \frac{100100}{500} = ₹ 200.20$

3. (3) C's 1 day's work
$= \frac{1}{4} - \left(\frac{1}{8} + \frac{1}{12}\right) = \frac{1}{4} - \left(\frac{3+2}{24}\right)$
$= \frac{1}{4} - \frac{5}{24} = \frac{6-5}{24} = \frac{1}{24}$
$A : B : C = \frac{1}{8} : \frac{1}{12} : \frac{1}{24} = 3 : 2 : 1$
C's share = $₹\left(\frac{1}{6} \times 4500\right) = ₹750$

4. (3)
More persons, more earning
Less working hours, less earning
} Direct proportion
6 : 9
8 : 6
} :: 8400 : x,
where x = required earning
Therefore,
$\therefore 6 \times 8 \times x = 9 \times 6 \times 8400$
or $x = \frac{9 \times 6 \times 8400}{6 \times 8} = ₹ 9450$

5. (2) A's 1 day's work = $\frac{1}{6}$
B's 1 day's work = $\frac{1}{8}$
(A + B + C)'s 1 day's work = $\frac{1}{3}$
$\therefore$ C's 1day's work
$= \frac{1}{3} - \frac{1}{6} - \frac{1}{8} = \frac{8-4-3}{24} = \frac{1}{24}$
$\therefore$ Ratio of their one day's work respectively

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$= \frac{1}{6}:\frac{1}{8}:\frac{1}{24} = 4:3:1$

Sum of the ratios = 4 + 3 + 1 = 8

∴ C's share

$= ₹\ \frac{1}{8} \times 3200 = ₹\ 400$

6. (4) A's 1 day's work $= \frac{1}{15}$

B's 1 day's work $= \frac{1}{10}$

Ratio $= \frac{1}{15} : \frac{1}{10} = 2:3$

Sum of the ratios = 2 + 3 = 5

∴ A's share

$= ₹\ \frac{2}{5} \times 30000 = ₹\ 12000$

7. (4) Man : boy = 3 : 1

∴ Boy's share $= \frac{1}{4} \times 800 = ₹\ 200$

∴ The daily wages of boy

$= ₹\left(\frac{200}{5}\right) = ₹\ 40$

8. (2) It is required to find the highest common factor of 5750 and 5000, because his daily wage is their common factor.

5000) 5750 (1
5000
750) 5000 (6
4500
500) 750 (1
500
250) 500 (2
500
×

Hence, the daily wage is ₹ 250.

9. (2) Ratio of wages of A, B and C respectively

= 5 × 6 : 6 × 4 : 4 × 9

= 30 : 24 : 36 = 5 : 4 : 6

∴ Amount received by A

$= \frac{5}{5+4+6} \times 1800$

$= \frac{5}{15} \times 1800 = ₹\ 600$

10. (3) Total salary for 20 days

= ₹ (75 × 20) = ₹ 1500

Actual salary received = ₹ 1140

Difference = ₹ (1500 – 1140)

= ₹ 360

Money deducted for 1 day's absence from work

= ₹ (15 + 75) = ₹ 90

∴ Number of days he was absent $= \frac{360}{90} = 4$ days

11. (3) First man's 1 day's work $= \frac{1}{7}$

Second man's 1 day's work $= \frac{1}{8}$

Let, Boy's 1 day's work $= \frac{1}{x}$

$\therefore \frac{1}{7} + \frac{1}{8} + \frac{1}{x} = \frac{1}{3}$

$\Rightarrow \frac{1}{x} = \frac{1}{3} - \frac{1}{7} - \frac{1}{8}$

$= \frac{56-24-21}{168} = \frac{11}{168}$

∴ Ratio of their one day's work

$= \frac{1}{7}:\frac{1}{8}:\frac{11}{168} = 24:21:11$

Sum of the ratios

= 24 + 21 + 11 = 56

∴ Boy's share in wages

$= \frac{11}{56} \times 1400 = ₹\ 275$

12. (4) 5 men = 7 women

[Both earn same amount in 1 day]

∴ 7 men $= \frac{7}{5} \times 7 = \frac{49}{5}$ women

∴ 7 men + 13 women

$= \frac{49}{5} + 13 = \frac{114}{5}$ women

Now,

∵ 7 women = ₹ 5250

∴ $\frac{114}{5}$ women

$= \frac{5250}{7} \times \frac{114}{5} = ₹\ 17100$

13. (1) According to the question,

(2 × 14) men + 14 women

= 16 men + 32 women

⇒ (28 – 16) men

= (32–14) women

⇒ 12 men = 18 women

⇒ 2 men = 3 women

∴ 1 woman $= \frac{2}{3}$ man

∴ Amount received by 1 woman per day $= \frac{2}{3} \times 600 = ₹\ 400$

14. (3) Work done by the third person in 1 day

$= \frac{1}{8} - \frac{1}{16} - \frac{1}{24} = \frac{6-3-2}{48} = \frac{1}{48}$

Ratio of their 1 day's work

$= \frac{1}{16}:\frac{1}{24}:\frac{1}{48}$

= 3 : 2 : 1

∴ Share of the third person

$= \frac{1}{(3+2+1)} \times 960 = \frac{960}{6} = ₹\ 160$

15. (1) Required ratio

= 15 × 22 : 11 × 25 = 6 : 5

16. (4) Expert's 1 day's work

$= \frac{1}{12} - \frac{1}{36} - \frac{1}{48}$

$= \frac{12-4-3}{144} = \frac{5}{144}$

∴ Ratio of their respective work for 1 day

$= \frac{1}{36}:\frac{1}{48}:\frac{5}{144} = 4:3:5$

∴ Expert's share

$= \frac{5}{12} \times 28800 = ₹\ 12000$

17. (1) According to the question,

$\frac{1}{15} + \frac{1}{12} + \frac{1}{C} = \frac{1}{5}$

Let C's work in day be $\frac{1}{C}$

$\Rightarrow \frac{1}{C} = \frac{1}{5} - \frac{1}{15} - \frac{1}{12}$

$= \frac{12-4-5}{60} = \frac{1}{20}$

$\therefore A:B:C = \frac{1}{15}:\frac{1}{12}:\frac{1}{20}$

= 4 : 5 : 3

∴ C's share

$= \frac{3}{12} \times 1200 = ₹\ 300$

18. (4) A's 1 day's work $= \frac{1}{21}$

B's 1 day's work $= \frac{1}{28}$

Total work done by both

$= \frac{1}{21} + \frac{1}{28} = \frac{4+3}{84} = \frac{1}{12}$

∴ Amount is sufficient to pay 12 days wages of both.

19. (4) Work done by A and B in 5 days

$= 5\left(\frac{1}{12} + \frac{1}{15}\right) = 5\left(\frac{5+4}{60}\right)$

$= \frac{9}{12} = \frac{3}{4}$

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Time taken by C in doing $\frac{1}{4}$ work

= 5 days

∴ C will complete in 20 days.

∴ Ratio of wages = $\frac{1}{12}:\frac{1}{15}:\frac{1}{20}$

= 5 : 4 : 3

∴ Amount received by A

= $\frac{5}{12}\times 960$ = ₹ 400

20. (2) The daily earning of 'C' = Daily earning of (A + C) and (B + C) – Daily earning of (A + B + C) = 94 + 76 – 150

= ₹ 20

21. (3) If the fourth person completes the work in x days, then

$\frac{3}{8}+\frac{3}{12}+\frac{3}{16}+\frac{3}{x}=1$

$\Rightarrow \frac{1}{x}=\frac{1}{3}-\frac{1}{8}-\frac{1}{12}-\frac{1}{16}$

$=\frac{16-6-4-3}{48}=\frac{1}{16}$

∴ x = 16

∴ Ratio of wages

$=\frac{1}{8}:\frac{1}{12}:\frac{1}{16}:\frac{1}{16}$

= 6 : 4 : 3 : 3

Sum of ratios = 6 + 4 + 3+3 = 16

∴ Fourth person's share

= $\frac{3}{16}\times 1200$ = ₹ 225

22. (1) If C alone completes the work in x days, then

$\frac{1}{16}+\frac{1}{24}+\frac{1}{x}=\frac{1}{6}$

$\Rightarrow \frac{1}{x}=\frac{1}{6}-\frac{1}{16}-\frac{1}{24}$

$=\frac{8-3-2}{48}=\frac{1}{16}$

$\Rightarrow x$ = 16 days

∴ Ratio of their remuneration

$=\frac{1}{16}:\frac{1}{24}:\frac{1}{16}$

= 3 : 2 : 3

∴ A's remuneration

= $\frac{3}{8}\times 400$ = ₹ 150

B's remuneration = $\frac{2}{8}\times 400$

= ₹ 100

C's remuneration = $\frac{3}{8}\times 400$

= ₹ 150

⇒ A : 150, B : 100, C : 150

23. (4) Skilled : half skilled : unskilled = $\frac{1}{3}:\frac{1}{4}:\frac{1}{6}$

$=\left(\frac{1}{3}\times 12\right):\left(\frac{1}{4}\times 12\right):\left(\frac{1}{6}\times 12\right)$

= 4 : 3 : 2

Share of the trained labourer

$=\frac{28}{(7\times 4+8\times 3+2\times 10)}\times 369$

$=\frac{28}{(28+24+20)}\times 369$

$=\frac{28}{72}\times 369$ = ₹ 143.50

24. (2) Work done by B

$=1-\frac{19}{23}=\frac{23-19}{23}=\frac{4}{23}$

∴ (A + C) : B = $\frac{19}{23}:\frac{4}{23}$ = 19 : 4

∴ Sum of ratios = 19 + 4 = 23

∴ B's share

= $\frac{4}{23}\times 575$ = ₹ 100

25. (4) Earning in the first one hour = $\frac{2000}{50}$ = Rs. 40

Earnings for additional 5 hours

= $40\times\frac{3}{2}\times 5$ = Rs. 300

26. (3) (2 men + 1 woman)'s 14 days' work

≡ (4 women + 2 men)'s 8 days' work

⇒ 28 men + 14 women ≡ 32 women + 16 men

⇒ (28 – 16) = 12 men ≡ (32 – 14) = 18 women

⇒ 2 men ≡ 3 women

∴ 1 woman ≡ $\frac{2}{3}$ man

∵ Wages per day of 1 man = Rs. 180

∴ Wages per day of 1 woman

= $\frac{2}{3}\times 180$ = Rs. 120

TYPE-VIII

1. (1) Let initially the number of men be x.

⇒ According to question,

$M_1 D_1 W_2 = M_2 D_2 W_1$

$x \times 30 = (x + 5) \times (30 - 10)$

$x \times 30 = 20x + 100$

$30x - 20x = 100$

$10x = 100$

$x = 10$

2. (4) **Tricky Approach**

Expenditure	Days	Hours/ day	Burners
450 ↓	8 ↑	6 ↑	6 ↓
625 ↓	10 ↑	5 ↑	x ↓

∴ 450 : 625, 10 : 8, 5 : 6 } :: 6 : x

⇒ $450 \times 10 \times 5 \times x$

$= 625 \times 8 \times 6 \times 6$

⇒ $x = \frac{625\times 8\times 6\times 6}{450\times 10\times 5} = 8$

3. (1) Work done by A in 15 days

= $\frac{1}{60}\times 15=\frac{1}{4}$

Remaining work = $\left(1-\frac{1}{4}\right)=\frac{3}{4}$

Now, $\frac{3}{4}$ work is done by B in 30 days

Whole work will be done by B in $\frac{30\times 4}{3}$ = 40 days

A's 1 day's work = $\frac{1}{60}$ and B's 1 day's work = $\frac{1}{40}$

(A + B)'s 1 day's work

$=\frac{1}{60}+\frac{1}{40}=\frac{2+3}{120}=\frac{5}{120}=\frac{1}{24}$

Hence, both will finish the work in 24 days.

4. (3) A's 1 day's work

= (B +C)'s 1 day's work ...(i)

(A + B)'s 1 day's work = $\frac{1}{10}$

C's 1 day's work = $\frac{1}{50}$

(A + B + C)'s 1 day's work

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$= \frac{1}{10}+\frac{1}{50}=\frac{5+1}{50}=\frac{6}{50}=\frac{3}{25}$ ...(iii)

(A + A)'s 1 day's work = $\frac{3}{25}$

(By (i) & (iii)

A's 1 day's work = $\frac{3}{50}$

B's 1 day's work = $\frac{1}{10}-\frac{3}{50}$

$=\frac{5-3}{50}=\frac{2}{50}=\frac{1}{25}$

Hence, B alone will complete the work in 25 days

5. (3) Let the son take x days to do the work.

$\therefore \frac{1}{5}+\frac{1}{x}=\frac{1}{3}$

$\Rightarrow \frac{x+5}{5x}=\frac{1}{3}$

$\Rightarrow 3x+15=5x$

$\Rightarrow 2x=15 \Rightarrow x=\frac{15}{2}$

$=7\frac{1}{2}$ days

6. (4) Let the number of men in the beginning = x

Then, $\frac{x+8}{x}=\frac{60}{50}$

$\Rightarrow \frac{x+8}{x}=\frac{6}{5}$

$\Rightarrow 6x=5x+40 \Rightarrow x=40$

7. (1) 12 persons can complete a work in 4 days.

$\Rightarrow$ 24 persons can complete the work in 2 days.

$\Rightarrow$ 24 persons can complete the 8 times work in 16 days

$\Rightarrow$ 24 × 8 persons = 192 persons can complete the 8 times work in 2 days.

8. (2) Let the original number of workers = x. Then,

$x \times 100 = (x-10) \times 110$

$\Rightarrow 10x = 11x - 110$

$\Rightarrow x = 110$

9. (3) Work done by 12 men in 6 days = $\frac{1}{2}$

Remaining work

$= 1-\frac{1}{2}=\frac{1}{2}$

6 men leave the work.

$\therefore$ Time taken = $\frac{12\times12}{6\times2}$

= 12 days

10. (2) 60 men can complete a work in 250 days.

$\therefore$ Work done by 60 men in 1 day

$=\frac{1}{250}$

$\Rightarrow$ Work done by 60 men in 200 days = $\frac{200}{250}=\frac{4}{5}$

Remaining work = $1-\frac{4}{5}=\frac{1}{5}$

Work is stopped for 10 days.

Now, $\frac{1}{5}$ work is to be complete by x men in 40 days.

60 men can complete $\frac{1}{5}$ work in 50 days.

Days	Men
50 ↑	60 ↓
40	x

$\therefore 40 : 50 :: 60 : x$

$\Rightarrow 40x = 50\times60$

$\Rightarrow x=\frac{50\times60}{40}=75$

Hence, 15 more men should be engaged.

11. (1) Working 5 hours a day, A can complete a work in 8 days.

i.e. A can complete the work in 40 hours.

Similarly,

B will complete the same work in 60 hours.

$\therefore$ (A + B)'s 1 hour's work

$=\frac{1}{40}+\frac{1}{60}=\frac{3+2}{120}$

$=\frac{5}{120}=\frac{1}{24}$

Hence, A and B together will complete the work in 24 hours.

$\therefore$ They can complete the work in 3 days working 8 hours a day.

12. (4) According to the question,

2 persons with equal abilities can do 1 job in 1 day

$\therefore$ Time taken by 1 man to complete 1 job = 2 days

$\Rightarrow$ Time taken by 100 persons in completing 100 jobs = 2 days

13. (2) Part of the field mowed by Ganga and Saraswati in first 2 hours = $\frac{1}{8}+\frac{1}{12}=\frac{3+2}{24}=\frac{5}{24}$

$\therefore$ Part of the field mowed in first 8 hours = $\frac{5\times4}{24}=\frac{20}{24}=\frac{5}{6}$

Remaining work = $1-\frac{5}{6}=\frac{1}{6}$

Now, it is the turn of Ganga, part of work done by Ganga in 1 hour

$=\frac{1}{8}$

Remaining work = $\frac{1}{6}-\frac{1}{8}$

$=\frac{4-3}{24}=\frac{1}{24}$

Now, time taken by Saraswati in completing this part of work

$=\frac{1}{24}\times12=\frac{1}{2}$ hour

$\therefore$ Total time = $9\frac{1}{2}$ hours

The mowing starts at 9 am.

Hence, the mowing will be completed at 6.30 pm.

14. (3) Remaining work

$=5-\frac{7}{2}=\frac{3}{2}$

$M_1\times D_1\times W_2 = M_2\times D_2\times W_1$

$\Rightarrow 280\times80\times\frac{3}{2}$

$= M_2\times20\times\frac{7}{2}$

$\Rightarrow M_2=\frac{280\times80\times3}{20\times7}=480$

$\therefore$ Required number of additional men = 480 − 280 = 200

15. (1) Let B alone do the work in x days.

$\therefore 6\times\frac{1}{12}+3\times\frac{1}{x}=1$

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$\Rightarrow \frac{1}{2}+\frac{3}{x}=1$

$\Rightarrow \frac{3}{x}=\frac{1}{2} \Rightarrow x=6$ days

16. (4) Efficiency and time taken are inversely proportional.
$\therefore$ Required ratio = 4 : 3

17. (3) Scheduled time to complete the work = 40 days

25 men in 24 days do $\frac{1}{3}$ work

$\therefore$ 1 man in 1 day does

$\frac{1}{3\times25\times24}=\frac{1}{1800}$ work.

Work remaining $=1-\frac{1}{3}=\frac{2}{3}$

The work is to be completed 4 days before schedule i.e., in (40 – 4) 36 days

No. of days left for $\frac{2}{3}$rd work

= 36 – 24 = 12 days

$\frac{1}{1800}$work is done in 1 day by 1man.

$\therefore \frac{2}{3}$work will be done in 12 days by

$1800\times\frac{2}{3}\times\frac{1}{12}=100$ men

25 men are already working
$\therefore$ Extra men to be employed
= 100 – 25 = 75

18. (2) 20 × 16 women
= 16 × 15 men
$\Rightarrow$ 4 women = 3 men

$\Rightarrow \frac{\text{men}}{\text{women}}=\frac{4}{3}$

Hence, working capacity of man : woman = 4 : 3

19. (1) Man : Woman (efficiency)
= 3 : 2

i.e., Woman completes $\frac{2}{5}$th work in 18 days.
$\therefore$ Time taken by the woman to complete the whole work

$=\frac{18\times5}{2}=45$ days

20. (1) 1 man's 1 day's work = $\frac{1}{2x}$

1 woman's 1 day's work = $\frac{1}{3y}$

$\therefore$ Required ratio = $\frac{1}{2x}:\frac{1}{3y}$

= 3y : 2x

21. (2) $D_1T_1 = D_2T_2$
$\Rightarrow 18\times6=12\times T_2$

$\Rightarrow T_2=\frac{18\times6}{12}=9$ hours

22. (3)

Carpenters	Working hours/day	Days	Chairs
12 ↓	6 ↓	240 ↓	460 ↓
18 ↓	8 ↓	36 ↓	x ↓

$\therefore$ 12 : 18
6 : 8
240 : 36
:: 460 : x

$\Rightarrow 12\times6\times240\times x$
$\Rightarrow = 18\times8\times36\times460$

$\Rightarrow x=\frac{18\times8\times36\times460}{12\times6\times240}=138$

23. (3)

Length	Breadth	Height	Working hours	days	workers
18 ↓	2 ↓	12 ↓	9 ↑	10 ↑	8 ↓
32 ↓	3 ↓	9 ↓	6 ↑	8 ↑	x ↓

$\therefore$ 18 : 32
2 : 3
12 : 9
6 : 9
8 : 10
:: 8 : x

$\Rightarrow 18\times2\times12\times6\times8x=32\times3\times9\times9\times10\times8$

$\Rightarrow x=\frac{32\times3\times9\times9\times10\times8}{18\times2\times12\times6\times8}$

= 30 days

24. (2) (P + Q)'s 1 day's work = $\frac{1}{6}$

(Q + R)'s 1 day's work = $\frac{7}{60}$

Let P alone do the work in x days.

According to the question,

$\frac{3}{x}+\frac{6\times7}{60}=1$

$\Rightarrow \frac{3}{x}=1-\frac{7}{10}=\frac{3}{10}$

$\Rightarrow x=10$ days
$\therefore$ Q's 1 day's work

$=\frac{1}{6}-\frac{1}{10}=\frac{5-3}{30}=\frac{1}{15}$

R's 1 day's work

$=\frac{7}{60}-\frac{1}{15}=\frac{7-4}{60}=\frac{1}{20}$

$\therefore$ Time taken by R = 20 days
$\therefore$ Required answer = 20 – 10
= 10 days

25. (3) Let 150 workers complete the work in x days.
$\therefore$ 150 × x = 150 + 146 + ... to (x + 8) terms
On putting x = 17
LHS = 150 × 17 = 2550
RHS = 150 + 146 + ... to 25 terms
$a = 150,\ d = -4,\ n = 25$

$\therefore S=\frac{n}{2}[2a+(n-1)d]$

$=\frac{25}{2}[2\times150+24\times(-4)]$

$=\frac{25}{2}(300-96)=\frac{25\times204}{2}=2550$

Note : It is better to solve by options.

26. (1) According to the question,

$M_1D_1 = M_2D_2$
$\Rightarrow (x+4)(x+5)$
$=(x-5)(x+20)$
$\Rightarrow x^2+5x+4x+20$
$=x^2-5x+20x-100$
$\Rightarrow 9x+20=15x-100$
$\Rightarrow 15x-9x=100+20$
$\Rightarrow 6x=120$

$\Rightarrow x=\frac{120}{6}=20$

□□□

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TEST YOURSELF

1. A alone takes as much time as B and C together take to complete a piece of work. If A and B together take 10 days and B alone takes 50 days to complete it, in what time can A and C together do the work?

   (1) $7\frac{1}{2}$ days (2) $7\frac{1}{7}$ days

   (3) $8\frac{1}{7}$ days (4) $15\frac{1}{7}$ days

2. A can do a work in 12 days and B can do it in 16 days. A and B started the work jointly and A left 2 days before the work is finished. Find the number of days they took to finish the work.

   (1) 6 days (2) 7 days

   (3) 9 days (4) 8 days

3. A and B can do a piece of work in 10 days, B and C in 15 days and C and A in 20 days. C alone can do the work in :

   (1) 60 days (2) 120 days

   (3) 80 days (4) 30 days

4. 12 men and 18 boys working $7\frac{1}{2}$ hours a day can do a work in 60 days. If one man works equal to 2 boys, then the number of boys required to help 21 men to do twice the work in 50 days working 9 hours a day will be :

   (1) 42 (2) 44

   (3) 46 (4) None of these

5. Rita, Sita and Meeta are employed to do a piece of work for ₹625. Rita and Sita together are supposed to do $\frac{17}{23}$ of the work. What should Meeta be paid?

   (1) ₹162.04 (2) ₹163.04

   (3) ₹161.04 (4) None of these

6. A contract is to be completed in 50 days and 105 men were set to work, each working 8 hours a day. After 25 days, $\frac{2}{5}$ th of the work is finished. How many additional men be employed so that the work may be completed on time, each man now working 9 hours a day?

   (1) 35 (2) 40

   (3) 45 (4) None of these

7. If *A* alone can do a work in 12 days and *B* alone can do it in 8 days, Working together, in how many days will they complete it?

   (1) $4\frac{4}{5}$ days (2) 4 days

   (3) $3\frac{4}{5}$ days (4) 6 days

8. *A* can do $\frac{1}{2}$ of a work in 9 days while *B* can do $\frac{1}{3}$ of the same work in 6 days. How long would it take for *A* and *B* together to complete the work?

   (1) 8 days (2) 9 days

   (3) 10 days (4) 7 days

9. *A* and *B* can do a work in 8 days. *B* alone can do it in 24 days. In how many days, *A* alone can do the same work?

   (1) 10 days (2) 9 days

   (3) 12 days (4) 14 days

10. *A* and *B* can do a piece of work in 12 days, *B* and *C* in 15 days; *C* and *A* in 20 days. In how many days will they finish it working together? In what time can *A* do it separately?

    (1) 45 days (2) 20 days

    (3) 60 days (4) 30 days

11. *A*, *B* and *C* can complete a work in 8 days. *B* alone can do it in 18 days and *C* alone can do it in 24 days. In how many days can *A* alone do the same work?

    (1) 36 days (2) 24 days

    (3) 38 days (4) 30 days

12. *A* can do a piece of work in 40 days. He works on it for 5 days and then *B* completes it in 21 days. How long will *A* and *B* together take to complete the work?

    (1) 10 days (2) 15 days

    (3) 20 days (4) 25 days

13. Ram can do a piece of work in 20 days and Shyam in 30 days. They work together for 10 days. After that Shyam leaves and rest of the work is completed by Ram alone. How long does it take Ram to finish the remaining work?

    (1) 3 days (2) $2\frac{1}{3}$ days

    (3) $3\frac{1}{3}$ days (4) $4\frac{1}{3}$ days

14. *A* and *B* can complete a piece of work in 45 and 40 days respectively. Both started to work together, but after some days *A* left and *B* alone completed the rest work in 23 days. For how many days did *A* work?

    (1) 12 days (2) 10 days

    (3) 8 days (4) 9 days

15. *A* and *B* together can finish a work in 15 days. *A* and *C* take 2 days more to complete the same work than that of *B* and *C*. *A*, *B* and *C* together complete the work in 8 days. In how many days will A finish it separately?

    (1) 40 days (2) 24 days

    (3) $17\frac{1}{7}$ days (4) 20 days

16. *A* and *B* together can do a piece of work in 30 days, *B* and *C* together can do it in 20 days. *A* starts the work and works on it for 5 days, then *B* takes it up and works for 15 days. Finally *C* finishes the work in 18 days. In how many days can C do the work when doing it separately?

    (1) 40 days (2) 24 days

    (3) 120 days (4) 60 days

17. *A* and *B* can do a piece of work in 30 days while *B* and *C* can do the same work in 24 days and *C* and *A* in 20 days. They all work for 10 days when *B* and *C* leave. How many days more will *A* take to complete the work?

    (1) 16 days (2) 15 days

    (3) 18 days (4) 20 days

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18. *A*, *B* and *C* can complete a work separately in 24, 36 and 48 days respectively. They started together but *C* left after 4 days of start and *A* left 3 days before the completion of work. In how many days will the work be completed?
(1) 20 days (2) 18 days
(3) 16 days (4) 15 days

19. *A* can complete a work in 24 days, *B* in 32 days and *C* in 64 days. They start together. *A* works for 6 days and leaves and *B* leaves 6 days before the work is finished. In how many days was the work finished?
(1) 20 days (2) 21 days
(3) 22 days (4) 25 days

20. *A* can complete a work in 10 days, *B* can complete the same work in 20 days and *C* in 40 days. *A* starts working on the first day, *B* works for second day and *C* works for third day. Again *A* works for fourth day and *B* for fifth day and so on. If they continued working in the same way, in how many days will the work be completed?
(1) 15 days (2) 16.5 days
(3) 15.5 days (4) 17 days

21. *A* can do a piece of work in 120 days and *B* can do it in 150 days. They work together for 20 days. Then *B* leaves and *A* alone continues the work. 12 days after that *C* joins *A* and the work is completed in 48 days more. In how many days can *C* do it if he works alone?
(1) 230 days (2) 225 days
(3) 240 days (4) 220 days

SHORT ANSWERS

1. (2)	2. (4)	3. (2)	4. (1)
5. (2)	6. (1)	7. (1)	8. (2)
9. (3)	10. (4)	11. (1)	12. (2)
13. (3)	14. (4)	15. (1)	16. (2)
17. (3)	18. (4)	19. (1)	20. (2)
21. (3)			

EXPLANATIONS

1. (2) (A + B)'s 1 day's work = $\frac{1}{10}$

B's 1 day's work = $\frac{1}{50}$

A's 1 day's work = $\frac{1}{10}-\frac{1}{50}$ = $\frac{5-1}{50}=\frac{2}{25}$

(B + C)'s 1 day's work = $\frac{2}{25}$

C's 1 day's work = $\frac{2}{25}-\frac{1}{50}$

= $\frac{4-1}{50}=\frac{3}{50}$

(A + C)'s 1 day's work

= $\frac{2}{25}+\frac{3}{50}$

= $\frac{4+3}{50}=\frac{7}{50}$

∴ (A + C) will complete the work in $\frac{50}{7}=7\frac{1}{7}$ days.

2. (4) Let the required number of days be x.
∴ A's work in $(x-2)$ days

= $\frac{x-2}{12}$

B's work in x days = $\frac{x}{16}$

$\therefore \frac{x-2}{12}+\frac{x}{16}=1$

$\Rightarrow \frac{4x-8+3x}{48}=1$

$\Rightarrow 7x = 48 + 8 = 56$

$\Rightarrow x = 8$ days

3. (2) According to the question
Work done by A and B together in one day = $\frac{1}{10}$ part

Work done by B and C together in one day = $\frac{1}{15}$ part

Work done by C and A together in one day = $\frac{1}{20}$ part

So,

$A + B = \frac{1}{10}$ ....(I)

$B + C = \frac{1}{15}$ ...(II)

$C + A = \frac{1}{20}$ ....(III)

Adding I, II, III, we get

$2(A + B + C) = \frac{1}{10}+\frac{1}{15}+\frac{1}{20}$

$2(A + B + C) = \frac{6+4+3}{60}=\frac{13}{60}$

$A + B + C = \frac{13}{120}$ ....(IV)

Putting the value of eqn. (I) in eqn. (IV)

$\frac{1}{10}+C=\frac{13}{120}$

$C=\frac{13}{120}-\frac{1}{10}=\frac{13-12}{120}=\frac{1}{120}$

∴ Work done in 1 day by C is $\frac{1}{120}$ part

Hence, C will finish the whole work in 120 days

4. (1) 12 men + 18 boys = 21 men

Work		Hours/day		Days		Men
1	↓	$\frac{15}{2}$	↑	60	↑	21
2		9		50		x

$1:2$
$9:\frac{15}{2}$ } : : $21 : x$
$50:60$

$\Rightarrow 9\times 50\times x=\frac{15}{2}\times 60\times 21\times 2$

$\Rightarrow x=\frac{15\times 60\times 21\times 2}{2\times 9\times 50}=42$

∴ Number of boys = 2 × 21 = 42

5. (2) Amount received by Meeta

= $\frac{6}{23}\times 625$ = Rs. 163.04

6. (1)

Work		hours/days		Days		Men
$\frac{2}{5}$	↓	8	↑	25		105
$\frac{3}{5}$		9		25		x

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$\therefore \left.\begin{matrix}\frac{2}{5}:\frac{3}{5}\\ 9:8\end{matrix}\right\} :: 105 : x$

$\Rightarrow \frac{2}{5}\times 9\times x = \frac{3}{5}\times 8\times 105$

$\Rightarrow x = \frac{3\times 8\times 105}{2\times 9} = 140$

Number of additional men
$= 140 - 105 = 35$

7. (1) A's one day's work $= \frac{1}{12}$

B's one day's work $= \frac{1}{8}$

$(A + B)$'s one day's work

$= \frac{1}{12}+\frac{1}{8} = \frac{2+3}{24} = \frac{5}{24}$

Now, $\frac{5}{24}$ work is done in 1 day

$\therefore$ 1 work is done in $= \frac{24}{5}$ days

$= 4\frac{4}{5}$ days

8. (2) A's 9 days' work $= \frac{1}{2}$

$\therefore$ A's 1 day's work

$= \frac{1}{2\times 9} = \frac{1}{18}$

B's 6 days' work $= \frac{1}{3}$

$\therefore$ B's 1 day's work

$= \frac{1}{3\times 6} = \frac{1}{18}$

$\therefore$ $(A + B)$'s 1 day's work

$= \frac{1}{18}+\frac{1}{18} = \frac{2}{18} = \frac{1}{9}$

$\therefore$ A and B both together will complete the work in 9 days.

9. (3) $(A + B)$'s 1 day's work $= \frac{1}{8}$

B's 1 day's work $= \frac{1}{24}$

$\therefore$ A's one day's work
$= (A + B)$'s one day's work $-$ B's one day's work

$= \frac{1}{8}-\frac{1}{24} = \frac{3-1}{24} = \frac{2}{24} = \frac{1}{12}$

$\therefore$ A will complete the work in 12 days.

10. (4) $(A + B)$'s 1 day's work $= \frac{1}{12}$

$(B + C)$'s 1 day's work $= \frac{1}{15}$

$(C + A)$'s 1 day's work $= \frac{1}{20}$

Adding all,
$2(A + B + C)$'s 1 day's work

$= \frac{1}{12}+\frac{1}{15}+\frac{1}{20}$

$= \frac{5+4+3}{60} = \frac{12}{60} = \frac{1}{5}$

$\therefore$ $(A + B + C)$'s 1 day's work

$= \frac{1}{5\times 2} = \frac{1}{10}$

$\therefore$ $(A + B + C)$ together can complete the work in 10 days.
Now, A's 1 day's work
$= (A + B + C)$'s 1 day's work $-$ $(B + C)$'s 1 day's work

$= \frac{1}{10}-\frac{1}{15} = \frac{3-2}{30} = \frac{1}{30}$

$\therefore$ A alone can finish the work in 30 days.

11. (1) $(A + B + C)$'s 1 day's work

$= \frac{1}{8}$

B's 1 day's work $= \frac{1}{18}$

C's 1 day's work $= \frac{1}{24}$

$\therefore$ A's 1 day's work
$= (A + B + C)$'s 1 day's work $-$ B's 1 day's work $-$ C's 1 day's work

$= \frac{1}{8}-\frac{1}{18}-\frac{1}{24}$

$= \frac{9-4-3}{72} = \frac{2}{72} = \frac{1}{36}$

$\Rightarrow$ A's 1 day's work $= \frac{1}{36}$

$\therefore$ A alone can do the same work in 36 days.

12. (2) A's 1 day's work $= \frac{1}{40}$

$\therefore$ A's 5 days' work $= \frac{5}{40} = \frac{1}{8}$

Remaining work $= 1-\frac{1}{8} = \frac{7}{8}$

This part of work is done by B in 21 days.

$\therefore$ B's 1 day's work

$= \frac{7}{8\times 21} = \frac{1}{24}$

$\therefore$ $(A + B)$'s 1 day's work

$= \frac{1}{40}+\frac{1}{24} = \frac{3+5}{120}$

$= \frac{8}{120} = \frac{1}{15}$

Hence, A and B together will complete the work in 15 days.

13. (3) Ram's 1 day's work $= \frac{1}{20}$

Shyam's 1 day's work $= \frac{1}{30}$

$\therefore$ (Ram + Shyam)'s 1 day's work

$= \frac{1}{20}+\frac{1}{30} = \frac{3+2}{60}$

$= \frac{5}{60} = \frac{1}{12}$

$\therefore$ (Ram + Shyam)'s 10 days' work $= 10\times\frac{1}{12} = \frac{5}{6}$

$\triangleright$ Remaining work $= 1-\frac{5}{6} = \frac{1}{6}$

Now, $\frac{1}{6}$ work is completed by Ram alone.
To finish this part Ram will take

$= \frac{\text{Remaining work}}{\text{Ram's 1 day's work}} = \frac{\frac{1}{6}}{\frac{1}{20}}$

$= \frac{1}{6}\times 20 = \frac{10}{3} = 3\frac{1}{3}$ days

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14. (4) Let A worked for x days.

A's 1 day's work $= \frac{1}{45}$

$\therefore$ A's x day's work $= \frac{x}{45}$

B's 1 day's work $= \frac{1}{40}$

$\therefore$ B's x day's work

$= \frac{1}{40} \times x = \frac{x}{40}$

$(A + B)$ together worked for x days.

$\therefore$ $(A + B)$'s x day's work

$= \frac{x}{45} + \frac{x}{40}$

$= \frac{8x+9x}{360} = \frac{17x}{360}$

$\therefore$ Remaining work

$= 1 - \frac{17x}{360} = \frac{360-17x}{360}$

This part of work, i.e., $\frac{360-17x}{360}$ is completed by B alone in 23 days.

$\therefore$ $\frac{360-17x}{360} = 23 \times B$'s 1 day's work

$\frac{360-17x}{360} = 23 \times \frac{1}{40} = \frac{23}{40}$

$\Rightarrow 360 - 17x$

$= \frac{23}{40} \times 360 = 207$

$\Rightarrow 17x = 360 - 207 = 153$

$\Rightarrow x = \frac{153}{17} = 9$ days.

Hence, A worked for 9 days.

15. (1) $(A + B)$'s 1 day's work $= \frac{1}{15}$

$(A + B + C)$'s 1 day's work $= \frac{1}{8}$

$\therefore$ C's 1 day's work

$= \frac{1}{8} - \frac{1}{15} = \frac{15-8}{120} = \frac{7}{120}$

Let $(B + C)$ can complete the work in x days.

$\therefore$ $(A + C)$ can complete the work in $(x + 2)$ days.

$\therefore$ $(B + C)$'s 1 day's work $= \frac{1}{x}$

$(A + C)$'s 1 day's work $= \frac{1}{x+2}$

$\therefore$ B's 1 day's work

$= \frac{1}{x} - \frac{7}{120} = \frac{120-7x}{120x}$

and, A's 1 day's work

$= \frac{1}{x+2} - \frac{7}{120}$

$= \frac{120-7(x+2)}{120(x+2)}$

$= \frac{106-7x}{120(x+2)}$

Now, A's 1 day's work + B's 1 day's work = $(A + B)$'s 1 day's work

$\Rightarrow \frac{106-7x}{120(x+2)} + \frac{120-7x}{120x} = \frac{1}{15}$

$\Rightarrow \frac{106x-7x^2+120x+240-7x^2-14x}{120x(x+2)}$

$= \frac{1}{15}$

$\Rightarrow -14x^2 + 212x + 240$

$= 8x^2 + 16x$

$\Rightarrow 22x^2 - 196x - 240 = 0$

$\Rightarrow 11x^2 - 98x - 120 = 0$

$\Rightarrow 11x^2 - 110x + 12x - 120 = 0$

$\Rightarrow 11x(x - 10) + 12(x - 10) = 0$

$\Rightarrow (x - 10)(11x + 12) = 0$

$\Rightarrow x = 10$, and $-\frac{12}{11}$

But no. of days cannot be negative

$\therefore$ $x = 10$

$\therefore$ A's 1 day's work

$= \frac{1}{10+2} - \frac{7}{120}$

$= \frac{1}{12} - \frac{7}{120}$

$= \frac{10-7}{120} = \frac{3}{120} = \frac{1}{40}$

$\therefore$ A alone can complete the work in 40 days.

16. (2) Let us denote A's 1 day's work by A, B's 1 day's work by B and C's work by C.

So, $A + B = \frac{1}{30}$

and $B + C = \frac{1}{20}$

Also, $5A + 15B + 18C = 1$ work.

This can be written as,

$5(A + B) + 10(B + C) + 8C = 1$

Substituting the values of $(A + B)$ and $(B + C)$ we get,

$\left(5 \times \frac{1}{30}\right) + \left(10 \times \frac{1}{20}\right) + 8C = 1$

or $\frac{1}{6} + \frac{1}{2} + 8C = 1$

or $8C = 1 - \frac{1}{6} - \frac{1}{2}$

or $8C = \frac{6-1-3}{6}$

or $8C = \frac{2}{6}$

or $C = \frac{2}{6 \times 8} = \frac{1}{24}$

Hence, C will complete the work in 24 days.

17. (3) $(A + B)$'s 1 day's work $= \frac{1}{30}$

$(B + C)$'s 1 day's work $= \frac{1}{24}$

$(C + A)$'s 1 day's work $= \frac{1}{20}$

Adding all the above, we have

2 { $A + B + C$)'s 1 day's work

$= \frac{1}{30} + \frac{1}{24} + \frac{1}{20}$

$= \frac{4+5+6}{120} = \frac{15}{120} = \frac{1}{8}$

$\therefore$ $(A + B + C)$'s 1 day's work

$= \frac{1}{8 \times 2} = \frac{1}{16}$

Now, all three worked together for 10 days.

$\therefore$ $(A + B + C)$'s 10 days' work

$= \frac{1}{16} \times 10 = \frac{5}{8}$

$\therefore$ Remaining part of work

$= 1 - \frac{5}{8} = \frac{8-5}{8} = \frac{3}{8}$

Now, A's 1 day's work

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$= \frac{1}{16} - \frac{1}{24} = \frac{3-2}{48} = \frac{1}{48}$

Since, A finishes $\frac{1}{48}$ part of work in 1 day

$\therefore$ A will finish $\frac{3}{8}$ part of work in $1 \times 48 \times \frac{3}{8} = 18$ days.

18. (4) Let the work be completed in x days. Therefore, A worked for $x-3$ days, B for x days and C for 4 days.

A's 1 day's work $= \frac{1}{24}$

B's 1 day's work $= \frac{1}{36}$

and, C's 1 day's work $= \frac{1}{48}$

$\therefore (x-3) \times \frac{1}{24} + x \times \frac{1}{36} + 4 \times \frac{1}{48} = 1$

$\Rightarrow \frac{x-3}{24} + \frac{x}{36} + \frac{1}{12} = 1$

$\Rightarrow \frac{3x-9+2x+6}{72} = 1$

$\Rightarrow 5x - 3 = 72$

$\Rightarrow 5x = 75$

$\Rightarrow x = \frac{75}{5} = 15$

Hence, the work was completed in 15 days.

19. (1) Let the work was completed in x days. Hence, A worked for 6 days, B worked for $(x-6)$ days and C worked for x days.

Now, A's 1 day's work $= \frac{1}{24}$

$\therefore$ A's 6 days' work

$= \frac{1}{24} \times 6 = \frac{1}{4}$

B's 1 day's work $= \frac{1}{32}$

$\therefore$ B's $(x-6)$ days' work

$= \frac{1}{32} \times (x-6) = \frac{x-6}{32}$

C's 1 day's work $= \frac{1}{64}$

$\therefore$ C's x days' work

$= \frac{1}{64} \times x = \frac{x}{64}$

$\therefore \frac{1}{4} + \frac{x-6}{32} + \frac{x}{64} = 1$

$\Rightarrow \frac{x-6}{32} + \frac{x}{64} = 1 - \frac{1}{4} = \frac{3}{4}$

$\Rightarrow \frac{2x-12+x}{64} = \frac{3}{4}$

$\Rightarrow 3x - 12 = 48$

$\Rightarrow 3x = 48 + 12 = 60$

$\Rightarrow x = \frac{60}{3} = 20$

Hence, the work was completed in 20 days.

20. (2) A's work for the first day $= \frac{1}{10}$

B's work for the second day $= \frac{1}{20}$

C's work for the third day $= \frac{1}{40}$

Work done in 3 days by them together $= \frac{1}{10} + \frac{1}{20} + \frac{1}{40}$

$= \frac{4+2+1}{40} = \frac{7}{40}$

Hence, $\frac{7}{40}$ part of work will be completed in 3 days.

$\frac{7 \times 5}{40}$ i.e $\frac{35}{40}$ part of work will be completed in 3×5 or 15 days.

Remaining work

$= 1 - \frac{35}{40} = \frac{5}{40} = \frac{1}{8}$

Now, A will work on 16th day.

The remaining work after 16 days

$= \frac{1}{8} - \frac{1}{10} = \frac{5-4}{40} = \frac{1}{40}$

Again, B will work on 17th day.

$\because$ B completes the work in 20 days.

$\therefore$ B will complete $\frac{1}{40}$ part of work in $20 \times \frac{1}{40} = \frac{1}{2}$ day

Hence, Total time taken in completion of work

$= 15 + 1 + \frac{1}{2} = 16\frac{1}{2}$ days

21. (3) A's 1 day's work $= \frac{1}{120}$

B's 1 day's work $= \frac{1}{150}$

$(A+B)$'s 1 day's work

$= \frac{1}{120} + \frac{1}{150}$

$= \frac{5+4}{600} = \frac{9}{600} = \frac{3}{200}$

$(A+B)$ work together for 20 days

Hence, $(A+B)$'s 20 days' work

$= 20 \times \frac{3}{200} = \frac{3}{10}$

After 20 days B leaves, and A alone works for 12 days

$\therefore$ A's 12 days' work

$= \frac{1}{120} \times 12 = \frac{1}{10}$

Now, after 12 days, C joins A and the work is finished in 48 days. It means A works for 48 days more.

$\therefore$ A's 48 days' work

$= \frac{1}{120} \times 48 = \frac{2}{5}$

$\therefore$ Total work done by A and B together

$= \frac{3}{10} + \frac{1}{10} + \frac{2}{5}$

$= \frac{3+1+4}{10} = \frac{8}{10} = \frac{4}{5}$

$\therefore$ Remaining work

$= 1 - \frac{4}{5} = \frac{1}{5}$

This part of work, i.e., $\frac{1}{5}$ is done by C in 48 days

$\therefore$ C's 48 days' work $= \frac{1}{5}$

$\therefore$ C's 1 day's work

$= \frac{1}{5 \times 48} = \frac{1}{240}$

Hence, C alone can finish the work in 240 days.

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13 PIPE AND CISTERN

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. Two pipes A and B can fill a tank in 20 minutes and 30 minutes respectively. If both pipes are opened together, the time taken to fill the tank is :
(1) 50 minutes (2) 12 minutes
(3) 25 minutes (4) 15 minutes
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CPO S.I. Exam. 07.09.2003)

2. A tap can empty a tank in one hour. A second tap can empty it in 30 minutes. If both the taps operate simultaneously, how much time is needed to empty the tank?
(1) 20 minutes (2) 30 minutes
(3) 40 minutes (4) 45 minutes
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. A cistern can be filled with water by a pipe in 5 hours and it can be emptied by a second pipe in 4 hours. If both the pipes are opened when the cistern is full, the time in which it will be emptied is :
(1) 9 hours (2) 18 hours
(3) 20 hours (4) $20\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. Two pipes A and B can separately fill a cistern in 60 minutes and 75 minutes respectively. There is a third pipe in the bottom of the cistern to empty it. If all the three pipes are simultaneously opened, then the cistern is full in 50 minutes. In how much time the third pipe alone can empty the cistern?
(1) 110 minutes (2) 100 minutes
(3) 120 minutes (4) 90 minutes
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. Two pipes can fill a cistern in 3 hours and 4 hours respectively and a waste pipe can empty it in 2 hours. If all the three pipes are kept open, then the cistern will be filled in :
(1) 5 hours (2) 8 hours
(3) 10 hours (4) 12 hours
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

6. Two pipes can fill a tank in 15 hours and 20 hours respectively, while the third can empty it in 30 hours. If all the pipes are opened simultaneously, the empty tank will be filled in
(1) 10 hours (2) 12 hours
(3) 15 hours (4) $15\frac{1}{2}$ hours
(SSC CPO S.I. Exam. 05.09.2004)

7. A tap can fill a cistern in 8 hours and another tap can empty it in 16 hours. If both the taps are open, the time (in hours) taken to fill the tank will be :
(1) 8 (2) 10
(3) 16 (4) 24
(SSC CPO S.I. Exam. 26.05.2005)

8. A pipe can fill a tank in 'x' hours and another pipe can empty it in 'y' ($y > x$) hours. If both the pipes are open, in how many hours will the tank be filled ?
(1) $(x-y)$ hours
(2) $(y-x)$ hours
(3) $\frac{xy}{x-y}$ hours
(4) $\frac{xy}{y-x}$ hours
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. 12 pumps working 6 hours a day can empty a completely filled reservoir in 15 days. How many such pumps working 9 hours a day will empty the same reservoir in 12 days ?
(1) 15 (2) 9
(3) 10 (4) 12
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. Three pipes P, Q and R can separately fill a cistern in 4,8 and 12 hours respectively. Another pipe S can empty the completely filled cistern in10 hours. Which of the following arrangements will fill the empty cistern in less time than others ?
(1) Q alone is open.
(2) P and S are open.
(3) P, R and S are open.
(4) P, Q and S are open.
(SSC CPO S.I. Exam. 09.11.2008)

11. Two pipes can fill a cistern separately in 10 hours and 15 hours. They can together fill the cistern in
(1) 6 hours (2) 7 hours
(3) 8 hours (4) 9 hours
(SSC Data Entry Operator Exam. 02.08.2009)

12. Three taps A,B and C together can fill an empty cistern in 10 minutes. The tap A alone can fill it in 30 minutes and the tap B alone in 40 minutes. How long will the tap C alone take to fill it ?
(1) 16 minutes (2) 24 minutes
(3) 32 minutes (4) 40 minutes
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

13. One tap can fill a water tank in 40 minutes and another tap can make the filled tank empty in 60 minutes. If both the taps are open, in how many hours will the empty tank be filled ?
(1) 2 hours (2) 2.5 hours
(3) 3 hours (4) 3.5 hours
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

14. A tank can be filled by pipe A in 2 hours and pipe B in 6 hours. At 10 A.M. pipe A was opened. At what time will the tank be filled if pipe B is opened at 11 A.M.?
(1) 12.45 A.M. (2) 5 P.M
(3) 11.45 A.M. (4) 12 P.M.
(SSC Graduate Level Tier-II Exam.16.09.2012)

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15. Two pipes, P and Q, together can fill a cistern in 20 minutes and P alone can in 30 minutes. Then Q alone can fill the cistern in
(1) 62 minutes (2) 60 minutes
(3) 61 minutes (4) 51 minutes
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

16. Two pipes A and B can fill a cistern in 3 hours and 5 hours respectively. Pipe C can empty in 2 hours. If all the three pipes are open, in how many hours the cistern will be full?
(1) can't be filled
(2) 10 hours (3) 15 hours
(4) 30 hours
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

17. Three taps A, B, C can fill an overhead tank in 4, 6 and 12 hours respectively. How long would the three taps take to fill the tank if all of them are opened together?
(1) 2 hrs. (2) 4 hrs.
(3) 3 hrs. (4) 5 hrs.
(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

18. If two pipes function simultaneously, a tank is filled in 12 hours. One pipe fills the tank 10 hours faster than the other. How many hours does the faster pipe alone take to fill the tank?
(1) 20 hrs (2) 18 hrs
(3) 15 hrs (4) 12 hrs
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

19. Two pipes X and Y can fill a cistern in 24 minutes and 32 minutes respectively. If both the pipes are opened together, then after how much time (in minutes) should Y be closed so that the tank is full in 18 minutes?
(1) 10 (2) 8
(3) 6 (4) 5
(SSC CHSL DEO & LDC Exam. 10.11.2013 (Ist Sitting)

20. A cistern is provided with two pipes A and B. A can fill it in 20 minutes and B can empty it in 30 minutes. If A and B be kept open alternately for one minute each, how soon will the cistern be filled?
(1) 121 minutes (2) 110 minutes
(3) 115 minutes (4) 120 minutes
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

21. A water tank can be filled by a tap in 30 minutes and another tap can fill it in 60 minutes. If both the taps are kept open for 5 minutes and then the first tap is closed, how long will it take for the tank to be full?
(1) 20 minutes (2) 25 minutes
(3) 30 minutes (4) 45 minutes
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

22. Two pipes A and B can fill a tank in 36 minutes and 45 minutes respectively. Another pipe C can empty the tank in 30 minutes. First A and B are opened. After 7 minutes, C is also opened. The tank is filled up in
(1) 39 minutes (2) 46 minutes
(3) 40 minutes (4) 45 minutes
(SSC CHSL DEO & LDC Exam. 9.11.2014)

23. Two pipes A and B can separately fill a tank in 2 hours and 3 hours respectively. If both the pipes are opened simultaneously in the empty tank, then the tank will be filled in
(1) 1 hour 12 minutes
(2) 2 hours 30 minutes
(3) 1 hour 15 minutes
(4) 1 hour 20 minutes
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

24. A pipe can fill a tank in x hours and another can empty it in y hours. They can together fill it in $(y > x)$
(1) $\frac{xy}{y-x}$ hours (2) $x-y$ hours
(3) $y-x$ hours (4) $\frac{xy}{x-y}$ hours
(SSC CGL Tier-I Exam, 09.03.2015 (Ist Sitting) TF No. 1443088)

25. Pipe A can fill an empty tank in 6 hours and pipe B in 8 hours. If both the pipes are opened and after 2 hours pipe. A is closed, how much time B will take to fill the remaining tank?
(1) $7\frac{1}{2}$ hours (2) $2\frac{2}{5}$ hours
(3) $2\frac{1}{3}$ hours (4) $3\frac{1}{3}$ hours
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–II

1. If $\frac{1}{3}$ of a tank holds 80 litres of water, then the quantity of water that $\frac{1}{2}$ tank holds is:
(1) 240 litres (2) 120 litres
(3) $\frac{80}{3}$ litres (4) 100 litres
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. A cistern has two pipes. One can fill it with water in 8 hours and other can empty it in 5 hours. In how many hours will the cistern be emptied if both the pipes are opened together when $\frac{3}{4}$ of the cistern is already full of water?
(1) $13\frac{1}{3}$ hours (2) 10 hours
(3) 6 hours (4) $3\frac{1}{3}$ hours
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

3. $\frac{3}{4}$ part of a tank is full of water. When 30 litres of water is taken out, the tank becomes empty. The capacity of the tank is
(1) 36 litres (2) 42 litres
(3) 40 litres (4) 38 litres
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

4. A tap can fill an empty tank in 12 hours and another tap can empty half the tank in 10 hours. It both the taps are opened simultaneously, how long would it take for the empty tank to be filled to half its capacity?
(1) 30 hours (2) 20 hours
(3) 15 hours (4) 12 hours
(SSC (South Zone) Investigator Exam. 12.09.2010)

5. Pipes P and Q can fill a tank in 10 and 12 hours respectively and C can empty it in 6 hours. If all the three are opened at 7 a.m., at what time will one-fourth of the tank be filled?
(1) 10 a.m. (2) 10 p.m.
(3) 11 p.m. (4) 11 a.m.
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

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6. If $\frac{3}{5}$ th of a cistern is filled in 1 minute, the time needed to fill the rest is
(1) 40 sec (2) 30 sec
(3) 36 sec (4) 24 sec
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting))

7. There are two pumps to fill a tank with water. First pump can fill the empty tank in 8 hours, while the second in 10 hours. If both the pumps are opened at the same time and kept open for 4 hours, the part of tank that will be filled up is :
(1) $\frac{9}{10}$ (2) $\frac{1}{10}$
(3) $\frac{2}{5}$ (4) $\frac{1}{5}$
(SSC Multi-Tasking Staff Exam. 10.03.2013)

8. Three pipes A, B and C can fill a tank in 6 hours, 9 hours and 12 hours respectively. B and C are opened for half an hour, then A is also opened. The time taken by the three pipes together to fill the remaining part of the tank is
(1) 3 hours (2) 2 hours
(3) $2\frac{1}{2}$ hours (4) $3\frac{1}{2}$ hours
(SSC Multi-Tasking Staff Exam. 17.03.2013 (Kolkata Region))

TYPE–III

1. Three taps A, B and C can fill a tank in 12, 15 and 20 hours respectively. If A is open all the time and B and C are open for one hour each alternatively, the tank will be full in :
(1) 6 hours (2) $6\frac{1}{2}$ hours
(3) 7 hours (4) $7\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting))

2. A pump can fill a tank with water in 2 hours. Because of a leak in the tank it was taking $2\frac{1}{3}$ hours to fill the tank. The leak can drain all the water off the tank in :
(1) 8 hours (2) 7 hours
(3) $4\frac{1}{3}$ hours (4) 14 hours
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CPO S.I. Exam. 03.09.2006)

3. A pipe can fill a tank with water in 3 hours. Due to leakage in bottom, it takes $3\frac{1}{2}$ hours to fill it . In what time the leak will empty the fully filled tank ?
(1) 12 hours (2) 21 hours
(3) $6\frac{1}{2}$ hours (4) $10\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone))

4. A tap can fill a tank in 6 hours. After half the tank is filled, three more similar taps are opened. What is the total time taken to fill the tank completely ?
(1) 4 hours
(2) 4 hours 15 minutes
(3) 3 hours 15 minutes
(4) 3 hours 45 minutes
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting))

5. Two pipes A and B can fill a cistern in $37\frac{1}{2}$ minutes and 45 minutes respectively. Both pipes are opened. The cistern will be filled just in half an hour, if the pipe B is turned off after :
(1) 15 minutes (2) 10 minutes
(3) 5 minutes (4) 9 minutes
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting))

6. A tank is fitted with two taps. The first tap can fill the tank completely in 45 minutes and the second tap can empty the full tank in one hour. If both the taps are opened alternately for one minute, then in how many hours the empty tank will be filled completely ?
(1) 2 hours 55 minutes
(2) 3 hours 40 minutes
(3) 4 hours 48 minutes
(4) 5 hours 53 minutes
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

7. A tank can be filled by two pipes in 20 minutes and 30 minutes respectively. When the tank was empty, the two pipes were opened. After some time, the first pipe was stopped and the tank was filled in 18 minutes. After how much time of the start was the first pipe stopped?
(1) 5 minutes (2) 8 minutes
(3) 10 minutes (4) 12 minutes
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC MTS Exam. 17.03.2013) (Ist Sitting))

8. A tap takes 36 hours extra to fill a tank due to a leakage equivalent to half of its inflow. The inflow can fill the tank in how many hours ?
(1) 36 hrs (2) 24 hrs
(3) 30 hrs (4) 18 hrs
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting))

9. A tank can be filled with water by two pipes A and B together in 36 minutes. If the pipe B was stopped after 30 minutes, the tank is filled in 40 minutes. The pipe B can alone fill the tank in
(1) 45 minutes (2) 60 minutes
(3) 75 minutes (4) 90 minutes
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting))

10. A tank has a leak which would empty the completely filled tank in 10 hours. If the tank is full of water and a tap is opened which admits 4 litres of water per minute in the tank, the leak takes 15 hours to empty the tank. How many litres of water does the tank hold ?
(1) 2400 l (2) 4500 l
(3) 1200 l (4) 7200 l
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting))

11. An empty tank can be filled by pipe A in 4 hours and by pipe B in 6 hours. If the two pipes are opened for 1 hour each alternately with first opening pipe A, then the tank will be filled in
(1) $1\frac{3}{4}$ hours (2) $2\frac{3}{5}$ hours
(3) $4\frac{2}{3}$ hours (4) $5\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & (SSC MTS Exam. 17.03.2013))

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12. Three pipes A, B and C can fill a cistern in 6 hours. After working at it together for 2 hours, C is closed and A and B fill it in 7 hours more. The time taken by C alone to fill the cistern is

(1) 14 hours (2) 15 hours
(3) 16 hours (4) 17 hours

(SSC CPO S.I. Exam. 06.09.2009)

13. A tap can fill a cistern in 40 minutes and a second tap can empty the filled cistern in 60 minutes. By mistake without closing the second tap, the first tap was opened. In how many minutes will the empty cistern be filled ?

(1) 72 (2) 84
(3) 108 (4) 120

(SSC CISF ASI Exam. 29.08.2010 (Paper-1))

14. Two pipes, P and Q can fill a cistern in 12 and 15 minutes respectively. Both are opened together, but at the end of 3 minutes, P is turned off. In how many more minutes will Q fill the cistern ?

(1) 7 minutes (2) $7\frac{1}{2}$ minutes

(3) 8 minutes (4) $8\frac{1}{4}$ minutes

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I) & (SSC GL Tier-I Exam. 21.04.2013)

15. A cistern is normally filled in 8 hours but takes another 2 hours longer to fill because of a leak in its bottom. If the cistern is full, the leak will empty it in :

(1) 16 hours (2) 20 hours
(3) 25 hours (4) 40 hours

(SSC SAS Exam. 26.06.2010 (Paper-I) & (FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

16. Pipe A can fill a cistern in 6 hours and pipe B can fill it in 8 hours. Both the pipes are opened simultaneously, but after two hours, pipe A is closed. How many hours will B take to fill the remaining part of the cistern ?

(1) 2 hrs (2) $3\frac{1}{3}$ hrs

(3) $2\frac{2}{3}$ hrs (4) 4 hrs

(SSC CHSL DEO & LDC Exam. 27.11.2010)

17. Two pipes A and B can fill a tank in 6 hours and 8 hours respectively. If both the pipes are opened together, then after how many hours should B be closed so that the tank is full in 4 hours?

(1) $\frac{2}{3}$ hrs (2) 1hrs

(3) 2 hrs (4) $\frac{8}{3}$ hrs

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

18. Three pipes A, B and C can fill a tank in 6 hours. After working together for 2 hours, C is closed and A and B fill the tank in 8 hours. The time (in hours) in which the tank can be filled by pipe C alone is

(1) 10 (2) 12
(3) 8 (4) 9

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

19. A pipe can fill a cistern in 9 hours. Due to a leak in its bottom, the cistern fills up in 10 hours. If the cistern is full, in how much time will it be emptied by the leak ?

(1) 70 hours (2) 80 hours
(3) 90 hours (4) 100 hours

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

20. Three pipes A, B and C can fill a tank in 6 hours. After working together for 2 hours, C is closed and A and B can fill the remaining part in 7 hours. The number of hours taken by C alone to fill the tank is

(1) 10 (2) 12
(3) 14 (4) 16

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

21. A tank has two pipes. The first pipe can fill it in 4 hours and the second can empty it in 16 hours. If two pipes be opened together at a time, then the tank will be filled in

(1) $5\frac{1}{2}$ hours (2) 10 hours

(3) 6 hours (4) $5\frac{1}{3}$ hours

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

22. Pipe A can fill a tank in 4 hours and pipe B can fill it in 6 hours. If they are opened on alternate hours and if pipe A is opened first, in how many hours, the tank shall be full ?

(1) $4\frac{1}{2}$ (2) $3\frac{1}{2}$

(3) $3\frac{1}{4}$ (4) $4\frac{2}{3}$

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

23. Two pipes A and B can fill a tank with water in 30 minutes and 45 minutes respectively. The water pipe C can empty the tank in 36 minutes. First A and B are opened. After 12 minutes C is opened. Total time (in minutes) in which the tank will be filled up is :

(1) 30 (2) 12
(3) 36 (4) 24

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

24. A leak in the bottom of a tank can empty the full tank in 6 hours. An inlet pipe fills water at the rate of 4 litres a minute. When the tank is full, the inlet is opened and due to the leak the tank is empty in 8 hours. Find the capacity of the tank.

(1) 5760 litres (2) 96 litres
(3) 10 litres (4) 24 litres

(SSC CGL Tier-I Re-Exam, 30.08.2015)

25. A pipe can fill a tank in 24 hrs. Due to a leakage in the bottom, it is filled in 36 hrs. If the tank is half full, how much time will the leak take to empty the tank?

(1) 48 hrs (2) 72 hrs
(3) 36 hrs (4) 24 hrs

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

TYPE–IV

1. One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 36 minutes, the slower pipe alone will be able to fill the tank in

(1) 81 minutes (2) 108 minutes
(3) 144 minutes (4) 192 minutes

(SSC CPO S.I. Exam. 12.01.2003) & (SSC CGL Tier-I Exam. 16.05.2010) (IInd Sitting)

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2. A pipe can empty a tank in 40 minutes. A second pipe with diameter twice as much as that of the first is also attached with the tank to empty it. The two together can empty the tank in :
(1) 8 minutes (2) $13\frac{1}{3}$ minutes
(3) 30 minutes (4) 38 minutes
(SSC CPO S.I. Exam. 26.05.2005)

3. Two pipes can fill a tank with water in 15 and 12 hours respectively and a third pipe can empty it in 4 hours. If the pipes be opened in order at 8, 9 and 11 a.m. respectively, the tank will be emptied at
(1) 11 : 40 a.m. (2) 12 : 40 p.m.
(3) 1 : 40 p.m. (4) 2 : 40 p.m.
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

4. A Boy and girl together fill a cistern with water. The boy pours 4 litres of water every 3 minutes and the girl pours 3 litres every 4 minutes. How much time will it take to fill 100 litres of water in the cistern ?
(1) 36 minutes (2) 42 minutes
(3) 48 minutes (4) 44 minutes
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. A pipe of diameter d can drain a certain water tank in 40 minutes. The time taken by a pipe of diameter 2d for doing the same job in :
(1) 5 minutes (2) 10 minutes
(3) 20 minutes (4) 80 minutes
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. Two pipes A and B can fill a water tank in 20 and 24 minutes respectively and a third pipe C can empty at the rate of 3 gallons per minute. If A, B and C are opened together to fill the tank in 15 minutes, the capacity (in gallons) of the tank is :
(1) 180 (2) 150
(3) 120 (4) 60
(SSC CPO S.I. Exam. 16.12.2007)

7. A swimming pool has 3 drain pipes. The first two pipes A and B, operating simultaneously, can empty the pool in half the time that C, the 3rd pipe, alone takes to empty it. Pipe A, working alone, takes half the time taken by pipe B. Together they take 6 hours 40 minutes to empty the pool. Time taken by pipe A to empty the pool, (in hours) is
(1) 15 (2) 10
(3) 30 (4) 7
(SSC Graduate Level Tier-II Exam.16.09.2012)

8. Which of these pipes will empty a pool the fastest?
(i) One pipe of diameter 60 cm
(ii) Two pipes of diameter 30 cm each
(iii) Three pipes of diameter 20 cm each
(1) (i) (2) (iii)7
(3) (ii) (4) None of these
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

9. A tap drips at a rate of one drop/sec. 600 drops make 100ml. The number of litres wasted in 300 days is
(1) 4320000 (2) 432000
(3) 43200 (4) 4320
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

10. Having the same capacity 9 taps fill up a water tank in 20 minutes. How many taps of the same capacity are required to fill up the same water tank in 15 minutes ?
(1) 10 (2) 12
(3) 15 (4) 18
(SSC CGL Tier-II Exam. 21.09.2014)

11. A tap can empty a tank in 30 minutes. A second tap can empty it in 45 minutes. If both the taps operate simultaneously, how much time is needed to empty the tank ?
(1) 30 minutes (2) 18 minutes
(3) 14 minutes (4) 15 minutes
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

SHORT ANSWERS

TYPE-I

1. (2)	2. (1)	3. (3)	4. (2)
5. (4)	6. (2)	7. (3)	8. (4)
9. (3)	10. (4)	11. (1)	12. (2)
13. (1)	14. (3)	15. (2)	16. (4)
17. (1)	18. (1)	19. (2)	20. (3)
21. (4)	22. (2)	23. (1)	24. (1)
25. (4)			

TYPE-II

1. (2)	2. (2)	3. (3)	4. (1)
5. (2)	6. (1)	7. (1)	8. (3)

TYPE-III

1. (3)	2. (4)	3. (2)	4. (4)
5. (4)	6. (4)	7. (2)	8. (4)
9. (4)	10. (4)	11. (3)	12. (1)
13. (4)	14. (4)	15. (4)	16. (2)
17. (4)	18. (2)	19. (3)	20. (3)
21. (4)	22. (4)	23. (4)	24. (1)
25. (3)			

TYPE-IV

1. (3)	2. (1)	3. (1)	4. (3)
5. (2)	6. (3)	7. (1)	8. (1)
9. (4)	10. (2)	11. (2)	

EXPLANATIONS

TYPE-I

1. (2) Part of the tank filled by both pipes in one minute

$$= \frac{1}{20} + \frac{1}{30}$$

$$\text{Required time} = \frac{1}{\frac{1}{20} + \frac{1}{30}}$$

$$= \frac{20 \times 30}{50} = 12 \text{ minutes}$$

2. (1) 1 hour = 60 minutes.
Rate of emptying the tank by the two taps are $\frac{1}{60}$ and $\frac{1}{30}$ of the tank per minute respectively.
Rate of emptying the tank when both operate simultaneously

$$= \frac{1}{60} + \frac{1}{30} = \frac{1+2}{60} = \frac{3}{60} = \frac{1}{20}$$

of the tank per minute.
∴ Time taken by the two taps together to empty the tank = 20 minutes

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3. (3) According to the question

Cistern filled in 1 hour = $\frac{1}{5}$ part

Cistern emptied in 1 hour

= $\frac{1}{4}$ part

When the both pipes are opened, simultaneously :

Cistern emptied in 1 hour

$= \frac{1}{4} - \frac{1}{5} = \frac{5-4}{20} = \frac{1}{20}$ part

∴ The time in which it will be emptied = 20 hours.

4. (2) Let the third pipe empty the cistern in x minutes.

Part of cistern filled in 1 minute when all three pipes are opened simultaneously

$= \frac{1}{60} + \frac{1}{75} - \frac{1}{x}$

According to the question,

$\frac{1}{60} + \frac{1}{75} - \frac{1}{x} = \frac{1}{50}$

$\Rightarrow \frac{1}{x} = \frac{1}{60} + \frac{1}{75} - \frac{1}{50}$

$= \frac{5+4-6}{300} = \frac{3}{300} \Rightarrow \frac{1}{x} = \frac{3}{300}$

$\therefore \quad x = \frac{300}{3} = 100$ minutes

5. (4) Part of the cistern filled in 1 hour $= \frac{1}{3} + \frac{1}{4} - \frac{1}{2}$

[Cistern filled by 1st pipe + Cistern filled by 2nd pipe − Cistern emptied by 3rd pipe]

$= \frac{4+3-6}{12} = \frac{1}{12}$

Hence, the cistern will be filled in 12 hours.

6. (2) Part of tank filled in 1 hour when all three pipes are opened simultaneously

$= \frac{1}{15} + \frac{1}{20} - \frac{1}{30}$

$= \frac{4+3-2}{60} = \frac{5}{60} = \frac{1}{12}$

Hence, the tank will be filled in 12 hours.

7. (3) Part of the cistern filled in 1 hour $= \frac{1}{8}$

Part of the cistern emptied in 1 hour $= \frac{1}{16}$

When both the taps are opened simultaneously, part of cistern filled in 1 hour

$= \frac{1}{8} - \frac{1}{16} = \frac{2-1}{16} = \frac{1}{16}$

Hence, the cistern will be filled in 16 hours.

8. (4) Part of the tank filled in 1 hour $= \frac{1}{x}$

Part of the tank emptied in 1 hour $= \frac{1}{y}$

Part of the tank filled in 1 hour when both are opened

$= \frac{1}{x} - \frac{1}{y} = \frac{y-x}{xy}$

∴ Tank will be filled in

$\frac{xy}{y-x}$ hours.

9. (3)

Hours/day	Days	Pumps
6 ↑	15 ↑	12 ↓
9	12	x

Let x be number of pumps

$\therefore 9:6 :: 12:x = 12:15 :: 12:x$

$\Rightarrow 9 \times 12 \times x = 6 \times 12 \times 15$

$\Rightarrow x = \frac{6 \times 12 \times 15}{9 \times 12} = 10$

10. (4) Part of the cistern filled in 1 hour when pipes P and S are open

$= \frac{1}{4} - \frac{1}{10} = \frac{5-2}{20} = \frac{3}{20}$

Hence, the cistern will be filled in $\frac{20}{3}$ hours = 6.6 hours

Part of the cistern filled in 1 hour when pipes P, R and S are open

$= \frac{1}{4} + \frac{1}{12} - \frac{1}{10}$

$= \frac{15+5-6}{60} = \frac{14}{60} = \frac{7}{30}$

Hence, the cistern will be filled in $\frac{30}{7}$ hours = 4.3 hours

Part of the cistern filled in 1 hour when pipes P, Q and S are open

$= \frac{1}{4} + \frac{1}{8} - \frac{1}{10}$

$= \frac{10+5-4}{40} = \frac{11}{40}$

Hence, the cistern will be filled in $\frac{40}{11}$ hours ≈ 3.6 hours

∴ Cistern can be filled faster when P, Q & S are open

11. (1) Part of the cistern filled by both pipes in 1 hour

$= \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{1}{6}$

∴ The cistern will be filled in 6 hours.

12. (2) Part of the cistern filled by taps A, B and C in 1 minute = $\frac{1}{10}$

Part of the cistern filled by taps A and B in 1 minute

$= \frac{1}{30} + \frac{1}{40} = \frac{4+3}{120} = \frac{7}{120}$

∴ Part of the cistern filled by tap C in 1 minute

$= \frac{1}{10} - \frac{7}{120} = \frac{12-7}{120} = \frac{5}{120} = \frac{1}{24}$

∴ Tap C will fill the cistern in 24 minutes.

13. (1) Part of the tank filled when both taps are opened together

$= \frac{1}{40} - \frac{1}{60} = \frac{3-2}{120} = \frac{1}{120}$

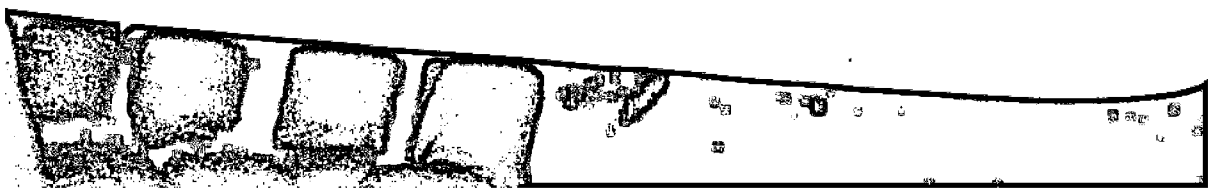
Hence, the tank will be filled in 120 minutes 2 hours.

14. (3) Part of the tank filled in 1 hour by pipe A = $\frac{1}{2}$

Part of the tank filled by both pipes in1 hour

$= \frac{1}{2} + \frac{1}{6} = \frac{3+1}{6} = \frac{2}{3}$

So, Time taken to fill $\frac{2}{3}$ part



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= 60 minutes

∴ Time taken to fill $\frac{1}{2}$ part

$= \frac{60 \times 3}{2} \times \frac{1}{2} = 45$ minutes

∴ The tank will be filleld at 11:45 A.M.

5. (2) Part of the cistern filled by pipe Q in 1 minute

$= \frac{1}{20} - \frac{1}{30} = \frac{3-2}{60} = \frac{1}{60}$

∴ Required time = 60 minutes

6. (4) Part of cistern filled by three pipes in an hour

$= \frac{1}{3} + \frac{1}{5} - \frac{1}{2} = \frac{10+6-15}{30}$

$= \frac{1}{30}$

Hence, the cistern will be filled in 30 hours.

17. (1) Part of the tank filled by all three taps in an hour

$= \frac{1}{4} + \frac{1}{6} + \frac{1}{12} = \frac{6+4+2}{24} = \frac{1}{2}$

∴ Hence, the tank will be filled in 2 hours.

18. (1) If the slower pipe fills the tank in x hours, then

$\frac{1}{x} + \frac{1}{x-10} = \frac{1}{12}$

$\Rightarrow \frac{x-10+x}{x(x-10)} = \frac{1}{12}$

$\Rightarrow x^2 - 10x = 24x - 120$

$\Rightarrow x^2 - 34x + 120 = 0$

$\Rightarrow x^2 - 30x - 4x + 120 = 0$

$\Rightarrow x(x-30) - 4(x-30) = 0$

$\Rightarrow (x-4)(x-30) = 0$

∴ $x = 30$ because $x \neq 4$

∴ Required time

= 30 − 10 = 20 hours

19. (2) If pipe y be closed after x minutes, then

$\frac{18}{24} + \frac{x}{32} = 1$

$\Rightarrow \frac{x}{32} = 1 - \frac{18}{24} = 1 - \frac{3}{4} = \frac{1}{4}$

$\Rightarrow x = \frac{32}{4} = 8$ minutes

20. (3) Part of the tank filled in first two minutes $= \frac{1}{20} - \frac{1}{30} = \frac{3-2}{60}$

$= \frac{1}{60}$

∴ Part of tank filllied in 114 minutes

$= \frac{57}{60} = \frac{19}{20}$

∴ Remaining part of cistern will be filled in 115th minute

21. (4) Part of the tank filled by both taps in 5 minutes

$= 5\left(\frac{1}{30} + \frac{1}{60}\right)$

$= 5\left(\frac{2+1}{60}\right) = 5 \times \frac{3}{60} = \frac{1}{4}$

Remaining part $= 1 - \frac{1}{4} = \frac{3}{4}$ that is filled by second tap.

∴ Time taken $= \frac{3}{4} \times 60$

= 45 minutes

22. (2) Part of the tank filled by pipes A and B in 1 minute

$= \frac{1}{36} + \frac{1}{45} = \frac{5+4}{180}$

$= \frac{9}{180} = \frac{1}{20}$

Part of the tank filled by these pipes in 7 minutes

$= \frac{7}{20}$

Remaining unfilled part

$= 1 - \frac{7}{20} = \frac{20-7}{20} = \frac{13}{20}$

When all three pipes are opened.

$= \frac{1}{20} - \frac{1}{30}$

$= \frac{3-2}{60} = \frac{1}{60}$

∴ Time taken in filling $\frac{13}{20}$ part

$= \frac{13}{20} \times 60 = 39$ minutes

Required time = 39 + 7

= 46 minutes

23. (1) Part of tank filled by pipes A and B in 1 hour

$= \frac{1}{2} + \frac{1}{3} = \frac{3+2}{6} = \frac{5}{6}$ parts

∴ Required time $= \frac{6}{5}$ hours

$= 1$ hour $\frac{1}{5} \times 60$

= 1 hour 12 minutes

24. (1) When both pipes are opened simultaneously, part of the tank filled in 1 hour

$= \frac{1}{x} - \frac{1}{y} = \frac{y-x}{xy}$

∴ Required time $= \frac{xy}{y-x}$ hours

25. (4) Part of tank filled by pipes A and B in 2 hours

$= 2\left(\frac{1}{6} + \frac{1}{8}\right)$

$= 2\left(\frac{4+3}{24}\right) = \frac{7}{12}$

Remaining part $= 1 - \frac{7}{12} = \frac{5}{12}$

This part is filled by pipe B.

∴ Required time $= \frac{5}{12} \times 8$

$= \frac{10}{3}$ hours

$= 3\frac{1}{3}$ hours

TYPE-II

1. (2) Let the capacity of the tank be x litres then $\frac{x}{3} = 80$

∴ x = 240

∴ $\frac{x}{2} = \frac{240}{2} = 120$ litres

2. (2) Part of cistern emptied in 1 hour

$= \frac{1}{5} - \frac{1}{8} = \frac{8-5}{40} = \frac{3}{40}$

∵ $\frac{3}{40}$ part is emptied in 1 hour.

∴ $\frac{3}{4}$ part is emptied in $\frac{40}{3} \times \frac{3}{4}$

= 10 hours.

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3. (3) Let the capacity of the tank be x litres.
According to the question,

$\frac{3x}{4} = 30$

$\Rightarrow 3x = 30 \times 4$

$\Rightarrow x = \frac{30 \times 4}{3} = 40$ litres

4. (1) Part of the tank filled in 1 hour,

$= \frac{1}{12} - \frac{1}{20} = \frac{5-3}{60} = \frac{1}{30}$

$\therefore$ Tank will be filled in 30 hours.

5. (2) Part of tank filled in 1 hour when all three pipes are opened

$= \frac{1}{10} + \frac{1}{12} - \frac{1}{6}$

$= \frac{6+5-10}{60} = \frac{1}{60}$

$\therefore$ The tank will be filled in 60 hours.

$\therefore$ One fourth of the tank will be filled in 15 hours $\left[\frac{1}{4} \times 60\right]$ i.e. the tank will be filled at 10 p.m.

6. (1) Time taken to fill the $\frac{3}{5}$ of the cistern = 60 seconds

$\therefore$ Time taken in filling $\frac{2}{5}$ part

$= \frac{60 \times 5}{3} \times \frac{2}{5} = 40$ seconds

7. (1) Part of the tank filled in an hour by both pumps

$= \frac{1}{8} + \frac{1}{10} = \frac{5+4}{40} = \frac{9}{40}$

$\therefore$ Part of the tank filled in 4 hours

$= \frac{4 \times 9}{40} = \frac{9}{10}$

8. (3) Part of the tank filled by B and C in half an hour

$= \frac{1}{2}\left(\frac{1}{9} + \frac{1}{12}\right)$

$= \frac{1}{2}\left(\frac{4+3}{36}\right) = \frac{7}{72}$

Remaining part

$= 1 - \frac{7}{72} = \frac{72-7}{72} = \frac{65}{72}$

Part of tank filled by three pipes in an hour

$= \frac{1}{6} + \frac{1}{9} + \frac{1}{12}$

$= \frac{6+4+3}{36} = \frac{13}{36}$

$\therefore$ Time to fill remaining part

$= \frac{65}{72} \times \frac{36}{13} = \frac{5}{2} = 2\frac{1}{2}$ hours

TYPE-III

1. (3) Part filled by A and B in 1 hour

$= \frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{3}{20}$ + ...(i)

Part filled by A and C in the next 1 hour

$= \frac{1}{12} + \frac{1}{20} = \frac{5+3}{60} = \frac{2}{15}$

Part filled in 2 hours

$= \frac{3}{20} + \frac{2}{15} = \frac{9+8}{60} = \frac{17}{60}$

$\Rightarrow$ Part filled in 6 hours $= \frac{51}{60}$

Remaining part

$= 1 - \frac{51}{60} = \frac{9}{60} = \frac{3}{20}$

This part will be filled by (A+B) in 1 hour. [By (i)]

$\therefore$ Total time taken = 7 hours

2. (4) Work done in 1 hour by the filling pump $= \frac{1}{2}$

Work done in 1 hour by the leak and the filling pump $= \frac{3}{7}$

$\therefore$ Work done by the leak in 1 hour

$= \frac{1}{2} - \frac{3}{7} = \frac{7-6}{14} = \frac{1}{14}$

Hence, the leak can empty the tank in 14 hours.

3. (2) Let the leak empty the full tank in x hours.

$\frac{1}{3} - \frac{1}{x} = \frac{2}{7}$

$\Rightarrow \frac{1}{x} = \frac{1}{3} - \frac{2}{7} = \frac{7-6}{21}$

$\Rightarrow \frac{1}{x} = \frac{1}{21} \Rightarrow x = 21$ hours

4. (4) A tap can fill the tank in 6 hours. In filling the tank to its half, time required = 3 hours.

Remaining part $= \frac{1}{2}$

$\because$ 1 tap takes 6 hours to fill the tank

$\therefore$ Time taken by 4 taps take to fill $\frac{1}{2}$ of the tank

$= \frac{6}{4} \times \frac{1}{2} = \frac{3}{4}$ hour

$\therefore$ Total time $= 3 + \frac{3}{4}$

$= 3\frac{3}{4}$ hours

= 3 hours 45 minutes

5. (4) Pipe A fills the tank in $\frac{75}{2}$ minutes.
$\therefore$ Part of the tank filled by A in 30 minutes

$= \frac{2}{75} \times 30 = \frac{4}{5}$

Remaining part $= 1 - \frac{4}{5} = \frac{1}{5}$

Now, 1 part is filled by pipe B in 45 minutes

$\therefore \frac{1}{5}$ part is filled in

$= 45 \times \frac{1}{5} = 9$ minutes

Hence, the pipe B should be turned off after 9 minutes.

6. (4) Part of the tank filled in one minute

$= \frac{1}{45} - \frac{1}{60}$

$= \frac{4-3}{180} = \frac{1}{180}$

$\because \frac{1}{180}$ part is filled in 1 minute

$\therefore 1 - \frac{1}{45} = \frac{44}{45}$ part is filled in

$\frac{2 \times 180 \times 44}{45} = 352$ minutes

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i.e. 5 hours 52 minutes

Remaining $\frac{1}{45}$ part will be filled in 1 minute.

∴ Total time taken = 5 hours 53 minutes

7. (2) Let the first pipe be closed after x minutes

$\therefore \frac{x}{20}+\frac{18}{30} = 1$

$\Rightarrow \frac{x}{20} = 1-\frac{18}{30} = 1-\frac{3}{5} = \frac{2}{5}$

$\Rightarrow x = \frac{2}{5} \times 20 = 8$ minutes

8. (4) Let the inflow fill the tank in x hours.

$\therefore \frac{1}{x}-\frac{1}{2x} = \frac{1}{36}$

[leakage being half of inflow]

$\Rightarrow \frac{2-1}{2x} = \frac{1}{36}$

$\Rightarrow 2x = 36$

$\Rightarrow x = \frac{36}{2} = 18$ hours

9. (4) Let the pipe B fill the tank in x minutes.

Part of the tank filled by pipes A and B in 1 minute = $\frac{1}{36}$

∴ Part of the tank filled by pipe A in 1 minute $= \frac{1}{36}-\frac{1}{x}$

According to the question,

$30 \times \frac{1}{x} + 40\left(\frac{1}{36}-\frac{1}{x}\right) = 1$

$\Rightarrow \frac{30}{x}+\frac{10}{9}-\frac{40}{x} = 1$

$\Rightarrow \frac{40}{x}-\frac{30}{x} = \frac{10}{9}-1$

$\Rightarrow \frac{10}{x} = \frac{1}{9} \Rightarrow x = 90$ minutes

10. (4) Let the capacity of the tank = x litres

According to the question,

Quantity of water emptied by the leak in 1 hour = $\frac{x}{10}$ litres

Qunatity of water filled by the tap in 1 hour = 240 litres

According to the question,

$\frac{x}{10}-\frac{x}{15} = 240$

$\Rightarrow \frac{3x-2x}{30} = 240$

$\Rightarrow \frac{x}{30} = 240$

$\Rightarrow x = 240 \times 30 = 7200$ litres

11. (3) Part of the tank filled in first 2 hours

$= \frac{1}{4}+\frac{1}{6} = \frac{3+2}{12} = \frac{5}{12}$ Part

∴ Part of the tank filled in first 4 hours

$= \frac{2\times5}{12}$ parts $= \frac{5}{6}$ parts

Remaining part $= 1-\frac{5}{6} = \frac{1}{6}$

Now it is the turn of pipe A,

Time taken to fill $\frac{1}{4}$ part = 1 hour

∴ Time taken to fill $\frac{1}{6}$ part

$= \frac{1}{6}\times4 = \frac{2}{3}$ hour

∴ Total time $= 4+\frac{2}{3}$

$= 4\frac{2}{3}$ hours

12. (1) Part of the cistern filled by pipes A, B and C in 1 hour $= \frac{1}{6}$

∴ Part of the cistern filled by all three pipes in 2 hours $= \frac{1}{3}$

∴ Remaining part $= 1-\frac{1}{3} = \frac{2}{3}$

Now, pipe A and B fill $\frac{2}{3}$ part of the cistern in 7 hours

∴ Pipe A and B will fill the cistern in $\frac{7\times3}{2} = \frac{21}{2}$ hours

∴ Part of the cistern filled by A and B in 1 hour $= \frac{2}{21}$

So Part of the cistern filled by C in 1 hour $= \frac{1}{6}-\frac{2}{21}$

$= \frac{7-4}{42} = \frac{1}{14}$

∴ Pipe C will fill the cistern in 14 hours.

13. (4) Tricky Approach

Part of the cistern filled in 1 minute by both the taps

$= \frac{1}{40}-\frac{1}{60} = \frac{3-2}{120} = \frac{1}{120}$

∴ Empty cistern will be filled in 120 minutes.

14. (4) Part of the tank filled in 3 minutes by pipes P and Q

$= 3\left(\frac{1}{12}+\frac{1}{15}\right)$

$= 3\left(\frac{5+4}{60}\right) = \frac{3\times9}{60} = \frac{9}{20}$

So, Remaining part

$= 1-\frac{9}{20} = \frac{11}{20}$

∴ Time taken by Q

$= \frac{11}{20}\times15 = \frac{33}{4} = 8\frac{1}{4}$ minutes

15. (4) Part emptied by the leak in 1 hour

$= \frac{1}{8}-\frac{1}{10} = \frac{5-4}{40} = \frac{1}{40}$

∴ The leak will empty the cistern in 40 hours.

16. (2) Part of the cistern filled in 2 hours by pipe A and B

$= 2\left(\frac{1}{6}+\frac{1}{8}\right) = 2\left(\frac{4+3}{24}\right) = \frac{7}{12}$

Remaining part $= 1-\frac{7}{12} = \frac{5}{12}$

∴ Time taken by pipe B in filling $\frac{5}{12}$ part

$= \frac{5}{12}\times8 = \frac{10}{3} = 3\frac{1}{3}$ hours

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17. (4) Part of the tank filled in 4 hours by pipe A $= \frac{4}{6} = \frac{2}{3}$

Remaining part $= \frac{1-2}{3} = \frac{1}{3}$

Time taken by pipe B in filling $\frac{1}{3}$ part $= \frac{8}{3}$ hours

[Time by B 8 hours required]

18. (2) Part of the tank filled by (A + B + C) in 1 hour $= \frac{1}{6}$

Part of tank filled by these in 2 hours $= \frac{2}{6} = \frac{1}{3}$

Remaining part $= 1 - \frac{1}{3} = \frac{2}{3}$

Time taken by A and B in filling $\frac{2}{3}$rd part

= 8 hours

∴ Time taken by A and B in filling the whole tank

$= \frac{8 \times 3}{2} = 12$ hours

∴ Part of tank filled by C in an hour

$= \frac{1}{6} - \frac{1}{12} = \frac{1}{12}$

Hence, required time = 12 hours

19. (3) Part of the tank emptied by the leak in 1 hour $= \frac{1}{9} - \frac{1}{10}$

$= \frac{10-9}{90} = \frac{1}{90}$

∴ Required time = 90 hours

20. (3) A, B and C together fill the tank in 6 hours.

∴ Part of the tank filled in 1 hour by (A + B + C) $= \frac{1}{6}$

∴ Part of the tank filled in 2 hours by all three pipes

$= \frac{2}{6} = \frac{1}{3}$

Remaining empty part

$= 1 - \frac{1}{3} = \frac{2}{3}$

This $\frac{2}{3}$ part is filled by (A + B).

∴ Time taken by (A + B) to fill the fully empty tank

$= \frac{7 \times 3}{2} = \frac{21}{2}$ hours

∴ Part of tank filled by C in 1 hour

$= \frac{1}{6} - \frac{2}{21} = \frac{7-4}{42} = \frac{3}{42} = \frac{1}{14}$

∴ Required time = 14 hours.

21. (4) Part of tank filled by both the pipes in 1 hour $= \frac{1}{4} - \frac{1}{16}$

$= \frac{4-1}{16} = \frac{3}{16}$

∴ Required time $= \frac{16}{3}$

$= 5\frac{1}{3}$ hours

22. (4) Part of tank filled in first two hours

$= \frac{1}{4} + \frac{1}{6} = \frac{3+2}{12} = \frac{5}{12}$

Part of tank filled in first 4 hours

$= \frac{10}{12} = \frac{5}{6}$

Remaining part

$= 1 - \frac{5}{6} = \frac{1}{6}$

This remaining part will be filled by pipe A.

Time taken by pipe A

$= \frac{1}{6} \times 4 = \frac{2}{3}$ hour

∴ Total time

$= 4 + \frac{2}{3} = 4\frac{2}{3}$ hours

23. (4) Part of tank filled by pipes A and B in 1 minute

$= \frac{1}{30} + \frac{1}{45} = \frac{3+2}{90} = \frac{1}{18}$ part

∴ Part of tank filled in 12 minutes

$= \frac{12}{18} = \frac{2}{3}$ part

Remaining part

$= 1 - \frac{2}{3} = \frac{1}{3}$ part

When pipe C is opened,

Part of tank filled by all three pipes $= \frac{1}{30} + \frac{1}{45} - \frac{1}{36}$

$= \frac{6+4-5}{180} = \frac{5}{180} = \frac{1}{36}$

∴ Time taken in filling $\frac{1}{3}$ part

$= \frac{1}{3} \times 36 = 12$ minutes

∴ Total time = 12 + 12

= 24 miuntes

24. (1) Part of tank filled by inlet pipe in 1 hour

$= \frac{1}{6} - \frac{1}{8} = \frac{4-3}{24} = \frac{1}{24}$

Hence, if there is no leak, the inlet pipe will fill the tank in 24 hours.

∴ Capacity of the tank

$= 24 \times 60 \times 4$

= 5760 litres

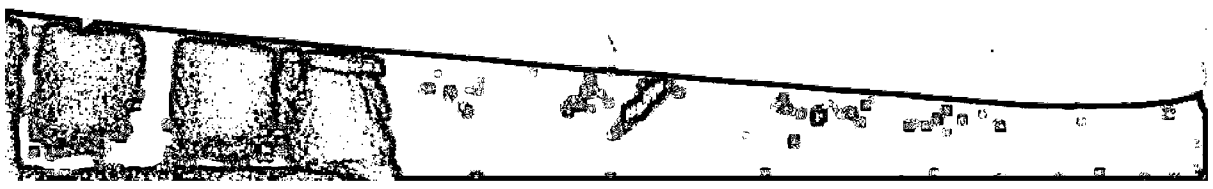
25. (3) Part of tank emptied by leak in an hour $= \frac{1}{36} - \frac{1}{24}$

$= \frac{2-3}{72} = \frac{-1}{72}$

∴ Time taken in emptying the full tank

= 72 hours

∴ Required time = 36 hours



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TYPE-IV

1. (3) Let time taken by faster pipe be x minutes.

$\therefore \frac{1}{x}+\frac{1}{3x}=\frac{1}{36}$

$\Rightarrow \frac{3+1}{3x}=\frac{1}{36}$

$\Rightarrow 3x = 36 \times 4$

$\Rightarrow x = 48$

$\therefore$ Time taken by slower pipe to fill the tank $= 3x$

$= 3 \times 48 = 144$ minutes

2. (1) Here, the diameter of the second pipe is twice that of first pipe.

$\therefore$ Volume of water emptied by the second pipe will be 4 times to that of first pipe.

Hence, time taken will be $\frac{1}{4}$ of the first pipe.

$\therefore$ Second pipe will empty the tank in $\frac{1}{4}\times 40 = 10$ minutes

When both the pipes are open, the part of the tank emptied in 1 minute $= \frac{1}{40}+\frac{1}{10}=\frac{1+4}{40}=\frac{1}{8}$

Hence, the tank will be emptied in 8 minutes.

3. (1) Part filled by A from 8 a.m to 11 a.m. $= \frac{3}{15}=\frac{1}{5}$

Part filled by B from 9 a.m. to 11 a.m. $= \frac{2}{12}=\frac{1}{6}$

Total Part filled till 11 a.m.

$= \frac{1}{5}+\frac{1}{6}=\frac{6+5}{30}=\frac{11}{30}$

At 11 a.m. pipe C is opened to empty it.

$\therefore$ Part of tank emptied in 1 hour

$= \frac{1}{4}-\frac{1}{15}-\frac{1}{12}$

$= \frac{15-4-5}{60}=\frac{1}{10}$

$\therefore \frac{11}{30}$ part will be emptied in

$\frac{11}{30}\times 10 = \frac{11}{3}$ hours or $3\frac{2}{3}$

i.e. 3 hours 40 minutes

i.e. at 11.40 a.m.

4. (3) Water filled by the boy and girl in 1 minute

$= \frac{4}{3}+\frac{3}{4}=\frac{16+9}{12}=\frac{25}{12}$ litres

$\therefore$ Time taken to fill 100 litres

$= \frac{100}{25}\times 12 = 48$ mintues

5. (2)

$\text{Time} \propto \frac{1}{\text{cross sectional area of the pipe}}$

$\text{Time} \propto \frac{1}{\frac{\pi}{4}d^2}$

$\text{Time} \propto \frac{1}{d^2}$

$\therefore \frac{t_2}{t_1}=\frac{(d_1)^2}{(d_2)^2}$

[Being inversely related]

$t_2 = t_1\left(\frac{d_1}{d_2}\right)^2$

$t_1 = 40$ minutes, $d_1 = d$, $d_2 = 2d$

$\therefore t_2 = 40\left(\frac{d}{2d}\right)^2$

$t_2 = 40\left(\frac{1}{2}\right)^2$

$t_2 = 10$ minutes

6. (3) Let the capacity of the tank be x gallons.

Quantity of water filled in the tank in 1 minute when all the pipes A, B and C are opened simultaneously $= \frac{x}{20}+\frac{x}{24}-3$

According to the question,

$\frac{x}{20}+\frac{x}{24}-3=\frac{x}{15}$

$\Rightarrow \frac{x}{20}+\frac{x}{24}-\frac{x}{15}=3$

$\Rightarrow \frac{6x+5x-8x}{120}=3$

$\Rightarrow 3x = 3 \times 120$

$\Rightarrow x = \frac{3\times 120}{3} = 120$ gallons

7. (1) Time taken by pipe B $= 2x$ hours

Time taken by pipe A $= x$ hours

$\therefore$ Time taken by pipe C

$= \frac{2}{\frac{1}{2x}+\frac{1}{x}}=\frac{2}{\frac{1+2}{2x}}$

$= \frac{4x}{3}$ hours

$\therefore \frac{1}{x}+\frac{1}{2x}+\frac{3}{4x}$

$= \frac{1}{6+\frac{40}{60}}=\frac{1}{6+\frac{2}{3}}$

$\Rightarrow \frac{4+2+3}{4x}=\frac{3}{20}$

$\Rightarrow 9 \times 20 = 4x \times 3$

$\Rightarrow x = \frac{9\times 20}{4\times 3} = 15$ hours

8. (1) If the flow of water per unit time be x km, then

$V = \pi r^2 h$ [$\because$ Pipe is in cylinderical shape]

Greater the radius, larger the capacity of pipe.

Radius is greatest in (i) i.e. 30cm.

Hence, pipe with 60 cm diameter will empty the pool fastest.

Therefore, $V \propto r^2$

9. (4) 300 days $=$ (300 × 24) hours

$=$ (300 × 24 × 60 × 60) seconds

$\therefore$ Number of drops

$= 300 \times 24 \times 60 \times 60$

$\because$ 600 drops $= 100$ ml.

$\therefore 300 \times 24 \times 60 \times 60$ drops

$= \left(\frac{300\times 24\times 60\times 60}{6}\right)$ ml.

$=$ (1200 × 60 × 60) ml.

$= \left(\frac{1200\times 60\times 60}{1000}\right)$ litre

$= 4320$ litre.

10. (2) $M_1 D_1 = M_2 D_2$

$\Rightarrow 9 \times 20 = M_2 \times 15$

$\Rightarrow M_2 = \frac{9\times 20}{15} = 12$ pipes

Note : Same relation as men and days is applicable

11. (2) Part of tank emptied by both pipes in 1 minute

$= \frac{1}{30}+\frac{1}{45}=\frac{3+2}{90}$

$= \frac{5}{90}=\frac{1}{18}$

$\therefore$ Required time $= 18$ minutes

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TEST YOURSELF

1. Pipe 1 and 2 can fill a tank alone in 6 hours and 9 hours respectively. Pipe 3 can empty the full tank in 18 hours. If all the 3 pipes are opened simultaneously, then how much time is required to fill the tank completely?
(1) 2 hours
(2) 3.6 hours
(3) 4.5 hours
(4) cannot be filled

2. Pipe A and B can fill a tank in 12 and 15 hours respectively. An outlet pipe C, can empty it in 6 hours. Initially pipes A and B are opened together, and after 5 hours pipe C is also opened. Find the time required to empty the tank?
(1) 45 hours (2) 50 hours
(3) 60 hours (4) None of these

3. Three pipes 1, 2 and 3 together take 24 hours to fill a tank. The three pipes are opened for 6 hours after which Pipe 3 is closed. Pipe 1 and 2 take another 30 hours to fill the tank. In how much time would Pipe 3, alone fill the tank?
(1) 40 hours (2) 30 hours
(3) 68 hours (4) None of these

4. Two pipes x and y can fill a tank in 24 and 30 minutes respectively. Both the pipes are opened for 6 minutes, after which Pipe x is turned off. How much more time will it take to fill the tank?
(1) 16.5 minutes
(2) 22.5 minutes
(3) 24 minutes
(4) cannot be determined

5. A tank is usually filled in 18 hours. But because of a leak in it's bottom, it takes another 6 hours to fill. How much time will it take to the leak to empty the full tank?
(1) 72 (2) 74
(3) 75 (4) 76

6. A pipe can fill a tank in 4 hours, but due to a leak in the tank, it is filled in 5 hours. If the tank is full, how much time will the leak take to empty the tank completely?
(1) 10 hours (2) 15 hours
(3) 20 hours (4) 12 hours

7. Pipes 1 and 2 can fill a tank in 18 and 24 hours respectively. Both pipes work simultaneously for sometime after which Pipe 1 is turned off. It takes 12 hours in all to fill the tank completely. Find the time for which Pipe 1 was turned on.
(1) 9 hours (2) 10 hours
(3) 11 hours (4) 12 hours

8. The volume of water flowing through a pipe is directly proportional to square of it's radius. A tank has four inlet pipes with diameters as 2 cm, 4 cm, 6 cm and 8 cm. If the smallest pipe, alone, can fill a tank in 30 hours, then how much time would all the four pipes, when working together would take?
(1) 1 hour (2) 4 hours
(3) 6 hours (4) None of these

9. Two pipes can fill a tank in 10 minutes and 30 minutes respectively and a third pipe can empty the full tank in 20 minutes. If all the three pipes are opened simultaneously, the tank will be filled in
(1) 10 minutes (2) 8 minutes
(3) 7 minutes (4) None of these

10. A cistern can be filled by two pipes in 20 and 30 minutes respectively. Both pipes being opened, when must the first pipe be turned off so that the cistern may be filled in 10 minutes more?
(1) after 10 minutes
(2) after 12 minutes
(3) after 20 minutes
(4) after 8 minutes

11. Tap A, B and C are connected to a water tank and the rate of flow of water is 42 litres/hr, 56 litres/hr and 48 litres/hr respectively. Tap A and B fill the tank while tap C empties the tank. If all the three taps are opened simultaneously, the tank gets completely filled up in 16 hours. What is the capacity of the tank?
(1) 960 litres (2) 2346 litres
(3) 1600 litres (4) 800 litres

12. Two full tanks, one shaped like a cylinder and the other like a cone, contain jet fuel. The cylindrical tank holds 500 L more than the conical tank. After 200 L of fuel has been pumped out from each tank, the cylindrical tank contains twice the amount of fuel in the conical tank. How many litres of fuel did the cylindrical tank have when it was full?
(1) 700 L (2) 1,000 L
(3) 1,100 L (4) 1,200 L

SHORT ANSWERS

1. (3)	2. (1)	3. (4)	4. (1)
5. (1)	6. (3)	7. (1)	8. (1)
9. (4)	10. (4)	11. (4)	12. (4)

EXPLANATIONS

1. (3) Work done in 1 hour by all 3 pipes $= \frac{1}{6}+\frac{1}{9}-\frac{1}{18}=\frac{4}{18}$

$\therefore$ Time required to fill the tank completely $= \frac{18}{4} = 4.5$ hours

2. (1) Tank filled by A & B in 5 hours

$=\left(\frac{1}{12}+\frac{1}{15}\right)5=\frac{9\times5}{60}=\frac{3}{4}$

Work done in 1 hour when all 3 pipes are opened

$=\frac{1}{12}+\frac{1}{15}-\frac{1}{6}=\frac{9-10}{60}=\frac{-1}{60}$

Since the result (or net effect) is negative, hence tank would be emptied.

So, $\frac{1}{60}$ is emptied in 1 hour

$\frac{3}{4}$ would be emptied in $\frac{1}{1/60}\times\frac{3}{4}=45$ hours

3. (4) Tank filled by all 3 in 6 hours

$=\left(\frac{1}{24}\right)6=\frac{1}{4}$

Remaining $=\left(1-\frac{1}{4}\right)=\frac{3}{4}$ is filled by, Pipe 1 and 2 in 30 hours
So, the entire tank would be filled by 1 and 2 in 40 hours

1 hour work of all 3 $=\frac{1}{24}$.

1 hour work of Pipe 1 & 2 $=\frac{1}{40}$

Hence, 1 hour work of Pipe

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$3 = \frac{1}{24} - \frac{1}{40} = \frac{2}{120} = \frac{1}{60}$

$\therefore$ Pipe 3 alone would fill the tank in 60 hours.

4. (1) When Pipe x is turned off (after 6 minutes),
Work done by x and y in 6 minutes

$= \left(\frac{1}{24} + \frac{1}{30}\right)6 = \frac{9}{20}$

Remaining work

$= 1 - \frac{9}{20} = \frac{11}{20}$ which would be done by Pipe y alone.
1 work is done by Pipe y (alone) in 30 minutes

$\frac{11}{20}$ work is done by Pipe y (alone)

in $30 \times \frac{11}{20} = \frac{33}{2}$ minutes = 16.5 minutes.

5. (1) Consider the case when there is no leak – Then in one hour, work done = $\frac{1}{18}$, and in 6 hours

$= \frac{6}{18} = \frac{1}{3}$.

This means $\frac{1}{3}$rd of the tank is emptied because of the leakage in 18 + 6 = 24 hours.

So, $\frac{1}{3}$rd is emptied in 24 hours, full tank would be emptied in 24 × 3 = 72 hours.
Method-2 : Using formula directly, we get
Time required by leakage to empty the full tank $= \frac{ab}{b-a}$
Here, $a = 18$, $b = 24$ Hence, t

$= \frac{18 \times 24}{24 - 18} = 72$ hours

6. (3) In 1 hour, water filled = $\frac{1}{4}$th of the tank.

$\frac{1}{4}$th is emptied by leakage in 5 hours.
Full tank would be emptied in 20 hours (i.e. 5 × 4).

OR

[Using formula, t

$= \frac{5 \times 4}{5 - 4} = 20$ hours]

7. (1) Let the time for which Pipe 1 is turned on be 'x' hours, hence Pipe 1 has worked for 'x' hours and Pipe 2 has worked for 12 hours.

$\frac{1}{18}(x) + \frac{1}{24}(12) = 1$

$\frac{x}{18} + \frac{1}{2} = 1$ or $\frac{x}{18} = \frac{1}{2} \Rightarrow x = 9$

$\therefore$ Pipe 1 was turned on for 9 hours.
Method-2 :
For 'x' hours both pipes worked, and for $(12 - x)$ hours, only Pipe 2 worked, hence,

$x\left(\frac{1}{18} + \frac{1}{24}\right) + \frac{1}{24}(12 - x) = 1$

$\frac{7}{72}x - \frac{x}{24} = \frac{1}{2}$

$\Rightarrow \frac{(14-6)x}{72 \times 2} = \frac{1}{2}$ and

$x = \frac{1}{2} \times \frac{2 \times 72}{8} = 9$ hours

8. (1) We are given that $V = k(r)^2$ where V is volume of water and 'r' is radius of pipe and K is a constant.
The smallest pipe takes 30 hours to fill the tank alone, hence work done in 1 hour $= \frac{1}{30}$,

radius $= \frac{\text{diameter}}{2} = \frac{2}{2} = 1$

$\frac{1}{30} = k(1)^2$ so, $k = \frac{1}{30}$.

Work done in 1 hour by Pipe 2

$= \frac{1}{30}\left(\frac{4}{2}\right)^2 = \frac{4}{30}$

Work done in 1 hour by Pipe 3

$= \frac{1}{30}\left(\frac{6}{2}\right)^2 = \frac{9}{30}$

Work done in 1 hour by Pipe 4

$= \frac{1}{30}\left(\frac{8}{2}\right)^2 = \frac{16}{30}$

In 1 hour, work done by all 4 pipes

$= \frac{1}{30} + \frac{4}{30} + \frac{9}{30} + \frac{16}{30} = \frac{30}{30} = 1$

Hence, the whole tank gets filled in 1 hour.

9. (4) Part of the tank filled in 1 minute when all the three pipes are opened simultaneously

$= \frac{1}{10} + \frac{1}{30} - \frac{1}{20} = \frac{6+2-3}{60}$

$= \frac{5}{60} = \frac{1}{12}$

Hence, the tank will be filled in 12 minutes.

10. (4) In 1 minute both pipes can fill

$= \frac{1}{20} + \frac{1}{30}$ part of the cistern

In 10 minutes, second pipe can fill $= \frac{1}{30} \times 10 = \frac{1}{3}$ part

Cistern filled by both pipes

$= 1 - \frac{1}{3} = \frac{2}{3}$

$\therefore$ Time taken by both the pipes to fill $\frac{2}{3}$ part of cistern

$= \frac{12 \times 2}{3} = 8$ minutes

Therefore, the first pipe can be turned off after 8 minutes.

11. (4) Net amount of water filled in the tank in 1 hour when all three taps are opened simultaneously,
= 42 + 56 – 48 litres = 50 litres
The tank gets completely filled in 16 hours.
$\therefore$ Capacity of the tank
= 16 × 50 = 800 litres

12. (4) Let conical tank contain 'x' litres of fuel, then cylindrical tank would hold $(x + 500)$ litres. So,
$(x - 200)2 = x + 500 - 200$
$2x - 400 = x + 300 \Rightarrow x = 700$
Hence, cylindrical tank would hold
700 + 500 = 1200 L

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14 TIME AND DISTANCE

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. A train is travelling at the rate of 45km/hr. How many seconds it will take to cover a distance of $\frac{4}{5}$ km ?
(1) 36 sec. (2) 64 sec.
(3) 90 sec. (4) 120 sec.
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

2. An aeroplane covers a certain distance at a speed of 240 km hour in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of :
(1) 300 km./hr. (2) 360 km./hr.
(3) 600 km./hr. (4) 720 km./hr.
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A man walking at the rate of 5 km/hr. crosses a bridge in 15 minutes. The length of the bridge (in metres) is :
(1) 600 (2) 750
(3) 1000 (4) 1250
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A man crosses a road 250 metres wide in 75 seconds. His speed in km/hr is :
(1) 10 (2) 12
(3) 12.5 (4) 15
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. An athlete runs 200 metres race in 24 seconds. His speed (in km/hr) is :
(1) 20 (2) 24
(3) 28.5 (4) 30
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

6. A car goes 10 metres in a second. Find its speed in km/hour.
(1) 40 (2) 32
(3) 48 (4) 36
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

7. A car travelling at a speed of 40 km/hour can complete a journey in 9 hours. How long will it take to travel the same distance at 60 km/hour ?
(1) 6 hours (2) 3 hours
(3) 4 hours (4) $4\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. A man travelled a certain distance by train at the rate of 25 kmph. and walked back at the rate of 4 kmph. If the whole journey took 5 hours 48 minutes, the distance was
(1) 25 km (2) 30 km
(3) 20 km (4) 15 km
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

9. A boy goes to his school from his house at a speed of 3 km/hr and returns at a speed of 2 km/hr. If he takes 5 hours in going and coming, the distance between his house and school is :
(1) 6 km (2) 5 km
(3) 5.5 km (4) 6.5 km
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

10. A boy runs 20 km in 2.5 hours. How long will he take to run 32 km at double the previous speed ?
(1) 2 hours (2) $2\frac{1}{2}$ hours
(3) $4\frac{1}{2}$ hours (4) 5 hours
(SSC CPO S.I. Exam. 26.05.2005)

11. A train is moving with the speed of 180 km/hr. Its speed (in metres per second) is :
(1) 5 (2) 40
(3) 30 (4) 50
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

12. A man riding his bicycle covers 150 metres in 25 seconds. What is his speed in km per hour ?
(1) 25 (2) 21.6
(3) 23 (4) 20
(SSC CGL Prelims Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting)

13. A and B travel the same distance at speed of 9 km/hr and 10 km/hr respectively. If A takes 36 minutes more than B, the distance travelled by each is
(1) 48 km (2) 54 km
(3) 60 km (4) 66 km
(SSC SAS Exam. 26.06.2010 (Paper-1)

14. A person started his journey in the morning. At 11 a.m. he covered $\frac{3}{8}$ of the journey and on the same day at 4.30 p.m. he covered $\frac{5}{6}$ of the journey. He started his journey at
(1) 6.00 a.m. (2) 3.30 a.m.
(3) 7.00 a.m. (4) 6.30 a.m.
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

15. The speed of a bus is 72 km/hr. The distance covered by the bus in 5 seconds is
(1) 100 m (2) 60 m
(3) 50 m (4) 74.5 m
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

16. Two men start together to walk a certain distance, one at 4 km/h and another at 3 km/h. The former arrives half an hour before the latter. Find the distance.
(1) 8 km (2) 7 km
(3) 6 km (4) 9 km
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

17. A train starts from a place A at 6 a.m. and arrives at another place B at 4.30 p.m. on the same day. If the speed of the train is 40 km per hour, find the distance travelled by the train ?
(1) 420 km (2) 230 km
(3) 320 km (4) 400 km
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

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18. Walking at the rate of 4 km an hour, a man covers a certain distance in 3 hours 45 minutes. If he covers the same distance on cycle, cycling at the rate of 16·5 km/hour, the time taken by him is
(1) 55.45 minutes
(2) 54.55 minutes
(3) 55.44 minutes
(4) 45.55 minutes
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

19. A train covers a distance of 10 km in 12 minutes. If its speed is decreased by 5 km/hr, the time taken by it to cover the same distance will be :
(1) 10 minutes
(2) 13 minutes 20 sec
(3) 13 minutes
(4) 11 minutes 20 sec
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

20. A man walks 'a' km in 'b' hours. The time taken to walk 200 metres is
(1) $\frac{200b}{a}$ hours (2) $\frac{b}{5a}$ hours
(3) $\frac{b}{a}$ hours (4) $\frac{ab}{200}$ hours
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

21. The speed $3\frac{1}{3}$ m/sec when expressed in km/hour becomes
(1) 8 (2) 9
(3) 10 (4) 12
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

22. A bullock cart has to cover a distance of 120 km. in 15 hours. If it covers half of the journey in $\frac{3}{5}$ th time, the speed to cover the remaining distance in the time left has to be
(1) 6.4 km/hr (2) 6.67 km/hr
(3) 10 km/hr (4) 15 km/hr
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

23. A train covers a certain distance in 210 minutes at a speed of 60 kmph. The time taken by the train, to cover the same distance at a speed of 80 kmph is :
(1) $3\frac{5}{8}$ hours (2) $2\frac{5}{8}$ hours
(3) $4\frac{5}{8}$ hours (4) 3 hours
(SSC Multi-Tasking Staff Exam. 10.03.2013

24. A man rides at the rate of 18 km/hr, but stops for 6 mins. to change horses at the end of every 7th km. The time that he will take to cover a distance of 90 km is
(1) 6 hrs.
(2) 6 hrs. 12 min.
(3) 6 hrs. 18 min.
(4) 6 hrs. 24 min.
(SSC Graduate Level Tier-I Exam. 21.04.2013)

25. A speed of 30.6 km/.hr is the same as
(1) 8.5 m/sec. (2) 10 m/sec.
(3) 12 m/sec. (4) 15.5 m/sec.
(SSC Constable (GD) Exam. 12.05.2013)

26. A man covers $\frac{2}{15}$ of the total journey by train, $\frac{9}{20}$ by bus and the remaining 10 km on foot. His total journey (in km) is
(1) 15.6 (2) 24
(3) 16.4 (4) 12.8
(SSC Graduate Level Tier-I Exam. 19.05.2013)

27. You arrive at your school 5 minutes late if you walk with a speed of 4 km/h, but you arrive 10 minutes before the scheduled time if you walk with a speed of 5 km/h. The distance of your school from your house (in km) is
(1) 4 (2) 5
(3) 10 (4) 2
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

28. Sarita and Julie start walking from the same place in the opposite directions. If Julie walks at a speed of $2\frac{1}{2}$ km/hr and Sarita at a speed of 2 km/hr, in how much time will they be 18 km apart ?
(1) 4.0 hrs (2) 4.5 hrs
(3) 5.0 hrs (4) 4.8 hrs
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

29. A man travelled a distance of 80 km in 7 hrs partly on foot at the rate of 8 km per hour and partly on bicycle at 16km per hour. The distance travelled on the foot is
(1) 32 km (2) 48 km
(3) 36 km (4) 44 km
(SSC CGL Tier-II Exam. 21.09.2014)

30. A car driver leaves Bangalore at 8.30 A.M. and expects to reach a place 300 km from Bangalore at 12.30 P.M. At 10.30 he finds that he has covered only 40% of the distance. By how much he has to increase the speed of the car in order to keep up his schedule?
(1) 45 km/hr (2) 40 km/hr
(3) 35 km/hr (4) 30 km/hr
(SSC CGL Tier-II Exam. 21.09.2014)

31. A man is walking at a speed of 10 kmph. After every km, he takes a rest for 5 minutes. How much time will he take to cover a distance of 5 km?
(1) 60 minutes (2) 50 minutes
(3) 40 minutes (4) 70 minutes
(SSC CGL Tier-II Exam. 21.09.2014)

32. A train covers a distance of 10 km in 12 minutes. If its speed is decreased by 5 km/hr, the time taken by it to cover the same distance is equal to
(1) 40 minutes (2) $\frac{40}{3}$ minutes
(3) 20 minutes (4) 15 minutes
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

33. Motor-cyclist P started his journey at a speed of 30 km/hr. After 30 minutes, motor-cyclist Q started from the same place but with a speed of 40 km/hr. How much time (in hours) will Q take to overtake P ?
(1) 1 (2) $\frac{3}{2}$
(3) $\frac{3}{8}$ (4) 2
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

34. A is twice as fast as B and B is thrice as fast as C is. The journey covered by C in $1\frac{1}{2}$ hours will be covered by A in
(1) 15 minutes (2) 20 minutes
(3) 30 minutes (4) 1 hour
(SSC CHSL DEO & LDC Exam. 9.11.2014)

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35. A truck travels at 90 km/hr for the first $1\frac{1}{2}$ hours. After that it travels at 70 km/hr. Find the time taken by the truck to travel 310 kilometres.
(1) 2.5 hrs (2) 3 hrs
(3) 3.5 hrs (4) 4 hrs
(SSC CHSL DEO Exam. 02.11.2014 (1st Sitting)

36. A car travels at a speed of 60 km/hr and covers a particular distance in one hour. How long will it take for another car to cover the same distance at 40 km/hr?
(1) $\frac{5}{2}$ hours (2) 2 hours
(3) $\frac{3}{2}$ hours (4) 1 hour
(SSC CHSL DEO Exam. 16.11.2014 (1st Sitting)

37. A student goes to school at the rate of $\frac{5}{2}$ km/hr and reaches 6 minutes late. If he travels at the speed of 3 km/hr, he reaches 10 minutes earlier. The distance of the school is
(1) 45 km (2) 20 km
(3) 10 km (4) 4 km
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

38. Sriya with her family travelled from Bolpur to Suri by car at a speed of 40 km/hr and returned to Bolpur at a speed of 50 km/hr. The average speed for the whole journey is
(1) $44\frac{4}{9}$ km/hr
(2) 45 km/hr
(3) $45\frac{1}{2}$ km/hr
(4) 44.78 km/hr
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

39. A journey takes 4 hours 30 minutes at a speed of 60 km/hr. If the speed is 15 m/s, then the journey will take
(1) 5 hours
(2) 5 hours 30 minutes
(3) 6 hours
(4) 6 hours 15 minutes
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

40. The distance between 2 places R and S is 42 km. Anita starts from R with a uniform speed of 4 km/h towards S and at the same time Romita starts from S towards R also with some uniform speed. They meet each other after 6 hours. The speed of Romita is
(1) 18 km/hour (2) 6 km/hour
(3) 20 km/hour (4) 8 km/hour
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

41. A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot at the rate 4 kmph and partly on bicycle at the rate 9 kmph. The distance travelled on foot is
(1) 16 km (2) 14 km
(3) 17 km (4) 15 km
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9) & SSC CGL Tier-I Exam. 09.08.2015 Ist Sitting TF No. 1443088)

42. A bus moving at 40 km per hour covers a distance in 6 hours 15 minutes. If it travels the same distance at 50 km per hour how long will it take to cover the distance?
(1) 2 hrs. (2) 6 hrs.
(3) 4 hrs. (4) 5 hrs.
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

43. A student starting from his house walks at a speed of $2\frac{1}{2}$ km/hour and reaches his school 6 minutes late. Next day starting at the same time he increases his speed by 1 km/hour and reaches 6 minutes early. The distance between the school and his house is
(1) 4 km (2) $3\frac{1}{2}$ km
(3) $1\frac{3}{4}$ km (4) 6 km
(SSC Constable (GD) Exam. 04.10.2015, Ist Sitting)

44. A man starts from a place P and reaches the place Q in 7 hours. He travels $\frac{1}{4}$ th of the distance at 10 km/hour and the remaining distance at 12 km/hour. The distance between P and Q is
(1) 72 km (2) 90 km
(3) 80 km (4) 70 km
(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099038)

45. A student goes to school at the rate of $2\frac{1}{2}$ km/hr and reaches 6 minutes late. If he travels at the speed of 3 km/hr. he is 10 minutes early. What is the distance to the school?
(1) 4 km (2) $3\frac{1}{2}$ km
(3) 1 km (4) $3\frac{1}{4}$ km
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

46. A man travels for 5 hours 15 minutes. If he covers the first half of the journey at 60 km/h and rest at 45 km/h. Find the total distance travelled by him.
(1) $1028\frac{6}{7}$ km. (2) 189 km.
(3) 378 km. (4) 270 km.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

TYPE–II

1. The length of a train and that of a platform are equal. If with a speed of 90 km/hr the train crosses the platform in one minute, then the length of the train (in metres) is :
(1) 500 (2) 600
(3) 750 (4) 900
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. A train passes two bridges of lengths 800 m and 400 m in 100 seconds and 60 seconds respectively. The length of the train is :
(1) 80 m (2) 90 m
(3) 200 m (4) 150 m
(SSC CGL Prelim Exam. 24.02.2002 (1st Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (1st Sitting)

3. A train 300 metres long is running at a speed of 25 metres per second. It will cross a bridge of 200 metres in
(1) 5 seconds (2) 10 seconds
(3) 20 seconds (4) 25 seconds
(SSC CPO S.I. Exam. 12.01.2003

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4. A train 800 metres long is running at the speed of 78 km/hr. If it crosses a tunnel in 1 minute, then the length of the tunnel (in metres) is :
(1) 77200 (2) 500
(3) 1300 (4) 13
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. A train is moving at a speed of 132 km/hour. If the length of the train is 110 metres, how long will it take to cross a railway platform 165 metres long?
(1) 5 seconds (2) 7.5 seconds
(3) 10 seconds (4) 15 seconds
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

6. A train takes 18 seconds to pass through a platform 162 m long and 15 seconds to pass through another platform 120 m long. The length of the train (in m) is :
(1) 70. (2) 80
(3) 90 (4) 105
(SSC CPO S.I. Exam. 26.05.2005)

7. A train, 150 m long, takes 30 seconds to cross a bridge 500 m long. How much time will the train take to cross a platform 370 m long ?
(1) 36 secs (2) 30 secs
(3) 24 secs (4) 18 secs
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

8. A 120 metre long train is running at a speed of 90 km per hour. It will cross a railway platform 230 m long in :
(1) $4\frac{4}{5}$ seconds (2) $9\frac{1}{5}$ seconds
(3) 7 seconds (4) 14 seconds
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

9. A train travelling at a speed of 30 m/sec crosses a platform, 600 metres long, in 30 seconds. The length (in metres) of train is
(1) 120 (2) 150
(3) 200 (4) 300
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

10. A train with a uniform speed passes a platform, 122 metres long, in 17 seconds and a bridge, 210 metres long, in 25 seconds. The speed of the train is
(1) 46.5 km/hour
(2) 37.5 km/hour
(3) 37.6 km/hour
(4) 39.6 km/hour
(SSC CPO S.I. Exam. 09.11.2008)

11. A train, with a uniform speed, crosses a platform, 162 metres long, in 18 seconds and another platform, 120 metres long, in 15 seconds. The speed of the train is
(1) 14 km/hr (2) 42 km/hr
(3) 50.4 km/hr (4) 67.2 km/hr
(SSC Data Entry Operator Exam. 02.08.2009)

12. A train travelling with uniform speed crosses two bridges of lengths 300 m and 240 m in 21 seconds and 18 seconds respectively. The speed of the train is :
(1) 72 km/hr (2) 68 km/hr
(3) 65 km/hr (4) 60 km/hr
(SSC CHSL DEO & LDC Exam. 27.11.2010)

13. A train, 110m long , is running at a speed of 60km/hr. How many seconds does it take to cross another train, 170 m long, standing on parallel track ?
(1) 15.6 sec (2) 16.8 sec
(3) 17.2 sec (4) 18 sec
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

14. A train of length 500 feet crosses a platform of length 700 feet in 10 seconds. The speed of the train is
(1) 70 ft/second
(2) 85 ft/second
(3) 100 ft/second
(4) 120 ft/second
(SSC CISF Constable (GD) Exam. 05.06.2011)

15. A train 200 m long running at 36 kmph takes 55 seconds to cross a bridge. The length of the bridge is
(1) 375 m. (2) 300 m.
(3) 350 m. (4) 325 m.
(SSC Constable (GD) Exam. 12.05.2013)

16. A train 270 metres long is running at a speed of 36 km per hour, then it will cross a bridge of length 180 metres in :
(1) 40 sec (2) 45 sec
(3) 50 sec (4) 35 sec
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

17. A train 50 metres long passes a platform of length 100 metres in 10 seconds. The speed of the train in metre/second is
(1) 50 (2) 10
(3) 15 (4) 20
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

18. A train 50 metre long passes a platform 100 metre long in 10 seconds. The speed of the train in km/hr is
(1) 10 (2) 54
(3) 15 (4) 100
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

19. How many seconds will a train 120 metre long running at the rate of 36 km/hr take to cross a bridge of 360 metres in length ?
(1) 48 sec (2) 40 sec
(3) 46 sec (4) 36 sec
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

20. If a man running at 15 kmph crosses a bridge in 5 minutes, the length of the bridge is
(1) 1000 metres
(2) 500 metres
(3) 750 metres
(4) 1250 metres
(SSC CGL Tier-I Re-Exam, 30.08.2015)

21. A 200 metre long train is running at a speed of 72 km/hr. How long will it take to cross 800metre long bridge ?
(1) 50 seconds (2) 40 seconds
(3) 60 seconds (4) 30 seconds
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

22. A train passes two bridges of lengths 500 m and 250 m in 100 seconds and 60 seconds respectively. The length of the train is :
(1) 152 m (2) 125 m
(3) 250 m (4) 120 m
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636836)

TYPE–III

1. A train 180 m long moving at the speed of 20 m/sec. over-takes a man moving at a speed of 10m/sec in the same direction. The train passes the man in :
(1) 6 sec (2) 9 sec
(3) 18 sec (4) 27 sec
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A train 100m long is running at the speed of 30 km/hr. The time (in second) in which it will pass a man standing near the railway line is :
(1) 10 (2) 11
(3) 12 (4) 15
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

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3. How many seconds will a 500 metre long train take to cross a man walking with a speed of 3 km/hr. in the direction of the moving train if the speed of the train is 63 km/hr ?
(1) 25 sec (2) 30 sec
(3) 40 sec (4) 45 sec
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. A train is 125 m long. If the train takes 30 seconds to cross a tree by the railway line, then the speed of the train is :
(1) 14 km/hr (2) 15 km/hr
(3) 16 km/hr (4) 12 km/hr
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

5. A 120 m long train takes 10 seconds to cross a man standing on a platform. What is the speed of the train ?
(1) 12 m/sec. (2) 10 m/sec.
(3) 15 m/sec. (4) 20 m/sec.
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CPO S.I. Exam. 03.09.2006)

6. A 75 metre long train is moving at 20 kmph. It will cross a man standing on the platform in
(1) 12 seconds
(2) 14 seconds
(3) 13.5 seconds
(4) 15.5 seconds
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

7. In what time will a train 100 metres long cross an electric pole, if its speed be 144 km/hour ?
(1) 2.5 seconds
(2) 5 seconds
(3) 12.5 seconds
(4) $3\frac{5}{4}$ seconds
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

8. A man observed that a train 120 m long crossed him in 9 seconds. The speed (in km/hr) of the train was
(1) 42 (2) 45
(3) 48 (4) 55
(SSC CPO S.I. Exam. 07.09.2003)

9. If a train, with a speed of 60 km/hr, crosses a pole in 30 seconds, the length of the train (in metres) is :
(1) 1000 (2) 900
(3) 750 (4) 500
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

10. A train passes two persons walking in the same direction at a speed of 3 km/hour and 5km/hour respectively in 10 seconds and 11 seconds respectively. The speed of the train is
(1) 28 km/hour (2) 27 km/hour
(3) 25 km/hour (4) 24 km/hour
(SSC CPO S.I. Exam. 03.09.2006)

11. A passenger train 150m long is travelling with a speed of 36 km/hr. If a man is cycling in the direction of train at 9 km/hr., the time taken by the train to pass the man is
(1) 10 sec (2) 15 sec
(3) 18 sec (4) 20 sec
(SSC CPO S.I. Exam. 06.09.2009)

12. Buses start from a bus terminal with a speed of 20 km/hr at intervals of 10 minutes. What is the speed of a man coming from the opposite direction towards the bus terminal if he meets the buses at intervals of 8 minutes?
(1) 3 km/hr (2) 4 km/hr
(3) 5 km/hr (4) 7 km/hr
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

13. A train, 300m long, passed a man, walking along the line in the same direction at the rate of 3 km/hr in 33 seconds. The speed of the train is
(1) 30 km/h (2) 32 km/h
(3) $32\frac{8}{11}$ km/h (4) $35\frac{8}{11}$ km/h
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

14. A train, 240 m long crosses a man walking along the line in opposite direction at the rate of 3 kmph in 10 seconds. The speed of the train is
(1) 63 kmph (2) 75 kmph
(3) 83.4 kmph (4) 86.4 kmph
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

15. A train is running at 36 km/hr. If it crosses a pole in 25 seconds, its length is
(1) 248 m (2) 250 m
(3) 255 m (4) 260 m
(SSC (South Zone) Investigator Exam 12.09.2010)

16. A train is running at a speed of 90 km/hr. If it crosses a signal in 10 sec., the length of the train (in metres) is
(1) 150 (2) 324
(3) 900 (4) 250
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

17. A train 100 metres long meets a man going in opposite direction at 5 km/hr and passes him in $7\frac{1}{5}$ seconds. What is the speed of the train (in km/hr) ?
(1) 45 km/hr (2) 60 km/hr
(3) 55 km/hr (4) 50 km/hr
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

18. A train, 120 m long, takes 6 seconds to pass a telegraph post; the speed of train is
(1) 72 km/hr (2) 62 km/hr
(3) 55 km/hr (4) 85 km/hr
(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (SSC Constable (GD) Exam. 12.05.2013 (Ist Sitting)

19. A train 300 m long is running with a speed of 54 km/hr. In what time will it cross a telephone pole?
(1) 20 seconds (2) 15 seconds
(3) 17 seconds (4) 18 seconds
(SSC CGL Tier-II Exam. 21.09.2014)

20. A train 180 metres long is running at a speed of 90 km/h. How long will it take to pass a post ?
(1) 8.2 secs (2) 7.8 secs
(3) 8 secs (4) 7.2 secs
(SSC CGL Tier-I Exam, 16.05.2015 (Ist Sitting) TF No. 3196279)

21. If a man walks at the rate of 5 km/hour, he misses a train by 7 minutes. However if he walks at the rate of 6 km/hour, he reaches the station 5 minutes before the arrival of the train. The distance covered by him to reach the station is
(1) 6 km (2) 7 km
(3) 6.25 km (4) 4 km
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

22. A train passes an electrical pole in 20 seconds and passes a platform 250 m long in 45 seconds. Find the length of the train.
(1) 400m (2) 200m
(3) 300m (4) 250m
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

23. A train is 250m long. If the train takes 50 seconds to cross a tree by the railway line, then the speed of the train in km/hr is :
(1) 10 (2) 9
(3) 5 (4) 18
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1376233)

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24. A train 150m long passes a km stone in 30 seconds and another train of the same length travelling in opposite direction in 10 seconds. The speed ot the second train is :
(1) 90 km/hr (2) 125 km/hr
(3) 25 km/hr (4) 75 km/hr
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–IV

1. The distance between two cities A and B is 330 km. A train starts from A at 8 a.m. and travels towards B at 60 km/hr. Another train starts from B at 9 a.m. and travels towards A at 75 km/hr. At what time do they meet?
(1) 10 a.m. (2) 10 : 30 a.m.
(3) 11 a.m. (4) 11 : 30 a.m.
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. Two men are standing on opposite ends of a bridge 1200 metres long. If they walk towards each other at the rate of 5m/minute and 10m/minute respectively, in how much time will they meet each other ?
(1) 60 minutes (2) 80 minutes
(3) 85 minutes (4) 90 minutes
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Two trains, one 160 m and the other 140 m long are running in opposite directions on parallel rails, the first at 77 km an hour and the other at 67 km an hour. How long will they take to cross each other?
(1) 7 seconds (2) $7\frac{1}{2}$ seconds
(3) 6 seconds (4) 10 seconds
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

4. Two trains are running in opposite direction with the same speed. If the length of each train is 120 metres and they cross each other in 12 seconds, the speed of each train (in km/hour) is
(1) 72 (2) 10
(3) 36 (4) 18
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

5. Two trains 140 m and 160 m long run at the speed of 60 km/hour and 40 km/hour respectively in opposite directions on parallel tracks. The time (in seconds) which they take to cross each other, is :
(1) 10 sec. (2) 10.8 sec.
(3) 9 sec. (4) 9.6 sec.
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

6. Two trains start from stations A and B and travel towards each other at speed of 50 km/hour and 60 km/hour respectively. At the time of their meeting, the second train has travelled 120 km more than the first. The distance between A and B is :
(1) 990 km (2) 1200 km
(3) 1320 km (4) 1440 km
(SSC CPO S.I. Exam. 26.05.2005)

7. Two trains are moving on two parallel tracks but in opposite directions. A person sitting in the train moving at the speed of 80 km/hr passes the second train in 18 seconds. If the length of the second train is 1000 m, its speed is
(1) 100 km/hr (2) 120 km/hr
(3) 140 km/hr (4) 150 km/hr
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

8. Two trains 105 metres and 90 metres long, runs at the speed of 45 km/hr and 72 km/hr respectively, in opposite directions on parallel tracks. The time which they take to cross each other, is
(1) 8 seconds (2) 6 seconds
(3) 7 seconds (4) 5 seconds
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

9. Two trains of equal length, running in opposite directions, pass a pole in 18 and 12 seconds. The trains will cross each other in
(1) 14.4 seconds
(2) 15.5 seconds
(3) 18.8 seconds
(4) 20.2 seconds
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. A train, 150m long, passes a pole in 15 seconds and another train of the same length travelling in the opposite direction in 12 seconds. The speed of the second train is
(1) 45 km./hr (2) 48 km./hr
(3) 52 km./hr (4) 54 km./hr
(SSC CGL Prelim Exam. 27.07.2008 (IInd Sitting) & (SSC GL Tier-I Exam. 19.05.2013)

11. A train travelling at 48 km/hr crosses another train, having half its length and travelling in opposite direction at 42 km/hr, in 12 seconds. It also passes a railway platform in 45 seconds. The length of the railway platform is
(1) 200 m (2) 300 m
(3) 350 m (4) 400 m
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

12. Two towns A and B are 500 km. apart. A train starts at 8 AM from A towards B at a speed of 70 km/hr. At 10 AM, another train starts from B towards A at a speed of 110 km/hr. When will the two trains meet ?
(1) 1 PM (2) 12 Noon
(3) 12.30 PM (4) 1.30 PM
(SSC CPO S.I. Exam. 06.09.2009)

13. Two trains of length 70 m and 80 m are running at speed of 68 km/hr and 40 km/hr respectively on parallel tracks in opposite directions. In how many seconds will they pass each other ?
(1) 10 sec (2) 8 sec
(3) 5 sec (4) 3 sec
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

14. Two trains of equal length take 10 seconds and 15 seconds respectively to cross a telegraph post. If the length of each train be 120 metres, in what time (in seconds) will they cross each other travelling in opposite direction ?
(1) 16 (2) 15
(3) 12 (4) 10
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

15. Two trains of length 137 metre and 163 metre are running with speed of 42 km/hr and 48 km/hr respectively towards each other on papallel tracks. In how many seconds will th.; cross each other?
(1) 30 sec (2) 24 sec
(3) 12 sec (4) 10 sec
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

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16. Two trains 150 m and 120 m long respectively moving from opposite directions cross each other in 10 secs. If the speed of the second train is 43.2 km/hr, then the speed of the first train is
(1) 54 km/hr (2) 50 km/hr
(3) 52 km/hr (4) 51 km/hr
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

17. Two trains start from station A and B and travel towards each other at speed of 16 miles/ hour and 21 miles/ hour respectively. At the time of their meeting, the second train has travelled 60 miles more than the first. The distance between A and B (in miles) is :
(1) 444 (2) 496
(3) 333 (4) 540
(SSC Multi-Tasking Staff Exam. 10.03.2013)

18. Two trains 108 m and 112 m in length are running towards each other on the parallel lines at a speed of 45 km/hr and 54 km/ hr respectively. To cross each other after they meet, it will take
(1) 12 sec (2) 9 sec
(3) 8 sec (4) 10 sec
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

19. A man standing on a platform finds that a train takes 3 seconds to pass him and another train of the same length moving in the opposite direction, takes 4 seconds. The time taken by the trains to pass each other will be
(1) $2\frac{3}{7}$ seconds (2) $3\frac{3}{7}$ seconds
(3) $4\frac{3}{7}$ seconds (4) $5\frac{3}{7}$ seconds
(SSC CPO S.I. Exam. 03.09.2006)

0. Two trains, each of length 125 metre, are running in parallel tracks in opposite directions. One train is running at a speed 65 km/hour and they cross each other in 6 seconds. The speed of the other train is
(1) 75 km/hour (2) 85 km/hour
(3) 95 km/hour (4) 105 km/hour
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

21. A train running at the speed of 84 km/hr passes a man walking in opposite direction at the speed of 6 km/hr in 4 seconds. What is the length of train (in metre) ?
(1) 150 (2) 120
(3) 100 (4) 90
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

22. Two trains X and Y start from Jodhpur to Jaipur and from Jaipur to Jodhpur respectively. After passing each other they take 4 hours 48 minutes and 3 hours 20 minutes to reach Jaipur and Jodhpur respectively. If X is moving at 45 km/hr, the speed of Y is
(1) 60 km/hr (2) 58 km/hr
(3) 54 km/hr (4) 64.8 km/hr
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 8)

23. P and Q starting simultaneously from two different places proceed towards each other at a speed of 20 km/hour and 30 km/hour respectively. By the time they meet each other, Q has covered 36 km more than that of P. The distance (in km.) between the two places is
(1) 144 (2) 162
(3) 180 (4) 108
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

24. Two places P and Q are 162 km apart. A train leaves P for Q and simultaneously another train leaves Q for P. They meet at the end of 6 hours. If the former train travels 8 km/hour faster than the other, then speed of train from Q is
(1) $12\frac{5}{6}$ km/hour
(2) $10\frac{5}{6}$ km/hour
(3) $9\frac{1}{2}$ km/hour
(4) $8\frac{1}{2}$ km/hour
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

25. Two trains start at the same time from A and B and proceed toward each other at the speed of 75 km/hr and 50 km/hr respectively. When both meet at a point in between, one train was found to have travelled 175 km more than the other. Find the distance between A and B.
(1) 875 km. (2) 785 km.
(3) 758 km. (4) 857 km.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203762)

26. Two trains of lengths 150m and 180m respectively are running in opposite directions on parallel tracks. If their speeds be 50 km/ hr and 58 km/hr respectively, in what time will they cross each other?
(1) 22 seconds (2) 15 seconds
(3) 30 seconds (4) 11 seconds
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

27. Two trains start at the same time from Aligarh and Delhi and proceed towards each other at the rate of 14 km and 21 km per hour respectively. When they meet, it is found that one train has travelled 70 km more than the other. The distance between two stations is
(1) 350 km (2) 210 km
(3) 300 km (4) 140 km
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–V

1. A train running at $\frac{7}{11}$ of its own speed reached a place in 22 hours. How much time could be saved if the train would run at its own speed?
(1) 14 hours (2) 7 hours
(3) 8 hours (4) 16 hours
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

2. A man with $\frac{3}{5}$ of his usual speed reaches the destination $2\frac{1}{2}$ hours late. Find his usual time to reach the destination.
(1) 4 hours (2) 3 hours
(3) $3\frac{3}{4}$ hours (4) $4\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

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3. A car travelling with $\frac{5}{7}$ of its usual speed covers 42 km in 1 hour 40 min 48 sec. What is the usual speed of the car?

(1) $17\frac{6}{7}$ km/hr (2) 35 km/hr

(3) 25 km/hr (4) 30 km/hr

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

4. Walking at three-fourth of his usual speed, a man covers a certain distance in 2 hours more than the time he takes to cover the distance at his usual speed. The time taken by him to cover the distance with his usual speed is

(1) 4.5 hours (2) 5.5 hours

(3) 6 hours (4) 5 hours

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

5. By walking at $\frac{3}{4}$ of his usual speed, a man reaches his office 20 minutes later than his usual time. The usual time taken by him to reach his office is

(1) 75 minutes (2) 60 minutes

(3) 40 minutes (4) 30 minutes

(SSC CGL Tier-I Exam. 16.05.2010 (Ist Sitting) & (SSC GL Tier-I Exam. 19.05.2013)

6. Walking at $\frac{3}{4}$ of his usual speed, a man is $1\frac{1}{2}$ hours late. His usual time to cover the same distance, (in hours) is

(1) $4\frac{1}{2}$ (2) 4

(3) $5\frac{1}{2}$ (4) 5

(SSC CGL Tier-1 Exam 19.06.2011 (First Sitting)

7. Walking at $\frac{6}{7}$ th of his usual speed a man is 25 minutes late. His usual time to cover this distance is

(1) 2 hours 30 minutes

(2) 2 hours 15 minutes

(3) 2 hours 25 minutes

(4) 2 hours 10 minutes

(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

8. Walking $\frac{6}{7}$ th of his usual speed, a man is 12 minutes late. The usual time taken by him to cover that distance is

(1) 1 hour

(2) 1 hour 12 minutes

(3) 1 hour 15 minutes

(4) 1 hour 20 minutes

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

9. A car travels from P to Q at a constant speed. If its speed were increased by 10 km/h, it would have been taken one hour lesser to cover the distance. It would have taken further 45 minutes lesser if the speed was further increased by 10 km/h. The distance between the two cities is

(1) 540 km (2) 420 km

(3) 600 km (4) 620 km

(SSC CGL Tier-I Exam. 19.10.2014)

10. A car covers four successive 7 km distances at speeds of 10 km/hour, 20 km/hour, 30 km/hour and 60 km/hour respectively. Its average speed over this distance is

(1) 30 km/hour (2) 20 km/hour

(3) 60 km/hour (4) 40 km/hour

(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099685)

11. A car goes 20 metres in a second. Find its speed in km/hr.

(1) 18 (2) 72

(3) 36 (4) 20

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 15.11.2015 (Ist Sitting) TF No. 8636838)

12. The speed of a car is 54 km/hr. What is its speed in m/sec?

(1) 15 m/sec (2) 19.44 m/sec

(3) 194.4 m/sec (4) 150 m/sec

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–VI

1. A boy rides his bicycle 10km at an average speed of 12 km/hr and again travels 12 km at an average speed of 10 km/hr. His average speed for the entire trip is approximately :

(1) 10.4 km/hr (2) 10.8 km/hr

(3) 11.0 km/hr (4) 12.2 km/hr

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. A person travels 600 km by train at 80km/hr, 800 km by ship at 40 km/hr 500 km by aeroplane at 400 km/hr and 100 km by car at 50km/hr. What is the average speed for the entire distance ?

(1) $65\frac{5}{123}$ km./hr.

(2) 60 km./hr.

(3) $60\frac{5}{123}$ km./hr.

(4) 62 km./hr.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. A train moves with a speed of 30 kmph for 12 minutes and for next 8 minutes at a speed of 45 kmph. Find the average speed of the train:

(1) 37.5 kmph (2) 36 kmph

(3) 48 kmph (4) 30 kmph

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

4. A man covers half of his journey at 6km/hr and the remaining half at 3km/hr. His average speed is

(1) 9 km/hr (2) 4.5 km/hr

(3) 4 km/hr (4) 3 km/hr

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

5. A man goes from A to B at a uniform speed of 12 kmph and returns with a uniform speed of 4 kmph His average speed (in kmph) for the whole journey is :

(1) 8 (2) 7.5

(3) 6 (4) 4.5

(SSC CPO S.I. Exam. 16.12.2007)

6. A train covers a distance of 3584 km in 2 days 8 hours. If it covers 1440 km on the first day and 1608 km on the second day, by how much does the average speed of the train for the remaining part of the journey differ from that for the entire journey ?

(1) 3 km/hour more

(2) 3 km/hour less

(3) 4 km/hour more

(4) 5 km/hour less

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

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7. A man travels a distance of 24 km at 6 kmph. Another distance of 24 km at 8 kmph and a third distance of 24 km at 12 kmph. His average speed for the whole journey (in kmph) is

(1) $8\frac{2}{3}$ (2) 8

(3) $2\frac{10}{13}$ (4) 9

(SSC CPO S.I. Exam. 09.11.2008)

8. A constant distance from Chennai to Bangalore is covered by Express train at 100 km/hr. If it returns to the same distance at 80 km/hr, then the average speed during the whole journey is

(1) 90.20 km/hr
(2) 88.78 km/hr
(3) 88.98 km/hr
(4) 88.89 km/hr

(SSC CPO S.I. Exam. 06.09.2009)

9. A person went from A to B at an average speed of x km/hr and returned from B to A at an average speed of y km/hr. What was his average speed during the total journey ?

(1) $\frac{x+y}{2xy}$ (2) $\frac{2xy}{x+y}$

(3) $\frac{2}{x+y}$ (4) $\frac{1}{x}+\frac{1}{y}$

(SSC SAS Exam. 26.06.2010 (Paper-1))

10. A man goes from Mysore to Bangalore at a uniform speed of 40 km/hr and comes back to Mysore at a uniform speed of 60 km/hr. His average speed for the whole journey is

(1) 48 km/hr (2) 50 km/hr
(3) 54 km/hr (4) 55 km/hr

(SSC CISF ASI Exam. 29.06.2010 (Paper-1) & (SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

11. A man goes from a place A to B at a speed of 12 km/hr and returns from B to A at a speed of 18 km/hr. The average speed for the whole journey is

(1) $14\frac{2}{5}$ km/hr

(2) 15 km/hr

(3) $15\frac{1}{2}$ km/hr

(4) 16 km/hr

(SSC (South Zone) Investigator Exam. 12.09.2010)

12. One third of a certain journey is covered at the rate of 25 km/hour, one-fourth at the rate of 30 km/hour and the rest at 50 km/hour. The average speed for the whole journey is

(1) 35 km/hour

(2) $33\frac{1}{3}$ km/hour

(3) 30 km/hour

(4) $37\frac{1}{12}$ km/hour

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

13. A man completes 30 km of a journey at the speed of 6 km/hr and the remaining 40 km of the journey in 5 hours. His average speed for the whole journey is

(1) 7 km/hr (2) $6\frac{4}{11}$ km/hr

(3) 8 km/hr (4) 7.5 km/hr

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

14. A man covers the journey from a station A to station B at a uniform speed of 36 km/hr and returns to A with a uniform speed of 45 km/hr. His average speed for the whole journey is :

(1) 40 km/hr (2) 40.5 km/hr
(3) 41 km/hr (4) 42 km/hr

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

15. The speed of a train going from Nagpur to Allahabad is 100 kmph while its speed is 150 kmph when coming back from Allahabad to Nagpur. Then the average speed during the whole journey is :

(1) 120 kmph (2) 125 kmph
(3) 140 kmph (4) 135 kmph

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

16. P travels for 6 hours at the rate of 5 km/ hour and for 3 hours at the rate of 6 km/ hour. The average speed of the journey in km/ hour is

(1) $3\frac{1}{5}$ (2) $5\frac{1}{3}$

(3) $1\frac{2}{9}$ (4) $2\frac{2}{5}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

17. With an average speed of 40 km/hr, a train reaches its destination in time. If it goes with an average speed of 35 km/hr, it is late by 15 minutes. The total journey is

(1) 30 km (2) 40 km
(3) 70 km (4) 80 km

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

18. A bus covers four successive 3 km stretches at speed of 10 km/hr, 20 km/hr, 30 km/hr and 60 km/hr respectively. Its average speed over this distance is

(1) 30 km/hr (2) 25 km/hr
(3) 20 km/hr (4) 10 km/hr

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

19. A train travelled at a speed of 35 km/hr for the first 10 minutes and at a speed of 20 km/hr for the next 5 minutes. The average speed of the train for the total 15 minutes is

(1) 30 km/hr (2) 23 km/hr
(3) 31 km/hr (4) 29 km/hr

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

20. On a journey across Kolkata, a taxi averages 50 km per hour for 50% of the distance, 40 km per hour for 40% of it and 20 km per hour for the remaining. The average speed (in km/hour) for the whole journey is :

(1) 42 (2) 40
(3) 35 (4) 45

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

21. A train goes from Ballygunge to Sealdah at an average speed of 20 km/hour and comes back at an average speed of 30 km/hour. The average speed of the train for the whole journey is

(1) 27 km/hr (2) 26 km/hr
(3) 25 km/hr (4) 24 km/hr

(SSC Graduate Level Tier-II Exam. 29.09.2013

22. A and B are 20 km apart. A can walk at an average speed of 4 km/hour and B at 6 km/hr. If they start walking towards each other at 7 a.m., when they will meet ?

(1) 8.00 a.m. (2) 8.30 a.m.
(3) 9.00 a.m. (4) 10.00 a.m.

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)



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23. A train runs from Howrah to Bandel at an average speed of 20 km/hr and returns at an average speed of 30 km/hr. The average speed (in km/hr) of the train in the whole journey is
(1) 20 (2) 22.5
(3) 24 (4) 25
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

24. A motorist travels to a place 150 km away at an average speed of 50 km/hr and returns at 30 km/hr. His average speed for the whole journey in km/hr is
(1) 37.5 (2) 37
(3) 35 (4) 40
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

25. A man walks from his house at an average speed of 5 km per hour and reaches his office 6 minutes late. If he walks at an average speed of 6 km/h he reaches 2 minutes early. The distance of the office from his house is
(1) 6 km (2) 9 km
(3) 12 km (4) 4 km
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

26. A train runs at an average speed of 75 km/hr. If the distance to be covered is 1050 kms, how long will the train take to cover it?
(1) 13 hrs (2) 12 hrs
(3) 15 hrs (4) 14 hrs
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

27. A train travels 500 m in first minute. In the next 4 minutes, it travels in each minute 125 m more than that in the previous minute. The average speed per hour of the train during those 5 minutes will be
(1) 30 km/hr (2) 45 km/hr
(3) 50 km/hr (4) 55 km/hr
(SSC CGL Tier-I Re-Exam, 30.08.2015)

TYPE–VII

1. In covering a certain distance, the speed of A and B are in the ratio of 3 : 4. A takes 30 minutes more than B to reach the destination. The time taken by A to reach the destination is :
(1) 1 hour (2) $1\frac{1}{2}$ hours
(3) 2 hours (4) $2\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The speed of A and B are in the ratio 3 : 4. A takes 20 minutes more than B to reach a destination. In what time does A reach the destination?
(1) $1\frac{1}{3}$ hours (2) 2 hours
(3) $2\frac{2}{3}$ hours (4) $1\frac{2}{3}$ hours
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. The ratio of length of two trains is 5 : 3 and the ratio of their speed is 6 : 5. The ratio of time taken by them to cross a pole is
(1) 5 : 6 (2) 11 : 8
(3) 25 : 18 (4) 27 : 16
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

4. A train starts from *A* at 7 a.m. towards *B* with speed 50 km/h. Another train starts from *B* at 8 a.m. with speed 60 km/h towards *A*. Both of them meet at 10 a.m. at *C*. The ratio of the distance *AC* to *BC* is
(1) 5 : 6 (2) 5 : 4
(3) 6 : 5 (4) 4 : 5
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

5. Two trains started at the same time, one from A to B and the other from B to A. If they arrived at B and A respectively 4 hours and 9 hours after they passed each other, the ratio of the speed of the two trains was
(1) 2 : 1 (2) 3 : 2
(3) 4 : 3 (4) 5 : 4
(SSC CGL Prelim Exam. 08.02.2004 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

6. The speed of two trains are in the ratio 6 : 7. If the second train runs 364 km in 4 hours, then the speed of first train is
(1) 60 km/hr (2) 72 km/hr
(3) 78 km/hr (4) 84 km/hr
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

7. A truck covers a distance of 550 metres in 1 minute whereas a bus covers a distance of 33 kms in 45 minutes. The ratio of their speed is :
(1) 4 : 3 (2) 3 : 5
(3) 3 : 4 (4) 50 : 3
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

8. Three cars travelled distance in the ratio 1 : 2 : 3. If the ratio of the time of travel is 3 : 2 : 1, then the ratio of their speed is
(1) 3 : 9 : 1 (2) 1 : 3 : 9
(3) 1 : 2 : 4 (4) 4 : 3 : 2
(SSC CPO S.I. Exam. 06.09.2009)

9. *A* and *B* run a 5 km race on a round course of 400 m. If their speed are in the ratio 5 : 4, the number of times, the winner passes the other, is
(1) 1 (2) 2
(3) 3 (4) 5
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

10. A cyclist, after cycling a distance of 70 km on the second day, finds that the ratio of distance covered by him on the first two days is 4 : 5. If he travels a distance of 42 km. on the third day, then the ratio of distance travelled on the third day and the first day is :
(1) 4 : 3 (2) 3 : 2
(3) 3 : 4 (4) 2 : 3
(SSC Multi-Tasking Staff Exam. 10.03.2013)

11. A certain distance is covered by a cyclist at a certain speed. If a jogger covers half the distance in double the time, the ratio of the speed of the jogger to that of the cyclist is
(1) 1 : 4 (2) 4 : 1
(3) 1 : 2 (4) 2 : 1
(SSC GL Tier-I Exam. 19.08.2013 (Ist Sitting) & (SSC Graduate Level Tier-II Exam. 29.09.2013)

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12. It takes 8 hours for a 600 km journey, if 120 km is done by train and the rest by car. It takes 20 minutes more if 200 km is done by train and the rest by car. The ratio of the speed of the train to that of the car is
(1) 2 : 3 (2) 3 : 2
(3) 3 : 4 (4) 4 : 3
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

TYPE–VIII

1. A thief is noticed by a policeman from a distance of 200m. The thief starts running and the policeman chases him. The thief and the policeman run at the rate of 10 km./hr and 11 km./hr respectively. What is the distance between them after 6 minutes ?
(1) 100 m (2) 190 m
(3) 200 m (4) 150 m
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. A moving train, 66 metres long, overtakes another train of 88 metres long, moving in the same direction in 0.168 minutes. If the second train is moving at 30 km/hr, at what speed is the first train moving ?
(1) 85 km/hr. (2) 50 km/hr.
(3) 55 km/hr. (4) 25 km/hr.
(SSC CPO S.I. Exam. 07.09.2003)

3. A constable is 114 metres behind a thief. The constable runs 21 metres and the thief runs 15 metres in a minute. In what time will the constable catch the thief ?
(1) 19 minutes (2) 18 minutes
(3) 17 minutes (4) 16 minutes
(SSC CPO S.I. Exam. 07.09.2003)

4. How much time does a train, 50 m long, moving at 68 km/hour take to pass another train, 75 m long, moving at 50 km/hour in the same direction ?
(1) 5 seconds (2) 10 seconds
(3) 20 seconds (4) 25 seconds
(SSC CPO S.I. Exam. 05.09.2004)

5. A constable follows a thief who is 200 m ahead of the constable. If the constable and the thief run at speed of 8 km/hour and 7 km/hour respectively, the constable would catch the thief in
(1) 10 minutes (2) 12 minutes
(3) 15 minutes (4) 20 minutes
(SSC CPO S.I. Exam. 05.09.2004)

6. Two trains are running with speed 30 km/hr and 58 km/hr in the same direction. A man in the slower train passes the faster train in 18 seconds. The length (in metres) of the faster train is :
(1) 70 (2) 100
(3) 128 (4) 140
(SSC CPO S.I. Exam. 26.05.2005)

7. Two trains travel in the same direction at the speed of 56 km/h and 29 km/h respectively. The faster train passes a man in the slower train in 10 seconds. The length of the faster train (in metres) is
(1) 100 (2) 80
(3) 75 (4) 120
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

8. A bus moving at a speed of 45 km/hr overtakes a truck 150 metres ahead going in the same direction in 30 seconds. The speed of the truck is
(1) 27 km/hr (2) 24 km/hr
(3) 25 km/hr (4) 28 km/hr
(SSC Data Entry Operator Exam. 31.08.2008)

9. Two trains of equal length are running on parallel lines in the same direction at 46 km/h and 36 km/h. The faster train passes, the slower train in 36 seconds. The length of each train is :
(1) 82 m (2) 50 m
(3) 80 m (4) 72 m
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

10. Two trains start from a certain place on two parallel tracks in the same direction. The speed of the trains are 45 km/hr and 40 km/hr respectively. The distance between the two trains after 45 minutes will be
(1) 2 km 500 m (2) 2 km 750 m
(3) 3 km 750 m (4) 3 km 250 m
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

11. A boy started from his house by bicycle at 10 a.m. at a speed of 12 km per hour. His elder brother started after 1 hr 15 mins by scooter along the same path and caught him at 1.30 p.m. The speed of the scooter will be (in km/hr)
(1) 4.5 (2) 36
(3) $18\frac{2}{3}$ (4) 9
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

12. A policeman goes after a thief who has 100 metres start, if the policeman runs a kilometre in 8 min, and the thief a km in 10 min, the distance covered by thief before he is over-powered is
(1) 350 m (2) 400 m
(3) 320 m (4) 420 m
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

13. Two trains are running 40 km/hr and 20 km/hr respectively in the same direction. The fast train completely passes a man sitting in the slow train in 5 seconds. The length of the fast train is
(1) $23\frac{2}{9}$ m (2) 27 m
(3) $27\frac{7}{9}$ m (3) 23 m
(SSC Graduate Level Tier-II Exam. 29.09.2013

14. A train is moving at a speed of 80 km/h and covers a certain distance in 4.5 hours. The speed of the train to cover the same distance in 4 hours is
(1) 100 km/h (2) 70 km/h
(3) 85 km/h (4) 90 km/h
(SSC CHSL DEO & LDC Exam. 20.10.2013)

15. Two trains 180 metres and 120 metres in length are running towards each other on parallel tracks, one at the rate 65 km/hour and another at 55 km/hour. In how many seconds will they be clear of each other from the moment they meet ?
(1) 6 (2) 9
(3) 12 (4) 15
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

16. Two trains, of same length, are running on parallel tracks in the same direction with speed 60 km/hour and 90 km/hour respectively. The latter completely crosses the former in 30 seconds. The length of each train (in metres) is
(1) 125 (2) 150
(3) 100 (4) 115
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

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17. Two trains, 80 metres and 120 metres long, are running at the speed of 25 km/hr and 35 km/hr respectively in the same direction on parallel tracks. How many seconds will they take to pass each other ?
(1) 48 (2) 64
(3) 70 (4) 72
(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

18. A goods train starts running from a place at 1 P.M. at the rate of 18 km/hour. Another goods train starts from the same place at 3 P.M. in the same direction and overtakes the first train at 9 P.M. The speed of the second train in km/hr is
(1) 24 (2) 30
(3) 15 (4) 18
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

19. Two trains 125 metres and 115 metres in length, are running towards each other on parallel lines, one at the rate of 33 km/hr and the other at 39 km/hr. How much time (in seconds) will they take to pass each other from the moment they meet ?
(1) 8 (2) 10
(3) 12 (4) 15
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

20. A thief steals a car at 1.30 p.m. and drives it off at 40 km/hr. The theft is discovered at 2 p.m. and the owner sets off in another car at 50 km/hr. He will overtake the thief at
(1) 5 p.m. (2) 4 p.m.
(3) 4.30 p.m. (4) 6 p.m.
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

21. Two trains of equal length are running on parallel lines in the same direction at the rate of 46 km/hr and 36 km/hr. The faster train passes the slower train in 36 seconds. The length of each train is
(1) 50 m (2) 72 m
(3) 80 m (4) 82 m
(SSC CGL Tier-II Exam. 21.09.2014)

22. Two trains start from stations A and B and travel towards each other at speeds of 50 kmph and 60 kmph respectively. At the time of their meeting, the second train has travelled 120 km more than the first. The distance between A and B is
(1) 1200 km (2) 1440 km
(3) 1320 km (4) 990 km
(SSC CHSL DEO & LDC Exam. 16.11.2014)

TYPE-IX

1. If a man walks 20 km at 5 km/hr, he will be late by 40 minutes. If he walks at 8 km/hr, how early from the fixed time will he reach?
(1) 15 minutes (2) 25 minutes
(3) 50 minutes (4) $1\frac{1}{2}$ hours
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If a man reduces his speed to 2/3, he takes 1 hour more in walking a certain distance. The time (in hours) to cover the distance with his normal speed is :
(1) 2 (2) 1
(3) 3 (4) 1.5
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. A student rides on bicycle at 8 km/hour and reaches his school 2.5 minutes late. The next day he increases his speed to 10 km/hour and reaches school 5 minutes early. How far is the school from his house ?
(1) $\frac{5}{8}$ km (2) 8 km
(3) 5 km (4) 10 km
(SSC CPO S.I. Exam. 12.01.2003

4. A man covered a certain distance at some speed. Had he moved 3 km per hour faster, he would have taken 40 minutes less. If he had moved 2 km per hour slower, he would have taken 40 minutes more. The distance (in km) is :
(1) 20 (2) 35
(3) $36\frac{2}{3}$ (4) 40
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

5. If a train runs at 40 km/hour, it reaches its destination late by 11 minutes. But if it runs at 50 km/hour, it is late by 5 minutes only. The correct time (in minutes) for the train to complete the journey is
(1) 13 (2) 15
(3) 19 (4) 21
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

6. A student walks from his house at a speed of $2\frac{1}{2}$ km per hour and reaches his school 6 minutes late. The next day he increases his speed by 1 km per hour and reaches 6 minutes before school time. How far is the school from his house ?
(1) $\frac{5}{4}$ km (2) $\frac{7}{4}$ km
(3) $\frac{9}{4}$ km (4) $\frac{11}{4}$ km
(SSC CGL Prelim Exam. 08.02.2004) (Ist Sitting) & (SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

7. A boy is late by 9 minutes if he walks to school at a speed of 4 km/hour. If he walks at the rate of 5 km/hour, he arrives 9 minutes early. The distance to his school is
(1) 9 km (2) 5 km
(3) 4 km (4) 6 km
(SSC CPO S.I. Exam. 06.09.2009)

8. A car can cover a certain distance in $4\frac{1}{2}$ hours. If the speed is increased by 5 km/hour, it would take $\frac{1}{2}$ hour less to cover the same distance. Find the slower speed of the car.
(1) 50 km/hour (2) 40 km/hour
(3) 45 km/hour (4) 60 km/hour
(SSC CPO S.I. Exam. 06.09.2009)

9. Shri X goes to his office by scooter at a speed of 30km/h and reaches 6 minutes earlier. If he goes at a speed of 24 km/h, he reaches 5 minutes late. The distance of his office is
(1) 20 km (2) 21 km
(3) 22 km (4) 24 km
(SSC CGL Tier-I Exam 19.06.2011 (First Sitting)

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10. Walking at 5 km/hr a student reaches his school from his house 15 minutes early and walking at 3 km/hr he is late by 9 minutes. What is the distance between his school and his house ?
(1) 5 km (2) 8 km
(3) 3 km (4) 2 km
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

11. A student goes to school at the rate of $2\frac{1}{2}$ km/h and reaches 6 minutes late. If he travels at the speed of 3 km/h. he is 10 minutes early. The distance (in km) between the school and his house is
(1) 5 (2) 4
(3) 3 (4) 1
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

12. When a person cycled at 10 km per hour he arrived at his office 6 minutes late. He arrived 6 minutes early, when he increased his speed by 2 km per hour. The distance of his office from the starting place is
(1) 6 km (2) 7 km
(3) 12 km (4) 16 km
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

13. A train covers a distance between station A and station B in 45 minutes. If the speed of the train is reduced by 5 km/hr, then the same distance is covered in 48 minutes. The distance between station A and B is
(1) 60 km (2) 64 km
(3) 80 km (4) 55 km
(SSC Graduate Level Tier-II Exam.16.09.2012)

14. A train covers a distance of 10 km in 12 minutes. If its speed is decreased by 5 km/hr, the time taken by it to cover the same distance will be :
(1) 10 minutes
(2) 13 minutes 20 sec
(3) 13 minutes
(4) 11 minutes 20 sec
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

15. Walking at a speed of 5 km/hr, a man reaches his office 6 minutes late. Walking at 6 km/hr, he reaches there 2 minutes early. The distance of his office is
(1) 3 km (2) 4 km
(3) 3.5 km (4) 2 km
(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

16. If a boy walks from his house to school at the rate of 4 km per hour, he reaches the school 10 minutes earlier than the scheduled time. However, if he walks at the rate of 3 km per hour, he reaches 10 minutes late. Find the distance of his school from his house.
(1) 5 km (2) 4 km
(3) 6 km (4) 4.5 km
(SSC Graduate Level Tier-II Exam. 29.09.2013

17. A train travelling at a speed of 55 km/hr travels from place X to place Y in 4 hours. If its speed is increased by 5 km/hr., then the time of journey is reduced by
(1) 25 minutes (2) 35 minutes
(3) 20 minutes (4) 30 minutes
(SSC CGL Tier-I Exam. 26.10.2014)

18. If a train runs at 70 km/hour, it reaches its destination late by 12 minutes. But if it runs at 80 km/hour, it is late by 3 minutes. The correct time to cover the journey is
(1) 58 minutes (2) 2 hours
(3) 1 hour (4) 59 minutes
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

TYPE–X

1. A train passes a 50 metres long platform in 14 seconds and a man standing on the platform in 10 seconds.The speed of the train is :
(1) 24 km/hr (2) 36km/hr
(3) 40 km/hr (4) 45 km/hr
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. A train passes a man standing on a platform in 8 seconds and also crosses the platform which is 264 metres long in 20 seconds. The length of the train (in metres) is :
(1) 188 (2) 176
(3) 175 (4) 96
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005)

3. A train moves past a telegraph post and a bridge 264 m long in 8 seconds and 20 seconds respectively. What is the speed of the train ?
(1) 69.5 km/hr (2) 70 km/hr
(3) 79 km/hr (4) 79.2 km/hr
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

4. A person standing on a railway platform noticed that a train took 21 seconds to completely pass through the platform which was 84 m long and it took 9 seconds in passing him. The speed of the train was
(1) 25.2 km/hour
(2) 32.4 km/hour
(3) 50.4 km/hour
(4) 75.6 km/hour
(SSC CPO S.I. Exam. 05.09.2004)

5. A moving train passes a platform 50 metres long in 14 seconds and a lamp-post in 10 seconds. The speed of the train is
(1) 24 km/hr. (2) 36 km/hr.
(3) 40 km/hr. (4)45 km/hr.
(SSC CPO S.I. Exam. 07.09.2003)

6. A train passes a platform 90 metre long in 30 seconds and a man standing on the platform in 15 seconds. The speed of the train is :
(1) 12.4 kmph (2) 14.6 kmph
(3) 18.4 kmph (4) 21.6 kmph
(SSC CPO S.I. Exam. 16.12.2007)

7. A moving train crosses a man standing on a platform and a bridge 300 metres long in 10 seconds and 25 seconds respectively. What will be the time taken by the train to cross a platform 200 metres long ?
(1) $16\frac{2}{3}$ seconds (2) 18 seconds
(3) 20 seconds (4) 22 seconds
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

8. A train passes a platform 110 m long in 40 seconds and a boy standing on the platform in 30 seconds . The length of the train is
(1) 100 m (2) 110 m
(3) 220 m (4) 330 m
(SSC CPO S.I. Exam. 09.11.2008)



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9. A train crosses a pole in 15 seconds and a platform 100 metres long in 25 seconds. Its length (in metres) is
(1) 50 (2) 100
(3) 150 (4) 200
(SSC (South Zone) Investigator Exam 12.09.2010)

10. Points 'A' and 'B' are 70 km apart on a highway. A car starts from 'A' and another from 'B' at the same time. If they travel in the same direction, they meet in 7 hours, but if they travel towards each-other, they meet in one hour. Find the speed of the two cars (in km/hr).
(1) 20, 30 (2) 40, 30
(3) 30, 50 (4) 20, 40
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

11. Two trains 100 metres and 95 metres long respectively pass each other in 27 seconds when they run in the same direction and in 9 seconds when they run in opposite directions. Speed of the two trains are
(1) 44 km/hr, 22 km/hr
(2) 52 km/hr, 26 km/hr
(3) 36 km/hr, 18 km/hr
(4) 40 km/hr, 20 km/hr
(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

12. A train passes by a lamp post on a platform in 7 sec. and passes by the platform completely in 28 sec. If the length of the platform is 390 m, then length of the train (in metres) is
(1) 120 (2) 130
(3) 140 (4) 150
(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

13. A train moving at a rate of 36 km/hr. crosses a standing man in 10 seconds. It will cross a platform 55 metres long, in :
(1) 6 seconds
(2) 7 seconds
(3) $15\frac{1}{2}$ seconds
(4) $5\frac{1}{2}$ seconds
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

14. A train crosses a platform in 30 seconds travelling with a speed of 60 km/h. If the length of the train be 200 metres, then the length (in metres) of the platform is
(1) 400 (2) 300
(3) 200 (4) 500
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

15. A train leaves a station A at 7 am and reaches another station B at 11 am. Another train leaves B at 8 am and reaches A at 11.30 am. The two trains cross one another at
(1) 8:36 am (2) 8:56 am
(3) 9:00 am (4) 9:24 am
(SSC CGL Tier-I Exam. 19.10.2014)

TYPE–XI

1. In a one-kilometre race A, B and C are the three participants. A can give B a start of 50 m. and C a start of 69 m. The start, which B can allow C is
(1) 17 m. (2) 20 m.
(3) 19 m. (4) 18 m.
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

2. A runs twice as fast as B and B runs thrice as fast as C. The distance covered by C in 72 minutes, will be covered by A in :
(1) 18 minutes (2) 24 minutes
(3) 16 minutes (4) 12 minutes
(SSC CPO S.I. Exam. 16.12.2007)

3. In a race of one kilometre, A gives B a start of 100 metres and still wins by 20 seconds. But if A gives B a start of 25 seconds, B wins by 50 metres. The time taken by A to run one kilometre is
(1) 17 seconds
(2) $\frac{500}{29}$ seconds
(3) $\frac{1200}{29}$ seconds
(4) $\frac{700}{29}$ seconds
(SSC CPO S.I. Exam. 09.11.2008)

4. In a 100m race, Kamal defeats Bimal by 5 seconds. If the speed of Kamal is 18 Kmph, then the speed of Bimal is
(1) 15.4 kmph (2) 14.5 kmph
(3) 14.4 kmph (4) 14 kmph
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

5. In a race of 1000 m, A can beat B by 100m. In a race of 400 m, B beats C by 40m. In a race of 500m. A will beat C by
(1) 95 m (2) 50 m
(3) 45 m (4) 60 m
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

6. In a race of 800 metres, A can beat B by 40 metres. In a race of 500 metres, B can beat C by 5 metres. In a race of 200 metres, A will beat C by
(1) 11.9 metre (2) 1.19 metre
(3) 12.7 metre (4) 1.27 metre
(SSC CPO S.I. Exam. 16.12.2007)

7. In a race of 200 metres, B can give a start of 10 metres to A, and C can give a start of 20 metres to B. The start that C can give to A, in the same race, is
(1) 30 metres (2) 25 metres
(3) 29 metres (4) 27 metres
(SSC CPO S.I. Exam. 16.12.2007)

8. A can give 40 metres start to B and 70 metres to C in a race of one kilometre How many metres start can B give to C in a race of one kilometre ?
(1) 30 metre (2) $31\frac{1}{4}$ metre
(3) $31\frac{3}{4}$ metre (4) 32 metre
(SSC CPO S.I. Exam. 09.11.2008)

9. A jeep is chasing a car which is 5km ahead. Their respective speed are 90 km/hr and 75 km/hr. After how many minutes will the jeep catch the car ?
(1) 18 min. (2) 20 min.
(3) 24 min. (4) 25 min.
(SSC Data Entry Operator Exam. 02.08.2009)

10. A is twice as fast as B, and B is thrice as fast as C is. The journey covered by C in $1\frac{1}{2}$ hours will be covered by A in
(1) 15 minutes (2) 30 minutes
(3) 1 hour (4) 10 minutes
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF-No. 789 TH 7)

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1. Walking at the rate of 4 kmph a man covers certain distance in 2 hrs 45 min. Running at a speed of 16.5 kmph the man will cover the same distance in how many minutes?
(1) 50 min. (2) 35 min.
(3) 40 min. (4) 45 min.
(SSC CGL Tier-I Exam. 09.08.2015 (1st Sitting) TF No. 1443088)

TYPE–XII

2. I walk a certain distance and ride back taking a total time of 37 minutes. I could walk both ways in 55 minutes. How long would it take me to ride both ways?
(1) 9.5 minutes (2) 19 minutes
(3) 18 minutes (4) 20 minutes
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. A and B start at the same time with speed of 40 km/hr and 50 km/hr respectively. If in covering the journey A takes 15 minutes longer than B, the total distance of the journey is :
(1) 46 km (2) 48 km
(3) 50 km (4) 52 km
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

4. A man can reach a certain place in 30 hours. If he reduces his speed by $\frac{1}{15}$th, he goes 10 km less in that time. Find his speed per hour.
(1) 6 km/hr (2) $5\frac{1}{2}$ km/hr
(3) 4 km/hr (4) 5 km/hr
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. A, B and C start at the same time in the same direction to run around a circular stadium. A completes a round in 252 seconds, B in 308 seconds and C in 198 seconds, all starting at the same point. After what time will they next meet at the starting point again?
(1) 46 minutes 12 seconds
(2) 45 minutes
(3) 42 minutes 36 seconds
(4) 26 minutes 18 seconds
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

6. A man walks a certain distance and rides back in 4 hours 30 minutes. He could ride both ways in 3 hours. The time required by the man to walk both ways is
(1) 4 hours 30 minutes
(2) 4 hours 45 minutes
(3) 5 hours
(4) 6 hours
(SSC CPO S.I. Exam. 07.09.2003)

7. A person, who can walk down a hill at the rate of $4\frac{1}{2}$ km/hour and up the hill at the rate of 3 km/hour, ascends and comes down to his starting point in 5 hours. How far did he ascend?
(1) 13.5 km (2) 3 km
(3) 15 km (4) 9 km
(SSC CPO S.I. Exam. 05.09.2004)

8. A walks at a uniform rate of 4 km an hour; and 4 hours after his start, B bicycles after him at the uniform rate of 10 km an hour. How far from the starting point will B catch A?
(1) 16.7 km (2) 18.6 km
(3) 21.5 km (4) 26.7 km
(SSC CPO S.I. Exam. 26.05.2005)

9. A car completes a journey in 10 hours. If it covers half of the journey at 40 kmph and the remaining half at 60 kmph, the distance covered by car is
(1) 400 km (2) 480 km
(3) 380 km (4) 300 km
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

10. *A* and *B* run a kilometre and *A* wins by 25 sec. *A* and *C* run a kilometre and *A* wins by 275 m. When *B* and *C* run the same distance, *B* wins by 30 sec. The time taken by *A* to run a kilometre is
(1) 2 min 25 sec
(2) 2 min 50 sec
(3) 3 min 20 sec
(4) 3 min 30 sec
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

11. Two cars start at the same time from one point and move along two roads at right angles to each other. Their speeds are 36 km/hour and 48 km/hour respectively. After 15 seconds the distance between them will be
(1) 400 m (2) 150 m
(3) 300 m (4) 250 m
(SSC CPO S.I. Exam. 03.09.2006)

12. In a kilometre race, A beats B by 30 seconds and B beats C by 15 seconds. If A beats C by 180 metres, the time taken by A to run 1 kilometre is
(1) 250 seconds (2) 205 seconds
(3) 200 seconds (4) 210 seconds
(SSC CPO S.I. Exam. 03.09.2006)

13. Two guns are fired from the same place at an interval of 6 minutes. A person approaching the place observes that 5 minutes 52 seconds have elapsed between the hearing of the sound of the two guns. If the velocity of the sound is 330 m/sec, the man was approaching that place at what speed (in km/hr)?
(1) 24 (2) 27
(3) 30 (4) 36
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

14. Ram arrives at a Bank 15 minutes earlier than scheduled time if he drives his car at 42 km/hr. If he drives car at 35 km/hr he arrives 5 minutes late. The distance of the Bank from his starting point is
(1) 70 km (2) 210 km
(3) 72 km (4) 60 km
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

15. A and B started at the same time from the same place for a certain destination. B walking at $\frac{5}{6}$ of A's speed reached the destination 1 hour 15 minutes after A. B reached the destination in
(1) 6 hours 45 minutes
(2) 7 hours 15 minutes
(3) 7 hours 30 minutes
(4) 8 hours 15 minutes
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

16. In covering a distance of 30 km, Abhay takes 2 hours more than Sameer. If Abhay doubles his speed, then he would take 1 hour less than Sameer. Abhay's speed (in km/hr) is
(1) 5 (2) 6
(3) 6.25 (4) 7.5
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

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16. A man takes 6 hours 15 minutes in walking a distance and riding back to the starting place. He could walk both ways in 7 hours 45 minutes. The time taken by him to ride both ways, is
(1) 4 hours
(2) 4 hours 30 minutes
(3) 4 hours 45 minutes
(4) 5 hours
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

17. A man completed a certain journey by a car. If he covered 30% of the distance at the speed of 20km/hr, 60% of the distance at 40km/hr and the remaining distance at 10km/hr; his average speed for the whole journey was
(1) 25 km/hr (2) 28 km/hr
(3) 30 km/hr (4) 33 km/hr
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

18. From two places, 60 km apart, A and B start towards each other at the same time and meet each other after 6 hours. Had A travelled with $\frac{2}{3}$ of his speed and B travelled with double of his speed, they would have met after 5 hours. The speed of A is
(1) 4 km/hr. (2) 6 km/hr.
(3) 10 km/hr. (4) 12 km/hr.
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

19. P and Q are 27 km away. Two trains with speed of 24 km/hr and 18 km/hr respectively start simultaneously from P and Q and travel in the same direction. They meet at a point R beyond Q. Distance QR is
(1) 126 km (2) 81 km
(3) 48 km (4) 36 km
(SSC Graduate Level Tier-II Exam.16.09.2012)

20. Ravi and Ajay start simultaneously from a place A towards B, 60 km apart. Ravi's speed is 4km/hr less than that of Ajay. Ajay, after reaching B, turns back and meets Ravi at a place 12 km away from B. Ravi's speed is
(1) 12 km/hr (2) 10 km/hr
(3) 8 km/hr (4) 6 km/hr
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

21. A man travelled a distance of 61 km in 9 hours, partly on foot at the rate of 4 km/hr and partly on bicycle at the rate of 9 km/hr. The distance travelled on foot was
(1) 12 km (2) 16 km
(3) 20 km (4) 24 km
(SSC (South Zone) Investigator Exam 12.09.2010)

22. If I walk at 5 km/hour, I miss a train by 7 minutes. If, however, I walk at 6 km/hour, I reach the station 5 minutes before the departure of the train. The distance (in km) between my house and the station is
(1) 6 (2) 5
(3) 4 (4) 3
(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

23. A man has to be at a certain place at a certain time. He finds that he shall be 20 minutes late if he walks at 3 km/hour speed and 10 minutes earlier if he walks at a speed of 4 km/hour. The distance he has to walk is
(1) 24 km (2) 12·5 km
(3) 10 km (4) 6 km
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

24. Ravi travels 300 km partly by train and partly by car. He takes 4 hours to reach, if he travels 60 km by train and rest by car. He will take 10 minutes more if he were to travel 100 km by train and rest by car. The speed of the train is :
(1) 50 km/hr (2) 60 km/hr
(3) 100 km/hr (4) 120 km/hr
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

25. A is twice as fast runner as B, and B is thrice as fast runner as C. If C travelled a distance in 1 hour 54 minutes, the time taken by B to cover the same distance is
(1) 19 minutes (2) 38 minutes
(3) 51 minutes (4) 57 minutes
(SSC SAS Exam. 26.06.2010 (Paper-1)

26. Two trains, A and B, start from stations X and Y towards Y and X respectively. After passing each other, they take 4 hours 48 minutes and 3 hours 20 minutes to reach Y and X respectively. If train A is moving at 45 km/hr., then the speed of the train B is
(1) 60 km/hr (2) 64.8 km/hr
(3) 54 km/hr (4) 37.5 km/hr
(SSC Graduate Level Tier-II Exam.16.09.2012)

27. Ram travelled 1200 km by air which formed $\frac{2}{5}$ of his trip. He travelled one-third of the trip by car and the rest by train. The distance (in km) travelled by train was
(1) 480 (2) 800
(3) 1600 (4) 1800
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

28. A, B, C walk 1 km in 5 minutes, 8 minutes and 10 minutes respectively. C starts walking from a point, at a certain time, B starts from the same point 1 minutes later and A starts from the same point 2 minutes later than C. Then A meets B and C after
(1) $\frac{5}{3}$ min, 2 min
(2) 1 min, 2 min
(3) 2 min, 3 min
(4) $\frac{4}{3}$ min, 3 min
(SSC Graduate Level Tier-I Exam. 21.04.2013)

29. Two cars are moving with speed v_1, v_2 towards a crossing along two roads. If their distance from the crossing be 40 metres and 50 metres at an instant of time then they do not collide if their speed are such that
(1) $v_1 : v_2 = 16 : 25$
(2) $v_1 : v_2 \neq 4 : 5$
(3) $v_1 : v_2 \neq 5 : 4$
(4) $v_1 : v_2 = 25 : 16$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

30. The distance between place A and B is 999 km. An express train leaves place A at 6 am and runs at a speed of 55.5 km/hr. The train stops on the way for 1 hour 20 minutes. It reaches B at
(1) 1.20 am (2) 12 pm
(3) 6 pm (4) 11 pm
(SSC Graduate Level Tier-II Exam. 29.09.2013)

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31. A speed of 45 km per hour is the same as
(1) 12.5 metre/seccond
(2) 13 metre/seccond
(3) 15 metre/seccond
(4) 12 metre/seccond
(SSC CGL Tier-I Exam. 26.10.2014)

32. If a distance of 50 m is covered in 1 minute, that 90 m in 2 minutes and 130 m in 3 minutes find the distance covered in 15 minutes.
(1) 610 m (2) 750 m
(3) 1000 m (4) 650 m
(SSC CGL Tier-II Exam. 21.09.2014)

33. A train leaves station A at 5 AM and reaches station B at 9 AM on the same day. Another train leaves station B at 7 AM and reaches station A at 10:30 AM on the same day. The time at which the two trains cross each other is :
(1) 8 : 26 AM (2) 7: 36 AM
(3) 7: 56 AM (4) 8 AM
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

34. A plane can cover 6000 km in 8 hours. If the speed is increased by 250 kmph, then the time taken by the plane to cover 9000 km is
(1) 8 hours (2) 6 hours
(3) 5 hours (4) 9 hours
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	2. (4)	3. (4)	4. (2)
5. (4)	6. (4)	7. (1)	8. (3)
9. (1)	10. (1)	11. (4)	12. (2)
13. (2)	14. (4)	15. (1)	16. (3)
17. (1)	18. (2)	19. (2)	20. (2)
21. (4)	22. (3)	23. (2)	24. (2)
25. (1)	26. (2)	27. (2)	28. (1)
29. (1)	30. (4)	31. (2)	32. (2)
33. (2)	34. (1)	35. (4)	36. (3)
37. (4)	38. (1)	39. (1)	40. (*)
41. (1)	42. (4)	43. (3)	44. (3)
45. (1)	46. (4)		

TYPE-II

1. (3)	2. (3)	3. (3)	4. (2)
5. (2)	6. (3)	7. (3)	8. (4)
9. (4)	10. (4)	11. (3)	12. (1)
13. (2)	14. (4)	15. (3)	16. (2)
17. (3)	18. (2)	19. (1)	20. (4)
21. (1)	22. (2)		

TYPE-III

1. (3)	2. (3)	3. (2)	4. (2)
5. (1)	6. (3)	7. (1)	8. (3)
9. (4)	10. (3)	11. (4)	12. (3)
13. (4)	14. (3)	15. (2)	16. (4)
17. (1)	18. (1)	19. (1)	20. (4)
21. (1)	22. (2)	23. (4)	24. (1)

TYPE-IV

1. (3)	2. (2)	3. (2)	4. (3)
5. (2)	6. (3)	7. (2)	8. (2)
9. (1)	10. (4)	11. (4)	12. (2)
13. (3)	14. (3)	15. (3)	16. (1)
17. (1)	18. (3)	19. (2)	20. (2)
21. (3)	22. (3)	23. (3)	24. (3)
25. (1)	26. (4)	27. (1)	

TYPE-V

1. (3)	2. (3)	3. (2)	4. (3)
5. (2)	6. (1)	7. (1)	8. (2)
9. (2)	10. (2)	11. (2)	12. (1)

TYPE-VI

1. (2)	2. (1)	3. (2)	4. (3)
5. (3)	6. (1)	7. (2)	8. (4)
9. (2)	10. (1)	11. (1)	12. (2)
13. (1)	14. (1)	15. (1)	16. (2)
17. (3)	18. (3)	19. (1)	20. (2)
21. (4)	22. (3)	23. (3)	24. (1)
25. (4)	26. (4)	27. (2)	

TYPE-VII

1. (3)	2. (1)	3. (3)	4. (2)
5. (2)	6. (3)	7. (3)	8. (2)
9. (3)	10. (3)	11. (1)	12. (3)

TYPE-VIII

1. (1)	2. (1)	3. (1)	4. (4)
5. (2)	6. (4)	7. (3)	8. (1)
9. (2)	10. (3)	11. (3)	12. (2)
13. (3)	14. (4)	15. (2)	16. (1)
17. (4)	18. (1)	19. (3)	20. (2)
21. (1)	22. (3)		

TYPE-IX

1. (3)	2. (1)	3. (3)	4. (4)
5. (3)	6. (2)	7. (4)	8. (2)
9. (3)	10. (3)	11. (2)	12. (3)
13. (1)	14.(2)	15. (2)	16. (2)
17. (3)	18. (3)		

TYPE-X

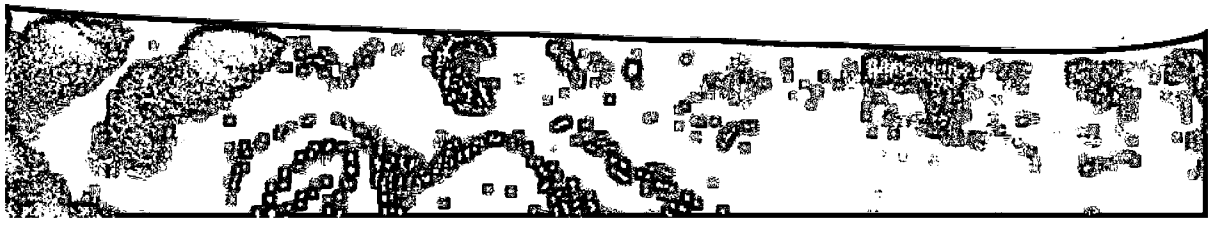
1. (4)	2. (2)	3. (4)	4. (1)
5. (4)	6. (4)	7. (3)	8. (4)
9. (3)	10. (2)	11. (2)	12. (2)
13. (3)	14. (2)	15. (4)	

TYPE-XI

1. (2)	2. (4)	3. (2)	4. (3)
5. (1)	6. (1)	7. (3)	8. (2)
9. (2)	10. (1)	11. (3)	

TYPE-XII

1. (2)	2. (3)	3. (4)	4. (1)
5. (4)	6. (4)	7. (4)	8. (2)
9. (1)	10. (4)	11. (2)	12. (2)
13. (1)	14. (3)	15. (1)	16. (3)
17. (1)	18. (2)	19. (2)	20. (3)
21. (2)	22. (1)	23. (4)	24. (2)
25. (2)	26. (3)	27. (2)	28. (1)
29. (2)	30. (1)	31. (1)	32. (1)
33. (3)	34. (4)		



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EXPLANATIONS

TYPE-I

1. (2) Time taken = $\frac{\text{Distance}}{\text{time}}$

$= \frac{4}{5} \text{ hour} = \frac{4\times60\times60}{5\times45}$ sec.

= 64 seconds

2. (4) Let the required speed is x km/hr

Then, $240\times5 = \frac{5}{3}\times x$

$\therefore x = 720$ km/hr.

3. (4) Speed of the man = 5km/hr

$= 5\times\frac{1000}{60}\text{m/min} = \frac{250}{3}\text{m/min}$

Time taken to cross the bridge = 15 minutes

Length of the bridge = speed × time

$= \frac{250}{3}\times15\text{m} = 1250\text{m}$

4. (2) Speed $= \frac{\text{Distance}}{\text{Time}} = \frac{250}{75}$

$= \frac{10}{3}\text{m/sec} = \frac{10}{3}\times\frac{18}{5}\text{km/hr.}$

$\left[\because 1\text{ m/s} = \frac{18}{5}\text{km/hr}\right]$

= 2 × 6 km/hr. = 12 km/hr.

5. (4) Speed $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{200}{24}\text{m/s}$

$\frac{200}{24}\text{m/s} = \frac{200}{24}\times\frac{18}{5}$

= 30 km/h

$\left[\because x\text{ m/s} = \frac{18}{5}x\text{ km/h}\right]$

6. (4) Speed of car = 10 m/sec.

Required speed in kmph

$= \frac{10\times18}{5} = 36$ km/hr

7. (1) Total distance covered = Speed × Time

= 40 × 9 = 360 km.

The required time at 60 kmph

$= \frac{360}{60} = 6$ hours.

8. (3) Let the distance be x km.

Total time = 5 hours 48 minutes

$= 5 + \frac{48}{60} = \left(5+\frac{4}{5}\right)$ hours

$= \frac{29}{5}$ hours

$\therefore \frac{x}{25} + \frac{x}{4} = \frac{29}{5}$

$\Rightarrow \frac{4x+25x}{100} = \frac{29}{5}$

$\Rightarrow 5\times29x = 29\times100$

$\Rightarrow x = \frac{29\times100}{5\times29} = 20$ km.

9. (1) Let the required distance be x km.

Then,

$\frac{x}{3} + \frac{x}{2} = 5$

$\Rightarrow \frac{2x+3x}{6} = 5$

$\Rightarrow 5x = 6\times5$

$\therefore x = \frac{6\times5}{5} = 6$ km

10. (1) The boy covers 20 km in 2.5 hours.

$\Rightarrow$ Speed $= \frac{20}{2.5} = 8$ km/hr.

New speed = 16 km/hr

$\therefore$ Time $= \frac{32}{16} = 2$ hours.

11. (4) Speed = 180 kmph

$= \frac{180\times5}{18}$ m/sec = 50 m/sec

$\left[\because 1\text{ km/hr} = \frac{5}{18}\text{m/s}\right]$

12. (2) Speed $= \frac{150}{25} = 6$ m/sec

$= 6\times\frac{18}{5} = \frac{108}{5} = 21.6$ kmph

13. (2) Let the distance between A and B be x km, then

$\frac{x}{9} - \frac{x}{10} = \frac{36}{60} = \frac{3}{5}$

$\Rightarrow \frac{x}{90} = \frac{3}{5}$

$\Rightarrow x = \frac{3}{5}\times90 = 54$ km.

14. (4) Difference of time = 4.30 p.m − 11.a.m.

$= 5\frac{1}{2}\text{hours} = \frac{11}{2}\text{hours}$

Distance covered in $\frac{11}{2}$ hrs

$= \frac{5}{6} - \frac{3}{8} = \frac{20-9}{24} = \frac{11}{24}$ part

$\because \frac{11}{24}$ part of the journey is covered in $\frac{11}{2}$ hours

$\Rightarrow \frac{3}{8}$ part of the journey is covered in

$= \frac{11}{2}\times\frac{24}{11}\times\frac{3}{8} = \frac{9}{2}$ hours

$= 4\frac{1}{2}$ hours.

Clearly the person started at 6.30 a.m.

15. (1) Speed of bus = 72 kmph

$= \left(\frac{72\times5}{18}\right)$ metre/second

= 20 metre/second

$\therefore$ Required distance = 20 × 5 = 100 metre

16. (3) If the required distance be x km, then

$\frac{x}{3} - \frac{x}{4} = \frac{1}{2}$

$\Rightarrow \frac{4x-3x}{12} = \frac{1}{2}$

$\Rightarrow \frac{x}{12} = \frac{1}{2} \Rightarrow x = 6$ km

17. (1) Time $= 10\frac{1}{2}$ hours

$= \frac{21}{2}$ hours

Speed = 40 kmph

Distance = Speed × Time

$= 40\times\frac{21}{2} = 420$ km

18. (2) Distance covered on foot

$= 4\times3\frac{3}{4}$ km. = 15 km.

$\therefore$ Time taken on cycle

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$= \frac{\text{Distance}}{\text{Speed}} = \frac{15}{16.5}$ hour

$= \frac{15 \times 60}{16.5}$ minutes

= 54.55 minutes

19. (2) Speed of train = $\frac{\text{Distance}}{\text{Time}}$

$= \frac{10}{\frac{12}{60}}$ kmph

$= \frac{10 \times 60}{12} = 50$ kmph

New speed = 45 kmph

∴ Required time = $\frac{10}{45}$ hour

$= \frac{2}{9} \times 60$ minutes

$= \frac{40}{3}$ minutes

= 13 minutes 20 seconds

20. (2) Man's speed = $\frac{\text{Distance}}{\text{Time}}$

$= \frac{a}{b}$ kmph

$= \frac{1000a}{b}$ m/hour

∴ Time taken in walking 200 metre

$= \frac{200}{\frac{1000a}{b}} = \frac{b}{5a}$ hours

21. (4) ∵ 1 m/sec = $\frac{18}{5}$ kmph

∴ $\frac{10}{3}$ m/sec

$= \frac{18}{5} \times \frac{10}{3} = 12$ kmph

22. (3) Remaining time

$= \frac{2}{5} \times 15 = 6$ hours

∴ Required speed

$= \frac{60}{6} = 10$ kmph

23. (2) Speed of train = 60 kmph

Time = 210 minutes

$= \frac{210}{60}$ hours

or $\frac{7}{2}$ hours

Distance covered

$= 60 \times \frac{7}{2} = 210$ km

Time taken at 80 kmph

$= \frac{210}{80} = \frac{21}{8}$ hours

$= 2\frac{5}{8}$ hours

24. (2) 90 km = 12 × 7km + 6 km. To cover 7 km total time taken = $\frac{7}{18}$ hours + 6 min. = $\frac{88}{3}$ min. So, (12 × 7 km) would be covered in $\left(12 \times \frac{88}{3}\right)$ min. and remaining 6 km is $\frac{6}{18}$ hrs or 20 min.

∴ Total time = $\frac{1056}{3} + 20$

$= \frac{1116}{3 \times 60}$ hours = $6\frac{1}{5}$ hours

= 6 hours 12 minutes.

25. (1) 30.6 kmph

$= \left(30.6 \times \frac{5}{18}\right)$ m/sec.

= 8.5 m/sec

26. (2) Let the total journey be of x km, then

$\frac{2x}{15} + \frac{9x}{20} + 10 = x$

$\Rightarrow x - \frac{2x}{15} - \frac{9x}{20} = 10$

$\Rightarrow \frac{60x - 8x - 27x}{60} = 10$

$\Rightarrow \frac{25x}{60} = 10$

$\Rightarrow x = \frac{60 \times 10}{25} = 24$ km

27. (2) If the required distance be = x km, then

$\frac{x}{4} - \frac{x}{5} = \frac{10+5}{60}$

$\Rightarrow \frac{5x - 4x}{20} = \frac{1}{4}$

$\Rightarrow \frac{x}{20} = \frac{1}{4}$

$\Rightarrow x = \frac{1}{4} \times 20 = 5$ km.

28. (1) Relative speed

$= \left(\frac{5}{2} + 2\right)$ kmph = $\frac{9}{2}$ kmph

Time = $\frac{\text{Distance}}{\text{Relative speed}} = \frac{18}{\frac{9}{2}}$

$= \frac{18 \times 2}{9} = 4$ hours

29. (1) Journey on foot = x km

Journey on cycle = $(80 - x)$ km

∴ $\frac{x}{8} + \frac{80 - x}{16} = 7$

$\Rightarrow \frac{2x + 80 - x}{16} = 7$

$\Rightarrow x + 80 = 16 \times 7 = 112$

$\Rightarrow x = 112 - 80 = 32$ km.

30. (4) Distance covered by car in 2 hours

$= \frac{300 \times 40}{100} = 120$ km

Remaining distance

= 300 − 120 = 180 km

Remaining time = 4 − 2

= 2 hours

∴ Required speed = $\frac{180}{2}$

= 90 kmph

Original speed of car = $\frac{120}{2}$

= 60 kmph

∴ Required increase in speed

= 90 − 60 = 30 kmph

31. (2) Time taken in covering 5 Km

$= \frac{5}{10} = \frac{1}{2}$ hour

= 30 minutes

That person will take rest for four times.

∴ Required time

= (30 + 4 × 5) minutes

= 50 minutes



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32. (2) Time = 12 minutes

$= \frac{12}{60}$ hour $= \frac{1}{5}$ hour

Speed of train $= \frac{10}{\frac{1}{5}}$

= 50 kmph

New speed = 50 – 5 = 45 kmph

$\therefore$ Required time $= \frac{\text{Distance}}{\text{Speed}}$

$= \frac{10}{45} = \frac{2}{9}$ hour

$= \left(\frac{2}{9} \times 60\right)$ minutes

$= \frac{40}{3}$ minutes

33. (2) Distance covered by motor cyclist P in 30 minutes

$= 30 \times \frac{1}{2} = 15$ km

Relative speed

= 40 – 30 = 10 kmph

$\therefore$ Required speed = Time taken to cover is km at 10 kmph

$= \frac{15}{10} = \frac{3}{2}$ hours

34. (1) Speed of B = x kmph (let)

Speed of A = $2x$ kmph

Speed of C $= \frac{x}{3}$ kmph

$\therefore \frac{\text{Speed of A}}{\text{Speed of C}} = \frac{2x}{\frac{x}{3}} = 6$

$\therefore$ Required time $= \frac{1}{6}$ of $\frac{3}{2}$ hours

$= \frac{1}{4}$ hour = 15 minutes

35. (4) Distance covered by truck in $\frac{3}{2}$ hours

= Speed × Time

$= 90 \times \frac{3}{2} = 135$ km

Remaining distance

= 310 – 135 = 175 km

$\therefore$ Time taken at 70 kmph

$= \frac{175}{70} = 2.5$ hours

$\therefore$ Total time = 1.5 + 2.5

= 4 hours

36. (3) Distance = Speed × Time

= 60 km.

Time taken at 40 kmph

$= \frac{60}{40} = \frac{3}{2}$ hours

37. (4) Distance of school = x km

Difference of time

= 16 minutes $= \frac{16}{60}$ hour

$\therefore \frac{x}{\frac{5}{2}} - \frac{x}{3} = \frac{16}{60}$

$\Rightarrow \frac{2x}{5} - \frac{x}{3} = \frac{4}{15}$

$\Rightarrow \frac{6x - 5x}{15} = \frac{4}{15}$

$\Rightarrow \frac{x}{15} = \frac{4}{15}$

$\Rightarrow x = \frac{4}{15} \times 15 = 4$ km

38. (1) Average speed of journey

$= \left(\frac{2xy}{x+y}\right)$ kmph

$= \frac{2 \times 40 \times 50}{40+50} = \frac{2 \times 40 \times 50}{90}$

$= \frac{400}{9} = 44\frac{4}{9}$ kmph

39. (1) 60 kmph $= \left(\frac{60 \times 5}{18}\right)$ m/sec

$= \frac{50}{3}$ m/sec.

$\therefore$ Speed $\propto \frac{1}{\text{Time}}$

$\Rightarrow S_1 \times T_1 = S_2 \times T_2$

$\Rightarrow \frac{50}{3} \times \frac{9}{2} = 15 \times T_2$

$\Rightarrow 75 = 15 \times T_2$

$\Rightarrow T_2 = \frac{75}{15} = 5$ hours

40. (*) Speed of Romita = x kmph (let)

Distance = Speed × Time

According to the question,

$4 \times 6 + x \times 6 = 42$

$\Rightarrow 6x = 42 - 24 = 18$

$\Rightarrow x = 18 \div 6 = 3$ kmph

41. (1) Distance travelled by farmer on foot = x km (let)

$\therefore$ Distance covered by cycling = $(61-x)$ km.

Time $= \frac{\text{Distance}}{\text{Speed}}$

According to the question,

$\frac{x}{4} + \frac{61-x}{9} = 9$

$\Rightarrow \frac{9x + 61 \times 4 - 4x}{9 \times 4} = 9$

$\Rightarrow 5x + 244 = 9 \times 9 \times 4 = 324$

$\Rightarrow 5x = 324 - 244 = 80$

$\Rightarrow x = \frac{80}{5} = 16$ km.

42. (4) Distance = Speed × Time

$= \left(40 \times 6\frac{1}{4}\right)$ km

$= \left(\frac{40 \times 25}{4}\right)$ km = 250 km

New speed = 50 kmph

$\therefore$ Required time

$= \frac{\text{Distance}}{\text{Speed}} = \frac{250}{50}$

= 5 hours

43. (3) Distance between school and house = x km (let)

Time $= \frac{\text{Distance}}{\text{Speed}}$

According to the question,

$\frac{x}{\frac{5}{2}} - \frac{x}{\frac{7}{2}} = \frac{6+6}{60} = \frac{1}{5}$

(Difference of time = 6 + 6 =12 minutes)

$\Rightarrow \frac{2x}{5} - \frac{2x}{7} = \frac{1}{5}$

$\Rightarrow \frac{14x - 10x}{35} = \frac{1}{5} \Rightarrow \frac{4x}{35} = \frac{1}{5}$

$\Rightarrow 4x = \frac{35}{5} = 7$

$\Rightarrow x = \frac{7}{4} = 1\frac{3}{4}$ km.

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44. (3) Let the total distance be $4x$ km.

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

According to the question,

$$\frac{x}{10} + \frac{3x}{12} = 7$$

$$\Rightarrow \frac{x}{10} + \frac{x}{4} = 7$$

$$\Rightarrow \frac{2x+5x}{20} = 7$$

$$\Rightarrow 7x = 7 \times 20$$

$$\therefore x = \frac{7\times 20}{7} = 20 \text{ km.}$$

$\therefore$ PQ $= 4x = 4 \times 20 = 80$ km.

45. (1) Let the distance of school be x km.

Difference of time $= 6 + 10$

$$= 16 \text{ minutes} = \frac{16}{60} \text{ hour}$$

$$= \frac{4}{15} \text{ hour}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\therefore \frac{x}{\frac{5}{2}} - \frac{x}{3} = \frac{4}{15}$$

$$\Rightarrow \frac{2x}{5} - \frac{x}{3} = \frac{4}{15}$$

$$\Rightarrow \frac{6x-5x}{15} = \frac{4}{15}$$

$\Rightarrow x = 4$ km.

46. (4) Let the distance covered be $2x$ km.

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

According to the question,

$$\frac{x}{60} + \frac{x}{45} = 5\frac{15}{60} = 5\frac{1}{4}$$

$$\Rightarrow \frac{3x+4x}{180} = \frac{21}{4}$$

$$\Rightarrow 7x = \frac{21}{4} \times 180$$

$$\Rightarrow x = \frac{21\times 180}{4\times 7} = 135 \text{ km.}$$

$\therefore$ Length of total journey $= 2 \times 135 = 270$ km.

TYPE-II

1. (3) Let the length of train be x metre

Speed $= 90$ km/hr

$$= \frac{90\times 5}{18} \text{ metre/sec.}$$

$= 25$ metre/sec.

$\therefore$ Distance covered in 60 sec.

$= 25 \times 60 = 1500$ metres

Now, according to question,

$2x = 1500$

$\therefore x = 750$ metre

2. (3) When a train crosses a bridge it covers the distance equal to length of Bridge & its own length

Let the length of the train be $= x$

$\therefore$ Speed of the train

$$= \frac{x+800}{100} \text{ m/s}$$

Since train passes the 800 m bridge in 100 seconds.

Again, train passes the 400 m bridge in 60 seconds.

$$\therefore \frac{400+x}{\frac{x+800}{100}} = 60$$

$$\Rightarrow \frac{(400+x)\times 100}{x+800} = 60$$

$$\Rightarrow 40000 + 100x = 60x + 48000$$

$$\Rightarrow 100x - 60x = 48000 - 40000$$

$$\Rightarrow 40x = 8000$$

$$\therefore x = \frac{8000}{40} = 200\text{m}$$

3. (3) In crossing the bridge, the train travels its own length plus the length of the bridge.

Total distance (length)

$= 300 + 200 = 500$ m.

Speed $= 25$m/sec.

$\therefore$ The required time

$= 500 \div 25 = 20$ seconds

4. (2) When a train crosses a tunnel, it covers a distance equal to the sum of its own length and tunnel.

Let the length of tunnel be x

Speed $= 78$ kmph

$$= \frac{78\times 1000}{60\times 60} \text{ m/sec.} = \frac{65}{3} \text{ m/sec.}$$

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\Rightarrow \frac{65}{3} = \frac{800+x}{60}$$

$$\Rightarrow (800 + x) \times 3 = 65x \times 60$$

$$\Rightarrow 800 + x = 65 \times 20 \text{ m}$$

$$\Rightarrow x = 1300 - 800 = 500$$

$\therefore$ Length of tunnel $= 500$ metres.

5. (2) When a train crosses a railway platform, it travels a distance equal to sum of length of platform and its own length.

Speed $= 132$ kmph

$$= 132 \times \frac{5}{18} = \frac{110}{3} \text{ m/sec.}$$

$\therefore$ Required time

$$= \frac{110+165}{\frac{110}{3}} \text{ seconds}$$

$$= \frac{275\times 3}{110} = 7.5 \text{ seconds}$$

6. (3) Let the length of the train be x metres.

When a train corsses a platform it covers a distance equal to the sum of lengths of train and platform. Also, the speed of train is same.

$$\therefore \frac{x+162}{18} = \frac{x+120}{15}$$

$$\Rightarrow 6x + 720 = 5x + 810$$

$$\Rightarrow 6x - 5x = 810 - 720$$

$$\Rightarrow x = 90$$

$\therefore$ The length of the train $= 90$m.

7. (3) When a train croses a bridge, distance covered = length of (bridge + train).

$\therefore$ Speed of train

$$= \frac{150+500}{30}$$

$$= \frac{650}{30} = \frac{65}{3} \text{ m/sec.}$$

$\therefore$ Time taken to cross the 370m long platform

$$= \frac{370+150}{\frac{65}{3}}$$

$$= \frac{520\times 3}{65} = 24 \text{ seconds}$$

8. (4) Speed of train $= 90$ kmph

$$= 90 \times \frac{5}{18} = 25 \text{ m/sec}$$

Distance covered

$= 230 + 120 = 350$ m

$$\therefore \text{Time taken} = \frac{350}{25}$$

$= 14$ seconds

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9. (4) Let the length of train be x
According to the question,

$\frac{x+600}{30} = 30$

$\Rightarrow x + 600 = 900$

$\Rightarrow x = 900 - 600 = 300$ m

10. (4) Let the length of the train be x
According to the question,

$\frac{x+122}{17} = \frac{x+210}{25}$

$\Rightarrow 25x + 3050 = 17x + 3570$

$\Rightarrow 25x - 17x = 3570 - 3050$

$\Rightarrow 8x = 520$

$\Rightarrow x = \frac{520}{8} = 65$ metres

$\therefore$ Speed of the train

$= \frac{65+122}{17}$

$= \frac{187}{17}$ metre/second

$= 11$ metre/second

$= \frac{11 \times 18}{5}$ kmph

$= 39.6$ kmph

11. (3) Let the Length of the train be x

Then, $\frac{x+162}{18} = \frac{x+120}{15}$

(Speed of the train)

$\Rightarrow \frac{x+162}{6} = \frac{x+120}{5}$

$\Rightarrow 6x + 720 = 5x + 810$

$\Rightarrow x = 810 - 720 = 90$

$\therefore$ Speed of the train

$= \frac{90+162}{18}$ m/sec.

$= \frac{252}{18} \times \frac{18}{5}$ kmph

$= 50.4$ kmph

2. (1) Let the length of the train be x

$\therefore$ Speed of train

$\frac{x+300}{21} = \frac{x+240}{18}$

$\Rightarrow \frac{x+300}{7} = \frac{x+240}{6}$

$\Rightarrow 7x + 1680 = 6x + 1800$

$\Rightarrow x = 120$

$\therefore$ Speed of train

$= \frac{x+300}{21} = \frac{420}{21} = 20$ m/sec

$= \left(\frac{20 \times 18}{5}\right)$ kmph $= 72$ kmph

13. (2) Speed of train

$= \frac{\text{Sum of length of both trains}}{\text{Time taken}}$

$\Rightarrow \frac{60 \times 5}{18} = \frac{110+170}{t} = \frac{280}{t}$

$\Rightarrow t = \frac{280 \times 18}{60 \times 5}$

$= 16.8$ seconds.

14. (4) Speed of train

$= \frac{\text{Length of (train + platform)}}{\text{Time taken to cross}}$

$= \left(\frac{500+700}{10}\right)$ feet/second

$= 120$ feet/second

15. (3) Speed of train $= 36$kmph

$= 36 \times \frac{5}{18} = 10$ m/sec.

If the length of bridge be x metre, then

$10 = \frac{200+x}{55}$

$\Rightarrow 200 + x = 550$

$\Rightarrow x = 550 - 200 = 350$ metre.

16. (2) 36 kmph

$= \left(36 \times \frac{5}{18}\right)$ m/sec.

$= 10$ m/sec.

Required time $= \frac{270+180}{10}$

$= 45$ seconds

17. (3) Speed of train

$= \frac{\text{Length of (train + platform)}}{\text{Time taken in crossing}}$

$= \frac{(50+100)}{10}$

$= \frac{150}{10} = 15$ m/sec

18. (2) Speed of train

$= \frac{\text{Length of platform and train}}{\text{Time taken in crossing}}$

$= \left(\frac{100+50}{10}\right)$ metre/second

$= 15$ metre/second

$= \left(15 \times \frac{18}{5}\right)$ kmph

$= 54$ kmph

19. (1) Speed of train $= 36$ kmph

$= \left(\frac{36 \times 5}{18}\right)$ m/sec.

$= 10$ m/sec

Required time

$= \frac{\text{Length of train and bridge}}{\text{Speed of train}}$

$= \frac{120+360}{10} = \frac{480}{10}$

$= 48$ seconds

20. (4) Time $= 5$ minutes

$= \frac{1}{12}$ hour

$\therefore$ Length of bridge = Speed $\times$ Time

$= 15 \times \frac{1}{12} = \frac{5}{4}$ km.

$= \left(\frac{5}{4} \times 1000\right)$ metre

$= 1250$ metre

21. (1) Speed of train $= 72$ kmph

$= \left(\frac{72 \times 5}{18}\right)$ m/sec.

$= 20$ m/sec.

Required time

$= \frac{\text{Length of train and bridge}}{\text{Speed of train}}$

$= \frac{(200+800)}{20}$

$= \frac{1000}{20} = 50$ seconds

22. (2) Length of train $= x$ metre (let)
Speed of train

$= \frac{\text{(Length of train and bridge)}}{\text{Time taken in crossing}}$

$\Rightarrow \frac{x+500}{100} = \frac{x+250}{60}$

$\Rightarrow \frac{x+500}{5} = \frac{x+250}{3}$

$\Rightarrow 5x + 1250 = 3x + 1500$

$\Rightarrow 5x - 3x = 1500 - 1250$

$\Rightarrow 2x = 250$

$\Rightarrow x = \frac{250}{2} = 125$ metre

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TYPE-III

1. (3) Relative speed of man and train = 20 – 10 = 10m/sec.

$\therefore$ Required time $= \frac{180}{10}$

= 18 seconds

2. (3) In this situation, the train covers it length.
Required time

$= \frac{100}{30\times1000}$hr.

$= \frac{100\times60\times60}{30\times1000}$ = 12 seconds

3. (2) Relative speed of train
= 63–3 = 60 kmph

$= 60\times\frac{5}{18} m/sec$

$\therefore$ Time = $\frac{\text{Length of train}}{\text{Relative Speed}}$

$= \frac{500\times18}{60\times5}$ = 30 sec.

4. (2) Speed = $\frac{\text{Distance}}{\text{Time}}$

$= \frac{125}{30} = 4.16$m/s

4.16 m/s $= 4.16\times\frac{18}{5}$

= 15 km/hr

5. (1) In crossing a man standing on platform, train crosses its own length.
$\therefore$ Speed of train

$= \frac{120}{10} = 12$ m/s

6. (3) Speed of train (in m/s)

$= 20\times\frac{5}{18} = \frac{50}{9}$ m/sec

Required time = $\frac{75}{50}\times9$

= 13.5 seconds

7. (1) Speed of the train

= 144 kmph $= 144\times\frac{5}{18}$

= 40 m/s
When a train crosses a pole, it covers a distance equal to its own length.

The required time = $\frac{100}{40}$

$= \frac{5}{2} = 2.5$ seconds.

8. (3) Speed of train

$= \frac{120}{9}\times\frac{18}{5}$ = 48 kmph

9. (4) Speed of train = 60 kmph

$= 60\times\frac{5}{18} = \frac{50}{3}$ m/sec

$\therefore$ Length of train
= Speed × Time

$= \frac{50}{3}\times30$ = 500 m

10. (3) Let the speed of train be x kmph and its length be y km.
When the train crosses a man, it covers its own length
According to he question,

$\frac{y}{(x-3)\times\frac{5}{18}} = 10$

$\Rightarrow 18y = 10\times5(x-3)$
$\Rightarrow 18y = 50x-150$ ..... (i)

and, $\frac{y}{(x-5)\times\frac{5}{18}} = 11$

$\Rightarrow 18y = 55(x-5)$
$\Rightarrow 18y = 55x-275$ .... (ii)
From equations (i) and (ii).
$55x-275 = 50x-150$
$\Rightarrow 55x-50x = 275-150$
$\Rightarrow 5x = 125$

$\Rightarrow x = \frac{125}{5} = 25$

$\therefore$ Speed of the train = 25 kmph

11. (4) Relative speed of train
= (36 – 9) kmph = 27 kmph

$= \frac{27\times5}{18}$ m/sec

$= \frac{15}{2}$ m/sec

$\therefore$ Required time

$= \frac{\text{Length of the train}}{\text{Relative speed}}$

$= \frac{150\times2}{15} = 20$ seconds

12. (3) Distance covered in 10 minutes at 20kmph = distance covered in 8 minutes at (20 + x) kmph

$\Rightarrow 20\times\frac{10}{60} = \frac{8}{60}(20+x)$
$\Rightarrow 200 = 160+8x$
$\Rightarrow 8x = 40$

$\Rightarrow x = \frac{40}{8} = 5$ kmph

13. (4) If the speed of the train be x kmph, then relative speed = $(x-3)$ kmph.

or $(x-3)\times\frac{5}{18}$ m/sec

$\therefore \frac{300}{(x-3)\times\frac{5}{18}} = 33$

$\Rightarrow 5400 = 33\times5(x-3)$
$\Rightarrow 360 = 11(x-3)$
$\Rightarrow 11x-33 = 360$

$\Rightarrow x = \frac{393}{11} = 35\frac{8}{11}$ kmph

14. (3) If the speed of train be x kmph then,
Its relative speed = $(x+3)$ kmph

$\therefore$ Time = $\frac{\text{Length of the train}}{\text{Relative speed}}$

$\Rightarrow \frac{10}{3600} = \frac{\frac{240}{1000}}{(x+3)} = \frac{240}{1000(x+3)}$
$\Rightarrow x+3 = 86.4$
$\Rightarrow x = 83.4$ kmph

15. (2) Speed of train = 36 kmph

$= \left(\frac{36\times5}{18}\right)$ m/sec = 10 m/sec.

$\therefore$ Length of train
= Speed × time
= 10 × 25 = 250 metre

16. (4) Speed of train = 90 kmph

$= \left(\frac{90\times5}{18}\right)$ metre/second

= 25 metre/second
If the length of the train be x then,
Speed of train

$= \frac{\text{Length of train}}{\text{Time taken in crossing the signal}}$

$\Rightarrow 25 = \frac{x}{10}$
$\Rightarrow x = 250$ metre

17. (1) Let speed of train be x kmph
Relative speed = $(x+5)$ kmph

Length of train = $\frac{100}{1000}$ km

$= \frac{1}{10}$ km

$\therefore \frac{\frac{1}{10}}{x+5} = \frac{36}{5\times60\times60}$

$\Rightarrow \frac{1}{10(x+5)} = \frac{1}{500}$
$\Rightarrow x+5 = 50$
$\Rightarrow x = 45$ kmph

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18. (1) Speed of train
$= \frac{\text{Length of train}}{\text{Time taken in crossing the pole}}$
$= \frac{120}{6} = 20$ m/sec
$= 20 \times \frac{18}{5} = 72$ kmph

19. (1) Speed of train = 54 kmph
$= \left(\frac{54 \times 5}{18}\right)$ m/sec = 15 m/sec
Required time
$= \frac{\text{Length of trains}}{\text{Speed of train}}$
$= \frac{300}{15} = 20$ seconds

20. (4) Speed of train
= 90 kmph
$= \left(90 \times \frac{5}{18}\right)$ m/sec.
= 25 m/sec.
When a train crosses a post, it covers a distance equal to its own length.
$\therefore$ Required time $= \frac{\text{Distance}}{\text{Speed}}$
$= \frac{180}{25} = 7.2$ seconds

21. (1) Let the required distance be x km.
Difference of time = 7 + 5 = 12 minutes $= \frac{1}{5}$ hour
Time $= \frac{\text{Distance}}{\text{Speed}}$
According to the question,
$\frac{x}{5} - \frac{x}{6} = \frac{1}{5}$
$\Rightarrow \frac{6x - 5x}{30} = \frac{1}{5}$
$\Rightarrow \frac{x}{30} = \frac{1}{5}$
$\Rightarrow x = \frac{30}{5} = 6$ km.

22. (2) If the length of train be x metre, then speed of train
$= \frac{x}{20} = \frac{x+250}{45}$
$\Rightarrow \frac{x}{4} = \frac{x+250}{9}$
$\Rightarrow 9x = 4x + 1000$
$\Rightarrow 9x - 4x = 1000$
$\Rightarrow 5x = 1000$
$\Rightarrow x = \frac{1000}{5}$
= 200 metre

23. (4) Speed of train
$= \frac{\text{Length of train}}{\text{Time taken in crossing}}$
$= \frac{250}{50} = 5$ m/sec.
$= \left(5 \times \frac{18}{5}\right)$ kmph
= 18 kmph

24. (1) $\therefore$ Speed of train A
$= \frac{150}{30} = 5$ m/sec.
Speed of train B = x m/sec.
Relative speed = (5+x) m/sec.
$\therefore$ Length of both trains = Relative speed × Time
$\Rightarrow 300 = (5 + x) \times 10$
$\Rightarrow 5 + x = \frac{300}{10} = 30$
$\Rightarrow x = 30 - 5 = 25$ m/sec.
$= \left(\frac{25 \times 18}{5}\right)$ kmph.
= 90 kmph.

TYPE-IV

1. (3) Distance travelled by first train in one hour
= 60 × 1 = 60km
330km
A ⟵ ⟶ B
Therefore, distance between two train at 9 a.m.
= 330 − 60 = 270 km
Now, Relative speed of two trains
= 60 + 75 = 135 km/hr
$\therefore$ Time of meeting of two trains
$= \frac{270}{135} = 2$ hrs.
Therefore, both the trains will meet at 9 + 2 = 11 A.M.

2. (2) Men are walking in opposite directions. Hence, they will cover the length of bridge at their relative speed.
Required time
$= \frac{1200}{(5+10)} = 80$ minutes

3. (2) If two trains be moving in opposite directions at rate u and v kmph respectively, then their relative speed
= (u + v) kmph.
Further, if their length be x and y km. then time taken to cross each other $= \frac{x+y}{u+v}$ hours.
Here,
Total length = 160 + 140
= 300m.
Relative speed = (77 + 67) kmph
$= 144$ kmph $= 144 \times \frac{5}{18}$ m/s
or 40 m/sec.
$\therefore$ Time $= \frac{300}{40} = 7\frac{1}{2}$ Seconds

4. (3) Let the speed of each train be x kmph.
Their relative speed
$= x + x = 2x$ kmph.
Time taken
$= \frac{\text{Total length of trains}}{\text{Relative Speed}}$
$= \frac{12}{60 \times 60} = \frac{240 \times \frac{1}{1000}}{2x}$
$= \frac{1}{300} = \frac{120}{1000x}$
$x = \frac{300 \times 120}{1000} = 36$
The required speed = 36 kmph.

5. (2) Total length of trains
= 140 + 160 = 300 m.
Relative speed = 60 + 40
= 100 kmph
$= 100 \times \frac{5}{18}$ m/sec.
or $\frac{250}{9}$ m/sec.
$\therefore$ Time taken to cross each other
$= \frac{300}{\frac{250}{9}} = \frac{300 \times 9}{250} = 10.8$ sec.

6. (3) Let train A start from station A and B from station B.
Let the trains A and B meet after t hours.
$\therefore$ Distance covered by train A in t hours = 50t
Distance covered by train B in t hours = 60t km

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According to the question,
$60t - 50t = 120$

$\Rightarrow t = \frac{120}{10} = 12$ hours.

$\therefore$ Distance AB $= 50 \times 12 + 60 \times 12 = 600 + 720 = 1320$ km

7. (2) Let the speed of second train be x m/s.

$80 \text{ km/h} = \frac{80 \times 5}{18} \text{ m/s}$

According to the question

$\frac{1000}{x + \frac{80 \times 5}{18}} = 18$

$\Rightarrow 1000 = 18x + 400$

$\therefore x = \frac{600}{18}$ m/s

$= \frac{600}{18} \times \frac{18}{5}$ km/h $= 120$ km/h

8. (2) Length of both trains
$= 105 + 90 = 195$ m.
Relative speed $= (45 + 72)$
$= 117$ kmph

$= 117 \times \frac{5}{18}$ or $\frac{65}{2}$ m/sec.

$\therefore$ Time taken $= \frac{195}{\frac{65}{2}} = \frac{195 \times 2}{65}$

$= 6$ seconds

9. (1) Let the length of each train be x metre.

Speed of first train $= \frac{x}{18}$ m/sec

Speed of second train $= \frac{x}{12}$ m/sec

When both trains cross each other, time taken

$= \frac{2x}{\frac{x}{18} + \frac{x}{12}}$

$= \frac{2x}{\frac{2x + 3x}{36}} = \frac{2x \times 36}{5x}$

$= \frac{72}{5} = 14.4$ seconds

10. (4) Let the speed of the second train be x m/s
Speed of first train

$= \frac{150}{15} = 10$ m/sec

Relative speed of trains
$= (x + 10)$ m/s
Total distance covered
$= 150 + 150 = 300$ metre

$\therefore$ Time taken $= \frac{300}{x + 10}$

$\Rightarrow \frac{300}{x + 10} = 12$

$\Rightarrow 12x + 120 = 300$

$\Rightarrow 12x = 300 - 120 = 180$

$\Rightarrow x = \frac{180}{12} = 15$ m/s

$= \frac{15 \times 18}{5}$ or 54 kmph.

11. (4) Let the length of the train travelling at 48 kmph be x metres.
Let the length of the platform be y metres.
Relative speed of train
$= (48 + 42)$ kmph

$= \frac{90 \times 5}{18}$ m./sec.

$= 25$ m./sec.
and 48 kmph

$= \frac{48 \times 5}{18} = \frac{40}{3}$ m./sec.

According to the question,

$\frac{x + \frac{x}{2}}{25} = 12$

$\Rightarrow \frac{3x}{2 \times 25} = 12$

$\Rightarrow 3x = 2 \times 12 \times 25 = 600$

$\Rightarrow x = 200$ m.

Also, $\frac{200 + y}{40/3} = 45$

$\Rightarrow 600 + 3y = 40 \times 45$

$\Rightarrow 3y = 1800 - 600 = 1200$

$\Rightarrow y = \frac{1200}{3} = 400$ m.

12. (2) Let two trains meet after t hours when the train from town A leaves at 8 AM.
$\therefore$ Distance covered in t hours at 70 kmph + Distance covered in $(t - 2)$ hours at 110 kmph $= 500$km

$\therefore 70t + 110(t - 2) = 500$

$\Rightarrow 70t + 110t - 220 = 500$

$\Rightarrow 180t = 500 + 220 = 720$

$\Rightarrow t = \frac{720}{180} = 4$ hours

Hence, the trains will meet at 12 noon.

13. (3) Relative speed
$= (68 + 40)$ kmph $= 108$ kmph

$= \left(\frac{108 \times 5}{18}\right)$ m/s or 30 m/s

$\therefore$ Required time

$= \frac{\text{Sum of the lengths of both trains}}{\text{Relative speed}}$

$= \left(\frac{70 + 80}{30}\right)$ second $= 5$ seconds

14. (3) When a train crosses a telegraph post, it covers its own length.

$\therefore$ Speed of first train $= \frac{120}{10}$

$= 12$ m/sec.

Speed of second train $= \frac{120}{15}$

$= 8$ m/sec.
Relative speed $= 12 + 8$
$= 20$ m/sec.
Required time

$= \frac{\text{Total length of trains}}{\text{Relative speed}}$

$= \frac{2 \times 120}{20} = 12$ seconds.

15. (3) Relative speed $= 42 + 48$
$= 90$ kmph

$= \left(\frac{90 \times 5}{18}\right)$ m/s $= 25$ m/s

Sum of the length of both trains
$= 137 + 163 = 300$ metres
$\therefore$ Required time

$= \frac{300}{25} = 12$ seconds

16. (1) Speed of second train
$= 43.2$ kmph

$= \frac{43.2 \times 5}{18}$ m/sec.

or 12 m/sec.
Let the speed of first train be x m per second, then

$\frac{150 + 120}{x + 12} = 10$

$\Rightarrow 27 = x + 12$

$\Rightarrow x = 15$ m/s

$= 15 \times \frac{18}{5}$ kmph $= 54$ kmph

17. (1) Let the trains meet after t hours
Then, $21t - 16t = 60$

$\Rightarrow 5t = 60 \Rightarrow t = 12$ hours

$\therefore$ Distance between A and B
$= (16 + 21) \times 12$
$= 37 \times 12 = 444$ miles

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18. (3) Relative speed = 45 + 54 = 99 kmph

$= \left(99 \times \frac{5}{18}\right)$ m/sec.

or $\frac{55}{2}$ m/sec.

$\therefore$ Required time $= \frac{108+112}{\frac{55}{2}}$

$= \frac{220 \times 2}{55} = 8$ seconds

19. (2) Let the length of each train be x metres

Then, Speed of first train $= \frac{x}{3}$ m/sec

Speed of second train $= \frac{x}{4}$ m/sec

They are moving in opposite directions

$\therefore$ Relaive speed $= \frac{x}{3} + \frac{x}{4}$

$= \frac{4x+3x}{12} = \frac{7x}{12}$ m/sec.

Total length $= x + x = 2x$ m.

$\therefore$ Time taken $= \frac{2x}{\frac{7x}{12}} = \frac{24}{7}$

$= 3\frac{3}{7}$ sec.

20. (2) Total length of both trains = 250 metres

Let speed of second train = x kmph

Relative speed = $(65 + x)$ kmph

$= (65+x) \times \frac{5}{18}$ m/sec

$\therefore$ Time

$= \frac{\text{Sum of length of trains}}{\text{Relative speed}}$

$\Rightarrow 6 = \frac{250}{(65+x) \times \frac{5}{18}}$

$\Rightarrow 6 \times \frac{5}{18} \times (65+x) = 250$

$\Rightarrow 65 + x = \frac{250 \times 3}{5}$

$\Rightarrow 65 + x = 150$

$\Rightarrow x = 150 - 65 = 85$ kmph

21. (3) Relative speed = (84 + 6) = 90 kmph

$= \left(90 \times \frac{5}{18}\right)$ m/sec.

= 25 m/sec.

$\therefore$ Length of train = Relative speed × Time

= 25 × 4 = 100 metre

22. (3) $\frac{\text{Speed of X}}{\text{Speed of Y}}$

$= \sqrt{\frac{\text{Time taken by Y}}{\text{Time taken by X}}}$

$\Rightarrow \frac{45}{y} = \sqrt{\frac{3 \text{ hours } 20 \text{ min.}}{4 \text{ hours } 48 \text{ min.}}}$

$\Rightarrow \frac{45}{y} = \sqrt{\frac{200 \text{ minutes}}{288 \text{ minutes}}}$

$= \frac{10}{12}$

$\Rightarrow 10y = 12 \times 45$

$\Rightarrow y = \frac{12 \times 45}{10} = 54$ kmph

23. (3) Let P and Q meet after t hours.

Distance = speed × time

According to the question,

$30t - 20t = 36$

$\Rightarrow 10t = 36$

$\Rightarrow t = \frac{36}{10} = 3.6$ hours

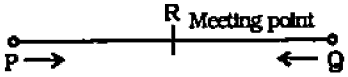
$\therefore$ Distance between P and Q

$= 30t + 20t$

$= 50t = (50 \times 3.6)$ km.

= 180 km.

24. (3)



Speed of train starting from Q = x kmph

$\therefore$ Speed of train starting from P = $(x + 8)$ kmph

According to the question,

PR + RQ = PQ

$\Rightarrow (x + 8) \times 6 + x \times 6 = 162$

[Distance = Speed × Time]

$\Rightarrow 6x + 48 + 6x = 162$

$\Rightarrow 12x = 162 - 48 = 114$

$\Rightarrow x = \frac{114}{12} = \frac{19}{2}$

$= 9\frac{1}{2}$ kmph

25. (1) Let the trains meet after t hours.

Distance = Speed × Time

According to the question,

$75t - 50t = 175$

$\Rightarrow 25t = 175$

$\Rightarrow t = \frac{175}{25} = 7$ hours

$\therefore$ Distance between A and B

$= 75t + 50t = 125t$

$= 125 \times 7 = 875$ km.

26. (4) Relative speed

= (50 + 58) kmph

$= \left(108 \times \frac{5}{18}\right)$ m/sec.

= 30 m/sec

$\therefore$ Required time

$= \frac{\text{Total length of trains}}{\text{Relative speed}}$

$= \left(\frac{150+180}{30}\right)$ seconds

$= \left(\frac{330}{30}\right)$ seconds

= 11 seconds

27. (1) Let the trains meet each other after t hours.

Distance = Speed × Time

According to the question,

$21t - 14t = 70$

$\Rightarrow 7t = 70 \Rightarrow t = \frac{70}{7}$

= 10 hours

$\therefore$ Required distance

$= 21t + 14t = 35t$

$= 35 \times 10 = 350$ km.

TYPE-V

1. (3) Since the train runs at $\frac{7}{11}$ of its own speed, the time it takes is $\frac{11}{7}$ of its usual speed.

Let the usual time taken be t hours.

Then we can write, $\frac{11}{7}t = 22$

$\therefore t = \frac{22 \times 7}{11} = 14$ hours

Hence, time saved

$= 22 - 14 = 8$ hours

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2. (3) $\frac{3}{5}$ of usual speed will take $\frac{5}{3}$ of usual time.

[$\because$ time & speed are inversely proportional]

$\therefore \frac{5}{3}$ of usual time

$=$ usual time $+ \frac{5}{2}$

$\Rightarrow \frac{2}{3}$ of usual time $= \frac{5}{2}$

$\Rightarrow$ usual time

$= \frac{5}{2} \times \frac{3}{2} = \frac{15}{4} = 3\frac{3}{4}$ hours.

3. (2) 1 hr 40 min 48 sec

$= 1 \text{ hr } \left(40 + \frac{48}{60}\right) \text{ min}$

$= 1 \text{ hr } \left(40 + \frac{4}{5}\right) \text{ min}$

$= 1 \text{ hr } \frac{204}{5} \text{ min}$

$= \left(1 + \frac{204}{300}\right) \text{ hr} = \frac{504}{300} \text{ hr}$

$\therefore$ Speed $= \frac{42}{\frac{504}{300}} = 25$ kmph

Now, $\frac{5}{7} \times$ usual speed $= 25$

$\therefore$ Usual speed $= \frac{25 \times 7}{5}$

$= 35$ kmph

4. (3) $\frac{4}{3} \times$ usual time $-$ usual time $= 2$

$\Rightarrow \frac{1}{3}$ usual time $= 2$

$\therefore$ Usual time $= 2 \times 3 = 6$ hours

5. (2) $\frac{4}{3}$ of usual time

$=$ Usual time $+ 20$ minutes

$\therefore \frac{1}{3}$ of usual time $= 20$ minutes

$\Rightarrow$ Usual time $= 20 \times 3$

$= 60$ minutes

6. (1) Time and speed are inversely proportional.

$\therefore \frac{4}{3}$ of usual time $-$ usual time

$= \frac{3}{2}$

$\Rightarrow \frac{1}{3} \times$ usual time $= \frac{3}{2}$

$\therefore$ Usual time $= \frac{3 \times 3}{2} = \frac{9}{2}$

$= 4\frac{1}{2}$ hours

7. (1) Time and speed are inversely proportional.

$\therefore \frac{7}{6} \times$ Usual time $-$ Usual time

$= 25$ minutes

$\Rightarrow$ Usual time $\left(\frac{7}{6} - 1\right)$

$= 25$ minutes

$\Rightarrow$ Usual time $\times \frac{1}{6}$

$= 25$ minutes

$\therefore$ Usual time $= 25 \times 6$

$= 150$ minutes

$= 2$ hours 30 minutes

8. (2) Time and speed are inversely proportional.

$\therefore$ Usual time $\times \frac{7}{6}$ $-$ usual time

$= 12$ minutes

$\Rightarrow$ Usual time $\times \frac{1}{6} = 12$ minutes

$\therefore$ Usual time $= 72$ minutes

$= 1$ hour 12 minutes

9. (2) Fixed distance $= x$ km and certain speed $= y$ kmph (let).

Case I,

$$\frac{x}{y+10} = \frac{x}{y} - 1$$

$$\Rightarrow \frac{x}{y+10} + 1 = \frac{x}{y} \quad \text{--- (i)}$$

Case II,

$$\frac{x}{y+20} = \frac{x}{y} - 1 - \frac{3}{4}$$

$$= \frac{x}{y} - \frac{4+3}{4}$$

$$\Rightarrow \frac{x}{y+20} + \frac{7}{4} = \frac{x}{y} \quad \text{--- (ii)}$$

From equations (i) and (ii),

$$\frac{x}{y+10} + 1 = \frac{x}{y+20} + \frac{7}{4}$$

$$\Rightarrow \frac{x}{y+10} - \frac{x}{y+20} = \frac{7}{4} - 1$$

$$\Rightarrow x\left(\frac{y+20-y-10}{(y+10)(y+20)}\right)$$

$$= \frac{7-4}{4} = \frac{3}{4}$$

$$\Rightarrow \frac{x \times 10}{(y+10)(y+20)} = \frac{3}{4}$$

$$\Rightarrow 3(y+10)(y+20) = 40x$$

$$\Rightarrow \frac{3(y+10)(y+20)}{40} = x \quad \text{--(iii)}$$

From equation (i),

$$\frac{3(y+10)(y+20)}{40(y+10)} + 1$$

$$= \frac{3(y+10)(y+20)}{40y}$$

$$\Rightarrow 3(y+20) + 40$$

$$= \frac{3(y+10)(y+20)}{y}$$

$\Rightarrow 3y^2 + 60y + 40y = 3(y^2 + 30y + 200)$

$\Rightarrow 3y^2 + 100y = 3y^2 + 90y + 600$

$\Rightarrow 10y = 600 \Rightarrow y = 60$

Again from equation (i),

$$\frac{x}{y+10} + 1 = \frac{x}{y}$$

$$\Rightarrow \frac{x}{60+10} + 1 = \frac{x}{60}$$

$$\Rightarrow \frac{x}{70} + 1 = \frac{x}{60}$$

$$\Rightarrow \frac{x+70}{70} = \frac{x}{60}$$

$\Rightarrow 6x + 420 = 7x$

$\Rightarrow 7x - 6x = 420$

$\Rightarrow x = 420$ km.

10. (2) Total distance

$= 7 \times 4 = 28$ km.

Total time

$= \left(\frac{7}{10} + \frac{7}{20} + \frac{7}{30} + \frac{7}{60}\right)$ hours

$= \left(\frac{42+21+14+7}{60}\right)$ hours

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$= \frac{84}{60}$ hours $= \frac{7}{5}$ hours

∴ Average speed

$= \frac{\text{Total distance}}{\text{Total time}} = \left(\frac{28}{\frac{7}{5}}\right)$ kmph

$= \frac{28 \times 5}{7} = 20$ kmph

11. (2) 1 m/sec $= \frac{18}{5}$ kmph

∴ 20 m/sec $= \frac{20 \times 18}{5}$

$= 72$ kmph

12. (1) 1 kmph $= \frac{5}{18}$ m/sec

∴ 54 kmph $= \frac{5}{18} \times 54$

$= 15$ m/sec.

TYPE-VI

1. (2) Total distance = 10 + 12 = 22 km

Total time $= \frac{10}{12} + \frac{12}{10} = \frac{244}{120}$ hours

∴ Required average speed

$= \frac{\text{Total distance}}{\text{Total time}} = \frac{22}{\frac{244}{120}} = \frac{22}{244} \times 120$

= 10.8 km/hr.

2. (1) Total time

$= \frac{600}{80} + \frac{800}{40} + \frac{500}{400} + \frac{100}{50}$

$= \frac{246}{8}$ hours.

Average speed

$= \frac{600 + 800 + 500 + 100}{\frac{246}{8}}$

$= \frac{2000 \times 8}{246} = 65\frac{5}{123}$ km/hr.

3. (2) Average speed

$= \frac{\text{Total distance}}{\text{time taken}}$

$= \frac{30 \times \frac{12}{60} + 45 \times \frac{8}{60}}{\frac{12}{60} + \frac{8}{60}}$

$= 12 \times 3 = 36$ kmph

4. (3) If the same distance are covered at different speed of x kmph and y kmph, the average speed of the whole journey is given by

$= \frac{2xy}{x+y}$ kmph.

∴ Required average speed

$= \frac{2 \times 6 \times 3}{6+3} = \frac{36}{9} = 4$ kmph

5. (3) If two equal distances are covered at two unequal speed of x kmph and y kmph, then average

speed $= \left(\frac{2xy}{x+y}\right)$ kmph

$= \frac{2 \times 12 \times 4}{12 + 4} = \frac{96}{16} = 6$ kmph

6. (1) Remaining distance
= (3584 – 1440 – 1608) km
= 536 km.
This distance is covered at the rate of $\frac{536}{8} = 67$ kmph.
Average speed of whole journey
$= \frac{3584}{56} = 64$ kmph
∴ Required difference in speed
= (67 – 64) kmph i.e. = 3 kmph more

7. (2) Total distance
= 24 + 24 + 24 = 72 km.
Total time

$= \left(\frac{24}{6} + \frac{24}{8} + \frac{24}{12}\right)$ hours

= (4 + 3 + 2) hours = 9 hours
∴ Required average speed

$= \frac{\text{Total distance}}{\text{Total time}} = \frac{72}{9} = 8$ kmph.

8. (4) If same distance are covered at two different speed of x and y kmph, the average speed of journey $= \frac{2xy}{x+y}$

$= \left(\frac{2 \times 100 \times 80}{100 + 80}\right)$ kmph

= 88.89 kmph

9. (2) Required average speed

$= \left(\frac{2xy}{x+y}\right)$ kmph

[Since, can be given as corollary If the distance between A and B be z units, then

Average speed $= \frac{\text{Total distance}}{\text{Time taken}}$

$= \frac{z+z}{\frac{z}{x} + \frac{z}{y}}$

$= \frac{2}{\frac{1}{x} + \frac{1}{y}} = \frac{2}{\frac{x+y}{xy}} = \frac{2xy}{x+y}$]

10. (1) Average speed

$= \left(\frac{2xy}{x+y}\right)$ kmph

$= \left(\frac{2 \times 40 \times 60}{40 + 60}\right)$ kmph

= 48 kmph

11. (1) Average speed

$= \left(\frac{2\,xy}{x+y}\right)$ kmph

$= \left(\frac{2 \times 12 \times 18}{12+18}\right)$ kmph

$= \left(\frac{2 \times 12 \times 18}{30}\right)$ kmph

$= 14\frac{2}{5}$ kmph

12. (2) Let the total distance be x km.

Total time $= \frac{\frac{x}{3}}{25} + \frac{\frac{x}{4}}{30} + \frac{\frac{5x}{12}}{50}$

$= \frac{x}{75} + \frac{x}{120} + \frac{x}{120}$

$= \frac{x}{75} + \frac{x}{60} = \frac{4x + 5x}{300} = \frac{3x}{100}$ hours

∴ Average speed

$= \frac{\text{Total distance}}{\text{Time taken}}$

$= \frac{x}{\frac{3x}{100}} = \frac{100}{3} = 33\frac{1}{3}$ kmph

13. (1) Time taken to cover 30km at 6 kmph $= \frac{30}{6} = 5$ hours

Time taken to cover 40 km = 5 hours
∴ Average speed

$= \frac{\text{Total distance}}{\text{Total time}} = \frac{30 + 40}{10}$

$= \frac{70}{10} = 7$ kmph

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14. (1) Here same distances are covered at different speeds.
∴ Average speed
$= \left(\frac{2xy}{x+y}\right)$ kmph
$= \left[\frac{2\times36\times45}{(36+45)}\right]$ kmph
$= \frac{2\times36\times45}{81} = 40$ kmph

15. (1) Here, the distances are equal.
∴ Average speed
$= \left(\frac{2\times100\times150}{100+150}\right)$ kmph
$= \frac{2\times100\times150}{250}$
= 120 kmph

16. (2) Total distance
= 5 × 6 + 3 × 6
= 30 + 18 = 48 km
Total time = 9 hours
∴ Average speed
$= \frac{48}{9} = \frac{16}{3} = 5\frac{1}{3}$ kmph

17. (3) Let the length of journey be x km, then
$\frac{x}{35} - \frac{x}{40} = \frac{15}{60} = \frac{1}{4}$
$\Rightarrow \frac{8x-7x}{280} = \frac{1}{4}$
$\Rightarrow x = \frac{280}{4} = 70$ km

18. (3) Average speed
$= \frac{\text{Total distance}}{\text{Time taken}}$
$= \frac{12}{\frac{3}{10}+\frac{3}{20}+\frac{3}{30}+\frac{3}{60}}$
$= \frac{12}{3\left(\frac{6+3+2+1}{60}\right)}$
$= \frac{12\times60}{3\times12} = 20$ kmph

19. (1) Distance covered
$= \left(35\times\frac{10}{60}+20\times\frac{5}{60}\right)$ km
$= \left(\frac{35}{6}+\frac{10}{6}\right) = \frac{45}{6}$ km
Total time = 15 minutes
$= \frac{1}{4}$ hour
∴ Required average speed
$= \frac{\text{Distance covered}}{\text{Time taken}}$
$= \frac{45}{6}\times4$
= 30 kmph

20. (2) Total distance = 100 km.
Total time
$= \frac{50}{50}+\frac{40}{40}+\frac{10}{20}$
$= 1+1+\frac{1}{2} = \frac{5}{2}$ hours
∴ Average speed $= \frac{100\times2}{5}$
= 40 kmph

21. (4) Required average speed
$= \frac{2\times30\times20}{30+20}$
[∵ Distance covered is same]
$= \frac{2\times30\times20}{50} = 24$ kmph

22. (3) If A and B meet after t hours, then
$4t + 6t = 20$
$\Rightarrow 10t = 20$
$\Rightarrow t = \frac{20}{10} = 2$ hours.
Hence, both will meet at 9 a.m.

23. (3) Average speed
$= \frac{2xy}{x+y}$ kmph
$= \frac{2\times20\times30}{20+30} = \frac{2\times20\times30}{50}$
= 24 kmph

24. (1) Average speed of whole journey
$= \left(\frac{2xy}{x+y}\right)$ kmph
$= \frac{2\times50\times30}{50+30} = \frac{2\times50\times30}{80}$
= 37.5 kmph

25. (4) Required distance of office from house = x km. (let)
$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$
∴ According to the question,
$\frac{x}{5} - \frac{x}{6} = \frac{6+2}{60} = \frac{2}{15}$
$\Rightarrow \frac{6x-5x}{30} = \frac{2}{15}$
$\Rightarrow \frac{x}{30} = \frac{2}{15}$
$\Rightarrow x = \frac{2}{15}\times30 = 4$ km.

26. (4) Time $= \frac{\text{Distance}}{\text{Speed}} = \frac{1050}{75} =$ 14 hours

27. (2) Total distance covered by train in 5 minutes
= (500 + 625 + 750 + 875 + 1000) metre = 3750 metre
= 3.75 km.
Time = 5 minutes $= \frac{5}{60}$ hour
$= \frac{1}{12}$ hour
Speed of train $= \frac{\text{Distance}}{\text{Time}}$
$= \left(\frac{3.75}{\frac{1}{12}}\right)$ kmph
= (3.75 × 12) kmph
= 45 kmph

TYPE-VII

1. (3) Let the distance of destination be D km
Let the speed of A = 3x km/hr
then speed of B = 4x km/hr
∴ According to question,
$\frac{D}{3x} - \frac{D}{4x} =$ 30 minutes
$= \frac{1}{2}$ hr
$\therefore \frac{D}{12x} = \frac{1}{2}$
$\Rightarrow \frac{D}{3x} = \frac{4}{2} = 2$ hours
Hence, time taken by A to reach destination = 2hrs.

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2. (1) Ratio of speed = 3 : 4
Ratio of time taken = 4 : 3
Let the time taken by A and B be $4x$ hours and $3x$ hours respectively.

Then, $4x-3x = \frac{20}{60} \Rightarrow x = \frac{1}{3}$

$\therefore$ Time taken by A = $4x$ hours

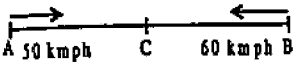
$= \left(4\times\frac{1}{3}\right)$ hours $= 1\frac{1}{3}$ hours

3. (3) Required ratio

$= \frac{5}{6}:\frac{3}{5} = \frac{30\times5}{6}:\frac{30\times3}{5}$

= 25 : 18

4. (2)



AC = Distance covered by train starting from A in 3 hours
= 50 × 3 = 150 km
BC = Distance covered by train starting from B in 2 hours
= 60 ×2 = 120 km
$\therefore$ AC : BC = 150 : 120 = 5 : 4

5. (2) Required ratio of the speed of two trains $= \frac{\sqrt{9}}{\sqrt{4}} = \frac{3}{2}$ or 3 : 2

6. (3) Speed of second train

$= \frac{364}{4} = 91$ kmph

$\therefore$ $7x = 91$

$\Rightarrow 6x = \frac{91}{7x}\times 6x = 78$ kmph

7. (3) Speed of truck
= 550m/minute

Speed of bus $= \frac{33000}{45}$ m/minute

or $\frac{2200}{3}$ m/minute

$\therefore$ Required ratio $= 550:\frac{2200}{3}$

$= 1:\frac{4}{3} = 3:4$

8. (2) Required ratio $= \frac{1}{3}:\frac{2}{2}:\frac{3}{1}$

$= \frac{1}{3}:1:3$

$\frac{1}{3}\times3 : 1\times3 : 3\times3$

$\left[\because \text{Speed} = \frac{\text{Distance}}{\text{Time}}\right]$

= 1 : 3 : 9

9. (3) The winner will pass the other, one time in covering 1600m. Hence, the winner will pass the other 3 times in completing 5km race.

10. (3) Distance covered on the first day $= \frac{4}{5}\times70 = 56$ km

$\therefore$ Required ratio = 42 : 56
= 3 : 4

11. (1) Let speed of cyclist = x kmph & Time = t hours

Distance $= \frac{xt}{2}$ while time = $2t$

$\therefore$ Required ratio $= \frac{xt}{2\times2t}:x$

= 1 : 4

12. (3) Speed of train = x kmph
Speed of car = y kmph
Case I,

$\frac{120}{x}+\frac{600-120}{y} = 8$

$\Rightarrow \frac{120}{x}+\frac{480}{y} = 8$

$\Rightarrow \frac{15}{x}+\frac{60}{y} = 1$ ...(i)

Case II,

$\frac{200}{x}+\frac{400}{y}$ = 8 hours 20 minutes

$\Rightarrow \frac{200}{x}+\frac{400}{y} = 8\frac{1}{3}$ hours

$= \frac{25}{3}$

$\Rightarrow \frac{8}{x}+\frac{16}{y} = \frac{1}{3}$

$\Rightarrow \frac{24}{x}+\frac{48}{y} = 1$ .....(ii)

$\therefore \frac{15}{x}+\frac{60}{y} = \frac{24}{x}+\frac{48}{y}$

$\Rightarrow \frac{24}{x}-\frac{15}{x} = \frac{60}{y}-\frac{48}{y}$

$\Rightarrow \frac{9}{x} = \frac{12}{y} \Rightarrow \frac{x}{y} = \frac{9}{12} = \frac{3}{4} = 3:4$

TYPE-VIII

1. (1) Relative speed of police
= 11 – 10 = 1 kmph

$= \frac{5}{18}$ m / sec

$\therefore$ Distance decreased in 6 minutes $= \frac{5}{18}\times6\times60 = 100$ m

$\therefore$ Distance remained between them = 200–100 = 100 m

2. (1) Suppose the speed of first train be x kmph
Speed of second train
= 30 kmph

$= \frac{30\times1000}{60} = 500$ m per min.

$\therefore$ According to question

$\frac{\text{Total Distance}}{\text{Relative speed}}$

$= \frac{(66+88)}{x-500} = 0.168$

$\Rightarrow \frac{154}{x-500} = 0.168$

$\Rightarrow 0.168x - 84 = 154$

$\Rightarrow 0.168x = 238$

$\Rightarrow x = \frac{238}{0.168}$

$= \left(\frac{238\times1000}{168}\right)$ m per minute

$= \frac{238\times1000}{168}\times\frac{3}{50}$ kmph

= 85 kmph

3. (1) The gap of 114 metre will be filled at relative speed. Required time

$= \left(\frac{114}{21-15}\right)$ minutes

$= \frac{114}{6} = 19$ minutes

4. (4) Both trains are moving in the same direction.
$\therefore$ Their relative speed
= (68 – 50) kmph = 18 kmph

$= 18\times\frac{5}{8} = 5$ m/sec

Total length = 50 + 75 = 125 m
$\therefore$ Required time

$= \frac{\text{Total length}}{\text{Relative speed}}$

$= \frac{125}{5} = 25$ seconds.

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(2) The constable and thief are running in the same direction
∴ Their relative speed
= 8 – 7 = 1km.

$= 1 \times \frac{5}{18}$ m/sec.

∴ Required time $= \frac{200}{\frac{5}{18}}$

$= \frac{200 \times 18}{5} = 720$ sec

$= \frac{720}{60}$ minutes = 12 minutes

3. (4) Relative speed
= (58 – 30) km/hr

$= \left(28 \times \frac{5}{18}\right)$ m/sec. $= \frac{70}{9}$ m/sec.

∴ Length of train $= \frac{70}{9} \times 18$

= 140 metres

7. (3) Relative speed
= 56 – 29 = 27 kmph

$= 27 \times \frac{5}{18} = \frac{15}{2}$ m/sec

∴ Distance covered in 10 seconds

$= \frac{15}{2} \times 10 = 75$ m

Hence, length of train = 75 m.

8. (1) Let the speed of the truck be x kmph
Relative speed of the bus
$= (45 - x)$ kmph

∴ Time $= \frac{\text{Distance}}{\text{Relative speed}}$

$\Rightarrow \frac{30}{60 \times 60} = \frac{150}{\frac{1000}{(45-x)}}$

$\Rightarrow \frac{1}{120} = \frac{15}{100(45-x)}$

$\Rightarrow \frac{1}{6} = \frac{3}{(45-x)} \Rightarrow (45 - x) = 18$

$\Rightarrow x = 45 - 18 = 27$ kmph

9. (2) Let the length of each train be x metre.
Relative speed
= 46 – 36 = 10 kmph

$= \frac{10 \times 5}{18}$ metre/second

$= \frac{25}{9}$ metre/second

$\therefore \frac{2x}{\frac{25}{9}} = 36$

$\Rightarrow 2x = \frac{36 \times 25}{9} = 100$

$\Rightarrow x = 50$ metre

10. (3) Relative speed
= 45 – 40 = 5 kmph
∴ Required distance

$= \left(5 \times \frac{45}{60}\right)$ km

$= \frac{15}{4}$ km = 3 km 750

11. (3) Let the speed of Scooter be x
Distance covered by cycling in $3\frac{1}{2}$ hours = Distance covered by scooter in $2\frac{1}{4}$ hours

$\Rightarrow 12 \times \frac{7}{2} = x \times \frac{9}{4}$

$\Rightarrow x = \frac{12 \times 7 \times 2}{9}$

$= \frac{56}{3} = 18\frac{2}{3}$ kmph

12. (2) Relative speed

$= \frac{1000}{8} - \frac{1000}{10}$

$= \frac{5000 - 4000}{40} = \frac{1000}{40}$ m/minute

∴ Required time

$= \frac{100}{\frac{1000}{40}} = \frac{4000}{1000} = 4$ m/minute

∴ Distance covered by the thief

$= \frac{1000}{10} \times 4 = 400$ metres

13. (3) Relative speed = 40 – 20
= 20 km/hour

$= \frac{20 \times 5}{18}$ m/sec.

∴ Length of the faster train

$= \frac{20 \times 5}{18} \times 5$ metres

$= \frac{250}{9} = 27\frac{7}{9}$ metres

14. (4) Distance = Speed × Time
= 80 × 4.5 = 360 km

∴ Required speed $= \frac{360}{4}$

= 90 kmph.

15. (2) Required time

$= \frac{\text{Sum of the lengths of trains}}{\text{Relative speed}}$

Relative speed = 65 + 55
= 120 kmph

$= \frac{120 \times 5}{18}$ m/sec

Required time $= \frac{180 + 120}{\frac{120 \times 5}{18}}$

$= \frac{300 \times 18}{120 \times 5} = 9$ seconds

16. (1) When two trains cross each other, they cover distance equal to the sum of their length with relative speed.
Let length of each train = x metre
Relative speed = 90 – 60
= 30 kmph

$= \left(\frac{30 \times 5}{18}\right)$ m/sec.

$= \left(\frac{25}{3}\right)$ m/sec.

$\therefore \frac{2x}{\frac{25}{3}} = 30$

$\Rightarrow 2x = \frac{30 \times 25}{3}$

$\Rightarrow 2x = 250$

$\Rightarrow x = 125$ metres

17. (4) Relative speed = 35 – 25
= 10 kmph

$= \frac{10 \times 5}{18}$ m/sec.

Total length = 80 + 120
= 200 metres
∴ Required time

$= \frac{\text{Sum of the length of trains}}{\text{Relative speed}}$

$= \frac{200}{\frac{10 \times 5}{18}} = \frac{200 \times 18}{10 \times 5}$

= 72 seconds

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18. (1) Distance covered by the first goods train in 8 hours = Distance covered by the second gooda train in 6 hours.
$\Rightarrow 16 \times 8 = 6 \times x$
$\Rightarrow x = \frac{18 \times 8}{6} = 24$ kmph

19. (3) Relative speed
= (33 + 39) kmph
= 72 kmph
$= \left(\frac{72 \times 5}{18}\right)$ m/sec.
= 20 m/sec.
∴ Time taken in crossing
$= \frac{\text{Length of both trains}}{\text{Relative speed}}$
$= \frac{125+115}{20} = \frac{240}{20}$
= 12 seconds

20. (2) Distance covered by the thief in half an hour $= \frac{1}{2} \times 40 = 20$ km
Relative speed of car owner
= 50 – 40 = 10 km
∴ Required time
$= \frac{\text{Difference of distance}}{\text{Relative speed}}$
$= \frac{20}{10} = 2$ hours.
i.e. at 4 p.m.

21. (1) Length of each train
= x metre
Relative speed = 46 – 36
= 10 kmph
$= \left(10 \times \frac{5}{18}\right)$ m/sec
$= \frac{25}{9}$ m/sec
∴ Time taken in crossing
$= \frac{\text{Length of both trains}}{\text{Relative speed}}$
$\Rightarrow 36 = \frac{2x}{\frac{25}{9}}$
$\Rightarrow 2x = 36 \times \frac{25}{9} = 100$
$\Rightarrow x = \frac{100}{2} = 50$ metre

22. (3) Let both trains meet after t hours.
∴ Distance = speed × time
∴ 60t – 50t = 120
$\Rightarrow 10t = 120 \Rightarrow t = 12$ hours
∴ Required distance
= 60t + 50t
= 110t = 110 × 12
= 1320 km

TYPE-IX

1. (3) Time taken to cover 20 km at the speed of 5km/hr
= 4 hours.
∴ Fixed time = 4 hours – 40 minutes
= 3 hour 20 minutes
Time taken to cover 20 km at the speed of 8 km/hr $= \frac{20}{8} = 2$ hours 30 minutes
∴ Required time = 3 hours 20 minutes – 2 hours 30 minutes = 50 minutes

2. (1) Since man walks at $\frac{2}{3}$ of usual speed, time taken wil be $\frac{3}{2}$ of usual time.
∴ $\frac{3}{2}$ of usual time
= usual time + 1 hour.
$\Rightarrow \left(\frac{3}{2} - 1\right)$ of usual time = 1
$\Rightarrow$ usual time = 2 hours.

3. (3) Let x km. be the required distance.
Difference in time
= 2.5 + 5 = 7.5 minutes
$= \frac{7.5}{60}$ hrs. $= \frac{1}{8}$ hrs.
Now, $\frac{x}{8} - \frac{x}{10} = \frac{1}{8}$
$\Rightarrow \frac{5x-4x}{40} = \frac{1}{8}$
$\Rightarrow x = \frac{40}{8} = 5$ km.

4. (4) Let the distance be x km and initial speed be y kmph.
According to question,
$\frac{x}{y} - \frac{x}{y+3} = \frac{40}{60}$ ...(i)
and,
$\frac{x}{y-2} - \frac{x}{y} = \frac{40}{60}$ ...(ii)
From equations (i) and (ii),
$\frac{x}{y} - \frac{x}{y+3} = \frac{x}{y-2} - \frac{x}{y}$
$\Rightarrow \frac{1}{y} - \frac{1}{y+3} = \frac{1}{y-2} - \frac{1}{y}$
$\Rightarrow \frac{y+3-y}{y(y+3)} = \frac{y-y+2}{y(y-2)}$
$\Rightarrow 3(y-2) = 2(y+3)$
$\Rightarrow 3y - 6 = 2y + 6$
$\Rightarrow y = 12$
From equation (i),
$\frac{x}{12} - \frac{x}{15} = \frac{40}{60} \Rightarrow \frac{5x-4x}{60} = \frac{2}{3}$
$\Rightarrow x = \frac{2}{3} \times 60 = 40$
∴ Distance = 40 km.

5. (3) If the distance be x km, then
$\frac{x}{40} - \frac{x}{50} = \frac{6}{60}$
$\Rightarrow \frac{x}{4} - \frac{x}{5} = 1$
$\Rightarrow x = 20$ km.
∴ Required time
$= \left(\frac{20}{40}\right)$ hour – 11 minutes
$= \left(\frac{1}{2} \times 60 - 11\right)$ minutes
= 19 minutes

6. (2) Let the required distance be x km.
Difference of time
= 6 + 6 = 12 minutes $= \frac{1}{5}$ hr.
According to the question,
$\frac{x}{\frac{5}{2}} - \frac{x}{\frac{7}{2}} = \frac{1}{5} \Rightarrow \frac{2x}{5} - \frac{2x}{7} = \frac{1}{5}$
$\Rightarrow \frac{14x-10x}{35} = \frac{1}{5}$
$\Rightarrow \frac{4x}{35} = \frac{1}{5} \Rightarrow x = \frac{35}{20} = \frac{7}{4}$ km.

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7. (4) Let the required distance be x km.
According to the question,

$$\frac{x}{4}-\frac{x}{5}=\frac{18}{60}$$

$$\Rightarrow \frac{5x-4x}{20}=\frac{3}{10}$$

$$\Rightarrow x=\frac{3}{10}\times 20 = 6 \text{ km}$$

8. (2) Let the initial speed of the car be x kmph and the distance be y km.

Then, $y=\frac{9}{2}x$ ...(i)

and, $y=4(x+5)$ ...(ii)

$$\therefore \frac{9x}{2}=4(x+5)$$

$$\Rightarrow 9x=8x+40$$

$$\Rightarrow x=40 \text{ kmph}$$

9. (3) Let the distance of office be x km.

$$\therefore \frac{x}{24}-\frac{x}{30}=\frac{11}{60}$$

$$\Rightarrow \frac{5x-4x}{120}=\frac{11}{60}$$

$$\Rightarrow \frac{x}{120}=\frac{11}{60}$$

$$\Rightarrow x=\frac{11}{60}\times 120 = 22 \text{ km.}$$

10. (3) Let the required distance be x km.

Then, $\frac{x}{3}-\frac{x}{5}=\frac{24}{60}$

$$\Rightarrow \frac{5x-3x}{15}=\frac{2}{5} \Rightarrow \frac{2x}{3}=2$$

$$\Rightarrow 2x=2\times 3 \Rightarrow x=3 \text{ km}$$

11. (2) Let the required distance be x km.

$$\frac{\frac{x}{5}}{2}-\frac{x}{3}=\frac{16}{60}$$

$$\Rightarrow \frac{2x}{5}-\frac{x}{3}=\frac{4}{15}$$

$$\Rightarrow \frac{6x-5x}{15}=\frac{4}{15} \Rightarrow x=4 \text{ km.}$$

12. (3) Let the distance be x km.

$$\therefore \frac{x}{10}-\frac{x}{12}=\frac{12}{60}$$

$$\Rightarrow \frac{6x-5x}{60}=\frac{1}{5}$$

$$\Rightarrow x=\frac{1}{5}\times 60 = 12 \text{ km.}$$

13. (1) Let the distance between stations be x km, then speed of train

$$=\frac{x}{\frac{45}{60}}=\frac{4x}{3} \text{ kmph}$$

$$\therefore \frac{x}{\frac{4x}{3}-5}=\frac{48}{60}$$

$$\Rightarrow \frac{3x}{4x-15}=\frac{4}{5}$$

$$\Rightarrow 16x-60=15x$$

$$\Rightarrow x=60 \text{ km}$$

14. (2) Speed of train $=\frac{\text{Distance}}{\text{Time}}$

$$=\frac{10}{\frac{12}{60}} \text{ kmph}$$

$$=\frac{10\times 60}{12}=50 \text{ kmph}$$

New speed = 45 kmph

$\therefore$ Required time $=\frac{10}{45}$ hour

$$=\frac{2}{9}\times 60 \text{ minutes}$$

$$=\frac{40}{3} \text{ minutes}$$

or 13 minutes 20 seconds

15. (2) Let the distance of the office be x km, then

$$\frac{x}{5}-\frac{x}{6}=\frac{8}{60}$$

$$\Rightarrow \frac{6x-5x}{30}=\frac{2}{15}$$

$$\Rightarrow x=2\times 2=4 \text{ km}$$

16. (2) Let the distance of school be x km, then

$$\frac{x}{3}-\frac{x}{4}=\frac{20}{60}$$

$$\Rightarrow \frac{x}{12}=\frac{1}{3} \Rightarrow x=\frac{12}{3}=4 \text{ km}$$

17. (3) Distance between stations X and Y = Speed × Time
= 55 × 4 = 220 km.
New speed = 55 + 5 = 60 kmph

$\therefore$ Required time $=\frac{220}{60}$

$$=\frac{11}{3} \text{ hours}$$

= 3 hours 40 minutes.
$\therefore$ Required answer
= 4 hours – 3 hours 40 minutes
= 20 minutes

18. (3) Distance of Journey = x km
Difference of time = 12 – 3
= 9 minutes

$$=\frac{9}{60} \text{ hour} = \frac{3}{20} \text{ hour}$$

$$\therefore \frac{x}{70}-\frac{x}{80}=\frac{3}{20}$$

$$\Rightarrow \frac{x}{7}-\frac{x}{8}=\frac{3}{2}$$

$$\Rightarrow \frac{8x-7x}{56}=\frac{3}{2}$$

$$\Rightarrow \frac{x}{56}=\frac{3}{2}$$

$$\Rightarrow x=\frac{3}{2}\times 56 = 84 \text{ km}$$

$\therefore$ Required correct time

$$=\frac{84}{70} \text{ hours} - 12 \text{ minutes}$$

$$=\left(\frac{84}{70}\times 60-12\right) \text{ minutes}$$

= 72 – 12 = 60 minutes
= 1 hour

TYPE-X

1. (4) Let the length of train be x metres
$\therefore$ According to question

Speed of the train $=\frac{x}{10}$ m/sec.

Also, the speed of the train

$$=\left(\frac{x+50}{14}\right) \text{m/sec.}$$

[$\because$ It passes the platform in 14 seconds]
Both the speeds should be equal. i.e.,

$$\frac{x}{10}=\frac{x+50}{14}$$

or $14x = 10x + 500$
or $14x - 10x = 500$
or $4x = 500$
$\therefore x = 125$ metres

Hence, Speed $=\frac{125}{10}=12.5 \text{m/sec.}$

$$=\frac{12.5\times 18}{5} \text{ km/hr.}$$

= 45 km/hr.

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2. (2) Let length of train be x m

$\therefore$ Speed of train $= \frac{x+264}{20}$

Also, speed of train $= \frac{x}{8}$

Obviously, $\frac{x}{8} = \frac{x+264}{20}$

$\Rightarrow \frac{x}{2} = \frac{x+264}{5}$

$\Rightarrow 5x = 2x + 528$

$\Rightarrow 5x - 2x = 528$

$\Rightarrow x = 528 \div 3 = 176$ m

3. (4) Let the length of train be x metres.

Then, speed of train when it passes a telegraph post $= \frac{x}{8}$ m/sec.

and speed of train, when it passes the bridge $= \frac{x+264}{20}$

Clearly,

$\frac{x}{8} = \frac{x+264}{20}$

$\Rightarrow \frac{x}{2} = \frac{x+264}{5}$

$\Rightarrow 5x = 2x + 528$

$\Rightarrow 3x = 528$

$\Rightarrow x = \frac{528}{3} = 176$m

$\therefore$ Speed of train

$= \frac{176}{8} = 22$ m/sec.

$= 22 \times \frac{18}{5}$ Kmph

$= 79.2$ kmph

4. (1) Let the length of train be x metres.

When the train crosses the standing man, its speed $= \frac{x}{9}$

When the train crosses the platform of length 84 m, its speed

$= \frac{x+84}{21}$

Obviously, $\frac{x}{9} = \frac{x+84}{21}$

$\Rightarrow 21x - 9x = 9 \times 84$

$\Rightarrow 12x = 9 \times 84$

$\Rightarrow x = \frac{9 \times 84}{12} = 63$ m

$\therefore$ Required speed $= \frac{63}{9}$ m/sec

$= \frac{63}{9} \times \frac{18}{5}$ kmph $= 25.2$ kmph

5. (4) Suppose length of train be x

According to question

$\frac{x+50}{14} = \frac{x}{10}$

$\Rightarrow 14x = 10x + 500$

$\Rightarrow 4x = 500$

$\Rightarrow x = \frac{500}{4} = 125$ m

Therefore, speed

$= \frac{125}{10} \times \frac{18}{5} = 45$ kmph

6. (4) Let the length of the train be x

According to the question,

Speed of the train

$= \frac{x+90}{30} = \frac{x}{15}$

$\Rightarrow x + 90 = 2x$

$\Rightarrow x = 90$ m

$\therefore$ Speed of train $= \frac{90}{15}$

$= 6$ m/s $= 6 \times \frac{18}{5}$ kmph

$= 21.6$ kmph

7. (3) Let the length of the train be x metre

Speed of train when it crosses man $= \frac{x}{10}$

Speed of train when it crosses platform $= \frac{x+300}{25}$

According to the question,

Speed of train $= \frac{x}{10} = \frac{x+300}{25}$

$\Rightarrow 25x = 10x + 3000$

$\Rightarrow 15x = 3000$

$\Rightarrow x = \frac{3000}{15} = 200$ metres

$\therefore$ Length of train $= 200$ metre

Speed of train $= \frac{x}{10} = \frac{200}{10}$

$= 20$ m/sec

$\therefore$ Time taken in crossing a 200 m long platform $= \frac{200+200}{20}$

$= 20$ seconds

8. (4) Let the length of the train be x metres.

Speed of train in crossing boy $= \frac{x}{30}$

Speed of train in crossing platform $= \frac{x+110}{40}$

According to the question,

$\frac{x+110}{40} = \frac{x}{30}$

$\Rightarrow \frac{x+110}{4} = \frac{x}{3}$

$\Rightarrow 4x = 3x + 330$

$\Rightarrow x = 330$ metres

9. (3) Let the length of train be x metre.

$\therefore \frac{x}{15} = \frac{x+100}{25}$

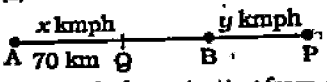
$\Rightarrow \frac{x}{3} = \frac{x+100}{5}$

$\Rightarrow 5x = 3x + 300$

$\Rightarrow 2x = 300$

$\Rightarrow x = \frac{300}{2} = 150$ metres

10. (2)



Let speed of car starting from A be x kmph

and speed of car starting from B be y kmph

Case I

When cars meet at P,

$7x = AP = AB + BP = 70 + 7y$

$\Rightarrow 7x - 7y = 70$

$\Rightarrow x - y = 10$ ...(i)

Case II

When cars meet at Q,

$x + y = 70$ ...(ii)

On adding these equations,

$x = 40$ kmph

Putting the value of x in equation (i),

$y = 40 - 10 = 30$ kmph

11. (2) Let the speed of trains be x and y metre/sec respectively.

$\frac{100+95}{x-y} = 27$

$\Rightarrow x - y = \frac{195}{27} = \frac{65}{9}$ .....(i)

Again,

$\frac{195}{x+y} = 9$

$\Rightarrow x + y = \frac{195}{9}$ .....(ii)

By equation (i) + (ii)

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$2x = \frac{65}{9} + \frac{195}{9} = \frac{260}{9}$

$\Rightarrow x = \frac{260}{2\times 9} = \frac{130}{9}$ m/sec.

$= \left(\frac{130}{9}\times\frac{18}{5}\right)$ kmph = 52 kmph

From equation (ii),

$y = \frac{195}{9} - \frac{130}{9} = \frac{65}{9}$ m/sec.

$= \frac{65}{9}\times\frac{18}{5} = 26$ kmph

12. (2) Let the length of train be x metre, then

∴ Speed of train

$= \frac{x}{7} = \frac{x+390}{28}$

$\Rightarrow x = \frac{x+390}{4}$

$\Rightarrow 4x - x = 390$

$\Rightarrow x = \frac{390}{3} = 130$ metres

13. (3) Speed of train = 36 kmph

$= 36\times\frac{5}{18} = 10$ m/sec

Length of train = 10 × 10 = 100 metres

∴ Required time $= \frac{100+55}{10}$

$= 15\frac{5}{10} = 15\frac{1}{2}$ second

= 15.5 seconds

14. (2) Speed of train = 60 kmph

$= \left(60\times\frac{5}{18}\right)$ m/sec.

$= \frac{50}{3}$ m/sec.

If the length of platform be x metre, then

Speed of train

$= \frac{\text{Length of (train + platform)}}{\text{Time taken in crossing}}$

$\Rightarrow \frac{50}{3} = \frac{200+x}{30}$

$\Rightarrow 50\times 10 = 200 + x$

$\Rightarrow x = 500 - 200 = 300$ metre

15. (4) Let both trains meet after t hours since 7 a.m.

Distance between stations A and B = x Km.

$\therefore \frac{x}{4}\times t + \frac{x}{\frac{7}{2}}\times(t-1) = x$

$\left[\text{Speed} = \frac{\text{Distance}}{\text{Time}}\right]$

$\Rightarrow \frac{t}{4} + \frac{2(t-1)}{7} = 1$

$\Rightarrow \frac{7t+8t-8}{28} = 1$

$\Rightarrow 15t - 8 = 28$

$\Rightarrow 15t = 28 + 8 = 36$

$\Rightarrow t = \frac{36}{15} = \frac{12}{5}$ hours

= 2 hours 24 minutes

∴ Required time = 9 :24 a.m.

TYPE-XI

1. (2) Let the time taken to complete the race by A, B, and C be x minutes.

∴ Speed of A $= \frac{1000}{x}$,

B $= \frac{1000-50}{x} = \frac{950}{x}$

C $= \frac{1000-69}{x} = \frac{931}{x}$

Now, time taken to complete the race by

B $= \frac{1000}{\frac{950}{x}} = \frac{1000\times x}{950}$

and distance travelled by C in $\frac{1000x}{950}$ min

$= \frac{1000x}{950}\times\frac{931}{x} = 980$ km.

∴ B can allow C

= 1000 − 980 = 20 m

2. (4) Ratio of the speed of A, B and C = 6 : 3 : 1

⇒ Ratio of the time taken

$= \frac{1}{6} : \frac{1}{3} : 1 = 1 : 2 : 6$

∴ Time taken by A

$= \frac{72}{6} = 12$ minutes

3. (2) Let A take x seconds in covering 1000m and b takes y seconds

According to the question,

$x + 20 = \frac{900}{1000}y$

$\Rightarrow x + 20 = \frac{9y}{10}$ ...(i)

and, $\frac{950}{1000}x + 25 = y$ ...(ii)

From equation (i),

$\frac{10x}{9} + \frac{200}{9} = y$

$\Rightarrow \frac{10x}{9} + \frac{200}{9} = \frac{950x}{1000} + 25$

$\Rightarrow \frac{10x}{9} + \frac{200}{9} = \frac{19x}{20} + 25$

$\Rightarrow \frac{10x}{9} - \frac{19x}{20} = 25 - \frac{200}{9}$

$\Rightarrow \frac{200x - 171x}{180} = \frac{225-200}{9}$

$\Rightarrow \frac{29x}{180} = \frac{25}{9}$

$\Rightarrow x = \frac{25}{9}\times\frac{180}{29} = \frac{500}{29}$

seconds.

4. (3) Time taken by Kamal

$= \frac{100}{18\times\frac{5}{18}} = 20$ seconds

∴ Time taken by Bimal

= 20 + 5 = 25 seconds

∴ Bimal's speed $= \frac{100}{25} = 4$ m/sec

$= \frac{4\times 18}{5}$ kmph = 14.4 kmph.

5. (1) When A runs 1000m, B runs 900m.

∴ When A runs 500m, B runs 450 m.

Again, when B runs 400m, C runs 360 m.

∴ When B runs 450m, C runs

$= \frac{360}{400}\times 450 = 405$ metres

Required distance = 500 − 405 = 95 metres

6. (1) According to the question,

∴ When A runs 800 metres, B runs 760 metres

∴ When A runs 200 metres, B runs $= \frac{760}{800}\times 200 = 190$ metres

Again, when B runs 500 metres, C runs 495 metres.

∴ When B runs 190 metres, C runs $= \frac{495}{500}\times 190 = 188.1$ metres

∴ Hence, A will beat C by 200 − 188.1 = 11.9 metres in a race of 200 metres.

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7. (3) According to the question,
∵ When B runs 200 m metres, A runs 190 metres
∴ When B runs 180 metres, A runs $= \frac{190}{200} \times 180 = 171$ metres
When C runs 200m, B runs 180 metres.
Hence, C will give a start to A by $= 200 - 171 = 29$ metres

8. (2) According to the question,
When A covers 1000m, B covers $= 1000 - 40 = 960$ m
and C covers $= 1000 - 70 = 930$ m
When B covers 960m, C covers 930 m.
∴ When B covers 1000m, C covers $= \frac{930}{960} \times 1000$
$= 968.75$ metre
Hence, B gives C a start of
$= 1000 - 968.75 = 31.25$ metre

9. (2) Relative speed
$= 95 - 75 = 15$ kmph
$\text{Required time} = \frac{\text{Distance}}{\text{Relative speed}}$
$= \frac{5}{15}$ hours $= \frac{5}{15} \times 60$ minutes
$= 20$ minutes

10. (1) Time taken by C $= t$ hours
∴ Time taken by B $= \frac{t}{3}$ hours
and time taken by A $= \frac{t}{6}$ hours
Here, $t = \frac{3}{2}$ hours
∴ Required time taken by A
$= \frac{\frac{3}{2}}{6}$ hour
$= \frac{1}{4}$ hour
$= \left(\frac{1}{4} \times 60\right)$ minutes
$= 15$ minutes

11. (3) 2 hours 45 minutes
$= \left(2 + \frac{45}{60}\right)$ hours
$= \left(2 + \frac{3}{4}\right)$ hours $= \frac{11}{4}$ hours
∴ Distance = Speed × Time
$= 4 \times \frac{11}{4} = 11$ km.
∴ Time taken in covering 11 km at 16.5 kmph
$= \frac{11}{16.5}$ hour
$= \left(\frac{11 \times 10 \times 60}{165}\right)$ minutes
$= 40$ minutes

TYPE-XII

1. (2) Two ways walking time $= 55$ min ...(i)
One way walking + One way riding time $= 37$ min. ....(ii)
By $2 \times$ (ii) − (i),
2 ways riding time
$= 2 \times 37 - 55 = 19$ minutes.

2. (3) Let the distance be x km
Time taken by A $= \frac{x}{40}$ hrs.
Time taken by B $= \frac{x}{50}$ hrs.
Now, $\frac{x}{40} - \frac{x}{50} = \frac{15}{60}$
$\frac{5x - 4x}{200} = \frac{15}{60}$
$\therefore x = \frac{15}{60} \times 200 = 50$km
Method 2 :
Distance
$= \frac{\text{Product of speed}}{\text{Diff. of speed}} \times \text{Diff. in time}$
$= \frac{40 \times 50}{50 - 40} \times \frac{15}{60} = 50$ km

3. (4) Let the speed of man be x kmph.
$\therefore 30x - 30\left(x - \frac{x}{15}\right) = 10$
$\Rightarrow 30\left(x - x + \frac{x}{15}\right) = 10$
$\Rightarrow \frac{x}{15} = \frac{10}{30}$
$\Rightarrow x = \frac{150}{30} = 5$ kmph

4. (1) Required time = LCM of 252, 308 and 198 seconds.
Now, $252 = 2 \times 2 \times 3 \times 3 \times 7$
$308 = 2 \times 2 \times 7 \times 11$
$198 = 2 \times 3 \times 3 \times 11$
∴ LCM $= 2 \times 2 \times 3 \times 3 \times 7 \times 11$
$= 36 \times 77$ seconds
$= \frac{36 \times 77}{60}$ minutes
$= \frac{231}{5} = 46$ minutes 12 seconds

5. (4) Suppose, time taken while walking be x hours
And, time taken on riding be y hours
∴ According to question
$x + y = 4\frac{1}{2}$ hours ...(i)
Then, $2y = 3$ hours
$y = 1\frac{1}{2}$ hours
From equation (i)
$x = 4\frac{1}{2} - 1\frac{1}{2} = 3$ hours
Time required to walk both ways $= 6$ hours

6. (4) Let the required distance be x km.
$\therefore \frac{\frac{x}{9}}{2} + \frac{x}{3} = 5$
$\Rightarrow x\left(\frac{2}{9} + \frac{1}{3}\right) = 5 \Rightarrow x\left(\frac{2+3}{9}\right) = 5$
$\Rightarrow x = \frac{5 \times 9}{5} = 9$ km.

7. (4) Distance covered by A in 4 hours $= 4 \times 4 = 16$ km
Relative speed of B with respect to A $= 10 - 4 = 6$ km/hr
∴ Time taken to catch A
$= \frac{16}{6} = \frac{8}{3}$ hours
∴ Required distance
$= \frac{8}{3} \times 10 = \frac{80}{3}$
$= 26.67$ km. ≈ 26.7 km

8. (2) Suppose distance be x km
$\frac{x}{2 \times 40} + \frac{x}{2 \times 60} = 10$
$\Rightarrow \frac{x}{80} + \frac{x}{120} = 10$
$\Rightarrow \frac{3x + 2x}{240} = 10$
$\Rightarrow \frac{5x}{240} = 10$
$x = 480$ km

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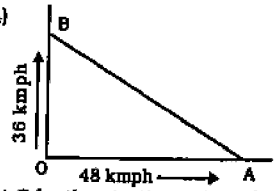
9. (1) If A covers the distance of 1 km in x seconds, B covers the distance of 1 km in $(x+25)$ seconds. If A covers the distance of 1 km, then in the same time C covers only 725 metres.
If B covers 1 km in $(x+25)$ seconds, then C covers 1 km in $(x+55)$ seconds.
Thus in x seconds, C covers the distance of 725 m.

$\therefore \frac{x}{725} \times 1000 = x + 55$

$\Rightarrow x = 145$

$\therefore$ A covers the distance of 1 km in 2 minutes 25 seconds.

10. (4)



Let O be the starting point. The car running at 36 kmph is moving along OB and that at 48 kmph moving along OA. Also let they reach at B and A respectively after 15 seconds.

$\therefore OA = 48 \times \frac{5}{18} \times 15 = 200$ m

and $OB = 36 \times \frac{5}{18} \times 15 = 150$ m

$\therefore$ Required distance = AB

$= \sqrt{(200)^2 + (150)^2}$

W (By Pythagoras theorem)

$= \sqrt{40000 + 22500}$

$= \sqrt{62500} = 250$ m

11. (2) A beats B by 30 seconds and B beats C by 15 seconds.
Clearly, A beats C by 45 seconds.
Also, A beats C by 180 metres.
Hence, C covers 180 metres in 45 seconds.

$\therefore$ Speed of C $= \frac{180}{45} = 4$ m/sec

$\therefore$ Time taken by C to cover 1000 m

$= \frac{1000}{4} = 250$ sec.

$\therefore$ Time taken by A to cover 1000 m
$= 250 - 45 = 205$ sec.

12. (2) Difference of time
= 6 min. – 5 min. 52 sec.
= 8 seconds
Distance covered by man in 5 min. 52 seconds
= Distance covered by sound in 8 seconds
$= 330 \times 8 = 2640$ m.
$\therefore$ Speed of man

$= \frac{2640\text{ m}}{5\text{ min. }52\text{ sec.}}$

$= \frac{2640}{352}$ m/sec

$= \frac{2640}{352} \times \frac{18}{5}$ kmph

$= 27$ kmph

13. (1) Let the required distance be x km.
Difference of time
= 15 + 5 = 20 minutes

$= \frac{1}{3}$ hour

According to the question,

$\frac{x}{35} - \frac{x}{42} = \frac{1}{3} \Rightarrow \frac{6x - 5x}{210} = \frac{1}{3}$

$\Rightarrow \frac{x}{210} = \frac{1}{3}$

$\Rightarrow x = \frac{210}{3} = 70$ km.

14. (3) $\left(1 - \frac{5}{6}\right)$ of time taken by B
= 1 hour 15 minutes
$\therefore$ Time taken by B
= 1 hour 15 minutes $\times$ 6
= 7 hours 30 minutes

15. (1) Abhay's speed = x kmph
Sameer's speed = y kmph

$\therefore \frac{30}{x} - \frac{30}{y} = 2$ ...(i)

and, $\frac{30}{y} - \frac{30}{2x} = 1$ ...(ii)

On adding,

$\frac{30}{x} - \frac{30}{2x} = 3$

$\Rightarrow \frac{60 - 30}{2x} = 3$

$\Rightarrow \frac{30}{2x} = 3 \Rightarrow 6x = 30$

$\Rightarrow x = 5$ kmph

16. (3) Time taken in walking both ways = 7 hours 45 minutes ....(i)
Time taken in walking one way and riding back = 6 hours 15 minutes ....(ii)
By equation (ii) $\times$ 2 – (i), we have
Time taken by the man to ride both ways
= 12 hours 30 minutes – 7 hours 45 minutes
= 4 hours 45 minutes

17. (1) Let the total distance be 100 km.
Average speed

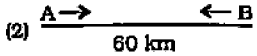
$= \frac{\text{Total distance covered}}{\text{Time taken}}$

$= \frac{100}{\frac{30}{20} + \frac{60}{40} + \frac{10}{10}}$

$= \frac{100}{\frac{3}{2} + \frac{3}{2} + 1} = \frac{100}{\frac{3+3+2}{2}}$

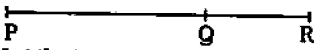
$= \frac{100 \times 2}{8} = 25$ kmph

18. (2)



Let the speed of A = x kmph and that of B = y kmph
According to the question,
$x \times 6 + y \times 6 = 60$
$\Rightarrow x + y = 10$ ....(i)
and, $\frac{2}{3}x \times 5 + 2y \times 5 = 60$
$\Rightarrow 10x + 30y = 180$
$\Rightarrow x + 3y = 18$ ...(ii)
From equations (i) $\times$ (3) – (ii)
$3x + 3y - x - 3y = 30 - 18$
$\Rightarrow 12x = 12$
$\Rightarrow x = 6$ kmph.

19. (2)



Let the trains meet after t hours, then
$24t - 18t = 27$
$\Rightarrow 6t = 27$

$\Rightarrow t = \frac{27}{6} = \frac{9}{2}$ hours

$\therefore QR = 18t = 18 \times \frac{9}{2} = 81$ km

20. (3) Let the speed of Ravi be x kmph then, Ajay's speed = $(x+4)$ kmph
Distance covered by Ajay
= 60 + 12 = 72 km
Distance covered by Ravi
= 60 – 12 = 48 km.
According to the question,

$\frac{72}{x+4} = \frac{48}{x}$

$\Rightarrow \frac{3}{x+4} = \frac{2}{x}$
$\Rightarrow 3x = 2x + 8$
$\Rightarrow x = 8$ kmph

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21. (2) Let man walked for t hours.
then, $t \times 4 + (9 - t) \times 9 = 61$
$\Rightarrow 4t + 81 - 9t = 61$
$\Rightarrow 81 - 5t = 61$
$\Rightarrow 5t = 20$
$\Rightarrow t = 4$
$\therefore$ Distance travelled on foot
$= 4 \times 4 = 16$ km.

22. (1) Let the required distance be x km, then

$$\frac{x}{5} - \frac{x}{6} = \frac{12}{60} = \frac{1}{5}$$

$$\Rightarrow \frac{6x - 5x}{30} = \frac{1}{5} \Rightarrow \frac{x}{30} = \frac{1}{5}$$

$\Rightarrow x = 6$ km.

23. (4) Let the required distance be x km.

$$\therefore \frac{x}{3} - \frac{x}{4} = \frac{30}{60}$$

$$\Rightarrow \frac{x}{12} = \frac{1}{2} \Rightarrow x = \frac{1}{2} \times 12 = 6 \text{ km}$$

24. (2) Let the speed of train be x kmph and that of car be y kmph. then

$$\frac{60}{x} + \frac{240}{y} = 4 \quad \ldots(i)$$

and, $$\frac{100}{x} + \frac{200}{y} = \frac{25}{6}$$

$$\Rightarrow \frac{4}{x} + \frac{8}{y} = \frac{1}{6} \quad \ldots(ii)$$

By equation (i) – equation (ii) × 30

$$\frac{60}{x} + \frac{240}{y} - \frac{120}{x} - \frac{240}{y} = 4 - 5$$

$$\Rightarrow -\frac{60}{x} = -1$$

$\Rightarrow x = 60$ kmph

25. (2) Ratio of the speed of A and B
$= A : B = 2 : 1 = 6 : 3$
$B : C = 3 : 1$
$\therefore A : B : C = 6 : 3 : 1$
$\therefore$ Ratio of their time taken

$$= \frac{1}{6} : \frac{1}{3} : 1 = 1 : 2 : 6$$

$\therefore$ Time taken by B

$$= \left(\frac{2}{6} \times 114\right) \text{ minutes}$$

$= 38$ minutes

26. (3) Let speed of train A = x kmph and speed of train B = y kmph

$$\therefore \frac{x}{y} = \sqrt{\frac{t_2}{t_1}}$$

$$\Rightarrow \frac{45}{y} = \sqrt{\frac{3 + \frac{1}{3}}{4 + \frac{48}{60}}} = \sqrt{\frac{\frac{10}{3}}{4 + \frac{4}{5}}}$$

$$= \sqrt{\frac{10}{3} \times \frac{5}{24}} = \sqrt{\frac{25}{36}} = \frac{5}{6}$$

$$\Rightarrow 5y = 45 \times 6 \Rightarrow y = \frac{45 \times 6}{5}$$

$= 54$ kmph

27. (2) Total distance of trip

$$= \frac{1200 \times 5}{2} = 3000 \text{ km}$$

Part of journey covered by train

$$= 1 - \frac{2}{5} - \frac{1}{3} = \frac{15 - 6 - 5}{15} = \frac{4}{15}$$

$\therefore$ Distance covered by train

$$= 3000 \times \frac{4}{15} = 800 \text{ km}$$

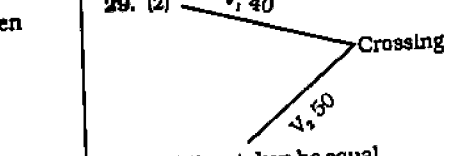
28. (1) A's speed = $\frac{1000}{5}$
$= 200$ m/minute
B's speed = $\frac{1000}{8}$
$= 125$ m/minute
C's speed = $\frac{1000}{10}$
$= 100$ m/minute
Distance covered by C in 2 minutes = 200 metre
Distance covered by B in 1 minute = 125 metre
Relative speed of A with respect to C = 100 metre

$$\therefore \text{Time} = \frac{200}{100} = 2 \text{ minutes}$$

Relative speed of A with respect ot B = 75 metre

$$\therefore \text{Time} = \frac{125}{75} = \frac{5}{3} \text{ minutes}$$

29. (2)



Let time taken be equal
i.e., $\frac{40}{V_1} = \frac{50}{V_2}$, then they will collide i.e. cars will reach at the same time.

$$\therefore \frac{V_1}{V_2} = \frac{40}{50} = \frac{4}{5}$$

30. (1) Time taken in covering 999km

$$= \frac{999}{55.5} = 18 \text{ hours}$$

$\therefore$ Required time = 18 hours + 1 hour 20 minutes
= 19 hours 20 minutes
i.e. 1 : 20 am

31. (1) Speed = 45 kmph

$$= \left(\frac{45 \times 1000}{60 \times 60}\right) \text{ metre/second}$$

$$= \left(\frac{45 \times 5}{18}\right) \text{ metre/second}$$

$= 12.5$ metre/second

32. (1) Distance covered in 2nd minute = 90 – 50 = 40 metre
Distance covered in 3rd minute
= 130 – 90 = 40 metre
$\therefore$ Required distance
$= 50 + 40 \times 14$
$= 50 + 560 = 610$ metre

33. (3) Here distance is constant.

$$\therefore \text{Speed} \propto \frac{1}{\text{Time}}$$

$\therefore$ Ratio of the speeds of A and B

$$= \frac{7}{\frac{2}{4}} = 7 : 8$$

$\therefore$ A's speed = $7x$ kmph (let)
B's speed = $8x$ kmph
$\therefore AB = 7x \times 4 = 28x$ km.
Let both trains cross each other after t hours from 7 a.m.
According to the question,
$7x(t + 2) + 8x \times t = 28x$
$\Rightarrow 7t + 14 + 8t = 28$
$\Rightarrow 15t = 28 - 14 = 14$

$$\Rightarrow t = \frac{14}{15} \text{ hours}$$

$$= \left(\frac{14}{15} \times 60\right) \text{ minutes}$$

$= 56$ minutes
$\therefore$ Required time = 7 : 56 A.M.

34. (4) Speed of plane = $\frac{\text{Distance}}{\text{Time}}$

$$= \frac{6000}{8} = 750 \text{ kmph}$$

New speed = (750 + 250) kmph
= 1000 kmph

$$\therefore \text{Required time} = \frac{9000}{1000}$$

= 9 hours

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TEST YOURSELF

1. Express speed of 36 km per hr. in metres per second.
(1) 10 m/sec. (2) 8 m/sec.
(3) 12 m/sec. (4) 18m/sec.

2. Express speed of 60 metres per sec. in km per hour.
(1) 232 kmph (2) 216 kmph
(3) 116 kmph (4) 118 kmph

3. A man covers 20 kms in 2 hours. Find the distance covered by him in $5\frac{1}{2}$ hours.
(1) 50 km (2) 65 km
(3) 55 km (4) 45 km

4. A car runs at 60 km per hr. A man runs at one-third the speed of the car and reaches office from his house in 15 minutes. How far is his office from his house?
(1) 7 km (2) 5.5 km
(3) 6 km (4) 5 km

5. Walking at a speed of 6 km per hour, a man takes 5 hours to complete his journey. How much time will he need to complete the same journey at the rate of 8 km per hr.?
(1) $3\frac{3}{4}$ hours (2) 3 hours
(3) $2\frac{3}{4}$ hours (4) 3.5 hours

6. A person covers 10 kms at 4 km per hr. and then further 21 kms at 6 km per hr. Find his average speed for whole journey.
(1) $5\frac{1}{3}$ kmph (2) $5\frac{1}{6}$ kmph
(3) $5\frac{1}{2}$ kmph (4) $4\frac{1}{2}$ kmph

7. P and Q are two cities. A boy travels on cycle from P to Q at a speed of 20 km per hr. and returns at the rate of 10 km per hr. Find his average speed for the whole journey.
(1) $13\frac{2}{3}$ kmph (2) $12\frac{1}{3}$ kmph
(3) $13\frac{1}{3}$ kmph (4) $12\frac{2}{3}$ kmph

8. A man walked a certain distance. One-third he walked at 5 km per hr. Another one-third he walked at 10 km per hr. and the rest at 15 km per hr. Find his average speed.
(1) $8\frac{1}{11}$ kmph (2) $7\frac{1}{11}$ kmph
(3) $7\frac{2}{11}$ kmph (4) $8\frac{2}{11}$ kmph

9. An aeroplane travels a distance in the form of a square with the speed of 400 km per hr, 600 km per hr, 800 km per hr. and 1200 km per hr respectively. Find the average speed for the whole distance along the four sides of the square.
(1) 640 kmph (2) 620 kmph
(3) 630 kmph (4) 650 kmph

10. A man covers one-third of his journey at 30 km per hr. and the remaining two-third at 45 km per hr. If the total journey is of 150 kms, what is his average speed for the whole journey?
(1) 38 kmph (2) $38\frac{4}{7}$ kmph
(3) 64 kmph (4) $39\frac{4}{7}$ kmph

11. When a person covers the distance between his house and office at 50 km per hr. he is late by 20 minutes. But when he travels at 60 km per hr. he reaches 10 minutes early. What is the distance between his office and his house?
(1) 140 km. (2) 160 km.
(3) 150 km. (4) 120 km.

12. A boy walks from his house at 4 km per hr. and reaches his school 9 minutes late. If his speed had been 5 km per hr. he would have reached his school 6 minutes earlier. How far his school from house?
(1) 6.5 km. (2) 5.5 km.
(3) 6 km. (4) 5 km.

13. A car travels a distance of 300 kms at uniform speed. If the speed of the car is 5 km per hr more it takes two hours less to cover the same distance. Find the original speed of the car.
(1) 25 kmph (2) 20 kmph
(3) 24 kmph (4) 28 kmph

14. A car can finish a certain journey in 10 hours at a speed of 48 km per hr. In order to cover the same distance in 8 hours, how much the speed be increased by?
(1) 10 kmph (2) 12 kmph
(3) 14 kmph (4) 15 kmph

15. If a boy walks from his house to school at the rate of 4 km per hr, he reaches the school 10 minutes earlier than the scheduled time. However if he walks at the rate of 3 km per hr, he reaches 10 minutes late. Find the distance of his school from his house.
(1) 3.5 km (2) 3 km
(3) 4 km (4) 4.5 km

16. A man has to reach a place 40 kms away. He walks at the rate of 4 km per hr. for the first 16 kms and then he hires a rickshaw for the rest of the journey. However if he had travelled by the rickshaw for the first 16 kms and the remaining distance on foot at 4 km per hr, he would have taken an hour longer to complete the journey. Find the speed of rickshaw.
(1) 6.5 kmph (2) 7.5 kmph
(3) 6 kmph (4) 8 kmph

17. Walking $\frac{3}{4}$ of my usual speed, a late is marked on my cards by 10 minutes. Find my usual time.
(1) 30 minutes (2) 35 minutes
(3) 32 minutes (4) 36 minutes

18. By walking $\frac{5}{3}$ of usual speed a student reaches school 20 minutes earlier. Find his usual time.
(1) 45 minutes
(2) 50 minutes
(3) 60 minutes
(4) None of these

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19. Walking at $\frac{3}{4}$ of his usual speed a man is late by $2\frac{1}{2}$ hours. The usual time would have been what?
(1) 7 hours (2) 7.5 hours
(3) 8 hours (4) 8.5 hours

20. Two men *A* and *B* walk from *X* to *Y* a distance of 42 kms at 5 km and 7 km an hour respectively. *B* reaches *Y* and returns immediately and meets *A* at *R*. Find the distance from *X* to *R*.
(1) 32 km (2) 30 km
(3) 35 km (4) 40 km

21. Two men *A* and *B* start walking simultaneously from *P* to *Q*, a distance of 21 kms, at the speed of 3 km and 4 km an hour respectively. *B* reaches *Q*, returns immediately and meets *A* at *R*. Find the distance from *P* to *R*.
(1) 22 km (2) 20 km
(3) 16 km (4) 18 km

22. Ram travelled one-third of a journey with a speed of 10 km per hr, the next one-third with a speed of 9 km per hr, and the rest at a speed of 8 km per hr. If he had travelled half the journey at speed of 10 km per hr, and the other half with a speed of 8 km per hr, he would have been 1 minute longer on the way. What distance did he travel?
(1) 36 km (2) 32 km
(3) 35 km (4) 40 km

23. A man walks a distance of 35 kms. He walks for some time at 4 km per hour and for some time at 5 km per hr. If he walks at 5 km per hr. instead of 4 km per hr. and 4 km per hr. instead of 5 km per hr, he will walk 2 kms more in the same span of time. Find his total time of total journey.
(1) 8.5 hours (2) 7.5 hours
(3) 8 hours (4) 7 hours

24. A man travels 400 kms in 4 hours partly by air and partly by train. If he had travelled all the way by air, he would have saved $\frac{4}{5}$ of the time he was in train and would have arrived his destination 2 hours early. Find the distance he travelled by train.
(1) 95 km. (2) 85 km.
(3) 90 km. (4) 100 km.

25. On increasing the speed of a train at the rate of 10 km per hr, 30 minutes is saved in a journey of 100 kms. Find the initial speed of train.
(1) 40 kmph (2) 45 kmph
(3) 42 kmph (4) 44 kmph

26. Ravi can walk a certain distance in 40 days when he rests 9 hours a day. How long will he take to walk twice the distance, twice as fast and rest twice as long each day?
(1) 80 days (2) 100 days
(3) 90 days (4) 95 days

27. A monkey climbing up a greased pole ascends 12 metres and slips down 5 metres in alternate minutes. If the pole is 63 metres high, how long will it take him to reach the top?
(1) 18 minutes
(2) 16 minutes
(3) $16\frac{7}{12}$ minutes
(4) 18 minutes 20 seconds

28. A hare sees a dog 100 metres away from her and scuds off in the opposite direction at a speed of 12 km per hr. A minute later the dog perceives her and chases her at a speed of 16 km per hr. How soon will the dog overtake the hare and at what distance from the spot when the hare took flight?
(1) 900 metres (2) 950 metres
(3) 1000 metres (4) 1100 metres

29. A hare, pursued by a grey hound is 50 of her own leaps before him. While the hare takes 4 leaps, the grey hound takes 3 leaps. In one leap, the hare goes 1.75 metres and the grey hound 2.75 metres. In how many leaps, will the grey hound overtake the hare?
(1) 210 leaps (2) 220 leaps
(3) 230 leaps (4) 250 leaps

30. In a flight of 600 kms, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km per hr. and the time of flight increased by 30 minutes. Find the duration of flight.
(1) 1.2 hours (2) 1 hour
(3) 1.5 hours (4) 2 hours

31. Two trains leave a railway station at the same time. The first train travels due west and the second train due north. The first train travels 5 km per hr, faster than the second train. If after two hours they are 50 km apart, find the average speed of faster train.
(1) 18 kmph (2) 15 kmph
(3) 20 kmph (4) 25 kmph

32. A carriage driving in a fog passed a man who was walking at the rate of 6 km per hr. in the same direction. He could see the carriage for 4 minutes and it was visible to him up to a distance of 200 metres. Find the speed of the carriage.
(1) 8.75 kmph (2) 8.5 kmph
(3) 8 kmph (4) 9 kmph

33. Two bullets were fired at a place at an interval of 12 minutes. A person approaching the firing point in his car hears the two sounds at an interval of 11 minutes 40 seconds. The speed of sound is 330 metres per second. What is the approximate speed of the car?
(1) 34 kmph (2) 32 kmph
(3) 36 kmph (4) 38 kmph

34. *A* and *B* start simultaneously at 5 km per hr. and 4 km per hr. from *P* and *Q*, 180 kms apart, towards *Q* and *P* respectively. They cross each other at *M* and after reaching *Q* and *P* turn back immediately and meet again at *N*. Find the distance *MN*.
(1) 45 km (2) 40 km
(3) 35km (4) 42 km

35. A car driving in the morning fog passes a man walking at 4 km per hr. in the same direction. The man can see the car for 3 minutes and visibility is upto a distance of 130 metres. Find the speed of the car.
(1) 7.5 kmph (2) 6.6 kmph
(3) 6 kmph (4) 7 kmph

36. Ram starts his journey from Bombay to Pune and simultaneously Mohan starts from Pune to Bombay. After crossing each other they finish their remaining journey in $6\frac{1}{4}$ and 4 hours re-

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spectively. What is Mohan's speed if Ram's speed is 20 km per hr. ?
(1) 28 kmph (2) 24 kmph
(3) 25 kmph (4) 30 kmph

37. A train meets with an accident after travelling 30 kms, after which it moves with $\frac{4}{5}$ th of its original speed and arrives at the destination 45 minutes late. Had the accident happened 18 kms further on, it would have been 9 minutes before. Find the distance of journey and original speed of the train.
(1) 120 km ; 25 kmph
(2) 125 km ; 25 kmph
(3) 130 km ; 30 kmph
(4) 120 km ; 30 kmph

38. A train met with an accident 3 hours after starting, which detains it for one hour, after which it proceeds at 75% of its original speed. It arrives at the destination 4 hours late. Had the accident taken place 150 km further along the railway line, the train would have arrived only $3\frac{1}{2}$ hours late. Find the length of the trip and the original speed of the train.
(1) 1100 km ; 100 kmph
(2) 1200 km ; 100 kmph
(3) 1200 km ; 90 kmph
(4) 1600 km ; 90 kmph

39. A train after travelling 100 kms from *P* meets with an accident and then proceeds at $\frac{3}{4}$ th of its original speed and arrives at the terminus *Q* 90 minutes late. Had the accident occurred 60 kms further on, it would have reached 15 minutes sooner. Find the original speed of the train and the distance *PQ*.
(1) 65 kmph; 480 km
(2) 75 kmph; 450 km
(3) 80 kmph; 460 km
(4) 85 kmph; 460 km

40. Two trains *A* and *B* are 110 km apart on a straight line. One train starts from *A* at 7 a.m. and travels towards *B* at 20 km per hr. Another train starts from *B* at 8 am. and travels towards *A* at a speed of 25 km per hr. At what time will they meet?
(1) 10 : 15 a.m.
(2) 09 : 50 a.m.
(3) 09 : 30 a.m.
(4) 10 : 00 a.m.

41. Two boys begin together to write out a booklet containing 817 lines. The first boy starts with the first line, writing at the rate of 200 lines an hour and the second boy starts with the last lines then writes line 816 and so on. Backward proceeding at the rate of 150 lines an hour. At what line will they meet?
(1) 467th line (2) 468th line
(3) 470th line (4) 475th line

42. Two men set out the same time to walk towards each other from two points *A* and *B*, 72 km apart. The first man walks at the rate of 4 km per hr. The second man walks 2 km in the first hour, $2\frac{1}{2}$ km in the second hour, 3 km in the third hour and so on. Find the time after which the two men will meet.
(1) 8 hours (2) 9 hours
(3) 8.5 hours (4) 9.5 hours

43. A man is standing on a railway bridge which is 50 metres long. He finds that a train crosses the bridge in $4\frac{1}{2}$ seconds but himself in 2 seconds. Find the length of the train and its speed.
(1) 60 m ; 20 m/sec
(2) 40 m ; 20 kmph
(3) 40 m ; 20 m/sec
(4) 40 m ; 25 m/sec

44. Two places *A* and *B* are 162 kms apart. A train leaves *A* for *B* and at the same time another train leaves *B* for *A*. The two trains meet at the end of 6 hours. If the train travelling from *A* to *B* travels 8 km per hr. faster than the other, find the speed of the faster train.
(1) 16.5 kmph (2) 16 kmph
(3) 17 kmph (4) 17.5 kmph

45. A train running at 25 km per hour take 18 seconds to pass a platform. Next, it takes 12 seconds to pass a man walking at the rate of 5 km per hr. in the same direction. Find the length of the platform.
(1) 25 metres (2) 20 metres
(3) 24 metres (4) 28 metres

46. Two trains 200 metres and 175 metres long are running on parallel lines. They take $7\frac{1}{2}$ seconds when running in opposite directions and $37\frac{1}{2}$ seconds when running in the same direction to pass each other. Find their speeds in km per hour.
(1) 118 kmph ; 75 kmph
(2) 108 kmph ; 72 kmph
(3) 120 kmph ; 75 kmph
(4) 125 kmph ; 80 kmph

47. A train travelling at the rate of 60 km per hr, while inside a tunnel, meets another train of half its length travelling at 90 km per hr. and passes completely in $4\frac{1}{2}$ seconds. Find the length of the tunnel if the first train passes completely through it in 4 minutes $37\frac{1}{2}$ seconds.
(1) 5 km (2) 3.5 km
(3) 4.5 km (4) 6 km

48. A train overtakes two person walking at 2 km per hr. and 4 km per hr. respectively and passes completely them in 9 sec. and 10 sec. respectively. What is the length of the train?
(1) 65 metres (2) 60 metres
(3) 55 metres (4) 50 metres

49. A train takes 18 seconds to pass completely through a station 162 metres long and 15 seconds to pass completely through another station 120 metres long. Find the speed of train in km per hr.
(1) 50.4 kmph (2) 52 kmph
(3) 55 kmph (4) 60 kmph

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50. Two trains of which one is 50 metres longer than the other are running in opposite directions and cross each other in 10 seconds. If they be running in the same direction then faster train would have passed the other train in 1 minute 30 seconds. The speed of faster train is 90 km per hr. Find the speed of other train.
(1) 25 m/sec. (2) 20 m/sec.
(3) 30 m/sec. (4) 35 m/sec.

51. A man standing on a 170 metre long platform watches that a train takes $7\frac{1}{2}$ seconds to pass him and 21 seconds to cross the platform. Find the speed of train.
(1) $12\frac{16}{27}$ m/sec.
(2) 12.5 m/sec.
(3) $12\frac{13}{27}$ m/sec.
(4) None of these

52. A goods train 158 metres long and travelling at the speed of 32 km per hr. leaves Delhi at 6 am. Another mail train 130 metres long and travelling at the average speed of 80 km per hr. leaves Delhi at 12 noon and follows the goods train. At what time will the mail train completely cross the goods train?
(1) 4 hours
(2) 4 hours 21.6 sec.
(3) 5 hours 21.6 sec.
(4) None of these

53. A motor-boat goes 2 km upstream in a stream flowing at 3 km per hr. and then returns downstream to the starting point in 30 minutes. Find the speed of the motor-boat in still water.
(1) 9.5 kmph (2) 8.5 kmph
(3) 9 kmph (4) 8 kmph

54. A person can row a boat 32 km upstream and 60 km downstream in 9 hours. Also, he can row 40 km upstream and 84 km downstream in 12 hours. Find the rate of the current.
(1) 3 kmph (2) 2.5 kmph
(3) 1.5 kmph (4) 2 kmph

55. A boatman takes his boat in a river against the stream from a place A to a place B where AB is 21 km and again returns to A. Thus he takes 10 hours in all. The time taken by him downstream in going 7 km is equal to the time taken by him against stream in going 3 km. Find the speed of river.
(1) 2 kmph (2) 2.5 kmph
(3) 3 kmph (4) 3.5 kmph

56. A motorist and a cyclist start from A to B at the same time. AB is 18 km. The speed of motorist is 15 m per hr. more than the cyclist. After covering half the distance, the motorist rests for 30 minutes and thereafter his speed is reduced by 20%. If the motorist reaches the destination B, 15 minutes earlier than that of the cyclist, then find the speed of the cyclist.
(1) 16 kmph (2) 12 kmph
(3) 14 kmph (4) 15 kmph

57. A man covered a distance of 3990 km partly by air, partly by sea and remaining by land. The time spent in air, on sea and on land is in the ratio 1 : 16 : 2 and the ratio of average speed is 20 : 1 : 3 respectively. If total average speed is 42 km per hr, find the distance covered by sea.
(1) 1720 km. (2) 1620 km.
(3) 1520 km. (4) 1820 km.

58. A railway engine is proceeding towards A at uniform speed of 30 km/hr. While the engine is 20 kms away from A an insect starting from A flies again and again between A and the engine relentlessly. The speed of insect is 42 km per hr. Find the distance covered by the insect till the engine reaches A.
(1) 25 km. (2) 32 km.
(3) 30 km. (4) 28 km.

59. Distance between two stations X and Y is 220 km. Trains P and Q leave station X at 8 a.m. and 9.51 a.m. respectively at the speed of 25 kmph and 20 kmph respectively for journey towards Y. A train R leaves station Y at 11.30 a.m. at a speed of a 30 kmph. for journey towards X. When will P be at equal distance from Q and R?
(1) 12:48 pm. (2) 12:30 pm.
(3) 12:45 pm. (4) 11:48 pm.

60. A person travels a certain distance on a bicycle at a certain speed. Had he moved 3 km/hour faster, he would have taken 40 minutes less. Had he moved 2km/hour slower, he would have taken 40 minutes more. Find the distance.
(1) 45 km. (2) 40 km.
(3) 50 km. (4) 55 km.

61. A steamer goes downstream from one port to another in 4 hours. It covers the same distance upstream in 5 hours. If the speed of the stream be 2 km/hr, find the distance between the two ports.
(1) 60 km. (2) 45 km.
(3) 80 km. (4) 65 km.

62. In a 200 metre race, A beats B by 20 metres; while in a 100 metres race, B beats C by 5 metres. Assuming that the speed of A, B and C remain the same in various races, by how many metres will A beat C in one kilometre race?
(1) 140 metre (2) 145 metre
(3) 135 metre (4) 125 metre

63. Two places A and B are 80 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in the same direction, they meet each other in 8 hours. If they move in opposite directions towards each other, they meet in 1 hour 20 minutes. Determine the speed of the faster car.
(1) 20 kmph (2) 25 kmph
(3) 35 kmph (4) 30 kmph

64. In a one-kilometre race, A beats B by 15 seconds and B beats C by 15 seconds. If C is 100 metres away from the finishing mark, when B has reached it, find the speed of A.
(1) 9.5 m/sec. (2) 9 m/sec.
(3) 8 m/sec. (4) 8.3 m/sec.

65. A train running at the speed of 72 km/hr passes a tunnel completely in 3 minutes. While inside the tunnel, it meets another train of $\frac{3}{4}$ of its length coming from opposite direction at the speed of 90km/hr and passes it completely in $3\frac{1}{2}$ seconds. Find the length of the tunnel.
(1) 3510 metre (2) 3500 metre
(3) 3400 metre (4) 3600 metre

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SHORT ANSWERS

1. (1)	2. (2)	3. (3)	4. (4)
5. (1)	6. (2)	7. (3)	8. (4)
9. (1)	10. (2)	11. (3)	12. (4)
13. (1)	14. (2)	15. (3)	16. (4)
17. (1)	18. (2)	19. (2)	20. (3)
21. (4)	22. (1)	23. (3)	24. (4)
25. (1)	26. (2)	27. (3)	28. (4)
29. (1)	30. (2)	31. (3)	32. (4)
33. (1)	34. (2)	35. (2)	36. (3)
37. (4)	38. (2)	39. (3)	40. (4)
41. (1)	42. (2)	43. (3)	44. (4)
45. (1)	46. (2)	47. (3)	48. (4)
49. (1)	50. (2)	51. (1)	52. (2)
53. (3)	54. (4)	55. (1)	56. (2)
57. (3)	58. (4)	59. (1)	60. (2)
61. (3)	62. (2)	63. (3)	64. (4)
65. (1)			

EXPLANATIONS

1. (1) 36 km/hr.

$= \left(36 \times \frac{5}{18}\right)$ m/sec.

= 10 m/sec.

2. (2) 60 metres per sec.

$= \left(60 \times \frac{18}{5}\right)$ km per hr.

= 216 km per hr.

3. (3) Distance = 20 kms

Time = 2 hours

$\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{20}{2} = 10$ km per hr.

Now, we have, Speed = 10 km per hr.

Time $= \frac{11}{2}$ hr.

$\therefore$ Distance = Speed × Time

$= 10 \times \frac{11}{2} = 55$ km.

4. (4) Man's speed $= \frac{1}{3}$ of the speed of car

$= \frac{1}{3} \times 60 = 20$ km per hr.

Time taken to reach office= 15 minutes $= \frac{15}{60} = \frac{1}{4}$ hr.

$\therefore$ Distance between his house and office

= Speed × Time

$= 20 \times \frac{1}{4} = 5$ km.

5. (1) Speed = 6 km/hr

Time taken = 5 hours

$\therefore$ Distance covered

= 6 × 5 = 30 kms

$\therefore$ Time required to cover 30 kms at the speed of 8 km/hr.

$= \frac{\text{Distance}}{\text{Speed}} = \frac{30}{8} = \frac{15}{4}$ hours

$= 3\frac{3}{4}$ hours

6. (2) **Case I.**

Distance = 10 kms

Speed = 4 km/hr.

$\therefore$ Time taken $(t_1) = \frac{10}{4} = \frac{5}{2}$ hrs.

Case II.

Distance = 21 kms

Speed = 6 km/hr.

$\therefore$ Time taken $(t_2) = \frac{21}{6} = \frac{7}{2}$ hrs.

Total time taken $= \frac{5}{2} + \frac{7}{2}$

$= \frac{5+7}{2} = 6$ hrs.

Total distance covered

= 10 + 21 = 31 kms

$\therefore$ Average Speed

$= \frac{\text{Total distance}}{\text{Total time}}$

$= \frac{31}{6}$ km per hr.

$= 5\frac{1}{6}$ km per hr.

7. (3) Let the speed between P and Q be x km.

Then time taken to cover x km.

P to $Q = \frac{x}{20}$ hrs.

Time taken to cover x km from Q to P at 10 km per hr. P to Q

$= \frac{x}{10}$ hrs.

$\therefore$ Total distance covered

$= x + x = 2x$ km.

Time taken to cover $2x$ km.

$= \frac{x}{20} + \frac{x}{10} = \frac{x+2x}{20} = \frac{3x}{20}$ hrs.

$\therefore$ Average Speed

$= \frac{2x}{\frac{3x}{20}} = \frac{2x \times 20}{3x}$

$= \frac{40}{3}$ km per hr.

$= 13\frac{1}{3}$ km per hr.

Method 2 :

Here, $x = 20$ km per hr.

$y = 10$ km per hr.

$\therefore$ Average speed

[$\because$ Distance is same]

$= \frac{2xy}{x+y} = \frac{2 \times 20 \times 10}{20+10}$

$= \frac{400}{30} = \frac{40}{3} = 13\frac{1}{3}$ km per hr.

8. (4) Here, the man covers equal distance at different speeds. Using the formula, the Average Speed is given by

$= \frac{3}{\frac{1}{5} + \frac{1}{10} + \frac{1}{15}} = \frac{3}{\frac{6+3+2}{30}}$

$= \frac{90}{11} = 8\frac{2}{11}$ km per hour.

9. (1) As distance is covered along four sides (equal) of a square at different speeds, the average speed of the aeroplane

$= \frac{4}{\frac{1}{400} + \frac{1}{600} + \frac{1}{800} + \frac{1}{1200}}$

[$\because$ All the sides of square are equal, so distance between them is same]

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$= \frac{4}{\frac{30+20+15+10}{12000}}$

$= \frac{48000}{75} = 640$ km per hr.

10. (2) Length of journey = 150 kms

$\frac{1}{3}$ rd of journey $= \frac{150}{3} = 50$ kms

Remaining $\frac{2}{3}$ journey

= 150 – 50 = 100 kms

Time taken in $\frac{1}{3}$ rd journey at 30 km per hr.

$t_1 = \frac{50}{30} = \frac{5}{3}$ hrs.

Time taken in $\frac{2}{3}$ rd journey at 45 km per hr.

$t_2 = \frac{100}{45} = \frac{20}{9}$ hrs.

Total time taken in whole journey = $t_1 + t_2$

$= \frac{5}{3} + \frac{20}{9} = \frac{15+20}{9} = \frac{35}{9}$ hrs.

Average Speed

$= \frac{150}{\frac{35}{9}} = \frac{150 \times 9}{35} = \frac{270}{7}$

$= 38\frac{4}{7}$ km per hr.

11. (3) Let time taken to reach office at 50 kmph be x hrs

Then time taken to reach office at 60 kmph $= \left(x + \frac{30}{60}\right)$ hrs

As, distance covered is same,

$\therefore x \times 50 = 60\left(x + \frac{30}{60}\right)$

$50x = 60x + 30$

$\Rightarrow x = 3$ hrs

Hence, distance = 3 × 50

= 150 km

12. (4) Let time taken to reach school at 4 kmph be x hrs.

Then time taken to reach school at 5 kmph $= \left(x + \frac{15}{60}\right)$ hrs

Since, distance is equal.

$\therefore 4x = 5\left(x + \frac{15}{60}\right)$

$x = \frac{5}{4}$ hrs.

Hence, distance between school & house $= 4 \times \frac{5}{4}$ km = 5 km

13. (1) Let the original speed of the car = x km per hr.

When it is increased by 5 km per hr, the speed = $x + 5$ km per hr.

As per the given information in the question,

$\frac{300}{x} - \frac{300}{x+5} = 2$

$\Rightarrow \frac{300(x+5) - 300x}{x(x+5)} = 2$

$\Rightarrow \frac{300x + 1500 - 300x}{x^2 + 5x} = 2$

$\Rightarrow \frac{1500}{x^2 + 5x} = 2$

$\Rightarrow \frac{750}{x^2 + 5x} = 1$

$\Rightarrow x^2 + 5x = 750$

$\Rightarrow x^2 + 5x - 750 = 0$

$\Rightarrow x^2 + 30x - 25x - 750 = 0$

$\Rightarrow x(x + 30) - 25(x + 30) = 0$

$\Rightarrow (x + 30)(x - 25) = 0$

$\Rightarrow x = -30$ or 25

The negative value of speed is inadmissible.

Hence, the required speed = 25 km per hr.

14. (2) Time = 10 hours,

Speed = 48 km per hr.

$\therefore$ Distance = Speed × Time

= 48 × 10 = 480 km

Now, this distance of 480 kms is to be covered in 8 hours.

Hence, the required Speed

$= \frac{\text{Distance}}{\text{New time}} = \frac{480}{8}$

= 60 km per hr.

$\therefore$ Increase in speed

= 60 – 48 = 12 km per hr.

15. (3) Let the distance be x kms.

$\therefore$ Time taken at 4 km per hr. t_1

$= \frac{x}{4}$ hrs.

Time taken at 3 km per hr. t_2

$= \frac{x}{3}$ hrs.

Difference in timings

= 10 + 10 = 20 minutes

or $\frac{20}{60} = \frac{1}{3}$ hour

$\therefore \frac{x}{3} - \frac{x}{4} = \frac{1}{3}$

$\Rightarrow \frac{4x - 3x}{12} = \frac{1}{3}$

$\Rightarrow \frac{x}{12} = \frac{1}{3}$

$\therefore x = 4$ km.

Hence the required distance = 4 kms.

16. (4) Let the speed of Rickshaw be 'x'.

Then, time taken to cover 16 km on foot and 24 km on Rikshaw $= \frac{16}{4} + \frac{24}{x}$ hrs

and time taken to travel 24 km on foot & 16 km on Rikshaw

$= \frac{16}{x} + \frac{24}{4}$ hrs

According to question,

$\frac{16}{4} + \frac{24}{x} + 1 = \frac{16}{x} + \frac{24}{4}$

$\Rightarrow \frac{5 + 24}{x} = \frac{16}{x} + 6$

$\Rightarrow \frac{24 - 16}{x} = 1$

$\Rightarrow x = 8$ km/hr

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17. (1) Since I walk at $\frac{3}{4}$ of my usual speed the time taken is $\frac{4}{3}$ of my usual time.

[∵ the speed and time are in the inverse ratio]

$\therefore \frac{4}{3}$ of usual time

= Usual time + Time I reach late

$\therefore \frac{1}{3}$ of usual time

= 10 minutes

∴ Usual time

= 10 × 3 = 30 minutes.

18. (2) $\frac{5}{3}$ of usual speed means $\frac{3}{5}$ of usual time as he reaches earlier.

$\therefore \frac{3}{5}$ usual time + 20 minutes= Usual time

20 minutes $= \left(1-\frac{3}{5}\right)$ usual time

$= \frac{2}{5}$ usual time

∴ Usual time

$= \frac{20\times5}{2}$ = 50 minutes.

19. (2) New speed is $\frac{3}{4}$ of the usual speed

∴ New time taken $= \frac{4}{3}$ of the usual time

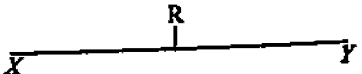
$\therefore \frac{4}{3}$ of the usual time : Usual time $= \frac{5}{2}$

$\Rightarrow \frac{1}{3}$ of the usual time $= \frac{5}{2}$

$\therefore$ Usual time $= \frac{5}{2}\times3$

$= \frac{15}{2}$ hours or 7.5 hrs

20. (3) When B meets A at R, by then B has walked a distance (XY + YR) and A, the distance XR. That is both of them have together walked twice the distance from X to Y, i.e., 42 kms.

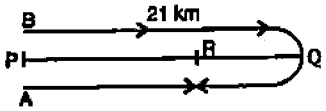


Now, the ratio of speed of A and B is 5 : 7 and they walk 84 kms.

∴ Hence, the distance XR travelled by

$A = \frac{5}{5+7}\times84$ = 35 kms.

21. (4) Let A and B meet after time t hours.



Distance covered by A in t hours = 3 t km.

Distance covered by B in t hours = 4 t km.

Total distance covered by A and B = (3t + 4t) km = 7 t km.

From the diagram we can see that the total distance covered by A and B is equal to twice the distance between P and Q.

$\therefore 7t = 2\times21$

$t = \frac{2\times21}{7}$

t = 6 hours

Distance PR = 6 × 3 = 18 km.

22. (1) Let the total distance travelled be x kms.

Case I :

Speed for the first one-third distance i.e. $\frac{x}{3}$ kms =10 km per hr.

$\therefore$ Time taken $= \frac{x}{30}$ hours

Similarly, time taken for the next one-third distance

$= \frac{x}{27}$ hours

and time taken for the last one-third distance $= \frac{x}{24}$ hours.

∴ Total time taken to cover x kms.

$= \left(\frac{x}{30}+\frac{x}{27}+\frac{x}{24}\right)$ hours.

Case II :

Time taken for one-half distance at the speed of 10 km per hr.

$= \frac{x}{20}$ hrs.

and time taken for remaining $\frac{1}{2}$ of distance $= \frac{x}{16}$ hrs. at 8 km per hr.

Total time taken

$= \left(\frac{x}{20}+\frac{x}{16}\right)$ hrs.

Time taken in (Case II – Case I)

= 1 minute $= \frac{1}{60}$ hr.

∴ According to the question

$\frac{x}{20}+\frac{x}{16}-\left(\frac{x}{30}+\frac{x}{27}+\frac{x}{24}\right)$

$= \frac{1}{60}$

$\Rightarrow \frac{108x+135x-72x-80x-90x}{2160}$

$= \frac{1}{60}$

$\Rightarrow \frac{243x-242x}{2160} = \frac{1}{60}$

$\Rightarrow \frac{x}{2160} = \frac{1}{60}$

$\Rightarrow x = \frac{2160}{60}$ = 36 km.

Hence the required distance = 36 km.

23. (3) Let the man walks for x hours at 4 km per hr. and y hours at 5 km per hr. and covers a distance of 35 kms.

$\therefore$ Distance = $4x + 5y = 35$ ...(i)

Now, he walks at 5 km per hr.

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for x hours and at 4 km per hr. for y hours and covers a distance (35 + 2) = 37 kms

$\therefore$ Distance = $5x + 4y = 37$...(i)

By 5 × (i) – 4 × (ii) we have

$20x + 25y = 175$

$20x + 16y = 148$

$- \quad - \quad -$

$9y = 27$

$\Rightarrow y = 3$

Putting the value of (y) in equation (i), we have

$4x + 5 \times 3 = 35$

$\Rightarrow 4x = 35 - 15 = 20$

$\Rightarrow x = 5$

$\therefore$ Total time taken

$= x + y = 5 + 3 = 8$ hours.

24. (4) Obviously, $\frac{4}{5}$ of total time in train = 2 hours

$\therefore$ Total time in train

$= \frac{5}{4} \times 2 = \frac{5}{2}$ hours

Total time to cover 400 km is 4 hours

$\therefore$ Time spent in travelling by air $= 4 - \frac{5}{2} = \frac{8-5}{2} = \frac{3}{2}$ hours

If 400 kms is travelled by air, then time taken = 2 hours

$\therefore$ In 2 hours, distance covered by air = 400 kms

In $\frac{3}{2}$ hours distance covered

$= \frac{400}{2} \times \frac{3}{2} = 300$ kms

Distance covered by the train = 400 – 300 = 100 kms.

25. (1) Let the original speed be x km/hr

then, increased speed = $(x + 10)$ km/hr

According to question,

$\frac{100}{x} - \frac{100}{x+10} = \frac{30}{60}$

[$\because$ Original time – New time = 30 minute or $\frac{30}{60}$ hr]

$\Rightarrow 100\left[\frac{1}{x} - \frac{1}{x+10}\right] = \frac{1}{2}$

$\Rightarrow \frac{x+10-x}{x(x+10)} = \frac{1}{200}$

$\Rightarrow 10 \times 200 = x(x + 10)$

$\Rightarrow x^2 + 10x - 2000 = 0$

$\Rightarrow x^2 + 50x - 40x - 2000 = 0$

$\Rightarrow x(x + 50) - 40(x + 50) = 0$

$\Rightarrow x = -50, 40$

Speed can't be negative.

Hence, Original speed = 40 kmph

26. (2) Working hours per day = 24 – 9 = 15 hrs.

Total working hours for 40 days = 15 × 40 = 600 hrs.

On doubling the distance, the time required becomes twice but on walking twice as fast, the time required gets halved. Therefore, the two together cancel each other with respect to time required. Increasing rest to twice reduces walking hours per day to

24 – (2 × 9) = 6 hrs.

$\therefore$ Total number of days required to cover twice the distance, at twice speed with twice the rest.

$= \frac{600}{6} = 100$ days

27. (3) In 1 minute the monkey climbs 12 metres but then he takes 1 minute to slip down 5 metres. So, at the end of 2 minutes the net ascending of the monkey is 12 – 5 = 7 metres. So, to cover 63 metres the above process is repeated $\frac{63}{7} = 9$ times. Obviously, in 9 such happenings the monkey will slip 8 times, because on 9th time, it will climb to the top.

Thus, in climbing 8 times and slipping 8 times, he covers 8 × 7 = 56 metres.

Time taken to cover 56 metres

$= \frac{56 \times 2}{7} = 16$ minutes

Remaining distance = 63 – 56 = 7 metres

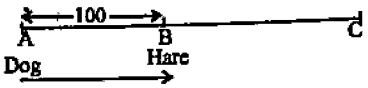
Time taken to ascend 7 metres

$= \frac{7}{12}$ minutes

$\therefore$ Total time taken $= 16 + \frac{7}{12}$

$= 16\frac{7}{12}$ minutes.

28. (4)



Let the hare at B sees that dog is at A.

$\therefore AB = 100$ metres

Again, let C be the position of the hare when the dog sees her.

$\therefore BC$= the distance covered by the hare in 1 minute

$= \frac{12 \times 1000 \times 1}{60} = 200$ metres

$\therefore AC = AB + BC$

= 100 + 200 = 300 metres

Thus, hare has a start of 300 metres.

Now, the dog gains 16 – 12 = 4 kms

4000 metres in 1 hour i.e. 60 minutes

$\therefore$ The distance gained by dog in 1 minute

$= \frac{4000}{60} = \frac{200}{3}$ metres

$\because \frac{200}{3}$ metres is covered in 1 minute

$\therefore$ 300 metres is covered in $\frac{300 \times 3}{200} = \frac{9}{2}$ minutes

Again the distance walked by hare in $\frac{9}{2}$ minutes

$= \frac{12000}{60} \times \frac{9}{2} = 900$ metres

$\therefore$ Total distance from B = 200 + 900 = 1100 metres.

29. (1) Grey hound and hare make 3 leaps and 4 leaps respectively. This happens at the same time. The hare goes 1.75 metres in 1 leap.

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∴ Distance covered by hare in 4 leaps = 4 × 1.75 = 7 metres
The grey hound goes 2.75 metres in one leap.
∴ Distance covered by it in 3 leaps
= 3 × 2.75 = 8.25 metres
Distance gained by grey hound in 3 leaps = (8.25 − 7)
= 1.25 metres
Distance covered by hare in 50 leaps = 50 × 1.75 metres
= 87.5 metres
Now, 1.25 metres is gained by grey hound in 3 leaps
∴ 87.5 metres is gained in $\frac{3}{1.25} \times 87.5 = 210$ leaps.

30. (2) Let the original speed be x kmph
then, new speed = $(x - 200)$ kmph
According to question,
Time taken with new speed − time taken with original speed = 30 min. i.e $\frac{1}{2}$ hr.

$$\therefore \frac{600}{x-200} - \frac{600}{x} = \frac{1}{2}$$

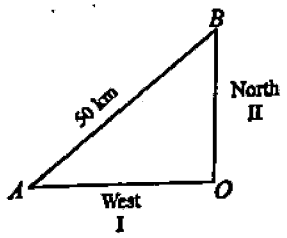
$$\Rightarrow 600\left[\frac{1}{x-200} - \frac{1}{x}\right] = \frac{1}{2}$$

$$\Rightarrow \frac{x - x + 200}{x(x-200)} = \frac{1}{1200}$$

$$\Rightarrow 24000 = x(x-200)$$
$$\Rightarrow x^2 - 200x - 24000 = 0$$
$$\Rightarrow x^2 - 600x + 400x - 24000 = 0$$
$$\Rightarrow x(x-600) + 400(x-600) = 0$$
$$\Rightarrow (x-600)(x+400) = 0$$
$$\Rightarrow x = 600, -400$$

Speed cannot be negative
Hence, original speed = 600 kmph and duration of flight
$= \frac{600}{600}$ hr. = 1 hr.

31. (3) Let the speed of the second train be x km per hr. Then the speed of the first train is $x + 5$ km per hr.



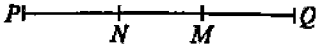
Let O be the position of the railway station from which the two trains leave. Distance travelled by the first train in 2 hours = $OA = 2(x + 5)$ km.
Distance travelled by the 2nd train in 2 hours = $OB = 2x$ km.
By Pythagoras theorem, $AB^2 = OA^2 + OB^2$
$$\Rightarrow 50^2 = [2(x+5)]^2 + [2x]^2$$
$$\Rightarrow 2500 = 4(x+5)^2 + 4x^2$$
$$\Rightarrow 2500 = 4(x^2 + 10x + 25) + 4x^2$$
$$\Rightarrow 8x^2 + 40x - 2400 = 0$$
$$\Rightarrow x^2 + 5x - 300 = 0$$
$$\Rightarrow x^2 + 20x - 15x - 300 = 0$$
$$\Rightarrow x(x+20) - 15(x+20) = 0$$
$$\Rightarrow (x-15)(x+20) = 0$$
$$\Rightarrow x = 15, -20$$

But x cannot be negative
$\therefore x = 15$
∴ The speed of the second train is 15 km per hr. and the speed of the first train is 20 km per hr.

32. (4) The distance covered by man in 4 minutes
$= \frac{6 \times 1000 \times 4}{60} = 400$ metres
The distance covered by carriage in 4 minutes
= 200 + 400 = 600 metres
∴ Speed of carriage
$= \frac{600}{4} \times \frac{60}{1000}$ km per hr.
= 9 km per hr.

33. (1) If the car were not moving, the person would have heard the two sounds at an interval of 12 minutes. Therefore, the distance travelled by car in 11 minutes 40 seconds is equal to the distance that could have been covered by sound in 12 min − 11 min. 40 seconds = 20 seconds.
Distance covered by sound in 20 seconds
= 330 × 20 = 6600 m
In 11 min 40 seconds or 700 seconds the car travels 6600 m.
In 1 second the car will travel
$\frac{6600}{700}$ metre $= \frac{66}{7}$ metre
$\therefore$ Speed of the car $= \frac{66}{7}$ metre per second
$= \frac{66}{7} \times \frac{18}{5}$ km per hr.
$= \frac{1188}{35}$ km per hr.
$= 33\frac{33}{35}$ km per hr. ≈ 34 kmph

34. (2)



When A and B cross each other at M for the first time, they have together covered the whole distance PQ = 180 km.
When they meet again at N, they have together covered total distance equal to 3 times of PQ = 3 × 180 = 540 km.

$$PM = \frac{5}{5+4} \times 180 = 100 \text{ km}$$

[Distance covered by each will be in the ratio of their speeds]

$$QP + PN = \frac{4}{5+4} \times 540$$

= 240 km
or PN = 240 − QP = 240 − 180
= 60 km.
Then, $MN = PM - PN$
= 100 − 60 = 40 km.

35. (2) Distance covered by man in 3 minutes
$= \left(\frac{4 \times 1000}{60}\right) \frac{\text{m}}{\text{minutes}} \times 3 \text{ minutes}$
=200 metres
Total distance covered by the car in 3 min.
= (200 + 130) m = 330 metres
∴ Speed of the car
$= \frac{330}{3}$ m per min.

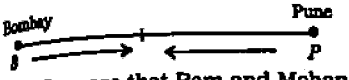
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= 110 m per minutes

$$= \frac{\frac{110}{1000}}{\frac{1}{60}} = \frac{33}{5} \text{ km per hr.}$$

or 6.6 kmph

36. (3)



Suppose that Ram and Mohan meet at A. Let Ram's speed be x km per hr. and Mohan's speed be y km per hr. Then $AP = \frac{25}{4}x$ km and $AB = 4y$ km.

Now, time taken by Ram in going from B to $A = \frac{4y}{x}$

and the time taken by Mohan in going from P to $A = \frac{25x}{4y}$.

Obviously time taken is equal

$$\therefore \frac{4y}{x} = \frac{25x}{4y}$$

$$\Rightarrow 16y^2 = 25x^2$$

$$\Rightarrow \frac{y^2}{x^2} = \frac{25}{16}$$

$$\Rightarrow \frac{y}{x} = \frac{5}{4}$$

$$\Rightarrow y = \frac{5}{4}x$$

Here, $x = 20$ km per hr.

$\therefore$ y = Mohan's speed

$$= \frac{5}{4} \times 20 = 25 \text{ km per hr.}$$

37. (4) Let the original speed be x and distance be y

Case I.

Time taken by train to travel

30 km = $\frac{30}{x}$

Time taken by train after accident

$= \frac{y-30}{4/5x}$

Total time taken = $\frac{30}{x} + \frac{y-30}{4/5x}$

Case II :

Time taken by train to travel

48 km = $\frac{48}{x}$

Time taken by train after accident = $\frac{y-48}{4/5x}$

Total time taken = $\frac{48}{x} + \frac{y-48}{4/5x}$

According to question,

$$\left(\frac{30}{x} + \frac{y-30}{4/5x}\right) - \left(\frac{48}{x} + \frac{y-48}{4/5x}\right)$$

$= \frac{9}{60}$ [$\because$ Difference between time is 9 minutes]

$$\left(\frac{y-30}{4/5x} - \frac{y-48}{4/5x}\right) + \left(\frac{30}{x} - \frac{48}{x}\right)$$

$$= \frac{9}{60}$$

$$\frac{y-y-30+48}{4/5x} + \frac{(-18)}{x} = \frac{9}{60}$$

$$\frac{5(18)}{4x} - \frac{18}{4x} = \frac{9}{60}$$

$$\Rightarrow \frac{90-72}{4x} = \frac{9}{60}$$

$$x = \frac{18 \times 60}{4 \times 9} = 30$$

Hence, original speed = 30 kmph

Also,

$$\frac{30}{x} + \frac{y-30}{4/5x} = \frac{y}{x} + \frac{45}{60}$$

[Original time + 45 minute = New time]

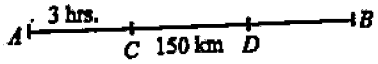
$\Rightarrow 3x - y = -30$

$\Rightarrow 3(30) - y = -30$

$\Rightarrow y = 120$ km

i.e. Distance = 120 km

38. (2) Let A be the starting point, B the terminus. C and D are points where accidents take place.



$$\therefore 0.75 = \frac{3}{4}$$

By travelling at $\frac{3}{4}$ of its original speed, the train would take $\frac{4}{3}$ of its usual time i.e., $\frac{1}{3}$ more of the usual time.

$\therefore$ $\frac{1}{3}$ of the usual time taken to travel the distance CB.

$= 4 - 1 = 3$ hrs. ...(i)

and $\frac{1}{3}$ of the usual time taken to travel the distance

$DB = 3\frac{1}{2} - 1 = 2\frac{1}{2}$ hrs. ...(ii)

Subtracting equation (ii) from (i) we can write,

$\frac{1}{3}$ of the usual time taken to travel the distance

$CD = 3 - 2\frac{1}{2} = \frac{1}{2}$ hr.

$\therefore$ Usual time taken to travel

$$CD\,(150 \text{ km}) = \frac{\frac{1}{2}}{\frac{1}{3}} = \frac{3}{2} \text{ hr.}$$

Usual speed of the train

$$= \frac{150}{\frac{3}{2}} = 100 \text{ km per hr.}$$

Usual time taken to travel CB

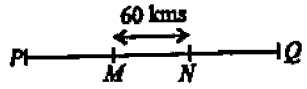
$$= \frac{3}{\frac{1}{3}} = 9 \text{ hrs.}$$

Total time = 3 + 9 = 12 hrs.

$\therefore$ Length of the trip = 12 × 100 = 1200 km.

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39. (3)



Let P be the starting point, Q the terminus, M and N the places where accidents occur.

At $\frac{3}{4}$th of the original speed, the train will take $\frac{4}{3}$ of its usual time to cover the same distance i.e., $\frac{1}{3}$rd more than the usual time.

$\frac{1}{3}$rd of the usual time to travel a distance of 60 kms between MN = 15 min.

$\therefore$ Usual time to travel 60 kms

$= 15 \times 3 = 45$ min. $= \frac{3}{4}$ hr.

$\therefore$ Usual speed of the train per hour $= 60 \times \frac{4}{3} = 80$ km per hr.

Usual time taken to travel $MQ = 90 \times 3$

$= 270$ min. or $\frac{9}{2}$ hrs.

$\therefore$ The distance MQ

$= 80 \times \frac{9}{2} = 360$ km.

Therefore, the total distance $PQ = PM + MQ$

$= 100 + 360 = 460$ kms.

40. (4) Let they meet x hrs after 7 am.

Distance covered by A in x hours $= 20x$ km

Distance covered by B in $(x-1)$ hr. $= 25\,(x-1)$ km

$\therefore 20x + 25\,(x-1) = 110$

$\Rightarrow 20x + 25x - 25 = 110$

$\Rightarrow 45x = 110 + 25 = 135$

$\Rightarrow x = 3$

$\therefore$ Trains meet at 10 a.m.

41. (1) Writing ratio $= 200 : 150 = 4 : 3$

In a given time first boy will be writing the line number

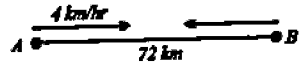
$\frac{4}{7} \times 817$

$= \frac{3268}{7}$ th line $= 466\frac{6}{7}$ th line

or, 467 th line

Hence, both of them shall meet on 467th line.

42. (2) Let the two men meet after t hours.



Distance covered by the first man starting from $A = 4t$ km.

Distance covered by the second man starting from B

$= 2 + 2.5 + 3 + \ldots + \left[2 + \left(\frac{t-1}{2}\right)\right]$

This is an arithmetic series of t terms with $\frac{1}{2}$ as common difference.

$\therefore$ By applying formula

$$S = \frac{n}{2}\left[2a + (n-1)d\right]$$

Where, n = no. of terms

a = first term

d = common difference

We have its sum

$= \frac{t}{2}\left[(2 \times 2) + (t-1) \times \frac{1}{2}\right]$

$= 2t + \frac{t^2 - t}{4}$

Total distance covered by two men $= 4t + 2t + \frac{t^2 - t}{4} = 72$

or $6t + \frac{t^2 - t}{4} = 72$

or $24t + t^2 - t = 288$

or $t^2 + 23t - 288 = 0$

or $t^2 - 9t + 32t - 288 = 0$

or $t\,(t-9) + 32\,(t-9) = 0$

or $(t-9)\,(t+32) = 0$

$\therefore$ Either $t - 9 = 0 \Rightarrow t = 9$

or, $(t + 32) = 0 \Rightarrow t = -32$

Time cannot be negative. Hence, the two men will meet after 9 hrs.

43. (3) Let the length of the train be x metres

Then, the time taken by the train to cover $(x + 50)$ metres is $4\frac{1}{2}$ seconds

$\therefore$ Speed of the train

$= \frac{x+50}{\frac{9}{2}}$ m/s

or $\frac{2x+100}{9}$ m per second ...(i)

Again, the time taken by the train to cover x metres in 2 seconds.

$\therefore$ Speed of the train $= \frac{x}{2}$ metre per second ...(ii)

From equations (i) and (ii), we have

$\frac{2x+100}{9} = \frac{x}{2}$

$\Rightarrow 4x + 200 = 9x$

$\Rightarrow 5x = 200$

$\Rightarrow x = 40$

$\therefore$ Length of the train $= 40$ metres

$\therefore$ Speed of the train

$= \frac{x}{2} = \frac{40}{2} = 20$ m per sec.

44. (4) Both trains meet after 6 hours.

$\therefore$ The relative speed of two trains $= \frac{162}{6} = 27$ km per hr.

The speed of the slower train starting from B

$= \frac{27-8}{2} = \frac{19}{2} = 9\frac{1}{2}$ km per hr.

$\therefore$ The speed of the faster train

$= 9\frac{1}{2} + 8 = 17\frac{1}{2}$ km per hr.

45. (1) Let the length of train be x metres and the length of platform be y metres.

Speed of the train

$= \left(25 \times \frac{5}{18}\right)$ m/sec

$= \frac{125}{18}$ m per sec.

Time taken by train to pass the platform

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$= \left[(x+y) \times \frac{18}{125}\right]$ sec.

$\therefore (x+y) \times \frac{18}{125} = 18$

or, $x + y = 125$ ...(i)

Speed of train relative to man = (25 + 5) km per hr.

$= \left(30 \times \frac{5}{18}\right)$ m per sec.

$= \frac{25}{3}$ m per sec.

Time taken by the train to pass the man

$= \left(x \times \frac{3}{25}\right)$ sec. $= \frac{3x}{25}$ sec.

$\therefore \frac{3x}{25} = 12$

$\Rightarrow x = \left(\frac{25 \times 12}{3}\right) = 100$ metres

Putting $x = 100$ in equation (i), we get, $y = 25$ metres.

$\therefore$ Length of train = 100 metres and length of the platform = 25 metres.

46. (2) Let the speed of the train be x metre per sec. and y metre per sec. respectively.

Sum of the length of the trains = 200 + 175 = 375 metres

Case : I

When the trains are moving in opposite directions

Relative speed = $(x + y)$ m per sec.

In this case the time taken by the trains to cross each other

$= \frac{375}{x+y}$ sec.

$\therefore \frac{375}{x+y} = \frac{15}{2}$

$\Rightarrow x + y = 50$ ...(i)

Case : II

When the trains are moving in the same direction.

Relative speed = $(x - y)$ m per sec.

In this case, the time taken by the trains to cross each other

$= \frac{375}{x-y}$ sec.

$\therefore \frac{375}{x-y} = \frac{75}{2}$

$\Rightarrow x - y = 10$ ...(ii)

Now, $x + y = 50$

$x - y = 10$

$2x = 60$

$\Rightarrow x = 30$

Putting this value in equation (i), we have

$y = 50 - 30 = 20$

$\therefore$ Speed of trains = 30 m per sec.

$= 30 \times \frac{18}{5} = 108$ km per hr.

and 20 m per sec. $= 20 \times \frac{18}{5}$

= 72 km per hr.

47. (3) Trains are running in opposite direction.

$\therefore$ Relative speed of the two trains = 90 + 60 = 150 km per hr.

Distance travelled in $4\frac{1}{2}$ seconds with speed of 150 km per hr. $= 150 \times \frac{5}{18}$ m per sec.

$= 150 \times \frac{5}{18} \times \frac{9}{2} = \frac{375}{2}$ metres

Let the length of the first train be x metres.

Then the length of the second train be $\frac{x}{2}$ metres

$\therefore x + \frac{x}{2} = \frac{375}{2}$

$\Rightarrow \frac{3x}{2} = \frac{375}{2}$

$\Rightarrow 3x = 375$

$\Rightarrow x = 125$ metres

Hence, the length of the first train = 125 metres

Speed of the first train = 60 km per hr.

$= 60 \times \frac{5}{18} = \frac{50}{3}$ m per sec.

Time taken by the first train to cross the tunnel = 4 minutes and $37\frac{1}{2}$ sec.

$= 240 + \frac{75}{2}$ sec. $= \frac{480+75}{2}$

$= \frac{555}{2}$ sec.

Speed of first train

$= \frac{50}{3}$ m per sec.

$\therefore$ Distance covered by it in $\frac{555}{2}$ sec.

$= \frac{50}{3} \times \frac{555}{2} = 4625$ metres

Hence, length of tunnel = 4625 − 125 = 4500 metres = 4.5 km

48. (4) Let the length of the train be x km and its speed y km per hr.

Case I : When it passes the man walking at 2 km per hr. in the same direction

Relative speed of train = $(y - 2)$ km per hr.

$\therefore \frac{x}{y-2}$ = 9 seconds

$= \frac{9}{3600} = \frac{1}{400}$ hour ...(i)

Case II : When the train crosses the man walking at 4 km per hr. in the same direction.

Relative speed of train = $(y - 4)$ km per hr.

$\therefore \frac{x}{y-4} = 10$ sec.

$\Rightarrow \frac{x}{y-4} = \frac{10}{3600}$ hrs.

$\Rightarrow \frac{x}{y-4} = \frac{1}{360}$ hrs. ...(ii)

On dividing equation (i) by (ii), we have

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$$\frac{y-4}{y-2}=\frac{\frac{1}{400}}{\frac{1}{360}}=\frac{360}{400}=\frac{9}{10}$$

$\Rightarrow 10y-40=9y-18$

$\Rightarrow 10y-9y=40-18$

$\Rightarrow y=22$ km per hr.

$\therefore$ From equaton (i), we have

$$\frac{x}{22-2}=\frac{1}{400}$$

$$\Rightarrow x=\frac{1}{20}\text{ km}$$

$$=\frac{1000}{20}=50\text{ metres.}$$

49. (1) Let the length of the train be x metres

Then, in 18 sec. the train travels $(x+162)$ metres ...(i)

and in 15 sec. the train travels $(x+120)$ metres

$\therefore$ In $(18-15)=3$ sec. the train travels $(x+162)-(x+120)=42$m.

$\therefore$ In 1 sec the train travels $=\frac{42}{3}=14$ metres ...(ii)

$\therefore$ In 18 sec. the train travels $=14\times 18=252$ metres ...(iii)

From equations (i) and (iii)

$\therefore x+162=252$

$\Rightarrow x=252-162=90$

$\therefore$ Length of the train = 90 metres

Also, from equation (ii) we see that in 1hr. the train travels $=14\times 60\times 60$ metres

$$=\frac{14\times 60\times 60}{1000}\text{ km}=50.4\text{ km}$$

$\therefore$ The speed of the train = 50.4 km per hr.

50. (2) Let the length of trains be x m and $(x+50)$m and the speed of other train be y m per sec.

The speed of the first train = 90 km per hr.

$$=90\times\frac{5}{18}=25\text{ m per sec.}$$

Case I: Opposite direction,

Their relative speed $=(y+25)$m per sec.

Distance covered $=x+x+50=2x+50$ metres

$$\therefore\text{ Time taken}=\frac{2x+50}{y+25}=10$$

$\Rightarrow 2x+50=10y+250$ ...(i)

Case II. Direction is Same

Their relative speed $=(25-y)$ m per sec.

Distance covered $=x+x+50=2x+50$m

$$\therefore\text{ Time taken}=\frac{2x+50}{25-y}=90$$

$\Rightarrow 2x+50=90(25-y)$ ...(ii)

From equations (i) and (ii)

$10y+250=2250-90y$

$\Rightarrow 10y+90y=2250-250$

$$\Rightarrow y=\frac{2000}{100}=20$$

Putting $y=20$ in equation (i), we have

$2x+50=10\times 20+250=450$

$\Rightarrow 2x=450-50=400$

$$\Rightarrow x=\frac{400}{2}=200$$

$\therefore x+50=200+50$

$=250$ metres.

Hence,

The length of the 1st train = 200 metres.

The length of the 2nd train = 250 metres.

The speed of the 2nd train = 20 m per sec.

51. (1) Let the length of the train be x m and its speed y m/sec.

Distance covered in crossing the platform $=170+x$ metres

and time taken = 21 seconds

$$\therefore\text{ Speed } y=\frac{170+x}{21}\quad\text{...(i)}$$

Distance covered to cross the man = x metres

and time taken $=7\frac{1}{2}=\frac{15}{2}$ seconds

$$\therefore\text{ Speed } y=\frac{x}{\frac{15}{2}}=\frac{2x}{15}\quad\text{...(ii)}$$

From equations (i) and (ii),

$$\frac{170+x}{21}=\frac{2x}{15}$$

$\Rightarrow 2550+15x=42x$

$\Rightarrow 42x-15x=2550$

$\Rightarrow 27x=2550$

$$\Rightarrow x=\frac{2550}{27}=94\frac{4}{9}\text{ metres}$$

From equation (ii),

$$y=\frac{2\times 2550}{15\times 27}$$

$$=\frac{340}{27}=12\frac{16}{27}\text{ m per sec.}$$

Hence, speed $=12\frac{16}{27}$ m per sec

52. (2) The goods train leaves Delhi at 6 am and mail train at 12 noon, hence after 6 hours

The distance covered by the goods train in 6 hours at 32 km per hr. $=32\times 6=192$ kms

The relative velocity of mail train with respect to goods train = 80 − 32 = 48 km per hr.

To completely cross the goods train, the mail train will have to cover a distance

= 192 km + 158m + 130m

= 192km + 0.158 km + 0.130 km

= 192.288 km more

Since, the mail train goes 48 kms more in 1 hour.

$\therefore$ The mail train goes 192.288 kms more in

$$=\frac{192288}{1000}\times\frac{1}{48}=\frac{2003}{500}$$

= 4 hours 21.6 sec.

53. (3) Let the speed of the motorboat in still water be Z km per hr.

Downstream speed= $(Z+3)$ km per hr.

Upstream speed $=(Z-3)$ km per hr.

Total journey time

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$= 30 \text{ minutes} = \frac{30}{60}\text{hr.} = \frac{1}{2}\text{hour}$

We can write,

$$\frac{2}{Z-3}+\frac{2}{Z+3}=\frac{1}{2}$$

$$\text{or, } 2\left[\frac{(Z+3)+(Z-3)}{(Z-3)(Z-3)}\right]=\frac{1}{2}$$

$$\text{or, } \frac{2Z}{Z^2-9}=\frac{1}{4}$$

$$\text{or, } Z^2-9=8Z$$

$$\text{or, } Z^2-8Z-9=0$$

$$\text{or, } Z^2+Z-9Z-9=0$$

$$\text{or, } Z(Z+1)-9(Z+1)=0$$

$$\text{or, } (Z+1)(Z-9)=0$$

$$\therefore Z=-1 \text{ or } 9.$$

Since speed can't be negative

Therefore, the speed of the motor-boat in still water = 9 km per hr.

54. (4) Let the upstream speed be x km per hr. and downstream speed be y km per hr.

Then, we can write,

$$\frac{32}{x}+\frac{60}{y}=9$$

$$\text{and, } \frac{40}{x}+\frac{84}{y}=12$$

Let $\frac{1}{x}=m$ and $\frac{1}{y}=n$

The above two equations can now be written as

$32m + 60n = 9$ ...(i)

and, $40m + 84n = 12$ ...(ii)

$7 \times (i) - 5 \times (ii)$ gives $24m = 3$

$$\text{or } m=\frac{1}{8} \text{ or } x = 8 \text{ km per hr.}$$

$4 \times (ii) - 5 \times (i)$ gives $36n = 3$

$$\text{or, } n=\frac{1}{12} \text{ or } y = 12 \text{ km per hr.}$$

Rate of current

$$=\frac{y-x}{2}=\frac{12-8}{2}=2 \text{ km. per hr.}$$

55. (1) Let the speed of boat and river be x km per hr. and y km per hr. respectively. Then,

The speed of boatman downstream = $(x + y)$ km per hr.

and the speed of boatman upstream = $(x - y)$ km per hr.

Time taken by boatman in going 21 km downstream

$$=\frac{21}{x+y} \text{ hours}$$

Time taken by boatman in going 21 km upstream $=\frac{21}{x-y}$ hrs.

According to the question,

$$\frac{21}{x+y}+\frac{21}{x-y}=10 \quad ...(i)$$

Now, time taken for 7 kms downstream $=\frac{7}{x+y}$ hrs.

and time taken for 3 kms upstream $=\frac{3}{x-y}$ hrs.

According to the question

$$\frac{7}{x+y}-\frac{3}{x-y}=0 \quad ...(ii)$$

By $(ii) \times 7 + (i)$

$$\frac{49}{x+y}-\frac{21}{x-y}+\frac{21}{x+y}+\frac{21}{x-y}=10$$

$$\Rightarrow \frac{70}{x+y}=10$$

$$\Rightarrow x + y = 7 \quad ...(iii)$$

Putting $x + y = 7$ in equation (ii) we have

$$\frac{7}{7}-\frac{3}{x-y}=0$$

$$\Rightarrow 1-\frac{3}{x-y}=0$$

$$\Rightarrow x - y = 3 \quad ...(iv)$$

On adding (iii) and (iv), we have

$2x = 10$

$\Rightarrow x = 5$

$\therefore y = 7 - x = 7 - 5 = 2$

$\therefore$ Speed of river = 2 km per hr.

56. (2) Let the speed of the cyclist be x km per hr.

Speed of the motorist = $(x + 15)$ km per hr.

Time taken by the motorist to cover half of the distance

$$=\frac{18}{2\times(x+15)}=\frac{9}{x+15} \text{ hrs.}$$

After covering 9 kms, the speed of motorist gets reduced by 20%

$$\therefore \text{ New speed } = (x+15)\times\frac{80}{100}$$

$$=\frac{4(x+15)}{5} \text{ km per hr.}$$

Time taken by the motorist to cover the remaining half distance

$$=\frac{9\times5}{4(x+15)}=\frac{45}{4(x+15)} \text{ hrs.}$$

Total time taken by the motorist

$$=\frac{9}{x+15}+\frac{1}{2}+\frac{45}{4(x+15)} \text{ hrs.}$$

Total time taken by the cyclist

$$=\frac{18}{x} \text{ hrs.}$$

Motorist reaches 15 minutes, i.e. $\frac{1}{4}$ hr. earlier.

$$\therefore \frac{18}{x}-\frac{9}{x+15}-\frac{1}{2}-\frac{45}{4(x+15)}$$

$$=\frac{1}{4}$$

$$\Rightarrow$$

$$\frac{18\times4(x+15)-36x-2x(x+15)-45x}{4x(x+15)}$$

$$=$$

$$\Rightarrow 72x + 1080 - 36x - 2x^2$$

$$30x - 45x = x^2 + 15x$$

$$\Rightarrow 3x^2 + 54x - 1080 = 0$$

$$\Rightarrow x^2 + 18x - 360 = 0$$

$$\Rightarrow x^2 + 30x - 12x - 360 = 0$$

$$\Rightarrow x(x + 30) - 12(x + 30) = 0$$

$$\Rightarrow (x + 30)(x - 12) = 0$$

$$\Rightarrow x = -30, 12$$

The speed cannot be negative

$\therefore$ The speed of the cyclist = 12 km per hr.



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57. (3) Total distance travelled = 3990 km
Distance = Time × Speed
Ratio of time spent = 1 : 16 : 2
Ratio of speed = 20 : 1 : 3
∴ Ratio of time × speed
= 20 × 1 : 16 × 1 : 2 × 3
= 20 : 16 : 6
Sum of the ratios
= 20 + 16 + 6 = 42
∴ Distance covered by sea

$$=\frac{3990}{42}\times 16 = 1520 \text{ kms}$$

58. (4) Relative speed of insect = 30 + 42 = 72 km per hr.
Distance between railway engine and insect = 20 km.
Engine and insect will meet for the first time after $=\frac{20}{72}$ hr.
Distance covered in this period

$$=\frac{20}{72}\times 42 = \frac{35}{3} \text{ km}$$

The insect will cover $\frac{35}{3}$ km in returning to A.
The distance covered by engine in this period

$$=\frac{20}{72}\times 30 = \frac{25}{3} \text{ km}$$

Since, the insect when reaches A, the engine will cover $\frac{25}{3}$ km to A.
∴ Remaining distance between A and engine

$$=20-\left(\frac{25}{3}+\frac{25}{3}\right)$$

$$=20-\frac{50}{3}=\frac{10}{3} \text{ km.}$$

Again, engine and insect will meet after $\frac{10}{3\times 72}=\frac{5}{108}$ hr.
The distance covered by the insect in this period

$$=\frac{5}{108}\times 42 = \frac{35}{18} \text{ km}$$

and again the insect will cover $\frac{35}{18}$ km in returning.
∴ Total distance covered by the insect $=\frac{70}{3}+\frac{70}{18}+.....$

$$\left[\frac{35}{3}+\frac{35}{3}=\frac{70}{3} \text{ and } \frac{35}{18}+\frac{35}{18}=\frac{70}{18} \text{ and so on}\right]$$

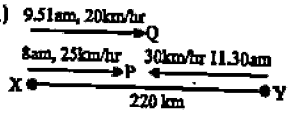
$$=\frac{70}{3}\left[1+\frac{1}{6}+.....\infty\right]$$

It is a Geometric Progression to infinity with common ratio $\frac{1}{6}$.

$$=\frac{70}{3}\left[\frac{1}{1-\frac{1}{6}}\right] \quad \left[\because S_\infty=\frac{a}{1-r}\right]$$

$$=\frac{70}{3}\times\frac{1}{\frac{5}{6}}=\frac{70}{3}\times\frac{6}{5}=28 \text{ km}$$

59. (1)



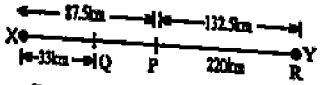
Distance covered by P till 11.30 a.m.
= (11.30 a.m. – 8 a.m.) × 25km

$$=3\frac{1}{2}\times 25 = 87.5 \text{ km.}$$

Distance covered by Q till 11.30 a.m.
= (11.30 – 9.51 am) × 20

$$=1\frac{39}{60} \text{ hrs.} \times 20 = 33 \text{ km}$$

So, at 11.30 a.m. the three trains will be at positions shown below :



P gains 5 km every hour over Q.
Relative speed of P w.r.t. R
= 20 + 30 = 50 km per hr
Let P be at equal distance from Q and R after t hours.
∴ (87.5 – 33) + 5t
= 132.5 –55t
or, 54.5 + 5t = 132.5 – 55t
or, 60 t = 78

$$\text{or, } t=\frac{78}{60} \text{ hrs.}$$

= 1 hr 18 minutes
11.30 am + 1 hr. 18 min.
= 12.48 pm
At 12.48 pm, P would have covered a distance
= (12.48 pm – 8 am) × 25
= 120 km
Therefore, P will be at equal distance from Q and R at 12.48 pm

60. (2) Let the original speed of the person be x km/hr. and the distance be y km.

Case I : $\frac{y}{x}-\frac{y}{x+3}=40$ minutes

$$\text{or } \frac{40}{60} \text{ hr}$$

$$\text{or, } \frac{y}{x}-\frac{y}{x+3}=\frac{40}{60}=\frac{2}{3}$$

$$\text{or, } y\left[\frac{1}{x}-\frac{1}{(x+3)}\right]=\frac{2}{3}$$

$$\text{or, } y\left[\frac{x+3-x}{x(x+3)}\right]=\frac{2}{3}$$

$$\text{or, } \frac{3y}{x(x+3)}=\frac{2}{3}$$

or, $2x(x+3) = 9y$ ...(i)

Case II : $\frac{y}{x-2}-\frac{y}{x}=\frac{40}{60}$

$$\text{or, } y\left(\frac{1}{x-2}-\frac{1}{x}\right)=\frac{2}{3}$$

$$\text{or, } y\left[\frac{x-x+2}{x(x-2)}\right]=\frac{2}{3}$$

$$\text{or, } \frac{2y}{x(x-2)}=\frac{2}{3}$$

or, $x(x-2) = 3y$ ... (ii)
On dividing equation (i) by (ii) we have,

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$\frac{2x(x+3)}{x(x-2)} = \frac{9y}{3y}$

or, $\frac{2(x+3)}{(x-2)} = 3$

or, $2x + 6 = 3x - 6$

or, $3x - 2x = 6 + 6 = 12$

or, $x = 12$ km/hr.

∴ Original speed of the person = 12 km/hr.

Putting the value of x in equation (ii)

$12(12 - 2) = 3y$

or, $3y = 12 \times 10$

or, $y = \frac{12 \times 10}{3} = 40$

∴ The required distance = 40km.

61. (3) Let the speed of steamer in still water = x kmph

∴ Rate downstream = $(x + 2)$ kmph

Rate upstream = $(x - 2)$ kmph

Obviously, distance covered downstream and upstream are equal

$\Rightarrow 4(x + 2) = 5(x - 2)$

$\Rightarrow 4x + 8 = 5x - 10$

$\Rightarrow 5x - 4x = 10 + 8 \Rightarrow x = 18$

∴ Rate downstream = 18 + 2 = 20 kmph

Therefore, the required distance = Speed downstream × Time = 20 × 4 = 80 km.

62. (2) According to the question, when A covers the distance of 200 metres, B covers only 200–20 = 180 metres

Again, in 100 metre race, B beats C by 5 metres.

Hence, if B runs 100 metres, C runs 100–5 = 95 metres

∵ If B runs 100 m, C runs = 95 m

∴ If B runs 180 m, C runs

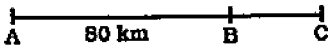
$= \frac{95 \times 180}{100} = 171$ m

∴ A : B : C = 200 : 180 : 171

Hence, A will beat C by = 200–171 = 29 m in 200 m race.

i.e., 29 × 5 = 145 m in 1 km race.

63. (3) **Case I :** When the cars are moving in the same direction.



Let A and B be two places and C be the place of meeting.

Let the speed of car starting from A be x kmph, and that of car starting from B be y kmph.

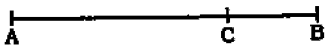
Relative speed = $(x - y)$ kmph

According to the question.

$(x - y) \times 8 = 80$

$\Rightarrow x - y = 10$ ...(i)

Case II : When the cars are moving in the opposite directions and they meet at point C.



Relative speed = $(x + y)$ kmph

Time taken = 1 hour 20 minutes

$= 1 + \frac{1}{3} = \frac{4}{3}$ hours

$\therefore (x + y) \times \frac{4}{3} = 80$

$\Rightarrow x + y = \frac{80 \times 3}{4}$

$\Rightarrow x + y = 60$ ...(ii)

Adding equations (i) and (ii),

$2x = 70$

$\Rightarrow x = 35$

From equation (ii),

$x + y = 60$

$\Rightarrow 35 + y = 60$

$\Rightarrow y = 60 - 35 = 25$

∴ Speed of the faster car = 35 kmph

64. (4) Let B take x seconds to run 1000 m.

∴ Time taken by C = $(x + 15)$ seconds

$\therefore \frac{x}{x+15} = \frac{900}{1000} = \frac{9}{10}$

$\Rightarrow 10x = 9x + 135$

$\Rightarrow x = 135$ seconds

Now in a one kilometre race, A beats B by 15 seconds.

It means A covers 1000 m in 135 – 15 = 120 seconds

∴ Speed of A

$= \frac{1000}{120} = \frac{25}{3}$ m/sec

= 8.3 m/sec.

65. (1) Trains are running in opposite directions.

∴ Relative speed = 72 + 90 = 162 kmph

$= 162 \times \frac{5}{18} = 45$ m/sec

Let the length of the first train be = x metre.

∴ Length of the second train $= \frac{3}{4}x$ meter.

Now,

distance travelled in $3\frac{1}{2}$ seconds at 45 m/sec

$= 45 \times \frac{7}{2} = \frac{315}{2}$ metre

This distance is equal to sum of the lengths of trains.

$\therefore x + \frac{3x}{4} = \frac{315}{2}$

$\Rightarrow \frac{4x + 3x}{4} = \frac{315}{2}$

$\Rightarrow \frac{7x}{4} = \frac{315}{2}$

$\Rightarrow x = \frac{315}{2} \times \frac{4}{7} = 90$

Hence, the length of the first train = 90 metre.

Speed of first train = 72 kmph

$= 72 \times \frac{5}{18} = 20$ m/sec

Time taken by the first train to cross the tunnel = 3 minutes = 180 seconds

∴ Distance covered by it in 180 seconds = 180 × 20 = 3600 metre

∴ Length of (first train + tunnel = 3600 metre

∴ Length of tunnel = 3600 – 90 = 3510 metre

□□□

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15 BOAT AND STREAM

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. A man rows a boat 18 kilometres in 4 hours downstream and returns upstream in 12 hours. The speed of the stream (in km per hour) is :
(1) 1 (2) 1.5
(3) 2 (4) 1.75
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting) & (SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

2. A motorboat in still water travels at a speed of 36 kmph. It goes 56 km upstream in 1 hour 45 minutes. The time taken by it to cover the same distance down the stream will be :
(1) 2 hours 25 minutes
(2) 3 hours
(3) 1 hour 24 minutes
(4) 2 hours 21 minutes
(SSC CPO S.I. Exam. 16.12.2007)

3. A boat running downstream covers a distance of 20km in 2 hrs while it covers the same distance upstream in 5 hrs. Then speed of the boat in still water is
(1) 7 km/hr (2) 8 km/hr
(3) 9 km/hr (4) 10 km/hr
(SSC CPO S.I. Exam. 06.09.2009)

4. A boatman rows 1 km in 5 minutes, along the stream and 6 km in 1 hour against the stream. The speed of the stream is
(1) 3 kmph (2) 6 kmph
(3) 10 kmph (4) 12 kmph
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

5. A boat covers 24 km upstream and 36 km downstream in 6 hours, while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. The speed of the current is
(1) 1 km/hr (2) 2 km/hr
(3) 1.5 km/hr (4) 2.5 km/hr
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

6. The speed of a boat in still water is 10 km/hr. It covers (upstream) a distance of 45 km in 6 hours. The speed (in km/hr) of the stream is
(1) 2.5 (2) 3
(3) 3.5 (4) 4
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

7. A man rows 40 km upstream in 8 hours and a distancec of 36 km downstream in 6 hours. Then speed of stream is
(1) 0.5 km/hr (2) 1.5 km/hr
(3) 1 km/hr (4) 3 km/hr
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

8. A boat travels 24 km upstream in 6 hours and 20 km downstream in 4 hours. Then the speed of boat in still water and the speed of water current are respectively
(1) 4 kmph and 3 kmph
(2) 4.5 kmph and 0.5 kmph
(3) 4 kmph and 2 kmph
(4) 5 kmph and 2 kmph
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

9. If a boat goes 100 km downstream in 10 hours and 75 km upstream in 15 hours, then the speed of the stream is
(1) 2 km/hour (2) 2·5 km/hour
(3) 3 km/hour (4) 3·5 km/hour
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

10. A boat covers 12 km upstream and 18 km downstream in 3 hours, while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. What is the speed of the current ?
(1) 1.5 km/hr (2) 1 km/hr
(3) 2 km/hr (4) 2.5 km/hr
(SSC Graduate Level Tier-II Exam.16.09.2012)

11. A boy can swim in still water at a speed of 10 km/hr. If the speed of the current would have been 5 kmph, then the boy could swim 60km
(1) upstream in 4 hour
(2) downstream in 12 hours
(3) upstream in 6 hours
(4) downstream in 4 hours
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

12. A man can swim at the rate of 4 km/hr in still water. If the speed of the water is 2 km/hr, then the time taken by him to swim 10 km upstream is
(1) $2\frac{1}{2}$ hrs (2) $3\frac{1}{2}$ hrs
(3) 5 hrs (4) 4 hrs
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

13. Speed of a boat along and against the current are 12 km/hr and 8 km/hr respectively. Then the speed of the current in km/hr is
(1) 5 (2) 4
(3) 3 (4) 2
(SSC Multi-Tasking Staff Exam. 17.03.2013 (Kolkata Region)

14. A man can swim 3 km/hr. in still water. If the velocity of the stream is 2 km/hr., the time taken by him to swim to a place 10 km upstream and back is :
(1) $9\frac{1}{3}$ hr. (2) 10 hr.
(3) 12 hr. (4) $8\frac{1}{3}$ hr
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

15. A swimmer swims from a point A against a current for 5 minutes and then swims backwards in favour of the current for next 5 minutes and comes to the point B. If AB is 100 metres, the speed of the current (in km per hour) is :
(1) 0.4 (2) 0.2
(3) 1 (4) 0.6
(SSC Graduate Level Tier-I Exam. 21.04.2013)

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16. A person can row a distance of one km upstream in ten minutes and downstream in four minutes. What is the speed of the stream ?
(1) 4.5 km/h (2) 4 km/h
(3) 9 km/h (4) 5.6 km/h
(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)

17. A boat goes 20 km downstream in one hour and the same distance upstream in two hours. The speed of the boat in still water is
(1) 15 km/hr. (2) 10 km/hr.
(3) 5 km/hr. (4) 7.5 km/hr.
(SSC CPO S.I. Exam. 13.01.2003

18. A man rows 750 m in 675 seconds against the stream and returns in $7\frac{1}{2}$ minutes. Find his rowing speed in still water.
(1) 3 kmph (2) 4 kmph
(3) 5 kmph (4) 6 kmph
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

19. A boat goes 40 km upstream in 8 hours and 36 km downstream in 6 hours. The speed of the boat in still water is :
(1) 6.5 km/hour (2) 5.5 km/hour
(3) 6 km/hour (4) 5 km/hour
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

20. A boat goes 12 km downstream and comes back to the starting point in 3 hours. If the speed of the current is 3 km/hr, then the speed (in km/hr) of the boat in still water is
(1) 12 (2) 9
(3) 8 (4) 6
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

21. The speed of the current is 5 km/hour. A motorboat goes 10 km upstream and back again to the starting point in 50 minutes. The speed (in km/hour) of the motorboat in still water is
(1) 20 (2) 26
(3) 25 (4) 28
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

22. A man can row 15km/ hr downstream and 9 km/hr upstream. The speed of the boat in still water is
(1) 8 km/hr. (2) 10 km/hr.
(3) 15 km/hr. (4) 12 km/ hr.
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

23. A sailor goes 12 km downstream in 48 minutes and returns in 1 hour 20 minutes. The speed of the sailor in still water is :
(1) 12 km/hr (2) 12.5 km/ hr
(3) 13 km/hr (4) 15 km/hr
(SSC CHSL DEO & LDC Exam. 27.11.2010)

24. The current of a stream runs at the rate of 4 km an hour. A boat goes 6 km and comes back to the starting point in 2 hours. The speed of the boat in still water is
(1) 6 km/hour (2) 8 km/hour
(3) 7.5 km/hour
(4) 6·8 km/hour
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

25. A man swims downstream a distance of 15 km in 1 hour. If the speed of the current is 5 km/hour, the time taken by the man to swim the same distance upstream is
(1) 1 hour 30 minutes
(2) 45 minutes
(3) 2 hours 30 minutes
(4) 3 hours
(SSC CHSL DEO & LDC Exam. 11.12.2011 (1st Sitting (East Zone)

26. The speed of a stream is 3 km/hr. and the speed of a man in still water is 5 km/hr. The time taken by the man to swim 26 km downstream is :
(1) $8\frac{2}{3}$ hrs. (2) $3\frac{1}{4}$ hrs.
(3) 13 hrs. (4) $5\frac{1}{5}$ hrs.
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

27. A man rows down a river 15 km in 3 hrs. with the stream and returns in $7\frac{1}{2}$ hrs, The rate at which he rows in still water is
(1) 2.5 km/hr (2) 1.5 km/hr
(3) 3.5 km/hr (4) 4.5 km/hr
(SSC Graduate Level Tier-I Exam. 21.04.2013)

28. A boat takes half time in moving a certain distance downstream than upstream. The ratio of the speed of the boat in still water and that of the current is
(1) 2 : 1 (2) 1 : 2
(3) 4 : 3 (4) 3 : 1
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

29. A man rows upstream 36 km and downstream 48 km taking 6 hours each time. The speed of the current is
(1) 0.5 kmph (2) 2 kmph
(3) 1 kmph (4) 1.5 kmph
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

30. A man rows 750 m in 600 seconds against the stream and returns in $7\frac{1}{2}$ minutes. Its rowing speed in still water is (in km/hr).
(1) 5.5 (2) 5.75
(3) 5 (4) 5.25
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

31. A boat moves downstream at the rate of 1 km in $7\frac{1}{2}$ minutes and upstream at the rate of 5 km an hour. What is the speed of the boat in the still water?
(1) $3\frac{1}{2}$ km/hour
(2) $6\frac{1}{2}$ km/hour
(3) 4 km/hour
(4) 8 km/hour
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–II

1. A boat goes 6 km an hour in still water, but takes thrice as much time in going the same distance against the current. The speed of the current (in km/hour) is :
(1) 4 (2) 5
(3) 3 (4) 2
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

2. In a fixed time, a boy swims double the distance along the current that he swims against the current. If the speed of the current is 3 km/hr, the speed of the boy in still water is
(1) 6 km/hr (2) 9 km/hr
(3) 10 km/hr (4) 12 km/hr
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

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3. A man can row 30 km downstream and return in a total of 8 hours. If the speed of the boat in still water is four times the speed of the current, then the speed of the current is
(1) 1 km/hour (2) 2 km/hour
(3) 4 km/hour (4) 3 km/hour
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

4. A person can row $7\frac{1}{2}$ km an hour in still water and he finds that it takes him twice as long to row up as to row down the river. The speed of the stream is :
(1) 2 km/hr (2) 3 km/hr
(3) $2\frac{1}{2}$ km/hr (4) $3\frac{1}{2}$ km/hr
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

5. A man can row at a speed of $4\frac{1}{2}$ km/hr in still water. If he takes 2 times as long to row a distance upstream as to row the same distance downstream, then, the speed of stream (in km/hr) is
(1) 1 (2) 1.5
(3) 2 (4) 2.5
(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) and SSC CGL Prelim Exam. 27.07.2008)

6. A boat can travel with a speed of 13 km/hr in still water. If the speed of stream is 4 km/hr in the same direction, time taken by boat to go 63 km in opposite direction is
(1) 9 hrs (2) 4 hrs
(3) 7 hrs (4) $3\frac{9}{17}$ hrs
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239375)

7. The speed of a boat in still water is 6 kmph and the speed of the stream is 1.5 kmph. A man rows to a place at a distance of 22.5 km and comes back to the starting point. The total time taken by him is :
(1) 10 hours
(2) 4 hours 10 minutes
(3) 6 hours 10 minutes
(4) 8 hours
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

8. A motor boat covers a certain distance downstream in a river in 3 hours. It covers the same distance upstream in 3 hours and a half. If the speed of water is 1.5 km/h, then the speed of the boat in still water is :
(1) 17 km/h (2) 19.5 km/h
(3) 17.5 km/h (4) 19 km/h
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1975232)

TYPE–III

1. A man can row at 5 kmph. in still water. If the velocity of current is 1 kmph. and it takes him 1 hour to row to a place and come back, how far is the place ?
(1) 2.5 km (2) 3 km
(3) 2.4 km (4) 3.6 km
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

2. The speed of a motor-boat is that of the current of water as 36 : 5. The boat goes along with the current in 5 hours 10 minutes. It will come back in
(1) 5 hours 50 minutes
(2) 6 hours
(3) 6 hours 50 minutes
(4) 12 hours 10 minutes
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. A man goes downstream with a boat to some destination and returns upstream to his original place in 5 hours. If the speed of the boat in still water and the stream are 10 km/hr and 4 km/hr respectively, the distance of the destination from the starting place is
(1) 16 km (2) 18 km
(3) 21 km (4) 25 km
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

4. Two boats A and B start towards each other from two places, 108 km apart. Speed of the boat A and B in still water are 12km/hr and 15km/hr respectively. If A proceeds down and B up the stream, they will meet after.
(1) 4.5 hours (2) 4 hours
(3) 5.4 hours (4) 6 hours
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. A man can row 6 km/h in still water. If the speed of the current is 2 km/h, it takes 3 hours more in upstream than in the downstream for the same distance. The distance is
(1) 30 km (2) 24 km
(3) 20 km (4) 32 km
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

6. Speed of motorboat in still water is 45kmph. If the motorboat travels 80 km along the stream in 1 hour 20 minutes, then the time taken by it to cover the same distance against the stream will be
(1) 3 hours
(2) 1 hour 20 minutes
(3) 2 hours 40 minutes
(4) 2 hours 55 minutes
(SSC CPO S.I. Exam. 09.11.2008)

7. Speed of a boat is 5 km per hour in still water and the speed of the stream is 3 km per hour. If the boat takes 3 hours to go to a place and come back, the distance of the place is :
(1) 3.75 km (2) 4 km
(3) 4.8 km (4) 4.25 km
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

8. The speed of a boat along the stream is 12 km/h and against the stream is 8 km/h. The time taken by the boat to sail 24 km in still water is
(1) 2 hours (2) 3 hours
(3) 2.4 hours (4) 1.2 hours
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (2)	2. (3)	3. (1)	4. (1)
5. (2)	6. (1)	7. (1)	8. (2)
9. (2)	10. (3)	11. (4)	12. (3)
13. (4)	14. (3)	15. (4)	16. (1)
17. (1)	18. (3)	19. (2)	20. (2)
21. (3)	22. (4)	23. (1)	24. (2)
25. (4)	26. (2)	27. (3)	28. (4)
29. (3)	30. (4)	31. (2)	

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TYPE-II

1. (1)	2. (2)	3. (2)	4. (3)
5. (2)	6. (3)	7. (4)	8. (2)

TYPE-III

1. (3)	2. (3)	3. (3)	4. (2)
5. (2)	6. (3)	7. (3)	8. (3)

EXPLANATIONS

TYPE-I

1. (2) Tricky Approach

Rate downstream

$= \frac{18}{4} = \frac{9}{2}$ kmph

Rate upstream $= \frac{18}{12} = \frac{3}{2}$ kmph.

Now, speed of the stream

$= \frac{\text{Rate downstream} - \text{Rate upstream}}{2}$

$= \frac{\frac{9}{2} - \frac{3}{2}}{2} = \frac{6}{4} = \frac{3}{2} = 1.5$ kmph.

2. (3) Speed of the motorboat upstream

$= \frac{56\text{ km}}{1\frac{3}{4}\text{ hours}} = \frac{56 \times 4}{7} = 32$ kmph

Let the speed of the current be x kmph

$\therefore\ 36 - x = 32$

$\Rightarrow x = 36 - 32 = 4$ kmph

Speed of motor boat downstream $= 36 + 4 = 40$ kmph

$\therefore$ Time taken to cover 56 km at 40 kmph $= \frac{56}{40} = \frac{7}{5}$ hours

or 1 hour 24 minutes

3. (1) Let the speed of boat in still water be x kmph and that of stream be y kmph.

$\therefore\ \frac{20}{x+y} = 2$

$\Rightarrow x + y = 10$ ...(i)

$\frac{20}{x-y} = 5$

$\Rightarrow x - y = 4$ ...(ii)

On adding, $2x = 14$ kmph

$= 7$ kmph

4. (1) Tricky Approach

Speed of current

$= \frac{1}{2}$ [Rate downstream − Rate upstream] $= \frac{1}{2}(12 - 6)$ kmph

$= 3$ kmph [Rate downstream $= \frac{1}{5} \times 60 = 12$ kmph]

5. (2) Let speed of boat in still water $= x$ kmph

and speed of current $= y$ kmph

$\therefore\ \frac{24}{x-y} + \frac{36}{x+y} = 6$ .....(i)

and, $\frac{24}{x+y} + \frac{36}{x-y} = \frac{13}{2}$ .....(ii)

By equation (i) × 2 − equation (ii) × 3, we have

$\frac{48}{x-y} - \frac{108}{x-y} = 12 - \frac{39}{2}$

$\Rightarrow \frac{60}{x-y} = \frac{15}{2}$

$\Rightarrow x - y = 8$ ..... (iii)

By equation (i) × 3 − equation (ii) × 2, we have

$\frac{108}{x+y} - \frac{48}{x+y} = 18 - 13$

$\Rightarrow \frac{60}{x+y} = 5$

$\Rightarrow x + y = 12$ ..... (iv)

From equation (iv) − (iii), we have

$x + y - x + y = 12 - 8$

$\Rightarrow 2y = 4 \Rightarrow y = 2$ kmph

6. (1) Upstream speed of boat

$= \frac{\text{Distance}}{\text{Time}} = \frac{45}{6} = \frac{15}{2}$

$= 7.5$ kmph

$\therefore$ Speed of current $= 10 - 7.5$

$= 2.5$ kmph

7. (1) Speed of stream

$= \frac{1}{2}\left(\frac{36}{6} - \frac{40}{8}\right)$

$= \frac{1}{2} = 0.5$ kmph

8. (2) Rate upstream $= 4$ kmph

Rate downstream $= 5$ kmph

$\therefore$ Speed of boat in still water

$= \frac{1}{2}(4 + 5)$

$= 4.5$ kmph

Speed of current $= \frac{1}{2}(5 - 4)$

$= 0.5$ kmph

9. (2) Rate downstream $= 10$ kmph

Rate upstream $= 5$ kmph

$\therefore$ Speed of current

$= \frac{1}{2}(10 - 5)$ kmph

$= 2.5$ kmph

10. (3) Let the speed of boat in still water be x kmph and that of current be y kmph, then

$\frac{12}{x-y} + \frac{18}{x+y} = 3$ ....(i)

$\frac{36}{x-y} + \frac{24}{x+y} = \frac{13}{2}$ .....(ii)

By equation (i) × 3 − equation (ii),

$\frac{54}{x+y} - \frac{24}{x+y} = 9 - \frac{13}{2}$

$\Rightarrow \frac{30}{x+y} = \frac{5}{2} \Rightarrow x + y = 12$... (iii)

From equation (i),

$\frac{12}{x-y} + \frac{18}{12} = 3$

$\Rightarrow \frac{12}{x-y} = 3 - \frac{3}{2} = \frac{3}{2}$

$\Rightarrow x - y = \frac{12 \times 2}{3} = 8$ ..... (iii)

$\therefore$ Speed of current $= \frac{1}{2}(12 - 8)$

$= 2$ kmph

11. (4) Rate downstream

$= 10 + 5 = 15$ kmph

Rate upstream $= 10 - 5 = 5$ kmph

Time taken in swimming 60km downstream

$= \frac{60}{15} = 4$ hours

Time taken in swimming 60km upstream

$= \frac{60}{5} = 12$ hours

From, given options, boy can swim 60km downstream in 4 hrs.

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12. (3) Rate upstream
$= 4 - 2 = 2$ kmph

$\therefore$ Required time $= \frac{10}{2} = 5$ hours

13. (4) Speed of current

$= \frac{1}{2}$ (Rate downstream − rate upstream)

$= \frac{1}{2}(12 - 8) = 2$ kmph

14. (3) Rate downstream = 5 kmph
Rate upstream = 1 kmph
$\therefore$ Required time

$= \frac{10}{5} + \frac{10}{1} = 12$ hours

15. (4)

B ——— A ——— C

The distance covered upstream
= AC = d
AB = 100
BC = 100 + d
Rate upstream
= (x − y) m/minute
Rate downstream
= (x + y) m/minute

$\therefore \frac{d}{x-y} = 5$

$\Rightarrow d = 5(x - y)$ ....(i)
Again,

$\frac{100+d}{x+y} = 5$

$\Rightarrow \frac{100+5(x-y)}{x+y} = 5$ (By (i))

$\Rightarrow 100 + 5x - 5y = 5x + 5y$
$\Rightarrow 10y = 100$
$\Rightarrow y = 10$ m/minute

$= \frac{10}{1000} \times 60$ kmph
= 0.6kmph

8. (1) Speed in still water = x km/h
Speed of current = y km/h

$\therefore x + y = \frac{\frac{1}{4}}{60} = 15$

$x - y = \frac{\frac{1}{10}}{60} = 6$

$\therefore$ Speed of current

$= \frac{1}{2}[(x+y) - (x-y)]$

$= \frac{1}{2}(15 - 6) = \frac{9}{2} = 4.5$ km/h

17. (1) Let the speed of boat in still water be x kmph and the rate of stream be y kmph.
$\therefore$ Downstream rate
= (x + y) kmph and upstream rate
= (x − y) kmph.

Now, $\frac{20}{x+y} = 1$

$\Rightarrow x + y = 20$ ..(i)

and $\frac{20}{x-y} = 2$

$\Rightarrow x - y = 10$ ...(ii)
From (i) and (ii) we have
x = 15 kmph.

18. (3) Let the speed of man in still water be x kmph and rate of stream be y kmph

$\therefore$ Distance $= \frac{750}{1000}$ km $= \frac{3}{4}$ km.
Time = 675 seconds

$= \frac{675}{60} = 11\frac{1}{4}$ minutes

$\therefore x - y = \frac{\frac{3}{4}}{\frac{45}{4}} = \frac{3}{45} = \frac{1}{15}$ km/min

and $x + y = \frac{\frac{3}{4}}{\frac{15}{2}}$

$= \frac{3}{4} \times \frac{2}{15} = \frac{1}{10}$ km/min
$\therefore$ Speed in still water

$= \frac{1}{2}\left(\frac{1}{10} + \frac{1}{15}\right) = \frac{1}{2}\left(\frac{3+2}{30}\right)$

$= \frac{1}{12}$ km/min

$= \frac{1}{12} \times 60$ kmph = 5 kmph

19. (2) Speed upstream $= \frac{40}{8}$
= 5 kmph

Speed downstream $= \frac{36}{6}$
= 6 kmph
$\therefore$ Speed of boat in still water

$= \frac{1}{2}(5 + 6) = 5.5$ kmph

20. (2) Tricky Approach

Let the speed of boat in still water be x kmph, then

$\frac{12}{x+3} + \frac{12}{x-3} = 3$

$\Rightarrow 12\left(\frac{x-3+x+3}{(x+3)(x-3)}\right) = 3$

$\Rightarrow 4 \times 2x = x^2 - 9$
$\Rightarrow x^2 - 8x - 9 = 0$
$\Rightarrow x^2 - 9x + x - 9 = 0$
$\Rightarrow x(x - 9) + 1(x - 9) = 0$
$\Rightarrow (x - 9)(x + 1) = 0$
$\Rightarrow x = 9$ because $x \neq -1$
$\therefore$ Speed can't be negetive.
Hence, speed of boat in still water
= 9 kmph

21. (3) Let the speed of motorboat in still water be x kmph.

$\therefore \frac{10}{x-5} + \frac{10}{x+5} = \frac{50}{60}$

$\Rightarrow 10\left(\frac{x+5+x-5}{(x+5)(x-5)}\right) = \frac{5}{6}$

$\Rightarrow 20x \times 6 = (x^2 - 25) \times 5$
$\Rightarrow x^2 - 24x - 25 = 0$
$\Rightarrow x^2 - 25x + x - 25 = 0$
$\Rightarrow x(x - 25) + 1(x - 25) = 0$
$\Rightarrow (x - 25)(x + 1) = 0$
$\Rightarrow x = 25$ because $x \neq -1$
Speed of motorboat in still water
= 25 kmph

22. (4) Speed of boat in still water

$= \frac{1}{2}$ (Rate downstream + Rate upstream) $= \frac{1}{2}(15 + 9)$

$= \frac{1}{2} \times 24 = 12$ kmph

23. (1) Let the speed of sailor in still water be x kmph.
and Speed of current = y kmph

$\therefore x + y = \frac{12}{\frac{48}{60}} = \frac{12}{48} \times 60 = 15$ kmph

and, $x - y = \frac{12}{\frac{80}{60}} = \frac{12 \times 60}{80}$

= 9 kmph
Adding these equations,
$2x = 15 + 9 = 24$
$\Rightarrow x = 12$ kmph

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24. (2) Let the speed of boat in still water be x kmph.

$$\therefore \frac{6}{x+4}+\frac{6}{x-4}=2$$

$$\Rightarrow 6\left(\frac{x-4+x+4}{(x+4)(x-4)}\right)=2$$

$\Rightarrow 6x = x^2 - 16$
$\Rightarrow x^2 - 6x - 16 = 0$
$\Rightarrow x^2 - 8x + 2x - 16 = 0$
$\Rightarrow x(x-8) + 2(x-8) = 0$
$\Rightarrow (x+2)(x-8) = 0$
$\Rightarrow x = 8$ kmph and $x \neq -2$ kmph

25. (4) Let the speed of man in still water be x kmph.

$$\therefore \frac{15}{x+5}=1$$

$\Rightarrow x + 5 = 15 \Rightarrow x = 10$ kmph
$\therefore$ Time taken in swimming up-stream

$$=\frac{15}{10-5}=3 \text{ hours}$$

26. (2) Time $= \dfrac{\text{Distance}}{\text{Rate downstream}}$

$$=\frac{26}{5+3}=\frac{13}{4}=3\frac{1}{4} \text{ hours}$$

27. (3) Let speed of person in still water $= x$ kmph and speed of current $= y$ kmph

$$\therefore x+y=\frac{15}{3}=5 \text{ kmph}$$

$$\& \; x-y=\frac{15}{\frac{15}{2}}=2 \text{ kmph}$$

On adding,

$$2x = 7 \Rightarrow x = \frac{7}{2} = 3.5 \text{ kmph}$$

28. (4) Speed of boat in still water = x kmph (let)
Speed of current = y kmph
Rate downstream = $(x+y)$ kmph
Rate upstream = $(x-y)$ kmph
Distance = Speed × Time
$\therefore (x-y) \times 2t = (x+y) \times t$
$\Rightarrow 2x - 2y = x + y$
$\Rightarrow 2x - x = 2y + y \Rightarrow x = 3y$

$$\Rightarrow \frac{x}{y}=\frac{3}{1}=3:1$$

29. (3) Rate downstream of boat

$$=\frac{48}{6}=8 \text{ kmph}$$

$$\text{Rate upstream} = \frac{36}{6} = 6 \text{ kmph}$$

$\therefore$ Speed of current $= \dfrac{1}{2}$ (Rate down stream − rate upstream)

$$=\frac{1}{2}(8-6)=1 \text{ kmph}$$

30. (4) Rate downstream

$$=\left(\frac{750}{\frac{15}{2}}\right) \text{m/minute}$$

$= 100$ m/minute

$$=\frac{100\times 60}{1000} \text{ kmph} = 6 \text{ kmph}$$

Rate upstream

$$=\left(\frac{750}{600}\times\frac{18}{5}\right) \text{ kmph}$$

$= 4.5$ kmph
$\therefore$ Rowing speed in still water

$$=\frac{1}{2}(6+4.5)=\frac{10.5}{2}$$

$= 5.25$ kmph

31. (2) Rate downstream of boat

$$=\left(\frac{1}{\frac{15}{2\times 60}}\right) \text{ kmph}$$

$$=\frac{2\times 60}{15}=8 \text{ kmph}$$

Rate upstream of boat
$= 5$ kmph
$\therefore$ Speed of boat in still water

$$=\frac{1}{2} \text{ (Rate downstream + Rate upstream)}$$

$$=\frac{1}{2}(8+5)=\frac{13}{2} \text{ kmph}$$

$$=6\frac{1}{2} \text{ kmph}$$

TYPE-II

1. (1) Let the speed of the current be x kmph.
According to the question,

$$\frac{6}{6-x}=3$$

$$\Rightarrow 18-3x=6 \Rightarrow 3x=18-6$$

$$\Rightarrow x=\frac{12}{3}=4 \text{ kmph.}$$

2. (2) Let the rate of swimming in still water be x kmph
$\therefore$ Rate down-stream
$= (x+3)$ kmph
$\therefore$ Rate up-stream $= (x-3)$ kmph
According to the question,
$(x+3)\,t = 2(x-3) \times t$
$\Rightarrow x + 3 = 2x - 6$
$\Rightarrow x = 9$ kmph

3. (2) Let the speed of stream be x kmph, then speed of boat in still water $= 4x$ kmph
$\therefore$ Rate downstream
$= 4x + x = 5x$ kmph
Rate upstream $= 4x - x$
$= 3x$ kmph

$$\therefore \frac{30}{3x}+\frac{30}{5x}=8 \Rightarrow \frac{10}{x}+\frac{6}{x}=8$$

$$\Rightarrow \frac{16}{x}=8 \Rightarrow x=\frac{16}{8}=2 \text{ kmph}$$

4. (3) Let the speed of current be x kmph.

$$\therefore 2\left(\frac{15}{2}-x\right)=\frac{15}{2}+x$$

$$\Rightarrow 15-2x=\frac{15}{2}+x$$

$$\Rightarrow 3x=15-\frac{15}{2}=\frac{15}{2}$$

$$\Rightarrow x=\frac{5}{2}=2\frac{1}{2} \text{ kmph}$$

5. (2) Let the speed of stream be x kmph

$$\therefore \text{Rate upstream} = \frac{9}{2}-x$$

$$\text{Rate downstream} = \frac{9}{2}+x$$

Then,

$$\frac{2}{\frac{9}{2}+x}=\frac{1}{\frac{9}{2}-x}$$

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$\Rightarrow 9-2x=\frac{9}{2}+x$

$\Rightarrow 3x=9-\frac{9}{2}=\frac{9}{2}$

$\Rightarrow x=\frac{9}{2\times3}=\frac{3}{2}=1.5$ kmph

6. (3) Rate upstream of boat
$= 13-4 = 9$ kmph

$\therefore$ Required time $=\frac{\text{Distance}}{\text{Speed}}$

$=\frac{63}{9}=7$ hours

7. (4) Rate downstream
$= (6+1.5)$ kmph $= 7.5$ kmph
Rate upstream $= (6-1.5)$ kmph
$= 4.5$ kmph
According to the question,

$\text{Time}=\frac{\text{Distance}}{\text{Speed}}$

$\therefore$ Required time $=\frac{22.5}{7.5}+\frac{22.5}{4.5}$

$= 3+5 = 8$ hours.

8. (2) Let the speed of boat in still water be x kmph and the distance be y km.
$\therefore$ Rate downstream
$= (x+1.5)$ kmph
Rate upstream
$= (x-1.5)$ kmph
According to the question,

$\frac{y}{x+1.5}=3$ — (i)

$\frac{y}{x-1.5}=\frac{7}{2}$ — (ii)

On dividing equation (i) by (ii),

$\frac{x-1.5}{x+1.5}=\frac{3\times2}{7}=\frac{6}{7}$

$\Rightarrow 7x-10.5=6x+9$

$\Rightarrow x = 10.5+9 = 19.5$ kmph.

TYPE-III

1. (3) Let the distance be x km.
Speed upstream $= 5-1$
$= 4$ kmph
Speed downstream
$= 5+1 = 6$ kmph

$\therefore \frac{x}{6}+\frac{x}{4}=1$

$\Rightarrow \frac{2x+3x}{12}=1$

$\Rightarrow 5x=12$

$\Rightarrow x=\frac{12}{5}=2.4$ km

2. (3) Let the speed of motor-boat be $36x$ kmph and
and Speed of current $= 5x$ kmph
The boat goes along with the current in 5 hours 10 minutes i.e.

$\frac{31}{6}$ hours.

$\therefore$ Distance $=\frac{31}{6}\times(36x+5x)$

$=\frac{41x\times31}{6}$ km.

Rate upstream $= 36x-5x$
$= 31x$ kmph

$\therefore$ Time taken $=\frac{41x\times\frac{31}{6}}{31x}$

$=\frac{41}{6}$ hours

or 6 hours 50 minutes

3. (3) Let the distance of the destination from the starting point be x km.
Rate downstream $= (10+4)$ kmph
$= 14$ kmph
Rate upstream $= (10-4)$ kmph
$= 6$ kmph
According to the question,

$\frac{x}{14}+\frac{x}{6}=5$

$\Rightarrow \frac{3x+7x}{42}=5$

$\Rightarrow 10x=42\times5$

$\Rightarrow x=\frac{42\times5}{10}=21$ km

4. (2) Let the speed of the stream be x kmph and both the boats meet after t hours
According to the question,
$(12+x)\,t+(15-x)\,t=108$
$\Rightarrow 12t+15t=108$
$\Rightarrow 27t=108$

$\Rightarrow t=\frac{108}{27}=4$ hours

5. (2) Let the required distance be x km.

$\therefore \frac{x}{6-2}-\frac{x}{6+2}=3$

$\Rightarrow \frac{x}{4}-\frac{x}{8}=3$

$\Rightarrow \frac{2x-x}{8}=3$

$\Rightarrow x=3\times8=24$ km.

6. (3) Let the speed of the current be x kmph
$\therefore$ Rate downstream
$= (x+45)$ kmph.
According to the question,

$\frac{80}{x+45}=1$ hour 20 minutes

$=\frac{4}{3}$ hours

$\Rightarrow 4x+180=240$
$\Rightarrow 4x=240-180=60$

$\Rightarrow x=\frac{60}{4}$ kmph $= 15$ kmph

Rate upstream
$= 45-15 = 30$ kmph

$\therefore$ Required time $=\frac{80}{30}$ hours

$=\frac{8}{3}=2$ hours 40 minutes

7. (3) Let the required distance be x km, then

$\frac{x}{5+3}+\frac{x}{5-3}=3$

$\Rightarrow \frac{x}{8}+\frac{x}{2}=3$

$\Rightarrow \frac{x+4x}{8}=3$

$\Rightarrow 5x=24$

$\Rightarrow x=\frac{24}{5}=4.8$ km

8. (3) Let the speed of boat in still water be x kmph and that of current be y kmph., then
$x+y=12$
$x-y=8$
———
$\Rightarrow 2x=20$
$\Rightarrow x=10$ kmph.

$\therefore$ Required time $=\frac{24}{10}=2.4$ hour

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TEST YOURSELF

1. A boat covers 12 km upstream and 18 km downstream in 3 hours, while it covers 36 km upstream and 24 km downstream in $6\frac{1}{2}$ hours. What is the speed of the current ?
(1) 1.5 km/hr (2) 1 km/hr
(3) 2 km/hr (4) 2.5 km/hr

2. A boat running downstream covers a distance of 30 km in 2 hours. While coming back the boat takes 6 hours to cover the same distance. If the speed of the current is half of that of the boat, then what is the speed of the boat in kmph?
(1) 15 kmph
(2) 5 kmph
(3) 10 kmph
(4) cannot be determined

3. A boat covers 20 km in 4 hours along the current and 9 km in 3 hours against the current. What is the speed of the current ?
(1) 2 kmph (2) 1 kmph
(3) 1.5 kmph (4) 1.75 kmph

4. A boat running down stream covers a distance of 16 km in 2 hours while for covering the same distance upstream it takes 4 hours. What is the speed of the boat in still water ?
(1) 4 kmph
(2) 6 kmph
(3) 8 kmph
(4) Data inadequate

5. River is running at 2 kmph. It took a man twice as long to row up as to row down the river. The rate (in km ph) of the man in still water is :
(1) 8 (2) 10
(3) 4 (4) 6

6. A person can row a boat d km upstream and the same distance downstream in $5\frac{1}{4}$ hours. Also he can row the boat $2d$ km upstream in 7 hours. He will row the same distance downstream in
(1) $3\frac{1}{2}$ hours (2) $3\frac{1}{4}$ hours
(3) $4\frac{1}{4}$ hours (4) 4 hours

SHORT ANSWERS

1. (3)	2. (3)	3. (2)	4. (2)
5. (4)	6. (1)		

EXPLANATIONS

1. (3) Let the speed of boat in still water be x kmph and that of current be y kmph, then

$$\frac{12}{x-y}+\frac{18}{x+y}=3 \quad \text{....(i)}$$

$$\frac{36}{x-y}+\frac{24}{x+y}=\frac{13}{2} \quad \text{.....(ii)}$$

By equation (i) × 3 – equation (ii),

$$\frac{54}{x+y}-\frac{24}{x+y}=9-\frac{13}{2}$$

$$\Rightarrow \frac{30}{x+y}=\frac{5}{2} \Rightarrow x+y=12 \text{ ... (iii)}$$

From equation (i),

$$\frac{12}{x-y}+\frac{18}{12}=3$$

$$\Rightarrow \frac{12}{x-y}=3-\frac{3}{2}=\frac{3}{2}$$

$$\Rightarrow x-y=\frac{12\times 2}{3}=8 \text{ ..... (iii)}$$

$$\therefore \text{Speed of current} = \frac{1}{2}(12-8)$$

$= 2$ kmph

2. (3) Downstream speed = 30/2 = 15 kmph
Upstream speed
= 30/6 = 5 kmph
Let speed of the boat be x, then speed of the current = $x/2$.

$$x+\frac{x}{2}=15 \quad \text{...(1)}$$

$$x-\frac{x}{2}=5 \quad \text{...(2)}$$

From either of the two equations, we can find the value of x, $x = 10$ kmph
Another set of formula which can serve as **shortcut** in above case is
Speed of the boat =

$$\frac{\text{Downstream Speed + Upstream Speed}}{2}$$

Speed of the stream =

$$\frac{\text{Downstream Speed – Upstream Speed}}{2}$$

Putting these in the above example,
Speed of the boat

$$=\frac{15+5}{2}=10 \text{ kmph}$$

& Speed of the stream

$$=\frac{15-5}{2}=5 \text{ kmph}$$

3. (2) Rate downstream

$$=\frac{20}{4}=5 \text{ kmph}$$

$$\text{Rate upstream} = \frac{9}{3}=3 \text{ kmph}$$

$\therefore$ Speed of current

$$=\frac{1}{2}(5-3)=1 \text{ kmph}$$

4. (2) Rate upstream

$$=\frac{16}{2} \text{ kmph} = 8 \text{ kmph}$$

$$\text{Rate downs tream} = \frac{16}{4}$$

$= 4$ kmph
$\therefore$ Rate in still water

$$=\frac{1}{2}(8+4) \text{ kmph} = 6 \text{ kmph}$$

5. (4) Let rate upstream be x kmph.
Then, rate downstream
$= 2x$ kmph
$\therefore$ Rate of current

$$\frac{1}{2}(2x-x)=\frac{x}{2} \text{ kmph}$$

$$\therefore \frac{x}{2}=2 \Rightarrow x=4$$

$\therefore$ Rate upstream = 4 kmph
Rate downstream = 8 kmph
$\therefore$ Rate in still water

$$=\frac{1}{2}(8+4)=6 \text{kmph}$$

6. (1) Let the speed of boat in still water be x kmph and that of current by y kmph.
According to the question,

$$\therefore \frac{d}{x+y}+\frac{d}{x-y}=\frac{21}{4} \text{ .....(i)}$$

and,

$$\frac{2d}{x-y}=7 \Rightarrow \frac{d}{x-y}=\frac{7}{2} \text{ ....(ii)}$$

By equation (ii) – (i),

$$\frac{d}{x+y}=\frac{21}{4}-\frac{7}{2}=\frac{21-14}{4}=\frac{7}{4}$$

$$\Rightarrow \frac{2d}{x+y}=\frac{7}{2}=3\frac{1}{2} \text{ hours.}$$

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16 SEQUENCE AND SERIES

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. The next number of the sequence 3, 5, 9, 17, 33 ..... is :
(1) 65 (2) 60
(3) 50 (4) 49
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting) & (SSC CPO S.I. Exam. 05.09.2004)

2. The next term of the sequence $\frac{1}{2}, 3\frac{1}{4}, 6, 8\frac{3}{4}$ ..... is :
(1) $10\frac{1}{4}$ (2) $10\frac{3}{4}$
(3) $11\frac{1}{4}$ (4) $11\frac{1}{2}$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

3. Find the missing number of the sequence :
" 3, 14, 25, 36, 47, ?"
(1) 1114 (2) 1111
(3) 1113
(4) None of these
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. The next term of the sequence 1, 2, 5, 26, ... is :
(1) 677 (2) 47
(3) 50 (4) 152
(SSC CGLPrelim Exam. 27.02.2000 (Second Sitting)

5. The missing term in the sequence 0, 3, 8, 15, 24, ..., 48 is
(1) 35 (2) 30
(3) 36 (4) 39
(SSC CPO S.I. Exam. 07.09.2003)

6. In the sequence of numbers 5, 8, 15, 20, 29, 40, 53, one number is wrong. The wrong number is
(1) 15 (2) 20
(3) 29 (4) 40
(SSC CPO S.I. Exam. 07.09.2003)

7. 1 + 2 + 3 + ... + 49 + 50 + 49 + 48 + ... + 3 + 2 + 1 is equal to
(1) 1250 (2) 2500
(3) 2525 (4) 5000
(SSC CPO S.I. Exam. 07.09.2003)

8. The next number in the sequence 2, 8, 18, 32, 50, ... is :
(1) 68 (2) 72
(3) 76 (4) 80
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

9. Next term of the sequence 8, 12, 9, 13, 10, 14, ..., is
(1) 11 (2) 15
(3) 16 (4) 17
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

10. The number of terms in the series 1 + 3 + 5 + 7 ...+ 73 + 75 is
(1) 28 (2) 30
(3) 36 (4) 38
(SSC CPO S.I. Exam. 05.09.2004)

11. In the sequence of number 0, 7, 26, 63, ..., 215, 342 the missing term is
(1) 115 (2) 124
(3) 125 (4) 135
(SSC CPO S.I. Exam. 05.09.2004)

12. What will come in the place of question-mark (?) in the series "2, 7, 14, 23, ?, 47" ?
(1) 28 (2) 34
(3) 31 (4) 38
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

13. The missing number of the sequence 0, 2, 8, 18, —, 50 is :
(1) 28 (2) 30
(3) 32 (4) 36
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

14. The next number of the sequence 2, 5, 10, 14, 18, 23, 26, 32, ... is :
(1) 33 (2) 34
(3) 36 (4) 37
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

15. The next term in the sequence – 1, 6, 25, 62, 123, 214, ... is
(1) 343 (2) 342
(3) 341
(4) None of these
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

16. The wrong term in the sequence 7, 28, 63, 124, 215, 342, 511 is
(1) 7 (2) 28
(3) 124 (4) 215
(SSC CPO S.I. Exam. 03.09.2006)

17. The sixth term of the sequence 11, 13, 17, 19, 23, –, 29 is
(1) 24 (2) 19
(3) 25 (4) 22
(SSC CPO S.I. Exam. 03.09.2006)

18. Given below is a finite sequence of numbers with an unknown x:
0, 1, 1, 2, 3, 5, 8, 13, x, 34,
The value of x is
(1) 21 (2) 20
(3) 19 (4) 17
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

19. The next number of the sequence 2, 6, 12, 20, 30, 42, 56, ___ is
(1) 60 (2) 64
(3) 70 (4) 72
(SSC CGL Prelim Exam. 04.02.2007 & 27.07.2008 (First Sitting)

20. The value of ★ in the sequence 27, 9, 3, ★, $\frac{1}{3}, \frac{1}{9}, \frac{1}{27}$ is
(1) 0 (2) 1
(3) – 1 (4) –3
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

21. The value of x in the sequence 1, 2, 6, 24, x is
(1) 46 (2) 56
(3) 96 (4) 120
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

22. The missing term of the sequence 9, 12, 11, 14, 13, __, 15 is
(1) 12 (2) 16
(3) 10 (4) 17
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

23. Which number in the sequence 8, 27, 64, 100, 125, 216, 343 is wrongly written?
(1) 27 (2) 100
(3) 125 (4) 343
(SSC CPO S.I. Exam. 16.12.2007)

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24. The numbers of the sequence 56, 72, 90,110, 132, 154, form a pattern. Which of them is a misfit in the pattern?
(1) 72 (2) 110
(3) 132 (4) 154
(SSC CPO S.I. Exam.16.12.2007)

25. The wrong number in the sequence
3, 5, 7, 9, 13, 17, 19 is
(1) 17 (2) 13
(3) 9 (4) 7
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

26. The wrong number in the sequence 1, 8, 27, 84, 125, 216, 343 is
(1) 1 (2) 27
(3) 84 (4) 216
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

27. The next number of the sequence 5, 10, 13, 26, 29, 58, 61,... is
(1) 122 (2) 120
(3) 93 (4) 64
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

28. Which number in the sequence 41, 43, 47, 53, 61, 71, 73, 81 is wrongly written ?
(1) 61 (2) 71
(3) 73 (4) 81
(SSC CPO S.I. Exam. 09.11.2008)

29. The numbers of the sequence 52, 51, 48, 43, 34, 27, 16 form a pattern. Which of them is misfit in the pattern ?
(1) 27 (2) 34
(3) 43 (4) 485
(SSC CPO S.I. Exam. 09.11.2008)

30. The next term of the sequence 1, 9, 28, 65, 126, ... is
(1) 199 (2) 205
(3) 216 (4) 217
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

31. The wrong number of the sequence 36, 81, 144, 225, 256, 441 is
(1) 36 (2) 81
(3) 225 (4) 256
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

32. The next term of the sequence 2, 3, 6, 7, 14, ... is
(1) 15 (2) 17
(3) 18 (4) 20
(SSC (South Zone) Investigator Exam. 12.09.2010)

33. The next number of the sequence 3, 7, 15, 31, 63, ? is
(1) 95 (2) 111
(3) 123 (4) 127
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

34. The wrong number of the sequence
4, 9, 25, 49, 121, 144 is
(1) 144 (2) 121
(3) 49 (4) 4
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

35. The next number of the sequence 0, 3, 8, 15, 24, 35, ... is :
(1) 46 (2) 47
(3) 48 (4) 50
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

36. The next number of the sequence 2, 3, 5, 8, 13, 21,.... is
(1) 31 (2) 34
(3) 23 (4) 25
(SSC Data Entry Operator Exam. 31.08.2008)

37. The missing number in the sequence
5, 6, 15, __?__, 89, 170, 291 is
(1) 50 (2) 40
(3) 42 (4) 32
(SSC Data Entry Operator Exam. 02.08.2009)

38. Next number of the sequence
2, 9, 28, 65, 126, ____ is :
(1) 195 (2) 199
(3) 208 (4) 217
(SSC CHSL DEO & LDC Exam. 27.11.2010)

39. The wrong (misfit) number of the sequence 5, 15, 45, 135, 395, 1215, 3645 is :
(1) 395 (2) 135
(3) 45 (4) 5
(SSC CHSL DEO & LDC Exam. 27.11.2010)

40. The next number of the sequence 51, 52, 56, 65,_____is :
(1) 75 (2) 78
(3) 79 (4) 81
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

41. The wrong number of the sequence 4,9,19,39,79,169,319 is
(1) 169 (2) 79
(3) 39 (4) 9
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

42. Find out the wrong number in the sequence
169, 144, 121, 100, 82, 64, 49
(1) 144 (2) 49
(3) 64 (4) 82
(SSC CISF Constable (GD) Exam. 05.06.2011)

43. Insert the missing number
3, 18, 12, 72, 66, 396
(1) 300 (2) 380
(3) 350 (4) 390
(SSC Graduate Level Tier-II Exam.16.09.2012)

44. The wrong number in the series
2, 9, 28, 65, 126, 216, 344 is
(1) 65 (2) 216
(3) 9
(4) None of these
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

45. The odd term in the sequence
0, 7, 26, 63, 124, 217 is
(1) 217 (2) 7
(3) 26 (4) 63
(SSC Graduate Level Tier-II Exam. 29.09.2013)

46. What will come in place of the question mark (?) in the series?
3, 8, 27, 112, (?), 3396
(1) 565 (2) 452
(3) 560 (4) 678
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

47. In the following number series a wrong number is given. Find out that number.
8, 18, 40, 86, 178, 370, 752
(1) 178 (2) 180
(3) 128 (4) 156
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

48. The odd one out from the sequence of numbers
19, 23, 29, 37, 43, 46, 47 is
(1) 23 (2) 46
(3) 37 (4) 19
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

49. The next number of the sequence
$\frac{1}{2}, \frac{3}{4}, \frac{5}{8}, \frac{7}{16}$, ... is
(1) $\frac{10}{24}$ (2) $\frac{11}{32}$
(3) $\frac{9}{24}$ (4) $\frac{9}{32}$
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

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50. The next number of the sequence 3, 5, 9, 17, 33, ... is
(1) 65 (2) 60
(3) 50 (4) 49
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

51. Find out the wrong number in the sequence :
40960, 10240, 2560, 640, 200, 40, 10
(1) 2560 (2) 200
(3) 640 (4) 40
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE–II

1. The sum (101 + 102 + 103 + ... + 200) is equal to :
(1) 15000 (2) 15025
(3) 15050 (4) 25000
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. Which term of the series 72, 63, 54, ... is zero?
(1) 11th (2) 10th
(3) 9th (4) 8th
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

3. The sum 9 + 16 + 25 + 36 + ... + 100 is equal to :
(1) 350 (2) 380
(3) 400 (4) 420
(SSC CGLPrelim Exam. 27.02.2000 (Second Sitting)

4. What is the 507th term of the sequence
1, –1, 2, –2, 1, –1, 2, – 2, 1, ...?
(1) –1 (2) 1
(3) –2 (4) 2
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. If the 4th term of an arithmetic progression is 14 and the 12th term is 70, then the first term is :
(1) – 10 (2) – 7
(3) + 7 (4) + 10
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. By adding the same constant to each of 31, 7, – 1 a geometric progression results. The common ratio is :
(1) 13 (2) $2\frac{1}{3}$
(3) – 12 (4) None of these
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

7. The sum of the first 8 terms of a geometric progression is 6560 and the common ratio is 3. The first term is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CPO S.I. Exam. 07.09.2003)

8. How many terms of the series "1 + 2 + 3 ....." add upto 5050?
(1) 50 (2) 51
(3) 100 (4) 101
(SSC CPO S.I. Exam. 05.09.2004)

9. The seventh term of the sequence 1, 3, 6, 10, ... is :
(1) 20 (2) 26
(3) 28 (4) 32
(SSC CPO S.I. Exam. 26.05.2005)

10. If the 10th term of the sequence $a, a-b, a-2b, a-3b, \ldots$ is 20 and the 20th term is 10, then the xth term of the series is
(1) $10-x$ (2) $20-x$
(3) $29-x$ (4) $30-x$
(SSC CPO S.I. Exam. 03.09.2006)

11. When simplified, the sum
$$\frac{1}{2}+\frac{1}{6}+\frac{1}{12}+\frac{1}{20}+\frac{1}{30}+\ldots+\frac{1}{n(n+1)}$$
is equal to
(1) $\frac{1}{n}$ (2) $\frac{1}{n+1}$
(3) $\frac{2(n-1)}{n}$ (4) $\frac{n}{n+1}$
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

12. (1 + 3 + 5 + 7 + 9 + ... + 99) is equal to
(1) 2050 (2) 2500
(3) 2005 (4) 2002
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

13. The nth term of the sequence
$\frac{1}{n}, \frac{n+1}{n}, \frac{2n+1}{n}, \ldots$ is
(1) $\frac{n^2+1}{n}$ (2) $\frac{n^2-n+1}{n}$
(3) $n+1$ (4) 2
(SSC CPO S.I. Exam. 16.12.2007)

14. If $1+10+10^2+\ldots$ upto n terms $= \frac{10^n-1}{9}$, then the sum of the series $4+44+444+\ldots$ upto n term is
(1) $\frac{4}{9}(10^n-1)-\frac{4n}{9}$
(2) $\frac{4}{81}(10^n-1)-\frac{4n}{9}$
(3) $\frac{40}{81}(10^n-1)-\frac{4n}{9}$
(4) $\frac{40}{9}(10^n-1)-\frac{4n}{9}$
(SSC CPO S.I. Exam. 16.12.2007)

15. Which term of the sequence $\frac{1}{2}, -\frac{1}{4}, \frac{1}{8}, -\frac{1}{16}, \ldots$ is $-\frac{1}{256}$?
(1) 9th (2) 8th
(3) 7th (4) 5th
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

16. The first odd number is 1, the second odd number is 3, the third odd number is 5 and so on. The 200th odd number is
(1) 399 (2) 421
(3) 357 (4) 599
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

17. Only two entries are known of the following Arithmetic progression :
—, 5, —, —, 14, —, ---
What should be the number just after 14 ?
(1) 17 (2) 18
(3) 19 (4) 20
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

18. Which term of the sequence 7, 10, 13, ... is 151 ?
(1) 29th (2) 19th
(3) 59th (4) 49th
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

19. The sum of the first 20 terms of the series
$\frac{1}{5\times6}+\frac{1}{6\times7}+\frac{1}{7\times8}+\ldots\ldots$ is
(1) 0.16 (2) 1.6
(3) 16 (4) 0.016
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

20. Which term of the sequence 6, 13, 20, 27, ... is 98 more than its 24th term ?
(1) 36th (2) 38th
(3) 35th (4) 48th
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

21. The sum of series 1 + 2 + 3 + 4 + ... + 998 + 999 + 1000 is
(1) 5050 (2) 500500
(3) 550000 (4) 55000
(SSC CPO S.I. Exam. 09.11.2008)

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22. The sum of n terms the series $1+\frac{1}{2}+\frac{1}{2^2}+\frac{1}{2^3}$..... is

(1) $\frac{2^n-1}{2^{n-1}}$ (2) $\frac{2^{n-1}-1}{2^{n-2}}$

(3) $2-2^n$ (4) $\frac{2^n-1}{2^n}$

(SSC CPO S.I. Exam. 09.11.2006)

23. The ninth term of the sequence 0, 3, 8, 15, 24, 35, ... is
(1) 63 (2) 70
(3) 80 (4) 99
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

24. The sixth term of the sequence 2, 6, 11, 17, ... is
(1) 24 (2) 30
(3) 32 (4) 36
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

25. The ratio of the fifth and sixth terms of the sequence 1, 3, 6, 10, ... is
(1) 5 : 6 (2) 5 : 7
(3) 7 : 5 (4) 6 : 5
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

26. The middle term(s) of the following series $2 + 4 + 6 + ... + 198$ is
(1) 98 (2) 96
(3) 94 (4) 100
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

27. If p, q, r are in Geometric Progression, then which is true among the following?

(1) $q=\frac{p+r}{2}$ (2) $p^2=qr$

(3) $q=\sqrt{pr}$ (4) $\frac{p}{r}=\frac{r}{q}$

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

28. Terms a, 1, b are in Arithmetic Progression and terms 1, a, b are in Geometric Progression. Find 'a' and 'b' given $a \neq b$.
(1) 2,4 (2) –2, 1
(3) 4,1 (4) –2, 4
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

29. The fifth term of the sequence for which $t_1 = 1$, $t_2 = 2$ and $t_{n+2} = t_n + t_{n+1}$, is
(1) 5 (2) 10
(3) 6 (4) 8
(SSC Graduate Level Tier-I Exam. 21.04.2013)

30. $1 + (3 + 1)(3^2 + 1)(3^4 + 1)(3^8 + 1)(3^{16} + 1)(3^{32} + 1)$ is equal to

(1) $\frac{3^{64}-1}{2}$ (2) $\frac{3^{64}+1}{2}$

(3) $3^{64}-1$ (4) $3^{64}+1$

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

31. The sum '$5 + 6 + 7 + 8 + ... + 19$' is equal to :
(1) 150 (2) 170
(3) 180 (4) 190
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

32. Given that $1^2 + 2^2 + 3^2 + ... + 20^2 = 2870$, the value of $(2^2 + 4^2 + 6^2 + ... + 40^2)$ is :
(1) 11480 (2) 5740
(3) 28700 (4) 2870
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

33. Given $1^3 + 2^3 + 3^3 + ... + 10^3 = 3025$ then $2^3 + 4^3 + 6^3 + ...+ 20^3$ is equal to
(1) 6050 (2) 9075
(3) 12100 (4) 24200
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

34. $(45 + 46 + 47 + ... + 113 + 114 + 115)$ is equal to
(1) 5600 (2) 5656
(3) 5680 (4) 4000
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

35. The 12th term of the series

$\frac{1}{x}+\frac{x+1}{x}+\frac{2x+1}{x}+....$

(1) $\frac{11x+1}{x}$ (2) $\frac{12x+1}{x}$

(3) $\frac{x+12}{x}$ (4) $\frac{x+11}{x}$

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

36. The first term of an Arithmetic Progression is 22 and the last term is – 11. If the sum is 66, the number of terms in the sequence is
(1) 10 (2) 12
(3) 9 (4) 8
(SSC CHSL DEO & LDC Exam. 9.11.2014)

37. The 30th term of the series 30, $25\frac{1}{2}$, 21, $16\frac{1}{2}$,..... is

(1) 0 (2) $-100\frac{1}{2}$

(3) –183 (4) $-133\frac{1}{2}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

38. Find the nth term of the following sequence :
$5 + 55 + 555 + ... T_n$
(1) $5(10^n - 1)$ (2) $5^n(10^n - 1)$
(3) $\frac{5}{9}(10^n - 1)$ (4) $\left(\frac{5}{9}\right)^n (10^n-1)$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

39. Find the sum of first five terms of the following series :

$\frac{1}{1\times4}+\frac{1}{4\times7}+\frac{1}{7\times10}+$ .....+ .....

(1) $\frac{9}{32}$ (2) $\frac{7}{16}$

(3) $\frac{5}{16}$ (4) $\frac{1}{210}$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

40. The least value of n, such that $(1 + 3 + 3^2 + ... + 3^n)$ exceeds 2000, is
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

41. The next term of the sequence,

$\left(1+\frac{1}{2}\right),\left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right),$

$\left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right)\left(1+\frac{1}{4}\right),$ ___ is

(1) 3 (2) $\left(1+\frac{1}{5}\right)$

(3) 5 (4) $\left(1+\frac{1}{2}\right)\left(1+\frac{1}{5}\right)$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 909 KPG)

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TYPE–III

1. If $1 \times 2 \times 3 \times \ldots\ldots \times n$ is denoted by $\lfloor n$, then $\frac{\lfloor 8 - \lfloor 7}{\lfloor 6}$ is equal to :
(1) $6 \times 8 \times \lfloor 6$ (2) $7 \times 8 \times \lfloor 6$
(3) $6 \times 7 \times \lfloor 8$ (4) $7 \times 8 \times \lfloor 7$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. Find the sum of the first five terms of the following series.
$\frac{1}{1\times4}+\frac{1}{4\times7}+\frac{1}{7\times10}+\ldots\ldots+\ldots\ldots$
(1) $\frac{9}{32}$ (2) $\frac{7}{16}$
(3) $\frac{5}{16}$ (4) $\frac{1}{210}$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

3. If $(10^{12}+25)^2-(10^{12}-25)^2=10^n$, then the value of n is
(1) 20 (2) 14
(3) 10 (4) 5
(SSC CPO S.I. Exam. 07.09.2003)

4. Given $1+2+3+4+\ldots.+10=55$, then the sum $6+12+18+24+\ldots.+60$ is equal to :
(1) 300 (2) 655
(3) 330 (4) 455
(SSC CGL Prelim Exam. 06.02.2004 (First Sitting)

5. When simplified the product
$\left(1-\frac{1}{2}\right)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\ldots\left(1-\frac{1}{n}\right)$
gives :
(1) $\frac{1}{n}$ (2) $\frac{2}{n}$
(3) $\frac{2(n-1)}{n}$ (4) $\frac{2}{n(n+1)}$
(SSC CGL Prelim Exam. 06.02.2004 (1st Sitting) & (SSC CGL Prelim Exam. 27.07.2008)

6. The value of
$\frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}+\frac{9}{4^2.5^2}+\frac{11}{5^2.6^2}+\frac{13}{6^2.7^2}+\frac{15}{7^2.8^2}+\frac{17}{8^2.9^2}+\frac{19}{9^2.10^2}$ is
(1) $\frac{1}{100}$ (2) $\frac{99}{100}$
(3) $\frac{101}{100}$ (4) 1
(SSC CGL Prelim Exam. 06.02.2004 (Second Sitting)

7. The value of
$1-\frac{1}{20}+\frac{1}{20^2}-\frac{1}{20^3}+\ldots\ldots$
correct to 5 places of decimal is :
(1) 1.05 (2) 0.95238
(3) 0.95239 (4) 10.5
(SSC CGL Prelim Exam. 06.02.2004 (Second Sitting)

8. For all integral values of n, the largest number that exactly divides each number of the sequence
$(n-1)\,n(n+1)$, $n(n+1)(n+2)$, $(n+1)(n+2)(n+3)$,..... is
(1) 12 (2) 6
(3) 3 (4) 2
(SSC CPO S.I. Exam. 03.09.2006)

9. Given that
$1+2+3+\ldots.+x=\frac{x(x+1)}{2}$ then
$1+3+5+\ldots.+99$ is equal to
(1) 2250 (2) 2500
(3) 2525 (4) 3775
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

10. $\left(1-\frac{1}{5}\right)\left(1-\frac{1}{6}\right)\left(1-\frac{1}{7}\right)\ldots\left(1-\frac{1}{100}\right)$ is equal to
(1) 0 (2) $\frac{1}{25}$
(3) $\frac{1}{100}$ (4) $\frac{1}{50}$
(SSC CPO S.I. Exam. 09.11.2008)

11. The sum of the series
$(1+0.6+0.06+0.006+0.0006+\ldots.)$ is
(1) $1\frac{2}{3}$ (2) $1\frac{1}{3}$
(3) $2\frac{1}{3}$ (4) $2\frac{2}{3}$
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

12. $\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right)\ldots\left(1-\frac{1}{25}\right)$ is equal to
(1) $\frac{2}{25}$ (2) $\frac{1}{25}$
(3) $1\frac{19}{25}$ (4) $\frac{1}{325}$
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

TYPE–IV

1. The sum $(5^3+6^3+\ldots.10^3)$ is equal to :
(1) 2295 (2) 2425
(3) 2495 (4) 2925
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. If $1^3+2^3+3^3+\ldots.+10^3=3025$, then find the value of $2^3+4^3+6^3+\ldots.+20^3$
(1) 6050 (2) 9075
(3) 12100 (4) 24200
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. If $1^3+2^3+\ldots..+10^3=3025$, then $4+32+108+\ldots..+4000$ is equal to :
(1) 12000 (2) 12100
(3) 12200 (4) 12400
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

4. If $1^3+2^3+3^3+4^3+5^3+6^3=441$ then find the value of $2^3+4^3+6^3+8^3+10^3+12^3$
(1) 882 (2) 1323
(3) 1764 (4) 3528
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. If $1^2+2^2+3^2\ldots\ldots+x^2=\frac{x(x+1)(2x+1)}{6}$ then $1^2+3^2+5^2+\ldots..19^2$ is equal to
(1) 1330 (2) 2100
(3) 2485 (4) 2500
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

6. If $1^3+2^3+\ldots.+9^3=2025$, then the value of $(0.11)^3+(0.22)^3+\ldots.+(0.99)^3$ is close to
(1) 0.2695 (2) 2.695
(3) 3.695 (4) 0.3695
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

7. The value of $5^2+6^2+\ldots..+10^2+20^2$ is
(1) 755 (2) 760
(3) 765 (4) 770
(SSC CPO S.I. Exam. 07.09.2003)

8. $1^2-2^2+3^2-4^2+\ldots.-10^2$ is equal to
(1) 45 (2) –45
(3) –54 (4) –55
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC Investigator Exam. 12.09.2010 (South Zone)

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9. Given that $1^2 + 2^2 + 3^2 + ... + n^2 = \frac{n}{6}(n+1)(2n+1)$, then $10^2 + 11^2 + 12^2 + ... + 20^2$ is equal to
(1) 2616 (2) 2585
(3) 3747 (4) 2555
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

10. $[1^2 + 2^2 + 3^2 + ... + 10^2]$ is equal to
(1) 380 (2) 385
(3) 390 (4) 392
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

11. $(5^2 + 6^2 + 7^2 + ... + 10^2)$ is equal to
(1) 330 (2) 345
(3) 355 (4) 360
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

12. $[2^2 + 3^2 + 4^2 + 5^2 + 6^2 + 7^2 + 8^2 + 9^2 + 10^2]$ is equal to
(1) 385 (2) 2916
(3) 540 (4) 384
(SSC Data Entry Operator Exam. 31.08.2008)

13. $[1^3 + 2^3 + 3^3 + ... + 9^3 + 10^3]$ is equal to
(1) 3575 (2) 2525
(3) 5075 (4) 3025
(SSC Data Entry Operator Exam. 02.08.2009)

14. Given that $1^2 + 2^2 + 3^2 + ...+ 10^2 = 385$, the value of $2^2 + 4^2 + 6^2 + ...+ 20^2$ =
(1) 770 (2) 1540
(3) 1155 (4) $(385)^2$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

SHORT ANSWERS

TYPE-I

1. (1)	2. (4)	3. (4)	4. (1)
5. (1)	6. (1)	7. (2)	8. (2)
9. (1)	10. (4)	11. (2)	12. (2)
13. (3)	14. (2)	15. (3)	16. (2)
17. (3)	18. (1)	19. (4)	20. (2)
21. (4)	22. (2)	23. (2)	24. (4)
25. (3)	26. (3)	27. (1)	28. (4)
29. (2)	30. (4)	31. (4)	32. (1)
33. (4)	34. (1)	35. (3)	36. (2)
37. (2)	38. (4)	39. (1)	40. (4)
41. (1)	42. (4)	43. (4)	44. (2)
45. (1)	46. (1)	47. (1)	48. (2)
49. (4)	50. (1)	51. (2)	

TYPE-II

1. (3)	2. (3)	3. (2)	4. (4)
5. (2)	6. (4)	7. (2)	8. (3)
9. (3)	10. (4)	11. (4)	12. (2)
13. (2)	14. (3)	15. (2)	16. (1)
17. (1)	18. (4)	19. (1)	20. (2)
21. (2)	22. (1)	23. (3)	24. (3)
25. (2)	26. (4)	27. (3)	28. (4)
29. (4)	30. (2)	31. (3)	32. (1)
33. (4)	34. (3)	35. (1)	36. (2)
37. (2)	38. (3)	39. (3)	40. (3)
41. (1)			

TYPE-III

1. (1)	2. (3)	3. (2)	4. (3)
5. (1)	6. (2)	7. (2)	8. (2)
9. (4)	10. (2)	11. (1)	12. (1)

TYPE-IV

1. (4)	2. (4)	3. (2)	4. (4)
5. (1)	6. (2)	7. (1)	8. (4)
9. (2)	10. (2)	11. (3)	12. (4)
13. (4)	14. (2)		

EXPLANATIONS

TYPE-I

1. (1) 3, 5, 9, 17, 33, ...
(+2, +4=2^2, +8=2^3, +16=2^4)
∴ The next term in the sequence will be 65

2. (4) $\frac{1}{2}, 3\frac{1}{4}, 6, 8\frac{3}{4}$,.....
$= 0.5, 3.25, 6, 8.75$, ...
(+2.75, +2.75, +2.75)
∴ Next term of the sequence
$= 8.75 + 2.75 = 11.5 = 11\frac{1}{2}$

3. (4) 3, 14, 25, 36, 47, 58
(+11, +11, +11, +11, +11)
∴ Missing number in the sequence = 58

4. (1) The series is based on following pattern :
$(1)^2 + 1 = 2$
$(2)^2 + 1 = 5$
$(5)^2 + 1 = 26$
$(26)^2 + 1 =$ **677**
Therefore, the next number of the series will be 677.

5. (1)
0, 3, 8, 15, 24, **35**, 48
(+3, +5, +7, +9, +11, +13)
Missing no. = 35

6. (1)
5, 8, **13**, 20, 29, 40, 53
(+3, +5, +7, +9, +11, +13)
Incorrect no. = 15

7. (2) Required sum
$= 2\left(\frac{x(x+1)}{2}\right) + 50$
$= \frac{2 \times 49 \times 50}{2} + 50 = 2500$

8. (2) The given sequence is based on the following pattern :
2, 8, 18, 32, 50, **72**
(+6, +10, +14, +18, +22)
Hence, 72 will be the next number.

9. (1) The pattern of the sequence is :
$8 + 4 = 12$
$12 - 3 = 9$
$9 + 4 = 13$
$13 - 3 = 10$
$10 + 4 = 14$
$14 - 3 =$ **11**

10. (4) Let the number of terms be n. It is an Arithmetic Series whose first term, $a = 1$ and common difference $d = 2$.
$\therefore n^{th}$ term $= a + (n-1)d$
$\Rightarrow 75 = 1 + (n-1)2$
$\Rightarrow 2(n-1) = 74$
$\Rightarrow n-1 = \frac{74}{2} = 37$
$\Rightarrow n = 37 + 1 = 38$

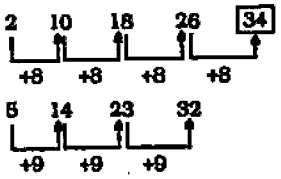
11. (2) The given series is based on the following pattern :
$1^3 - 1 = 0$ $2^3 - 1 = 7$
$3^3 - 1 = 26$ $4^3 - 1 = 63$
$5^3 - 1 =$ **124** $6^3 - 1 = 215$
$7^3 - 1 = 352$
Hence, the missing term is 124.

12. (2)
2, 7, 14, 23, **34**, 47
(+5, +7, +9, +11, +13)
∴ ? = 34

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13. (3) The sequence is based on the following pattern :
$2 \times 0^2 = 0$
$2 \times 1^2 = 2$
$2 \times 2^2 = 8$
$2 \times 3^2 = 18$
$2 \times 4^2 =$ **32**

14. (2) The twin sequence is based on the following pattern :

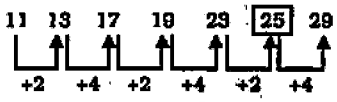


Hence, the required number is 34.

15. (3) The sequence is based on the following pattern :
$1^3 - 2 = 1 - 2 = -1$
$2^3 - 2 = 8 - 2 = 6$
$3^3 - 2 = 27 - 2 = 25$
$4^3 - 2 = 64 - 2 = 62$
$5^3 - 2 = 125 - 2 = 123$
$6^3 - 2 = 216 - 2 = 214$
$7^3 - 2 = 343 - 2 =$ **341**

16. (2) The given sequence is based on the following Pattern:
$2^3 - 1 = 7$
$3^3 - 1 = 26$ not **28**
$4^3 - 1 = 63$
$5^3 - 1 = 124$
$6^3 - 1 = 215$ and so on.
∴ The wrong term = 28

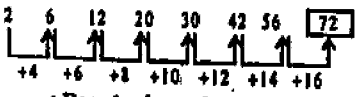
17. (3) The sequence is based on the following rule:



Hence, the sixth term is 25

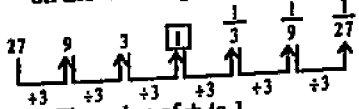
18. (1) In the given sequence, (starting from the third number) the succeeding number is sum of two just preceding numbers. i.e.,
$1 = 0 + 1$
$2 = 1 + 1$
$3 = 1 + 2$
∴ $x = 8 + 13 =$ **21**

19. (4) The given sequence is based on the following pattern :



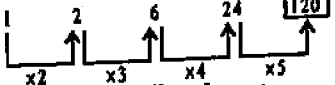
∴Required number = 72

20. (2) The given sequence is based on the following pattern :



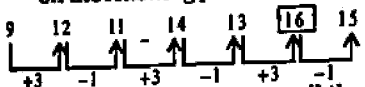
∴ The value of ★ is 1.

21. (4) The given sequence is based on the following pattern:



Hence, 120 will replace x.

22. (2) The given sequence is based on the following pattern:



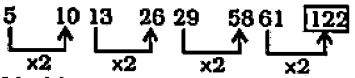
23. (2) In the given sequence all the numbers except 100 are perfect cubes of natural numbers. As, $8 = 2^3$, $27 = 3^3$, $64 = 4^3$ etc.

24. (4) The given sequence is based on the following pattern :
$7 \times 8 = 56$
$8 \times 9 = 72$
$9 \times 10 = 90$
$10 \times 11 = 110$
$11 \times 12 = 132$
$12 \times 13 \neq 154$, but 156
∴ 154 is the wrong number.

25. (3) The numbers of the sequence are the consecutive prime numbers starting from 3.
Since, 9 is not a prime number, it should be replaced by 11.

26. (3) The given sequence is :
$1^3, 2^3, 3^3, 4^3, 5^3, 6^3, 7^3$
Clearly, 84 is the wrong number.

27. (1) The given sequence is based on the following pattern :



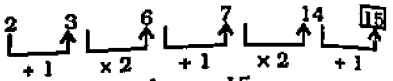
28. (4) All the numbers except 81 are prime numbers.

29. (2) The given sequence is based on the following pattern :
$52 - 1 = 51$
$51 - 3 = 48$
$48 - 5 = 43$
$43 - 7 = 36 \neq$ **34**
$36 - 9 = 27$
$27 - 11 = 16$
Hence, 34 is the wrong number.

30. (4) The pattern of the sequence is :
$1 + 2^3 = 9$
$1 + 3^3 = 28$
$1 + 4^3 = 65$
$1 + 5^3 = 126$
$1 + 6^3 =$ **217**

31. (4) The pattern of the sequence is :
$6^2 = 36$
$9^2 = 81$
$12^2 = 144$
$15^2 = 225$
$18^2 = 324 \neq$ **256**
$21^2 = 441$

32. (1) The pattern of the sequence is :



Required no. = 15

33. (4) The pattern of the sequence is:
$3 + 4 = 7$
$7 + 8 = 15$
$15 + 16 = 31$
$31 + 32 = 63$
$63 + 64 =$ **127**

34. (1) The pattern of the sequence is:
$2^2, 3^2, 5^2, 7^2, 11^2, 13^2$ or, squares of first 6 consecutive prime numbers. Hence, 144 should be replaced by 169.

35. (3) The series is based on following pattern :
$0 + 3 = 3$
$3 + 5 = 8$
$8 + 7 = 15$
$15 + 9 = 24$
$24 + 11 = 35$
$35 + 13 =$ **48**
Therefore, the required answer is 48.

36. (2) The pattern is :
$2 + 3 = 5$; $5 + 3 = 8$
$8 + 5 = 13$; $13 + 8 = 21$
$21 + 13 =$ **34**

37. (2) The pattern of the given number series is :
$5 + 1^2 = 6$
$6 + 3^2 = 15$
$15 + 5^2 =$ **40**
$40 + 7^2 = 89$
$89 + 9^2 = 170$

38. (4) The pattern of the sequence is :
$1^3 + 1 = 2$
$2^3 + 1 = 9$
$3^3 + 1 = 28$
$4^3 + 1 = 65$
$5^3 + 1 = 126$
$6^3 + 1 = 216 + 1 =$ **217**

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39. (1) The pattern of the sequence is :
$5 \times 3 = 15$
$15 \times 3 = 45$
$45 \times 3 = 135$
$135 \times 3 = 405 \neq$ 395
$405 \times 3 = 1215$

40. (4) The pattern of the sequence is :
$51 + 1^2 = 52$
$52 + 2^2 = 56$
$56 + 3^2 = 65$
$65 + 4^2 = 65 + 16 =$ 81

41. (1) The pattern of the sequence is :
$4 \times 2 + 1 = 9$
$9 \times 2 + 1 = 19$
$19 \times 2 + 1 = 39$
$39 \times 2 + 1 = 79$
$79 \times 2 + 1 = 159 \neq$ 169

42. (4) The pattern of the sequence is :
$169 = 13^2$
$144 = 12^2$
$121 = 11^2$
$100 = 10^2$
$81 = 9^2 \neq$ 82

43. (4) The pattern is :
$3 \times 6 = 18$
$18 - 6 = 12$
$12 \times 6 = 72$
$72 - 6 = 66$
$66 \times 6 = 396$
$396 - 6 =$ 390

44. (2) The pattern is :
$1^3 + 1 = 1 + 1 = 2$
$2^3 + 1 = 8 + 1 = 9$
$3^3 + 1 = 27 + 1 = 28$
$4^3 + 1 = 64 + 1 = 65$
$5^3 + 1 = 125 + 1 = 126$
$6^3 + 1 = 216 + 1 = 217 \neq$ 216

45. (1) The pattern is :
$1^3 - 1 = 1 - 1 = 0$
$2^3 - 1 = 8 - 1 = 7$
$3^3 - 1 = 27 - 1 = 26$
$4^3 - 1 = 64 - 1 = 63$
$5^3 - 1 = 125 - 1 = 124$
$6^3 - 1 = 216 - 1 = 215 \neq$ 217

46. (1) The pattern is :
$3 \times 2 + 2 = 6 + 2 = 8$
$8 \times 3 + 3 = 24 + 3 = 27$
$27 \times 4 + 4 = 108 + 4 = 112$
$112 \times 5 + 5 = 560 + 5 =$ 565

47. (1) The pattern is :
$8 \times 2 + 2 = 16 + 2 = 18$
$18 \times 2 + 4 = 36 + 4 = 40$
$40 \times 2 + 6 = 80 + 6 = 86$
$86 \times 2 + 8 = 172 + 8$
$= 180 \neq$ 178
$180 \times 2 + 10 = 360 + 10 = 370$

48. (2) Except 48, all others are prime numbers.
$46 = 2 \times 23$

49. (4) Sequence of numerators
$\Rightarrow$ 1, 3, 5, 7, 9
Sequence of denominators
$\Rightarrow$ 2, 4, 8, 16, 32
$\therefore$ Next fraction = $\frac{9}{32}$

50. (1) The pattern is :
$3 + 2 = 5$
$5 + 2 \times 2 = 5 + 4 = 9$
$9 + 2 \times 4 = 9 + 8 = 17$
$17 + 2 \times 8 = 17 + 16 = 33$
$33 + 2 \times 16 = 33 + 32 =$ 65

51. (2) The pattern is :
$40960 + 4 = 10240$
$10240 + 4 = 2560$
$2560 + 4 = 640$
$640 + 4 = 160 \neq$ 200
$160 + 4 = 40$
$40 + 4 = 10$

TYPE-II

1. (3) $101 + 102 + 103 + ... + 200$
$S = (100 + 1) + (100 + 2) + (100 + 3) + ... + (100 + 100)$
Thus, it consists of 100 terms.
$= (100 + 100 + 100 + ... 100 \text{ times}) + (1 + 2 + 3 + ... + 100)$
$= (100 \times 100) + (1 + 2 + 3 + ... + 100)$
$= (10000) + (1 + 2 + 3 + ... + 100)$
$= 10000 + \frac{100 \times (100+1)}{2}$
$= 10000 + 5050 = 15050$

2. (3) Here, a=72,
$d = 63 - 72 = -9$
$a_n = 0$
$\therefore a_n = a + (n-1)d$
$\Rightarrow 0 = 72 + (n-1) \times -9$
$\Rightarrow 72 = 9(7-1) \Rightarrow n-1 = 8$
$\Rightarrow n = 9$

3. (2) $? = 9 + 16 + 25 + 36 + 49 + 64 + 81 + 100 = 380$

4. (4) Clearly, repetition takes place for each set of four terms.
Hence, 507th term will be 2
507, when divided by 4, gives 3 as remainder and 3rd term is 2.

5. (2) $a_4 = a_1 + (4-1) \times d$
$14 = a_1 + 3d \Rightarrow a_1$
$= 14 - 3d$ ....(i)
$70 = a_1 + 11d$ ....(ii)
After putting the value of a_1 in equation (i)
$14 - 3d + 11d = 70$
$8d = 70 - 14$
$\therefore d = 7$
$\therefore a_1 = 14 - 21 = -7$

6. (4) A sequence is said to be in G.P if the ratio of a term to its precedding term is constant.
In 31, 7, -1, if we add 5, the sequence formed is 36, 12, 4 which is in G.P.
$\therefore$ Common ratio = $\frac{12}{36} = \frac{4}{12}$
$= \frac{1}{3}$

7. (2) Sum of x terms of a GP
$= \frac{a(r^n - 1)}{r-1}$ (when $r > 1$)
$\therefore 6560 = \frac{a(3^8 - 1)}{3-1}$
$\Rightarrow 6560 = \frac{a(6561-1)}{2}$
$\Rightarrow a = \frac{6560 \times 2}{6560} \Rightarrow a = 2$

8. (3) Let the number of terms be n.
$\therefore 1 + 2 + 3 + ... + n = 5050$
$\Rightarrow \frac{n(n+1)}{2} = 5050$
$\Rightarrow n(n+1) = 10100$ [or use splitting middle term method]
$= 100 \times 101$
$\Rightarrow n(n+1) = 100(100+1)$
$\Rightarrow n = 100$

9. (3) The given series is based on the following pattern :

1	3	6	10	15	21	28
	+2	+3	+4	+5	+6	+7

Hence, the seventh term of the series will be 28.

10. (4) $a, a-b, a-2b$ ..... is an AP with first term = a and common difference = $-b$
Now, $t_{10} = a + (10-1) \times (-b)$
$\Rightarrow 20 = a - 9b$ .... (i)
$t_{20} = a + (20-1)(-b)$
$\Rightarrow 10 = a - 19b$ ... (ii)

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From equation (i) – (ii),
$20 - 10 = a - 9b - a + 19b$
$\Rightarrow 10b = 10 \Rightarrow b = 1$
From equation (i),
$20 = a - 9 \Rightarrow a = 29$
$\therefore t_x = 29 + (x-1) \times -1$
$= 29 - x + 1 = 30 - x$

11. (4) Expression

$$= \frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \ldots + \frac{1}{n(n+1)}$$

$$= \frac{1}{1\times 2} + \frac{1}{2\times 3} + \frac{1}{3\times 4} + \frac{1}{4\times 5} + \ldots + \frac{1}{n(n+1)}$$

$$= 1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \frac{1}{4} - \frac{1}{5} \ldots + \frac{1}{n} - \frac{1}{n+1}$$

$$= 1 - \frac{1}{n+1} = \frac{n+1-1}{n+1} = \frac{n}{n+1}$$

12. (2) $1 + 3 + 5 + \ldots + 99$
$= (1 + 2 + 3 + 4 + \ldots + 100) - (2 + 4 + 6 \ldots + 100)$
$= (1 + 2 + 3 + 4 + \ldots + 100) - 2(1 + 2 + 3 \ldots + 50)$

$$= \frac{100(100+1)}{2} - \frac{2\times 50(50+1)}{2}$$

$$\left[\because 1+2+3+\ldots+n = \frac{n(n+1)}{2}\right]$$

$= 50 \times 101 - 50 \times 51$
$= 50(101 - 51) = 50 \times 50$
$= 2500$

13. (2) First term, $a = \frac{1}{n}$
Common difference,

$$d = \frac{n+1}{n} - \frac{1}{n} = \frac{n+1-1}{n} = 1$$

$\therefore$ nth term $= a + (n-1)d$

$$= \frac{1}{n} + (n-1) \cdot 1$$

$$= \frac{1 + n^2 - n}{n} = \frac{n^2 - n + 1}{n}$$

14. (3) **Tricky Approach**
Expression
$= 4 + 44 + 444 + \ldots$ to n terms
$= 4(1 + 11 + 111 + \ldots$ to n terms)

$$= \frac{4}{9}(9 + 99 + 999 + \ldots \text{to } n \text{ terms})$$

$= \frac{4}{9}[(10 - 1) + (100 - 1) + (1000 - 1) + \ldots$ to n terms]
$= \frac{4}{9}[(10 + 10^2 + 10^3 + \ldots$ to n terms) $- n]$ [$\because$ 1 has been added n times]

$$= \frac{4}{9}\left[10\left(1 + 10 + 10^2 + \ldots \text{ to } n \text{ terms}\right) - n\right]$$

$$= \frac{40}{9} \cdot \frac{(10^n - 1)}{9} - \frac{4}{9}n$$

$$\left[\because 1 + 10 + 10^2 + \ldots \text{ to n terms} = \frac{10^n - 1}{9}\right]$$

$$= \frac{40}{81}(10^n - 1) - \frac{4}{9}n$$

15. (2) The sequence is :

$$\frac{1}{2}, -\frac{1}{2^2}, \frac{1}{2^3}, -\frac{1}{2^4}, \ldots\ldots \frac{1}{-2^8}$$

It is a G.P. with common ratio

$$= \frac{-1}{2}$$

$\therefore a_n = ar^{n-1}$

$$\Rightarrow -\frac{1}{256} = \frac{1}{2} \cdot \frac{1}{(-2)^{n-1}}$$

$$\Rightarrow \frac{1}{-2^7} = \frac{1}{(-2)^{n-1}}$$

$\Rightarrow n - 1 = 7 \Rightarrow n = 8$

16. (1) First odd number = 1
Second odd number = 3
Third odd number = 5
$\therefore$ nth odd number
$= 1 + (n-1)2 = 2n - 1$
$\therefore$ 200th odd number
$= 2 \times 200 - 1 = 400 - 1 = 399$

17. (1) For an arithmetic sequence,
$t_n = a + (n-1)d$
$\therefore 5 = a + (2-1)d$
$\Rightarrow 5 = a + d$ .....(i)
and $14 = a + 4d$ .....(ii)
By subtracting equation (i) from (ii),

$$\begin{array}{rcl} 14 &=& a + 4d \\ 5 &=& a + d \\ \hline 9 &=& 3d \end{array}$$

$$\therefore d = \frac{9}{3} = 3$$

From equation (i),
$5 = a + 3 \Rightarrow a = 5 - 3 = 2$
$\therefore t_6 = 2 + (6-1) \times 3$
$= 2 + 15 = 17$

18. (4) Let the n th term = 151
Here, first term $= a = 7$
common difference $= d = 3$
$\therefore t_n = a + (n-1)d$
$\Rightarrow 151 = 7 + (n-1) \times 3$
$\Rightarrow (n-1) \times 3 = 144$
$\Rightarrow n - 1 = \frac{144}{3} = 48$
$\Rightarrow n = 49$

19. (1) First term $= \frac{1}{5\times 6} = \frac{1}{5} - \frac{1}{6}$

Second term $= \frac{1}{6\times 7} = \frac{1}{6} - \frac{1}{7}$

20th term $= \frac{1}{24\times 25} = \frac{1}{24} - \frac{1}{25}$

$\therefore$ Required sum $=$

$$\frac{1}{5} - \frac{1}{6} + \frac{1}{6} - \frac{1}{7} + \ldots + \frac{1}{24} - \frac{1}{25}$$

$$= \frac{1}{5} - \frac{1}{25} = \frac{5-1}{25} = \frac{4}{25}$$

$= 0.16$

20. (2) The 24th term of the sequence 6, 13, 20, 27.....
$t_{24} = 6 + (24 - 1)7$
$= 6 + 23 \times 7 = 6 + 161 = 167$
let the required nth term = 265
$\therefore 265 = 6 + (n-1)7$
$\Rightarrow (n-1)7 = 265 - 6 = 259$

$$\Rightarrow n - 1 = \frac{259}{7} = 37$$

$\Rightarrow n = 38$

21. (2) We know that
$1 + 2 + 3 + 4 + \ldots\ldots + n$

$$= \frac{n(n+1)}{2}$$

$\therefore 1 + 2 + 3 + 4 + \ldots\ldots + 1000$

$$= \frac{1000(1000+1)}{2}$$

$$= \frac{1000\times 1001}{2} = 500500$$

22. (1) $1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \ldots n$ to n terms is a Geometric series whose first term (a) is 1 and the common ratio (r) is $\frac{1}{2}$.

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$= 1 \cdot \frac{\left(1 - \frac{1}{2^n}\right)}{1 - \frac{1}{2}} = \frac{\left(\frac{2^n - 1}{2^n}\right)}{\frac{1}{2}}$$

$$= 2\left(\frac{2^n - 1}{2^n}\right) = \frac{2^n - 1}{2^{n-1}}$$

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23. (3) 0 + 3 = 3
3 + 5 = 8
8 + 7 = 15
15 + 9 = 24
24 + 11 = 35
35 + 13 = 48
48 + 15 = 63
63 + 17 = **60**

24. (3) 2 + 4 = 6
6 + 5 = 11
11 + 6 = 17
17 + 7 = 24
24 + 8 = **32**

25. (2) The pattern of the sequence is:
1 + 2 = 3
3 + 3 = 6
6 + 4 = 10
10 + 5 = 15
15 + 6 = 21
∴ Required ratio
= 15 : 21 = 5 : 7

26. (4) 2 + 4 + 6 + 8 + ... + 198
= 2 (1 + 2 + 3 + ... + 99)
∴ Number of terms = 99
Middle term
$= \frac{99+1}{2}$ = 50th term
= 100
Second Method
It is an arithmetic series.
$a = 2$, $a_n = 198$, d = common difference = 2
Number of terms = n
$\therefore a_n = a + (n-1)d$
$\Rightarrow 198 = 2 + (n-1)2$
$\Rightarrow (n-1)2 = 198 - 2 = 196$
$\Rightarrow n - 1 = \frac{196}{2} = 98$
$\Rightarrow n = 99$
Middle term
$= \frac{99+1}{2}$ = 50th term
$\therefore a_{50} = 2 + (50-1)2$
$= 2 + 98 = 100$

27. (3) p, q, r are in geometric progression.
$\therefore \frac{q}{p} = \frac{r}{q} \Rightarrow q^2 = pr$
$\Rightarrow q = \sqrt{pr}$

28. (4) a, 1, b are in A.P.
$\therefore 1 = \frac{a+b}{2}$
$\Rightarrow a + b = 2$ ....(i)
Again, 1, a, b are in G.P.
$\therefore a^2 = b$ .....(ii)
$\therefore a + a^2 = 2$
$\Rightarrow a^2 + a - 2 = 0$
$\Rightarrow a^2 + 2a - a - 2 = 0$
$\Rightarrow a(a+2) - 1(a+2) = 0$
$\Rightarrow (a-1)(a+2) = 0$
$\Rightarrow a = -2, 1 \; b = 4, 1$
$\therefore b = 4$ since $a \neq b$

29. (4) $t_{n+2} = t_n + t_{n+1}$
$t_3 = t_1 + t_2 = 3$
$t_4 = t_3 + t_2 = 3 + 2 = 5$
$t_5 = t_4 + t_3 = 3 + 5 = 8$

30. (2) $1 + (3+1)(3^2+1)(3^4+1)(3^8+1)(3^{16}+1)(3^{32}+1)$
$= 1 + \frac{(3-1)(3+1)}{3-1}(3^2+1)(3^4+1)...(3^{32}+1)$
$= 1 + \frac{(3^2-1)(3^2+1)(3^4+1)...(3^{32}+1)}{2}$
$= 1 + \frac{(3^4-1)(3^4+1)(3^8+1)...(3^{32}+1)}{2}$
$= 1 + \frac{(3^8-1)(3^8+1)(3^{16}+1)(3^{32}+1)}{2}$
$= 1 + \frac{(3^{16}-1)(3^{16}+1)(3^{32}+1)}{2}$
$= 1 + \frac{(3^{32}-1)(3^{32}+1)}{2}$
$= 1 + \frac{3^{64}-1}{2} = \frac{3^{64}+1}{2}$

31. (3) $1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}$
$\therefore 5 + 6 + 7 + ... + 19$
$= (1 + 2 + 3 + ... + 19) - (1 + 2 + 3 + 4)$
$= \frac{19(19+1)}{2} - 10 = 180$

32. (1) $2^2 + 4^2 + 6^2 + ... + 40^2$
$= 2^2 (1^2 + 2^2 + 3^2 + ... + 20^2)$
$= 4 \times 2870 = 11480$

33. (4) It is given,
$1^3 + 2^3 + 3^3 + ... + 10^3 = 3025$
Now,
$2^3 + 4^3 + 6^3 + ... + 20^3$
$= (1 \times 2)^3 + (2 \times 2)^3 + (2 \times 3)^3 + ... + (2 \times 10)^3$
$= 2^3 [1^3 + 2^3 + 3^3 + ... + 10^3]$
$= 8 \times 3025 = 24200$

34. (3) (45 + 46 + 47 + ... + 114 + 115)
$= (1 + 2 + 3 + ... + 115) - (1 + 2 + 3 + ... + 44)$
$= \frac{115 \times (115+1)}{2} - \frac{44 \times (44+1)}{2}$
$\left[\because 1 + 2 + 3 + ... + n = \frac{n(n+1)}{2}\right]$
$= \frac{115 \times 116}{2} - \frac{44 \times 45}{2}$
$= 115 \times 58 - 22 \times 45$
$= 6670 - 990 = 5680$

35. (1) First term = $\frac{x \times 0 + 1}{x}$
$= \frac{x(1-1)+1}{x}$
Second term = $\frac{x \times 1 + 1}{x}$
$= \frac{x(2-1)+1}{x}$
Third term = $\frac{x \times 2 + 1}{x}$
$= \frac{x(3-1)+1}{x}$
$\therefore$ 12th term = $\frac{x(12-1)+1}{x}$
$= \frac{11x+1}{x}$

36. (2) First term (a) = 22
Last term (l) = −11
Sum (S) = 66
Number of terms = n (let)
$\therefore S = \frac{n}{2}(a + l)$
$\Rightarrow 66 = \frac{n}{2}(22 - 11)$
$\Rightarrow 66 = \frac{11n}{2}$
$\Rightarrow 11n = 66 \times 2$
$\Rightarrow n = \frac{66 \times 2}{11} = 12$

37. (2) First term = $a = 30$
Common difference (d)
$= 25\frac{1}{2} - 30 = -4\frac{1}{2} = \frac{-9}{2}$
Number of terms = $n = 30$
$t_n = a + (n-1)d$
$\Rightarrow t_{30} = 30 + (30-1) \times \frac{-9}{2}$
$= 30 - \frac{29 \times 9}{2}$
$= 30 - \frac{261}{2}$
$= \frac{60 - 261}{2}$
$= \frac{-201}{2} = -100\frac{1}{2}$

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38. (3) Series = $5 + 55 + 555 + ... + T_n$
$= 5(1 + 11 + 111 + ... \text{ to } n \text{ terms})$
$= \frac{5}{9}(9 + 99 + 999 + ... \text{ to } n \text{ terms})$
$= \frac{5}{9}\{(10 - 1) + (10^2 - 1) + ... + (10^n - 1)\}$
$\therefore$ nth term $= \frac{5}{9}(10^n - 1)$

39. (3) Expression
$= \frac{1}{1\times4} + \frac{1}{4\times7} + \frac{1}{7\times10} + \frac{1}{10\times13} + \frac{1}{13\times16}$
$= \frac{1}{3}\left(1-\frac{1}{4}\right) + \frac{1}{3}\left(\frac{1}{4}-\frac{1}{7}\right) + ...+\frac{1}{3}\left(\frac{1}{13}-\frac{1}{16}\right)$
$= \frac{1}{3}\left(1-\frac{1}{4}+\frac{1}{4}-\frac{1}{7}+\frac{1}{7}-\frac{1}{10}+\frac{1}{10}-\frac{1}{13}+\frac{1}{13}-\frac{1}{16}\right)$
$= \frac{1}{3}\left(1-\frac{1}{16}\right) = \frac{1}{3}\times\frac{15}{16} = \frac{5}{16}$

40. (3) Series $\Rightarrow 1 + 3 + 3^2 + ... + 3^n$
It is a geometric series whose common ratio is 3.
$a + ar + ar^2 + ... + ar^{n-1}$
$= \frac{a(r^n-1)}{r-1}$
$\therefore 1 + 3 + 3^2 + ... + 3^n$
$= \frac{1(3^{n+1}-1)}{3-1}$
$= \frac{3^{n+1}-1}{2}$
According to question,
$\frac{3^{n+1}-1}{2} > 2000$
$\Rightarrow 3^{n+1} - 1 > 4000$
$\Rightarrow 3^{n+1} > 4000 + 1 = 4001$
For $n = 7$.
$3^8 = 6561 > 4001$

41. (1) First term $\Rightarrow 1+\frac{1}{2} = \frac{3}{2}$
Second term $\Rightarrow \left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right)$
$= \frac{3}{2}\times\frac{4}{3} = 2$
Third term
$\Rightarrow \left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right)\left(1+\frac{1}{4}\right)$
$= \frac{3}{2}\times\frac{4}{3}\times\frac{5}{4} = \frac{5}{2}$
$\therefore$ Fourth term
$= \left(1+\frac{1}{2}\right)\left(1+\frac{1}{3}\right)\left(1+\frac{1}{4}\right)\left(1+\frac{1}{5}\right)$
$= \frac{3}{2}\times\frac{4}{3}\times\frac{5}{4}\times\frac{6}{5} = \frac{6}{2} = 3$

TYPE-III

1. (1) $\lfloor n = 1 \times 2 \times 3 \times .....\times n$
$\therefore \lfloor 8 - \lfloor 7 - \lfloor 6$
$= (8 \times 7 \times \lfloor 6) - (7 \times \lfloor 6) - \lfloor 6$
$= 56\lfloor 6 - 7\lfloor 6 - \lfloor 6$
$= (56 - 7 - 1)\lfloor 6$
$= 48\lfloor 6 = 6 \times 8 \times \lfloor 6$

2. (3)
$\frac{1}{1\times4}+\frac{1}{4\times7}+\frac{1}{7\times10}+\frac{1}{10\times13}+\frac{1}{13\times16}$
$= \left(1-\frac{1}{4}+\frac{1}{4}-\frac{1}{7}+\frac{1}{7}-\frac{1}{10}+\frac{1}{10}-\frac{1}{13}+\frac{1}{13}-\frac{1}{16}\right)\times\frac{1}{3}$
$= \frac{15}{16}\times\frac{1}{3} = \frac{5}{16}$

3. (2) $\because (a+b)^2 - (a-b)^2 = 4ab$
$\therefore \left(10^{12}+25\right)^2 - \left(10^{12}-25\right)^2$
$= 4 \times 10^{12} \times 25 = 10^{14}$
$\Rightarrow 10^{14} = 10^n$
$\Rightarrow n = 14$

4. (3) $1 + 2 + 3 + 4 + ... + 10 = 55$.
Then,
$6 + 12 + 18 + 24 + ... + 60$
$= 6(1 + 2 + 3 + 4 + ... + 10) = 6 \times 55 = 330$

5. (1) Expression
$= \frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times....\frac{n-1}{n} = \frac{1}{n}$

6. (2) Expression
$= \frac{3}{1^2.2^2}+\frac{5}{2^2.3^2}+\frac{7}{3^2.4^2}+.....+\frac{17}{8^2.9^2}+\frac{19}{9^2.10^2}$
$\frac{2^2-1^2}{1^2.2^2}+\frac{3^2-2^2}{2^2.3^2}+\frac{4^2-3^2}{3^2.4^2}+...$
$= \left(\frac{1}{1^2}-\frac{1}{2^2}\right)+\left(\frac{1}{2^2}-\frac{1}{3^2}\right)+\left(\frac{1}{3^2}-\frac{1}{4^2}\right)$
$.....+\left(\frac{1}{8^2}-\frac{1}{9^2}\right)+\left(\frac{1}{9^2}-\frac{1}{10^2}\right)$
$= \frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{2^2}-\frac{1}{3^2}+\frac{1}{3^2}-\frac{1}{4^2}+.....+\frac{1}{8^2}-\frac{1}{9^2}+\frac{1}{9^2}-\frac{1}{10^2}$
$= 1-\frac{1}{10^2}$
$= 1-\frac{1}{100} = \frac{100-1}{100}$
$= \frac{99}{100}$

7. (2) Let S
$= 1 - \frac{1}{20}+\frac{1}{20^2}-\frac{1}{20^3}+.....$
It is a geometric series to infinity with first term, $a = 1$ and common ratio,
$r = -\frac{1}{20}$
$\therefore S_\infty = \frac{a}{1-r}$
$= \frac{1}{1-\left(-\frac{1}{20}\right)}$
$= \frac{1}{1+\frac{1}{20}} = \frac{20}{21} = 0.9523809$
$\therefore$ The value correct to 5 places of decimal
$= 0.95238$

8. (2) The largest number will be 6.
For $n = 2$
$(n-1)\,n(n+1) = 6$,
for $n = 3$. $(n-1)\,(n)\,(n+1) = 24$ etc.

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9. (4) $1+2+3+\ldots\ldots\ldots+x=\frac{x(x+1)}{2}$

$\therefore 1+3+5+\ldots\ldots\ldots+99$
$=(1+2+3+4+5+\ldots..100)-(2+4+6+\ldots..100)$
$=\frac{100\times(100+1)}{2}-\frac{50\times(50+1)}{2}$
$=5050-1275=3775$

10. (2) Expression,
$=\left(1-\frac{1}{5}\right)\left(1-\frac{1}{6}\right)\left(1-\frac{1}{7}\right)\ldots\left(1-\frac{1}{100}\right)$
$=\left(\frac{5-1}{5}\right)\left(\frac{6-1}{6}\right)\left(\frac{7-1}{7}\right)\ldots\left(\frac{99-1}{99}\right)\left(\frac{100-1}{100}\right)$
$=\frac{4}{5}\times\frac{5}{6}\times\frac{6}{7}\times\ldots\times\frac{98}{99}\times\frac{99}{100}$
$=\frac{4}{100}=\frac{1}{25}$

11. (1) Tricky approach
$1+0.6+0.06+0.006+0.0006+\ldots=1.666\ldots=1.\overline{6}$
$=1\frac{6}{9}=1\frac{2}{3}$

12. (1) $\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)\left(1-\frac{1}{5}\right)\ldots\ldots\left(1-\frac{1}{24}\right)\left(1-\frac{1}{25}\right)$
$=\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\ldots\ldots\times\frac{23}{24}\times\frac{24}{25}=\frac{2}{25}$

TYPE-IV

1. (4) $?=125+216+343+512+729+1000=2925$

2. (4) $2^3+4^3+6^3+\ldots.+20^3$
$=(2\times1)^3+(2\times2)^3+(2\times3)^3+\ldots..+(2\times10)^3$
$=8\times1^3+8\times2^3+8\times3^3\ldots.+8\times10^3$
$=8\times[1^3+2^3+3^3+4^3+\ldots+10^3]$
$=8\times3025=24200$
[$\because 1^3+2^3+3^3+\ldots.+10^3=3025$ (given)]

3. (2) Here, $1^3+2^3+\ldots.+10^3=3025$
Now, $4+32+108+\ldots.+4000$
$=4(1+8+27+\ldots.+4000)$
$=4(1^3+2^3+3^3+\ldots.+10^3)$
$=4\times3025=12100$

4. (4) $1^3+2^3+3^3+4^3+5^3+6^3=441$ (Given)
$2^3+4^3+6^3+8^3+10^3+12^3$
$=8(1^3+2^3+3^3+4^3+5^3+6^3)$
$=8\times441=3528$

5. (1) $1^2+2^2+3^2+\ldots..+n^2=\frac{n(n+1)(2n+1)}{6}$
$\therefore 1^2+3^2+5^2+\ldots..+19^2$
$=(1^2+2^2+3^2+\ldots..+20^2)-(2^2+4^2+\ldots..+20^2)$
$=\frac{20(20+1)(40+1)}{6}-2^2(1^2+2^2+\ldots..+10^2)$
$=\frac{20\times21\times41}{6}-\frac{4\times10(10+1)(20+1)}{6}$
$=2870-1540=1330$

6. (2) $1^3+2^3+\ldots..+9^3=2025$ (Given)
Now, $(0.11)^3+(0.22)^3+\ldots.+(0.99)^3$
$=\left(\frac{11}{100}\right)^3+\left(\frac{22}{100}\right)^3+\ldots..+\left(\frac{99}{100}\right)^3$
$=\left(\frac{11}{100}\right)^3(1^3+2^3+\ldots..+9^3)$
$=\frac{1331}{1000000}\times2025$
$=\frac{2695275}{1000000}=2.695275$
$=2.695$

7. (1) $1^2+2^2+3^2+\ldots..+n^2=\frac{n(n+1)(2n+1)}{6}$
$?=\frac{10\times11\times21}{6}+20^2-\frac{4\times5\times9}{6}$
$=385+400-30=755$

8. (4) $S=1^2-2^2+3^2-4^2+\ldots-10^2$
$S=(1^2+3^2+5^2+7^2+9^2)-(2^2+4^2+6^2+8^2+10^2)$
We know that sum of squares of first n odd natural numbers
$=\frac{n(4n^2-1)}{3}$
Sum of squares of first n even natural numbers
$=\frac{2}{3}n(n+1)(2n+1)$
Hence,
$S=\frac{5(4\times5\times5-1)}{3}-\frac{2}{3}\times5(5+1)(2\times5+1)$
$S=\frac{5\times99}{3}=\frac{2\times30\times11}{3}$
$=165-220=-55$

9. (2) $1^2+2^2+3^2+\ldots+n^2=\frac{n(n+1)(2n+1)}{6}$
$\therefore 10^2+11^2+12^2+\ldots.+20^2$
$=(1^2+2^2+3^2+\ldots.+20^2)-(1^2+2^2+3^2+\ldots+9^2)$
$=\frac{20(20+1)(2\times20+1)}{6}-\frac{9(9+1)(2\times9+1)}{6}$
$=\frac{20\times21\times41}{6}-\frac{9\times10\times19}{6}$
$=2870-285=2585$

10. (2) $1^2+2^2+3^2+\ldots+n^2=\frac{n(n+1)(2n+1)}{6}$
$\therefore 1^2+2^2+3^2+\ldots.+10^2=\frac{10(10+1)(20+1)}{6}=385$

11. (3) $1^2+2^2+3^2+4^2+\ldots+n^2=\frac{n(n+1)(2n+1)}{6}$
$\therefore 5^2+6^2+\ldots.10^2=(1^2+2^2+\ldots+10^2)-(1^2+2^2+3^2+4^2)$
$=\frac{10\times11\times21}{6}-\frac{4\times5\times9}{6}$
$=385-30=355$

12. (4) We know that
$1^2+2^2+3^2+\ldots.+n^2=\frac{n(n+1)(2n+1)}{6}$
$\therefore 2^2+3^2+4^2+\ldots..+10^2$
$=(1^2+2^2+3^2+\ldots..+10^2)-1$
$=\frac{10(10+1)(2\times10+1)}{6}-1$
$=\frac{10\times11\times21}{6}-1=385-1=384$

13. (4) Using formula $1^3+2^3+3^3+\ldots.+n^3=\left(\frac{n(n+1)}{2}\right)^2$ we have,
$1^3+2^3+3^3+\ldots..+10^3=\left(\frac{10\times11}{2}\right)^2=(55)^2$
$=55\times55=3025$

14. (2) $1^2+2^2+3^2+\ldots..+10^2=385$
$\therefore 2^2+4^2+6^2+\ldots.+20^2$
$=2^2(1^2+2^2+3^2+\ldots..+10^2)$
$=4\times385=1540$

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TEST YOURSELF

1. In the sequence of number 0, 7, 26, 63, ..., 215, 342 the missing term is
(1) 115 (2) 124
(3) 125 (4) 135

2. What is the next term in the following sequence ?
2 3 11 38 102 ?
(1) 225 (2) 227
(3) 230 (4) 235

3. Find $1^3 + 2^3 + 3^3 + ... + 15^3$
(1) 11025 (2) 13400
(3) 900 (4) 14400

4. The value of
$(1^3 + 2^3 + 3^3 + ... + 15^3) - (1 + 2 + 3 + ... + 15)$ is —
(1) 14280 (2) 14400
(3) 12280 (4) 13280

5. What is the next number in the series given below ?
53, 48, 50, 50, 47
(1) 51 (2) 46
(3) 53 (4) 52

6. In a GP, the first term is 5 and the common ratio is 2. The eighth term is —
(1) 640 (2) 1280
(3) 256 (4) 160

7. If the arithmetic mean of two numbers is 5 and geometric mean is 4, then the numbers are —
(1) 4, 6 (2) 4, 7
(3) 3, 8 (4) 2, 8

8. What is the next number in the series given below ?
2, 5, 9, 14, 20
(1) 25 (2) 26
(3) 27 (4) 28

9. The sum of 40 terms of an AP whose first term is 4 and common difference is 4, will be —
(1) 3200 (2) 1600
(3) 200 (4) 2800

10. Let S_n denote the sum of the first 'n' terms of an AP
$S_{2n} = 3S_n$. Then, the ratio $\frac{S_{3n}}{S_n}$ is equal to
(1) 4 (2) 6
(3) 8 (4) 10

11. The missing number in the series 8, 24, 12, 36, 18, 54, ... is —
(1) 27 (2) 108
(3) 68 (4) 72

12. The sum of the 6th and 15th elements of an arithmetic progression is equal to the sum of 7th, 10th and 12th elements of the same progression. Which element of the series should necessarily be equal to zero ?
(1) 10th (2) 8th
(3) 1st (4) 9th

13. If p, q, r, s are in harmonic progression and $p > s$, then —
(1) $\frac{1}{ps} < \frac{1}{qr}$
(2) $q + r = p + s$
(3) $\frac{1}{q} + \frac{1}{p} = \frac{1}{r} + \frac{1}{s}$
(4) None of these

14. What is the eighth term of the sequence 1, 4, 9, 16, 25 ..... ?
(1) 8 (2) 64
(3) 128 (4) 200

15. In a geometric progression, the sum of the first and the last term is 66 and the product of the second and the last but one term is 128. Determine the first term of the series.
(1) 64 (2) 64 or 2
(3) 2 or 32 (4) 32

16. A sequence is generated by the rule that the xth term is $x^2 + 1$ for each positive integer x. In this sequence, for any value $x > 1$, the value of $(x + 1)$th term less the value of xth term is —
(1) $2x^2 + 1$ (2) $x^2 + 1$
(3) $2x + 1$ (4) $x + 2$

17. Four different integers form an increasing AP. If one of these numbers is equal to the sum of the squares of the other three numbers, then the numbers are —
(1) –2, –1, 0, 1 (2) 0, 1, 2, 3
(3) –1, 0, 1, 2 (4) 1, 2, 3, 4

18. How many terms are there in an AP whose first and fifth terms are –14 and 2 respectively and the sum of terms is 40 ?
(1) 15 (2) 10
(3) 5 (4) 20

19. The first three numbers in a series are –3, 0, 3, the 10th number in the series will be —
(1) 18 (2) 21
(3) 24 (4) 27

SHORT ANSWERS

1.(2)	2.(2)	3.(4)	4.(1)
5.(4)	6.(1)	7.(4)	8.(3)
9.(1)	10.(2)	11.(1)	12.(2)
13.(4)	14.(2)	15.(2)	16.(3)
17.(3)	18.(2)	19.(3)	

EXPLANATIONS

1. (2) The given series is based on the following pattern :
$1^3 - 1 = 0$ $2^3 - 1 = 7$
$3^3 - 1 = 26$ $4^3 - 1 = 63$
$5^3 - 1 = \boxed{124}$ $6^3 - 1 = 215$
$7^3 - 1 = 342$

2. (2) The pattern is :
$2 + 1^3 = 2 + 1 = 3$
$3 + 2^3 = 3 + 8 = 11$
$11 + 3^3 = 11 + 27 = 38$
$38 + 4^3 = 38 + 64 = 102$
$102 + 5^3 = 102 + 125 = \boxed{227}$

3. (4) According to question, we have,
$1^3 + 2^3 + 3^3 + ... + n^3$
$= \left[\frac{n \times (n+1)}{2}\right]^2$
Here, n = number of terms = 15
$\therefore \left[\frac{n\,(n+1)}{2}\right]^2 = \left[\frac{15 \times 16}{2}\right]^2$
$= (120)^2 = 14400$

4. (1) According to question,
$(1^3 + 2^3 + 3^3 + ... + 15^3) - (1 + 2 + 3 + ... + 15)$
$= \left[\frac{n(n+1)}{2}\right]^2 - \left[\frac{n(n+1)}{2}\right]$

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$$= \left[\frac{15\times16}{2}\right]^2 - \left[\frac{15\times16}{2}\right]$$

$$= (120)^2 - (120)$$

$$= 120 \times 119 = 14280$$

5.(4) According to question,
53, 48, 50, 50, 47, ...
The above series can be splitted into two series one in ascending order and other in descending order
53 50 47 and other is
48 50 52
Hence, 52 will be the next number.

6.(1) According to question, nth term of a GP = ar^{n-1}.
$\therefore$ 8th term = $5 \times (2)^{8-1} = 5 \times (2)^7$
$= 5 \times 128 = 640$

7.(4) Let the two numbers be x and y.
Then, AM,

$$\frac{x+y}{2} = 5$$

$$\Rightarrow \quad x + y = 10$$

and GM, $\sqrt{xy} = 4$ ...(i)

$$xy = 16$$

$$\Rightarrow \quad (x-y)^2 = (x+y)^2 - 4xy$$
$$100 - 64 = 36$$
$$x - y = 6 \qquad ...(ii)$$

Or
Solving Eqs. (i) and (ii),
$x = 8$ and $y = 2$

8.(3) According to question,
2 5 9 14 20 27
+3 +4 +5 +6 +7
Hence, the next number of the series will be 27.

9.(1) According to question,

$$S_{40} = \frac{n}{2}[2a + (n-1)d]$$

$$= 20[4 + 39 \times 4] = 20 \times 160$$
$$= 3200$$

10.(2) Let a be the first term and d be the common difference.

Then, $S_n = \frac{n}{2}[2a + (n-1)d]$

$$S_{2n} = \frac{2n}{2}[2a + (2n-1)d]$$

and $S_{3n} = \frac{3n}{2}[2a + (3n-1)d]$

Given, $S_{2n} = 3S_n$

$$\therefore \quad \frac{2n}{2}[2a + (2n-1)d] = 2\frac{n}{2}[2a + (n-1)d]$$

$$\Rightarrow 4a + (4n-2)d = 6a + (3n-3)d$$
$$\Rightarrow \quad d(4n - 2 - 3n + 3) = 2a$$

$$\Rightarrow \quad d = \frac{2a}{n+1}$$

$$\therefore \quad S_n = \frac{2an^2}{n+1}$$

and $S_{3n} = \frac{12an^2}{n+1}$

$$\therefore \quad \frac{S_n}{S_{3n}} = \frac{2an^2}{n+1} \times \frac{n+1}{12an^2} = \frac{1}{6}$$

$$\Rightarrow \quad \frac{S_{3n}}{S_n} = 6$$

11.(1) According to question,
8, 24, 12, 36, 18, 54
8 24 12 36 18 54 27
×3 +2 ×3 +2 ×3 +2
Hence, 27 will come in the blank space.

12.(2) Let the first term and common term of the AP be a and d respectively.
Then, $(a + 5d) + (a + 14d) = (a + 6d) + (a + 9d) + (a + 11d)$
$\Rightarrow 2a + 19d = 3a + 26d$
$\Rightarrow a + 7d = 0$
$\therefore$ 8th term is 0.

13.(4) According to question,
If p, q, r, s are in HP.

$$\Rightarrow \quad \frac{1}{p}, \frac{1}{q}, \frac{1}{r}, \frac{1}{s} \text{ are in AP.}$$

$$\Rightarrow \quad \frac{1}{q} - \frac{1}{p} = \frac{1}{s} - \frac{1}{r}$$

$$\Rightarrow \quad \frac{1}{q} + \frac{1}{r} = \frac{1}{s} + \frac{1}{p}$$

Hence, the none of these be answer

14.(2) According to question,
1, 4, 9, 16, 25
$(1)^2$ $(2)^2$ $(3)^2$ $(4)^2$ $(5)^2$
Each term of the progression is the square of a natural number.
Hence, the eighth term of the sequence will be $(8)^2 = 64$

15.(2) Let the last term be n, then

$$a + ar^{n-1} = 66$$

and $ar.\ ar^{n-2} = 128$

$$a^2r^{n-1} = 128$$

From Eqs. (i) and (ii),

$$a(66 - a) = 128$$
$$\Rightarrow \quad a^2 - 66a + 128 = 0$$
$$\Rightarrow \quad a = 64, 2$$

16.(3) According to question,
$(x+1)^{th}$ term $- x^{th}$ term
$= (x+1)^2 + 1 - (x^2 + 1)$
$= x^2 + 2x + 1 + 1 - x^2 - 1 = 2x + 1$

17.(3) By hit and trial or common sense, we have,
$2 = (-1)^2 + (0)^2 + (1)^2$
Hence the numbers are
$-1, 0, 1, 2$

18.(2) According to question,
$T_5 = a + (n-1).d$
$2 = -14 + 4d$

$$d = \frac{16}{4} = 4$$

$$\therefore S_n = \frac{n}{2}[2a + (n-1) \times d]$$

$$40 = \frac{n}{2}[-28 + (n-1) \times 4]$$

$$\Rightarrow \quad 80 = -28n + 4n^2 - 4n$$
$$\Rightarrow \quad 4n^2 - 32n - 80 = 0$$
$$n^2 - 8n - 20 = 0$$
$$\Rightarrow \quad (n-10)(n+2) = 0$$
$$\therefore \quad n = 10 \ (\because n \neq -2)$$

19.(3) According to question,
$a = -3, d = 3$
$\therefore T_{10} = a + (10-1).d$
$T_{10} = -3 + 9 \times 3 = 24$

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17 ALGEBRA

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. If $a * b = 2a - 3b + ab$, then $3 * 5 + 5 * 3$ is equal to :
(1) 22 (2) 24
(3) 26 (4) 28
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If $p \times q = p + q + \frac{p}{q}$, the value of 8×2 is :
(1) 6 (2) 10
(3) 14 (4) 16
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. Two numbers x and y (x > y) are such that their sum is equal to three times their difference. Then value of $\frac{3xy}{2(x^2-y^2)}$ will be:
(1) $\frac{2}{3}$ (2) 1
(3) $1\frac{1}{2}$ (4) $1\frac{2}{3}$
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

4. The value of $\left(1+\frac{1}{x}\right)\left(1+\frac{1}{x+1}\right)\left(1+\frac{1}{x+2}\right)\left(1+\frac{1}{x+3}\right)$ is :
(1) $1+\frac{1}{x+4}$ (2) $x+4$
(3) $\frac{1}{x}$ (4) $\frac{x+4}{x}$
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. If $a * b = 2(a + b)$, then $5 * 2$ is equal to :
(1) 3 (2) 10
(3) 14 (4) 20
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

6. If $\frac{2a+b}{a+4b} = 3$, then find the value of $\frac{a+b}{a+2b}$
(1) $\frac{5}{9}$ (2) $\frac{2}{7}$
(3) $\frac{10}{9}$ (4) $\frac{10}{7}$
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

7. If $x = \sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1}}$, then the value of $5x^2 - 5x - 1$ is
(1) 0 (2) 3
(3) 4 (4) 5
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

8. If $a * b = a + b + ab$, then $3 * 4 - 2 * 3$ is equal to :
(1) 6 (2) 8
(3) 10 (4) 12
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

9. If $x = 7 - 4\sqrt{3}$, then the value of $\left(x+\frac{1}{x}\right)$ is :
(1) $3\sqrt{3}$ (2) $8\sqrt{3}$
(3) $14+8\sqrt{3}$ (4) 14
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

10. If $x \star y = 3x + 2y$, Then $2 \star 3 + 3 \star 4$ is equal to
(1) 18 (2) 29
(3) 32 (4) 38
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

11. If $\frac{a}{3} = \frac{b}{4} = \frac{c}{7}$ then $\frac{a+b+c}{c}$ is equal to
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CPO S.I.Exam.12.01.2003

12. If $\frac{144}{0.144} = \frac{14.4}{x}$, then the value of x is
(1) 144 (2) 14.4
(3) 1.44 (4) 0.0144
(SSC CPO S.I.Exam.12.01.2003

13. If $1 < x < 2$, then the value of $\sqrt{(x-1)^2} + \sqrt{(x-3)^2}$ is
(1) 1 (2) 2
(3) 3 (4) 2x–4
(SSC CPO S.I.Exam.12.01.2003

14. If $a \otimes b = (a \times b) + b$, then $5 \otimes 7$ equals to
(1) 12 (2) 35
(3) 42 (4) 50
(SSC CPO S.I.Exam.12.01.2003

15. Given that $10^{0.48} = x$, $10^{0.70} = y$, and $x^z = y^2$, then the value of z is close to
(1) 1.45 (2) 1.88
(3) 2.9 (4) 3.7
(SSC CPO S.I.Exam.12.01.2003)

16. If $47.2506 = 4A + \frac{7}{B} + \frac{5}{D} + 6E$, then the value of $5A + 3B + 6C + D + 3E$ is
(1) 53.6003 (2) 53.603
(3) 153.6003 (4) 213.0003
(SSC CGL Prelim Exam.11.05.2003 (First Sitting)

17. If $x * y = x^2 + y^2 - xy$, then the value of $9 * 11$ is
(1) 93 (2) 103
(3) 113 (4) 121
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

18. If $\frac{2p}{p^2-2p+1} = \frac{1}{4}, p \neq 0$, then the value of $p + \frac{1}{p}$ is
(1) 4 (2) 5
(3) 10 (4) 12
FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

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19. If $5^{2x+5} = 1$, then x equals
(1) 0 (2) -1
(3) 1 (4) $-\frac{4}{5}$
(SSC CPO S.I. Exam. 07.09.2003)

20. If $3^{x+3} + 7 = 250$, then x is equal to
(1) 5 (2) 3
(3) 2 (4) 1
(SSC CPO S.I.Exam.07.09.2003)

21. If $\frac{1}{4}\times\frac{2}{6}\times\frac{3}{8}\times\frac{4}{10}\times\frac{5}{12}\times$ ....$x\frac{31}{64} = \frac{1}{2^x}$, the value of x is
(1) 31 (2) 32
(3) 36 (4) 37
(SSC Section Officer (Commercial Audit) Exam.16.11.2003)

22. The value of $\frac{(243)^{\frac{n}{5}}.3^{2n+1}}{9^n.3^{n-1}}$ is
(1) 1 (2) 9
(3) 3 (4) 3^n
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

23. If $x = 0.5$ and $y = 0.2$, then value of $\sqrt{0.6} \times (3y)^x$ is equal to
(1) 1.0 (2) 0.5
(3) 0.6 (4) 1.1
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

24. If $x^{x\sqrt{x}} = \left(x\sqrt{x}\right)^x$, then x equals
(1) $\frac{4}{9}$ (2) $\frac{2}{3}$
(3) $\frac{9}{4}$ (4) $\frac{3}{2}$
(SSC CPO S.I. Exam. 05.09.2004)

25. If a = 7, b = 5 and c = 3, then the value of $a^2 + b^2 + c^2 - ab - bc - ca$ is
(1) 12 (2) –12
(3) 0 (4) 8
(SSC CPO S.I. Exam.05.09.2004)

26. If $7^x = \frac{1}{343}$, then the value of x is
(1) 3 (2) –3
(3) $\frac{1}{3}$ (4) $\frac{1}{7}$
(SSC CPO S.I. Exam. 05.09.2004)

27. If $\frac{a}{2} = \frac{b}{3} = \frac{c}{5}$, then $\frac{a+b+c}{c}$ is equal to
(1) 2 (2) 4
(3) 5 (4) 6
(SSC Data Entry Operator Exam. 31.08.2008)

28. If $0.13 + p^2 = 13$, then p is equal to
(1) 10 (2) 0.01
(3) 0.1 (4) 100
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

29. If $\frac{a}{3} = \frac{b}{2}$, then value of $\frac{2a+3b}{3a-2b}$ is
(1) $\frac{12}{5}$ (2) $\frac{5}{12}$
(3) 1 (4) $\frac{12}{7}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

30. For what value(s) of a is $x + \frac{1}{4}\sqrt{x} + a^2$ a perfect square?
(1) $\pm\frac{1}{18}$ (2) $\frac{1}{8}$
(3) $-\frac{1}{5}$ (4) $\frac{1}{4}$
(SSC CPO S.I. Exam. 03.09.2006)

31. If $a \neq b$, then which of the following statements is true ?
(1) $\frac{a+b}{2} = \sqrt{ab}$
(2) $\frac{a+b}{2} < \sqrt{ab}$
(3) $\frac{a+b}{2} > \sqrt{ab}$
(4) All of the above
(SSC CPO S.I. Exam. 03.09.2006)

32. If $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c} = 1$, then the value of $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c}$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone) & (SSC GL Tier-I Exam. 19.05.2013)

33. If x, y are two positive real numbers and $x^{1/3} = y^{1/4}$, then which of the following relations is *true*?
(1) $x^3 = y^4$ (2) $x^3 = y$
(3) $x = y^4$ (4) $x^{20} = y^{15}$
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

34. If $a^{2x+3} = 1$, where a is a positive real number other than 1, then x is equal to
(1) –2 (2) –1
(3) 0 (4) 1
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

35. If x is real, then the minimum value of $(x^2 - x + 1)$ is
(1) $\frac{3}{4}$ (2) 0
(3) 1 (4) $\frac{1}{4}$
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

36. If $\frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7} + b$, then the value of a is
(1) $\frac{11}{3}$ (2) $-\frac{4}{3}$
(3) $\frac{4}{3}$ (4) $\frac{-4\sqrt{7}}{3}$
(SSC CPO S.I. Exam. 16.12.2007)

37. If $(125)^x = 3125$, then the value of x is
(1) $\frac{1}{5}$ (2) $\frac{3}{5}$
(3) $\frac{5}{3}$ (4) $\frac{5}{7}$
(SSC CGL Prelim Exam. 27.07.200 (First Sitting

38. If $5^{\sqrt{x}} + 12^{\sqrt{x}} = 13^{\sqrt{x}}$, then x i equal to
(1) $\frac{25}{4}$ (2) 4
(3) 9 (4) 16
(SSC CGL Prelim Exam. 27.07.200 (First Sitting

39. If $2^{2x-y} = 16$ and $2^{x+y} = 32$, th value of xy is
(1) 2 (2) 4
(3) 6 (4) 8
(SSC CPO S.I. Exam. 06.09.2009

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40. If $\left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-6}=\left(\frac{3}{5}\right)^{2x-1}$, then x is equal to
(1) –2 (2) 2
(3) –1 (4) 1
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

41. If $\frac{2x-y}{x+2y}=\frac{1}{2}$, then value of $\frac{3x-y}{3x+y}$ is :
(1) $\frac{1}{5}$ (2) $\frac{3}{5}$
(3) $\frac{4}{5}$ (4) 1
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

42. If a and b be positive integers such that $a^2-b^2=19$, then the value of a is
(1) 19 (2) 20
(3) 9 (4) 10
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

43. $\frac{\sqrt{3+x}+\sqrt{3-x}}{\sqrt{3+x}-\sqrt{3-x}}=2$ then x is equal to
(1) $\frac{5}{12}$ (2) $\frac{12}{5}$
(3) $\frac{5}{7}$ (4) $\frac{7}{5}$
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

44. If $x+\frac{1}{x}=5$, then $\frac{2x}{3x^2-5x+3}$ is equal to
(1) 5 (2) $\frac{1}{5}$
(3) 3 (4) $\frac{1}{3}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

45. If $x=\frac{\sqrt{3}}{2}$, then the value of $\left(\frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}}\right)$ is
(1) $-\sqrt{3}$ (2) –1
(3) 1 (4) $\sqrt{3}$
(SSC SAS Exam. 26.06.2010 (Paper-1)

46. If $x=\frac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y=\frac{\sqrt{3}-1}{\sqrt{3}+1}$, then value of x^2+y^2 is :
(1) 14 (2) 13
(3) 15 (4) 10
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

47. If $4^{4x+1}=\frac{1}{64}$, then the value of x is
(1) $\frac{1}{2}$ (2) –1
(3) $-\frac{1}{2}$ (4) $-\frac{1}{6}$
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

48. If $\frac{\sqrt{x+4}+\sqrt{x-4}}{\sqrt{x+4}-\sqrt{x-4}}=2$ then x is equal to
(1) 2.4 (2) 3.2
(3) 4 (4) 5
(SSC (South Zone) Investigator Exam.12.09.2010)

49. If $\sqrt{2^x}=256$, then the value of x is
(1) 14 (2) 16
(3) 18 (4) 20
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

50. If $\left(\sqrt{5}\right)^7+\left(\sqrt{5}\right)^5=5^p$, then the value of p is
(1) 5 (2) 2
(3) $\frac{3}{2}$ (4) 1
(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

51. If $\sqrt{1-\frac{x^3}{100}}=\frac{3}{5}$, then x equals
(1) 2 (2) 4
(3) 16 (4) $(136)^{1/3}$
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

52. If $a \star b = 2a+3b-ab$, then the value of $(3 \star 5+5 \star 3)$ is
(1) 10 (2) 6
(3) 4 (4) 2
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

53. If $\sqrt{1+\frac{x}{9}}=\frac{13}{3}$, then the value of x is
(1) $\frac{1439}{9}$ (2) 160
(3) $\frac{1443}{9}$ (4) 169
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

54. If $\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}=a+b\sqrt{6}$, then the values of a and b are respectively
(1) $\frac{9}{15},-\frac{4}{15}$ (2) $\frac{3}{11},\frac{4}{33}$
(3) $\frac{9}{10},\frac{2}{5}$ (4) $\frac{3}{5},\frac{4}{15}$
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

55. If $x+y=2z$ then the value of $\frac{x}{x-z}+\frac{z}{y-z}$ is
(1) 1 (2) 3
(3) $\frac{1}{2}$ (4) 2
(SSC Delhi Police S.I.(SI) Exam. 19.06.2012)

56. If $a * b = a^b$, then the value of $5 * 3$ is
(1) 125 (2) 243
(3) 53 (4) 15
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

57. If $\sqrt{0.03\times0.3a}=0.3\times0.3\times\sqrt{b}$, value of $\frac{a}{b}$ is
(1) 0.009 (2) 0.03
(3) 0.9 (4) 0.08
(SSC CGL Tier-1 Exam 19.06.2011 (Second Sitting)

58. If $x * y = (x+3)^2(y-1)$, then the value of $5 * 4$ is
(1) 192 (2) 182
(3) 180 (4) 172
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

59. If $9\sqrt{x}=\sqrt{12}+\sqrt{147}$, then $x=?$
(1) 2 (2) 3
(3) 4 (4) 5
(SSC CGL Tier-1 Exam 26.06.2011 (First Sitting)

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60. If $X * Y = X^2 + Y^2 - XY$ then $11 * 13$ is
(1) 117 (2) 147
(3) 290 (4) 433
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

61. If $\sqrt{1+\frac{x}{961}} = \frac{32}{31}$, then the value of x is
(1) 63 (2) 61
(3) 65 (4) 64
(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

62. If $\sqrt{0.04 \times 0.4 \times a} = 0{\cdot}004 \times 0{\cdot}4 \times \sqrt{b}$, then the value of $\frac{a}{b}$ is
(1) 16×10^{-3} (2) 16×10^{-4}
(3) 16×10^{-5} (4) 16×10^{-6}
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

63. The expression $x^4 - 2x^2 + k$ will be a perfect square when the value of k is
(1) 2 (2) 1
(3) –1 (4) –2
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

64. If $2^{x+3} = 32$, then the value of 3^{x+1} is equal to
(1) 27 (2) 81
(3) 72 (4) 9
FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

65. The value of the expression $x^4 - 17x^3 + 17x^2 - 17x + 17$ at $x = 16$ is
(1) 0 (2) 1
(3) 2 (4) 3
FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

66. If $\frac{x}{y} = \frac{3}{4}$, the value of $\frac{6}{7} + \frac{y-x}{y+x}$ is :
(1) 1 (2) $\frac{2}{7}$
(3) $\frac{3}{7}$ (4) $1\frac{3}{7}$
(SSC CPO S.I.Exam.26.05.2005)

67. If $n + \frac{2}{3}n + \frac{1}{2}n + \frac{1}{7}n = 97$ then the value of n is
(1) 40 (2) 42
(3) 44 (4) 46
(SSC Data Entry Operator Exam. 31.08.2008)

68. If $x^2 - 3x + 1 = 0$, then the vaule of $x + \frac{1}{x}$ is
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Prelim Exam. 04.03.2007 (First Sitting)

69. If $1.5\ a = 0.04\ b$ then $\frac{b-a}{b+a}$ is equal to
(1) $\frac{73}{77}$ (2) $\frac{77}{33}$
(3) $\frac{2}{75}$ (4) $\frac{75}{2}$
(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

70. If $x = \left(\sqrt{2}+1\right)^{-\frac{1}{3}}$, the value of $\left(x^3 - \frac{1}{x^3}\right)$ is
(1) 0 (2) $-\sqrt{2}$
(3) –2 (4) $3\sqrt{2}$
(SSC SAS Exam. 26.06.2010 (Paper-1)

71. If $\frac{x^2-x+1}{x^2+x+1} = \frac{2}{3}$, then the value of $\left(x + \frac{1}{x}\right)$ is
(1) 4 (2) 5
(3) 6 (4) 8
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

72. If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = 3$, then $\frac{2a^2+3c^2+4e^2}{2b^2+3d^2+4f^2} = ?$
(1) 2 (2) 3
(3) 4 (4) 9
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

73. If x, y and z are real numbers such that $(x-3)^2 + (y-4)^2 + (z-5)^2 = 0$ then $(x + y + z)$ is equal to
(1) –12 (2) 0
(3) 8 (4) 12
(SSC Data Entry Operator Exam. 31.08.2008)

74. If $x = 7 - 4\sqrt{3}$, then $\sqrt{x} + \frac{1}{\sqrt{x}}$ is equal to :
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CPO S.I.Exam.26.05.2005)

75. If $(a-1)^2 + (b+2)^2 + (c+1)^2 = 0$, then the value of $2a - 3b + 7c$ is
(1) 12 (2) 3
(3) –11 (4) 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

76. If $2x + \frac{1}{3x} = 5$, find the value of $\frac{5x}{6x^2+20x+1}$.
(1) $\frac{1}{4}$ (2) $\frac{1}{6}$
(3) $\frac{1}{5}$ (4) $\frac{1}{7}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

77. If x varies inversely as $(y^2 - 1)$ and is equal to 24 when $y = 10$, then the value of x when $y = 5$ is
(1) 99 (2) 12
(3) 24 (4) 100
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

78. If $x^2 + y^2 + 2x + 1 = 0$, then the value of $x^{31} + y^{25}$ is
(1) –1 (2) 0
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

79. If $\frac{x}{2x^2+5x+2} = \frac{1}{6}$, then value of $\left(x + \frac{1}{x}\right)$ is :
(1) 2 (2) $\frac{1}{2}$
(3) $-\frac{1}{2}$ (4) –2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

80. If a, b, c are real and $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $2a - 3b + 4c$ is
(1) –1 (2) 0
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone) & (SSC GL Tier-I Exam. 21.04.2013) & (SSC CHSL DEO & LDC Exam. 20.10.2013)

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81. If $(3a+1)^2+(b-1)^2+(2c-3)^2=0$, then the value of $(3a+b+2c)$ is equal to :
(1) 3 (2) –1
(3) 2 (4) 5
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

82. The value of the expression
$$\frac{(a-b)^2}{(b-c)(c-a)}+\frac{(b-c)^2}{(a-b)(c-a)}+\frac{(c-a)^2}{(a-b)(b-c)}$$ is :
(1) 0 (2) 3
(3) $\frac{1}{3}$ (4) 2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone) & (SSC CHSL DEO & LDC Exam. 27.10.2013)

83. If $(a-3)^2+(b-4)^2+(c-9)^2=0$, then the value of $\sqrt{a+b+c}$ is :
(1) – 4 (2) 4
(3) ± 4 (4) ± 2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

84. If $a^2b=abc=180$, a, b, c are positive integers, then the value of c is
(1) 110 (2) 1
(3) 4 (4) 25
(SSC Graduate Level Tier-II Exam. 16.09.2012)

85. If $(x-3)^2+(y-5)^2+(z-4)^2=0$, then the value of
$$\frac{x^2}{9}+\frac{y^2}{25}+\frac{z^2}{16}$$ is
(1) 12 (2) 9
(3) 3 (4) 1
(SSC Graduate Level Tier-I Exam. 19.05.2013)

86. If a, b are rational numbers and $(a-1)\sqrt{2}+3=b\sqrt{2}+a$, the value of $(a+b)$ is
(1) –5 (2) 3
(3) –3 (4) 5
(SSC Graduate Level Tier-II Exam. 16.09.2012)

87. If $a=\frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b=\frac{\sqrt{5}-1}{\sqrt{5}+1}$, then the value of
$$\frac{a^2+ab+b^2}{a^2-ab+b^2}$$ is
(1) $\frac{3}{4}$ (2) $\frac{4}{3}$
(3) $\frac{3}{5}$ (4) $\frac{5}{3}$
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

88. If $64^{x+1}=\frac{64}{4^x}$, then the value of x is
(1) 1 (2) 0
(3) $\frac{1}{2}$ (4) 2
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

89. If $ax^2+bx+c=a(x-p)^2$, then the relation among a, b, c would be
(1) $abc=1$ (2) $b^2=ac$
(3) $b^2=4ac$ (4) $2b=a+c$
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

90. If $a+b+c+d=1$, then the maximum value of $(1+a)(1+b)(1+c)(1+d)$ is
(1) 1 (2) $\left(\frac{1}{2}\right)^3$
(3) $\left(\frac{3}{4}\right)^3$ (4) $\left(\frac{5}{4}\right)^4$
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

91. x varies inversely as square of y. Given that $y=2$ for $x=1$, the value of x for $y=6$ will be equal to
(1) 3 (2) 9
(3) $\frac{1}{3}$ (4) $\frac{1}{9}$
(SSC Multi-Tasking Staff , Exam. 17.03.2013, Kolkata Region)

92. If $x=\frac{\sqrt{3}}{2}$, then
$$\frac{\sqrt{1+x}}{1+\sqrt{1+x}}+\frac{\sqrt{1-x}}{1-\sqrt{1-x}}$$ is equal to
(1) 1 (2) $2/\sqrt{3}$
(3) $2-\sqrt{3}$ (4) 2
(SSC CPO S.I. Exam. 03.09.2006)

93. If $a^2+b^2+c^2+3=2(a-b-c)$, then the value of $2a-b+c$ is :
(1) 3 (2) 4
(3) 0 (4) 2
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

94. If $x^2-y^2=80$ and $x-y=8$, then the average of x and y is
(1) 2 (2) 3
(3) 4 (4) 5
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

95. If for non-zero, x, $x^2-4x-1=0$, the value of $x^2+\frac{1}{x^2}$ is
(1) 4 (2) 10
(3) 12 (4) 18
(SSC Section Officer (Commercial Audit) Exam. 28.11.2006 (Second Sitting)

96. The third proportional to $\left(\frac{x}{y}+\frac{y}{x}\right)$ and $\sqrt{x^2+y^2}$ is,
(1) xy (2) $\sqrt{xy}$
(3) $\sqrt[3]{xy}$ (4) $\sqrt[4]{xy}$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

97. If $\frac{4x}{3}+2P=12$ for what value of P, $x=6$?
(1) 6 (2) 4
(3) 2 (4) 1
(SSC Graduate Level Tier-I Exam. 19.05.2013)

98. The value of $\frac{4+3\sqrt{3}}{7+4\sqrt{3}}$ is
(1) $5\sqrt{3}-8$ (2) $5\sqrt{3}+8$
(3) $8\sqrt{3}+5$ (4) $8\sqrt{3}-5$
(SSC Graduate Level Tier-I Exam. 19.05.2013)

99. Let
$a=\sqrt{6}-\sqrt{5}$, $b=\sqrt{5}-2$,
$c=2-\sqrt{3}$
Then point out the correct alternative among the four alternatives given below.
(1) $b<a<c$ (2) $a<c<b$
(3) $b<c<a$ (4) $a<b<c$
(SSC CHSL DEO & LDC Exam. 20.10.2013)

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100. If $x = \frac{4\sqrt{15}}{\sqrt{5}+\sqrt{3}}$, the value of

$\frac{x+\sqrt{20}}{x-\sqrt{20}} + \frac{x+\sqrt{12}}{x-\sqrt{12}}$ is

(1) 1 (2) 2

(3) $\sqrt{3}$ (4) $\sqrt{5}$

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

101. If $x = 5 - \sqrt{21}$, then the value of

$\frac{\sqrt{x}}{\sqrt{32-2x-\sqrt{21}}}$ is

(1) $\frac{1}{\sqrt{2}}(\sqrt{3}-\sqrt{7})$

(2) $\frac{1}{\sqrt{2}}(\sqrt{7}-\sqrt{3})$

(3) $\frac{1}{\sqrt{2}}(\sqrt{7}+\sqrt{3})$

(4) $\frac{1}{\sqrt{2}}(7-\sqrt{3})$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

102. If $6x - 5y = 13$, $7x + 2y = 23$ then $11x + 18y =$

(1) –15 (2) 51

(3) 33 (4) 15

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

103. The value of

$\left(x^{b+c}\right)^{b-c}\left(x^{c+a}\right)^{c-a}\left(x^{a+b}\right)^{a-b}$,

$(x \neq 0)$ is

(1) 1 (2) 2

(3) –1 (4) 0

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

104. If $\frac{x}{a} = \frac{1}{a} - \frac{1}{x}$, then the value of $x - x^2$ is :

(1) $-a$ (2) $\frac{1}{a}$

(3) $-\frac{1}{a}$ (4) a

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

105. If $x + \frac{1}{x} = 99$, find the value of

$\frac{100x}{2x^2+102x+2}$

(1) $\frac{1}{6}$ (2) $\frac{1}{2}$

(3) $\frac{1}{3}$ (4) $\frac{1}{4}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

106. If $\frac{4x-3}{x} + \frac{4y-3}{y} + \frac{4z-3}{z} = 0$, then the value of $\frac{1}{x} + \frac{1}{y} + \frac{1}{z}$ is

(1) 9 (2) 3

(3) 4 (4) 6

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

107. If $\frac{xy}{x+y} = a, \frac{xz}{x+z} = b$ and $\frac{yz}{y+z} = c$, where a, b, c are all non-zero numbers, then x equals to

(1) $\frac{2abc}{ab+bc-ac}$

(2) $\frac{2abc}{ab+ac-bc}$

(3) $\frac{2abc}{ac+bc-ab}$

(4) $\frac{2abc}{ab+bc+ac}$

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

108. If $x = 3 + \sqrt{8}$, then $x^2 + \frac{1}{x^2}$ is equal to

(1) 38 (2) 36

(3) 34 (4) 30

(SSC CGL Prelim Exam. 04.02.2007 (Ist Sitting) & (SSC CGL Prelim Exam. 27.07.2006 (IInd Sitting) & (SSC Investigator Exam. 12.09.2010) (South Zone)

109. If x and y are positive real numbers and $xy = 8$, then the minimum value of $2x + y$ is

(1) 9 (2) 17

(3) 10 (4) 8

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

110. If the expression $x^2 + x + 1$ is written in the form $\left(x+\frac{1}{2}\right)^2 + q^2$, then the possible values of q are

(1) $\pm\frac{1}{3}$ (2) $\pm\frac{\sqrt{3}}{2}$

(3) $\pm\frac{2}{\sqrt{3}}$ (4) $\pm\frac{1}{2}$

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

111. If $a^2 - 4a - 1 = 0$, then value of $a^2 + \frac{1}{a^2} + 3a - \frac{3}{a}$ is

(1) 25 (2) 30

(3) 35 (4) 40

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

112. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$, then $c + \frac{1}{a}$ is equal to

(1) 0 (2) $\frac{1}{2}$

(3) 1 (4) 2

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

113. The minimum value of $(x-2)(x-9)$ is

(1) $-\frac{11}{4}$ (2) $\frac{49}{4}$

(3) 0 (4) $-\frac{49}{4}$

(SSC Graduate Level Tier-I Exam. 21.04.2013)

114. One of the factors of the expression $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ is :

(1) $4x + \sqrt{3}$ (2) $4x + 3$

(3) $4x - 3$ (4) $4x - \sqrt{3}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

115. If $\sqrt{x} = \sqrt{3} - \sqrt{5}$, then the value of $x^2 - 16x + 6$ is

(1) 0 (2) –2

(3) 2 (4) 4

(SSC Graduate Level Tier-II Exam. 29.09.2013

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116. If $x-\frac{1}{x}=4$, then $\left(x+\frac{1}{x}\right)$ is equal to

(1) $5\sqrt{2}$ (2) $2\sqrt{5}$

(3) $4\sqrt{2}$ (4) $4\sqrt{5}$

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

117. If $x=5+2\sqrt{6}$, then the value of $\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)$ is,

(1) $2\sqrt{2}$ (2) $3\sqrt{2}$

(3) $2\sqrt{3}$ (4) $3\sqrt{3}$

(SSC SAS Exam 26.06.2010 (Paper-I)

118. For $a>b$, if $a+b=5$ and $ab=6$, then the value of (a^2-b^2) is

(1) 1 (2) 3

(3) 5 (4) 7

(SSC (South Zone) Investigator Exam. 12.09.2010)

119. If $1.5x=0.04y$, then the value of $\frac{y^2-x^2}{y^2+2xy+x^2}$ is

(1) $\frac{730}{77}$ (2) $\frac{73}{77}$

(3) $\frac{73}{770}$ (4) $\frac{74}{77}$

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

120. If $a^{\frac{1}{3}}=11$, then the value of a^3-331a is

(1) 1331331 (2) 1331000

(3) 1334331 (4) 1330030

(SSC CGL Tier-1 Exam 26.06.2011 (Second Sitting)

121. If $x^2+y^2+\frac{1}{x^2}+\frac{1}{y^2}=4$, then the value of x^2+y^2 is

(1) 2 (2) 4

(3) 8 (4) 16

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

122. If $x^2=y+z$, $y^2=z+x$, $z^2=x+y$, then the value of $\frac{1}{x+1}+\frac{1}{y+1}+\frac{1}{z+1}$ is

(1) –1 (2) 1

(3) 2 (4) 4

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I) & (SSC CHSL DEO & LDC Exam. 04.12.2011) (Ist Sitting) & (SSC CGL Tier-I Exam. 19.05.2013) (Ist Sitting)

123. If $a^2+b^2=2$ and $c^2+d^2=1$, then the value of $(ad-bc)^2+(ac+bd)^2$ is

(1) $\frac{4}{9}$ (2) $\frac{1}{2}$

(3) 1 (4) 2

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

124. If $a^2+b^2+c^2+3=2(a+b+c)$ then the value of $(a+b+c)$ is

(1) 2 (2) 3

(3) 4 (4) 5

(FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

125. If $x-\frac{1}{x}=5$, then $x^2+\frac{1}{x^2}$ is :

(1) 5 (2) 25

(3) 27 (4) 23

(FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

126. If $x=3+2\sqrt{2}$, then the value of $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)$ is :

(1) 1 (2) 2

(3) $2\sqrt{2}$ (4) $3\sqrt{3}$

(SSC CPO S.I. Exam. 12.01.2003) & (FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

127. If $x=\sqrt{3}+\sqrt{2}$, then the value of $\left(x^2+\frac{1}{x^2}\right)$ is :

(1) 4 (2) 6

(3) 9 (4) 10

(SSC CHSL DEO & LDC Exam. 27.11.2010)

128. If $x+\frac{9}{x}=6$, then the value of $(x^2+\frac{9}{x^2})$ is

(1) 8 (2) 9

(3) 10 (4) 12

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

129. If $x=\frac{4ab}{a+b}$ $(a\neq b)$, the value of $\frac{x+2a}{x-2a}+\frac{x+2b}{x-2b}$ is

(1) a (2) b

(3) 2 ab (4) 2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

130. If $m+\frac{1}{m-2}=4$, find the value of $(m-2)^2+\frac{1}{(m-2)^2}$.

(1) –2 (2) 0

(3) 2 (4) 4

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone) & (SSC GL Tier-I Exam. 21.04.2013)

131. If $a^2+b^2+2b+4a+5=0$, then the value of $\frac{a-b}{a+b}$ is

(1) 3 (2) –3

(3) $\frac{1}{3}$ (4) $-\frac{1}{3}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

132. If $x-y=\frac{x+y}{7}=\frac{xy}{4}$, the numerical value of xy is

(1) $\frac{4}{3}$ (2) $\frac{3}{4}$

(3) $\frac{1}{4}$ (4) $\frac{1}{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

133. If $x+y+z=0$, then $\frac{x^2}{yz}+\frac{y^2}{zx}+\frac{z^2}{xy}=?$

(1) $(xyz)^2$ (2) $x^2+y^2+z^2$

(3) 9 (4) 3

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone) & (SSC GL Tier-I Exam.19.05.2013 (Ist Sitting)

134. If $a+b+c=0$, then the value of $\frac{1}{(a+b)(b+c)}+\frac{1}{(a+c)(b+a)}+\frac{1}{(c+a)(c+b)}$ is:

(1) 1 (2) 0

(3) –1 (4) –2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

135. If $a+b+c=0$, then the value of $\frac{a^2+b^2+c^2}{a^2-bc}$ is

(1) 0 (2) 1

(3) 2 (4) 3

(SSC Graduate Level Tier-II Exam. 16.09.2012)

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136. If $n = 7 + 4\sqrt{3}$, then the value of $\left(\sqrt{n} + \frac{1}{\sqrt{n}}\right)$ is

(1) $2\sqrt{3}$ (2) 4

(3) -4 (4) $-2\sqrt{3}$

(SSC Graduate Level Tier-II Exam. 16.09.2012)

137. If $x = \sqrt{3} + \sqrt{2}$, then the value of $\left(x + \frac{1}{x}\right)$ is

(1) $2\sqrt{2}$ (2) $2\sqrt{3}$

(3) 2 (4) 3

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

138. If $p + q = 10$ and $pq = 5$, then the numerical value of $\frac{p}{q} + \frac{q}{p}$ will be

(1) 16 (2) 20

(3) 22 (4) 18

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

139. If $x = 3 + 2\sqrt{2}$ and $xy = 1$, then the value of $\frac{x^2 + 3xy + y^2}{x^2 - 3xy + y^2}$ is

(1) $\frac{30}{31}$ (2) $\frac{70}{31}$

(3) $\frac{35}{31}$ (4) $\frac{37}{31}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

140. If $\frac{x}{b+c} = \frac{y}{c+a} = \frac{z}{a+b}$, then

(1) $\frac{x-y}{b-a} = \frac{y-z}{c-b} = \frac{z-x}{a-c}$

(2) $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$

(3) $\frac{x-y}{c} = \frac{y-z}{b} = \frac{z-x}{c}$

(4) None of the above is true

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

141. If $a + b + c = 0$, then the value of

$\left(\frac{a+b}{c} + \frac{b+c}{a} + \frac{c+a}{b}\right)$

$\left(\frac{a}{b+c} + \frac{b}{c+a} + \frac{c}{a+b}\right)$ is :

(1) 8 (2) -3

(3) 9 (4) 0

(SSC Graduate Level Tier-I Exam. 21.04.2013)

142. If a, b, c are non-zero, $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$, then the value of abc is :

(1) -1 (2) 3

(3) -3 (4) 1

(SSC Graduate Level Tier-I Exam. 21.04.2013)

143. If $a + b + c = 2s$, then

$\frac{(s-a)^2 + (s-b)^2 + (s-c)^2 + s^2}{a^2 + b^2 + c^2}$

is equal to

(1) $a^2 + b^2 + c^2$ (2) 0

(3) 1 (4) 2

(SSC Graduate Level Tier-I Exam. 21.04.2013)

144. If $x = 3 + 2\sqrt{2}$, the value of $x^2 + \frac{1}{x^2}$ is

(1) 36 (2) 30

(3) 32 (4) 34

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

145. If $x\left(3 - \frac{2}{x}\right) = \frac{3}{x}$, then the value of $x^2 + \frac{1}{x^2}$ is

(1) $2\frac{1}{9}$ (2) $2\frac{4}{9}$

(3) $3\frac{1}{9}$ (4) $3\frac{4}{9}$

(SSC Graduate Level Tier-I Exam. 19.05.2013)

146. If $x^2 - 3x + 1 = 0$, then the value of $x^2 + x + \frac{1}{x} + \frac{1}{x^2}$ is

(1) 10 (2) 2

(3) 6 (4) 8

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

147. If $a^2 + b^2 = 5ab$, then the value of $\left(\frac{a^2}{b^2} + \frac{b^2}{a^2}\right)$ is :

(1) 32 (2) 16

(3) 23 (4) -23

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

148. If $xy + yz + zx = 0$, then

$\left(\frac{1}{x^2 - yz} + \frac{1}{y^2 - zx} + \frac{1}{z^2 - xy}\right)$

$(x, y, z \neq 0)$ is equal to

(1) 3 (2) 1

(3) $x + y + z$ (4) 0

(SSC CHSL DEO & LDC Exam. 20.10.2013)

149. If $a + b + c = 9$ (where a, b, c are real numbers), then the minimum value of $a^2 + b^2 + c^2$ is

(1) 100 (2) 9

(3) 27 (4) 81

(SSC CHSL DEO & LDC Exam. 20.10.2013)

150. If $x + y + z = 13$ and $x^2 + y^2 + z^2 = 69$, then $xy + z(x + y)$ is equal to

(1) 70 (2) 40

(3) 50 (4) 60

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

151. If a = 0.1039, then the value of $\sqrt{4a^2 - 4a + 1} + 3a$ is

(1) 0.1039 (2) 0.2078

(3) 1.1039 (4) 2.1039

(SSC CPO S.I. Exam.12.01.2003)

152. If a = 0.25, b = $-$ 0.05, c = 0.5, then the value of

$\frac{a^2 - b^2 - c^2 - 2bc}{a^2 + b^2 - 2ab - c^2}$ is

(1) $\frac{7}{8}$ (2) $\frac{14}{17}$

(3) 1 (4) $\frac{25}{16}$

(SSC CPO S.I. Exam. 12.01.2003)

153. If $a = 23$ and $b = -29$ then the value of $25a^2 + 40ab + 16b^2$ is :

(1) 1 (2) -1

(3) 0 (4) 2

FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

154. If $x - y = 2$ and $x^2 + y^2 = 20$, then value of $(x + y)^2$ is

(1) 38 (2) 36

(3) 16 (4) 12

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

155. If $x^2 + y^2 - 4x - 4y + 8 = 0$, then the value of $x - y$ is

(1) 4 (2) -4

(3) 0 (4) 8

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

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156. If $x = b + c - 2a$, $y = c + a - 2b$, $z = a + b - 2c$, then the value of $x^3 + y^3 - z^3 + 2xy$ is

(1) 0 (2) $a + b + c$

(3) $a - b + c$ (3) $a + b - c$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

157. For real a, b, c if $a^2 + b^2 + c^2 = ab + bc + ca$, then value of $\frac{a+c}{b}$ is

(1) 1 (2) 2

(3) 3 (4) 0

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone) & (SSC CHSL DEO & LDC Exam. 10.11.2013)

158. If $x - y = 2$, $xy = 24$, then the value of $(x^2 + y^2)$ is :

(1) 25 (2) 36

(3) 63 (4) 52

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

159. If the expression $\frac{x^2}{y^2} + tc + \frac{y^2}{4}$ is a perfect square, then the values of t is

(1) ± 1 (2) ± 2

(3) 0 (4) ± 3

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

160. If $a = x + y$, $b = x - y$, $c = x + 2y$, then $a^2 + b^2 + c^2 - ab - bc - ca$ is

(1) $4y^2$ (2) $5y^2$

(3) $6y^2$ (4) $7y^2$

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

161. If $a^2 + b^2 + c^2 = ab + bc + ca$, where a, b, c are non zero real numbers, then the value of $\frac{a+b}{c}$ is

(1) 2 (2) 1

(3) 0 (4) –1

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

162. If $a^2 + b^2 + 4c^2 = 2(a + b - 2c) - 3$ and a, b, c are real, then the value of $(a^2 + b^2 + c^2)$ is

(1) 3 (2) $3\frac{1}{4}$

(3) 2 (4) $2\frac{1}{4}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

163. If $\frac{x-a^2}{b+c} + \frac{x-b^2}{c+a} + \frac{x-c^2}{a+b} = 4(a + b + c)$, then x is equal to

(1) $(a + b + c)^2$

(2) $a^2 + b^2 + c^2$

(3) $ab + bc + ca$

(4) $a^2 + b^2 + c^2 - ab - bc - ca$

(SSC Graduate Level Tier-II Exam. 29.09.2013)

164. Number of solutions of the two equations $4x - y = 2$ and $2y - 8x + 4 = 0$ is

(1) zero (2) one

(3) two

(4) infinitely many

(SSC CHSL DEO & LDC Exam. 20.10.2013)

165. If $\frac{a}{b} = \frac{4}{5}$ and $\frac{b}{c} = \frac{15}{16}$, then $\frac{18c^2 - 7a^2}{45c^2 + 20a^2}$ is equal to

(1) $\frac{1}{3}$ (2) $\frac{2}{5}$

(3) $\frac{3}{4}$ (4) $\frac{1}{4}$

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

166. If $x \neq 0$, $y \neq 0$ and $z \neq 0$ and $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx}$, then the relation among x, y, z is

(1) $x + y + z = 0$

(2) $x + y = z$

(3) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$

(4) $x = y = z$

(SSC Graduate Level Tier-I Exam. 21.04.2013)

167. The term to be added to $121a^2 + 64b^2$ to make a perfect square is

(1) $176\,ab$ (2) $276\,a^2b$

(3) $178\,ab$ (4) $188\,b^2a$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

168. If $a = 2 + \sqrt{3}$, then the value of $\left(a^2 + \frac{1}{a^2}\right)$ is

(1) 12 (2) 14

(3) 16 (4) 10

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

169. For what valsue (s) of k the expression $p + \frac{1}{4}\sqrt{p} + k^2$ is a perfect square ?

(1) $\pm\frac{1}{3}$ (2) $\pm\frac{1}{4}$

(3) $\pm\frac{1}{8}$ (4) $\pm\frac{1}{2}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

170. If $\frac{b-c}{a} + \frac{a+c}{b} + \frac{a-b}{c} = 1$ and $a - b + c \neq 0$ then which one of the following relations is true ?

(1) $\frac{1}{c} = \frac{1}{a} + \frac{1}{b}$ (2) $\frac{1}{a} = \frac{1}{b} + \frac{1}{c}$

(3) $\frac{1}{b} = \frac{1}{a} - \frac{1}{c}$ (4) $\frac{1}{b} = \frac{1}{a} + \frac{1}{c}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

171. If $a + b = 1$, $c + d = 1$ and $a - b = \frac{d}{c}$, then the value of $c^2 - d^2$ is

(1) $\frac{a}{b}$ (2) $\frac{b}{a}$

(3) 1 (4) –1

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

172. If $x = 3t$, $y = \frac{1}{2}(t + 1)$, then the value of t for which $x = 2y$ is

(1) 1 (2) $\frac{1}{2}$

(3) –1 (4) $\frac{2}{3}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

173. If $x^2 + \frac{1}{5}x + a^2$ is a perfect square, then a is

(1) $\frac{1}{100}$ (2) $\pm\frac{1}{10}$

(3) $\frac{1}{10}$ (4) $-\frac{1}{10}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

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174. Find the value of x for which the expression $2 - 3x - 4x^2$ has the greatest value.

(1) $-\frac{41}{16}$ (2) $\frac{3}{8}$

(3) $-\frac{3}{8}$ (4) $\frac{41}{16}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

175. The expression $x^4 - 2x^2 + k$ will be a perfect square if the value of k is

(1) 1 (2) 0

(3) $\frac{1}{4}$ (4) $\frac{1}{2}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

176. If $(x-1)$ and $(x+3)$ are the factors of $x^2 + k_1x + k_2$ then

(1) $k_1 = -2, k_2 = -3$
(2) $k_1 = 2, k_2 = -3$
(3) $k_1 = 2, k_2 = 3$
(4) $k_1 = -2, k_2 = 3$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

177. If $\frac{5x}{2x^2+5x+1} = \frac{1}{3}$, then the value of $\left(x + \frac{1}{2x}\right)$ is

(1) 15 (2) 10
(3) 20 (4) 5

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

178. The reciprocal of $x + \frac{1}{x}$ is

(1) $\frac{x}{x^2+1}$ (2) $\frac{x}{x+1}$

(3) $x - \frac{1}{x}$ (4) $\frac{1}{x} + x$

(SSC CGL Tier-I Exam. 26.10.2014)

179. If a, b, c are positive and $a + b + c = 1$, then the least value of $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ is

(1) 9 (2) 5
(3) 3 (4) 1

(SSC CGL Tier-I Exam. 26.10.2014)

180. If $a(2+\sqrt{3}) = b(2-\sqrt{3}) = 1$, then the value of $\frac{1}{a^2+1} + \frac{1}{b^2+1}$ is

(1) –5 (2) 1
(3) 4 (4) 9

(SSC CGL Tier-I Exam. 26.10.2014)

181. If $(2+\sqrt{3})a = (2-\sqrt{3})b = 1$ then the value of $\frac{1}{a} + \frac{1}{b}$ is

(1) 1 (2) 2

(3) $2\sqrt{3}$ (4) 4

(SSC CGL Tier-II Exam. 21.09.2014)

182. If $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$ $(a \neq b \neq c)$, then the value of abc is

(1) ± 1 (2) ± 2

(3) 0 (4) $\pm \frac{1}{2}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

183. If $\frac{x}{y} = \frac{4}{5}$, then the value of $\left(\frac{4}{7} + \frac{2y-x}{2y+x}\right)$ is

(1) $\frac{3}{7}$ (2) $1\frac{1}{7}$

(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 9.11.2014)

184. If $(x-2)$ is a factor of $x^2 + 3Qx - 2Q$, then the value of Q is

(1) 2 (2) –2
(3) 1 (4) –1

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

185. If $a + b = 12$, $ab = 22$, then $(a^2 + b^2)$ is equal to

(1) 188 (2) 144
(3) 34 (4) 100

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

186. If $x = \sqrt{3} - \frac{1}{\sqrt{3}}$ and $y = \sqrt{3} + \frac{1}{\sqrt{3}}$, then the value of $\frac{x^2}{y} + \frac{y^2}{x}$ is

(1) $\sqrt{3}$ (2) $3\sqrt{3}$

(3) $16\sqrt{3}$ (4) $2\sqrt{3}$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

187. If $x^2 + ax + b$ is a perfect square, then which one of the following relations between a and b is true?

(1) $a^2 = b$ (2) $a^2 = 4b$
(3) $b^2 = 4a$ (4) $b^2 = a$

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

188. If $a + b + c + d = 4$, then find the value of

$$\frac{1}{(1-a)(1-b)(1-c)} + \frac{1}{(1-b)(1-c)(1-d)} + \frac{1}{(1-c)(1-d)(1-a)} + \frac{1}{(1-d)(1-a)(1-b)}$$

(1) 0 (2) 5
(3) 1 (4) 4

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

189. If $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$, then a relation among a, b, c is

(1) $a + b + c = 0$
(2) $(a + b + c)^3 = 27abc$
(3) $a + b + c = 3abc$
(4) $a^3 + b^3 + c^3 = 0$

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

190. If $a = \sqrt{6} + \sqrt{5}$, $b = \sqrt{6} - \sqrt{5}$ then $2a^2 - 5ab + 2b^2 = ?$

(1) 38 (2) 39
(3) 40 (4) 41

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

191. If $a^2 + b^2 + c^2 = 2a - 2b - 2$, then the value of $3a - 2b + c$ is

(1) 0 (2) 3
(3) 5 (4) 2

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

192. If $a + b + c = 3$, $a^2 + b^2 + c^2 = 6$ and $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 1$, where a, b, c are all non-zero, then 'abc' is equal to

(1) $\frac{2}{3}$ (2) $\frac{3}{2}$

(3) $\frac{1}{2}$ (4) $\frac{1}{3}$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

193. If $a^2 - 4a - 1 = 0$, $a \neq 0$, then the value of $a^2 + 3a + \frac{1}{a^2} - \frac{3}{a}$ is

(1) 24 (2) 26
(3) 28 (4) 30

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

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194. If $x = 2 + \sqrt{3}$, then $x^2 + \frac{1}{x^2}$ is equal to
(1) 10 (2) 12
(3) -12 (4) 14
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

195. If $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $(a + b + c)$ is
(1) 0 (2) 1
(3) -1 (4) 2
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, Ist Sitting TF No. 333 LO 2)

196. If x is a prime number and $-1 \le \frac{2x-7}{5} \le 1$ then the number of values of x is
(1) 4 (2) 3
(3) 2 (4) 5
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

197. If $\frac{3-5x}{2x} + \frac{3-5y}{2y} + \frac{3-5z}{2z} = 0$, the value of $\frac{2}{x} + \frac{2}{y} + \frac{2}{z}$ is
(1) 20 (2) 5
(3) 10 (4) 15
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

198. If $2s = a + b + c$, then the value of $s(s - c) + (s - a)(s - b)$ is
(1) ab (2) abc
(3) 0 (4) $\frac{a+b+c}{2}$
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

199. If $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}$, then the value of $\left(p + \frac{1}{p}\right)$ is
(1) 7 (2) $\frac{2}{5}$
(3) 1 (4) 10
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

200. If $\sqrt{1 + \frac{27}{169}} = 1 + \frac{x}{13}$, then x equals
(1) 1 (2) 27
(3) 13 (4) $3\sqrt{3}$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

201. If $2x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $a > 0$, then the value of $\frac{\sqrt{x^2 - 1}}{x - \sqrt{x^2 - 1}}$ is
(1) $a + 1$ (2) $\frac{1}{2}(a + 1)$
(3) $\frac{1}{2}(a - 1)$ (4) $a - 1$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

202. If a, b, c are real numbers and $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $a + b + c$ is
(1) -1 (2) 1
(3) 3 (4) 0
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

203. If $\frac{a+b-c}{a+b} = \frac{b+c-a}{b+c} = \frac{c+a-b}{c+a}$ and $a + b + c \neq 0$, then
(1) $a \neq b \neq c$ (2) $a = b = c$
(3) $a = b \neq c$ (4) $a \neq b = c$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

204. If $bc + ab + ca = abc$, then the value of $\frac{b+c}{bc(a-1)} + \frac{a+c}{ac(b-1)} + \frac{a+b}{ab(c-1)}$ is
(1) 0 (2) $-\frac{1}{2}$
(3) $-\frac{3}{2}$ (4) 1
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

205. If $\frac{a^2 - bc}{a^2 + bc} + \frac{b^2 - ca}{b^2 + ca} + \frac{c^2 - ab}{c^2 + ab} = 1$, then the value of $\frac{a^2}{a^2 + bc} + \frac{b^2}{b^2 + ac} + \frac{c^2}{c^2 + ab}$ is
(1) 0 (2) 1
(3) -1 (4) 2
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

206. If $999x + 888y = 1332$
$888x + 999y = 555$,
then the value of $x + y$ is
(1) 888 (2) 555
(3) 1 (4) 999
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

207. If $a = \frac{\sqrt{x+2} + \sqrt{x-2}}{\sqrt{x+2} - \sqrt{x-2}}$, then the value of $(a^2 - ax)$ is
(1) 1 (2) 2
(3) -1 (4) 0
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

208. If $x = \frac{1}{2+\sqrt{3}}$, $y = \frac{1}{2-\sqrt{3}}$, then the value of $8xy(x^2 + y^2)$ is
(1) 196 (2) 290
(3) 112 (4) 194
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

209. If $a^2 + b^2 + c^2 = ab + bc + ca$, then the value of $\frac{a+c}{b}$ is
(1) 3 (2) 2
(3) 0 (4) 1
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

210. If $\frac{m-a^2}{b^2+c^2} + \frac{m-b^2}{c^2+a^2} + \frac{m-c^2}{a^2+b^2} = 3$, then the value of m is
(1) $a^2 + b^2 - c^2$ (2) $a^2 + b^2$
(3) $a^2 + b^2 + c^2$ (4) $a^2 - b^2 - c^2$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

211. If $x + \frac{1}{x} = 1$ then the value of $\frac{x^2 + 3x + 1}{x^2 + 7x + 1}$ is
(1) 1 (2) $\frac{3}{7}$
(3) $\frac{1}{2}$ (4) 2
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

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212. If $p = 99$ then, the value of $p(p^2 + 3p + 3)$ is :
(1) 989898 (2) 988899
(3) 999999 (4) 998889
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

213. If $x = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ and $y = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ then the value of $\frac{x^2+xy+y^2}{x^2-xy+y^2} = ?$
(1) $\frac{63}{61}$ (2) $\frac{67}{65}$
(3) $\frac{65}{63}$ (4) $\frac{69}{67}$
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

214. If $x + \frac{1}{x} = 1$ then the value of $\frac{2}{x^2-x+2} = ?$
(1) 2 (2) 4
(3) $\frac{2}{3}$ (4) 1
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

215. If $x = \frac{a-b}{a+b}$, $y = \frac{b-c}{b+c}$, $z = \frac{c-a}{c+a}$, then $\frac{(1-x)(1-y)(1-z)}{(1+x)(1+y)(1+z)}$ is equal to
(1) 1 (2) 0
(3) 2 (4) $\frac{1}{2}$
(SSC CGL Tier-I Re-Exam, 30.08.2015)

216. Let $x = \frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$ and $y = \frac{1}{x}$, then the value of $3x^2 - 5xy + 3y^2$ is
(1) 1717 (2) 1177
(3) 1771 (4) 1171
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

217. If $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a}$, where $a \neq b \neq c \neq 0$, then the value of $a^2 b^2 c^2$ is
(1) –1 (2) abc
(3) 0 (4) 1
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

218. For real a, b, c if $a^2 + b^2 + c^2 = ab + bc + ca$, the value of $\frac{a+c}{b}$ is
(1) 3 (2) 1
(3) 2 (4) 0
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

219. $9x^2 + 25 - 30x$ can be expressed as the square of
(1) $-3x - 5$ (2) $3x + 5$
(3) $3x - 5$ (4) $3x^2 - 25$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

220. If $\frac{x}{3} + \frac{3}{x} = 1$ then the value of x^3 is
(1) 1 (2) 27
(3) 0 (4) –27
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

221. If $x + y = 2a$, then the value of $\frac{a}{x-a} + \frac{a}{y-a}$ is
(1) 2 (2) 0
(3) 1 (4) –1
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

222. If $\frac{x+1}{x-1} = \frac{a}{b}$ and $\frac{1-y}{1+y} = \frac{b}{a}$, then the value of $\frac{x-y}{1+xy}$ is
(1) $\frac{2ab}{a^2-b^2}$ (2) $\frac{a^2-b^2}{2ab}$
(3) $\frac{a^2+b^2}{2ab}$ (4) $\frac{a^2-b^2}{ab}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

223. If $\frac{a}{b} + \frac{b}{a} = 2$, then the value of $(a - b)$ is :
(1) 1 (2) 2
(3) –1 (4) 0
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

224. If $\sqrt{y} = 4x$, then $\frac{x^2}{y}$ is :
(1) 2 (2) $\frac{1}{16}$
(3) $\frac{1}{4}$ (4) 4
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

225. If $\frac{x}{y} = \frac{a+2}{a-2}$, then the value of $\frac{x^2-y^2}{x^2+y^2}$ is :
(1) $\frac{4a}{a^2+2}$ (2) $\frac{2a}{a^2+2}$
(3) $\frac{4a}{a^2+4}$ (4) $\frac{2a}{a^2+4}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

226. If $x(x + y + z) = 20$, $y(x + y + z) = 30$, and $z(x + y + z) = 50$, then the value of $2(x + y + z)$ is :
(1) 20 (2) –10
(3) 15 (4) 18
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

227. If $x + y = 4$, $x^2 + y^2 = 14$ and $x > y$, then the correct value of x and y is :
(1) $2 + \sqrt{3}$, $2 - \sqrt{3}$
(2) $2 - \sqrt{2}$, $\sqrt{3}$
(3) 3, 1
(4) $2 + \sqrt{3}$, $2\sqrt{2}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

228. If $a^2 + b^2 + c^2 = 2(a + b + c) - 3$, then the value of $a + b + c$ is :
(1) 2 (2) –1
(3) 1 (4) –2
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

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229. If for non-zero x, $x^2 - 4x - 1 = 0$, the value of $x^2 + \frac{1}{x^2}$ is :

(1) 12 (2) 4
(3) 18 (4) 10

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 06.12.2015 (IInd Sitting) TF No. 3441135)

230. If $a + \frac{1}{b} = 1$ and $b + \frac{1}{c} = 1$ then $c + \frac{1}{a}$ is equal to :

(1) $\frac{1}{2}$ (2) 2
(3) 1 (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 06.12.2015 (IInd Sitting) TF No. 3441135)

231. If $\frac{a}{b} = \frac{25}{6}$, then the value of $\frac{a^2 - b^2}{a^2 + b^2}$ is

(1) $\frac{589}{661}$ (2) $\frac{661}{589}$
(3) $\frac{625}{36}$ (4) $\frac{589}{651}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 20.12.2015 (Ist Sitting) TF No. 9692915)

TYPE–II

1. If $x = \sqrt{3} + \sqrt{2}$, then the value of $\left(x^3 + \frac{1}{x^3}\right)$ is

(1) $6\sqrt{3}$ (2) $12\sqrt{3}$
(3) $18\sqrt{3}$ (4) $24\sqrt{3}$

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

2. If $x + y = 7$, then the value of $x^3 + y^3 + 21xy$ is
(1) 243 (2) 143
(3) 343 (4) 443

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

3. If $x^{\frac{1}{3}} + y^{\frac{1}{3}} = z^{\frac{1}{3}}$, then $(x + y - z)^3 + 27xyz$ equals :
(1) –1 (2) 1
(3) 0 (4) 27

(SSC CPO S.I. Exam. 16.12.2007)

4. If $4b^2 + \frac{1}{b^2} = 2$, then the value of $8b^3 + \frac{1}{b^3}$ is

(1) 0 (2) 1
(3) 2 (4) 5

(SSC CPO S.I. Exam. 09.11.2008)

5. If $2p + \frac{1}{p} = 4$, then value of $p^3 + \frac{1}{8p^3}$ is

(1) 4 (2) 5
(3) 8 (4) 15

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

6. If $a^4 + b^4 = a^2b^2$, then $(a^6 + b^6)$ equals
(1) 0 (2) 1
(3) $a^2 + b^2$ (4) $a^2b^4 + a^4b^2$

(SSC CPO S.I.Exam.12.12.2010 (Paper-I)

7. If $x + \frac{1}{x} = \sqrt{3}$ then the value of $x^{18} + x^{12} + x^6 + 1$ is
(1) 0 (2) 1
(3) 2 (4) 3

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

8. If $x + \frac{1}{x} = 2, x \neq 0$ then value of $x^2 + \frac{1}{x^2}$ is equal to

(1) 1 (2) 2
(3) 3 (4) 4

FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

9. If $\frac{a}{b} + \frac{b}{a} = 1, a \neq 0, b \neq 0$ the value of $a^3 + b^3$ is
(1) 0 (2) 1
(3) –1 (4) 2

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting) & (SSC GL Tier-I Exam. 19.05.2013 (Ist Sitting)

10. If $x + \frac{1}{x} = 3$, then the value of $\frac{x^3 + \frac{1}{x}}{x^2 - x + 1}$ is :

(1) $\frac{3}{2}$ (2) $\frac{5}{2}$
(3) $\frac{7}{2}$ (4) $\frac{11}{2}$

(SSC CHSL DEO & LDC Exam. 27.11.2010)

11. If $a + \frac{1}{a} + 1 = 0 (a \neq 0)$ then the value of $(a^4 - a)$ is :
(1) 0 (2) 1
(3) 2 (4) – 1

(SSC CHSL DEO & LDC Exam. 27.11.2010)

12. If $x = a + \frac{1}{a}$ and $y = a - \frac{1}{a}$, then the value of $x^4 + y^4 - 2x^2y^2$ is
(1) 24 (2) 18
(3) 16 (4) 12

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

13. If $x + \frac{1}{2x} = 2$, find the value of $8x^3 + \frac{1}{x^3}$.
(1) 48 (2) 88
(3) 40 (4) 44

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

14. If for two real constants a and b, the expression $ax^3 + 3x^2 - 8x + b$ is exactly divisible by $(x + 2)$ and $(x - 2)$, then
(1) $a = 2, b = 12$
(2) $a = 12, b = 2$
(3) $a = 2, b = -12$
(4) $a = -2, b = 12$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

15. If $x^2 - 3x + 1 = 0$, then the value of $x^3 + \frac{1}{x^3}$ is
(1) 9 (2) 18
(3) 27 (4) 1

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

16. If $x + \frac{1}{4x} = \frac{3}{2}$, find the value of $8x^3 + \frac{1}{8x^3}$.
(1) 18 (2) 36
(3) 24 (4) 16

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

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17. If $\frac{1}{x+y}=\frac{1}{x}+\frac{1}{y}$ $(x\neq 0, y\neq 0, x\neq y)$ then, the value of x^3-y^3 is
(1) 0 (2) 1
(3) -1 (4) 2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

18. If $x=a(b-c)$, $y=b(c-a)$ and $z=c(a-b)$, then
$\left(\frac{x}{a}\right)^3+\left(\frac{y}{b}\right)^3+\left(\frac{z}{c}\right)^3=$
(1) $\frac{xyz}{3abc}$ (2) $3xyzabc$
(3) $\frac{3xyz}{abc}$ (4) $\frac{xyz}{abc}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

19. If $xy(x+y)=1$, then the value of $\frac{1}{x^3y^3}-x^3-y^3$ is :
(1) 0 (2) 1
(3) 3 (4) –2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone) & (SSC GL Tier-I Exam. 21.04.2013)

20. If $x^4+\frac{1}{x^4}=119$ and $x>1$, then the value of $x^3-\frac{1}{x^3}$ is
(1) 54 (2) 18
(3) 72 (4) 36
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

21. If $3x+\frac{1}{2x}=5$, then the value of $8x^3+\frac{1}{27x^3}$ is :
(1) $118\frac{1}{2}$ (2) $30\frac{10}{27}$
(3) 0 (4) 1
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

22. If $x+y=z$, then the expression $x^3+y^3-z^3+3xyz$ will be equal to :
(1) 0 (2) $3xyz$
(3) $-3xyz$ (4) z^3
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

23. If $\left(x+\frac{1}{x}\right)^2=3$, then the value of $(x^{72}+x^{66}+x^{54}+x^{36}+x^{24}+x^6+1)$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC Graduate Level Tier-II Exam. 16.09.2012)

24. If $\left(x+\frac{1}{x}\right)^2=3$, then the value of $x^{606}+x^{600}+x^{60}+x^{54}+x^{18}+x^{12}+x^6+1$ is
(1) 0 (2) 1
(3) 84 (4) 206
(SSC Graduate Level Tier-II Exam. 16.09.2012)

25. If $a+\frac{1}{a}=\sqrt{3}$, then the value of $a^6-\frac{1}{a^6}+2$ will be
(1) 1 (2) 2
(3) $3\sqrt{3}$ (4) 5
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

26. If $x^3+y^3=35$ and $x+y=5$, then the value of $\frac{1}{x}+\frac{1}{y}$ will be :
(1) $\frac{1}{3}$ (2) $\frac{5}{6}$
(3) 6 (4) $\frac{2}{3}$
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

27. If $a^3-b^3=56$ and $a-b=2$, then value of a^2+b^2 will be :
(1) 48 (2) 20
(3) 22 (4) 5
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

28. If $(a^2+b^2)^3=(a^3+b^3)^2$, then $\frac{a}{b}+\frac{b}{a}$ is
(1) $\frac{1}{3}$ (2) $\frac{2}{3}$
(3) $-\frac{1}{3}$ (4) $-\frac{2}{3}$
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

29. If $x+\frac{1}{x}=5$, then the value of $\frac{x^4+3x^3+5x^2+3x+1}{x^4+1}$
(1) $\frac{43}{23}$ (2) $\frac{47}{21}$
(3) $\frac{41}{23}$ (4) $\frac{45}{21}$
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

30. If x is real, $x+\frac{1}{x}\neq 0$ and $x^3+\frac{1}{x^3}=0$, then the value of $\left(x+\frac{1}{x}\right)^4$ is
(1) 4 (2) 9
(3) 16 (4) 25
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

31. If $x+\frac{1}{x}=3$, then the value of $\left(x^5+\frac{1}{x^5}\right)$ is
(1) 322 (2) 126
(3) 123 (4) 113
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting) & (SSC CHSL DEO & LDC Exam. 27.10.2013 (IInd Sitting)

32. If $x-\frac{1}{x}=3$, then value of $x^3-\frac{1}{x^3}$ is
(1) 32 (2) 36
(3) 40 (4) 49
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

33. If $m^4+\frac{1}{m^4}=119$, then $m-\frac{1}{m}=?$
(1) ± 3 (2) 4
(3) ± 2 (4) ± 1
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting

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34. If $x+y+z=6$, then the value of $(x-1)^3+(y-2)^3+(z-3)^3$ is
(1) $3(x-1)(y+2)(z-3)$
(2) $3(x+1)(y-2)(z-3)$
(3) $3(x-1)(y-2)(z+3)$
(4) $3(x-1)(y-2)(z-3)$
(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)

35. If $x^2+1=2x$, then the value of $\frac{x^4+\frac{1}{x^2}}{x^2-3x+1}$ is
(1) 0 (2) 1
(3) 2 (4) –2
(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)

36. If $x=\sqrt{3}+\sqrt{2}$, then the value of $x^3-\frac{1}{x^3}$ is :
(1) $14\sqrt{2}$ (2) $14\sqrt{3}$
(3) $22\sqrt{2}$ (4) $10\sqrt{2}$
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

37. If $x>1$ and $x^2+\frac{1}{x^2}=83$, then $x^3-\frac{1}{x^3}$ is
(1) 764 (2) 750
(3) 756 (4) 760
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

38. If $\left(a+\frac{1}{a}\right)^2=3$, then $a^3+\frac{1}{a^3}=?$
(1) $2\sqrt{3}$ (2) 2
(3) $3\sqrt{3}$ (4) 0
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

39. If $\frac{x}{x^2-2x+1}=\frac{1}{3}$, then the value of $x^3+\frac{1}{x^3}$ is :
(1) 81 (2) 110
(3) 125 (4) 27
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

40. If, $\left(x+\frac{1}{x}\right)=4$, then the value of $x^4+\frac{1}{x^4}$ is :
(1) 64 (2) 194
(3) 81 (4) 124
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

41. If $x+y+z=6$ and $x^2+y^2+z^2=20$ then the value of $x^3+y^3+z^3-3xyz$ is
(1) 64 (2) 70
(3) 72 (4) 76
(SSC Graduate Level Tier-I Exam. 21.04.2013)

42. If $x=1-\sqrt{2}$, the value of $\left(x-\frac{1}{x}\right)^3$ is
(1) – 8 (2) 8
(3) $2\sqrt{2}$ (4) 1
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

43. If $x=a-b$, $y=b-c$, $z=c-a$, then the numerical value of the algebraic expression $x^3+y^3+z^3-3xyz$ will be
(1) $a+b+c$ (2) 0
(3) $4(a+b+c)$
(4) $3abc$
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

44. If $x=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and $y=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, then the value of x^3+y^3 is :
(1) 950 (2) 730
(3) 650 (4) 970
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

45. If $(x-a)(x-b)=1$ and $a-b+5=0$, then the value of $(x-a)^3-\frac{1}{(x-a)^3}$ is
(1) –125 (2) 1
(2) 125 (4) 140
(SSC Graduate Level Tier-II Exam. 29.09.2013

46. If $a^2+b^2+c^2=2(a-b-c)-3$, then the value of $4a-3b+5c$ is
(1) 2 (2) 3
(3) 5 (4) 6
(SSC Graduate Level Tier-II Exam. 29.09.2013

47. If $2x+\frac{2}{x}=3$, then the value of $x^3+\frac{1}{x^3}+2$ is
(1) $-\frac{9}{8}$ (2) $-\frac{25}{8}$
(3) $\frac{7}{8}$ (4) 11
(SSC Graduate Level Tier-II Exam. 29.09.2013

48. If $a+b+c=15$ and $a^2+b^2+c^2=83$ then the value of $a^3+b^3+c^3-3abc$
(1) 200 (2) 180
(3) 190 (4) 210
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

49. If $a-b=3$ and $a^3-b^3=117$ then $|a+b|$ is equal to
(1) 3 (2) 5
(3) 7 (4) 9
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

50. If $x+\frac{1}{x+1}=1$, then $(x+1)^5+\frac{1}{(x+1)^5}$ equals
(1) 1 (2) 2
(3) 4 (4) 8
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

51. If $\frac{1}{a}-\frac{1}{b}=\frac{1}{a-b}$, then the value of a^3+b^3 is
(1) 0 (2) –1
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

52. If $a+b+c=0$, then $a^3+b^3+c^3$ is equal to
(1) $a+b+c$ (2) abc
(3) $2abc$ (4) $3abc$
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

53. If $a=4.965$, $b=2.343$ and $c=2.622$, then the value of $a^3-b^3-c^3-3abc$ is :
(1) – 2 (2) – 1
(3) 0 (4) 9.9^3
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

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54. If $a = 1.21$, $b = 2.12$ and $c = -3.33$, then the value of $a^3 + b^3 + c^3 - 3abc$ is
(1) 0 (2) 1
(3) 2 (4) 3
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

55. If $p = 999$, then the value of $\sqrt[3]{p(p^2+3p+3)+1}$ is
(1) 1000 (2) 999
(3) 998 (4) 1002
(SSC CGL Prelim Exam. 11.05.2003 & 27.07.2006 (Second Sitting)

56. If $a = 4.36$, $b = 2.39$ and $c = 1.97$, then the value of $a^3 - b^3 - c^3 - 3abc$ is
(1) 3.94 (2) 2.39
(3) 0 (4) 1
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

57. $\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)\left(x^2+\frac{1}{x^2}-1\right)\left(x^2+\frac{1}{x^2}+1\right)$
is equal to
(1) $x^6+\frac{1}{x^6}$ (2) $x^8+\frac{1}{x^8}$
(3) $x^8-\frac{1}{x^8}$ (4) $x^6-\frac{1}{x^6}$
(SSC CPO S.I. Exam. 03.09.2006)

58. If $a = 11$ and $b = 9$, then the value of $\left(\frac{a^2+b^2+ab}{a^3-b^3}\right)$ is
(1) $\frac{1}{2}$ (2) 2
(3) $\frac{1}{20}$ (4) 20
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

59. If $a = \sqrt{7+2\sqrt{12}}$ and $b = \sqrt{7-2\sqrt{12}}$, then (a^3+b^3) is equal to
(1) 40 (2) 44
(3) 48 (4) 52
(SSC SAS Exam. 26.06.2010 (Paper-1)

60. If the sum of $\frac{a}{b}$ and its reciprocal is 1 and $a \neq 0$, $b \neq 0$, then the value of $a^3 + b^3$ is
(1) 2 (2) −1
(3) 0 (4) 1
(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

61. If $x = 2 - 2^{1/3} + 2^{2/3}$, then the value of $x^3 - 6x^2 + 18x + 18$ is
(1) 22 (2) 33
(3) 40 (4) 45
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

62. If $a^3 - b^3 - c^3 - 3abc = 0$, then
(1) $a = b = c$
(2) $a + b + c = 0$
(3) $a + c = b$
(4) $a = b + c$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

63. If p, q, r are all real numbers, then $(p-q)^3 + (q-r)^3 + (r-p)^3$ is equal to
(1) $(p-q)(q-r)(r-p)$
(2) $3(p-q)(q-r)(r-p)$
(3) 0
(4) 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone) (IInd Sitting (North Zone)

64. If $a = 2{\cdot}361$, $b = 3{\cdot}263$ and $c = 5{\cdot}624$, then the value of $a^3 + b^3 - c^3 + 3abc$ is
(1) 35·621 (2) 0
(3) 19·277 (4) 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

65. If $a + b + c = 6$, $a^2 + b^2 + c^2 = 14$ and $a^3 + b^3 + c^3 = 36$, then the value of abc is
(1) 3 (2) 6
(3) 9 (4) 12
(SSC Graduate Level Tier-II Exam. 16.09.2012)

66. If $a + b = 1$ and $a^3 + b^3 + 3ab = k$, then the value of k is
(1) 1 (2) 3
(3) 5 (4) 7
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

67. If $a = 34$, $b = c = 33$, then the value of $a^3 + b^3 + c^3 - 3abc$ is
(1) 0 (2) 111
(3) 50 (4) 100
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

68. If $x = y = 333$ and $z = 334$, then the value of $x^3 + y^3 + z^3 - 3xyz$ is
(1) 0 (2) 667
(3) 1000 (4) 2334
(SSC Graduate Level Tier-II Exam. 29.09.2013)

69. Out of the given responses, one of the factors of $(a^2-b^2)^3 + (b^2-c^2)^3 + (c^2-a^2)^3$ is
(1) $(a+b)(a-b)$
(2) $(a+b)(a+b)$
(3) $(a-b)(a-b)$
(4) $(b-c)(b-c)$
(SSC Graduate Level Tier-II Exam. 29.09.2013)

70. If $a = \frac{b^2}{b-a}$ then the value of $a^3 + b^3$ is
(1) $6ab$ (2) 0
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 20.10.2013)

71. If p = 99, then value of $p(p^2 + 3p + 3)$ is
(1) 999 (2) 9999
(3) 99999 (4) 999999
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

72. If $p = 101$, then the value of $\sqrt[3]{p(p^2-3p+3)-1}$ is
(1) 100 (2) 101
(3) 102 (4) 1000
(SSC SAS Exam. 26.06.2010 (Paper-1)

73. If p = 124, $\sqrt[3]{p(p^2+3p+3)+1} = ?$
(1) 5 (2) 7
(3) 123 (4) 125
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

74. If $p - 2q = 4$, then the value of $p^3 - 8q^3 - 24pq - 64$ is :
(1) 2 (2) 0
(3) 3 (4) −1
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

75. If $x = 19$ and $y = 18$, then the value of $\frac{x^2+y^2+xy}{x^3-y^3}$ is
(1) 1 (2) 37
(3) 324 (4) 361
(SSC CISF ASI Exam. 29.08.2010 (Paper-1)

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76. If $x+\frac{1}{x}=2$ and x is real, then the value of $x^{17}+\frac{1}{x^{19}}$ is

(1) 1 (2) 0
(3) 2 (4) –2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

77. The value of $(x+y+z)^3-(y+z-x)^3-(z+x-y)^3-(x+y-z)^3$ is :

(1) 12 xyz (2) 24xyz
(3) 36 xyz (4) 0

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

78. If $x=-1$, then the value of

$\frac{1}{x^{99}}+\frac{1}{x^{98}}+\frac{1}{x^{97}}+\frac{1}{x^{96}}+\frac{1}{x^{95}}+\frac{1}{x^{94}}+\frac{1}{x}-1$ is

(1) 1 (2) 0
(3) –2 (4) –1

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

79. If $\frac{1}{\sqrt[3]{4}+\sqrt[3]{2}+1}=a\sqrt[3]{4}+b\sqrt[3]{2}+c$ and a, b, c are rational numbers, then $a+b+c$ is equal to

(1) 0 (2) 1
(3) 2 (4) 3

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

80. If $x=\sqrt[3]{2+\sqrt{3}}$, then the value of $x^3+\frac{1}{x^3}$ is

(1) 8 (2) 9
(3) 2 (4) 4

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

81. If $x=\sqrt[3]{5}+2$, then the value of $x^3-6x^2+12x-13$ is

(1) –1 (2) 1
(3) 2 (4) 0

(SSC Graduate Level Tier-II Exam. 29.09.2013

82. If $x+y=a$ and $xy=b^2$, then the value of $x^3-x^2y-xy^2+y^3$ in terms of a and b is :

(1) $(a^2+4b^2)a$ (2) a^3-3b^2
(3) a^3-4b^2a (4) a^3+3b^2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

83. If $x-\frac{1}{x}=1$, then the value of $\frac{x^4-\frac{1}{x^2}}{3x^2+5x-3}$ is

(1) $\frac{1}{4}$ (2) $\frac{1}{2}$
(3) $\frac{3}{4}$ (4) 0

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

84. If $x+y=15$, then $(x-10)^3+(y-5)^3$ is

(1) 25 (2) 125
(3) 625 (4) 0

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

85. If $x^2+\frac{1}{x^2}=66$, then the value of $\frac{x^2-1+2x}{x}=?$

(1) ± 8 (2) 10, – 6
(3) 6, –10 (4) ± 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

86. If $a^2+a+1=0$, then the value of a^9 is

(1) 2 (2) 3
(3) 1 (4) 0

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

87. If $x+\frac{2}{x}=1$, then the value of $\frac{x^2+x+2}{x^2(1-x)}$ is

(1) 1 (2) –1
(3) 2 (4) –2

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

88. If $x=k^3-3k^2$ and $y=1-3k$, then for what value of k, will be $x=y$?

(1) 0 (2) 1
(3) –1 (4) 2

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

89. Find the value of $\sqrt{(x^2+y^2+z)(x+y-3z)}+\sqrt[3]{xy^3z^2}$ when $x=+1, y=-3, z=-1$.

(1) 1 (2) 0
(3) –1 (4) $\frac{1}{2}$

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

90. The simplest form of the expression $\frac{p^2-p}{2p^3+6p^2}+\frac{p^2-1}{p^2+3p}+\frac{p^2}{p+1}$ is

(1) $2p^2$ (2) $\frac{1}{2p^2}$
(3) $p+3$ (4) $\frac{1}{p+3}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

91. If $x+\frac{1}{x}=2$, then the value of $\left(x^2+\frac{1}{x^2}\right)\left(x^3+\frac{1}{x^3}\right)$ is

(1) 20 (2) 4
(3) 8 (4) 16

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

92. If a, b, c be all positive integers, then the least positive value of $a^3+b^3+c^3-3abc$ is

(1) 1 (2) 2
(3) 4 (4) 3

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

93. When $f(x)=12x^3-13x^2-5x+7$ is divided by $(3x+2)$, then the remainder is

(1) 2 (2) 0
(3) –1 (4) 1

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

94. If $ab+bc+ca=0$, then the value of $\frac{1}{a^2-bc}+\frac{1}{b^2-ac}+\frac{1}{c^2-ab}$ is

(1) 2 (2) –1
(3) 0 (4) 1

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

95. If the equation $2x^2-7x+12=0$ has two roots α and β, then the value of $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$ is

(1) $\frac{7}{2}$ (2) $\frac{1}{24}$
(3) $\frac{7}{24}$ (4) $\frac{97}{24}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

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96. If $x^3+\frac{3}{x}=4\ (a^3+b^3)$ and $3x+\frac{1}{x^3}=4\ (a^3-b^3)$, then a^2-b^2 is equal to
(1) 4 (2) 0
(3) 1 (4) 2
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

97. If $x=6+\frac{1}{x}$, then the value of $x^4+\frac{1}{x^4}$ is
(1) 1448 (2) 1442
(3) 1444 (4) 1446
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

98. If $x+\frac{1}{x}=5$, then $x^6+\frac{1}{x^6}$ is
(1) 12098 (2) 12048
(3) 14062 (4) 12092
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

99. If $x^2-3x+1=0$, then the value of $\frac{x^6+x^4+x^2+1}{x^3}$ will be
(1) 18 (2) 15
(3) 21 (4) 30
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

100. If $x^4+\frac{1}{x^4}=119$ and $x>1$, then find the positive value of $x^3-\frac{1}{x^3}$.
(1) 25 (2) 27
(3) 36 (4) 49
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

101. If $\frac{p}{a}+\frac{q}{b}+\frac{r}{c}=1$ and $\frac{a}{p}+\frac{b}{q}+\frac{c}{r}=0$, where p, q, r and a, b, c are non-zero, then the value of $\frac{p^2}{a^2}+\frac{q^2}{b^2}+\frac{r^2}{c^2}$ is
(1) –1 (2) 0
(3) 1 (4) 2
(SSC CGL Tier-I Exam. 19.10.2014)

102. If x is a rational number and $\frac{(x+1)^3-(x-1)^3}{(x+1)^2-(x-1)^2}=2$, then the sum of numerator and denominator of x is
(1) 3 (2) 4
(3) 5 (4) 7
(SSC CGL Tier-I Exam. 19.10.2014)

103. If $x=\sqrt{5}+2$, then the value $\frac{2x^2-3x-2}{3x^2-4x-3}$ is equal to
(1) 0.185 (2) 0.525
(3) 0.625 (4) 0.785
(SSC CGL Tier-I Exam. 19.10.2014)

104. If $a=2.234$, $b=3.121$ and $c=-5.355$, then the value of $a^3+b^3+c^3-3abc$ is
(1) –1 (2) 0
(3) 1 (4) 2
(SSC CGL Tier-I Exam. 19.10.2014)

105. If $x^2+y^2+1=2x$, then the value of x^3+y^3 is
(1) 2 (2) 0
(3) –1 (4) 1
(SSC CGL Tier-I Exam. 19.10.2014)

106. If $3(a^2+b^2+c^2)=(a+b+c)^2$, then the relation between a, b and c is
(1) $a=b=c$ (2) $a=b\neq c$
(3) $a<b<c$ (4) $a>b>c$
(SSC CGL Tier-I Exam. 19.10.2014)

107. If $x(x-3)=-1$, then the value of $x^3(x^3-18)$ is
(1) – 1 (2) 2
(3) 1 (4) 0
(SSC CGL Tier-I Exam. 26.10.2014)

108. If $a^2+b^2+c^2=ab+bc+ac$ then the value of $\frac{a+C}{b}$ is
(1) 0 (2) 2
(3) 1 (4) –1
(SSC CGL Tier-II Exam. 21.09.2014)

109. If $ab+bc+ca=0$ then the value of $\left(\frac{1}{a^2-bc}+\frac{1}{b^2-ca}+\frac{1}{c^2-ab}\right)$ is
(1) 0 (2) 1
(3) 3 (4) a + b + c
(SSC CGL Tier-II Exam. 21.09.2014)

110. If $3x+\frac{3}{x}=1$ then $x^3+\frac{1}{x^3}+1$ is
(1) 0 (2) $\frac{1}{27}$
(3) $\frac{5}{27}$ (4) $\frac{28}{27}$
(SSC CGL Tier-II Exam. 21.09.2014)

111. The factors of $(a^2+4b^2+4b-4ab-2a-8)$ are
(1) $(a-2b-4)(a-2b+2)$
(2) $(a-b+2)(a-4b-4)$
(3) $(a+2b-4)(a+2b+2)$
(4) $(a+2b-1)(a-2b+1)$
(SSC CGL Tier-II Exam. 21.09.2014)

112. The value of $\frac{1}{a^2+ax+x^2}-\frac{1}{a^2-ax+x^2}+\frac{2ax}{a^4+a^2x^2+x^4}$ is
(1) 2 (2) 1
(3) –1 (4) 0
(SSC CGL Tier-II Exam. 21.09.2014)

113. If $x=11$, then the value of $x^5-12x^4+12x^3-12x^2+12x-1$ is
(1) 5 (2) 10
(3) 15 (4) 20
(SSC CGL Tier-II Exam. 21.09.2014)

114. If p = 99, then the value of $p(p^2+3p+3)$ is
(1) 10000000 (2) 999000
(3) 999999 (4) 990000
(SSC CGL Tier-II Exam. 21.09.2014)

115. An example of an equality relation of two expressions in x, which is not an identity is
(1) $(x+3)^2=x^2+6x+9$
(2) $(x+2y)^3=x^3+8y^3+6xy(x+2y)$
(3) $(x+2)^2=x^2+2x+4$
(4) $(x+3)(x-3)=x^2-9$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

116. The numerical value of $\frac{(a-b)^2}{(b-c)(c-a)}+\frac{(b-c)^2}{(c-a)(a-b)}+\frac{(c-a)^2}{(a-b)(b-c)}$ is $(a\neq b\neq c)$
(1) 0 (2) 1
(3) $\frac{1}{3}$ (4) 3
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

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117. If $\left(a+\frac{1}{a}\right)^2 = 3$, then the value of $a^3 + \frac{1}{a^3}$ is

(1) 0 (2) 1
(3) 2 (4) 6

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

118. If $a + \frac{1}{a} = \sqrt{3}$, then the value of $a^{18} + a^{12} + a^6 + 1$ is

(1) 0 (2) 1
(3) – 1 (4) 4

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

119. If $x = 997$, $y = 998$ and $z = 999$, then the value of $x^2 + y^2 + z^2 - xy - yz - zx$ is

(1) 0 (2) 1
(3) – 1 (4) 3

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

120. If $x + \frac{1}{x} = 3$, then the value of $\frac{3x^2-4x+3}{x^2-x+1}$ is

(1) $\frac{4}{3}$ (2) $\frac{3}{2}$
(3) $\frac{5}{2}$ (4) $\frac{5}{3}$

(SSC CHSL DEO & LDC Exam. 9.11.2014)

121. If $x = 3 + 2\sqrt{2}$, then $\frac{x^6+x^4+x^2+1}{x^3}$ is equal to

(1) 216 (2) 192
(3) 198 (4) 204

(SSC CHSL CGLDEO & LDC Exam. 9.11.2014)

122. If $x = p + \frac{1}{p}$ and $y = p - \frac{1}{p}$ then the value of $x^4 - 2x^2y^2 + y^4$ is

(1) 24 (2) 4
(3) 16 (4) 8

(SSC CHSL DEO & LDC Exam. 9.11.2014)

123. If $a + b + c = 0$, then the value of $(a + b - c)^2 + (b + c - a)^2 + (c + a - b)^2$ is

(1) 0 (2) 8 abc
(3) $4(a^2 + b^2 + c^2)$
(4) $4(ab + bc + ca)$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

124. If $p^3 + 3p^2 + 3p = 7$, then the value of $p^2 + 2p$ is

(1) 4 (2) 3
(3) 5 (4) 6

(SSC CHSL DEO & LDC Exam. 16.11.2014)

125. If $x = 2015$, $y = 2014$ and $z = 2013$, then value of $x^2 + y^2 + z^2 - xy - yz - zx$ is

(1) 3 (2) 4
(3) 6 (4) 2

(SSC CHSL DEO & LDC Exam. 16.11.2014)

126. If $3a^2 = b^2 \neq 0$, then the value of $\frac{(a+b)^3-(a-b)^3}{(a+b)^2+(a-b)^2}$ is

(1) $\frac{3b}{2}$ (2) b
(3) $\frac{b}{2}$ (4) $\frac{2b}{3}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

127. If $x > 1$ and $x + \frac{1}{x} = 2\frac{1}{12}$, then the value of $x^4 - \frac{1}{x^4}$ is

(1) $\frac{58975}{20736}$ (2) $\frac{59825}{20736}$
(3) $\frac{57985}{20736}$ (4) $\frac{57895}{20736}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

128. The value of $\frac{4x^3-x}{(2x+1)(6x-3)}$ when $x = 9999$ is

(1) 1111 (2) 2222
(3) 3333 (4) 6666

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

129. If $a^3 + b^3 = 9$ and $a + b = 3$, then the value of $\frac{1}{a} + \frac{1}{b}$ is

(1) $\frac{1}{2}$ (2) $\frac{3}{2}$
(3) $\frac{5}{2}$ (4) –1

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

130. If $t^2 - 4t + 1 = 0$, then the value of $t^3 + \frac{1}{t^3}$ is

(1) 44 (2) 48
(3) 52 (4) 64

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

131. If $\sqrt[3]{a} + \sqrt[3]{b} = \sqrt[3]{c}$, then the simplest value of $(a + b - c)^3 + 27abc$ is

(1) – 1 (2) 3
(3) – 3 (4) 0

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

132. If $p = \frac{5}{18}$, then $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$ is equal to

(1) $\frac{4}{27}$ (2) $\frac{5}{27}$
(3) $\frac{8}{27}$ (4) $\frac{10}{27}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

133. If $x + \frac{1}{x} = 2$, then $x^{2013} + \frac{1}{x^{2014}} = ?$

(1) 0 (2) 1
(3) –1 (4) 2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

134. If $a = 331$, $b = 336$ and $c = -667$, then the value of $a^3 + b^3 + c^3 - 3abc$ is

(1) 1 (2) 6
(3) 3 (4) 0

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

135. If $a = 4.965$, $b = 2.343$ and $c = 2.622$, then the value of $a^3 - b^3 - c^3 - 3abc$ is

(1) –2 (2) –1
(3) 0 (4) 9.93

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

136. If $x + y + z = 0$, then the value of $\frac{x^2+y^2+z^2}{x^2-yz}$ is

(1) –1 (2) 0
(3) 1 (4) 2

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

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137. If $x + \frac{1}{x} = 0$, then the value of $x^5 + \frac{1}{x^5}$ is

(1) 2 (2) – 1
(3) 1 (4) 0

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

138. If $a^2 + b^2 + c^2 - ab - bc - ca = 0$, then

(1) $a = b = c$ (2) $a \neq b = c$
(3) $a = b \neq c$ (4) $a \neq b \neq c$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

139. If $x^4 + \frac{1}{x^4} = 119$, then the values of $x^3 + \frac{1}{x^3}$ are

(1) $\pm 10\sqrt{13}$ (2) $\pm \sqrt{13}$
(3) $\pm 16\sqrt{13}$ (4) $\pm 13\sqrt{13}$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

140. If $x + \frac{1}{x} = \sqrt{3}$, then the value of $x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$ is

(1) $\sqrt{3}$ (2) $-\sqrt{3}$
(3) 1 (4) 0

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

141. If $m + n = -2$, then the value of $m^3 + n^3 - 6mn$ is

(1) 8 (2) 4
(3) –8 (4) –4

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

142. If $u_n = \frac{1}{n} - \frac{1}{n+1}$ then the value of $u_1 + u_2 + u_3 + u_4 + u_5$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$
(3) $\frac{2}{5}$ (4) $\frac{5}{6}$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

143. If $x = 5$, $y = 6$ and $z = -11$, then the value of $x^3 + y^3 + z^3$ is

(1) –890 (2) –970
(3) –870 (4) –990

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

144. If $p + m = 6$ and $p^3 + m^3 = 72$, then the value of pm is

(1) 6 (2) 12
(3) 9 (4) 8

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

145. If average of two numbers x and $\frac{1}{x}$ (where $x \neq 0$) is A, what will be the average of x^3 and $\frac{1}{x^3}$?

(1) $4A^3 - 2A$ (2) $4A^3 - 3A$
(3) $4A^3 - 4A$ (4) $4A^3 - A$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

146. If $a = 2 + \sqrt{3}$, then the value of $\frac{a^6 + a^4 + a^2 + 1}{a^3}$ is

(1) 45 (2) 65
(3) 42 (4) 56

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

147. If $x = \sqrt{5} + \sqrt{3}$ and $y = \sqrt{5} - \sqrt{3}$, then the value of $(x^4 - y^4)$ is

(1) $64\sqrt{15}$ (2) 16
(3) 544 (4) $32\sqrt{15}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

148. If $x + y + z = 6$, then the value of $(x-1)^3 + (y-2)^3 + (z-3)^3$ is

(1) $3(x-1)(y-2)(z-3)$
(2) $3xyz$
(3) $(x-1)(y-2)(z-3)$
(4) $2(x-1)(y-2)(z-3)$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

149. If $p^4 = 119 - \frac{1}{p^4}$, then the value of $p^3 - \frac{1}{p^3}$ is

(1) 24 (2) 32
(3) 36 (4) 18

(SSC CGL Tier-II Exam, 201 12.04.2015 (Kolkata Region TF No. 789 TH 7

150. If $x + \left(\frac{1}{x}\right) = 2$, then the value o $x^7 + \left(\frac{1}{x^5}\right)$ is

(1) 2^{12} (2) 2
(3) 2^5 (4) 2^7

(SSC CAPFs SI, CISF ASI & Delh Police SI Exam, 21.06.201 (Ist Sitting) TF No. 8037731

151. If $x = 332$, $y = 333$, $z = 335$ then the value of $x^3 + y^3 + z^3 - 3xyz$ is

(1) 10000 (2) 7000
(3) 8000 (4) 9000

(SSC CGL Tier-I Exam, 09.08.201 (Ist Sitting) TF No. 1443088

152. If $m = -4$, $n = -2$, then the value o $m^3 - 3m^2 + 3m + 3n + 3n^2 + n^3$ is

(1) – 126 (2) 124
(3) – 124 (4) 126

(SSC CGL Tier-I Exam, 09.08.201 (Ist Sitting) TF No. 1443088

153. If $x + \frac{1}{x} = 2$ then the value o $x^{12} - \frac{1}{x^{12}}$ is

(1) 2 (2) – 4
(3) 0 (4) 4

(SSC CGL Tier-I Exam, 09.08.201 (IInd Sitting) TF No. 4239378

154. Given that $x^3 + y^3 = 72$ and xy 6 with $x > y$. Then the value of (– y) is

(1) 4 (2) – 4
(3) 2 (4) – 2

(SSC CGL Tier-I Exam, 09.08.201 (IInd Sitting) TF No. 4239378

155. If $x = 2$ then the value of $x^3 + 27x^2 + 243x + 631$ is

(1) 1233 (2) 1211
(3) 1231 (4) 1321

(SSC CGL Tier-I Exam, 16.08.201 (Ist Sitting) TF No. 3196278

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156. If $\frac{x^{24}+1}{x^{12}}=7$ then the value of $\frac{x^{72}+1}{x^{36}}$ is

(1) 433 (2) 322
(3) 343 (4) 432

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

157. The HCF of x^3-1 and x^4+2x^3-2x-1 is :

(1) x^2+1 (2) x^2-1
(3) $x+1$ (4) $x-1$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

158. If $x^2+y^2+z^2=2(x+z-1)$, then the value of :
$x^3+y^3+z^3=?$

(1) 2 (2) 0
(3) −1 (4) 1

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

159. If $x^2+x=5$ then the value of $(x+3)^3+\frac{1}{(x+3)^3}$ is :

(1) 140 (2) 110
(3) 130 (4) 120

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

160. If $x=z=225$ and $y=226$ then the value of :
$x^3+y^3+z^3-3xyz$ is

(1) 765 (2) 676
(3) 576 (4) 674

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

161. If $4a-\frac{4}{a}+3=0$ then the value of : $a^3-\frac{1}{a^3}+3=?$

(1) $\frac{3}{16}$ (2) $\frac{7}{16}$
(3) $\frac{21}{64}$ (4) $\frac{21}{16}$

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

162. If $a+b-c=0$ then the value of $2b^2c^2+2c^2a^2+2a^2b^2-a^4-b^4-c^4$

(1) 7 (2) 0
(3) 14 (4) 28

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

163. If $\frac{p^2}{q^2}+\frac{q^2}{p^2}=1$, then the value of (p^6+q^6) is

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I Re-Exam, 30.06.2015)

164. If $(m+1)=\sqrt{n}+3$, the value of $\frac{1}{2}\left(\frac{m^3-6m^2+12m-8}{\sqrt{n}}-n\right)$ is

(1) 0 (2) 1
(3) 2 (4) 3

(SSC CGL Tier-I Re-Exam, 30.06.2015)

165. If $(3x-2y):(2x+3y)=5:6$, then one of the values of $\left(\frac{\sqrt[3]{x}+\sqrt[3]{y}}{\sqrt[3]{x}-\sqrt[3]{y}}\right)^2$ is

(1) $\frac{1}{5}$ (2) 5
(3) 25 (4) $\frac{1}{25}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

166. If $a-\frac{1}{a-3}=5$, then the value of $(a-3)^3-\frac{1}{(a-3)^3}$ is

(1) 5 (2) 7
(3) 2 (4) 14

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

167. If $\left(\frac{p^{-1}q^2}{p^3q^{-2}}\right)^{\frac{1}{3}}+\left(\frac{p^6q^{-3}}{p^{-2}q^3}\right)^{\frac{1}{3}}=p^aq^b$, then the value of $a+b$, where p and q are different positive primes, is

(1) −1 (2) 2
(3) 1 (4) 0

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

168. If $a+b=1$, find the value of $a^3+b^3-ab-(a^2-b^2)^2$.

(1) −1 (2) 1
(3) 0 (4) 2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

169. If $x=a^{\frac{1}{2}}+a^{-\frac{1}{2}}$, $y=a^{\frac{1}{2}}-a^{-\frac{1}{2}}$ then value of $(x^4-x^2y^2-1)+(y^4-x^2y^2+1)$ is

(1) 16 (2) 13
(3) 12 (4) 14

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

170. If $x^2+y^2+z^2=xy+yz+zx$, then the value of $\frac{3x^4+7y^4+5z^4}{5x^2y^2+7y^2z^2+3z^2x^2}$ is

(1) 2 (2) 1
(3) 0 (4) −1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

171. If $x-\sqrt{3}-\sqrt{2}=0$ and $y-\sqrt{3}+\sqrt{2}=0$, then the value of $\left(x^3-20\sqrt{2}\right)-\left(y^3+20\sqrt{2}\right)$ is

(1) 0 (2) 1
(3) 3 (4) 2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

172. If $p^3-q^3=(p-q)\{(p-q)^2-xpq\}$, then find the value of x

(1) 3 (2) −3
(3) 1 (4) −1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

173. If $x+y+z=6$ and $xy+yz+zx=10$ then the value of $x^3+y^3+z^3-3xyz$ is :

(1) 36 (2) 48
(3) 42 (4) 40

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

174. If $x-\frac{1}{x}=2$, then the value of $x^3-\frac{1}{x^3}$ is :

(1) 15 (2) 2
(3) 14 (4) 11

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

175. If $a^2+a+1=0$, then the value of a^5+a^4+1 is :

(1) a^2 (2) 1
(3) 0 (4) $a+1$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

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176. If $x = a(b-c)$, $y = b(c-a)$, $z = c(a-b)$, then the value of $\left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 + \left(\frac{z}{c}\right)^3$ is :

(1) $\frac{2xyz}{abc}$ (2) $\frac{xyz}{abc}$

(3) 0 (4) $\frac{3xyz}{abc}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

177. If $x = y = z$, then $\frac{(x+y+z)^2}{x^2+y^2+z^2}$ is equal to

(1) 4 (2) 2

(3) 3 (4) 1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

178. The simplified value of following is :

$\left(\frac{3}{15}a^5b^6c^3 \times \frac{5}{9}ab^5c^4\right) \div \frac{10}{27}a^2bc^3$

(1) $\frac{9a^2bc^4}{10}$ (2) $\frac{3ab^4c^3}{10}$

(3) $\frac{3a^4b^{10}c^4}{10}$ (4) $\frac{1a^4b^4c^{10}}{10}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

179. If $(2a-1)^2 + (4b-3)^2 + (4c+5)^2 = 0$, then the value of $\frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2}$ is

(1) $1\frac{3}{8}$ (2) $2\frac{3}{8}$

(3) $3\frac{3}{8}$ (4) 0

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

180. If $x + \frac{1}{x} = 3$, then the value of $x^5 + \frac{1}{x^5}$ is

(1) 110 (2) 132

(3) 122 (4) 123

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–III

1. If $(2^x)(2^y) = 8$ and $(9^x)(3^y) = 81$, then (x, y) is :

(1) (1,2) (2) (2, 1)

(3) (1,1) (4) (2, 2)

FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)

2. The lines $2x + y = 5$ and $x + 2y = 4$ intersect at the point :

(1) (1,2) (2) (2,1)

(3) $(\frac{5}{2}, 0)$ (4) (0,2)

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

3. The graph of the linear equation $3x + 4y = 24$ is a straight line intersecting x-axis and y-axis at the points A and B respectively. P(2, 0) and Q $\left(0, \frac{3}{2}\right)$ are two points on the sides OA and OB respectively of Δ OAB, where O is the origin of the co-ordinate system. Given that AB = 10 cm, then PQ =

(1) 20 cm (2) 2.5 cm

(3) 40 cm (4) 5 cm

(SSC Graduate Level Tier-II Exam. 16.09.2012)

4. The length of the intercept of the graph of the equation $9x - 12y = 108$ between the two axes is

(1) 15 units (2) 9 units

(3) 12 units (4) 18 units

(SSC Graduate Level Tier-II Exam. 16.09.2012)

5. The x-intercept on the graph of $7x - 3y = 2$ is

(1) $\frac{3}{4}$ (2) $\frac{3}{7}$

(3) $\frac{2}{5}$ (4) $\frac{2}{7}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

6. If $2x + y = 6$ and $x = 2$ are two linear equations, then graph of two equations meet at a point :

(1) (2,0) (2) (0,2)

(3) (2,2) (4) (1,2)

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

7. An equation whose graph passes through the origin, out of the given equations $2x + 3y = 2$, $2x - 3y = 3$, $-2x + 3y = 5$ and $2x + 3y = 0$ is :

(1) $2x - 3y = 3$

(2) $-2x + 3y = 5$

(3) $2x + 3y = 0$

(4) $2x + 3y = 2$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

8. If a linear equation is of the form $x = k$ where k is a constant, then graph of the equation will be

(1) a line parallel to x-axis

(2) a line cutting both the axes

(3) a line making positive acute angle with x-axis

(4) a line parallel to y-axis

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

9. The graph of the equation $2x - 3y = 6$ intersects the y-axis at the point

(1) (-2, 0) (2) (0, -2)

(3) (2, 3) (4) (2, -3)

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

10. The graph of the equations $25x + 75y = 225$ and $x = 9$ meet at the point

(1) (0,9) (2) (9,0)

(3) (3,0) (4) (0,3)

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

11. The area bounded by the lines $x = 0$, $y = 0$, $x + y = 1$, $2x + 3y = 6$ (in square units) is

(1) 2 (2) $2\frac{1}{3}$

(3) $2\frac{1}{2}$ (4) 3

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting

12. The graph of the equation $4x - 5y = 20$ intersects the x-axis at the point

(1) (2, 0) (2) (5, 0)

(3) (4, 5) (4) (0, 5)

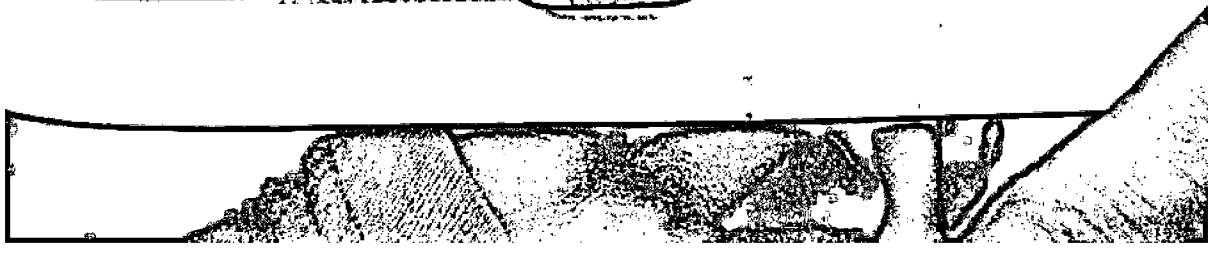
(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)

13. The graph of $2x + 1 = 0$ and $3y - 9 = 0$ intersect at the point

(1) $(-\frac{1}{2}, -3)$ (2) $(-\frac{1}{2}, 3)$

(3) $(\frac{1}{2}, -3)$ (4) None of these

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)



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14. An equation of the form $ax + by + c = 0$ where $a \neq 0$, $b \neq 0$, $c = 0$ represents a straight line which passes through
(1) (0, 0) (2) (3, 2)
(3) (2, 4) (4) None of these
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

15. The linear equation such that each point on its graph has an ordinate four times its abscissa is :
(1) $y + 4x = 0$ (2) $y = 4x$
(3) $x = 4y$ (4) $x + 4y = 0$
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

16. If the graph of the equations $3x + 2y = 18$ and $3y - 2x = 1$ intersect at the point (p, q), then the value of $p + q$ is
(1) 7 (2) 6
(3) 5 (4) 4
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

17. If the graph of the equations $x + y = 0$ and $5y + 7x = 24$ intersect at (m, n), then the value of $m + n$ is
(1) 2 (2) 1
(3) 0 (4) –1
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

18. The area of the triangle formed by the graph of $3x + 4y = 12$, x-axis and y-axis (in sq. units) is
(1) 4 (2) 12
(3) 6 (4) 8
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

19. Equation of the straight line parallel to x-axis and also 3 units below x-axis is :
(1) $x = -3$ (2) $y = 3$
(3) $y = -3$ (4) $x = 3$
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

20. The straight line $2x + 3y = 12$ passes through :
(1) 1st, 2nd and 3rd quadrant
(2) 1st, 2nd and 4th quadrant
(3) 2nd, 3rd and 4th quadrant
(4) 1st, 3rd and 4th quadrant
(SSC Graduate Level Tier-I Exam. 19.05.2013)

21. The graphs of $x = a$ and $y = b$ intersect at
(1) (a, b) (2) (b, a)
(3) $(-a, b)$ (4) $(a, -b)$
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

22. The area in sq. unit of the triangle formed by the graphs of $x = 4$, $y = 3$ and $3x + 4y = 12$ is
(1) 12 (2) 8
(3) 10 (4) 6
(SSC CGL Tier-I Exam. 19.10.2014)

23. The equations
$3x + 4y = 10$
$-x + 2y = 0$
have the solution (a, b). The value of $a + b$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CGL Tier-I Exam. 19.10.2014)

24. Area of the triangle formed by the graph of the straight lines $x - y = 0$, $x + y = 2$ and the x-axis is
(1) 1 sq unit (2) 2 sq units
(3) 4 sq units (4) None of these
(SSC CGL Tier-II Exam. 21.09.2014)

25. If $2\left(x^2 + \frac{1}{x^2}\right) - \left(x - \frac{1}{x}\right) - 7 = 0$, then two values of x are
(1) 1, 2 (2) $2, -\frac{1}{2}$
(3) 0, 1 (4) $\frac{1}{2}, 1$
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

26. The total area (in sq. unit) of the triangles formed by the graph of $4x + 5y = 40$, x - axis, y - axis and $x = 5$ and $y = 4$ is
(1) 10 (2) 20
(3) 30 (4) 40
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

27. For what value of k, the system of equations $kx + 2y = 2$ and $3x + y = 1$ will be coincident ?
(1) 2 (2) 3
(3) 5 (4) 6
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

28. The area (in square units) of the triangle formed by the graphs of the equations $x = 4$, $y = 3$ and $3x + 4y = 12$; is
(1) 24 (2) 12
(3) 6 (4) 3
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9 and SSC CGL Tier-I Exam, 16.06.2015 (IInd Sitting) TF No. 2176783)

29. If the ordinate and abscissa of the point $(k, 2k-1)$ be equal, then the value of k is
(1) 0 (2) – 1
(3) 1 (4) $\frac{1}{2}$
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

30. The graph of $3x + 4y - 24 = 0$ forms a triangle OAB with the coordinate axes, where O is the origin. Also the graph of $x + y + 4 = 0$ forms a triangle OCD with the coordinate axes. Then the area of ΔOCD is equal to
(1) $\frac{1}{2}$ of area of ΔOAB
(2) $\frac{1}{3}$ of area of ΔOAB
(3) $\frac{2}{3}$ of area of ΔOAB
(4) the area of ΔOAB
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

31. The angle between the graph of the linear equation $239x - 239y + 5 = 0$ and the x-axis is
(1) 0° (2) 60°
(3) 30° (4) 45°
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

32. The length of the portion of the straight line $3x + 4y = 12$ intercepted between the axes is
(1) 5 (2) 3
(3) 4 (4) 7
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

33. $2x - ky + 7 = 0$ and $6x - 12y + 15 = 0$ has no solution for
(1) $k = -1$ (2) $k = -4$
(3) $k = 4$ (4) $k = 1$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

34. Among the equations
$x + 2y + 9 = 0$; $5x - 4 = 0$; $2y - 13 = 0$; $2x - 3y = 0$, the equation of the straight line passing through origin is
(1) $2x - 3y = 0$
(2) $x + 2y + 9 = 0$
(3) $5x - 4 = 0$
(4) $2y - 13 = 0$
(SSC CGL Tier-I Exam, 16.06.2015 (Ist Sitting) TF No. 3196279)

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5. If the number of vertices, edges and faces of a rectangualr parallelopiped are denoted by v, e and f respectively, the value of (v–e+f) is
(1) 0 (2) 2
(3) 4 (4) 1
(SSC CGL Tier-I Exam, 16.08.2015 (1st Sitting) TF No. 3196279)

6. The area of the triangle formed by the graphs of the equations $x = 0$, $2x+3y = 6$ and $x+y = 3$ is :
(1) 3 sq. unit (2) $4\frac{1}{2}$ sq. unit
(3) $1\frac{1}{2}$ sq. unit (4) 1 sq. unit
(SSC CGL Tier-I Exam, 16.08.2015 (1st Sitting) TF No. 3196279)

37. If $5x+9y = 5$ and $125x^3 + 729y^3 = 120$ then the vlaue of the product of x and y is
(1) $\frac{1}{9}$ (2) $\frac{1}{135}$
(3) 45 (4) 135
(SSC CGL Tier-I Exam, 16.08.2015 (1st Sitting) TF No. 3196279)

38. A point in the 4th quadrant is 6 unit away from x-axis and 7 unit away from y-axis. The point is at
(1) (7, –6) (2) (–7, 6)
(3) (–6, –7) (4) (–6, 7)
(SSC CGL Tier-I Re-Exam, 30.08.2015)

39. The straight line $y = 3x$ must pass through the point :
(1) (0, 0) (2) (0, 1)
(3) (1, 2) (4) (2, 0)
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (1st Sitting) TF No. 1375232)

40. If (2, 0) is a solution of the linear equation $2x + 3y = k$, then the value of k is
(1) 6 (2) 5
(3) 2 (4) 4
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (1st Sitting) TF No. 9692916)

41. The graph of linear equation $y = x$ passes through the point
(1) $\left(0, \frac{3}{2}\right)$ (2) (1, 1)
(3) $\left(-\frac{1}{2}, \frac{1}{2}\right)$ (4) $\left(\frac{3}{2}, -\frac{3}{2}\right)$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (1st Sitting) TF No. 9692916)

TYPE–IV

1. If $\frac{a}{b} = \frac{2}{3}$ and $\frac{b}{c} = \frac{4}{5}$, then the ratio $\frac{a+b}{b+c}$ equal to :
(1) $\frac{20}{27}$ (2) $\frac{27}{20}$
(3) $\frac{6}{8}$ (4) $\frac{8}{6}$
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

2. If a : b = 2 : 3 and b : c = 4 : 5, find $a^2 : b^2 : bc$
(1) 4 : 9 : 45 (2) 16 : 36 : 45
(3) 16 : 36 : 20 (4) 4 : 36 : 40
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

3. If $A : B = \frac{1}{2} : \frac{3}{8}$, $B : C = \frac{1}{3} : \frac{5}{9}$ and $C : D = \frac{5}{6} : \frac{3}{4}$ then the ratio A : B : C : D is
(1) 6 : 4 : 8 : 10
(2) 6 : 8 : 9 : 10
(3) 8 : 6 : 10 : 9
(4) 4 : 6 : 8 : 10
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

4. If x : y = 3 : 2, then the ratio $2x^2 + 3y^2 : 3x^2 - 2y^2$ is equal to :
(1) 12 : 5 (2) 6 : 5
(3) 30 : 19 (4) 5 : 3
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

5. If A : B : C = 2 : 3 : 4, then $\frac{A}{B} : \frac{B}{C} : \frac{C}{A}$ is equal to :
(1) 8 : 9 : 16 (2) 8 : 9 : 12
(3) 8 : 9 : 24 (4) 4 : 9 : 16
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

6. If A : B = 1 : 2. B : C = 3 : 4 and C : D = 5 : 6, find D : C : B : A
(1) 6 : 5 : 4 : 2
(2) 6 : 3 : 2 : 1
(3) 6 : 4 : 2 : 1
(4) 48 : 40 : 30 : 15
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

7. If $\frac{2a-5b}{3a+6b} = \frac{4}{7}$ then $a : b$ is equal to
(1) 21 : 36 (2) 2 : 59
(3) 59 : 2 (4) 36 : 21
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

8. If $\frac{a}{b} = \frac{7}{9}, \frac{b}{c} = \frac{3}{5}$, then the value of a : b : c is
(1) 7 : 9 : 15 (2) 7 : 9 : 5
(3) 21 : 35 : 45 (4) 7 : 3 : 15
(SSC CPO S.I.Exam.12.01.2003

9. If x : y = 7 : 3, then the value of $\frac{xy+y^2}{x^2-y^2}$ is
(1) $\frac{3}{4}$ (2) $\frac{4}{3}$
(3) $\frac{3}{7}$ (4) $\frac{7}{3}$
(SSC CPO S.I.Exam.12.01.2003

10. If $\frac{3a+5b}{3a-5b} = 5$, then $a : b$ is equal to :
(1) 2 : 1 (2) 5 : 3
(3) 3 : 2 (4) 5 : 2
(SSC CPO S.I. Exam. 26.05.2005)

11. If $p : q = r : s = t : u = 2 : 3$, then $(mp + nr + ot) : (mq + ns + ou)$ equals :
(1) 3 : 2 (2) 2 : 3
(3) 1 : 3 (4) 1 : 2
(SSC CPO S.I.Exam.26.05.2005)

12. If $x : y = 3 : 4$, then $(7x + 3y) : (7x - 3y)$ is equal to :
(1) 5 : 2 (2) 4 : 3
(3) 11 : 3 (4) 37 : 19
(SSC CPO S.I. Exam. 26.05.2005)

13. If $a : b : c = (y - z) : (z - x) : (x - y)$ then the value of $ax + by + cz$ is
(1) 1 (2) 3
(3) 0 (4) –1
(SSC (South Zone) Investigator Exam. 12.09.2010)

14. If 50% of (p – q) =30% of (p + q), then p : q is equal to
(1) 5 : 3 (2) 4 : 1
(3) 3 : 5 (4) 1 : 4
(SSC (South Zone) Investigator Exam.12.09.2010)

15. If $x : y = 2 : 1$, then $(5x^2 - 13xy + 6y^2)$ is equal to
(1) $\frac{3}{4}$ (2) $\frac{4}{3}$
(3) 0 (4) $\frac{55}{4}$
(SSC CPO Sub-Inspector Exam. 12.12.2010 (Paper-I)

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16. If $y : x = 4 : 15$, then the value of $\left(\frac{x-y}{x+y}\right)$ is

(1) $\frac{11}{19}$ (2) $\frac{19}{11}$

(3) $\frac{4}{11}$ (4) $\frac{15}{19}$

FCI Assistant Grade-III Exam.25.02.2012 (Paper-I) North Zone (Ist Sitting)

17. If $x : y = 3 : 4$, then the value of $\frac{5x-2y}{7x+2y} =$

(1) $\frac{7}{25}$ (2) $\frac{7}{23}$

(3) $\frac{7}{29}$ (4) $\frac{7}{17}$

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

18. If $x^2 + 9y^2 = 6xy$, then $x : y$ is

(1) 1 : 3 (2) 3 : 2

(3) 3 : 1 (4) 2 : 3

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

19. If $a+b+c=4\sqrt{3}$ and $a^2+b^2+c^2=16$, then the ratio $a : b : c$ is

(1) 1 : 1 : 1 (2) $1:\sqrt{2}:\sqrt{3}$

(3) 1 : 2 : 3 (4) None of these

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

20. If $4x + 5y = 83$ and $3x : 2y = 21 : 22$, then $(y - x)$ equals

(1) 3 (2) 4

(3) 7 (4) 11

(SSC CGL Tier-II Exam. 21.09.2014)

21. If $\frac{x}{xa+yb+zc} = \frac{y}{ya+zb+xc} = \frac{z}{za+xb+yc}$ and $x+y+z \neq 0$, then each ratio is

(1) $\frac{1}{a-b-c}$ (2) $\frac{1}{a+b-c}$

(3) $\frac{1}{a-b+c}$ (4) $\frac{1}{a+b+c}$

(SSC CHSL DEO & LDC Exam. 9.11.2014)

22. If $x : y = 3 : 2$, then the value of $\frac{x+y}{x-y}$ is

(1) 5 : 1 (2) 1 : 3

(3) 1 : 5 (4) 3 : 1

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

23. If $a^2 + b^2 + c^2 - ab - bc - ca = 0$, Then $a : b : c$ is :

(1) 1 : 1 : 2 (2) 1 : 1 : 1

(3) 1 : 2 : 1 (4) 2 : 1 : 1

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

TYPE–V

1. If $[p]$ means the greatest integer less than or equal to p, then $\left[-\frac{1}{4}\right]+\left[4\frac{1}{4}\right]+[3]$ is equal to

(1) 4 (2) 5

(3) 6 (4) 7

(SSC Section Officer (Commercial Audit) Exam.16.11.2003)

2. If $\oplus$ is an operation such that
$a \oplus b = 2a$ when $a > b$
$= a + b$ when $a < b$
$= a^2$ when $a = b$,
then, $\left[\frac{(5\oplus 7)+(4\oplus 4)}{3(5\oplus 5)-(15\oplus 11)-3}\right]$ is equal to :

(1) $\frac{1}{3}$ (2) $\frac{14}{23}$

(3) $\frac{2}{3}$ (4) $\frac{14}{13}$

(SSC CPO S.I. Exam. 16.12.2007)

3. If $\circledast$ is an operation such that $a \circledast b = a + b$ when $a > 0, b > 0$
$a \circledast b = \sqrt{a^2+b^2}$ for all other values of a and b. The value of $\frac{8 \circledast (7-13)-(3 \circledast 1)}{(3-6) \circledast (9-5)}$ is

(1) $\frac{1}{5}$ (2) $\frac{4}{5}$

(3) $\frac{6}{5}$ (4) $\frac{2}{5}$

(SSC CPO S.I. Exam. 09.11.2008)

4. The expression $x^4 - 2x^3 + k$ will be a perfect square when the value of k is

(1) 2 (2) 1

(3) –1 (4) –2

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

5. If $x = \sqrt[3]{a+\sqrt{a^2+b^3}} + \sqrt[3]{a-\sqrt{a^2+b^3}}$, then $x^3 + 3bx$ is equal to

(1) 0 (2) a

(3) $2a$ (4) 1

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

6. $$\frac{\frac{1}{3}\cdot\frac{1}{3}\cdot\frac{1}{3}+\frac{1}{4}\cdot\frac{1}{4}\cdot\frac{1}{4}-3\cdot\frac{1}{3}\cdot\frac{1}{4}\cdot\frac{1}{5}+\frac{1}{5}\cdot\frac{1}{5}\cdot\frac{1}{5}}{\frac{1}{3}\cdot\frac{1}{3}+\frac{1}{4}\cdot\frac{1}{4}+\frac{1}{5}\cdot\frac{1}{5}-\left(\frac{1}{3}\cdot\frac{1}{4}+\frac{1}{4}\cdot\frac{1}{5}+\frac{1}{5}\cdot\frac{1}{3}\right)}$$ is equal to :

(1) $\frac{2}{3}$ (2) $\frac{3}{4}$

(3) $\frac{47}{60}$ (4) $\frac{49}{60}$

(SSC CGL Prelim Exam. 08.02.2004 (Ist Sitting) & (SSC Delhi Police S.I. Exam. 19.08.2012)

7. When x^m is multiplied by x^n, product is 1. The relation between m and n is

(1) $mn = 1$ (2) $m = n$

(3) $m + n = 1$ (4) $m = -n$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

8. The term, that should be added to $(4x^2 + 8x)$ so that resulting expression be a perfect square, is

(1) 2 (2) 4

(3) $2x$ (4) 1

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

9. The mean of x and $\frac{1}{x}$ is N. Then the mean of x^2 and $\frac{1}{x^2}$ is

(1) N^2 (2) $2N^2-1$

(3) N^2-2 (4) $4N^2-2$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

10. If $3(a^2 + b^2 + c^2) = (a + b + c)^2$, then the relation between a, b and c is

(1) $a \neq b \neq c$ (2) $a = b \neq c$

(3) $a \neq b = c$ (4) $a = b = c$

(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099685)

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SHORT ANSWERS

TYPE-I

1. (1)	2. (3)	3. (2)	4. (4)
5. (3)	6. (3)	7. (3)	8. (2)
9. (4)	10. (2)	11. (3)	12. (4)
13. (2)	14. (3)	15. (3)	16. (3)
17. (2)	18. (3)	19. (2)	20. (3)
21. (3)	22. (2)	23. (3)	24. (3)
25. (1)	26. (2)	27. (1)	28. (3)
29. (1)	30. (2)	31. (3)	32. (4)
33. (4)	34. (2)	35. (1)	36. (2)
37. (3)	38. (2)	39. (3)	40. (3)
41. (2)	42. (4)	43. (2)	44. (2)
45. (4)	46. (1)	47. (2)	48. (4)
49. (2)	50. (4)	51. (2)	52. (1)
53. (2)	54. (4)	55. (1)	56. (1)
57. (3)	58. (1)	59. (2)	60. (2)
61. (1)	62. (3)	63. (2)	64. (1)
65. (2)	66. (1)	67. (2)	68. (4)
69. (1)	70. (3)	71. (2)	72. (4)
73. (4)	74. (4)	75. (4)	76. (4)
77. (1)	78. (1)	79. (2)	80. (3)
81. (1)	82. (2)	83. (3)	84. (2)
85. (3)	86. (4)	87. (2)	88. (2)
89. (3)	90. (4)	91. (4)	92. (2)
93. (4)	94. (4)	95. (4)	96. (1)
97. (3)	98. (1)	99. (4)	100. (2)
101. (2)	102. (2)	103. (1)	104. (4)
105. (3)	106. (3)	107. (3)	108. (3)
109. (4)	110. (2)	111. (2)	112. (3)
113. (4)	114. (4)	115. (3)	116. (2)
117. (3)	118. (3)	119. (2)	120. (2)
121. (1)	122. (2)	123. (4)	124. (2)
125. (3)	126. (2)	127. (4)	128. (3)
129. (4)	130. (3)	131. (3)	132. (1)
133. (4)	134. (2)	135. (3)	136. (2)
137. (2)	138. (4)	139. (4)	140. (1)
141. (3)	142. (1)	143. (3)	144. (4)
145. (2)	146. (1)	147. (3)	148. (4)
149. (3)	150. (3)	151. (3)	152. (1)
153. (1)	154. (2)	155. (3)	156. (1)
157. (2)	158. (4)	159. (1)	160. (4)
161. (1)	162. (4)	163. (1)	164. (4)
165. (4)	166. (4)	167. (1)	168. (2)
169. (3)	170. (3)	171. (2)	172. (2)
173. (3)	174. (3)	175. (1)	176. (2)
177. (4)	178. (1)	179. (1)	180. (2)
181. (4)	182. (1)	183. (3)	184. (4)
185. (4)	186. (2)	187. (2)	188. (1)
189. (2)	190. (2)	191. (3)	192. (2)
193. (4)	194. (4)	195. (3)	196. (4)
197. (3)	198. (1)	199. (4)	200. (1)
201. (3)	202. (1)	203. (2)	204. (4)
205. (4)	206. (3)	207. (3)	208. (3)
209. (2)	210. (3)	211. (3)	212. (3)
213. (1)	214. (1)	215. (1)	216. (1)
217. (4)	218. (3)	219. (3)	220. (4)
221. (2)	222. (1)	223. (4)	224. (2)
225. (3)	226. (1)	227. (1)	228. (2)
229. (3)	230. (3)	231. (1)	

TYPE-II

1. (3)	2. (3)	3. (3)	4. (1)
5. (2)	6. (1)	7. (1)	8. (2)
9. (1)	10. (3)	11. (1)	12. (3)
13. (3)	14. (3)	15. (2)	16. (1)
17. (1)	18. (3)	19. (3)	20. (4)
21. (2)	22. (1)	23. (1)	24. (1)
25. (2)	26. (2)	27. (2)	28. (2)
29. (1)	30. (2)	31. (3)	32. (2)
33. (1)	34. (4)	35. (4)	36. (3)
37. (3)	38. (4)	39. (2)	40. (2)
41. (3)	42. (2)	43. (2)	44. (4)
45. (4)	46. (1)	47. (3)	48. (2)
49. (3)	50. (2)	51. (1)	52. (4)
53. (3)	54. (1)	55. (1)	56. (3)
57. (4)	58. (1)	59. (4)	60. (3)
61. (3)	62. (4)	63. (2)	64. (2)
65. (2)	66. (1)	67. (4)	68. (3)
69. (1)	70. (2)	71. (4)	72. (1)
73. (4)	74. (2)	75. (1)	76. (3)
77. (2)	78. (3)	79. (1)	80. (4)
81. (4)	82. (3)	83. (2)	84. (4)
85. (2)	86. (3)	87. (1)	88. (2)
89. (3)	90. (2)	91. (2)	92. (3)
93. (4)	94. (3)	95. (2)	96. (3)
97. (2)	98. (1)	99. (3)	100. (3)
101. (3)	102. (2)	103. (3)	104. (2)
105. (4)	106. (1)	107. (1)	108. (2)
109. (1)	110. (2)	111. (1)	112. (4)
113. (2)	114. (3)	115. (3)	116. (4)
117. (1)	118. (1)	119. (4)	120. (3)
121. (4)	122. (3)	123. (3)	124. (2)
125. (1)	126. (1)	127. (1)	128. (3)
129. (2)	130. (3)	131. (4)	132. (3)
133. (4)	134. (4)	135. (3)	136. (4)
137. (4)	138. (1)	139. (1)	140. (4)
141. (3)	142. (4)	143. (4)	144. (4)
145. (2)	146. (4)	147. (1)	148. (1)
149. (3)	150. (2)	151. (2)	152. (1)
153. (1)	154. (3)	155. (1)	156. (2)
157. (2)	158. (1)	159. (2)	160. (2)
161. (3)	162. (2)	163. (1)	164. (1)
165. (3)	166. (4)	167. (*)	168. (3)
169. (1)	170. (2)	171. (1)	172. (2)
173. (1)	174. (3)	175. (3)	176. (4)
177. (3)	178. (3)	179. (4)	180. (4)

TYPE-III

1. (1)	2. (2)	3. (2)	4. (1)
5. (4)	6. (3)	7. (3)	8. (4)
9. (2)	10. (2)	11. (3)	12. (2)
13. (2)	14. (1)	15. (2)	16. (1)
17. (3)	18. (3)	19. (3)	20. (2)
21. (1)	22. (4)	23. (3)	24. (1)
25. (2)	26. (2)	27. (4)	28. (3)
29. (3)	30. (2)	31. (4)	32. (1)
33. (3)	34. (1)	35. (2)	36. (3)
37. (2)	38. (1)	39. (1)	40. (4)
41. (2)			

TYPE-IV

1. (1)	2. (2)	3. (3)	4. (3)
5. (3)	6. (4)	7. (3)	8. (1)
9. (1)	10. (4)	11. (2)	12. (3)
13. (3)	14. (2)	15. (3)	16. (1)
17. (3)	18. (3)	19. (1)	20. (2)
21. (4)	22. (1)	23. (2)	

TYPE-V

1. (3)	2. (3)	3. (3)	4. (2)
5. (3)	6. (3)	7. (4)	8. (2)
9. (2)	10. (4)		

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EXPLANATIONS

TYPE-I

1. (1) $a * b = 2a - 3b + ab$
$\Rightarrow 3 * 5 = 2 \times 3 - 3 \times 5 + 3 \times 5 = 6$
$5 * 3 = 2 \times 5 - 3 \times 3 + 3 \times 5$
$= 10 - 9 + 15 = 16$
Therefore, $3 * 5 + 5 * 3$
$= 6 + 16 = 22$

2. (3) $p \times q = p + q + \frac{p}{q}$

$\therefore 8 \times 2 = 8 + 2 + \frac{8}{2}$

$= 10 + 4 = 14$

3. (2) $(x + y) = 3(x - y) = 3x - 3y$
$\Rightarrow 3y + y = 3x - x$
$\Rightarrow 2x = 4y$
$\Rightarrow x = 2y$

$\Rightarrow \frac{x}{y} = \frac{2}{1}$

$\therefore x = 2, y = 1$

$\frac{3xy}{2(x^2 - y^2)} = \frac{3 \times 2 \times 1}{2 \times (4 - 1)} = \frac{6}{6} = 1$

4. (4) Given expression

$= \left(1 + \frac{1}{x}\right)\left(1 + \frac{1}{x+1}\right)\left(1 + \frac{1}{x+2}\right)\left(1 + \frac{1}{x+3}\right)$

$= \frac{x+1}{x} \times \frac{x+2}{x+1} \times \frac{x+3}{x+2} \times \frac{x+4}{x+3}$

$= \frac{x+4}{x}$

5. (3) $a * b = 2(a + b)$
$\therefore 5 * 2 = 2(5 + 2)$
$= 2 \times 7 = 14$

6. (3) $\frac{2a + b}{a + 4b} = 3$ (Given)
$\Rightarrow 2a + b = 3a + 12b$
$\Rightarrow 3a - 2a = b - 12b$
$\Rightarrow a = -11b$

Then, $\frac{a + b}{a + 2b} = \frac{-11b + b}{-11b + 2b}$

$= \frac{-10b}{-9b} = \frac{10}{9}$

7. (3)

$x = \sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}+1}} = \sqrt{\frac{(\sqrt{5}+1)^2}{5-1}}$

$= \sqrt{\frac{(\sqrt{5}+1)^2}{4}} = \frac{\sqrt{5}+1}{2}$

$\therefore 5x^2 - 5x - 1$

$= 5\left(\frac{\sqrt{5}+1}{2}\right)^2 - 5\frac{(\sqrt{5}+1)}{2} - 1$

$= 5\left(\frac{5+1+2\sqrt{5}}{4}\right) - \frac{5\sqrt{5}+5}{2} - 1$

$= 5\left(\frac{3+\sqrt{5}}{2}\right) - \frac{5\sqrt{5}+5}{2} - 1$

$= \frac{15 + 5\sqrt{5} - 5\sqrt{5} - 5 - 2}{2}$

$= \frac{8}{2} = 4$

8. (2) Given $a * b = a + b + ab$
$\therefore 3 * 4 - 2 * 3$
$= (3 + 4 + 3 \times 4) - (2 + 3 + 2 \times 3)$
$= (7 + 12) - (5 + 6) = 19 - 11 = 8$

9. (4) $x = 7 - 4\sqrt{3}$

$\therefore \frac{1}{x} = \frac{1}{7 - 4\sqrt{3}}$

$= \frac{1(7 + 4\sqrt{3})}{(7 + 4\sqrt{3})(7 - 4\sqrt{3})}$

$= \frac{7 + 4\sqrt{3}}{49 - 48} = 7 + 4\sqrt{3}$

$\therefore x + \frac{1}{x}$

$= 7 - 4\sqrt{3} + 7 + 4\sqrt{3} = 14$

10. (2) $\because x * y = 3x + 2y$
$2 * 3 + 3 * 4$
$= 3 \times 2 + 2 \times 3 + 3 \times 3 + 2 \times 4$
$= 6 + 6 + 9 + 8 = 29$

11. (3) $\frac{a}{3} = \frac{b}{4} = \frac{c}{7} = k$ (Let)
$a = 3k, b = 4k, c = 7k$

$\therefore \frac{a + b + c}{c} = \frac{3k + 4k + 7k}{7k}$

$= \frac{14k}{7k} = 2$

12. (4) $\frac{144}{0.144} = \frac{14.4}{x}$
$\Rightarrow 144 \times x = 14.4 \times 0.144$
$\Rightarrow x = \frac{14.4 \times 0.144}{144}$

$= \frac{144 \times 144}{144 \times 10000} = 0.0144$

13. (2) Since $1 < x < 2$, we have
$x - 1 > 0$ and
$x - 3 < 0$
or, $3 - x > 0$

$\therefore \sqrt{(x-1)^2} + \sqrt{(x-3)^2}$

$= \sqrt{(x-1)^2} + \sqrt{(3-x)^2}$

$[\because (x-3)^2 = (3-x)^2]$
$= x - 1 + 3 - x = 2$

14. (3) It is given that
$a \otimes b = (a \times b) + b$

$\therefore 5 \otimes 7 = (5 \times 7) + 7 = 35 + 7 = 42$

15. (3) We have,
$10^{0.48} = x, 10^{0.70} = y$
$\therefore x^z = y^2$
$\Rightarrow (10^{0.48})^z = (10^{0.70})^2$
$\Rightarrow 10^{0.48z} = 10^{1.4}$
$\Rightarrow 0.48z = 1.4$

$\Rightarrow z = \frac{1.4}{0.48} = 2.9$

16. (3) $4A + \frac{7}{B} + 2C + \frac{5}{D} + 6E$
$= 47.2506$

$= 40 + 7 + \frac{2}{10} + \frac{5}{100} + \frac{6}{10000}$

$4A = 40 \Rightarrow A = 10$

$\frac{7}{B} = 7 \Rightarrow 7B = 7 = \Rightarrow B = 1$

$2C = \frac{2}{10} \Rightarrow C = 0.1$

$\frac{5}{D} = \frac{5}{100} \Rightarrow D = 100$

$6E = \frac{6}{10000} \Rightarrow E = 0.0001$

$5A + 3B + 6C + D + 3E$
$= 5 \times 10 + 3 \times 1 + 6 \times 0.1 + 100$
$+ 3 \times 0.0001$
$= 50 + 3 + 0.6 + 100 + 0.0003$
$= 153.6003$

17. (2) $x * y = x^2 + y^2 - xy$ (Given)
$\Rightarrow 9 * 11 = 9^2 + 11^2 - 9 \times 11$
$= 81 + 121 - 99$
$= 202 - 99 = 103$

18. (3) $\frac{2p}{p^2 - 2p + 1} = \frac{1}{4}$

$\Rightarrow \frac{p^2 - 2p + 1}{2p} = 4$

$\Rightarrow \frac{p^2 - 2p + 1}{p} = 8$

$\Rightarrow \frac{p^2}{p} - \frac{2p}{p} + \frac{1}{p} = 8$

$\Rightarrow p + \frac{1}{p} = 8 + 2 = 10$

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19. (2) $5^{5x+5}=1$

$\Rightarrow 5^{5x}\times 5^5=1$

$\Rightarrow 5^{5x}=\frac{1}{5^5}$

$\Rightarrow 5^{5x}=5^{-5} \Rightarrow 5x=-5$

$\Rightarrow x=-1$

Method 2 :

$5^{5x+5}=1$

$\Rightarrow 5^{5x+5}=5^0$

$\Rightarrow 5x+5=0 \Rightarrow x=-1$

20. (3) $3^{x+3}+7=250$

$\Rightarrow 3^{x+3}=243 \quad \Rightarrow 3^{x+3}=3^5$

$\Rightarrow x+3=5 \Rightarrow x=2$

21. (3) $\frac{1}{4}\times\frac{2}{6}\times\frac{3}{8}\times\frac{4}{10}\times\frac{5}{12}\ldots\times\frac{31}{64}$

$=\frac{1}{2^x}$

$\Rightarrow \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times$ ... to 30 terms

$\times\frac{1}{64}=\frac{1}{2^x}$

$\Rightarrow \frac{1}{2^{30}}\times\frac{1}{2^6}=\frac{1}{2^x}$

$\Rightarrow \frac{1}{2^{36}}=\frac{1}{2^x} \Rightarrow x=36$

22. (2) Expression

$=\frac{(243)^{\frac{n}{5}}\times 3^{2n+1}}{9^n\times 3^{n-1}}$

$=\frac{\left(3^5\right)^{\frac{n}{5}}\times 3^{2n+1}}{\left(3^2\right)^n\times 3^{n-1}}=\frac{3^n\times 3^{2n+1}}{3^{2n}\times 3^{n-1}}$

$=\frac{3^{n+2n+1}}{3^{2n+n-1}}=\frac{3^{3n+1}}{3^{3n-1}}$

$=3^{3n+1-3n+1}=3^2=9$

23. (3) $x=0.5$ and $y=0.2$ (Given)

$\therefore \sqrt{0.6}\times(3y)^x$

$=\sqrt{0.6}\times(3\times 0.2)^{0.5}$

$=\sqrt{0.6}\times(0.6)^{\frac{1}{2}}$

$=\sqrt{0.6\times 0.6}=0.6$

24. (3) $x^{x\sqrt{x}}=\left(x\sqrt{x}\right)^x$

$\Rightarrow x^{x.x^{\frac{1}{2}}}=\left(x\times x^{\frac{1}{2}}\right)^x$

$\Rightarrow x^{x^{1+\frac{1}{2}}}=\left(x^{1+\frac{1}{2}}\right)^x$

$x^{x^{3/2}}=\left(x^{3/2}\right)^x=x^{\frac{3x}{2}}$

$\Rightarrow x^{\frac{3}{2}}=\frac{3x}{2} \Rightarrow x^{\frac{3}{2}}-\frac{3x}{2}=0$

$\Rightarrow x\left(x^{\frac{1}{2}}-\frac{3}{2}\right)=0$

$\Rightarrow x=0$ or $x^{\frac{1}{2}}=\frac{3}{2}$

$\Rightarrow x=\left(\frac{3}{2}\right)^2=\frac{9}{4}$

$x=0$ given indeterminate value.

$\therefore x=\frac{9}{4}$

25. (1) $a^2+b^2+c^2-ab-bc-ca$

$=\frac{1}{2}\left[(a-b)^2+(b-c)^2+(c-a)^2\right]$

$=\frac{1}{2}\left[(7-5)^2+(5-3)^2+(3-7)^2\right]$

$=\frac{1}{2}(4+4+16)$

$=\frac{1}{2}\times 24=12$

26. (2) $7^x=\frac{1}{343}$

$\Rightarrow 7^x=\frac{1}{7^3}=7^{-3}$

$\Rightarrow x=-3$

27. (1) $\frac{a}{2}=\frac{b}{3}=\frac{c}{5}=k$ (Let)

$\therefore a=2k,\ b=3k,\ c=5k$

$\therefore \frac{a+b+c}{c}=\frac{2k+3k+5k}{5k}$

$=\frac{10k}{5k}=2$

28. (3) $0.13+p^2=13$

$\Rightarrow \frac{0.13}{p^2}=13$

$\Rightarrow p^2=\frac{0.13}{13}=\frac{1}{100}$

$\Rightarrow p=\frac{1}{10}=0.1$

29. (1) $\frac{a}{3}=\frac{b}{2} \Rightarrow \frac{a}{b}=\frac{3}{2}$

$\therefore \frac{2a+3b}{3a-2b}=\frac{2\times\frac{a}{b}+3}{3\times\frac{a}{b}-2}$

$=\frac{2\times\frac{3}{2}+3}{3\times\frac{3}{2}-2}=\frac{6}{\frac{9-4}{2}}=\frac{12}{5}$

30. (2) $x+\frac{1}{4}\sqrt{x}+a^2$

$=\left(\sqrt{x}\right)^2+2.\sqrt{x}.\frac{1}{8}+(a)^2$

Clearly $a=\frac{1}{8}$.

Then, expression $=\left(\sqrt{x}+\frac{1}{8}\right)^2$

31. (3) Arithmetic mean (AM) $=\frac{a+b}{2}$

Geometric mean (GM) $=\sqrt{ab}$

As AM > GM

$\frac{a+b}{2}>\sqrt{ab}$

32. (4) **Tricky Approach**

$\frac{a}{1-a}+\frac{b}{1-b}+\frac{c}{1-c}=1$

$\Rightarrow\left(\frac{a}{1-a}+1\right)+\left(\frac{b}{1-b}+1\right)+\left(\frac{c}{1-c}+1\right)$

$=3+1=4$

$\Rightarrow \frac{a+1-a}{1-a}+\frac{b+1-b}{1-b}+\frac{c+1-c}{1-c}=4$

$\Rightarrow \frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=4$

33. (4) $x^{\frac{1}{3}}=y^{\frac{1}{4}}$

$\Rightarrow\left(x^{\frac{1}{3}}\right)^{12}=\left(y^{\frac{1}{4}}\right)^{12} \Rightarrow x^4=y^3$

$\Rightarrow (x^4)^5=(y^3)^5 \Rightarrow x^{20}=y^{15}$

34. (2) We know that $a^0=1$

$\therefore a^{2x+2}=1=a^0$

$\Rightarrow 2x+2=0$

$\Rightarrow x=\frac{-2}{2}=-1$

35. (1) For expression ax^2+bx+c, $a>0$, the minimum value is given by

$\frac{4ac-b^2}{4a}$

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Here, for $x^2 - x + 1$
$a = 1, b = -1, c = 1$
∴ Minimum value

$$= \frac{4 \times 1 \times 1 - 1}{4 \times 1} = \frac{3}{4}$$

36. (2) $\frac{\sqrt{7}-2}{\sqrt{7}+2} = \frac{\sqrt{7}-2}{\sqrt{7}+2} \times \frac{\sqrt{7}-2}{\sqrt{7}-2}$

(Rationalising the denominator)

$$= \frac{(\sqrt{7}-2)^2}{7-4} = \frac{7+4-4\sqrt{7}}{3}$$

$$= \frac{11}{3} - \frac{4\sqrt{7}}{3}$$

$$\therefore \frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7} + b$$

$$\Rightarrow \frac{11}{3} - \frac{4}{3}\sqrt{7} = a\sqrt{7} + b$$

Clearly,

$$a = -\frac{4}{3} \text{ and } b = \frac{11}{3}$$

37. (3) $(125)^x = 3125$
$\Rightarrow (5^3)^x = 5^5 \Rightarrow 5^{3x} = 5^5$
$\Rightarrow 3x = 5$

$$\Rightarrow x = \frac{5}{3}$$

38. (2) $5^{\sqrt{x}} + 12^{\sqrt{x}} = 13^{\sqrt{x}}$
We know that $5^2 + 12^2 = 13^2$
(Pythagorean Triplet)
$\therefore \sqrt{x} = 2 \Rightarrow x = 2^2 = 4$

39. (3) $2^{2x-y} = 16 = 2^4$
$\Rightarrow 2x - y = 4$ ..... (i)
$2^{x+y} = 32 = 2^5$
$\Rightarrow x + y = 5$ ..... (ii)
On adding equations (i) and (ii),
$3x = 9 \Rightarrow x = 3$
From equation (ii),
$y = 5 - x = 5 - 3 = 2$
$\therefore xy = 3 \times 2 = 6$

40. (3) $\left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-6} = \left(\frac{3}{5}\right)^{2x-1}$

$$\Rightarrow \left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-3}\left(\frac{3}{5}\right)^{-3} = \left(\frac{3}{5}\right)^{2x-1}$$

$$\Rightarrow \left(\frac{3}{5}\right)^0\left(\frac{3}{5}\right)^{-3} = \left(\frac{3}{5}\right)^{2x-1}$$

$\Rightarrow 2x - 1 = -3$
$\Rightarrow 2x = -3 + 1 = -2$
$\Rightarrow x = -1$

Method : 2

$$\left(\frac{3}{5}\right)^3\left(\frac{3}{5}\right)^{-6} = \left(\frac{3}{5}\right)^{2x-1}$$

$$\Rightarrow \left(\frac{3}{5}\right)^{-6+3} = \left(\frac{3}{5}\right)^{2x-1}$$

$\Rightarrow -3 = 2x - 1$
$\Rightarrow -2 = 2x$
$\Rightarrow x = -1$

41. (2) $\frac{2x-y}{x+2y} = \frac{1}{2}$

$\Rightarrow 4x - 2y = x + 2y$
$\Rightarrow 3x = 4y$

$$\Rightarrow \frac{x}{y} = \frac{4}{3}$$

$$\therefore \frac{3x-y}{3x+y} = \frac{y\left(3\frac{x}{y}-1\right)}{y\left(3\frac{x}{y}+1\right)}$$

$$= \frac{3 \times \frac{4}{3} - 1}{3 \times \frac{4}{3} + 1}$$

$$= \frac{4-1}{4+1} = \frac{3}{5}$$

42. (4) Tricky approach
$a^2 - b^2 = 19$
$\Rightarrow 10^2 - 9^2 = 19$
$\Rightarrow a = 10$

43. (2) Tricky approach

$$\frac{\sqrt{3+x}+\sqrt{3-x}}{\sqrt{3+x}-\sqrt{3-x}} = \frac{2}{1}$$

By componendo and dividendo,

$$\Rightarrow \frac{2\sqrt{3+x}}{2\sqrt{3-x}} = \frac{2+1}{2-1} = 3$$

Squaring on both sides, we get

$$\frac{3+x}{3-x} = 9$$

$\Rightarrow 3 + x = 27 - 9x$
$\Rightarrow 9x + x = 27 - 3 = 24$

$$\Rightarrow x = \frac{24}{10} = \frac{12}{5}$$

44. (2) $x + \frac{1}{x} = 5$

$\Rightarrow x^2 - 5x + 1 = 0$
$\Rightarrow 3x^2 - 15x + 3 = 0$

$$\therefore \frac{2x}{3x^2 - 5x + 3} = \frac{2x}{15x - 5x}$$

$$= \frac{2x}{10x} = \frac{1}{5}$$

45. (4) $x = \frac{\sqrt{3}}{2} \Rightarrow \frac{1}{x} = \frac{2}{\sqrt{3}}$

By componendo and dividendo,

$$\frac{1+x}{1-x} = \frac{2+\sqrt{3}}{2-\sqrt{3}}$$

$$\Rightarrow \frac{1+x}{1-x} = \frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$$

$$= \frac{(2+\sqrt{3})^2}{(2-\sqrt{3})(2+\sqrt{3})} = \frac{(2+\sqrt{3})^2}{4-3}$$

$$\Rightarrow \frac{1+x}{1-x} = (2+\sqrt{3})^2$$

$$\therefore \frac{\sqrt{1+x}}{\sqrt{1-x}} = \frac{2+\sqrt{3}}{1}$$

By componendo and dividendo

$$\frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}} = \frac{2+\sqrt{3}+1}{2+\sqrt{3}-1}$$

$$= \frac{3+\sqrt{3}}{\sqrt{3}+1} = \frac{\sqrt{3}(\sqrt{3}+1)}{\sqrt{3}+1} = \sqrt{3}$$

46. (1) $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$

$$= \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)}$$

$$= \frac{(\sqrt{3}+1)^2}{3-1} = \frac{3+1+2\sqrt{3}}{2}$$

$$= \frac{4+2\sqrt{3}}{2} = 2+\sqrt{3}$$

Similarly,

$$y = \frac{\sqrt{3}-1}{\sqrt{3}+1} = 2-\sqrt{3}$$

$$\therefore x^2 + y^2 = (2+\sqrt{3})^2 + (2-\sqrt{3})^2$$

$$= 4 + 3 + 4\sqrt{3} + 4 + 3 - 4\sqrt{3}$$
$$= 14$$

47. (2) $4^{4x+1} = \frac{1}{64} = \frac{1}{4^3}$
$\Rightarrow 4^{4x+1} = 4^{-3} \Rightarrow 4x + 1 = -3$
$\Rightarrow 4x = -4 \Rightarrow x = -1$

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48. (4) $\frac{\sqrt{x+4}+\sqrt{x-4}}{\sqrt{x+4}-\sqrt{x-4}}=\frac{2}{1}$

By componendo and dividendo,

$\frac{2\sqrt{x+4}}{2\sqrt{x-4}}=\frac{3}{1}$

On squaring,

$\frac{x+4}{x-4}=\frac{9}{1}$

$\Rightarrow 9x-36=x+4$

$\Rightarrow 9x-x=36+4$

$\Rightarrow 8x=40$

$\Rightarrow x=5$

49. (2) $\sqrt{2^x}=256$

$\Rightarrow 2^{\frac{x}{2}}=2^8$

$\Rightarrow \frac{x}{2}=8 \Rightarrow x=16$

50. (4) $\frac{(\sqrt{5})^7}{(\sqrt{5})^5}=5^p$

$\Rightarrow (\sqrt{5})^{7-5}=5^p$

$\Rightarrow (\sqrt{5})^2=5^p$

$\Rightarrow 5^1=5^p \Rightarrow p=1$

51. (2) $\sqrt{1-\frac{x^3}{100}}=\frac{3}{5}$

Squaring both sides,

$1-\frac{x^3}{100}=\frac{9}{25}$

$\Rightarrow \frac{x^3}{100}=1-\frac{9}{25}=\frac{25-9}{25}=\frac{16}{25}$

$\Rightarrow x^3=\frac{16}{25}\times 100=64$

$\therefore x=\sqrt[3]{64}=\sqrt[3]{4\times4\times4}=4$

52. (1) Given that

$a \star b=2a+3b-ab$

$\therefore 3 \star 5+5 \star 3$

$=(2\times3+3\times5-3\times5)+(5\times2+3\times3-5\times3)$

$=(6+15-15)+(10+9-15)$

$=6+4=10$

53. (2) $\sqrt{1+\frac{x}{9}}=\frac{13}{3}$

Squaring both sides,

$1+\frac{x}{9}=\frac{169}{9}$

$\Rightarrow \frac{x}{9}=\frac{169}{9}-1=\frac{160}{9}$

$\Rightarrow x=\frac{160}{9}\times9=160$

54. (4) L.H.S. $=\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$

$=\frac{4\sqrt{3}+5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}}$

$=\frac{4\sqrt{3}+5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}}\times\frac{4\sqrt{3}-3\sqrt{2}}{4\sqrt{3}-3\sqrt{2}}$

(Rationalising the denominator)

$=\frac{16\times3-12\sqrt{6}+20\sqrt{6}-15\times2}{(4\sqrt{3})^2-(3\sqrt{2})^2}$

$=\frac{48+8\sqrt{6}-30}{48-18}$

$=\frac{18+8\sqrt{6}}{30}=\frac{9}{15}+\frac{4\sqrt{6}}{15}$

$=\frac{3}{5}+\frac{4\sqrt{6}}{15}$

Now, $\frac{3}{5}+\frac{4\sqrt{6}}{15}=a+b\sqrt{6}$

$\therefore a=\frac{3}{5}$ and $b=\frac{4}{15}$

55. (1) $x+y=2z$

$\Rightarrow x=2z-y,$

$\Rightarrow x-z=2z-y-z=z-y$

$\therefore \frac{x}{x-z}+\frac{z}{y-z}$

$=\frac{x}{x-z}-\frac{z}{z-y}$

$=\frac{x}{x-z}-\frac{z}{x-z}=\frac{x-z}{x-z}=1$

56. (1) $a * b=a^b$

$\therefore 5 * 3=5^3=5\times5\times5=125$

57. (3) $\sqrt{0.03\times0.3\times a}$

$=0.3\times0.3\sqrt{b}$

On squaring,

$0.03\times0.3\times a=0.09\times0.09\times b$

$\Rightarrow \frac{a}{b}=\frac{0.09\times0.09}{0.03\times0.3}=0.9$

58. (1) $x \star y=(x+3)^2(y-1)$

$\therefore 5 \star 4=(5+3)^2(4-1)$

$=64\times3=192$

59. (2)

$9\sqrt{x}=\sqrt{3\times2\times2}+\sqrt{3\times7\times7}$

$\Rightarrow 9\sqrt{x}=2\sqrt{3}+7\sqrt{3}=9\sqrt{3}$

$\therefore x=3$

60. (2) $X \star\star Y=X^2+Y^2-XY$

$\therefore 11 \star\star 13=11^2+13^2-11\times13$

$=121+169-143=147$

61. (1) $\sqrt{1+\frac{x}{961}}=\frac{32}{31}$

Squaring both sides,

$1+\frac{x}{961}=\left(\frac{32}{31}\right)^2=\frac{1024}{961}$

$\Rightarrow \frac{x}{961}=\frac{1024}{961}-1=\frac{1024-961}{961}=\frac{63}{961}$

$\Rightarrow x=63$

62. (3) $\sqrt{0.04\times0.4\times a}$

$=0.004\times0.4\times\sqrt{b}$

Squaring both sides,

$0.04\times0.4\times a$

$=0.004\times0.4\times0.004\times0.4\times b$

$\Rightarrow \frac{a}{b}$

$=\frac{0.004\times0.004\times0.4\times0.4}{0.04\times0.4}$

$=0.00016$

$=\frac{16}{100000}=16\times10^{-5}$

63. (2) $(a-b)^2=a^2-2ab+b^2$

$x^4-2x^2+k=(x^2)^2-2.x^2.1+1$

$\therefore k=(1)^2=1$

64. (1) $2^{x+3}=32=2^5$

$\Rightarrow x+3=5 \Rightarrow x=5-3=2$

$\therefore 3^{x+1}=3^3=27$

65. (2) $x^4-17x^3+17x^2-17x+17$

$=x^4-16x^3+16x^2-16x-x^3$

x^2-x+17

When $x=16$,

Expression $=16^4-15^4+16^3$

$16^2-16^3+16^2-16+17=1$

66. (1) Given, $\frac{x}{y}=\frac{3}{4}$

Now, $\frac{6}{7}+\frac{y-x}{y+x}=\frac{6}{7}+\frac{1-\frac{x}{y}}{1+\frac{x}{y}}$

[Dividing N^r and D^r by y]

$=\frac{6}{7}+\frac{1-\frac{3}{4}}{1+\frac{3}{4}}=\frac{6}{7}+\frac{4-3}{4+3}$

$=\frac{6}{7}+\frac{1}{7}=1$

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67. (2) $n+\frac{2n}{3}+\frac{n}{2}+\frac{n}{7}=97$

$\Rightarrow \frac{42n+28n+21n+6n}{42}=97$

$\Rightarrow \frac{97n}{42}=97 \Rightarrow n=\frac{97\times 42}{97}=42,$

$\therefore n=42$

68. (4) $x^2-3x+1=0$

$\Rightarrow x^2+1=3x$

$\Rightarrow \frac{x^2+1}{x}=\frac{3x}{x}$

$\Rightarrow x+\frac{1}{x}=3$

69. (1) Tricky Approach

$1.5a=0.04b$

$\frac{b}{a}=\frac{1.5}{0.04}$

By componendo and dividendo,

$\frac{b-a}{b+a}=\frac{1.5-0.04}{1.5+0.04}=\frac{1.46}{1.54}=\frac{73}{77}$

70. (3) $x=\left(\sqrt{2}+1\right)^{-\frac{1}{3}}$

$\Rightarrow x^3=\sqrt{2}+1$

$\Rightarrow \frac{1}{x3}=\sqrt{2}+1$

and $x^3=\frac{1}{\sqrt{2}+1}=\frac{1(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)}$

$=\sqrt{2}-1$

$\therefore x^3-\frac{1}{x^3}$

$=\sqrt{2}-1-\sqrt{2}-1=-2$

71. (2) $\frac{x^2-x+1}{x^2+x+1}=\frac{2}{3}$

$\Rightarrow \frac{x^2+1-x}{x^2+1+x}=\frac{2}{3}$

Dividing numerator and denominator by x,

$\frac{\left(x+\frac{1}{x}\right)-1}{\left(x+\frac{1}{x}\right)+1}=\frac{2}{3}$

$\Rightarrow 3\left(x+\frac{1}{x}\right)-3=2\left(x+\frac{1}{x}\right)+2$

$\Rightarrow x+\frac{1}{x}=2+3=5$

72. (4) $\frac{a}{b}=\frac{c}{d}=\frac{e}{f}=3$

$\Rightarrow a=3b;\ c=3d;\ e=3f$

$\therefore \frac{2a^2+3c^2+4e^2}{2b^2+3d^2+4f^2}$

$=\frac{2\times 9b^2+3\times 9d^2+4\times 9f^2}{2b^2+3d^2+4f^2}$

$=\frac{9\left(2b^2+3d^2+4f^2\right)}{2b^2+3d^2+4f^2}=9$

73. (4) $(x-3)^2+(y-4)^2+(z-5)^2=0$

$\Rightarrow x-3=0,\ y-4=0$

and $z-5=0$

$\Rightarrow x=3,\ y=4$ and $z=5$

$\therefore x+y+z=3+4+5=12$

74. (4) $x=7-4\sqrt{3}$

$\therefore \sqrt{x}=\sqrt{7-4\sqrt{3}}$

$=\sqrt{7-2\times 2\times\sqrt{3}}$

$=\sqrt{4+3-2\times 2\times\sqrt{3}}$

$=\sqrt{(2-\sqrt{3})^2}=2-\sqrt{3}$

$\therefore \frac{1}{\sqrt{x}}=\frac{1}{2-\sqrt{3}}$

$=\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}=\frac{2+\sqrt{3}}{4-3}$

$=2+\sqrt{3}$

$\therefore \sqrt{x}+\frac{1}{\sqrt{x}}=2-\sqrt{3}+2+\sqrt{3}=4$

75. (4) $(a-1)^2+(b+2)^2+(c+1)^2=0$

$\Rightarrow a-1=0 \Rightarrow a=1;$

$b+2=0 \Rightarrow b=-2$

$c+1=0 \Rightarrow c=-1$

$\therefore 2a-3b+7c$

$=2-3(-2)+7(-1)$

$=2+6-7=1$

76. (4) $2x+\frac{1}{3x}=5$

$\Rightarrow 6x^2+1=15x$

$\Rightarrow 6x^2+20x+1=15x+20x$

$=35x$

$\Rightarrow \frac{5x}{6x^2+20x+1}=\frac{5x}{35x}=\frac{1}{7}$

77. (1) $x\propto\frac{1}{y^2-1}$

$\Rightarrow x=\frac{k}{y^2-1}$

Where k is a constant.

When $y=10,\ x=24$, then

$\therefore 24=\frac{k}{10^2-1}\Rightarrow 24=\frac{k}{99}$

$\Rightarrow k=24\times 99$

When $y=5$, then

$x=\frac{k}{y^2-1}=\frac{24\times 99}{5^2-1}=\frac{24\times 99}{24}=99$

78. (1) $x^2+y^2+2x+1=0$

$\Rightarrow x^2+2x+1+y^2=0$

$\Rightarrow (x+1)^2+y^2=0$

$\Rightarrow x+1=0\Rightarrow x=-1$ and $y=0$

$\therefore x^{31}+y^{33}=-1$

79. (2) $\frac{x}{2x^2+5x+2}=\frac{1}{6}$

$\Rightarrow 2x^2+5x+2=6x$

$\Rightarrow 2x^2+2=6x-5x=x$

$\Rightarrow x^2+1=\frac{x}{2}$

On dividing by x,

$\Rightarrow x+\frac{1}{x}=\frac{1}{2}$

80. (3) $a^2+b^2+c^2=2a-2b-2c-3$

$\Rightarrow a^2-2a+b^2+2b+c^2+2c+1+1+1=0$

$\Rightarrow (a^2-2a+1)+(b^2+2b+1)+(c^2+2c+1)=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

$\Rightarrow a-1=0\Rightarrow a=1$

$\Rightarrow b+1=0\Rightarrow b=-1$

and $c+1=0\Rightarrow c=-1$

$\therefore 2a-3b+4c=2+3-4=1$

81. (1) $(3a+1)^2+(b-1)^2+(2c-3)^2=0$

$\Rightarrow 3a+1=0$

$\Rightarrow 3a=-1$

$b-1=0$

$\Rightarrow b=1$

$2c-3=0$

$\Rightarrow 2c=3$

$\therefore 3a+b+2c=-1+1+3=3$

82. (2) $\frac{(a-b)^2}{(b-c)(c-a)}+$

$\frac{(b-c)^2}{(a-b)(c-a)}+\frac{(c-a)^2}{(a-b)(b-c)}$

$=\frac{(a-b)^3}{(a-b)(b-c)(c-a)}+$

$\frac{(b-c)^3}{(a-b)(b-c)(c-a)}+$

$\frac{(c-a)^3}{(a-b)(b-c)(c-a)}$

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$$= \frac{(a-b)^3+(b-c)^3+(c-a)^3}{(a-b)(b-c)(c-a)}$$

$[\because (a-b)+(b-c)+(c-a)=0]$

$$= \frac{3(a-b)(b-c)(c-a)}{(a-b)(b-c)(c-a)} = 3$$

$$\left[\begin{matrix}\text{If } a+b+c=0,\\ \because a^3+b^3+c^3=3abc\end{matrix}\right]$$

83. (3) $(a-3)^2+(b-4)^2+(c-9)^2=0$

$\Rightarrow a-3=0 \Rightarrow a=3$

$b-4=0 \Rightarrow b=4$

and $c-9=0 \Rightarrow c=9$

$\therefore \sqrt{a+b+c} = \sqrt{3+4+9}$

$= \sqrt{16} = \pm 4$

84. (2) $180 = 2\times2\times3\times3\times5$

$a^2b = abc$

$\Rightarrow a^2 = c$

$\therefore a^2b = abc = 180 = 1^2\times180\times1$

$= 1^3\times180$

$\Rightarrow c = 1$

85. (3) $(x-3)^2+(y-5)^2+(z-4)^2=0$

$\Rightarrow x-3=0 \quad \Rightarrow x=3$

$y-5=0 \quad \Rightarrow y=5$

$z-4=0 \quad \Rightarrow z=4$

$$\therefore \frac{x^2}{9}+\frac{y^2}{25}+\frac{z^2}{16}$$

$$= \frac{9}{9}+\frac{25}{25}+\frac{16}{16}$$

$= 1+1+1=3$

86. (4) $(a-1)\sqrt{2}+3 = b\sqrt{2}+a$

$\Rightarrow a=3\ ;\ a-1=b$

$\Rightarrow 3-1=b \Rightarrow b=2$

$\therefore a+b=3+2=5$

87. (2) $$a = \frac{\sqrt{5}+1}{\sqrt{5}-1} = \frac{\sqrt{5}+1}{\sqrt{5}-1}\times\frac{\sqrt{5}+1}{\sqrt{5}+1}$$

$$= \frac{(\sqrt{5}+1)^2}{5-1} = \frac{5+1+2\sqrt{5}}{4}$$

$$= \frac{3+\sqrt{5}}{2}$$

$$\therefore b = \frac{\sqrt{5}-1}{2} = \frac{3-\sqrt{5}}{2}$$

$\therefore a+b$

$$= \frac{3+\sqrt{5}}{2}+\frac{3-\sqrt{5}}{2} = 3$$

and $$ab = \frac{\sqrt{5}+1}{\sqrt{5}-1}\times\frac{\sqrt{5}-1}{\sqrt{5}+1} = 1$$

$\therefore$ Expression

$$= \frac{a^2+ab+b^2}{a^2-ab+b^2} = \frac{(a+b)^2-ab}{(a+b)^2-3ab}$$

$$= \frac{9-1}{9-3} = \frac{8}{6} = \frac{4}{3}$$

88. (2) $(64)^{x+1} = \dfrac{64}{4^x}$

$\Rightarrow (4^3)^{x+1}\times4^x = 64$

$\Rightarrow 4^{3x+3+x} = 4^3$

$\Rightarrow 4^{4x+3} = 4^3$

$\Rightarrow 4x+3=3$

$\Rightarrow x=0$

89. (3) $ax^2+bx+c = a(x-p)^2$

$\Rightarrow ax^2+bx+c = a(x^2-2px+p^2)$

$\Rightarrow ax^2+bx+c = ax^2-2apx+ap^2$

Comparing the corresponding coefficients,

$b = -2ap$ and $c = ap^2$

$$\Rightarrow b^2 = 4a^2p^2 \text{ and } p^2 = \frac{c}{a}$$

$$\Rightarrow p^2 = \frac{b^2}{4a^2};$$

$$\therefore \frac{b^2}{4a^2} = \frac{c}{a} \Rightarrow b^2 = 4ac$$

90. (4) For maximum value,

$$a = b = c = d = \frac{1}{4}$$

$\therefore (1+a)(1+b)(1+c)(1+d)$

$$= \left(\frac{5}{4}\right)^4$$

91. (4) $x \propto \dfrac{1}{y^2}$

$$\Rightarrow x = \frac{k}{y^2}$$ where k is a constant of proportionality.

When, $x=1$, $y=2$

$$\Rightarrow 1 = \frac{k}{4} \Rightarrow k = 4$$

$$\therefore x = \frac{4}{y^2}$$

When $y=6$,

$$x = \frac{4}{6\times6} = \frac{1}{9}$$

92. (2) Given $x = \dfrac{\sqrt{3}}{2}$

Given expression

$$= \frac{\sqrt{1+x}}{1+\sqrt{1+x}}+\frac{\sqrt{1-x}}{1-\sqrt{1-x}}$$

$$= \frac{\sqrt{1+x}}{1+\sqrt{1+x}}\times\frac{1-\sqrt{1+x}}{1-\sqrt{1+x}}$$

$$+\frac{\sqrt{1-x}}{1-\sqrt{1-x}}\times\frac{1+\sqrt{1-x}}{1+\sqrt{1-x}}$$

$$= \frac{\sqrt{1+x}-1-x}{1-1-x}+\frac{\sqrt{1-x}+1-x}{1-1+x}$$

$$= \frac{\sqrt{1-x}+1-x}{x}-\frac{\sqrt{1+x}-1-x}{x}$$

$$= \frac{\sqrt{1-x}+1-x-\sqrt{1+x}+1+x}{x}$$

$$= \frac{2+\sqrt{1-x}-\sqrt{1+x}}{x}$$

$$= \frac{2+\sqrt{1-\frac{\sqrt{3}}{2}}-\sqrt{1+\frac{\sqrt{3}}{2}}}{\frac{\sqrt{3}}{2}}$$

$$= \frac{2+\sqrt{\frac{2-\sqrt{3}}{2}}-\sqrt{\frac{2+\sqrt{3}}{2}}}{\frac{\sqrt{3}}{2}}$$

$$= \frac{2+\frac{\sqrt{4-2\sqrt{3}}}{2}-\frac{\sqrt{4+2\sqrt{3}}}{2}}{\frac{\sqrt{3}}{2}}$$

$\left[\because \sqrt{4-2\sqrt{3}} = \sqrt{3+1-2\sqrt{3}}\right.$

$\left.= \sqrt{(\sqrt{3}-1)^2} = \sqrt{3}-1\right]$ and

$\left[\sqrt{4+2\sqrt{3}} = \sqrt{3+1+2\sqrt{3}}\right.$

$\left.= \sqrt{(\sqrt{3}+1)^2} = \sqrt{3}+1\right]$

$$= \frac{4+\sqrt{3}-1-\sqrt{3}-1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$$

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93. (4) $a^2+b^2+c^2+3 = 2a-2b-2c$

$\Rightarrow a^2-2a+1+b^2+2b+1+c^2+2c+1=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

$\therefore a-1=0 \Rightarrow a=1$

$b+1=0 \Rightarrow b=-1$

$c+1=0 \Rightarrow c=-1$

$\therefore 2a-b+c=2+1-1=2$

94. (4) $x^2-y^2=80$

$x-y=8$

$\therefore x+y=\dfrac{x^2-y^2}{x-y}=\dfrac{80}{8}=10$

$\therefore$ Required average

$=\dfrac{x+y}{2}=\dfrac{10}{2}=5$

95. (4) $x^2-4x-1=0$

$\Rightarrow x^2-1=4x$

Dividing by x,

$x-\dfrac{1}{x}=4$

On squaring both sides,

$\left(x-\dfrac{1}{x}\right)^2=16$

$\Rightarrow x^2+\dfrac{1}{x^2}-2=16$

$\Rightarrow x^2+\dfrac{1}{x^2}=16+2=18$

96. (1) Third proportional of a and b

$=\dfrac{b^2}{a}$

$=\dfrac{\left(\sqrt{x^2+y^2}\right)^2}{\dfrac{x}{y}+\dfrac{y}{x}}=\dfrac{x^2+y^2}{\dfrac{x^2+y^2}{xy}}=xy$

97. (3) When $x=6$,

$\dfrac{4\times 6}{3}+2P=12$

$\Rightarrow 8+2P=12$

$\Rightarrow 2P=12-8=4$

$\Rightarrow P=2$

98. (1) Expression $=\dfrac{4+3\sqrt{3}}{7+4\sqrt{3}}$

Rationalising the denominator,

$=\dfrac{(4+3\sqrt{3})(7-4\sqrt{3})}{(7+4\sqrt{3})(7-4\sqrt{3})}$

$=\dfrac{28-16\sqrt{3}+21\sqrt{3}-12\times 3}{49-48}$

$=28+5\sqrt{3}-36=5\sqrt{3}-8$

99. (4) $\dfrac{1}{a}=\dfrac{1}{\sqrt{6}-\sqrt{5}}$

$=\dfrac{\sqrt{6}+\sqrt{5}}{6-5}=\sqrt{6}+\sqrt{5}$

Similarly,

$\dfrac{1}{b}=\sqrt{5}+2;\ \dfrac{1}{c}=2+\sqrt{3}$

$\therefore \dfrac{1}{a}>\dfrac{1}{b}>\dfrac{1}{c} \Rightarrow a<b<c$

100. (2) $x=\dfrac{4\sqrt{15}}{\sqrt{5}+\sqrt{3}}$

$=\dfrac{4\sqrt{15}(\sqrt{5}-\sqrt{3})}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})}$

$=\dfrac{4\sqrt{15}(\sqrt{5}-\sqrt{3})}{5-3}$

$=2\sqrt{15}(\sqrt{5}-\sqrt{3})=10\sqrt{3}-6\sqrt{5}$

$\therefore \dfrac{x+\sqrt{20}}{x-\sqrt{20}}+\dfrac{x+\sqrt{12}}{x-\sqrt{12}}$

$=\dfrac{10\sqrt{3}-6\sqrt{5}+2\sqrt{5}}{10\sqrt{3}-6\sqrt{5}-2\sqrt{5}}+\dfrac{10\sqrt{3}-6\sqrt{5}+2\sqrt{3}}{10\sqrt{3}-6\sqrt{5}-2\sqrt{3}}$

$=\dfrac{10\sqrt{3}-4\sqrt{5}}{10\sqrt{3}-8\sqrt{5}}+\dfrac{12\sqrt{3}-6\sqrt{5}}{8\sqrt{3}-6\sqrt{5}}$

$=\dfrac{5\sqrt{3}-2\sqrt{5}}{5\sqrt{3}-4\sqrt{5}}+\dfrac{6\sqrt{3}-3\sqrt{5}}{4\sqrt{3}-3\sqrt{5}}$

$=\dfrac{60-15\sqrt{15}-8\sqrt{15}+30+90}{-15\sqrt{15}-24\sqrt{15}+60}$

$=\dfrac{(5\sqrt{3}-4\sqrt{5})(4\sqrt{3}-3\sqrt{5})}{}$

$=\dfrac{240-62\sqrt{15}}{60-15\sqrt{15}-16\sqrt{15}+60}$

$=\dfrac{240-62\sqrt{15}}{120-31\sqrt{15}}$

$=\dfrac{2(120-31\sqrt{15})}{120-31\sqrt{15}}=2$

101. (2) $\sqrt{x}=\sqrt{5-\sqrt{21}}$

$\Rightarrow \sqrt{x}=\dfrac{\sqrt{10-2\sqrt{21}}}{\sqrt{2}}$

$=\dfrac{\sqrt{7+3-2\times\sqrt{7}\times\sqrt{3}}}{\sqrt{2}}$

$=\dfrac{\sqrt{7}-\sqrt{3}}{\sqrt{2}}$

$\sqrt{32-2x}=\sqrt{32-2\left(5-\sqrt{21}\right)}$

$=\sqrt{32-10+2\sqrt{21}}$

$=\sqrt{22+2\sqrt{21}}$

$=\sqrt{21+1+2\times\sqrt{21}\times 1}$

$=\sqrt{21}+1$

$\therefore$ Expression

$=\dfrac{\sqrt{7}-\sqrt{3}}{\sqrt{2}\left(\sqrt{21}+1-\sqrt{21}\right)}$

$=\dfrac{1}{\sqrt{2}}\left(\sqrt{7}-\sqrt{3}\right)$

102. (2) $6x-5y=13$ ...(i)

$7x+2y=23$ ...(ii)

By equation (i) $\times 2$ + (ii) $\times 5$,

$12x-10y=26$

$35x+10y=115$

$47x=141$

$\Rightarrow x=3$

From equation (i),

$6\times 3-5y=13$

$\Rightarrow 18-5y=13$

$\Rightarrow 5y=5$

$\Rightarrow y=1$

$\therefore 11x+18y=11\times 3+18\times 1$

$=33+18=51$

103. (1) $(x^{b+c})^{b-c}.(x^{c+a})^{c-a}.(x^{a+b})^{a-b}$

$=x^{b^2-c^2}.x^{c^2-a^2}.x^{a^2-b^2}$

$=x^{b^2-c^2+c^2-a^2+a^2-b^2}=x^0=1$

104. (4) $\dfrac{x}{a}=\dfrac{1}{a}-\dfrac{1}{x}$

$\Rightarrow \dfrac{x}{a}=\dfrac{x-a}{ax}$

$\Rightarrow x^2=x-a$

$\Rightarrow x-x^2=a$

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105. (3) $x+\frac{1}{x}=99$

$\therefore \frac{100x}{2x^2+102x+2}$

$=\frac{100x}{2x^2+2+102x}$

On dividing by x,

$=\frac{100}{2x+\frac{2}{x}+102}$

$=\frac{100}{2\left(x+\frac{1}{x}\right)+102}$

$=\frac{100}{2\times 99+102}=\frac{100}{300}=\frac{1}{3}$

106. (3) $\frac{4x-3}{x}+\frac{4y-3}{y}+\frac{4z-3}{z}=0$

$\Rightarrow \frac{4x}{x}-\frac{3}{x}+\frac{4y}{y}-\frac{3}{y}+\frac{4z}{z}-\frac{3}{z}=0$

$\Rightarrow \frac{3}{x}+\frac{3}{y}+\frac{3}{z}=4+4+4=12$

$\Rightarrow \frac{1}{x}+\frac{1}{y}+\frac{1}{z}=\frac{12}{3}=4$

107. (3) $\frac{xy}{x+y}=a \Rightarrow \frac{x+y}{xy}=\frac{1}{a}$

$\Rightarrow \frac{1}{y}+\frac{1}{x}=\frac{1}{a}$ ...(i)

$\frac{xz}{x+z}=b \quad \Rightarrow \frac{x+z}{xz}=\frac{1}{b}$

$\Rightarrow \frac{1}{z}+\frac{1}{x}=\frac{1}{b}$ ...(ii)

Similarly,

$\frac{1}{z}+\frac{1}{y}=\frac{1}{c}$

$\Rightarrow \frac{1}{y}=\frac{1}{c}-\frac{1}{z}$ ...(iii)

By substitutio method

From equations (i) and (iii).

$\frac{1}{a}-\frac{1}{x}=\frac{1}{c}-\frac{1}{z}$

$\Rightarrow \frac{1}{a}-\frac{1}{x}=\frac{1}{c}-\frac{1}{b}+\frac{1}{x}$

[From equation (ii)]

$\Rightarrow \frac{1}{x}+\frac{1}{x}=\frac{1}{a}-\frac{1}{c}+\frac{1}{b}$

$\Rightarrow \frac{2}{x}=\frac{bc-ab+ac}{abc}$

$\Rightarrow x=\frac{2abc}{bc+ac-ab}$

108. (3) $x=3+\sqrt{8}$

$\therefore \frac{1}{x}=\frac{1}{3+\sqrt{8}}=\frac{3-\sqrt{8}}{(3+\sqrt{8})(3-\sqrt{8})}$

$=\frac{3-\sqrt{8}}{9-8}=3-\sqrt{8}$

Now, $x^2+\frac{1}{x^2}=\left(x+\frac{1}{x}\right)^2-2$

$=(3+\sqrt{8}+3-\sqrt{8})^2-2$

$=36-2=34$

109. (4) $xy=8=1\times 8=2\times 4$

$=\frac{1}{2}\times 16=\frac{1}{3}\times 24$

$\therefore$ Minimum value of $2x+y$

$=2\times 2+4=8$

110. (2) x^2+x+1

$=x^2+2.x.\frac{1}{2}+\frac{1}{4}+\frac{3}{4}$

$=\left(x+\frac{1}{2}\right)^2+\left(\pm\frac{\sqrt{3}}{2}\right)^2$

$\therefore \left(x+\frac{1}{2}\right)^2+\left(\pm\frac{\sqrt{3}}{2}\right)^2$

$=\left(x+\frac{1}{2}\right)^2+q^2$

$\Rightarrow q=\pm\frac{\sqrt{3}}{2}$

111. (2) $a^2-4a-1=0$

$\Rightarrow a^2-1=4a$

On dividing by a, we have

$a-\frac{1}{a}=4$

$\therefore a^2+\frac{1}{a^2}+3\left(a-\frac{1}{a}\right)$

$=\left(a-\frac{1}{a}\right)^2+2+3\left(a-\frac{1}{a}\right)$

$=16+2+3(4)=30$

112. (3) $a+\frac{1}{b}=1\Rightarrow a=1-\frac{1}{b}=\frac{b-1}{b}$

$\Rightarrow \frac{1}{a}=\frac{b}{b-1}$ and

$b+\frac{1}{c}=1\Rightarrow \frac{1}{c}=1-b\Rightarrow c=\frac{1}{1-b}$

$\therefore c+\frac{1}{a}=\frac{1}{1-b}+\frac{b}{b-1}$

$=\frac{1}{1-b}-\frac{b}{1-b}=\frac{1-b}{1-b}=1$

113. (4) Expression $=(x-2)(x-9)$

$=x^2-11x+18=ax^2+bx+c$

Minimum value $=\frac{4ac-b^2}{4a}$

$=\frac{4\times 1\times 18-121}{4}=\frac{-49}{4}$

114. (4) $4\sqrt{3}\,x^2+5x-2\sqrt{3}$

$=4\sqrt{3}\,x^2+8x-3x-2\sqrt{3}$

$=4x\left(\sqrt{3}x+2\right)-\sqrt{3}\left(\sqrt{3}x+2\right)$

$=\left(4x-\sqrt{3}\right)\left(\sqrt{3}x+2\right)\Rightarrow$ factors

115. (3) $\sqrt{x}=\sqrt{3}-\sqrt{5}$

On squaring both sides,

$x=3+5-2\sqrt{15}$

$\Rightarrow x-8=-2\sqrt{15}$

Squaring again,

$x^2-16x+64=60$

$\Rightarrow x^2-16x+4=0$

$\therefore x^2-16x+6=2$

116. (2) $x-\frac{1}{x}=4$ (Given)

$\therefore \left(x+\frac{1}{x}\right)^2=\left(x-\frac{1}{x}\right)^2+4$

$=(4)^2+4=20$

$\Rightarrow x+\frac{1}{x}=\sqrt{20}=2\sqrt{5}$

117. (3) $x=5+2\sqrt{6}$

$\therefore \frac{1}{x}=\frac{1}{5+2\sqrt{6}}=\frac{5-2\sqrt{6}}{(5+2\sqrt{6})(5-2\sqrt{6})}$

$=\frac{5-2\sqrt{6}}{25-24}=5-2\sqrt{6}$

$\therefore \left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2=x+\frac{1}{x}+2$

$=5+2\sqrt{6}+5-2\sqrt{6}+2=12$

$\therefore \sqrt{x}+\frac{1}{\sqrt{x}}=\sqrt{12}=2\sqrt{3}$

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118. (3) $(a-b)^2 = (a+b)^2 - 4ab$
$= 5^2 - 4 \times 6 = 1$
$\Rightarrow a - b = 1$
$\therefore (a^2 - b^2) = (a+b)(a-b) = 5$

119. (2) $1.5x = 0.04y$

$\Rightarrow \frac{x}{y} = \frac{0.04}{1.5} = \frac{4}{150} = \frac{2}{75}$

$\Rightarrow \frac{y}{x} = \frac{75}{2}$

Now, $\frac{y^2 - x^2}{y^2 + 2xy + x^2}$

$= \frac{(y-x)(y+x)}{(y+x)^2}$

$= \frac{y-x}{y+x} = \frac{\frac{y}{x} - 1}{\frac{y}{x} + 1}$

$= \frac{\frac{75}{2} - 1}{\frac{75}{2} + 1} = \frac{73}{77}$

120. (2) $a^{\frac{1}{3}} = 11 \Rightarrow a = 11^3 = 1331$
$\therefore a^2 - 331a = a(a - 331)$
$= 1331\,(1331 - 331)$
$= 1331 \times 1000 = 1331000$

121. (1) $x^2 + y^2 + \frac{1}{x^2} + \frac{1}{y^2} - 4 = 0$

$\Rightarrow x^2 + \frac{1}{x^2} - 2 + y^2 + \frac{1}{y^2} - 2 = 0$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + \left(y - \frac{1}{y}\right)^2 = 0$

$\Rightarrow x - \frac{1}{x} = 0$

$\Rightarrow x^2 - 1 = 0 \Rightarrow x = 1$
Similarly,
$y = 1$
$\therefore x^2 + y^2 = 1 + 1 = 2$

122. (2) **Tricky Approach**
$x^2 = y + z$
$\Rightarrow x^2 + x = x + y + z$
$\Rightarrow x(x+1) = x + y + z$ ....(i)
Similarly,
$y(y+1) = x + y + z$ .....(ii)
and, $z(z+1) = x + y + z$ ...(iii)

$\therefore \frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1}$

$= \frac{x}{x+y+z} + \frac{y}{x+y+z} + \frac{z}{x+y+z}$

$\Rightarrow \frac{x+y+z}{x+y+z} = 1$

123. (4) $(ad-bc)^2 + (ac+bd)^2$
$= a^2d^2 + b^2c^2 - 2abcd + a^2c^2 + b^2d^2 + 2abcd$
$= a^2d^2 + b^2c^2 + a^2c^2 + b^2d^2$
$= a^2d^2 + b^2d^2 + b^2c^2 + a^2c^2$
$= d^2(a^2 + b^2) + c^2(b^2 + a^2)$
$= (a^2 + b^2)(c^2 + d^2)$
$= 2 \times 1 = 2$

124. (2) $a^2 + b^2 + c^2 + 3$
$= 2a + 2b + 2c$
$\Rightarrow a^2 - 2a + 1 + b^2 - 2b + 1 + c^2 - 2c + 1 = 0$
$\Rightarrow (a-1)^2 + (b-1)^2 + (c-1)^2 = 0$
$\Rightarrow a - 1 = 0 \Rightarrow a = 1;$
$b - 1 = 0 \Rightarrow b = 1$
and, $c - 1 = 0 \Rightarrow c = 1$
$\therefore a + b + c = 3$

125. (3) $x - \frac{1}{x} = 5$

On squaring both sides,

$x^2 + \frac{1}{x^2} - 2 = 25$

$\Rightarrow x^2 + \frac{1}{x^2} = 27$

126. (2) $x = 3 + 2\sqrt{2}$

$\therefore \frac{1}{x} = \frac{1}{3+2\sqrt{2}}$

$= \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$

$= \frac{3-2\sqrt{2}}{9-8} = 3 - 2\sqrt{2}$

$\therefore \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = x + \frac{1}{x} - 2$

$= 3 + 2\sqrt{2} + 3 - 2\sqrt{2} - 2$
$= 4$

$\therefore \sqrt{x} - \frac{1}{\sqrt{x}} = 2$

127. (4) $x = \sqrt{3} + \sqrt{2}$

$\frac{1}{x} = \frac{1}{\sqrt{3}+\sqrt{2}}$

$= \frac{1}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}} = \sqrt{3} - \sqrt{2}$

$\therefore x + \frac{1}{x} = 2\sqrt{3}$

$\therefore \left(x^2 + \frac{1}{x^2}\right) = \left(x + \frac{1}{x}\right)^2 - 2$

$= \left(2\sqrt{3}\right)^2 - 2 = 12 - 2 = 1$

128. (3) $x + \frac{9}{x} = 6$

$\Rightarrow x^2 - 6x + 9 = 0$
$\Rightarrow (x-3)^2 = 0 \Rightarrow x = 3$

$\therefore \left(x^2 + \frac{9}{x^2}\right) = \left(9 + \frac{9}{9}\right) = 10$

129. (4) $x = \frac{4ab}{a+b} \Rightarrow \frac{x}{2a} = \frac{2b}{a+b}$

By componendo and dividendo,

$\frac{x+2a}{x-2a} = \frac{2b+a+b}{2b-a-b} = \frac{3b+a}{b-a}$

Similarly, $\frac{x}{2b} = \frac{2a}{a+b}$

$\Rightarrow \frac{x+2b}{x-2b} = \frac{2a+a+b}{2a-a-b}$

$= \frac{3a+b}{a-b}$

$\therefore \frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$

$= \frac{3b+a}{b-a} + \frac{3a+b}{a-b}$

$= \frac{3b+a-3a-b}{b-a} = \frac{2b-2a}{b-a}$

$= \frac{2(b-a)}{b-a} = 2$

130. (3) $m + \frac{1}{m-2} = 4$

$\Rightarrow m + \frac{1}{m-2} - 2 = 4 - 2$

$\Rightarrow (m-2) + \frac{1}{(m-2)} = 4 - 2 = 2$

On squaring both sides,

$(m-2)^2 + \frac{1}{(m-2)^2} +$

$2(m-2)\left(\frac{1}{m-2}\right) = 4$

$\Rightarrow (m-2)^2 + \frac{1}{(m-2)^2} = 4 - 2 = 2$

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131. (3) $a^2+b^2+2b+4a+5=0$
$\Rightarrow a^2+4a+b^2+2b+5=0$
$\Rightarrow a^2+4a+4+b^2+2b+1=0$
$\Rightarrow (a+2)^2+(b+1)^2=0$
It is possible only when
$a+2=0 \Rightarrow a=-2$
and, $b+1=0 \Rightarrow b=-1$
$\therefore \frac{a-b}{a+b}=\frac{-2+1}{-2-1}$
$=\frac{-1}{-3}=\frac{1}{3}$

132. (1) $x-y=\frac{x+y}{7}=\frac{xy}{4}=k$
$\Rightarrow x-y=k$
$x+y=7k$
$\therefore (x+y)^2-(x-y)^2=49k^2-k^2$
$\Rightarrow 4xy=48k^2$
$\Rightarrow 16k=48k^2$
$\Rightarrow k=\frac{1}{3}$
$\therefore xy=4k=4\times\frac{1}{3}=\frac{4}{3}$

133. (4) $\frac{x^2}{yz}+\frac{y^2}{zx}+\frac{z^2}{xy}$
$=\frac{x^3+y^3+z^3}{xyz}=\frac{3xyz}{xyz}=3$

134. (2) $\frac{1}{(a+b)(b+c)}+\frac{1}{(a+c)(b+a)}+\frac{1}{(c+a)(c+b)}$
$=\frac{c+a+b+c+a+b}{(a+b)(b+c)(c+a)}$
$=\frac{2(a+b+c)}{(a+b)(b+c)(c+a)}$
$=0$ [$\because a+b+c=0$]

135. (3) $a+b+c=0$
$\Rightarrow b+c=-a$
On squaring both sides,
$\Rightarrow (b+c)^2=a^2$
$\Rightarrow b^2+c^2+2bc=a^2$
$\Rightarrow a^2+b^2+c^2+2bc=2a^2$
$\Rightarrow a^2+b^2+c^2=2a^2-2bc$
$=2(a^2-bc)$
$\therefore \frac{a^2+b^2+c^2}{a^2-bc}=\frac{2(a^2-bc)}{a^2-bc}=2$

136. (2) $n=7+4\sqrt{3}=7+2\times2\times\sqrt{3}$
$=4+3+2\times2\times\sqrt{3}$
$=\left(2+\sqrt{3}\right)^2$
$\therefore \sqrt{n}=2+\sqrt{3}$
$\therefore \frac{1}{\sqrt{n}}=\frac{1}{2+\sqrt{3}}$
$=\frac{1}{2+\sqrt{3}}\times\frac{2-\sqrt{3}}{2-\sqrt{3}}=2-\sqrt{3}$
$\therefore \sqrt{n}+\frac{1}{\sqrt{n}}=2+\sqrt{3}+2-\sqrt{3}=4$

137. (2) $x=\sqrt{3}+\sqrt{2}$
$\therefore \frac{1}{x}=\frac{1}{\sqrt{3}+\sqrt{2}}$
$=\frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$
$=\sqrt{3}-\sqrt{2}$
$\therefore x+\frac{1}{x}$
$=\sqrt{3}+\sqrt{2}+\sqrt{3}-\sqrt{2}=2\sqrt{3}$

138. (4) $\frac{p}{q}+\frac{q}{p}=\frac{p^2+q^2}{pq}$
$=\frac{(p+q)^2-2pq}{pq}$
$=\frac{100-2\times5}{5}=\frac{90}{5}=18$

139. (4) $x=3+2\sqrt{2}$
$xy=1$
$\Rightarrow y=\frac{1}{3+2\sqrt{2}}$
$=\frac{1}{3+2\sqrt{2}}\times\frac{3-2\sqrt{2}}{3-2\sqrt{2}}$
$=\frac{3-2\sqrt{2}}{9-8}=3-2\sqrt{2}$
$\therefore x+y$
$=3+2\sqrt{2}+3-2\sqrt{2}=6$
$\therefore \frac{x^2+3xy+y^2}{x^2-3xy+y^2}$
$=\frac{(x+y)^2+xy}{(x+y)^2-5xy}$
$=\frac{36+1}{36-5}=\frac{37}{31}$

140. (1) $\frac{x}{b+c}=\frac{y}{c+a}$
$=\frac{x-y}{b+c-c-a}=\frac{x-y}{b-a}$;
$\frac{y}{c+a}=\frac{z}{a+b}$
$=\frac{y-z}{c+a-a-b}=\frac{y-z}{c-b}$;
$\frac{z}{a+b}=\frac{x}{b+c}$
$=\frac{z-x}{a+b-b-c}=\frac{z-x}{a-c}$
$\therefore \frac{x-y}{b-a}=\frac{y-z}{c-b}=\frac{z-x}{a-c}$

141. (3) $a+b+c=0$
$\Rightarrow a+b=-c$; $b+c=-a$,
$c+a=-b$
$\therefore \frac{a+b}{c}+\frac{b+c}{a}+\frac{c+a}{b}$
$=-1-1-1=-3$
$\frac{a}{b+c}+\frac{b}{c+a}+\frac{c}{a+b}$
$=-1-1-1=-3$
$\therefore$ Expression $=(-3)\times(-3)=9$

142. (1) $a+\frac{1}{b}=1 \Rightarrow ab+1=b$
$\Rightarrow ab=b-1$ .....(i)
Again,
$b+\frac{1}{c}=1$
$\frac{1}{c}=1-b \Rightarrow c=\frac{1}{1-b}$ .....(ii)
On multiplying (i) & (ii)
$abc=\frac{b-1}{1-b}=-1$

143. (3) Expression
$=\frac{(s-a)^2+(s-b)^2+(s-c)^2+s^2}{a^2+b^2+c^2}$
$s^2-2sa+a^2+s^2+b^2-$
$=\frac{2sb+s^2-2sc+c^2+s^2}{a^2+b^2+c^2}$

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$$= \frac{4s^2 + a^2 + b^2 + c^2 - 2s(a+b+c)}{a^2+b^2+c^2}$$

$$= \frac{4s^2 + a^2 + b^2 + c^2 - 4s^2}{a^2+b^2+c^2} = 1$$

144. (4) $x = 3 + 2\sqrt{2}$

$$\therefore \frac{1}{x} = \frac{1}{3+2\sqrt{2}}$$

$$= \frac{1}{3+2\sqrt{2}} \times \frac{3-2\sqrt{2}}{3-2\sqrt{2}}$$

$$= \frac{3-2\sqrt{2}}{9-8}$$

$$= 3 - 2\sqrt{2}$$

$$x + \frac{1}{x} = 3 + 2\sqrt{2} + 3 - 2\sqrt{2} = 6$$

$$\therefore x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2$$

$$= (6)^2 - 2 = 36 - 2 = 34$$

145. (2) $3x - 2 = \frac{3}{x}$

$$\Rightarrow 3x - \frac{3}{x} = 2$$

$$\Rightarrow x - \frac{1}{x} = \frac{2}{3}$$

On squaring both sides

$$\left(x - \frac{1}{x}\right)^2 = \frac{4}{9}$$

$$\Rightarrow x^2 + \frac{1}{x^2} - 2 = \frac{4}{9}$$

$$\Rightarrow x^2 + \frac{1}{x^2}$$

$$= \frac{4}{9} + 2 = \frac{22}{9} = 2\frac{4}{9}$$

146. (1) $x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

Dividing both sides by x,

$$\Rightarrow x + \frac{1}{x} = 3$$

$$\therefore x^2 + x + \frac{1}{x} + \frac{1}{x^2}$$

$$= \left(x^2 + \frac{1}{x^2}\right) + \left(x + \frac{1}{x}\right)$$

$$= \left(x + \frac{1}{x}\right)^2 - 2 + \left(x + \frac{1}{x}\right)$$

$$= 9 - 2 + 3 = 10$$

147. (3) $a^2 + b^2 = 5ab$

$$\Rightarrow \frac{a^2+b^2}{ab} = 5$$

$$\Rightarrow \frac{a}{b} + \frac{b}{a} = 5$$

On squaring both sides,

$$\therefore \left(\frac{a}{b} + \frac{b}{a}\right)^2 = 25$$

$$\Rightarrow \frac{a^2}{b^2} + \frac{b^2}{a^2} + 2 = 25$$

$$\Rightarrow \frac{a^2}{b^2} + \frac{b^2}{a^2} = 25 - 2 = 23$$

148. (4) $x^2 - yz = x^2 + xy + zx$

$= x(x + y + z)$

$$\left[\because xy + yz + zx = 0 \Rightarrow yz = -xy - zx\right]$$

Similarly,

$y^2 - zx = y(x + y + z)$

$z^2 - xy = x(x + y + z)$

$\therefore$ Expression

$$= \frac{1}{x(x+y+z)} + \frac{1}{y(x+y+z)} + \frac{1}{z(x+y+z)}$$

$$= \frac{yz + zx + xy}{xyz(x+y+z)} = 0$$

149. (3) $a + b + c = 9$

$a^2 + b^2 + c^2$

$= (a + b + c)^2 - 2(ab + bc + ca)$

$(ab + bc + ca$ will be maximum if $a = b = c)$

$a^2 + b^2 + c^2 = 9^2 - 2 \times 27$

$= 81 - 54 = 27$

150. (3) $x + y + z = 13$

$x^2 + y^2 + z^2 = 69$

$(x + y + z)^2$

$= x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$\Rightarrow (13)^2 = 69 + 2(xy + yz + zx)$

$\Rightarrow 2(xy + yz + zx)$

$= 169 - 69 = 100$

$$\Rightarrow xy + yz + zx = \frac{100}{2} = 50$$

151. (3) $a = 0.1039$ (Given)

Now, $\sqrt{4a^2 - 4a + 1} + 3a$

$= \sqrt{(1-2a)^2} + 3a$

$= 1 - 2a + 3a$

$= 1 + a = 1 + 0.1039$

$= 1.1039$

152. (1) $$\frac{a^2 - b^2 - c^2 - 2bc}{a^2 + b^2 - 2ab - c^2}$$

$$= \frac{a^2 - (b^2 + c^2 + 2bc)}{(a^2 + b^2 - 2ab) - c^2}$$

$$= \frac{a^2 - (b+c)^2}{(a-b)^2 - c^2}$$

$$= \frac{(a+b+c)(a-b-c)}{(a-b+c)(a-b-c)}$$

$$= \frac{a+b+c}{a-b+c} = \frac{0.25 - 0.05 + 0.5}{0.25 + 0.05 + 0.5}$$

$$= \frac{0.7}{0.8} = \frac{7}{8}$$

153. (1) $25a^2 + 40ab + 16b^2$

$= (5a + 4b)^2$

$= (5 \times 23 - 29 \times 4)^2$

$= (115 - 116)^2 = 1$

154. (2) $(x - y)^2 = x^2 + y^2 - 2xy$

$\Rightarrow 2^2 = 20 - 2xy$

$\Rightarrow 2xy = 20 - 4 = 16$

$\therefore (x + y)^2 = x^2 + y^2 + 2xy$

$= 20 + 16 = 36$

155. (3) $x^2 + y^2 - 4x - 4y + 8 = 0$

$\Rightarrow x^2 - 4x + 4 + y^2 - 4y + 4 = 0$

$\Rightarrow (x - 2)^2 + (y - 2)^2 = 0$

$\Rightarrow x = 2$ and $y = 2$

$\therefore x - y = 2 - 2 = 0$

156. (1) $x^2 + y^2 - z^2 + 2xy$

$= x^2 + y^2 + 2xy - z^2$

$= (x+y)^2 - z^2 = (x+y+z)(x+y-z)$

$= (b + c - 2a + c + a - 2b + a + b - 2c)(x + y - z) = 0$

157. (2) $a^2 + b^2 + c^2 = ab + bc + ca$

$\Rightarrow 2a^2 + 2b^2 + 2c^2$

$= 2ab + 2bc + 2ca$

$\Rightarrow a^2 - 2ab + b^2 + b^2 - 2bc + c^2 + c^2 - 2ac + a^2 = 0$

$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$

$\Rightarrow a - b = 0 \Rightarrow a = b$

$b - c = 0 \Rightarrow b = c$

$c - a = 0 \Rightarrow c = a$

$\Rightarrow a = b = c$

$$\therefore \frac{a+c}{b} = \frac{a+a}{a} = 2$$

158. (4) $x^2 + y^2 = (x - y)^2 + 2xy$

$= 4 + 2 \times 24 = 52$

159. (1) $(a \pm b)^2 = a^2 \pm 2ab + b^2$

If $a = \frac{x}{y}$; $b = \frac{y}{2}$

then,

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$\pm 2ab = \pm 2 \times \frac{x}{y} \times \frac{y}{2} = \pm x$

$\therefore tx = \pm x$

$\Rightarrow t = \pm 1$

160. (4) $a - b = x + y - x + y = 2y$
$b - c = x - y - x - 2y = -3y$
$c - a = x + 2y - x - y = y$
Now,
$a^2 + b^2 + c^2 - ab - bc - ca$

$= \frac{1}{2}(2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca)$

$= \frac{1}{2}[(a-b)^2 + (b-c)^2 + (c-a)^2]$

$= \frac{1}{2}((2y)^2 + (-3y)^2 + y^2)$

$= \frac{1}{2} \times 14y^2 = 7y^2$

161. (1) $a^2 + b^2 + c^2 = ab + bc + ca$
$\Rightarrow 2a^2 + 2b^2 + 2c^2 = 2ab + 2bc + 2ca$
$\Rightarrow a^2 - 2ab + b^2 + b^2 - 2bc + c^2 + c^2 - 2ac + a^2 = 0$
$\Rightarrow (a-b)^2 + (b-c)^2 + (c-a)^2 = 0$
$\therefore a - b = 0 \Rightarrow a = b$
$b - c = 0 \Rightarrow b = c$
$c - a = 0 \Rightarrow c = a$
$\therefore a = b = c$

$\therefore \frac{a+b}{c} = \frac{a+a}{a} = 2$

162. (4) $a^2 + b^2 + 4c^2 = 2a + 2b - 4c - 3$
$\Rightarrow a^2 + b^2 + 4c^2 - 2a - 2b + 4c + 3 = 0$
$\Rightarrow a^2 - 2a + 1 + b^2 - 2b + 1 + 4c^2 + 4c + 1 = 0$
$\Rightarrow (a-1)^2 + (b-1)^2 + (2c+1)^2 = 0$
$\therefore a - 1 = 0 \Rightarrow a = 1;$
$b - 1 = 0 \Rightarrow b = 1;$

$2c + 1 = 0 \Rightarrow c = -\frac{1}{2}$

$\therefore a^2 + b^2 + c^2 = 1 + 1 + \frac{1}{4} = 2\frac{1}{4}$

163. (1) Check through option
When $x = (a + b + c)^2$,

$\frac{x-a^2}{b+c} + \frac{x-b^2}{c+a} + \frac{x-c^2}{a+b}$

$= \frac{(a+b+c)^2 - a^2}{b+c} + \frac{(a+b+c)^2 - b^2}{c+a} + \frac{(a+b+c)^2 - c^2}{a+b}$

$= \frac{(2a+b+c)(b+c)}{b+c} +$

$\frac{(a+2b+c)(c+a)}{c+a} + \frac{(a+b+2c)(a+b)}{a+b}$
$= 2a + b + c + a + 2b + c + a + b + 2c$
$= 4a + 4b + 4c = 4(a + b + c) = RHS.$

164. (4) $4x - y = 2$ ....(i)
$2y - 8x + 4 = 0$
$\Rightarrow 8x - 2y = 4$ .....(ii)
For simultaneous linear equations
$a_1x + b_1y = c_1$
$a_2x + b_2y = c_2$ if
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, there are infinite solutions.

165. (4) $\frac{a}{b} \times \frac{b}{c} = \frac{4}{5} \times \frac{15}{16}$

$\frac{a}{c} = \frac{3}{4}$

$\Rightarrow a = \frac{3}{4}c$

Put in the given equation,

$= \frac{18c^2 - 7\left(\frac{3}{4}c\right)^2}{45c^2 + 20\left(\frac{3}{4}c\right)^2}$

$= \frac{18c^2 - \frac{63}{16}c^2}{45c^2 + \frac{180}{16}c^2} = \frac{1}{4}$

166. (4) Check through options.
If $x = y = z$, then

$\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{3}{x^2}$

and

$\frac{1}{xy} + \frac{1}{yz} + \frac{1}{zx}$

$= \frac{1}{x^2} + \frac{1}{x^2} + \frac{1}{x^2} = \frac{3}{x^2}$

167. (1) $121a^2 + 64b^2$
$= (11a)^2 + (8b)^2$
$\because (x + y)^2 = x^2 + y^2 + 2xy$
$\therefore$ Required expression
$= 2 \times 11a \times 8b = 176ab$

168. (2) $a = 2 + \sqrt{3}$

$\frac{1}{a} = \frac{1}{2+\sqrt{3}} = \frac{1}{(2+\sqrt{3})} \times \frac{2-\sqrt{3}}{(2-\sqrt{3})}$

$= \frac{2-\sqrt{3}}{4-3} = 2 - \sqrt{3}$

$\therefore a^2 + \frac{1}{a^2} = \left(a + \frac{1}{a}\right)^2 - 2$

$= \left(2 + \sqrt{3} + 2 - \sqrt{3}\right)^2 - 2$

$= 16 - 2 = 14$

169. (3) $p + \frac{1}{4}\sqrt{p} + k^2$

$= \left(\sqrt{p}\right)^2 + 2.\sqrt{p}.\frac{1}{8} + \left(\frac{1}{8}\right)^2 - \left(\frac{1}{8}\right)^2 + k^2$

$\Rightarrow k^2 = \left(\frac{1}{8}\right)^2 \Rightarrow k = \pm\frac{1}{8}$

170. (3) $\frac{b-c}{a} + \frac{a+c}{b} + \frac{a-b}{c} = 1$

$\Rightarrow \frac{b-c}{a} + \frac{a-b}{c} + \frac{a+c}{b} - 1 = 0$

$\Rightarrow \frac{b-c}{a} + \frac{a-b}{c} + \frac{a+c-b}{b} = 0$

$\Rightarrow \frac{c-b}{a} + \frac{b-a}{c} = \frac{a+c-b}{b}$

$\Rightarrow \frac{c^2 - bc + ab - a^2}{ac} = \frac{a+c-b}{b}$

$\Rightarrow \frac{(c^2 - a^2) - (bc - ab)}{ac} = \frac{a+c-b}{b}$

$\Rightarrow \frac{(c-a)(c+a) - b(c-a)}{ac}$

$= \frac{a+c-b}{b}$

$\Rightarrow \frac{(c-a)(c+a-b)}{ac} = \frac{a+c-b}{b}$

$\Rightarrow \frac{c-a}{ac} = \frac{1}{b}$

$\Rightarrow \frac{c}{ac} - \frac{a}{ac} = \frac{1}{b}$

$\Rightarrow \frac{1}{a} - \frac{1}{c} = \frac{1}{b}$

171. (2) $\frac{d}{c} = a - b$

$\Rightarrow \frac{c}{d} = \frac{1}{a-b} = \frac{a+b}{a-b}$

$\Rightarrow \frac{c+d}{c-d} = \frac{a+b+a-b}{a+b-a+b} = \frac{a}{b}$

(By componendo and dividendo)

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$\Rightarrow \frac{1}{c-d} = \frac{a}{b}$

$\Rightarrow (c-d) = \frac{b}{a}$

$\Rightarrow c^2 - d^2 = (c+d)(c-d) = \frac{b}{a}$

172. (2) $x = 2y$

$\Rightarrow 3t = 2 \times \frac{1}{2}(t+1)$

$\Rightarrow 3t = t + 1 \Rightarrow 3t - t = 1$

$\Rightarrow 2t = 1 \Rightarrow t = \frac{1}{2}$

173. (3) $x^2 + \frac{1}{5}x + a^2$

$= x^2 + 2x\frac{1}{10} + \left(\frac{1}{10}\right)^2 - \left(\frac{1}{10}\right)^2 + a^2$

$\therefore a^2 - \left(\frac{1}{10}\right)^2 = 0 \Rightarrow a^2 = \left(\frac{1}{10}\right)^2$

$\Rightarrow a = \frac{1}{10}$

174. (3) Expression $= 2 - 3x - 4x^2$

$= -(4x^2 + 3x - 2)$

$= -\left[(2x)^2 + 2 \times 2x \times \frac{3}{4} + \left(\frac{3}{4}\right)^2 - \left(\frac{3}{4}\right)^2 - 2\right]$

$= -\left[\left(2x + \frac{3}{4}\right)^2\right] + \left(\frac{3}{4}\right)^2 + 2$

The value of expression will be maximum if,

$2x + \frac{3}{4} = 0$

$\Rightarrow 2x = -\frac{3}{4}$

$\Rightarrow x = -\frac{3}{8}$

175. (1) Expression $= x^4 - 2x^2 + k$

$= (x^2)^2 - 2.x^2.1 + (1)^2 - (1)^2 + k$

For a perfect square,

$-1 + k = 0 \Rightarrow k = 1$

176. (2) $f(x) = x^2 + k_1x + k_2$

$(x-1)$ is a factor of $f(x)$.

$\therefore f(1) = 0$

$\Rightarrow 1 + k_1 + k_2 = 0$

$\Rightarrow k_1 + k_2 = -1$ ... (i)

Again,

$f(-3) = 0$

$\Rightarrow (-3)^2 + k_1(-3) + k_2 = 0$

$\Rightarrow 9 - 3k_1 + k_2 = 0$

$\Rightarrow 3k_1 - k_2 = 9$ ...(ii)

On adding both equations,

$4k_1 = 8 \Rightarrow k_1 = 2$

From equation (i),

$k_1 + k_2 = -1$

$\Rightarrow 2 + k_2 = -1$

$\Rightarrow k_2 = -1 - 2 = -3$

177. (4) $\frac{5x}{2x^2 + 5x + 1} = \frac{1}{3}$

Dividing Numerator and Denominator by x,

$\frac{5}{2x + 5 + \frac{1}{x}} = \frac{1}{3}$

On dividing N^r and D^r by 2,

$\frac{\frac{5}{2}}{x + \frac{5}{2} + \frac{1}{2x}} = \frac{1}{3}$

$\Rightarrow \left(x + \frac{1}{2x}\right) + \frac{5}{2} = \frac{15}{2}$

$\Rightarrow x + \frac{1}{2x} = \frac{15}{2} - \frac{5}{2} = \frac{10}{2} = 5$

178. (1) $x + \frac{1}{x} = \frac{x^2+1}{x}$

$\therefore$ Its reciprocal $= \frac{x}{x^2+1}$

179. (1) The value of $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ will be minimum, if values of a, b and c be maximum.

$a + b + c = 1$

$\therefore$ Values of a, b and c will be maximum if

$a = b = c$

$\therefore a = b = c = \frac{1}{3}$

$\therefore \frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 3 + 3 + 3 = 9$

180. (2) $a(2+\sqrt{3}) = b(2-\sqrt{3}) = 1$

$\Rightarrow a = \frac{1}{2+\sqrt{3}} = \frac{2-\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})}$

$= \frac{2-\sqrt{3}}{4-3} = 2 - \sqrt{3}$

and $b = \frac{1}{2-\sqrt{3}}$

$= \frac{2+\sqrt{3}}{(2-\sqrt{3})(2+\sqrt{3})} = \frac{2+\sqrt{3}}{4-3}$

$= 2 + \sqrt{3}$

$\therefore a^2 + 1 = (2-\sqrt{3})^2 + 1$

$= 4 + 3 - 4\sqrt{3} + 1 = 8 - 4\sqrt{3}$

$b^2 + 1 = (2+\sqrt{3})^2 + 1$

$= 4 + 3 + 4\sqrt{3} + 1 = 8 + 4\sqrt{3}$

$\therefore \frac{1}{a^2+1} + \frac{1}{b^2+1}$

$= \frac{1}{8-4\sqrt{3}} + \frac{1}{8+4\sqrt{3}}$

$= \frac{8+4\sqrt{3}+8-4\sqrt{3}}{(8-4\sqrt{3})(8+4\sqrt{3})}$

$= \frac{16}{64 - 16 \times 3} = \frac{16}{64-48}$

$= \frac{16}{16} = 1$

181. (4) $(2+\sqrt{3})a = (2-\sqrt{3})b = 1$

$\Rightarrow a = \frac{1}{2+\sqrt{3}}$

$\therefore \frac{1}{a} = 2 + \sqrt{3}$

Similarly,

$b = \frac{1}{2-\sqrt{3}}$

$\frac{1}{b} = 2 - \sqrt{3}$

$\therefore \frac{1}{a} + \frac{1}{b} = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$

182. (1) $a + \frac{1}{b} = b + \frac{1}{c} = c + \frac{1}{a} = \pm 1$

$\Rightarrow a + \frac{1}{b} = 1$

$\Rightarrow ab + 1 = b \Rightarrow ab = b - 1$

$b + \frac{1}{c} = 1, \Rightarrow \frac{1}{c} = 1 - b$

$\Rightarrow c = \frac{1}{1-b}$

$\therefore abc = \frac{b-1}{1-b} = -1$

Again, $a + \frac{1}{b} = -1$

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$\Rightarrow ab+1=-b \Rightarrow ab=-b-1$

$b+\frac{1}{c}=-1 \Rightarrow \frac{1}{c}=-1-b$

$\Rightarrow c=\frac{1}{-1-b}$

$\therefore abc=1$

$\therefore abc=\pm 1$

183. (3) $\frac{x}{y}=\frac{4}{5}$ (Given)

Expression $=\frac{4}{7}+\frac{2y-x}{2y+x}$

$=\frac{4}{7}+\frac{\frac{2y}{y}-\frac{x}{y}}{\frac{2y}{y}+\frac{x}{y}}$

$=\frac{4}{7}+\frac{2-\frac{x}{y}}{2+\frac{x}{y}}=\frac{4}{7}+\frac{2-\frac{4}{5}}{2+\frac{4}{5}}$

$=\frac{4}{7}+\frac{\frac{10-4}{5}}{\frac{10+4}{5}}=\frac{4}{7}+\frac{6}{14}$

$=\frac{4}{7}+\frac{3}{7}=\frac{7}{7}=1$

184. (4) $P(x)=x^2+3Qx-2Q$

$\because (x-2)$ is a factor of $P(x)$.

$\therefore P(2)=0$

$\Rightarrow (2)^2+3Q\times 2-2Q=0$

$\Rightarrow 4+6Q-2Q=0$

$\Rightarrow 4Q+4=0$

$\Rightarrow 4Q=-4 \Rightarrow Q=-1$

185. (4) $a+b=12$, $ab=22$

$\therefore a^2+b^2=(a+b)^2-2ab$

$=(12)^2-2\times 22$

$=144-44=100$

186. (2) $x=\sqrt{3}-\frac{1}{\sqrt{3}}$

$y=\sqrt{3}+\frac{1}{\sqrt{3}}$

$x+y=\sqrt{3}-\frac{1}{\sqrt{3}}+\sqrt{3}+\frac{1}{\sqrt{3}}$

$=2\sqrt{3}$

$xy=\left(\sqrt{3}-\frac{1}{\sqrt{3}}\right)\left(\sqrt{3}+\frac{1}{\sqrt{3}}\right)$

$=3-\frac{1}{3}=\frac{9-1}{3}=\frac{8}{3}$

$\therefore \frac{x^2}{y}+\frac{y^2}{x}=\frac{x^3+y^3}{xy}$

$=\frac{(x+y)^3-3xy(x+y)}{xy}$

$=\frac{(2\sqrt{3})^3-3\times\frac{8}{3}(2\sqrt{3})}{\frac{8}{3}}$

$=\frac{24\sqrt{3}-16\sqrt{3}}{\frac{8}{3}}$

$=\frac{8\sqrt{3}\times 3}{8}=3\sqrt{3}$

187. (2) ax^2+bx+c will be a perfect square, if $b^2=4ac$

$\therefore x^2+ax+b$ will be a perfect square if $a^2=4b$

Look : $x^2+2\sqrt{b}x+b$

$=x^2+2.x.\sqrt{b}+\left(\sqrt{b}\right)^2$

$=(x+\sqrt{b})^2$

188. (1) $a+b+c+d=4$ (Given)

Expression

$=\frac{1}{(1-a)(1-b)(1-c)}+\frac{1}{(1-b)(1-c)(1-d)}$

$+\frac{1}{(1-c)(1-d)(1-a)}+\frac{1}{(1-d)(1-a)(1-b)}$

$=\frac{1-d+1-a+1-b+1-c}{(1-a)(1-b)(1-c)(1-d)}$

$=\frac{4-(a+b+c+d)}{(1-a)(1-b)(1-c)(1-d)}$

$=\frac{4-4}{(1-a)(1-b)(1-c)(1-d)}=0$

189. (2) If $a+b+c=0$,

$a^3+b^3+c^3=3abc$

$\therefore$ If $a^{\frac{1}{3}}+b^{\frac{1}{3}}+c^{\frac{1}{3}}=0$

$\Rightarrow \left(a^{\frac{1}{3}}\right)^3+\left(b^{\frac{1}{3}}\right)^3+\left(c^{\frac{1}{3}}\right)^3$

$=3.a^{\frac{1}{3}}.b^{\frac{1}{3}}.c^{\frac{1}{3}}$

$\Rightarrow a+b+c=3a^{\frac{1}{3}}.b^{\frac{1}{3}}.c^{\frac{1}{3}}$

$\Rightarrow (a+b+c)^3$

$=3^3.\left(a^{\frac{1}{3}}.b^{\frac{1}{3}}.c^{\frac{1}{3}}\right)^3=27abc$

190. (2) $a=\sqrt{6}+\sqrt{5}$, $b=\sqrt{6}-\sqrt{5}$ $a-b=\sqrt{6}+\sqrt{5}-\sqrt{6}+\sqrt{5}$

$=2\sqrt{5}$

$ab=\left(\sqrt{6}+\sqrt{5}\right)\left(\sqrt{6}-\sqrt{5}\right)$

$=6-5=1$

$\therefore 2a^2-5ab+2b^2$

$=2\left(a^2-\frac{5}{2}ab+b^2\right)$

$=2\left(a^2-2ab+b^2-\frac{1}{2}ab\right)$

$=2(a^2-2ab+b^2)-ab$

$=2(a-b)^2-ab$

$=2\times\left(2\sqrt{5}\right)^2-1$

$=2\times 4\times 5-1=40-1=39$

191. (3) $a^2+b^2+c^2=2a-2b-2$

$\Rightarrow a^2+b^2+c^2-2a+2b+2=0$

$\Rightarrow a^2-2a+1+b^2+2b+1+c^2=0$

$\Rightarrow (a-1)^2+(b+1)^2+c^2=0$

$\Rightarrow a-1=0 \Rightarrow a=1$;

$\Rightarrow b+1=0 \Rightarrow b=-1$;

and $c=0$

$\therefore 3a-2b+c=3\times 1-2(-1)+0$

$=3+2=5$

192. (2) $a+b+c=3$; $a^2+b^2+c^2=6$

$\therefore (a+b+c)^2=a^2+b^2+c^2+2ab+2bc+2ca$

$\Rightarrow 3^2=6+2(ab+bc+ca)$

$\Rightarrow 9-6=2(ab+bc+ca)$

$\Rightarrow ab+bc+ca=\frac{3}{2}$

$\therefore \frac{1}{a}+\frac{1}{b}+\frac{1}{c}=1$

$\Rightarrow \frac{bc+ac+ab}{abc}=1$

$\Rightarrow abc=ab+bc+ca=\frac{3}{2}$

193. (4) $a^2-4a-1=0$

$\Rightarrow a^2-1=4a$

On dividing both sides by a.

$\frac{a^2-1}{a}=\frac{4a}{a}$

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$\Rightarrow a-\frac{1}{a}=4$ ...(i)

Expression $=a^2+3a+\frac{1}{a^2}-\frac{3}{a}$

$=a^2+\frac{1}{a^2}+3a-\frac{3}{a}$

$=\left(a-\frac{1}{a}\right)^2+2+3\left(a-\frac{1}{a}\right)$

$=(4)^2+2+3\times4$

$=16+2+12=30$

194. (4) $x=2+\sqrt{3}$

$\therefore \frac{1}{x}=\frac{1}{2+\sqrt{3}}=\frac{2-\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})}$

$=\frac{2-\sqrt{3}}{4-3}=2-\sqrt{3}$

$\therefore x^2+\frac{1}{x^2}=\left(x+\frac{1}{x}\right)^2-2$

$=(2+\sqrt{3}+2-\sqrt{3})^2-2$

$=4^2-2=16-2=14$

195. (3) $a^2+b^2+c^2=2a-2b-2c-3$

$\Rightarrow (a^2-2a+1)+(b^2+2b+1)+(c^2+2c+1)=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

$\Rightarrow a=1, b=-1, c=-1$

$\therefore a+b+c=1-1-1=-1$

196. (4) $-1\le\frac{2x-7}{5}\le1$

$\Rightarrow -5\le2x-7\le5$

$\Rightarrow -5+7\le2x-7+7\le5+7$

$\Rightarrow 2\le2x\le12$

$\Rightarrow 1\le x\le6$

197. (3)

$\frac{3-5x}{2x}+\frac{3-5y}{2y}+\frac{3-5z}{2z}=0$

$\Rightarrow \frac{3}{2x}-\frac{5x}{2x}+\frac{3}{2y}-\frac{5y}{2y}+\frac{3}{2z}-\frac{5z}{2z}=0$

$\Rightarrow \frac{3}{2x}+\frac{3}{2y}+\frac{3}{2z}-\frac{5}{2}-\frac{5}{2}-\frac{5}{2}=0$

$\Rightarrow \frac{3}{2x}+\frac{3}{2y}+\frac{3}{2z}=\frac{3\times5}{2}$

$\Rightarrow \frac{1}{2x}+\frac{1}{2y}+\frac{1}{2z}=\frac{5}{2}$

$\Rightarrow \frac{4}{2x}+\frac{4}{2y}+\frac{4}{2z}=\frac{4\times5}{2}$

$\Rightarrow \frac{2}{x}+\frac{2}{y}+\frac{2}{z}=10$

198. (1) $2s=a+b+c$

$\therefore s(s-c)=\left(\frac{a+b+c}{2}\right)\left(\frac{a+b+c}{2}-c\right)$

$=\frac{(a+b+c)(a+b-c)}{4}$

Again, $(s-a)(s-b)$

$=\frac{1}{4}(2s-2a)(2s-2b)$

$=\frac{1}{4}(a+b+c-2a)(a+b+c-2b)$

$=\frac{1}{4}(b+c-a)(a+c-b)$

$\therefore s(s-c)+(s-a)(s-b)$

$=\frac{1}{4}[(a+b+c)(a+b-c)+(b+c-a)(a+c-b)]$

$=\frac{1}{4}[(a+b)^2-c^2+ab+ac-a^2+bc+c^2-ac-b^2-bc+ab]$

$=\frac{1}{4}(a^2+b^2+2ab-c^2+ab+ac-a^2+bc+c^2-ac-b^2-bc+ab)$

$=\frac{1}{4}\times4ab=ab$

199. (4) $\frac{2p}{p^2-2p+1}=\frac{1}{4}$

On dividing numerator and denominator by p, we get,

$\frac{2}{p-2+\frac{1}{p}}=\frac{1}{4}$

$\Rightarrow p+\frac{1}{p}-2=8$

$\Rightarrow p+\frac{1}{p}=8+2=10$

200. (1) $\sqrt{1+\frac{27}{169}}=1+\frac{x}{13}$

$\Rightarrow \sqrt{\frac{169+27}{169}}=1+\frac{x}{13}$

$\Rightarrow \sqrt{\frac{196}{169}}=1+\frac{x}{13}$

$\Rightarrow \frac{14}{13}=1+\frac{x}{13}$

$\Rightarrow 1+\frac{1}{13}=1+\frac{x}{13}$

$\Rightarrow x=1$

201. (3) $2x=\sqrt{a}+\frac{1}{\sqrt{a}}$

On squaring both sides,

$4x^2=a+\frac{1}{a}+2$

$\Rightarrow 4x^2-4=a+\frac{1}{a}+2-4$

$=a+\frac{1}{a}-2$

$\therefore \sqrt{4x^2-4}=\sqrt{\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)^2}$

$=\sqrt{a}-\frac{1}{\sqrt{a}}$

$\therefore \sqrt{x^2-1}=\frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)$

$\therefore$ Expression $=\frac{\sqrt{x^2-1}}{x-\sqrt{x^2-1}}$

$=\frac{\frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)}{\frac{1}{2}\left(\sqrt{a}+\frac{1}{\sqrt{a}}\right)-\frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)}$

$=\frac{\frac{1}{2}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)}{\frac{1}{\sqrt{a}}}=\frac{1}{2}\sqrt{a}\left(\sqrt{a}-\frac{1}{\sqrt{a}}\right)$

$=\frac{1}{2}(a-1)$

202. (1) $a^2+b^2+c^2=2a-2b-2c-3$

$\Rightarrow a^2-2a+1+b^2+2b+1+c^2+2c+1=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

$\Rightarrow a-1=0, b+1=0, c+1=0$

$\Rightarrow a=1, b=-1, c=-1$

$\therefore a+b+c=1-1-1=-1$

203. (2) $\frac{a+b-c}{a+b}=\frac{b+c-a}{b+c}$

$=\frac{c+a-b}{c+a}$

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$\Rightarrow \frac{a+b}{a+b}-\frac{c}{a+b}=\frac{b+c}{b+c}-\frac{a}{b+c}$

$=\frac{c+a}{c+a}-\frac{b}{c+a}$

$\Rightarrow 1-\frac{c}{a+b}=1-\frac{a}{b+c}$

$=1-\frac{b}{c+a}$

$\Rightarrow \frac{c}{a+b}=\frac{a}{b+c}=\frac{b}{c+a}$

$\Rightarrow \frac{a+b}{c}=\frac{b+c}{a}=\frac{c+a}{b}$

$\Rightarrow \frac{a+b}{c}+1=\frac{b+c}{a}+1=\frac{c+a}{b}+1$

$\Rightarrow \frac{a+b+c}{c}=\frac{b+c+a}{a}$

$=\frac{c+a+b}{b}$

$\Rightarrow \frac{1}{c}=\frac{1}{a}=\frac{1}{b} \Rightarrow a=b=c$

204. (4) Given, $bc+ab+ca=abc$

$\therefore bc+ab=abc-ac$

$ab+ca=abc-bc$

$bc+ca=abc-ab$

$\therefore$ Expression $=\frac{b+c}{abc-bc}+\frac{a+c}{abc-ac}+\frac{a+b}{abc-ab}$

$=\frac{b+c}{ab+ac}+\frac{a+c}{bc+ab}+\frac{a+b}{bc+ca}$

$=\frac{b+c}{a(b+c)}+\frac{a+c}{b(c+a)}+\frac{a+b}{c(a+b)}$

$=\frac{1}{a}+\frac{1}{b}+\frac{1}{c}$

$=\frac{bc+ac+ab}{abc}$

$=\frac{abc}{abc}=1$

205. (4) $\frac{a^2-bc}{a^2+bc}+\frac{b^2-ca}{b^2+ca}+\frac{c^2-ab}{c^2+ab}=1$

$\Rightarrow \left(\frac{a^2-bc}{a^2+bc}+1\right)+\left(\frac{b^2-ca}{b^2+ca}+1\right)+\left(\frac{c^2-ab}{c^2+ab}+1\right)=4$

$\Rightarrow \frac{a^2-bc+a^2+bc}{a^2+bc}+\frac{b^2-ca+b^2+ca}{b^2+ca}+\frac{c^2-ab+c^2+ab}{c^2+ab}=4$

$\Rightarrow \frac{2a^2}{a^2+bc}+\frac{2b^2}{b^2+ca}+\frac{2c^2}{c^2+ab}=4$

$\Rightarrow \frac{a^2}{a^2+bc}+\frac{b^2}{b^2+ca}+\frac{c^2}{c^2+ab}$

$=\frac{4}{2}=2$

206. (3) $999x+888y=1332$

$888x+999y=555$

On adding,

$1887x+1887y=1887$

$\Rightarrow 1887(x+y)=1887$

$\Rightarrow x+y=\frac{1887}{1887}=1$

207. (3) $a=\frac{\sqrt{x+2}+\sqrt{x-2}}{\sqrt{x+2}-\sqrt{x-2}}$

By componendo and dividendo,

$\frac{a+1}{a-1}$

$=\frac{\sqrt{x+2}+\sqrt{x-2}+\sqrt{x+2}-\sqrt{x-2}}{\sqrt{x+2}+\sqrt{x-2}-\sqrt{x+2}+\sqrt{x-2}}$

$\Rightarrow \frac{a+1}{a-1}$

$=\frac{2\sqrt{x+2}}{2\sqrt{x-2}}=\frac{\sqrt{x+2}}{\sqrt{x-2}}$

On squaring both sides,

$\frac{a^2+2a+1}{a^2-2a+1}=\frac{x+2}{x-2}$

$\Rightarrow \frac{a^2+1+2a}{a^2+1-2a}=\frac{x+2}{x-2}$

By componendo and dividendo,

$\frac{2(a^2+1)}{4a}=\frac{2x}{4}$

$\Rightarrow \frac{a^2+1}{a}=x$

$\Rightarrow a^2+1=ax$

$\Rightarrow a^2-ax=-1$

208. (3) $x=\frac{1}{2+\sqrt{3}}$

$=\frac{1}{2+\sqrt{3}}\times\frac{2-\sqrt{3}}{2-\sqrt{3}}=\frac{2-\sqrt{3}}{4-3}$

$=2-\sqrt{3}$

$\therefore y=\frac{1}{2-\sqrt{3}}=2+\sqrt{3}$

$\therefore x+y=2-\sqrt{3}+2+\sqrt{3}=4$

$xy=(2-\sqrt{3})(2+\sqrt{3})$

$=4-3=1$

$\therefore 8xy(x^2+y^2)$

$=8xy[(x+y)^2-2xy]$

$=8\times 1(4^2-2\times 1)$

$=8(16-2)=8\times 14=112$

209. (2) $a^2+b^2+c^2=ab+bc+ca$

$\Rightarrow 2a^2+2b^2+2c^2-2ab-2bc-2ca=0$

$\Rightarrow a^2+b^2-2ab+b^2+c^2-2bc+c^2+a^2-2ca=0$

$\Rightarrow (a-b)^2+(b-c)^2+(c-a)^2=0$

$\Rightarrow a-b=0,\ b-c=0,\ c-a=0$

$\Rightarrow a=b,\ b=c,\ c=a$

$\Rightarrow a=b=c$

$\therefore \frac{a+c}{b}=\frac{2a}{a}=2$

210. (3) $\frac{m-a^2}{b^2+c^2}+\frac{m-b^2}{c^2+a^2}+\frac{m-c^2}{a^2+b^2}-3=0$

$\Rightarrow \frac{m-a^2}{b^2+c^2}-1+\frac{m-b^2}{c^2+a^2}-1+\frac{m-c^2}{a^2+b^2}-1=0$

$\Rightarrow \frac{m-a^2-b^2-c^2}{b^2+c^2}+\frac{m-b^2-c^2-a^2}{c^2+a^2}+\frac{m-c^2-a^2-b^2}{a^2+b^2}=0$

$\Rightarrow \frac{m-(a^2+b^2+c^2)}{b^2+c^2}+$

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$$\frac{m-(a^2+b^2+c^2)}{c^2+a^2}+\frac{m-(a^2+b^2+c^2)}{a^2+b^2}=0$$

$\therefore$ Each term $=0$

$$\therefore \frac{m-(a^2+b^2+c^2)}{b^2+c^2}=0$$

$\Rightarrow m-(a^2+b^2+c^2)=0$

$\Rightarrow m=a^2+b^2+c^2$

211. (3) $x+\frac{1}{x}=1$ (Given)

$$\text{Expression}=\frac{x^2+3x+1}{x^2+7x+1}$$

$$=\frac{x+\frac{1}{x}+3}{x+\frac{1}{x}+7}$$

(Dividing numerator and denominator by x)

$$=\frac{1+3}{1+7}=\frac{4}{8}=\frac{1}{2}$$

212. (3) $p=99$ (Given)

Expression $=p(p^2+3p+3)$

$=p^3+3p^2+3p$

$=p^3+3p^2+3p+1-1$

$=(p+1)^3-1$

$=(99+1)^3-1=(100)^3-1$

$=1000000-1=999999$

213. (1) $x=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$,

$$y=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

$$\therefore x+y=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}+\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

$$=\frac{\left(\sqrt{5}-\sqrt{3}\right)^2+\left(\sqrt{5}+\sqrt{3}\right)^2}{\left(\sqrt{5}+\sqrt{3}\right)\times\left(\sqrt{5}-\sqrt{3}\right)}$$

$$=\frac{2\left(\left(\sqrt{5}\right)^2+\left(\sqrt{3}\right)^2\right)}{5-3}$$

$=5+3=8$

$$xy=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\times\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}=1$$

$$\therefore \frac{x^2+xy+y^2}{x^2-xy+y^2}$$

$$=\frac{(x+y)^2-xy}{(x+y)^2-3xy}$$

$$=\frac{8^2-1}{8^2-3}=\frac{64-1}{64-3}=\frac{63}{61}$$

214. (1) $x+\frac{1}{x}=1$

$\Rightarrow x^2+1=x\Rightarrow x^2-x+1=0$

$$\therefore \frac{2}{x^2-x+2}=\frac{2}{x^2-x+1+1}$$

$$=\frac{2}{0+1}=2$$

215. (1) $\frac{x}{1}=\frac{a-b}{a+b}$

By componendo and dividendo,

$$\frac{1-x}{1+x}=\frac{1-\frac{a-b}{a+b}}{1+\frac{a-b}{a+b}}$$

$$=\frac{a+b-a+b}{a+b+a-b}=\frac{b}{a}$$

Similarly,

$$\frac{1-y}{1+y}=\frac{c}{b};\ \frac{1-z}{1+z}=\frac{a}{c}$$

$$\therefore \text{Expression}=\frac{(1-x)(1-y)(1-z)}{(1+x)(1+y)(1+z)}$$

$$=\frac{b}{a}\times\frac{c}{b}\times\frac{a}{c}=1$$

216. (1) $x=\frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}$

On rationalising the denominator,

$$=\frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}-\sqrt{11}}\times\frac{\sqrt{13}+\sqrt{11}}{\sqrt{13}+\sqrt{11}}$$

$$=\frac{\left(\sqrt{13}+\sqrt{11}\right)^2}{\left(\sqrt{13}\right)^2-\left(\sqrt{11}\right)^2}$$

$$=\frac{13+11+2\sqrt{143}}{13-11}$$

$$=\frac{24+2\sqrt{143}}{2}=12+\sqrt{143}$$

$$\therefore y=\frac{1}{x}=\frac{1}{12+\sqrt{143}}$$

$$=\frac{1}{12+\sqrt{143}}\times\frac{12-\sqrt{143}}{12-\sqrt{143}}$$

$$=\frac{12-\sqrt{143}}{144-143}=12-\sqrt{143}$$

$\therefore x-y=12+\sqrt{143}-12+\sqrt{143}=2\sqrt{143}$ and

$xy=\left(12+\sqrt{143}\right)\left(12-\sqrt{143}\right)$

$=144-143=1$

$\therefore 3x^2-5xy+3y^2=3x^2-6xy+3y^2+xy$.

$=3(x-y)^2+xy$

$=3\left(2\sqrt{143}\right)^2+1$

$=3\times4\times143+1=1716+1$

$=1717$

217. (4) $a+\frac{1}{b}=b+\frac{1}{c}=c+\frac{1}{a}$

$$\Rightarrow \frac{abc+c}{bc}=\frac{abc+a}{ac}$$

$$=\frac{abc+b}{ab}$$

$$\Rightarrow \frac{c}{bc}=\frac{a}{ac}=\frac{b}{ab}$$

$$\Rightarrow \frac{1}{b}=\frac{1}{c}=\frac{1}{a}$$

$\Rightarrow a=b=c=1$

$\therefore a^2b^2c^2=1$

218. (3) $a^2+b^2+c^2=ab+bc+ca$

$\Rightarrow 2a^2+2b^2+2c^2-2ab-2bc-2ca=0$

$\Rightarrow a^2+b^2-2ab+b^2+c^2-2bc+c^2+a^2-2ca=0$

$\Rightarrow (a-b)^2+(b-c)^2+(c-a)^2=0$

$\therefore a-b=0\Rightarrow a=b$

$b-c=0\Rightarrow b=c$

$c-a=0\Rightarrow c=a$

$\therefore a=b=c$

$$\therefore \frac{a+c}{b}=\frac{2a}{a}=2$$

219. (3) $9x^2+25-30x$

$=(3x)^2+(5)^2-2\times3x\times5$

$=(3x-5)^2$

220. (4) $\frac{x}{3}+\frac{3}{x}=1$

$$\Rightarrow \frac{x^2+9}{3x}=1$$

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$\Rightarrow x^2+9=3x$

$\Rightarrow x^2-3x+9=0$

$\therefore x^3+3^3=(x+3)(x^2-3x+9)=0$

$\Rightarrow x^3=-27$

221. (2) $x+y=2a=a+a$

$\Rightarrow x-a=a-y$

Expression $=\frac{a}{x-a}+\frac{a}{y-a}$

$=\frac{a}{x-a}-\frac{a}{a-y}$

$=\frac{a}{x-a}-\frac{a}{x-a}=0$

222. (1) $\frac{x+1}{x-1}=\frac{a}{b}$

By componendo and dividendo,

$\frac{x+1+x-1}{x+1-x+1}=\frac{a+b}{a-b}$

$\Rightarrow \frac{2x}{2}=\frac{a+b}{a-b}$

$\Rightarrow x=\frac{a+b}{a-b}$

Again,

$\frac{1-y}{1+y}=\frac{b}{a}$

$\Rightarrow \frac{1+y}{1-y}=\frac{a}{b}$

$\Rightarrow \frac{1+y+1-y}{1+y-1+y}=\frac{a+b}{a-b}$

$\Rightarrow \frac{2}{2y}=\frac{a+b}{a-b}$

$\Rightarrow y=\frac{a-b}{a+b}$

$\therefore x-y=\frac{a+b}{a-b}-\frac{a-b}{a+b}$

$=\frac{(a+b)^2-(a-b)^2}{(a+b)(a-b)}=\frac{4ab}{a^2-b^2}$

$xy=\frac{a+b}{a-b}\times\frac{a-b}{a+b}=1$

$\therefore$ Expression

$=\frac{x-y}{1+xy}=\frac{\frac{4ab}{a^2-b^2}}{1+1}$

$=\frac{4ab}{2(a^2-b^2)}=\frac{2ab}{a^2-b^2}$

223. (4) $\frac{a}{b}+\frac{b}{a}=2$

$\Rightarrow \frac{a^2+b^2}{ab}=2$

$\Rightarrow a^2+b^2=2ab$

$\Rightarrow a^2+b^2-2ab=0$

$\Rightarrow (a-b)^2=0\Rightarrow a-b=0$

224. (2) $\sqrt{y}=4x\Rightarrow y=(4x)^2=16x^2$

$\therefore \frac{x^2}{y}=\frac{x^2}{16x^2}=\frac{1}{16}$

225. (3) $\frac{x}{y}=\frac{a+2}{a-2}$

On squaring both sides,

$\frac{x^2}{y^2}=\frac{(a+2)^2}{(a-2)^2}$

By componendo and dividendo,

$\frac{x^2-y^2}{x^2+y^2}=\frac{(a+2)^2-(a-2)^2}{(a+2)^2+(a-2)^2}$

$\Rightarrow \frac{x^2-y^2}{x^2+y^2}=\frac{4\times a\times 2}{2(a^2+4)}$

$=\frac{4a}{a^2+4}$

[$\because (a+b)^2+(a-b)^2=2(a^2+b^2)$; $(a+b)^2-(a-b)^2=4ab$]

226. (1) $x(x+y+z)=20$

$\Rightarrow x^2+xy+xz=20$ --- (i)

Again, $y(x+y+z)=30$

$\Rightarrow xy+y^2+yz=30$ --- (ii)

and, $z(x+y+z)=50$

$\Rightarrow xz+yz+z^2=50$ --- (iii)

On adding all three equations,

$x^2+y^2+z^2+2xy+2yz+2zx=20+30+50$

$\Rightarrow (x+y+z)^2=100$

$\Rightarrow x+y+z=10$

$\Rightarrow 2(x+y+z)=20$

227. (1) $x+y=4$ --- (i)

$x^2+y^2=14$ --- (ii)

$\therefore (x+y)^2=x^2+y^2+2xy$

$\Rightarrow 16=14+2xy$

$\Rightarrow 2xy=16-14=2$

$\Rightarrow xy=1$ --- (iii)

$\therefore (x-y)^2=(x+y)^2-4xy$

$=(4)^2-4=16-4=12$

$\Rightarrow x-y=\sqrt{12}=2\sqrt{3}$ --- (iv)

$\therefore$ On adding equations (i) and (iv)

$x+y=4$

$x-y=2\sqrt{3}$

$2x=4+2\sqrt{3}$

$\Rightarrow x=2+\sqrt{3}$

From equation (i),

$2+\sqrt{3}+y=4$

$\Rightarrow y=4-2-\sqrt{3}=2-\sqrt{3}$

228. (2) $a^2+b^2+c^2=2(a-b-c)-3$

$\Rightarrow a^2+b^2+c^2-2a+2b+2c+3=0$

$\Rightarrow a^2-2a+1+b^2+2b+1+c^2+2c+1=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

$\therefore a-1=0\Rightarrow a=1$

$b+1=0\Rightarrow b=-1$

$c+1=0\Rightarrow c=-1$

[If $x^2+y^2+z^2=0\Rightarrow x=0, y=0, z=0$]

$\therefore a+b+c=1-1-1=-1$

229. (3) $x^2-4x-1=0$

$\Rightarrow x^2-1=4x$

$\Rightarrow \frac{x^2-1}{x}=\frac{4x}{x}$

$\Rightarrow x-\frac{1}{x}=4$

On squaring both sides,

$\left(x-\frac{1}{x}\right)^2=16$

$\Rightarrow x^2+\frac{1}{x^2}-2=16$

$\Rightarrow x^2+\frac{1}{x^2}=16+2=18$

230. (3) $a+\frac{1}{b}=1\Rightarrow a=\frac{1}{2}$; $b=2$

$b+\frac{1}{c}=1\Rightarrow b=2, c=-1$

$\therefore c+\frac{1}{a}=-1+2=1$

231. (1) $\frac{a}{b}=\frac{25}{6}$

$\Rightarrow \frac{a^2}{b^2}=\frac{25^2}{6^2}=\frac{625}{36}$

By componendo and dividendo,

$\frac{a^2-b^2}{a^2+b^2}=\frac{625-36}{625+36}$

$=\frac{589}{661}$

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TYPE-II

1. (3) $x = \sqrt{3}+\sqrt{2}$

$\therefore \frac{1}{x} = \frac{1}{\sqrt{3}+\sqrt{2}}$

$= \frac{1}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

$= \frac{\sqrt{3}-\sqrt{2}}{3-2} = \sqrt{3}-\sqrt{2}$

$\therefore x+\frac{1}{x} = \sqrt{3}+\sqrt{2}+\sqrt{3}-\sqrt{2}$

$= 2\sqrt{3}$

Now,

$x^3+\frac{1}{x^3} = \left(x+\frac{1}{x}\right)^3 - 3.x.\frac{1}{x}\left(x+\frac{1}{x}\right)$

$= (2\sqrt{3})^3 - 3(2\sqrt{3})$

$= 24\sqrt{3} - 6\sqrt{3} = 18\sqrt{3}$

2. (3) Given, $x + y = 7$

Now, $x^3 + y^3 + 21xy$

$= (x+y)^3 - 3xy(x+y) + 21xy$

$= (7)^3 - 3xy(7) + 21xy$

$= 343 - 21xy + 21xy = 343$

3. (3) $x^{\frac{1}{3}}+y^{\frac{1}{3}} = z^{\frac{1}{3}}$ .....(i)

Cubing both sides,

$\left(x^{\frac{1}{3}}+y^{\frac{1}{3}}\right)^3 = z$

$\Rightarrow x+y+3\,x^{\frac{1}{3}}.y^{\frac{1}{3}}\left(x^{\frac{1}{3}}+y^{\frac{1}{3}}\right) = z$

$\because (a+b)^3 = a^3+b^3+3ab(a+b)$

$\Rightarrow x+y-z$

$= -3.\ x^{\frac{1}{3}}.y^{\frac{1}{3}}.z^{\frac{1}{3}}$ .....(ii)

[From equation (i)]

$\therefore (x+y-z)^3 + 27xyz$

$= \left(-3x^{\frac{1}{3}}.y^{\frac{1}{3}}.z^{\frac{1}{3}}\right)^3 + 27xyz$

[From equation (ii)]

$-27xyz + 27xyz = 0$

4. (1) $\left(2b+\frac{1}{b}\right)^2$

$= 4b^2+\frac{1}{b^2}+2\times 2b\times\frac{1}{b} = 2+4 = 6$

$\Rightarrow 2b+\frac{1}{b} = \sqrt{6}$

$\therefore 8b^3+\frac{1}{b^3}$

$= \left(2b+\frac{1}{b}\right)^3 - 3\times 2b\times\frac{1}{b}\left(2b+\frac{1}{b}\right)$

$= \left(\sqrt{6}\right)^3 - 6\left(\sqrt{6}\right)$

$= 6\sqrt{6} - 6\sqrt{6} = 0$

5. (2) $2p+\frac{1}{p} = 4$

$\Rightarrow p+\frac{1}{2p} = 2$

$\therefore \left(p+\frac{1}{2p}\right)^3$

$= p^3+\frac{1}{8p^3}+3.p.\frac{1}{2p}\left(p+\frac{1}{2p}\right)$

$\Rightarrow 8 = p^3+\frac{1}{8p^3}+\frac{3}{2}\times 2$

$\Rightarrow p^3+\frac{1}{8p^3} = 8-3 = 5$

6. (1) $a^4+b^4-a^2b^2 = 0$ ..... (i)

We know, $a^6+b^6 = (a^2)^3+(b^2)^3$

$= (a^2+b^2)(a^4-a^2b^2+b^4)$

$= (a^2+b^2)\times 0 = 0$

[From equation (i)]

7. (1) $x+\frac{1}{x} = \sqrt{3}$

Cubing both sides,

$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right) = \left(\sqrt{3}\right)^3$

$\Rightarrow x^3+\frac{1}{x^3}+3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow x^3+\frac{1}{x^3} = 0$

Now, $x^{18}+x^{12}+x^6+1$

$= x^{12}(x^6+1)+1(x^6+1)$

$= (x^{12}+1)(x^6+1)$

$= (x^{12}+1).x^3\left(x^3+\frac{1}{x^3}\right) = 0$

8. (2) $x+\frac{1}{x} = 2$

$\Rightarrow x^2+1 = 2x \Rightarrow x^2-2x+1 = 0$

$\Rightarrow (x-1)^2 = 0$

$\Rightarrow x = 1$

$\therefore x^2+\frac{1}{x^3} = 1+1 = 2$

9. (1) $\frac{a}{b}+\frac{b}{a} = 1$

$\Rightarrow \frac{a^2+b^2}{ab} = 1$

$\Rightarrow a^2+b^2 = ab$

$\Rightarrow a^2+b^2-ab = 0$

$\therefore a^3+b^3$

$= (a+b)(a^2-ab+b^2) = 0$

10. (3) $\frac{x^3+\frac{1}{x}}{x^2-x+1} = \frac{x^2+\frac{1}{x^2}}{x-1+\frac{1}{x}}$

$= \frac{\left(x+\frac{1}{x}\right)^2-2}{\left(x+\frac{1}{x}\right)-1} = \frac{9-2}{3-1} = \frac{7}{2}$

11. (1) $a+\frac{1}{a}+1 = 0$

$\Rightarrow a^2+a+1 = 0$

$\Rightarrow a^4-a = a(a^3-1)$

$= a(a-1)(a^2+a+1) = 0$

12. (3) $x^4+y^4-2x^2y^2$

$= (x^2-y^2)^2$

$= [(x+y)(x-y)]^2$

$= \left[\left(a+\frac{1}{a}+a-\frac{1}{a}\right)\left(a+\frac{1}{a}-a+\frac{1}{a}\right)\right]^2$

$= \left(2a\times\frac{2}{a}\right)^2 = 16$

13. (3) $x+\frac{1}{2x} = 2$

$\Rightarrow 2x+\frac{2}{2x} = 4$

$\Rightarrow 2x+\frac{1}{x} = 4$

On cubing both sides,

$8x^3+\frac{1}{x^3}+3.2x.\ \frac{1}{x}\left(2x+\frac{1}{x}\right)$

$= 64$

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$\Rightarrow 8x^3+\frac{1}{x^3}+6\times 4=64$

$\Rightarrow 8x^3+\frac{1}{x^3}=64-24=40$

14. (3) $P(x)=ax^3+3x^2-8x+b$
$\because P(x)$ is div. by $(x+2)$ & $(x-2)$
$\therefore P(-2)=-8a+12+16+b=0$
$\Rightarrow -8a+b+28=0$ ...(i)
$\Rightarrow P(2)=8a+12-16+b=2$
$\Rightarrow 8a+b-4=0$ ...(ii)
By equation (i) + (ii)
$2b+24=0$

$\Rightarrow b=-\frac{24}{2}=-12$

From equation (i),
$-8a-12+28=0$
$\Rightarrow -8a=-16$
$\Rightarrow a=2$

15. (2) $x^2-3x+1=0$
$\Rightarrow x^2+1=3x$

$\Rightarrow x+\frac{1}{x}=3$

$\therefore x^3+\frac{1}{x^3}$

$=\left(x+\frac{1}{x}\right)^3-3x.\frac{1}{x}\left(x+\frac{1}{x}\right)$
$=27-3\times 3=18$

16. (1) $x+\frac{1}{4x}=\frac{3}{2}$
Multiplying both sides by 2

$\Rightarrow 2x+\frac{1}{2x}=3$
Cubing both sides,

$8x^3+\frac{1}{8x^3}+3\times 2x\times\frac{1}{2x}$

$\times\left(2x+\frac{1}{2x}\right)=27$

$\Rightarrow 8x^3+\frac{1}{8x^3}+3\times 3=27$

$\Rightarrow 8x^3+\frac{1}{8x^3}=27-9=18$

17. (1) $\frac{1}{x+y}=\frac{1}{x}+\frac{1}{y}=\frac{y+x}{xy}$
$\Rightarrow (x+y)^2=xy$
$\Rightarrow x^2+2xy+y^2=xy$
$\Rightarrow x^2+xy+y^2=0$
$\therefore x^3-y^3=(x-y)(x^2+xy+y^2)$
$=0$

18. (3)

$\frac{x}{a}=b-c;\ \frac{y}{b}=c-a;\ \frac{z}{c}=a-b$
Again, $b-c+c-a+a-b=0$

$\therefore \left(\frac{x}{a}\right)^3+\left(\frac{y}{b}\right)^3+\left(\frac{z}{c}\right)^3$
$=(b-c)^3+(c-a)^3+(a-b)^3$
$=3(b-c)(c-a)(a-b)$

$=\frac{3xyz}{abc}$

19. (3) $xy(x+y)=1$

$\Rightarrow x+y=\frac{1}{xy}$
Cubing both sides,

$x^3+y^3+3xy(x+y)=\frac{1}{x^3y^3}$

$\Rightarrow x^3+y^3+3xy\times\frac{1}{xy}=\frac{1}{x^3y^3}$

$\Rightarrow \frac{1}{x^3y^3}-x^3-y^3=3$

20. (4) $x^4+\frac{1}{x^4}=119$

$\Rightarrow \left(x^2+\frac{1}{x^2}\right)^2-2=119$

$\Rightarrow \left(x^2+\frac{1}{x^2}\right)^2=121$

$\Rightarrow x^2+\frac{1}{x^2}=11$

$\Rightarrow \left(x-\frac{1}{x}\right)^2+2=11$

$\Rightarrow \left(x-\frac{1}{x}\right)^2=9\Rightarrow x-\frac{1}{x}=3$
Cubing both sides,

$\left(x-\frac{1}{x}\right)^3=27$

$\Rightarrow x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)=27$

$\Rightarrow x^3-\frac{1}{x^3}-3\times 3=27$

$\Rightarrow x^3-\frac{1}{x^3}=27+9=36$

21. (2) $3x+\frac{1}{2x}=5$

On multiplying both sides by $\frac{2}{3}$,

$2x+\frac{1}{3x}=\frac{10}{3}$
Cubing both sides,

$8x^3+\frac{1}{27x^3}+3\times 2x\times\frac{1}{3x}$

$\left(2x+\frac{1}{3x}\right)=\frac{1000}{27}$

$\Rightarrow 8x^3+\frac{1}{27x^3}+2\times\frac{10}{3}=\frac{1000}{27}$

$\Rightarrow 8x^3+\frac{1}{27x^3}=\frac{1000}{27}-\frac{20}{3}$

$=\frac{1000-180}{27}=\frac{820}{27}=30\frac{10}{27}$

22. (1) $x+y=z\Rightarrow x+y+(-z)=0$
$\therefore x^3+y^3-z^3+3xyz$
$=x^3+y^3+(-z)^3-3xy(-z)=0$

23. (1) $\left(x+\frac{1}{x}\right)^2=3$

$\Rightarrow x+\frac{1}{x}=\sqrt{3}$
On cubing both sides,

$\left(x+\frac{1}{x}\right)^3=3\sqrt{3}$

$\Rightarrow x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=3\sqrt{3}$

$\Rightarrow x^3+\frac{1}{x^3}+3\sqrt{3}=3\sqrt{3}$

$\Rightarrow x^3+\frac{1}{x^3}=0\Rightarrow x^6+1=0$

$\therefore x^{72}+x^{66}+x^{54}+x^{36}+x^{24}+x^6+1$
$=(x^6)^{12}+(x^6)^{11}+(x^6)^9+(x^6)^6+(x^6)^4+x^6+1$
$=1-1-1+1+1+0=1$

24. (1) $\left(x+\frac{1}{x}\right)^2=3$

$\Rightarrow x+\frac{1}{x}=\sqrt{3}$
On cubing both sides,

$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=3\sqrt{3}$

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$\Rightarrow x^3+\frac{1}{x^3}=3\sqrt{3}-3\sqrt{3}=0$

$\Rightarrow x^6+1=0$

$\therefore x^{206}+x^{200}+x^{90}+x^{84}+x^{18}+x^{12}+x^6+1$

$=x^{200}(x^6+1)+x^{84}(x^6+1)+x^{12}(x^6+1)+(x^6+1)$

$=0$

25. (2) $a+\frac{1}{a}=\sqrt{3}$

On cubing both sides,

$a^3+\frac{1}{a^3}+3a.\frac{1}{a}\left(a+\frac{1}{a}\right)=3\sqrt{3}$

$\Rightarrow a^3+\frac{1}{a^3}+3\sqrt{3}=3\sqrt{3}$

$\Rightarrow a^3+\frac{1}{a^3}=0$ ....(i)

$\Rightarrow a^6-\frac{1}{a^6}+2$

$=\left(a^3\right)^2-\left(\frac{1}{a^3}\right)^2+2$

$=\left(a^3+\frac{1}{a^3}\right)\left(a^3-\frac{1}{a^3}\right)+2=2$

26. (2) $(x+y)^3=x^3+y^3+3(xy)(x+y)$

$\Rightarrow 125=35+3(5)xy$

$\Rightarrow 15xy=125-35=90$

$\Rightarrow xy=\frac{90}{15}=6$

$\Rightarrow \frac{x+y}{xy}=\frac{1}{y}+\frac{1}{x}=\frac{5}{6}$

27. (2) $a^3-b^3=56$

$\Rightarrow (a-b)(a^2+ab+b^2)=56$

$\Rightarrow a^2+ab+b^2=28$

$\Rightarrow (a-b)^2+3ab=28$

$\Rightarrow 4+3ab=28$

$\Rightarrow 3ab=28-4=24$

$\Rightarrow ab=8$

$\therefore a^2+b^2=(a-b)^2+2ab$

$=4+16=20$

28. (2) $(a^2+b^2)^3=(a^3+b^3)^2$

$\Rightarrow a^6+b^6+3a^2b^2(a^2+b^2)=a^6+b^6+2a^3b^3$

$\Rightarrow 3(a^2+b^2)=2ab$

$\Rightarrow \frac{a^2+b^2}{ab}=\frac{2}{3}$

$\Rightarrow \frac{a}{b}+\frac{b}{a}=\frac{2}{3}$

29. (1) $x+\frac{1}{x}=5$

On squaring both sides,

$x^2+\frac{1}{x^2}+2=25$

$\Rightarrow x^2+\frac{1}{x^2}=25-2=23$ ...(i)

Expression

$=\frac{x^4+3x^3+5x^2+3x+1}{x^4+1}$

$=\frac{x^4+1+3x^3+3x+5x^2}{x^4+1}$

$=\frac{x^2\left(x^2+\frac{1}{x^2}\right)+3x^2\left(x+\frac{1}{x}\right)+5x^2}{x^2\left(x^2+\frac{1}{x^2}\right)}$

$=\frac{\left(x^2+\frac{1}{x^2}\right)+3\left(x+\frac{1}{x}\right)+5}{x^2+\frac{1}{x^2}}$

$=\frac{23+3\times5+5}{23}=\frac{43}{23}$

30. (2) $\left(x+\frac{1}{x}\right)^3$

$=x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)$

$=3\left(x+\frac{1}{x}\right)$

$\Rightarrow \left(x+\frac{1}{x}\right)^2=3$

$\therefore \left(x+\frac{1}{x}\right)^4=3\times3=9$

31. (3) $\left(x+\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}+2$

$\Rightarrow x^2+\frac{1}{x^2}=9-2=7$

Again,

$\left(x+\frac{1}{x}\right)^3=x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)$

$\Rightarrow 27=x^3+\frac{1}{x^3}+3\times3$

$\Rightarrow x^3+\frac{1}{x^3}=18$

$\therefore \left(x^2+\frac{1}{x^2}\right)\left(x^3+\frac{1}{x^3}\right)$

$=7\times18=126$

$\Rightarrow x^5+\left(x+\frac{1}{x}\right)+\frac{1}{x^5}=126$

$\Rightarrow x^5+\frac{1}{x^5}=126-3=123$

32. (2) $x-\frac{1}{x}=3$

On cubing both sides,

$\left(x-\frac{1}{x}\right)^3=27$

$\Rightarrow x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)=27$

$\Rightarrow x^3-\frac{1}{x^3}-3\times3=27$

$\Rightarrow x^3-\frac{1}{x^3}=27+9=36$

33. (1) $m^4+\frac{1}{m^4}=119$

$\Rightarrow \left(m^2+\frac{1}{m^2}\right)^2-2=119$

$\Rightarrow \left(m^2+\frac{1}{m^2}\right)^2=119+2=121$

$\Rightarrow m^2+\frac{1}{m^2}=11$

$\Rightarrow \left(m-\frac{1}{m}\right)^2+2=11$

$\Rightarrow \left(m-\frac{1}{m}\right)^2=11-2=9$

$\Rightarrow m-\frac{1}{m}=\pm3$

34. (4) $x+y+z=6$

$\Rightarrow x+y+z-6=0$

$\Rightarrow (x-1)+(y-2)+(z-3)=0$

If $a+b+c=0$, then $a^3+b^3+c^3=3abc$

$\therefore (x-1)^3+(y-2)^3+(z-3)^3=3(x-1)(y-2)(z-3)$

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35. (4) $x^2+1=2x$ (Given)

$\Rightarrow x+\frac{1}{x}=2$ ...(i)

Expression

$$=\frac{x^4+\frac{1}{x^2}}{x^2-3x+1}=\frac{\frac{x^6+1}{x^2}}{(x^2-3x+1)}$$

$$=\frac{x^6+1}{(x^2+1-3x).x^2}$$

$$=\frac{x^6+1}{(2x-3x)x^2}=\frac{x^6+1}{-x^3}$$

$$=-\left(\frac{x^6+1}{x^3}\right)=-\left(\frac{x^6}{x^3}+\frac{1}{x^3}\right)$$

$$=-\left(x^3+\frac{1}{x^3}\right)$$

$$=-\left[\left(x+\frac{1}{x}\right)^3-3\left(x+\frac{1}{x}\right)\right]$$

$=-[2^3-3\times 2]$

$=-2$

36. (3) $x=\sqrt{3}+\sqrt{2}$

$$\therefore \frac{1}{x}=\frac{1}{\sqrt{3}+\sqrt{2}}$$

$$=\frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$$

$=\sqrt{3}-\sqrt{2}$

$\therefore x-\frac{1}{x}=\sqrt{3}+\sqrt{2}-\sqrt{3}+\sqrt{2}$

$=2\sqrt{2}$

Cubing both sides,

$\Rightarrow \left(x-\frac{1}{x}\right)^3=16\sqrt{2}$

$x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)$,

$=16\sqrt{2}$

$\Rightarrow x^3-\frac{1}{x^3}-3\times 2\sqrt{2}=16\sqrt{2}$

$\Rightarrow x^3-\frac{1}{x^3}=16\sqrt{2}+6\sqrt{2}=22\sqrt{2}$

37. (3) $x^2+\frac{1}{x^2}=83$

$\Rightarrow \left(x-\frac{1}{x}\right)^2+2=83$

$\Rightarrow \left(x-\frac{1}{x}\right)^2=83-2=81=9^2$

$\Rightarrow x-\frac{1}{x}=9$

Cubing both sides,

$\left(x-\frac{1}{x}\right)^3=9^3=729$

$\Rightarrow x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)=729$

$\Rightarrow x^3-\frac{1}{x^3}-3\times 9=729$

$\Rightarrow x^3-\frac{1}{x^3}=729+27=756$

38. (4) $\left(a+\frac{1}{a}\right)^2=3=\left(\sqrt{3}\right)^2$

$\Rightarrow a+\frac{1}{a}=\sqrt{3}$

Cubing both sides,

$\left(a+\frac{1}{a}\right)^3=3\sqrt{3}$

$\Rightarrow a^3+\frac{1}{a^3}+3\left(a+\frac{1}{a}\right)=3\sqrt{3}$

$\Rightarrow a^3+\frac{1}{a^3}+3\sqrt{3}=3\sqrt{3}$

$\Rightarrow a^3+\frac{1}{a^3}=0$

39. (2) $\frac{x}{x^2-2x+1}=\frac{1}{3}$

$\Rightarrow \frac{x^2-2x+1}{x}=3$

$\Rightarrow x-2+\frac{1}{x}=3$

$\Rightarrow x+\frac{1}{x}=5$

On cubing both sides

$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=125$

$\Rightarrow x^3+\frac{1}{x^3}=125-3\times 5=110$

40. (2) $\left(x+\frac{1}{x}\right)=4$

On squaring both sides

$x^2+\frac{1}{x^2}+2=16$

$\Rightarrow x^2+\frac{1}{x^2}=14$

On squaring again

$x^4+\frac{1}{x^4}+2=196$

$\Rightarrow x^4+\frac{1}{x^4}=194$

41. (3) $x+y+z=6$

On squaring,

$x^2+y^2+z^2+2xy+2zy+2zx=36$

$\Rightarrow 20+2(xy+yz+zx)=36$

$\Rightarrow xy+yz+zx=8$

$\therefore x^3+y^3+z^3-3xyz$

$=(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$

$=6(20-8)$

$=72$

42. (2) $x=1-\sqrt{2}$

$$\therefore \frac{1}{x}=\frac{1}{1-\sqrt{2}}\times\frac{1+\sqrt{2}}{1+\sqrt{2}}$$

$=-1-\sqrt{2}$

$\therefore \left(x-\frac{1}{x}\right)^3$

$=(1-\sqrt{2}+1+\sqrt{2})^3$

$=2^3=8$

43. (2) $x+y+z=a-b+b-c+c-a=0$

$\therefore x^3+y^3+z^3-3xyz=0$

44. (4) $x=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$$=\frac{(\sqrt{3}-\sqrt{2})(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$$

$$=\frac{(\sqrt{3}-\sqrt{2})^2}{3-2}$$

$=3+2-2\sqrt{3}.\sqrt{2}$

$=5-2\sqrt{6}$

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$\therefore y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} = 5+2\sqrt{6}$

$\therefore x+y$

$= 5-2\sqrt{6}+5+2\sqrt{6} = 10$

$xy = (5-2\sqrt{6})(5+2\sqrt{6})$

$= 25-24 = 1$

$\therefore x^3+y^3 = (x+y)^3 - 3xy(x+y)$

$= (10)^3 - 3(10)$

$= 1000 - 30 = 970$

45. (4) $(x-a)^3 - \frac{1}{(x-a)^3}$

$= \left(x-a-\frac{1}{x-a}\right)^3 + 3\left(x-a-\frac{1}{x-a}\right)$

$= (x-a-x+b)^3 + 3(x-a-x+b)$

$= (b-a)^3 + 3(b-a)$

$= 5^3 + 3 \times 5 = 125 + 15 = 140$

46. (1) $a^2+b^2+c^2 = 2(a-b-c)-3$

$\Rightarrow a^2+b^2+c^2-2a+2b+2c+3 = 0$

$\Rightarrow a^2-2a+1+b^2+2b+1+c^2+2c+1 = 0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2 = 0$

$\therefore a-1 = 0 \Rightarrow a = 1$

$b+1 = 0 \Rightarrow b = -1$

$c+1 = 0 \Rightarrow c = -1$

$\therefore 4a-3b+5c = 4 \times 1 - 3 \times (-1) + 5(-1) = 4+3-5 = 2$

47. (3) $2x+\frac{2}{x} = 3 \Rightarrow x+\frac{1}{x} = \frac{3}{2}$

On cubing,

$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right) = \frac{27}{8}$

$\Rightarrow x^3+\frac{1}{x^3}+3 \times \frac{3}{2} = \frac{27}{8}$

$\Rightarrow x^3+\frac{1}{x^3} = \frac{27}{8}-\frac{9}{2}$

$= \frac{27-36}{8} = -\frac{9}{8}$

$\therefore x^3+\frac{1}{x^3}+2 = 2-\frac{9}{8} = \frac{7}{8}$

48. (2) $a+b+c = 15$

$\therefore (a+b+c)^2 = 225$

$\therefore a^2+b^2+c^2+2(ab+bc+ca) = 225$

$\Rightarrow 2(ab+bc+ca) = 225-83 = 142$

$\Rightarrow ab+bc+ca = 142+2 = 71$

$\therefore a^3+b^3+c^3-3abc$

$= (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

$= 15(83-71) = 15 \times 12 = 180$

49. (3) $a-b = 3$

$a^3-b^3 = 117$

$a^3-b^3 = (a-b)^3+3ab(a-b)$

$\Rightarrow 117 = 27+3ab(3)$

$\Rightarrow 9ab = 117-27 = 90$

$\Rightarrow ab = 10$

$\therefore (a+b)^2 = (a-b)^2+4ab$

$= 9+40 = 49$

$\therefore |a+b| = 7$

50. (2) $x+\frac{1}{x+1} = 1$

$\Rightarrow (x+1)+\frac{1}{x+1} = 2$

On squaring,

$(x+1)^2+\frac{1}{(x+1)^2}+2 = 4$

$\Rightarrow (x+1)^2+\frac{1}{(x+1)^2} = 2 \ldots(i)$

Again, cubing $(x+1)+\frac{1}{(x+1)} = 2$,

$(x+1)^3+\frac{1}{(x+1)^3} + 3\left((x+1)+\frac{1}{(x+1)}\right) = 8$

$\Rightarrow (x+1)^3+\frac{1}{(x+1)^3}$

$= 8-3 \times 2 = 2$

$\therefore \left((x+1)^2+\frac{1}{(x+1)^2}\right)\left((x+1)^3+\frac{1}{(x+1)^3}\right)$

$= 2 \times 2 = 4$

$\Rightarrow (x+1)^5+\frac{1}{(x+1)}+\frac{1}{(x+1)^5}+(x+1) = 4$

$\therefore (x+1)^5+\frac{1}{(x+1)^5}$

$= 4-2 = 2$

51. (1) $\frac{1}{a}-\frac{1}{b} = \frac{1}{a-b}$

$\Rightarrow \frac{b-a}{ab} = \frac{1}{a-b}$

$\Rightarrow (a-b)(a-b) = -ab$

$\Rightarrow a^2-2ab+b^2 = -ab$

$\Rightarrow a^2-ab+b^2 = 0$

$\therefore a^3+b^3 = (a+b)(a^2-ab+b) = 0$

52. (4) $a^3+b^3+c^3-3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

If $a+b+c = 0$, then

$a^3+b^3+c^3 = 3abc$

53. (3) If $a+b+c = 0$

then $a^3+b^3+c = 3abc$

$\therefore$ When $a-b-c = 0$,

$a^3-b^3-c^3 = 3abc$

i.e., $a^3-b^3-c^3-3abc = 0$

Here,

$a = 4.965$, $b = 2.343$,

$c = 2.6222$

$\therefore a-b-c = 4.965-2.343-2.622 = 0$

Hence, $a^3-b^3-c^3-3abc = 0$

54. (1) Here, $a+b+c$

$= 1.21+2.12-3.33 = 0$

$a^3+b^3+c^3-3abc = 0$

$(\because a+b+c = 0)$

55. (1) $P = 999$ (Given)

Now, $\sqrt[3]{P(P^2+3P+3)+1}$

$\sqrt[3]{P^3+3P^2+3P+1}$

$= \sqrt[3]{(P+1)^3} = P+1$

$= 999+1 = 1000$

56. (3) Here, $a-b-c$

$= 4.36-2.39-1.97 = 0$

$\therefore a^3-b^3-c^3 = 3abc$

$\Rightarrow a^3-b^3-c^3-3abc = 0$

57. (4) $\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)\left(x^2+\frac{1}{x^2}-1\right)\left(x^2+\frac{1}{x^2}+1\right)$

$= \left(x^2-\frac{1}{x^2}\right)\left[\left(x^2+\frac{1}{x^2}\right)^2-1\right]$

$= \left(x^2-\frac{1}{x^2}\right)\left(x^4+\frac{1}{x^4}+1\right)$

$= x^6-\frac{1}{x^6}$

58. (1) $\frac{a^2+b^2+ab}{a^3-b^3}$

$= \frac{a^2+b^2+ab}{(a-b)(a^2+b^2+ab)}$

$= \frac{1}{a-b}$

$= \frac{1}{11-9} = \frac{1}{2}$

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59. (4) $a = \sqrt{7+2\times\sqrt{4}\times\sqrt{3}}$

$= \sqrt{4+3+2\times2\times\sqrt{3}}$

$= \sqrt{(2+\sqrt{3})^2} = 2+\sqrt{3}$

$\therefore\ b = \sqrt{7-2\sqrt{12}} = 2-\sqrt{3}$

$\Rightarrow a+b = 2+\sqrt{3}+2-\sqrt{3} = 4$

$ab = (2+\sqrt{3})(2-\sqrt{3}) = 1$

$\therefore a^3+b^3 = (a+b)^3 - 3ab(a+b)$

$= 64 - 3\times4 = 52$

60. (3) According to question,

$\frac{a}{b}+\frac{b}{a} = 1$

$\Rightarrow a^2+b^2 = ab$

$\Rightarrow a^2-ab+b^2 = 0$

$\therefore a^3+b^3$

$= (a+b)(a^2-ab+b^2) = 0$

61. (3) $x = 2 - 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$

$\Rightarrow x-2 = 2^{\frac{2}{3}} - 2^{\frac{1}{3}}$

On cubing both sides,

$x^3 - 3x^2\times2 + 3x\times4 - 8$

$= \left(2^{\frac{2}{3}}\right)^3 - \left(2^{\frac{1}{3}}\right)^3$

$- 3.2^{\frac{2}{3}}.2^{\frac{1}{3}}\left(2^{\frac{2}{3}} - 2^{\frac{1}{3}}\right)$

$\Rightarrow x^3 - 6x^2 + 12x - 8$

$= 4 - 2 - 6(x-2)$

$\Rightarrow x^3 - 6x^2 + 12x - 8$

$= 2 - 6x + 12$

$\Rightarrow x^3 - 6x^2 + 18x + 18$

$= 2 + 12 + 8 + 18 = 40$

62. (4) $a^3+b^3+c^3-3abc = 0$

If $a+b+c = 0$

$a^3 - b^3 - c^3 - 3abc = 0$

$\Rightarrow a-b-c = 0$

$\Rightarrow a = b+c$

63. (2) Here, $p-q+q-r+r-p = 0$

$\therefore\ (p-q)^3+(q-r)^3+(r-p)^3$

$= 3(p-q)(q-r)(r-p)$

[Formula : If $a+b+c = 0$, then $a^3+b^3+c^3 = 3abc$]

64. (2) $a+b+(-c) = 2.361 + 3.263 - 5.624 = 0$

$\therefore a^3+b^3+(-c)^3 - 3ab(-c) = 0$

i.e. $a^3+b^3-c^3+3abc = 0$

65. (2) $(a+b+c)^2$

$= a^2+b^2+c^2+2(ab+bc+ca)$

$\Rightarrow 36 = 14 + 2(ab+bc+ca)$

$\Rightarrow ab+bc+ca = (36-14)+2$

$\Rightarrow ab+bc+ca = 11$ .....(i)

$\therefore\ a^3+b^3+c^3-3abc$

$= (a+b+c)$

$(a^2+b^2+c^2-ab-bc-ca)$

$\Rightarrow 36 - 3abc = 6(14-11)$ [By (i)]

$\Rightarrow 36 - 3abc = 84 - 66 = 18$

$\Rightarrow 3abc = 36 - 18 = 18$

$\Rightarrow abc = 6$

66. (1) $a+b = 1$

Cubing both sides,

$(a+b)^3 = 1$

$\Rightarrow a^3+b^3+3ab(a+b) = 1$

$\Rightarrow a^3+b^3+3ab = 1 = k$

$\Rightarrow k = 1$

67. (4) $a^3+b^3+c^3-3abc$

$= \frac{1}{2}(a+b+c)[(a-b)^2+(b-c)^2+(c-a)^2]$

$= \frac{1}{2}\times100(1+0+1) = 100$

68. (3) $x^3+y^3+z^3-3xyz$

$= \frac{1}{2}(x+y+z)$

$\left[(x-y)^2+(y-z)^2+(z-x)^2\right]$

$= \frac{1}{2}(333+333+334)(0+1+1)$

$= 1000$

69. (1) $a^2-b^2+b^2-c^2+c^2-a^2 = 0$

$\therefore (a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3$

$= 3(a^2-b^2)(b^2-c^2)(c^2-a^2)$

[If $x+y+z = 0$, $x^3+y^3+z^3 = 3xyz$]

$= 3(a+b)(a-b)(b+c)(b-c)(c+a)(c-a)$

70. (2) $a = \frac{b^2}{b-a} \Rightarrow ab-a^2 = b^2$

$\Rightarrow a^2+b^2-ab = 0$

$\therefore a^3+b^3 = (a+b)(a^2+b^2-ab)$

$= (a+b)\times0 = 0$

71. (4) Expression $= p(p^2+3p+3)$

$= (p^3+3p^2+3p+1)-1$

$= (p+1)^3-1 = (99+1)^3-1$

$= (100)^3-1 = 1000000-1$

$= 999999$

72. (1) Expression

$= \sqrt[3]{p\left(p^2-3p+3\right)-1}$

$= \sqrt[3]{p^3-3p^2+3p-1}$

$\sqrt[3]{(p-1)^3} = p-1 = 101-1 = 100$

73. (4) Expression

$= \sqrt[3]{p\left(p^2+3p+3\right)+1}$

$= \sqrt[3]{p^3+3p^2+3p+1}$

$= \left[(p+1)^3\right]^{\frac{1}{3}} = (p+1)^{3\times\frac{1}{3}}$

$= p+1$

When $p = 124$,

$p+1 = 124+1 = 125$

74. (2) $p-2q = 4$

On cubing both sides,

$(p-2q)^3 = 64$

$\Rightarrow p^3 - 8q^3 + 3p.4q^2 - 3p^2.2q = 64$

$\Rightarrow p^3 - 8q^3 + 12pq^2 - 6p^2q = 64$

$\Rightarrow p^3 - 8q^3 - 6pq(p-2q) = 64$

$\Rightarrow p^3 - 8q^3 - 6pq\times4 = 64$

$\Rightarrow p^3 - 8q^3 - 24pq - 64 = 0$

75. (1) Expression $= \frac{x^2+y^2+xy}{x^3-y^3}$

$= \frac{x^2+y^2+xy}{(x-y)(x^2+y^2+xy)} = \frac{1}{x-y}$

$= \frac{1}{19-18} = 1$

76. (3) $x+\frac{1}{x} = 2$

$\Rightarrow x^2-2x+1 = 0$

$\Rightarrow (x-1)^2 = 0 \Rightarrow x = 1$

$\therefore\ x^{17}+\frac{1}{x^{19}} = 1+1 = 2$

77. (2) If $x = y = z = 1$, then

Expression

$= (3)^3-(1)^3-(1)^3-(1)^3$

$= 27-3 = 24 = 24\,xyz$

78. (3) $\frac{1}{x^{99}} = \frac{1}{(-1)^{99}} = -1$

$\frac{1}{x^{98}} = \frac{1}{(-1)^{98}} = 1$ and so on.

$\therefore$ Expression $= -1+1-1+1-1+1-1-1 = -2$

79. (1) $\frac{1}{\sqrt[3]{4}+\sqrt[3]{2}+1}$

$= a\sqrt[3]{4}+b\sqrt[3]{2}+c$

$\Rightarrow \frac{1}{2^{\frac{2}{3}}+2^{\frac{1}{3}}+1}$

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$= a.2^{\frac{2}{3}} + b.2^{\frac{1}{3}} + c$

$\Rightarrow \frac{\left(2^{\frac{1}{3}}-1\right)}{\left(2^{\frac{1}{3}}-1\right)\left(2^{\frac{2}{3}}+2^{\frac{1}{3}}+1\right)}$

$= a.2^{\frac{2}{3}} + b.2^{\frac{1}{3}} + c$

$\Rightarrow \frac{2^{\frac{1}{3}}-1}{2-1} = a.2^{\frac{2}{3}} + b.2^{\frac{1}{3}} + c$

$\left[\because (a-b)(a^2+ab+b^2) = a^3-b^3\right]$

$\Rightarrow a = 0,\ b = 1,\ c = -1$

$\therefore a + b + c = 0 + 1 - 1 = 0$

80. (4) $x = \sqrt[3]{2+\sqrt{3}}$

$\Rightarrow x^3 = 2+\sqrt{3}$

$\frac{1}{x^3} = \frac{1}{2+\sqrt{3}}$

$= \frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}}$

$= \frac{2-\sqrt{3}}{4-3} = 2-\sqrt{3}$

$\therefore x^3 + \frac{1}{x^3} = 2+\sqrt{3}+2-\sqrt{3} = 4$

81. (4) $x = \sqrt[3]{5}+2$

$\Rightarrow x-2 = \sqrt[3]{5}$

On cubing,

$x^3 - 3x^2 \times 2 + 3x.(-2)^2 - 2^3 = 5$

$\Rightarrow x^3 - 6x^2 + 12x - 8 = 5$

$\Rightarrow x^3 - 6x^2 + 12x - 13 = 0$

82. (3) $x^3 - x^2y - xy^2 + y^3$

$= x^3 + y^3 - x^2y - xy^2$

$= (x+y)^3 - 3xy(x+y) - xy(x+y)$

$= (x+y)^3 - 4xy(x+y) = a^3 - 4b^2a$

83. (2) Expression $= \frac{x^4 - \frac{1}{x^2}}{3x^2+5x-3}$

Dividing numerator and denominator by x,

$= \frac{x^3 - \frac{1}{x^3}}{3x+5-\frac{3}{x}} = \frac{x^3 - \frac{1}{x^3}}{3\left(x-\frac{1}{x}\right)+5}$

$= \frac{\left(x-\frac{1}{x}\right)^3 + 3\left(x-\frac{1}{x}\right)}{3\left(x-\frac{1}{x}\right)+5}$

$= \frac{1+3}{3+5} = \frac{4}{8} = \frac{1}{2}$

84. (4) $x + y = 15$

$\Rightarrow (x-10) + (y-5) = 0$

$\therefore (x-10)^3 + (y-5)^3$

$= (x-10+y-5)^3 - 3(x-10)(y-5)(x-10+y-5) = 0$

$[a^3+b^3 = (a+b)^3 - 3ab(a+b)]$

85. (2) $x^2 + \frac{1}{x^2} = 66$

$\Rightarrow \left(x-\frac{1}{x}\right)^2 + 2 = 66$

$\Rightarrow \left(x-\frac{1}{x}\right)^2 = 66 - 2 = 64$

$\Rightarrow x - \frac{1}{x} = \pm 8$

$\therefore$ Expression $= \frac{x^2-1+2x}{x}$

$= \frac{x^2}{x} - \frac{1}{x} + 2 = x - \frac{1}{x} + 2$

Putting the value of $x - \frac{1}{x}$

$= 8 + 2$ or $-8 + 2 = 10$ or -6

86. (3) $a^2 + a + 1 = 0$

$\Rightarrow (a-1)(a^2+a+1) = 0$

$\Rightarrow a^3 - 1 = 0$

$\Rightarrow a^3 = 1 \Rightarrow a = 1$

$\therefore a^9 = 1$

87. (1) Given, $x + \frac{2}{x} = 1$

Expression

$= \frac{x^2+x+2}{x^2(1-x)} = \frac{x+1+\frac{2}{x}}{x(1-x)}$

(Dividing numerator and denominator by x)

$= \frac{x+\frac{2}{x}+1}{x(1-x)} = \frac{1+1}{x \times \frac{2}{x}} = \frac{2}{2} = 1$

88. (2) $x = k^3 - 3k^2$

$y = 1 - 3k$

When $x = y$, then

$k^3 - 3k^2 = 1 - 3k$

$\Rightarrow k^3 - 3k^2 + 3k - 1 = 0$

$\Rightarrow (k-1)^3 = 0 \Rightarrow k - 1 = 0$

$\Rightarrow k = 1$

89. (3) Expression

$= \frac{\sqrt{(x^2+y^2+z)(x+y-3z)}}{\sqrt[3]{xy^3z^2}}$

Putting $x = 1,\ y = -3,\ z = -1$

$= \frac{\sqrt{(1+9-1)(1-3+3)}}{\sqrt[3]{1 \times -27 \times 1}}$

$= \frac{3}{-3} = -1$

Note : Original question is :

$\sqrt{(x^2+y^2+z)(x-y-3z)} \div \sqrt[3]{xy^3z^2}$

which gives answer $= -\sqrt{7}$ which is not in options.

90. (2) Expression

$= \frac{p^2-p}{2p^3+6p^2} + \frac{p^2-1}{p^2+3p} + \frac{p^2}{p+1}$

$= \frac{p(p-1)}{2p^2(p+3)} + \frac{(p+1)(p-1)}{p(p+3)} + \frac{p^2}{p+1}$

$= \frac{p(p-1)}{2p^2(p+3)} \times \frac{p(p+3)}{(p+1)(p-1)} \times \frac{(p+1)}{p^2}$

$= \frac{1}{2p^2}$

91. (2) $x + \frac{1}{x} = 2$

On squaring both sides,

$x^2 + \frac{1}{x^2} + 2 = 4$

$\Rightarrow x^2 + \frac{1}{x^2} = 4 - 2 = 2$

Again, $x + \frac{1}{x} = 2$

On cubing both sides,

$\left(x+\frac{1}{x}\right)^3 = 8$

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$\Rightarrow x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=8$

$\Rightarrow x^3+\frac{1}{x^3}+3\times 2=8$

$\Rightarrow x^3+\frac{1}{x^3}=8-6=2$

$\therefore \left(x^2+\frac{1}{x^2}\right)\left(x^3+\frac{1}{x^3}\right)$

$=2\times 2=4$

92. (3) $a^3+b^3+c^3-3abc$ will be minimum if $a=b=1$, $c=2$

$\therefore$ Least value $=1+1+8-3\times 1\times 1\times 2=10-6=4$

93. (4) By remainder theorem,

Remainder $=f\left(-\frac{2}{3}\right)$

$\because f(x)=12x^3-13x^2-5x+7$

$\therefore f\left(-\frac{2}{3}\right)=12\left(\frac{-2}{3}\right)^3-13\left(\frac{-2}{3}\right)^2-5\left(\frac{-2}{3}\right)+7$

$=-\frac{12\times 8}{27}-\frac{13\times 4}{9}+\frac{10}{3}+7$

$=-\frac{32}{9}-\frac{52}{9}+\frac{10}{3}+7$

$=\frac{-32-52+30+63}{9}=\frac{9}{9}=1$

Second Method

$3x+2)12x^3-13x^2-5x+7(4x^2-7x+3$

$\underline{\pm 12x^3\pm 8x^2}$

$-21x^2-5x$

$\underline{\mp 21x^2\mp 14x}$

$9x+7$

$\underline{\pm 9x\pm 6}$

1

94. (3) $ab+bc+ca=0$

$\Rightarrow ab+ca=-bc$

$\therefore a^2-bc=a^2+ab+ca$

$=a(a+b+c)$

Similarly,

$b^2-ac=b(a+b+c)$

$c^2-ab=c(a+b+c)$

$\therefore \frac{1}{a^2-bc}+\frac{1}{b^2-ac}+\frac{1}{c^2-ab}$

$=\frac{1}{a(a+b+c)}+\frac{1}{b(a+b+c)}+\frac{1}{c(a+b+c)}$

$=\frac{bc+ac+ab}{abc(a+b+c)}=0$

95. (2) $2x^2-7x+12=0$

$\therefore \alpha+\beta=\frac{7}{2}$

$\alpha\beta=\frac{12}{2}=6$

[In equation $ax^2+bx+c=0$,

$\alpha+\beta=\frac{-b}{a}$, $\alpha\beta=\frac{c}{a}$]

$\therefore \frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{\alpha^2+\beta^2}{\alpha\beta}$

$=\frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}$

$=\frac{\left(\frac{7}{2}\right)^2-2\times 6}{6}$

$=\frac{\frac{49}{4}-12}{6}$

$=\frac{49-48}{4\times 6}=\frac{1}{24}$

96. (3) $x^3+\frac{3}{x}=4(a^3+b^3)$

$3x+\frac{1}{x^3}=4(a^3-b^3)$

On adding,

$x^3+3x+\frac{3}{x}+\frac{1}{x^3}=8a^3$

$\Rightarrow \left(x+\frac{1}{x}\right)^3=(2a)^3$

$\Rightarrow x+\frac{1}{x}=2a\Rightarrow a=\frac{1}{2}\left(x+\frac{1}{x}\right)$

Similarly,

$x^3+\frac{3}{x}-3x-\frac{1}{x^3}=8b^3$

$\Rightarrow \left(x-\frac{1}{x}\right)^3=(2b)^3$

$\Rightarrow b=\frac{1}{2}\left(x-\frac{1}{x}\right)$

$\therefore a^2-b^2$

$=\frac{1}{4}\left[\left(x+\frac{1}{x}\right)^2-\left(x-\frac{1}{x}\right)^2\right]$

$=\frac{1}{4}\times 4=1$

97. (2) $x=6+\frac{1}{x}$

$\Rightarrow x-\frac{1}{x}=6$

On squaring both sides,

$\Rightarrow x^2+\frac{1}{x^2}-2=36$

$\Rightarrow x^2+\frac{1}{x^2}=36+2=38$

On squaring again,

$x^4+\frac{1}{x^4}+2=1444$

$\Rightarrow x^4+\frac{1}{x^4}=1444-2=1442$

98. (1) $x+\frac{1}{x}=5$

On cubing both sides,

$\left(x+\frac{1}{x}\right)^3=5^3$

$\Rightarrow x^3+\frac{1}{x^3}+3x.\frac{1}{x}\left(x+\frac{1}{x}\right)=125$

$\Rightarrow x^3+\frac{1}{x^3}+3\times 5=125$

$\Rightarrow x^3+\frac{1}{x^3}=125-15=110$

On squaring both sides,

$x^6+\frac{1}{x^6}+2.x^3.\frac{1}{x^3}=12100$

$\Rightarrow x^6+\frac{1}{x^6}=12100-2=12098$

99. (3) $x^2-3x+1=0$

$\Rightarrow x^2+1=3x$

$\Rightarrow \frac{x^2+1}{x}=3$

$\Rightarrow x+\frac{1}{x}=3$ ..... (i)

$\therefore \frac{x^6+x^4+x^2+1}{x^3}$

$=\frac{x^6}{x^3}+\frac{x^4}{x^3}+\frac{x^2}{x^3}+\frac{1}{x^3}$

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$= x^3 + x + \frac{1}{x} + \frac{1}{x^3}$

$= \left(x^3 + \frac{1}{x^3}\right) + \left(x + \frac{1}{x}\right)$

$= \left(x + \frac{1}{x}\right)^3 - 3.x.\frac{1}{x}\left(x + \frac{1}{x}\right) + \left(x + \frac{1}{x}\right)$

$= 3^3 - 3 \times 3 + 3 = 27 - 9 + 3 = 21$

100. (3) $x^4 + \frac{1}{x^4} = 119$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2 = 119$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 119 + 2 = 121$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 11^2$

$\Rightarrow x^2 + \frac{1}{x^2} = 11$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = 11$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 = 11 - 2 = 9 = 3^2$

$\Rightarrow x - \frac{1}{x} = 3$

On cubing both sides,

$\left(x - \frac{1}{x}\right)^3 = 3^3$

$\Rightarrow x^3 - \frac{1}{x^3} - 3x.\frac{1}{x}\left(x - \frac{1}{x}\right) = 27$

$\Rightarrow x^3 - \frac{1}{x^3} - 3 \times 3 = 27$

$\Rightarrow x^3 - \frac{1}{x^3} = 27 + 9 = 36$

101. (3) Let $\frac{p}{a} = x$, $\frac{q}{b} = y$, $\frac{r}{c} = z$

$\therefore x + y + z = 1$

and $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$

$\Rightarrow \frac{yz + xz + xy}{xyz} = 0$

$\Rightarrow xy + yz + zx = 0$

$\therefore x + y + z = 1$

On squaring both sides

$x^2 + y^2 + z^2 + 2xy + 2yz + 2zx = 1$

$\Rightarrow x^2 + y^2 + z^2 + 0 = 1$

$\Rightarrow x^2 + y^2 + z^2 = 1$

102. (2) $\frac{(x+1)^3 - (x-1)^3}{(x+1)^2 - (x-1)^2} = 2$

$\Rightarrow \frac{(x^3 + 3x^2 + 3x + 1) - (x^3 - 3x^2 + 3x - 1)}{(x^2 + 2x + 1) - (x^2 - 2x + 1)} = 2$

$\Rightarrow \frac{x^3 + 3x^2 + 3x + 1 - x^3 + 3x^2 - 3x + 1}{x^2 + 2x + 1 - x^2 + 2x - 1} = 2$

$\Rightarrow \frac{6x^2 + 2}{4x} = 2$

$\Rightarrow \frac{3x^2 + 1}{4x} = 1 \Rightarrow 3x^2 + 1 = 4x$

$\Rightarrow 3x^2 - 4x + 1 = 0$

$\Rightarrow 3x^2 - 3x - x + 1 = 0$

$\Rightarrow 3x(x-1) - 1(x-1) = 0$

$\Rightarrow (3x-1)(x-1) = 0$

$\Rightarrow 3x - 1 = 0$, or, $x - 1 = 0$

$\Rightarrow x = \frac{1}{3}$ or 1

Hence, sum of the numerator and denominator = 1 + 3 = 4
or, 1 + 1 = 2

103. (3) Expression $= \frac{2x^2 - 3x - 2}{3x^2 - 4x - 3}$

$= \frac{2(\sqrt{5}+2)^2 - 3(\sqrt{5}+2) - 2}{3(\sqrt{5}+2)^2 - 4(\sqrt{5}+2) - 3}$

$= \frac{2(5 + 4 + 4\sqrt{5}) - 3(\sqrt{5}+2) - 2}{3(5 + 4 + 4\sqrt{5}) - 4(\sqrt{5}+2) - 3}$

$= \frac{18 + 8\sqrt{5} - 3\sqrt{5} - 6 - 2}{27 + 12\sqrt{5} - 4\sqrt{5} - 8 - 3}$

$= \frac{10 + 5\sqrt{5}}{16 + 8\sqrt{5}} = \frac{5(2+\sqrt{5})}{8(2+\sqrt{5})} = \frac{5}{8}$

$= 0.625$

104. (2) $a = 2.234$, $b = 3.121$ and $c = -5.355$

$a + b + c = 2.234 + 3.121 - 5.355 = 0$

$\therefore a^3 + b^3 + c^3 - 3abc = 0$

105. (4) $x^2 + y^2 + 1 = 2x$

$\Rightarrow x^2 + y^2 + 1 - 2x = 0$

$\Rightarrow x^2 - 2x + 1 + y^2 = 0$

$\Rightarrow (x-1)^2 + y^2 = 0$

$\Rightarrow x - 1 = 0$

$\Rightarrow x = 1$ and $y = 0$

$\therefore x^3 + y^5 = 1 + 0 = 1$

106. (1) $3(a^2 + b^2 + c^2) = (a + b + c)^2$

$\Rightarrow 3a^2 + 3b^2 + 3c^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$

$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$

$\Rightarrow (a-b)^2 + (b-c)^2 + (c-a)^2 = 0$

$\Rightarrow a - b = 0 \Rightarrow a = b$

[If $x^2 + y^2 + z^2 = 0$, $x = 0$, $y = 0$, $z = 0$]

$b - c = 0 \Rightarrow b = c$

$c - a = 0 \Rightarrow c = a$

$\therefore a = b = c$

107. (1) $x(x-3) = -1$

$\Rightarrow x^2 - 3x = -1$

$\Rightarrow x^2 - 3x + 1 = 0$

Expression $= x^3(x^3 - 18)$

$= x^6 - 18x^3$

On dividing $x^6 - 18x^3$ by $x^2 - 3x + 1$

$$
\begin{array}{l}
x^2 - 3x + 1 \;\big)\; x^6 - 18x^3 \;\big(\; x^4 + 3x^3 + 8x^2 + 3x \\
\quad \underline{-x^6 \mp 3x^5 \pm x^4} \\
\quad\quad 3x^5 - x^4 - 18x^3 \\
\quad\quad \underline{3x^5 \mp 9x^4 \pm 3x^3} \\
\quad\quad\quad 8x^4 - 21x^3 \\
\quad\quad\quad \underline{8x^4 \mp 24x^3 + 8x^2} \\
\quad\quad\quad\quad 3x^3 - 8x^2 \\
\quad\quad\quad\quad \underline{3x^3 \mp 9x^2 \pm 3x} \\
\quad\quad\quad\quad\quad x^2 - 3x
\end{array}
$$

$\therefore x^6 - 18x^3 = (x^4 + 3x^3 + 8x^2 + 3x)(x^2 - 3x + 1) + x^2 - 3x$

$= 0 + x(x-3) = -1$

108. (2) $a^2 + b^2 + c^2 = ab + bc + ca$

$\Rightarrow a^2 + b^2 + c^2 - ab - bc - ca = 0$

On multiplying by 2,

$2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$

$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ac = 0$

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$\Rightarrow (a-b)^2+(b-c)^2+(c-a)^2=0 \Rightarrow$
$a-b=0$
$\Rightarrow a=b$
$b-c=0 \Rightarrow b=c$
$c-a=0 \Rightarrow c=a$
$\therefore \frac{a+c}{b}=\frac{2a}{a}=2$

109. (1) $ab+bc+ca=0$
$\Rightarrow ab+ca=-bc$
$\therefore a^2-bc=a^2+ab+ac$
$=a(a+b+c)$
Similarly,
$b^2-ac=b(a+b+c)$
$c^2-ab=c(a+b+c)$

$$\therefore \frac{1}{a^2-bc}+\frac{1}{b^2-ca}+\frac{1}{c^2-ab}$$

$$=\frac{1}{a(a+b+c)}+\frac{1}{b(a+b+c)}+\frac{1}{c(a+b+c)}$$

$$=\frac{1}{(a+b+c)}\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$$

$$=\frac{1}{a+b+c}\left(\frac{bc+ca+ab}{abc}\right)$$

$$=\frac{1}{a+b+c}\times\frac{0}{abc}=0$$

110. (2) $3x+\frac{3}{x}=1$

$$\Rightarrow x+\frac{1}{x}=\frac{1}{3}$$

On cubing both sides,

$$x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)=\frac{1}{27}$$

$$\Rightarrow x^3+\frac{1}{x^3}+3\times\frac{1}{3}=\frac{1}{27}$$

$$\Rightarrow x^3+\frac{1}{x^3}+1=\frac{1}{27}$$

111. (1) $a^2+4b^2+4b-4ab-2a-8$
$=a^2+4b^2-4ab-2a+4b-8$
$=(a-2b)^2-2(a-2b)-8$
Let $(a-2b)=x$
$\therefore$ Expression $=x^2-2x-8$
$=x^2-4x+2x-8$
$=x(x-4)+2(x-4)$
$=(x-4)(x+2)$
$=(a-2b-4)(a-2b+2)$

112. (4) $\frac{1}{a^2+ax+x^2}-\frac{1}{a^2-ax+x^2}+\frac{2ax}{a^4+a^2x^2+x^4}$

$$=\frac{a^2-ax+x^2-a^2-ax-x^2}{(a^2+ax+x^2)(a^2-ax+x^2)}+\frac{2ax}{a^4+a^2x^2+x^4}$$

$$=\frac{-2ax}{a^4+a^2x^2+x^4}+\frac{2ax}{a^4+a^2x^2+x^4}=0$$

113. (2) $x=11$ (Given)
$\therefore x^5-12x^4+12x^3-12x^2+12x-1$
$=x^5-(11+1)x^4+(11+1)x^3-(11+1)x^2+(11+1)x-1$
$=x^5-11x^4-x^4+11x^3+x^3-11x^2-x^2+11x+x-1$
When $x=11$,
$=11^5-11^5-11^4+11^4+11^3-11^3-11^2+11^2+11-1=10$

114. (3) $p=99$ (Given)
$\therefore p(p^2+3p+3)=p^3+3p^2+3p$
$=p^3+3p^2+3p+1-1$
$=(p+1)^3-1=(99+1)^3-1$
$=(100)^3-1=999999$

115. (3) According to equality relation $(x+2)^2=x^2+4x+4$ is not an identity

116. (4) Expression

$$=\frac{(a-b)^2}{(b-c)(c-a)}+\frac{(b-c)^2}{(c-a)(a-b)}+\frac{(c-a)^2}{(a-b)(b-c)}$$

$$=\frac{(a-b)^3+(b-c)^3+(c-a)^3}{(a-b)(b-c)(c-a)}$$

$$=\frac{3(a-b)(b-c)(c-a)}{(a-b)(b-c)(c-a)}=3$$

[Here, $a-b+b-c+c-a=0$. If $x+y+z=0$, $x^3+y^3+z^3=3xyz$]

117. (1) $\left(a+\frac{1}{a}\right)^2=3$

$$\Rightarrow a+\frac{1}{a}=\sqrt{3}$$

On cubing both sides,

$$\left(a+\frac{1}{a}\right)^3=\left(\sqrt{3}\right)^3$$

$$\Rightarrow a^3+\frac{1}{a^3}+3\left(a+\frac{1}{a}\right)=3\sqrt{3}$$

$$\Rightarrow a^3+\frac{1}{a^3}+3\sqrt{3}=3\sqrt{3}$$

$$\Rightarrow a^3+\frac{1}{a^3}=3\sqrt{3}-3\sqrt{3}=0$$

118. (1) $a+\frac{1}{a}=\sqrt{3}$

On squaring both sides.

$$a^2+\frac{1}{a^2}+2=3$$

$$\Rightarrow a^2+\frac{1}{a^2}=3-2=1$$

On cubing both sides,

$$\left(a^2+\frac{1}{a^2}\right)^3=1^3$$

$$\Rightarrow a^6+\frac{1}{a^6}+3\left(a^2+\frac{1}{a^2}\right)=1$$

$$\Rightarrow a^6+\frac{1}{a^6}=1-3=-2$$

$$\Rightarrow \frac{a^{12}+1}{a^6}=-2$$

$\Rightarrow a^6+2a^6+1=0$
$\Rightarrow (a^6+1)^2=0$
$\Rightarrow a^6+1=0$
$\therefore$ Expression
$=a^{18}+a^{12}+a^6+1$
$=a^{12}(a^6+1)+(a^6+1)=0$

119. (4) $x=997$
$y=998$
$z=999$
$\therefore x-y=997-998=-1$
$y-z=998-999=-1$
$z-x=999-997=2$
$\therefore x^2+y^2+z^2-xy-yz-zx$

$$=\frac{1}{2}(2x^2+2y^2+2z^2-2xy-2yz-2zx)$$

$$=\frac{1}{2}(x^2+y^2-2xy+y^2+z^2-2yz+x^2+z^2-2zx)$$

$$=\frac{1}{2}[(x-y)^2+(y-z)^2+(z-x)^2]$$

$$=\frac{1}{2}[(-1)^2+(-1)^2+(2)^2]$$

$$=\frac{1}{2}(1+1+4)=\frac{1}{2}\times 6=3$$

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120. (3) $x+\frac{1}{x}=3$ (Given)

Expression $=\frac{3x^2-4x+3}{x^2-x+1}$

$=\frac{(3x^2-3x+3)-x}{x^2-x+1}$

$=\frac{3(x^2-x+1)}{x^2-x+1}-\frac{x}{x^2-x+1}$

$=3-\frac{1}{x-1+\frac{1}{x}}$

$=3-\frac{1}{x+\frac{1}{x}-1}$

$=3-\frac{1}{3-1}=3-\frac{1}{2}$

$=\frac{6-1}{2}=\frac{5}{2}$

121. (4) Expression

$=\frac{x^6+x^4+x^2+1}{x^3}$

$=\frac{x^6}{x^3}+\frac{x^4}{x^3}+\frac{x^2}{x^3}+\frac{1}{x^3}$

$=x^3+x+\frac{1}{x}+\frac{1}{x^3}$

$=\left(x^3+\frac{1}{x^3}\right)+\left(x+\frac{1}{x}\right)$

$=\left(x+\frac{1}{x}\right)^3-3\left(x+\frac{1}{x}\right)+\left(x+\frac{1}{x}\right)$

$=\left(x+\frac{1}{x}\right)^3-2\left(x+\frac{1}{x}\right)$ —(i)

Now, $x=3+2\sqrt{2}$

$\therefore \frac{1}{x}=\frac{1}{3+2\sqrt{2}}$

$=\frac{1}{3+2\sqrt{2}}\times\frac{3-2\sqrt{2}}{3-2\sqrt{2}}=\frac{3-2\sqrt{2}}{9-8}$

$=3-2\sqrt{2}$

$\therefore x+\frac{1}{x}=3+2\sqrt{2}+3-2\sqrt{2}$

$=6$

$\therefore$ Expression $=(6)^3-2\times6$

$=216-12=204$

122. (3) $x=p+\frac{1}{p}$

$y=p-\frac{1}{p}$

$\therefore x+y=p+\frac{1}{p}+p-\frac{1}{p}=2p$

$x-y=p+\frac{1}{p}-p+\frac{1}{p}=\frac{2}{p}$

$\therefore x^4-2x^2y^2+y^4=(x^2-y^2)^2$

$=[(x+y)(x-y)]^2$

$=(2p\times\frac{2}{p})^2=4^2=16$

123. (3) $a+b+c=0$ (Given)

$\therefore a+b=-c$

$b+c=-a$

$c+a=-b$

$\therefore (a+b-c)^2+(b+c-a)^2+(c+a-b)^2$

$=(-c-c)^2+(-a-a)^2+(-b-b)^2$

$=(-2c)^2+(-2a)^2+(-2b)^2$

$=4c^2+4a^2+4b^2=4(c^2+a^2+b^2)$

124. (2) $p^3+3p^2+3p=7$

$\Rightarrow p^3+3p^2+3p+1=7+1=8$

$\Rightarrow (p+1)^3=(2)^3$

$\Rightarrow p+1=2\Rightarrow p=2-1=1$

$\therefore p^2+2p=1+2\times1=3$

125. (1) $x-y=2015-2014=1$

$y-z=2014-2013=1$

$z-x=2013-2015=-2$

$\therefore x^2+y^2+z^2-xy-yz-zx$

$=\frac{1}{2}(2x^2+2y^2+2z^2-2xy-2yz-2zx)$

$=\frac{1}{2}(x^2+y^2-2xy+y^2+z^2-2yz+z^2+x^2-2zx)$

$=\frac{1}{2}[(x-y)^2+(y-z)^2+(z-x)^2]$

$=\frac{1}{2}(1+1+4)=\frac{1}{2}\times6=3$

126. (1) Expression

$=\frac{(a+b)^3-(a-b)^3}{(a+b)^2+(a-b)^2}$

$=\frac{a^3+3a^2b+3ab^2+b^3-(a^3-3a^2b+3ab^2-b^3)}{a^2+b^2+2ab+a^2+b^2-2ab}$

$=\frac{a^3+3a^2b+3ab^2+b^3-a^3+3a^2b-3ab^2+b^3}{a^2+b^2+a^2+b^2}$

$=\frac{6a^2b+2b^3}{2(a^2+b^2)}=\frac{2b(3a^2+b^2)}{2(a^2+b^2)}$

$=\frac{b(b^2+b^2)}{\left(\frac{b^2}{3}+b^2\right)}=\frac{b\times2b^2}{\frac{4b^2}{3}}$

$=\left(\frac{3\times2}{4}\right)b=\frac{3b}{2}$

127. (1) $x+\frac{1}{x}=2\frac{1}{12}=\frac{25}{12}$

On squaring both sides,

$\left(x+\frac{1}{x}\right)^2=\left(\frac{25}{12}\right)^2$

$\Rightarrow x^2+\frac{1}{x^2}+2=\frac{625}{144}$

$\Rightarrow x^2+\frac{1}{x^2}=\frac{625}{144}-2$

$=\frac{625-288}{144}=\frac{337}{144}$

$\Rightarrow \left(x-\frac{1}{x}\right)^2+2=\frac{337}{144}$

$\Rightarrow \left(x-\frac{1}{x}\right)^2=\frac{337}{144}-2$

$=\frac{337-288}{144}=\frac{49}{144}$

$\Rightarrow x-\frac{1}{x}=\sqrt{\frac{49}{144}}=\frac{7}{12}$

$\therefore x^4-\frac{1}{x^4}=\left(x^2+\frac{1}{x^2}\right)\left(x^2-\frac{1}{x^2}\right)$

$=\left(x^2+\frac{1}{x^2}\right)\left(x+\frac{1}{x}\right)\left(x-\frac{1}{x}\right)$

$=\frac{337}{144}\times\frac{25}{12}\times\frac{7}{12}=\frac{58975}{20736}$

128. (3) Expression

$=\frac{4x^3-x}{(2x+1)(6x-3)}$

$=\frac{x(4x^2-1)}{(2x+1)\times3(2x-1)}$

$=\frac{x(2x+1)(2x-1)}{3(2x+1)(2x-1)}$

$=\frac{x}{3}=\frac{9999}{3}=3333$

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129. (2) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
$\Rightarrow 9 = 3(a^2 + b^2 - ab)$

$\Rightarrow a^2 + b^2 - ab = \frac{9}{3} = 3$

$\Rightarrow (a + b)^2 - 2ab - ab = 3$
$\Rightarrow 9 - 3ab = 3$
$\Rightarrow 3ab = 9 - 3 = 6$
$\Rightarrow ab = 2$

$\therefore \frac{1}{a} + \frac{1}{b} = \frac{a+b}{ab} = \frac{3}{2}$

130. (3) $t^2 - 4t + 1 = 0$
$\Rightarrow t^2 + 1 = 4t$

$\Rightarrow \frac{t^2+1}{t} = 4$

$\Rightarrow t + \frac{1}{t} = 4$

On cubing both sides,

$\left(t + \frac{1}{t}\right)^3 = 4^3$

$t^3 + \frac{1}{t^3} + 3\left(t + \frac{1}{t}\right) = 64$

$\Rightarrow t^3 + \frac{1}{t^3} + 3 \times 4 = 64$

$\Rightarrow t^3 + \frac{1}{t^3} = 64 - 12 = 52$

131. (4) $\sqrt[3]{a} + \sqrt[3]{b} - \sqrt[3]{c} = 0$

$\therefore a + b - c = -3(abc)^{\frac{1}{3}}$

On cubing both sides,
$(a + b - c)^3 = -27abc$
$\therefore (a + b - c)^3 + 27abc = 0$

132. (3) $27p^3 - \frac{1}{216} - \frac{9}{2}p^2 + \frac{1}{4}p$

$= (3p)^3 - \left(\frac{1}{6}\right)^3 - 3.(3p)^2.\left(\frac{1}{6}\right) + 3 \times 3p \times \frac{1}{6} \times \frac{1}{6}$

$= \left(3p - \frac{1}{6}\right)^3 = \left(3 \times \frac{5}{18} - \frac{1}{6}\right)^3$

$= \left(\frac{5}{6} - \frac{1}{6}\right)^3 = \left(\frac{4}{6}\right)^3$

$= \left(\frac{2}{3}\right)^3 = \frac{8}{27}$

133. (4) $x + \frac{1}{x} = 2$

$\Rightarrow x^2 + 1 = 2x$
$\Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x - 1)^2 = 0 \Rightarrow x = 1$

$\therefore x^{2013} + \frac{1}{x^{2014}} = 1 + 1 = 2$

134. (4) $a + b + c = 331 + 336 - 667 = 0$
$\therefore a^3 + b^3 + c^3 - 3abc = 0$

135. (3) $a = 4.965$, $b = 2.343$, $c = 2.622$
$a + (-b) + (-c) = 4.965 - 2.343 - 2.622 = 0$
$\therefore a^3 - b^3 - c^3 - 3abc = a^3 + (-b)^3 + (-c)^3 - 3abc = 0$

136. (4) $x + y + z = 0$
$\Rightarrow -x = y + z$
$\Rightarrow (-x)^2 = (y + z)^2$
$\Rightarrow x^2 = y^2 + z^2 + 2yz$ ...(i)

$\therefore$ Expression $= \frac{x^2 + y^2 + z^2}{x^2 - yz}$

$= \frac{y^2 + z^2 + 2yz + y^2 + z^2}{y^2 + z^2 + 2yz - yz}$

$= \frac{2y^2 + 2z^2 + 2yz}{y^2 + z^2 + yz}$

$= \frac{2(y^2 + z^2 + yz)}{y^2 + z^2 + yz} = 2$

137. (4) $x + \frac{1}{x} = 0$

On squaring both sides,

$\left(x + \frac{1}{x}\right)^2 = 0$

$\Rightarrow x^2 + \frac{1}{x^2} + 2 = 0$

$\Rightarrow x^2 + \frac{1}{x^2} = -2$..... (i)

(not admissible)

On cubing $\left(x + \frac{1}{x}\right) = 0$,

$x^3 + \frac{1}{x^3} + 3 \times 0 = 0$

$\Rightarrow x^3 + \frac{1}{x^3} = 0$

$\therefore \left(x^2 + \frac{1}{x^2}\right)\left(x^3 + \frac{1}{x^3}\right) = 0$

$\Rightarrow x^5 + \frac{1}{x^5} + x + \frac{1}{x} = 0$

$\Rightarrow x^5 + \frac{1}{x^5} = 0$

138. (1) $a^2 + b^2 + c^2 - ab - bc - ca = 0$
$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$
$\Rightarrow a^2 + b^2 - 2ab + b^2 + c^2 - 2bc + c^2 + a^2 - 2ca = 0$
$\Rightarrow (a - b)^2 + (b - c)^2 + (c - a)^2 = 0$
It is possible only when,
$a - b = 0 \Rightarrow a = b$
$b - c = 0 \Rightarrow b = c$
$c - a = 0 \Rightarrow c = a$
$\therefore a = b = c$

139. (1) $x^4 + \frac{1}{x^4} = 119$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2 = 119$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 119 + 2 = 121$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{121} = 11$

Again,

$\left(x + \frac{1}{x}\right)^2 - 2 = 11$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 11 + 2 = 13$

$\Rightarrow x + \frac{1}{x} = \pm\sqrt{13}$

On cubing both sides,

$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = \pm 13\sqrt{13}$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times (\pm\sqrt{13}) = \pm 13\sqrt{13}$

$\Rightarrow x^3 + \frac{1}{x^3}$

$= \pm\left(13\sqrt{13} - 3\sqrt{13}\right)$

$= \pm 10\sqrt{13}$

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140. (4) $x + \frac{1}{x} = \sqrt{3}$

On cubing both sides,

$x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 3\sqrt{3}$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow x^3 + \frac{1}{x^3} = 0$

$\therefore$ Expression $= x^{30} + x^{24} + x^{18} + x^{12} + x^6 + 1$

$= x^{24}(x^6 + 1) + x^{12}(x^6 + 1) + 1(x^6 + 1)$

$= (x^6 + 1)(x^{24} + x^{12} + 1)$

$= x^3\left(x^3 + \frac{1}{x^3}\right)(x^{24} + x^{12} + 1)$

$= 0$

141. (3) $m + n = -2$

On cubing both sides,

$(m + n)^3 = (-2)^3 = -8$

$\Rightarrow m^3 + n^3 + 3mn(m + n) = -8$

$\Rightarrow m^3 + n^3 - 6mn = -8$

142. (4) $u_n = \frac{1}{n} - \frac{1}{n+1}$

$\therefore u_1 = \frac{1}{1} - \frac{1}{1+1}$

$= 1 - \frac{1}{2}$; $u_2 = \frac{1}{2} - \frac{1}{3}$

$u_3 = \frac{1}{3} - \frac{1}{4}$; $u_4 = \frac{1}{4} - \frac{1}{5}$;

$u_5 = \frac{1}{5} - \frac{1}{6}$

$\therefore u_1 + u_2 + u_3 + u_4 + u_5$

$= 1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \frac{1}{4} - \frac{1}{5} + \frac{1}{5} - \frac{1}{6}$

$= 1 - \frac{1}{6} = \frac{6-1}{6} = \frac{5}{6}$

143. (4) $x + y + z = 5 + 6 - 11 = 0$

$\therefore x^3 + y^3 + z^3 = 3xyz$

$= 3 \times 5 \times 6 \times (-11) = -990$

144. (4) $(p + m)^3 = p^3 + m^3 + 3pm(p + m)$

$\Rightarrow (6)^3 = 72 + 3pm \times 6$

$\Rightarrow 216 - 72 = 18\,pm$

$\Rightarrow 18\,pm = 144$

$\Rightarrow pm = 144 \div 18 = 8$

145. (2) According to the question,

$\frac{x + \frac{1}{x}}{2} = A$

$\Rightarrow x + \frac{1}{x} = 2A$

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = (2A)^3 = 8A^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 8A^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 2A = 8A^3$

$\Rightarrow x^3 + \frac{1}{x^3} = 8A^3 - 6A$

$\therefore$ Required average

$= \frac{x^3 + \frac{1}{x^3}}{2}$

$= \frac{8A^3 - 6A}{2}$

$= 4A^3 - 3A$

146. (4) $a = 2 + \sqrt{3}$

$\Rightarrow \frac{1}{a} = \frac{1}{2 + \sqrt{3}}$

$= \frac{2 - \sqrt{3}}{(2 + \sqrt{3})(2 - \sqrt{3})}$

$= \frac{2 - \sqrt{3}}{4 - 3} = 2 - \sqrt{3}$

$\therefore a + \frac{1}{a} = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$

$\therefore$ Expression $= \frac{a^6 + a^4 + a^2 + 1}{a^3}$

$= a^3 + a + \frac{1}{a} + \frac{1}{a^3}$

$= a^3 + \frac{1}{a^3} + a + \frac{1}{a}$

$= \left(a + \frac{1}{a}\right)^3 - 3\left(a + \frac{1}{a}\right) + \left(a + \frac{1}{a}\right)$

$= \left(a + \frac{1}{a}\right)^3 - 2\left(a + \frac{1}{a}\right)$

$= (4)^3 - 2 \times 4 = 64 - 8 = 56$

147. (1) $x = \sqrt{5} + \sqrt{3}$

$x^2 = \left(\sqrt{5} + \sqrt{3}\right)^2$

$= 5 + 3 + 2\sqrt{15} = 8 + 2\sqrt{15}$

$y = \sqrt{5} - \sqrt{3}$

$\therefore y^2 = \left(\sqrt{5} - \sqrt{3}\right)^2 = 8 - 2\sqrt{15}$

$\therefore x^4 - y^4 = \left(x^2 + y^2\right)(x + y)(x - y)$

$= \left(8 + 2\sqrt{15} + 8 - 2\sqrt{15}\right)$

$\left(\sqrt{5} + \sqrt{3} + \sqrt{5} - \sqrt{3}\right)$

$\left(\sqrt{5} + \sqrt{3} - \sqrt{5} + \sqrt{3}\right)$

$= 16 \times 2\sqrt{5} \times 2\sqrt{3} = 64\sqrt{15}$

148. (1) If, $a + b + c = 0$, then

$a^3 + b^3 + c^3 = 3abc$

Here, $x - 1 + y - 2 + z - 3$

$= x + y + z - 6$

$= 6 - 6 = 0$

$\therefore (x - 1)^3 + (y - 2)^3 + (z - 3)^3$

$= 3(x - 1)(y - 2)(z - 3)$

149. (3) $p^4 = 119 - \frac{1}{p^4}$

$\Rightarrow p^4 + \frac{1}{p^4} = 119$

$\Rightarrow \left(p^2 + \frac{1}{p^2}\right)^2 - 2 = 119$

$\Rightarrow \left(p^2 + \frac{1}{p^2}\right)^2 = 119 + 2 = 121$

$\Rightarrow p^2 + \frac{1}{p^2} = \sqrt{121} = 11$

Again, $\left(p - \frac{1}{p}\right)^2 + 2 = 11$

$\Rightarrow \left(p - \frac{1}{p}\right)^2 = 11 - 2 = 9$

$\Rightarrow p - \frac{1}{p} = \sqrt{9} = \pm 3$

On cubing both sides,

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$\left(p-\frac{1}{p}\right)^3 = \pm 27$

$\Rightarrow p^3 - \frac{1}{p^3} - 3(p-q) = \pm 27$

$\Rightarrow p^3 - \frac{1}{p^3} - 3 \times (\pm 3) = \pm 27$

$\Rightarrow p^3 - \frac{1}{p^3} = \pm 27 \pm 9$

$\Rightarrow p^3 - \frac{1}{p^3} = \pm 36$

150. (2) $x + \frac{1}{x} = 2$

$\Rightarrow x^2 + 1 = 2x$
$\Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x-1)^2 = 0$
$\Rightarrow x - 1 = 0 \Rightarrow x = 1$

$\therefore x^7 + \frac{1}{x^5} = 1 + 1 = 2$

151. (2) $x = 332$, $y = 333$, $z = 335$
$\therefore x + y + z = 332 + 333 + 335$
$= 1000$
$\therefore x^3 + y^3 + z^3 - 3xyz$
$= \frac{1}{2}(x+y+z)[(x-y)^2 + (y-z)^2] + (z-x)^2]$
$= \frac{1000}{2}[(332-333)^2 + (333-335)^2 + (335-332)^2]$
$= 500(1+4+9) = 500 \times 14$
$= 7000$

152. (1) Expression $= m^3 - 3m^2 + 3m + 3n + 3n^2 + n^3$
$= m^3 - 3m^2 + 3m - 1 + n^3 + 3n^2 + 3n + 1$
$= (m-1)^3 + (n+1)^3$
$= (-4-1)^3 + (-2+1)^3$
$= (-5)^3 + (-1)^3$
$= -125 - 1 = -126$

153. (1) $x + \frac{1}{x} = 2$

$\Rightarrow \frac{x^2+1}{x} = 2 \Rightarrow x^2 + 1 = 2x$
$\Rightarrow x^2 - 2x + 1 = 0$
$\Rightarrow (x-1)^2 = 0$
$\Rightarrow x - 1 = 0 \Rightarrow x = 1$

$\therefore x^{12} + \frac{1}{x^{12}} = 1 + 1 = 2$

154. (3) $x^3 + y^3 = 72$
$= 64 + 8 = 4^3 + 2^3$
$\therefore x = 4, y = 2 \Rightarrow xy = 8$
$\therefore x - y = 4 - 2 = 2$

155. (1) $x^3 + 27x^2 + 243x + 631$
$= x^3 + 3 \cdot x^2 \times 9 + 3x \cdot 9^2 + 9^3 - 9^3 + 631$
$= (x+9)^3 - 729 + 631$
$= (2+9)^3 - 98$
$= 11^3 - 98 = 1331 - 98 = 1233$

156. (2) $\frac{x^{24}+1}{x^{12}} = 7$

$\Rightarrow \frac{x^{24}}{x^{12}} + \frac{1}{x^{12}} = 7$

$\Rightarrow x^{12} + \frac{1}{x^{12}} = 7$

$\therefore \frac{x^{72}+1}{x^{36}} = \frac{x^{72}}{x^{36}} + \frac{1}{x^{36}}$

$= x^{36} + \frac{1}{x^{36}}$

$= \left(x^{12} + \frac{1}{x^{12}}\right)^3 - 3 \times x^{12} \times \frac{1}{x^{12}}\left(x^{12} + \frac{1}{x^{12}}\right)$

$[\because a^3 + b^3 = (a+b)^3 - 3ab(a+b)]$
$= 7^3 - 3 \times 7 = 343 - 21 = 322$

157. (2) $x^8 - 1 = (x^4)^2 - 1^2$
$= (x^4+1)(x^4-1)$
$= (x^4+1)(x^2+1)(x^2-1)$
$= (x^4+1)(x^2+1)(x+1)(x-1)$
$[\because a^2 - b^2 = (a+b)(a-b)]$
$x^4 + 2x^3 - 2x - 1$
$= (x^4 - 1) + 2x^3 - 2x$
$= (x^2+1)(x^2-1) + 2x(x^2-1)$
$= (x^2 + 1 + 2x)(x^2-1)$
$= (x+1)^2(x+1)(x-1)$
$\therefore$ H.C.F $= (x+1)(x-1)$
$= x^2 - 1$

158. (1) $x^2 + y^2 + z^2 = 2(x + z - 1)$
$\Rightarrow x^2 + y^2 + z^2 = 2x + 2z - 2$
$\Rightarrow x^2 - 2x + y^2 + z^2 - 2z + 2 = 0$
$\Rightarrow x^2 - 2x + 1 + y^2 + z^2 - 2z + 1 = 0$
$\Rightarrow (x-1)^2 + y^2 + (z-1)^2 = 0$
$[\because a^2 + b^2 + c^2 = 0 \Rightarrow a = 0, b = 0, c = 0]$
$\therefore x - 1 = 0 \Rightarrow x = 1$
$y = 0$
$z - 1 = 0 \Rightarrow z = 1$
$\therefore x^3 + y^3 + z^3 = 1 + 0 + 1 = 2$

159. (2) $x^2 + x = 5$ (Given)
Let, $x + 3 = a$

$\therefore \frac{1}{x+3} = \frac{1}{a}$

Now,

$a + \frac{1}{a} = (x+3) + \frac{1}{(x+3)}$

$= \frac{(x+3)^2+1}{x+3}$

$= \frac{x^2+6x+9+1}{x+3}$

$= \frac{x^2+6x+10}{x+3}$

$= \frac{x^2+x+5x+10}{x+3}$

$= \frac{5+5x+10}{x+3}$

$= \frac{5x+15}{x+3} = \frac{5(x+3)}{x+3} = 5$

$\therefore a^3 + \frac{1}{a^3}$

$= \left(a+\frac{1}{a}\right)^3 - 3a \times \frac{1}{a}\left(a+\frac{1}{a}\right)$
$= (5)^3 - 3 \times 5 = 125 - 15 = 110$

160. (2) $x = z = 225$, $y = 226$
$\therefore x + y + z = 225 + 226 + 225$
$= 676$
$\therefore x^3 + y^3 + z^3 - 3xyz$
$= \frac{1}{2}(x+y+z)[(x-y)^2 + (y-z)^2 + (z-x)^2]$
$= \frac{1}{2} \times 676[(225-226)^2 + (226-225)^2 + (225-225)^2]$
$= \frac{1}{2} \times 676 \times (1+1) = 676$

161. (3) $4a - \frac{4}{a} = -3$

On dividing by 4,

$\Rightarrow a - \frac{1}{a} = \frac{-3}{4}$

$\therefore a^3 - \frac{1}{a^3} = \left(a - \frac{1}{a}\right)^3 + 3a \times \frac{1}{a}\left(a - \frac{1}{a}\right)$

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$= \left(\frac{-3}{4}\right)^3 + 3 \times \frac{-3}{4}$

$= -\frac{27}{64} - \frac{9}{4} = \frac{-27-144}{64}$

$= \frac{-171}{64}$

$\therefore a^3 - \frac{1}{a^3} + 3 = \frac{-171}{64} + 3$

$= \frac{-171+192}{64} = \frac{21}{64}$

162. (2) Expression $= 2b^2c^2 + 2c^2a^2 + 2a^2b^2 - a^4 - b^4 - c^4$
$= 4b^2c^2 - (2b^2c^2 - 2c^2a^2 - 2a^2b^2 + a^4 + b^4 + c^4)$
$= (2bc)^2 - (a^2 - b^2 - c^2)^2$
$= (2bc + a^2 - b^2 - c^2)(2bc - a^2 + b^2 + c^2)$
$= (a^2 - (b^2 + c^2 - 2bc))(b^2 + c^2 + 2bc - a^2)$
$= (a^2 - (b-c)^2)((b+c)^2 - a^2)$
$= (a - b + c)(a + b - c)(a + b + c)(b + c - a)$
If $a + b - c = 0$,
$\therefore$ Expression $= 0$.

163. (1) $\frac{p^2}{q^2} + \frac{q^2}{p^2} = 1$

$\Rightarrow \frac{p^4 + q^4}{p^2 q^2} = 1 \Rightarrow p^4 + q^4 = p^2 q^2$

$\Rightarrow p^4 + q^4 - p^2 q^2 = 0$ ..... (i)

$\therefore p^6 + q^6 = (p^2)^3 + (q^2)^3$
$= (p^2 + q^2)(p^4 + q^4 - p^2 q^2)$

$\left[\because a^3 + b^3 = (a+b)(a^2 - ab + b^2)\right]$

$= (p^2 + q^2) \times 0 = 0$

164. (1) $m + 1 = \sqrt{n} + 3$ (Given)

$\Rightarrow m + 1 - 3 = \sqrt{n}$

$\Rightarrow m - 2 = \sqrt{n}$

On cubing both sides,

$(m-2)^3 = \left(\sqrt{n}\right)^3$

$\Rightarrow m^3 - 3m^2 \times 2 + 3m(2)^2 - 2^3 = n\sqrt{n}$

$\left[\because (a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3\right]$

$\Rightarrow m^3 - 6m^2 + 12m - 8 = n\sqrt{n}$

$\Rightarrow \frac{m^3 - 6m^2 + 12m - 8}{\sqrt{n}} = n$

$\Rightarrow \frac{m^3 - 6m^2 + 12m - 8}{\sqrt{n}} - n = 0$

$\Rightarrow \frac{1}{2}\left[\frac{m^3 - 6m^2 + 12m - 8}{\sqrt{n}} - n\right] = 0$

165. (3) $\frac{3x - 2y}{2x + 3y} = \frac{5}{6}$

$\Rightarrow 18x - 12y = 10x + 15y$
$\Rightarrow 18x - 10x = 12y + 15y$
$\Rightarrow 8x = 27y$

$\Rightarrow \frac{x}{y} = \frac{27}{8}$

On taking cube root of both sides,

$\frac{\sqrt[3]{x}}{\sqrt[3]{y}} = \sqrt[3]{\frac{27}{8}} = \frac{3}{2}$

By componendo and dividendo,

$\frac{\sqrt[3]{x} + \sqrt[3]{y}}{\sqrt[3]{x} - \sqrt[3]{y}} = \frac{3+2}{3-2} = \frac{5}{1}$

On squaring both sides,

$\left(\frac{\sqrt[3]{x} + \sqrt[3]{y}}{\sqrt[3]{x} - \sqrt[3]{y}}\right)^2 = 5 \times 5 = 25$

166. (4) $a - \frac{1}{(a-3)} = 5$

$\Rightarrow (a-3) - \frac{1}{(a-3)} = 2$

On cubing both sides,

$\left\{(a-3) - \frac{1}{(a-3)}\right\}^3 = 8$

$\Rightarrow (a-3)^3 - \left(\frac{1}{a-3}\right)^3 - 3 \times (a-3)\left(\frac{1}{a-3}\right)\left((a-3) - \frac{1}{(a-3)}\right) = 8$

$\left[\because (a-b)^3 = a^3 - b^3 - 3ab(a-b)\right]$

$\Rightarrow (a-3)^3 - \left(\frac{1}{a-3}\right)^3 - 3 \times 2 = 8$

$\Rightarrow (a-3)^3 - \left(\frac{1}{a-3}\right)^3 = 8 + 6$

$= 14$

167. (*) $\left(\frac{p^{-1}q^2}{p^3q^{-2}}\right)^{\frac{1}{3}} + \left(\frac{p^6q^{-3}}{p^{-2}q^3}\right)^{\frac{1}{3}} = p^a q^b$

$\Rightarrow \left(p^{-1-3}\ q^{2+2}\right)^{\frac{1}{3}} + \left(p^{6+2}\ q^{-3-3}\right)^{\frac{1}{3}} = p^a q^b$

$\Rightarrow \left(p^{-4}q^4\right)^{\frac{1}{3}} + \left(p^8q^{-6}\right)^{\frac{1}{3}} = p^a q^b$

$\Rightarrow \frac{p^{\frac{-4}{3}}q^{\frac{4}{3}}}{p^{\frac{8}{3}}q^{\frac{-6}{3}}} = p^a q^b$

$\Rightarrow p^{\frac{-4}{3} - \frac{8}{3}}\ q^{\frac{4}{3} + \frac{6}{3}} = p^a q^b$

$\Rightarrow p^{-4}\ q^{\frac{10}{3}} = p^a q^b$

$\Rightarrow a = -4,\ b = \frac{10}{3}$

$\therefore a + b = -4 + \frac{10}{3} = \frac{-2}{3}$

168. (3) $a + b = 1$ (Given)
Expression $= a^3 + b^3 - ab - (a^2 - b^2)^2$
$= (a+b)(a^2 - ab + b^2) - ab - (a^2 - b^2)^2$
$= (a^2 - ab + b^2) - ab - (a+b)^2(a-b)^2$
$= a^2 - ab + b^2 - ab - (a^2 - 2ab + b^2)$
$= a^2 - 2ab + b^2 - a^2 + 2ab - b^2 = 0$

169. (1) $x = a^{\frac{1}{2}} + a^{\frac{-1}{2}}$

$y = a^{\frac{1}{2}} - a^{\frac{-1}{2}}$

$\therefore x^2 - y^2 = 4a^{\frac{1}{2}} \cdot a^{\frac{-1}{2}} = 4$

$\left[\because (a+b)^2 - (a-b)^2 = 4ab\right]$

Again, $y^2 - x^2 = -4 \cdot a^{\frac{1}{2}} \cdot a^{\frac{-1}{2}} = -4$

Expression
$= (x^4 - x^2y^2 - 1) + (y^4 - x^2y^2 + 1)$
$x^2(x^2 - y^2) - 1 + y^2(y^2 - x^2) + 1$
$= 4x^2 - 1 - 4y^2 + 1$
$= 4(x^2 - y^2) = 4 \times 4 = 16$

170. (2) $x^2 + y^2 + z^2 = xy + yz + zx$
$\Rightarrow x^2 + y^2 + z^2 - xy - yz - zx = 0$
$\Rightarrow 2x^2 + 2y^2 + 2z^2 - 2xy - 2yz - 2zx = 0$
$\Rightarrow x^2 + y^2 - 2xy + y^2 + z^2 - 2yz + x^2 + z^2 - 2zx = 0$
$\Rightarrow (x-y)^2 + (y-z)^2 + (z-x)^2 = 0$

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$\therefore x-y=0 \Rightarrow x=y$
$y-z=0 \Rightarrow y=z$
$z-x=0 \Rightarrow z=x$
$\therefore x=y=z$
[If $a^2+b^2+c^2=0$, then $a=0$, $b=0$, $c=0$]
$\therefore$ Expression

$$=\frac{3x^4+7y^4+5z^4}{5x^2y^2+7y^2z^2+3z^2x^2}$$

$$=\frac{3x^4+7x^4+5x^4}{5x^4+7x^4+3x^4}$$

$$=\frac{15x^4}{15x^4}=1$$

171. (1) $x-\sqrt{3}-\sqrt{2}=0$

$\Rightarrow x=\sqrt{3}+\sqrt{2}$

Again,

$y-\sqrt{3}+\sqrt{2}=0$

$\Rightarrow y=\sqrt{3}-\sqrt{2}$

$\therefore x-y=\sqrt{3}+\sqrt{2}-\sqrt{3}+\sqrt{2}$

$=2\sqrt{2}$

and $xy=\left(\sqrt{3}+\sqrt{2}\right)\left(\sqrt{3}-\sqrt{2}\right)$

$=3-2=1$

$\therefore$ Expression

$=x^3-20\sqrt{2}-y^3-2\sqrt{2}$

$=x^3-y^3-22\sqrt{2}$

$=(x-y)^3+3xy(x-y)-22\sqrt{2}$

$=\left(2\sqrt{2}\right)^3+3\left(2\sqrt{2}\right)-22\sqrt{2}$

$=16\sqrt{2}+6\sqrt{2}-22\sqrt{2}=0$

172. (2) $p^3-q^3=(p-q)\{(p-q)^2-x\,pq\}$

$\Rightarrow (p-q)(p^2+q^2+pq)=(p-q)(p^2+q^2-2pq-x\,pq)$

$\Rightarrow (p^2+q^2+pq)=p^2+q^2-(2+x)pq$.

$\therefore -(2+x)=1$

$\Rightarrow x=-2-1=-3$

173. (1) $x+y+z=6$

$xy+yz+zx=10$

$\therefore (x+y+z)^2=36$

$\Rightarrow x^2+y^2+z^2+2xy+2yz+2zx=36$

$\Rightarrow x^2+y^2+z^2+2\times 10=36$

$\Rightarrow x^2+y^2+z^2=36-20=16$

$\therefore x^3+y^3+z^3-3xyz=(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$

$=6(16-10)$

$=6\times 6=36$

174. (3) $x-\frac{1}{x}=2$

On cubing both sides,

$$\left(x-\frac{1}{x}\right)^3=2^3$$

$$\Rightarrow x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)=8$$

$$\Rightarrow x^3-\frac{1}{x^3}-3\times 2=8$$

$$\Rightarrow x^3-\frac{1}{x^3}=8+6=14$$

175. (3) $a^2+a+1=0$

$$\Rightarrow \frac{a^2+a+1}{a}=0$$

$$\Rightarrow a+1+\frac{1}{a}=0 \quad \ldots.(i)$$

Expression $=a^5+a^4+1$

$=a^4(a+1)+1$

$=a^4\left(-\frac{1}{a}\right)+1$

$=-a^3+1=1-a^3$

$=(1-a)(1+a+a^2)$

$=(1-a)\times 0=0$

176. (4) $x=a(b-c)$

$$\Rightarrow \frac{x}{a}=b-c$$

Similarly, $y=b(c-a)$

$$\Rightarrow \frac{y}{b}=c-a$$

and, $\frac{z}{c}=a-b$

$$\therefore \frac{x}{a}+\frac{y}{b}+\frac{z}{c}=b-c+c-a+a-b=0$$

$$\therefore \left(\frac{x}{a}\right)^3+\left(\frac{y}{b}\right)^3+\left(\frac{z}{c}\right)^3$$

$$=3\times\frac{x}{a}\times\frac{y}{b}\times\frac{z}{c}=\frac{3xyz}{abc}$$

[If $a+b+c=0$, $a^3+b^3+c^3=3abc$]

177. (3) $x=y=z$

$$\therefore \text{Expression}=\frac{(x+y+z)^2}{x^2+y^2+z^2}$$

$$=\frac{(x+x+x)^2}{x^2+x^2+x^2}$$

$$=\frac{9x^2}{3x^2}=3$$

178. (3) Expression

$$=\frac{\frac{3}{15}a^5b^6c^3\times\frac{5}{9}ab^5c^4}{\frac{10}{27}a^2bc^3}$$

$$=\left(\frac{3}{15}\times\frac{5}{9}\times\frac{27}{10}\right)\left(\frac{a^6b^{11}c^7}{a^2bc^3}\right)$$

$$=\frac{3}{10}a^{6-2}b^{11-1}c^{7-3}$$

$$=\frac{3}{10}a^4b^{10}c^4$$

$\left[\because a^m\times a^n=a^{m+n}\right.$
$\left.a^m+a^n=a^{m-n}\right]$

179. (4) $(2a-1)^2+(4b-3)^2+(4c+5)^2=0$

$\therefore 2a-1=0\Rightarrow 2a=1\Rightarrow a=\frac{1}{2}$

$4b-3=0\Rightarrow 4b=3\Rightarrow b=\frac{3}{4}$

$4c+5=0\Rightarrow 4c=-5\Rightarrow c=\frac{-5}{4}$

[If $x^2+y^2+z^2=0$, $x=0$, $y=0$, $z=0$]

$$\therefore a+b+c=\frac{1}{2}+\frac{3}{4}-\frac{5}{4}$$

$$=\frac{6+9-15}{12}=0$$

$\therefore a^3+b^3+c^3-3abc=0$

$\therefore$ Required answer $=0$

180. (4) $x+\frac{1}{x}=3$

On squaring both sides,

$$x^2+\frac{1}{x^2}+2=9$$

$$\Rightarrow x^2+\frac{1}{x^2}=9-2=7 \quad \ldots(i)$$

Again,

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$\left(x+\frac{1}{x}\right)^3 = 3^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x+\frac{1}{x}\right) = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 3 = 27$

$\therefore x^3 + \frac{1}{x^3} = 27 - 9 = 18$...(ii)

$\therefore \left(x^3+\frac{1}{x^3}\right)\left(x^2+\frac{1}{x^2}\right)$

$= 18 \times 7 = 126$

$\Rightarrow x^5 + x + \frac{1}{x^5} + \frac{1}{x} = 126$

$\Rightarrow x^5 + \frac{1}{x^5} = 126 - 3 = 123$

TYPE-III

1. (1) $2^x.2^y = 8$

$\Rightarrow 2^{x+y} = 2^3$

$\Rightarrow x + y = 3$ ...(i)

$9^x.3^y = 3^4$

$\Rightarrow 3^{2x}.3^y = 3^4$

$\Rightarrow 2x + y = 4$ ...(ii)

By equation (ii) – (i),

$x = 1$

From equation (i),

$1 + y = 3$

$\Rightarrow y = 3 - 1 = 2$

Method 2 :

You can check through options also.

$\Rightarrow y = 2$

$\Rightarrow (1, 2)$

2. (2) $2x + y = 5$ ...(i)

$x + 2y = 4$ ...(ii)

By equation (i) × 2 – equation (ii), we have

$4x + 2y = 10$

$x + 2y = 4$

– – –

$3x = 6$

$\Rightarrow x = 2$

From equation (i),

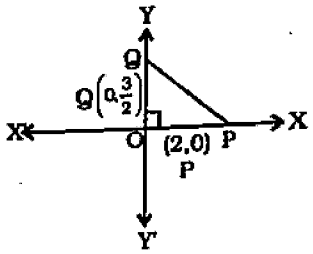
$2 \times 2 + y = 5$

$\Rightarrow y = 5 - 4 = 1$

$\therefore$ Point of intersection = (2, 1)

3. (2) $OP = 2$

$OQ = \frac{3}{2}$



$\therefore PQ = \sqrt{OP^2 + OQ^2}$

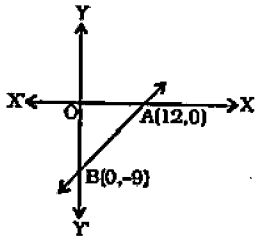
$= \sqrt{2^2 + \left(\frac{3}{2}\right)^2}$

$= \sqrt{4 + \frac{9}{4}}$

$= \sqrt{\frac{16+9}{4}} = \sqrt{\frac{25}{4}}$

$= \frac{5}{2} = 2.5$ cm

4. (1)



Putting $x = 0$ in $9x - 12y = 108$,

$0 - 12y = 108$

$y = -9$

Putting $y = 0$ in $9x - 12y = 108$

$9x - 0 = 108$

$\Rightarrow x = 12$

$\therefore OA = 12, OB = 9$

$\therefore AB = \sqrt{OA^2 + OB^2}$

$= \sqrt{12^2 + 9^2}$

$= \sqrt{144 + 81}$

$= \sqrt{225}$

$\therefore AB = 15$ units

5. (4) At x-axis, y-co-ordinate = 0

$\therefore$ Putting $y = 0$ in $7x - 3y = 2$,

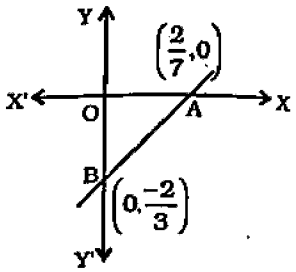
$7x - 3 \times 0 = 2$

$\Rightarrow 7x = 2$

$\Rightarrow x = \frac{2}{7}$

Similarly, putting $x = 0$ in $7x - 3y = 2$,

$y = -\frac{2}{3}$



6. (3) Putting $x = 2$ in the equation $2x + y = 6$,

$2 \times 2 + y = 6$

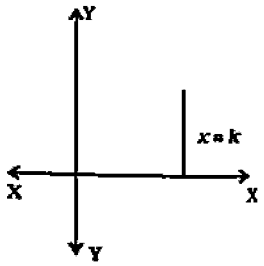
$\Rightarrow y = 6 - 4 = 2$

$\therefore$ Required point = (2, 2)

7. (3) Putting $x = 0$ in equation $2x + 3y = 0$, we get $y = 0$

Hence, this straight line passes through the origin.

8. (4)



Hence, the graph of the equation will be a line parallel to y-axis i.e. $x = k$.

9. (2) At y-axis, $x = 0$

$\therefore$ Putting $x = 0$ in $2x - 3y = 6$,

$0 - 3y = 6 \Rightarrow y = -2$

$\therefore$ Co-ordinates of point of intersection = (0, – 2)

10. (2) Putting $x = 9$ in the equation $25x + 75y = 225$,

$\Rightarrow 25 \times 9 + 75y = 225$

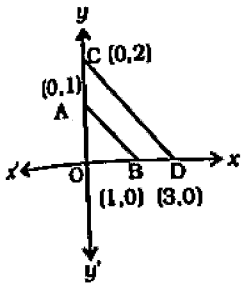
$\Rightarrow 75y = 225 - 225 = 0$

$\Rightarrow y = 0$

$\therefore$ Point of intersection = (9, 0)

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11. (3)

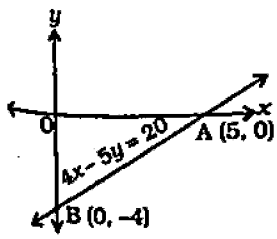


$x = 0$ is the equation of y-axis.
$y = 0$ is the equation of x-axis.
Putting $x = 0$ in $x + y = 1$, $y = 1$
Putting $y = 0$ in $x + y = 1$, $x = 1$
Putting $x = 0$ in $2x + 3y = 6$
$3y = 6 \Rightarrow y = 2$
Putting $y = 0$ in $2x + 3y = 6$
$2x = 6 \Rightarrow x = 3$
$\therefore$ OB = 1; OA = 1
OD = 3; OC = 2
$\therefore$ Required area = $\Delta OCD - \Delta OAB$

$$= \frac{1}{2}\times 3\times 2 - \frac{1}{2}\times 1\times 1$$

$$= 3 - \frac{1}{2} = 2\frac{1}{2} \text{ sq. units}$$

12. (2) When a straight line cuts x-axis, the coordinates of point of intersection = $(x, 0)$, i.e., $y = 0$.
$\therefore$ Putting $y = 0$ in $4x - 5y = 20$
$4x = 20 \Rightarrow x = 5$
$\therefore$ Point of intersection = (5, 0)
[**Note :** Putting $y = 0$ in $4x - 5y = 20$, point of intersection on x-axis = (5, 0)
Putting $x = 0$ in $4x - 5y = 20$, point of intersection on y-axis = (0, –4).
Look at the graph of the equation:



13. (2) $2x + 1 = 0 \Rightarrow x = -\frac{1}{2}$
and $3y - 9 = 0 \Rightarrow y = 3$
$\therefore \left(\frac{-1}{2}, 3\right)$

14. (1) $ax + by + c = 0$
When $c = 0$,
$ax + by = 0$

$$by = -ax \Rightarrow y = -\frac{a}{b}x$$

When $x = 0$, $y = 0$ i.e. this line passes through the origin (0, 0).

15. (2) Check through options
$y = 4x$,
When, $x = 1$, $y = 4$

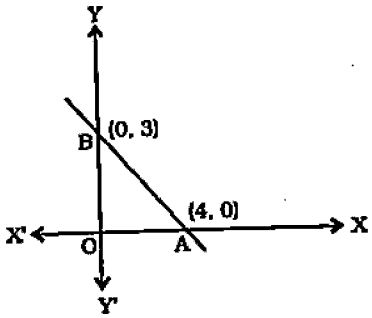
16. (1) $3x + 2y = 18$ ...(i)
$3y - 2x = 1$ ...(ii)
By equation (i) × 2 + (ii) × 3 gives,

$$\begin{array}{r} 6x + 4y = 36 \\ -6x + 9y = 3 \\ \hline 13y = 39 \end{array}$$

$\Rightarrow y = 3$
Putting $y = 3$ in (ii)
$3(3) - 2x = 1 \Rightarrow x = 4$
$\therefore (p, q) = (4, 3)$
and hence, $p + q = 7$

17. (3) On putting $y = -x$ in the equation $5y + 7x = 24$,
$-5x + 7x = 24$
$\Rightarrow 2x = 24 \Rightarrow x = 12$
& $y = -12$
$\therefore m = x = 12$, $n = y = -12$
$\Rightarrow m + n = 12 - 12 = 0$

18. (3)

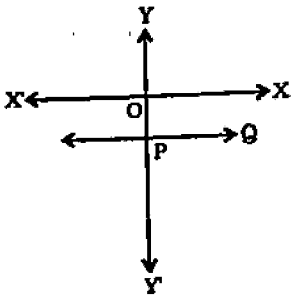


x – axis $\Rightarrow y = 0$, putting in equation $3x + 4y = 12$
$3x = 12 \Rightarrow x = 4$
$\Rightarrow$ Co-ordinates of point of intersection on x-axis = (4, 0)
Putting $x = 0$ in the equation $3x + 4y = 12$
$4y = 12 \Rightarrow y = 3$
$\therefore$ Co-ordinates of point of intersection on y – axis = (0, 3)
$\therefore$ OA = 4
OB = 3
$\therefore$ Area of Δ OAB

$$= \frac{1}{2}\times OA \times OB = \frac{1}{2}\times 4\times 3$$

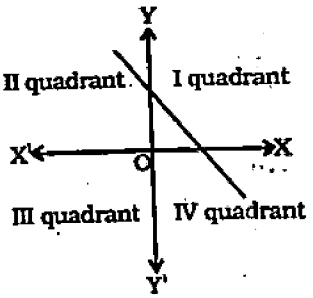
= 6 sq. units

19. (3)

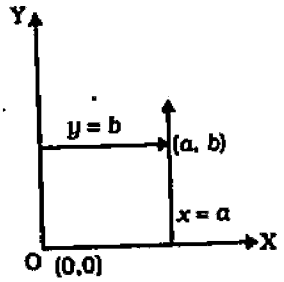


Equation of a straight line parallel to x-axis : $y = a$
Here, $a = -3$
$\therefore$ Equation is : $y = -3$

20. (2) Putting $y = 0$ in $4x + 3y = 12$, we get $x = 3$
Putting $x = 0$ in $4x + 3y = 12$, we get, $y = 4$



21. (1) Point of intersection = (a, b)



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22. (4) $x = 4$, a straight line parallel to y-axis.

$y = 3$, a straight line parallel to x-axis.

Putting $x = 0$ in $3x + 4y = 12$,

$3 \times 0 + 4y = 12$,

$\Rightarrow 4y = 12 \Rightarrow y = \frac{12}{3} = 4$

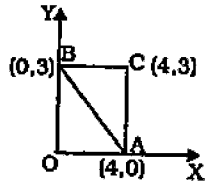
$\therefore$ Point of intersection on y-axis $= (0, 4)$

Again, putting $y = 0$ in $3x + 4y = 12$,

$3x + 4 \times 0 = 12$

$\Rightarrow 3x = 12 \Rightarrow x = \frac{12}{3} = 4$

$\therefore$ Point of intersection on x-axis $= (4, 0)$



Area of $\square OACB = OA \times OB$

$= 4 \times 3 = 12$ sq. units

Area of $\Delta OAB = \frac{1}{2} \times OA \times OB$

$= \frac{1}{2} \times 4 \times 3 = 6$ sq. units

$\therefore$ Area of $\Delta ABC = 12 - 6$

$= 6$ sq. units

23. (3) $3x + 4y = 10$ —(i)

$-x + 2y = 0$

$\Rightarrow x = 2y$

$\therefore$ From equation (i),

$3 \times 2y + 4y = 10 \Rightarrow 10y = 10$

$\Rightarrow y = \frac{10}{10} = 1$

$\therefore x = 2$

$\therefore (a, b) = (2, 1)$

$\therefore a + b = 2 + 1 = 3$

24. (1) On putting $x = 0$ in

$x + y = 2$,

$0 + y = 2 \Rightarrow y = 2$

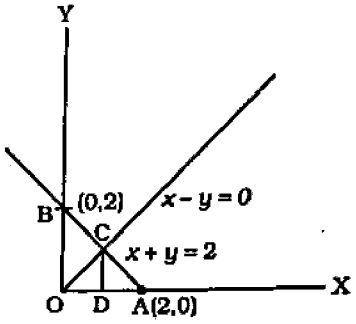
$\therefore$ Point of intersection on y-axis $= (0, 2)$

Again, putting $y = 0$ in $x + y = 2$,

$x = 2$

$\therefore$ Point of intersection on x-axis $= (2, 0)$

$x - y = 0$ will pass through origin and be equally inclined to axes.



On putting $x = y$ in $x + y = 2$,

$2y = 2 \Rightarrow y = 1$

$\therefore CD = 1$

$OA = 2$

Area of $\Delta OAC = \frac{1}{2} \times OA \times CD$

$= \frac{1}{2} \times 2 \times 1 = 1$ sq. unit

25. (2) $2\left(x^2 + \frac{1}{x^2}\right) - \left(x - \frac{1}{x}\right) - 7 = 0$

$\Rightarrow 2\left\{\left(x - \frac{1}{x}\right)^2 + 2\right\} - \left(x - \frac{1}{x}\right) - 7 = 0$

$\Rightarrow 2\left(x - \frac{1}{x}\right)^2 + 4 - \left(x - \frac{1}{x}\right) - 7 = 0$

$\Rightarrow 2\left(x - \frac{1}{x}\right)^2 - \left(x - \frac{1}{x}\right) - 3 = 0$

If $x - \frac{1}{x} = y$, then

$2y^2 - y - 3 = 0$

$\Rightarrow 2y^2 - 3y + 2y - 3 = 0$

$\Rightarrow y(2y - 3) + 1(2y - 3) = 0$

$\Rightarrow (y + 1)(2y - 3) = 0$

$\Rightarrow y = -1$ or $\frac{3}{2}$

when $y = -1$

$\Rightarrow x - \frac{1}{x} = -1$

$\Rightarrow x^2 + x + = 0$

The value of x will not be real.

Again,

$x - \frac{1}{x} = \frac{3}{2}$

$\Rightarrow \frac{x^2 - 1}{x} = \frac{3}{2}$

$\Rightarrow 2x^2 - 2 = 3x$

$\Rightarrow 2x^2 - 3x - 2 = 0$

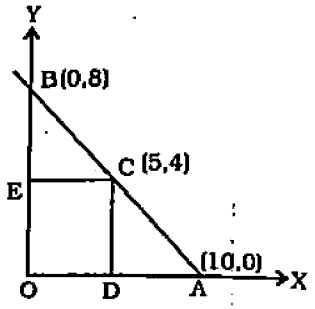
$\Rightarrow 2x^2 - 4x + x - 2 = 0$

$\Rightarrow 2x(x - 2) + 1(x - 2) = 0$

$\Rightarrow (2x + 1)(x - 2) = 0$

$\Rightarrow x = -\frac{1}{2}$ or 2

26. (2)



Putting $x = 0$ in $4x + 5y = 40$,

$4 \times 0 + 5y = 40 \Rightarrow 5y = 40$

$\Rightarrow y = \frac{40}{5} = 8$

$\therefore$ Point of intersection on y-axis $= (0, 8)$

Again, putting $y = 0$ in $4x + 5y = 40$,

$4x + 5 \times 0 = 40 \Rightarrow 4x = 40$

$\Rightarrow x = \frac{40}{4} = 10$

$\therefore$ Point of intersection on x-axis $= (10, 0)$

$OA = 10$ units

$OD = 5$ units $= EC$

$\therefore DA = 10 - 5 = 5$ units

Again, $OB = 8$ units

$OE = 4$ units

$BE = 8 - 4 = 4$ units

$\therefore$ Area of ΔADC

$= \frac{1}{2} \times DA \times DC$

$= \frac{1}{2} \times 5 \times 4 = 10$ sq. units

Area of $\Delta BEC = \frac{1}{2} \times EC \times BE$

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$= \frac{1}{2} \times 5 \times 4 = 10$ sq. units

$\therefore$ Required area $= 10 + 10$

$= 20$ sq. units.

27. (4) $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ will be coincident if

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\Rightarrow \frac{k}{3} = \frac{2}{1} = \frac{2}{1}$$

$\Rightarrow k = 3 \times 2 = 6$

The system of equations has infinite solutions.

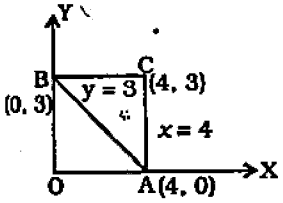
28. (3) On putting $x = 0$ in the equation $3x + 4y = 12$,

$4y = 12, \Rightarrow y = 3$

Again on putting $y = 0$,

$3x = 12 \Rightarrow x = 4$

x	0	4
y	3	0



Area of $\Delta ABC = \frac{1}{2} \times AC \times BC$

$= \frac{1}{2} \times 3 \times 4 = 6$ square units

29. (3) Abscissa $= k$,

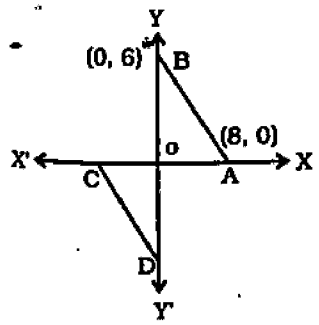
Ordinate $= 2k - 1$

According to the question,

$k = 2k - 1$

$\Rightarrow 2k - k = 1 \Rightarrow k = 1$

30. (2)



On putting $x = 0$ in the equation $3x + 4y = 24$,

$4y = 24 \Rightarrow y = \frac{24}{4} = 6$

$\therefore$ Co-ordinates of B $= (0, 6)$

Again, putting $y = 0$ in the equation $3x + 4y = 24$,

$3x = 24 \Rightarrow x = 8$

$\therefore$ Co-ordinates of A $= (8, 0)$

Similarly, for $x + y = -4$

Co-ordinates of C $= (-4, 0)$

Co-ordinates of D $= (0, -4)$

$\therefore$ Area of ΔOAB

$= \frac{1}{2} \times OA \times OB$

$= \frac{1}{2} \times 8 \times 6 = 24$ sq. units

Area of ΔOCD

$= \frac{1}{2} \times OC \times OD$

$= \frac{1}{2} \times 4 \times 4 = 8$ sq. units

Clearly,

$\Delta OCD = \frac{1}{3} \Delta OAB$.

31. (4) Putting $y = 0$ in the equation $239x - 239y + 5 = 0$

$$\Rightarrow x = \frac{-5}{239}$$

$\therefore$ Co-ordinates of A

$$= \left(\frac{-5}{239}, 0\right)$$

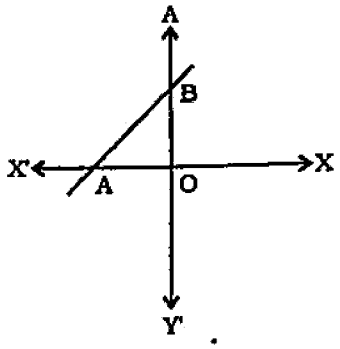
Again putting $x = 0$ in the equation $239x - 239y + 5 = 0$,

$-239y = -5$

$$\Rightarrow y = \frac{5}{239}$$

$\therefore$ Co-ordinates of B

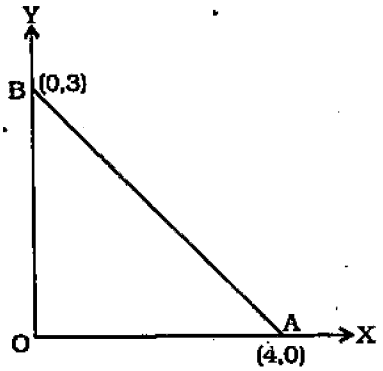
$$= \left(0, \frac{5}{239}\right)$$



$\therefore$ OA = OB $= \frac{5}{239}$

$\therefore \angle OAB = \angle OBA = 45°$ because $\angle AOB = 90°$

32. (1)



Putting $x = 0$ in $3x + 4y = 12$

$3 \times 0 + 4y = 12$

$$\Rightarrow y = \frac{12}{4} = 3$$

$\therefore$ Point of intersection on y-axis $= (0, 3)$

Again, putting $y = 0$ in $3x + 4y = 12$

$3x + 4 \times 0 = 12$

$\Rightarrow 3x = 12 \Rightarrow x = 4$

$\therefore$ Point of intersection on x-axis $= (4, 0)$

$\therefore$ OA $= 4$ and OB $= 3$

$\therefore AB = \sqrt{OA^2 + OB^2}$

$= \sqrt{4^2 + 3^2} = \sqrt{16 + 9}$

$= \sqrt{25} = 5$ units

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33. (3) For pair of equations,
$a_1x + b_1y + c_1 = 0$
$a_2x + b_2y + c_2 = 0$, there is no solution if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

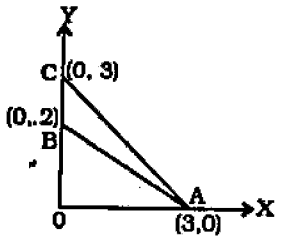
$\therefore \frac{2}{6} = \frac{-k}{-12}$

$\Rightarrow \frac{1}{3} = \frac{k}{12} \Rightarrow k = \frac{12}{3} = 4$

34. (1) Co-ordinates of origin = (0, 0). These co-ordinates satisfy the equation $2x - 3y = 0$

35. (2) Vertices of parallel to piped = $v = 8$
Edges = $e = 12$
Surfaces = $f = 6$
$\therefore v - e + f = 8 - 12 + 6 = 2$

36. (3)



$x = 0 \Rightarrow$ Equation of y – axis
Putting $x = 0$ in $2x + 3y = 6$
$0 + 3y = 6 \Rightarrow y = 2$
$\therefore$ Co-ordinates of point of intersection on y – axis
= (0, 2)
Again, putting $y = 0$, $x = 3$
$\therefore$ Point of intersection on x – axis
= (3, 0)
In $x + y = 3$
Putting $x = 0$, $y = 3$
and on putting $y = 0$, $x = 3$
$\therefore$ Required area
= Δ OAC – Δ OAB

$= \frac{1}{2} \times 3 \times 3 - \frac{1}{2} \times 2 \times 2$

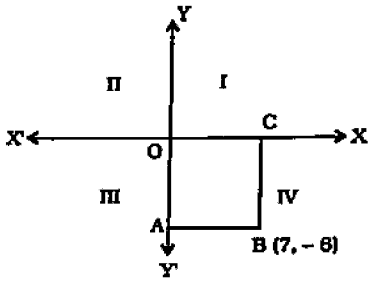
$= \frac{9}{2} - \frac{6}{2} = \frac{3}{2}$

$= 1\frac{1}{2}$ sq. units

37. (2) $5x + 9y = 5$
On cubing both sides,
$(5x)^3 + (9y)^3 + 3 \times 5x \times 9y\,(5x + 9y) = (5)^3$
[$\because (a + b)^3 = a^3 + b^3 + 3ab\,(a + b)$]
$\Rightarrow 125x^3 + 729y^3 + 135xy \times 5 = 125$
$\Rightarrow 120 + 135 \times 5xy = 125$
$\Rightarrow 135 \times 5xy = 125 - 120 = 5$

$\Rightarrow xy = \frac{5}{135 \times 5} = \frac{1}{135}$

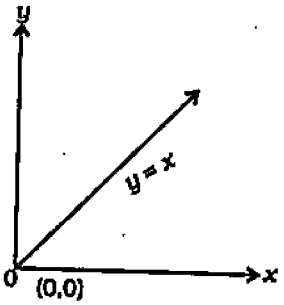
38. (1)



39. (1) $y = 3x$, passes through the origin (0, 0).

40. (4) Solution of $2x + 3y = k$
= (2, 0)
$\therefore 2 \times 2 + 3 \times 0 = k$
$\Rightarrow k = 4$

41. (2)



Point (1, 1) satisfies the equation $y = x$.

TYPE-IV

1. (1) $\frac{a}{b} = \frac{2}{3} = \frac{8}{12}$

$\frac{b}{c} = \frac{4}{5} = \frac{12}{15}$ [Making B equal]

$\therefore$ Required ratio

$= \frac{8+12}{12+15} = \frac{20}{27}$

2. (2) a : b = 2 : 3
b : c = 4 : 5
or a : b = 8 : 12
b : c = 12 : 15
$\therefore$ a : b : c = 8 : 12 : 15
$\therefore a^2 : b^2 : bc$
$= 8^2 : 12^2 : 15 \times 12$
= 64 : 144 : 180
= 16 : 36 : 45

3. (3) $A : B = \frac{1}{2} : \frac{3}{8}$

$= \frac{8}{2} : \frac{8 \times 3}{8} = 4 : 3$

$B : C = \frac{1}{3} : \frac{5}{9}$

$= \frac{9}{3} : \frac{9 \times 5}{9} = 3 : 5$

$C : D = \frac{5}{6} : \frac{3}{4}$

$= \frac{5 \times 6}{6} : \frac{3 \times 6}{4} = 5 : \frac{9}{2}$

$\therefore A : B : C : D = 4 : 3 : 5 : \frac{9}{2}$

= 8 : 6 : 10 : 9

4. (3) Here $\frac{x}{y} = \frac{3}{2}$

$\therefore \frac{x^2}{y^2} = \left(\frac{3}{2}\right)^2 = \frac{9}{4}$

Now, $\frac{2x^2 + 3y^2}{3x^2 - 2y^2} = \frac{2\left(\frac{x^2}{y^2}\right) + 3}{3\left(\frac{x^2}{y^2}\right) - 2}$

[On dividing N^r and D^r by y^2]

$= \frac{\left(2 \times \frac{9}{4}\right) + 3}{\left(3 \times \frac{9}{4}\right) - 2} = \frac{\frac{9}{2} + 3}{\frac{27}{4} - 2}$

$= \frac{\frac{9+6}{2}}{\frac{27-8}{4}} = \frac{15}{2} \times \frac{4}{19}$

$= \frac{30}{19} = 30 : 19$

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6. (3) $A : B : C = 2 : 3 : 4$

$\therefore \frac{A}{B} = \frac{2}{3}, \frac{B}{C} = \frac{3}{4}, \frac{C}{A} = \frac{4}{2}$

Now,

$\frac{A}{B} : \frac{B}{C} : \frac{C}{A} = \frac{2}{3} : \frac{3}{4} : \frac{4}{2}$

$= \frac{2}{3} : \frac{3}{4} : \frac{2}{1}$

$= \frac{2}{3} \times 12 : \frac{3}{4} \times 12 : 2 \times 12$

$\because$ [LCM of 3, 4, 1 = 12]

$= 8 : 9 : 24$

8. (4) $C : D = 5 : 6$

$\Rightarrow D : C = 6 : 5$,

$C : B = 4 : 3$ and $B : A = 2 : 1$

$\therefore D : C : B : A$

$= 6 \times 4 \times 2 : 5 \times 4 \times 2 : 5 \times 3 \times 2 : 5 \times 3 \times 1$

$= 48 : 40 : 30 : 15$

7. (3) $\frac{2a - 5b}{3a + 6b} = \frac{4}{7}$

$\Rightarrow 14a - 35b = 12a + 24b$

$\Rightarrow 2a = 59b$

$\Rightarrow \frac{a}{b} = \frac{59}{2} = 59 : 2$

8. (1) $a : b = 7 : 9$

$b : c = 3 : 5 = 9 : 15$

$\therefore a : b : c = 7 : 9 : 15$

9. (1) $\frac{x}{y} = \frac{7}{3}$ (Given)

Now,

$\frac{xy + y^2}{x^2 - y^2} = \frac{y(x + y)}{(x + y)(x - y)}$

$= \frac{y}{x - y} = \frac{1}{\frac{x}{y} - 1} = \frac{1}{\frac{7}{3} - 1} = \frac{1}{\frac{7 - 3}{3}} = \frac{3}{4}$

10. (4) $\frac{3a + 5b}{3a - 5b} = \frac{5}{1}$

By componendo and dividendo,

$\frac{3a + 5b + 3a - 5b}{3a + 5b - 3a + 5b} = \frac{5 + 1}{5 - 1}$

$\Rightarrow \frac{6a}{10b} = \frac{6}{4} \Rightarrow \frac{a}{b} = \frac{6}{4} \times \frac{10}{6} = \frac{5}{2}$

$\Rightarrow 5 : 2 = a : b$

11. (2) $\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{3}$

$\Rightarrow \frac{p}{2} = \frac{q}{3} = k$

$\Rightarrow p = 2k, q = 3k$

Similarly, $r = 2k$, $s = 3k$,

$t = 2k$, $u = 3k$

Now, $\frac{mp + nr + ot}{mq + ns + ou}$

$= \frac{m.2k + n.2k + o.2k}{m.3k + n.3k + o.3k}$

$= \frac{2k(m + n + o)}{3k(m + n + o)} = \frac{2}{3}$ or $2 : 3$

12. (3) $\frac{x}{y} = \frac{3}{4} \Rightarrow \frac{7x}{3y} = \frac{7}{3} \times \frac{3}{4} = \frac{7}{4}$

By componendo and dividendo,

$\frac{7x + 3y}{7x - 3y} = \frac{7 + 4}{7 - 4} = \frac{11}{3}$ or $11 : 3$

13. (3) $\frac{a}{y - z} = \frac{b}{z - x} = \frac{c}{x - y} = k$

$\Rightarrow a = k(y - z)$; $b = k(z - x)$;

$c = k(x - y)$

$\therefore ax + by + cz = k(xy - xz + yz - xy + xz - yz) = 0$

14. (2) $\frac{50}{100}(p - q) = \frac{30}{100}(p + q)$

$\Rightarrow 5(p - q) = 3(p + q)$

$\Rightarrow 5p - 5q = 3p + 3q$

$\Rightarrow 2p = 8q$

$\Rightarrow p = 4q$

$\therefore p : q = 4 : 1$

15. (3) $\frac{x}{y} = 2 \Rightarrow x = 2y$

$\Rightarrow x - 2y = 0$ ...(i)

$\therefore 5x^2 - 13xy + 6y^2$

$= 5x^2 - 10xy - 3xy + 6y^2$

$= 5x(x - 2y) - 3y(x - 2y)$

$= (x - 2y)(5x - 3y)$

$= 0 \times (5x - 3y) = 0$ [Using (i)]

16. (1) $y : x = 4 : 15$

$\Rightarrow x : y = 15 : 4$

By componendo and dividendo,

$\frac{x - y}{x + y} = \frac{15 - 4}{15 + 4} = \frac{11}{19}$

17. (3) $\frac{x}{y} = \frac{3}{4}$ (Given)

$\therefore \frac{5x - 2y}{7x + 2y} = \frac{5\frac{x}{y} - 2}{7\frac{x}{y} + 2}$

$= \frac{5 \times \frac{3}{4} - 2}{7 \times \frac{3}{4} + 2} = \frac{\frac{15 - 8}{4}}{\frac{21 + 8}{4}} = \frac{7}{29}$

18. (3) $x^2 + 9y^2 = 6xy$

$\Rightarrow x^2 - 6xy + 9y^2 = 0$

$\Rightarrow x^2 - 2.x.3y + (3y)^2 = 0$

$\Rightarrow (x - 3y)^2 = 0$

$\Rightarrow x - 3y = 0$

$\Rightarrow x = 3y$

$\Rightarrow x : y = 3 : 1$

19. (1) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

$\Rightarrow (4\sqrt{3})^2 = 16 + 2(ab + bc + ca)$

$\Rightarrow 48 = 16 + 2(ab + bc + ca)$

$\Rightarrow 2(ab + bc + ca) = 48 - 16 = 32$

$\Rightarrow ab + bc + ca = 16$

$\therefore a = b = c = \frac{4\sqrt{3}}{3} = \frac{4}{\sqrt{3}}$

$\therefore a : b : c = 1 : 1 : 1$

20. (2) $\frac{3x}{2y} = \frac{21}{22}$

$\Rightarrow \frac{x}{y} = \frac{21}{22} \times \frac{2}{3} = \frac{7}{11}$

$\Rightarrow \frac{x}{7} = \frac{y}{11} = k$

$\therefore 4x + 5y = 83$

$\Rightarrow 4 \times 7k + 5 \times 11k = 83$

$\Rightarrow 28k + 55k = 83$

$\Rightarrow 83k = 83 \Rightarrow k = 1$

$\therefore x = 7, y = 11$

$\therefore y - x = 11 - 7 = 4$

21. (4) $\frac{x}{xa + yb + zc} = \frac{y}{ya + zb + xc}$

$= \frac{z}{za + xb + yc}$

$= \frac{x + y + z}{xa + yb + zc + ya + zb + xc + za + xb + yc}$

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$$= \frac{x+y+z}{xa+ya+za+yb+ya+yc+zc+zb+za}$$

$$= \frac{x+y+z}{a(x+y+z)+b(x+y+z)+c(x+y+z)}$$

$$= \frac{x+y+z}{(a+b+c)(x+y+z)}$$

$$= \frac{1}{a+b+c}$$

22. (1) $\frac{x}{y} = \frac{3}{2}$

By componendo and dividend,

$$\frac{x+y}{x-y} = \frac{3+2}{3-2}$$

$$\Rightarrow \frac{x+y}{x-y} = \frac{5}{1} = 5:1$$

23. (2) $a^2+b^2+c^2-ab-bc-ca=0$
$\Rightarrow 2a^2+2b^2+2c^2-2ab-2bc-2ca=0$
$\Rightarrow (a^2+b^2-2ab)+(b^2+c^2-2bc)+(c^2+a^2-2ca)=0$
$\Rightarrow (a-b)^2+(b-c)^2+(c-a)^2=0$
[If $x^2+y^2+z^2=0$ then, $x=0, y=0, z=0$]
$\therefore a-b=0 \Rightarrow a=b$
$b-c=0 \Rightarrow b=c$
$c-a=0 \Rightarrow c=a$
$\therefore a=b=c$
$\therefore a:b:c=1:1:1$

TYPE-V

1. (3) $\left[-\frac{1}{4}\right]+\left[4\frac{1}{4}\right]+[3]$
$= -1+4+3=6$

2. (3) $a \oplus b = 2a$ if $a > b$
$= a+b$ if $a < b$
$= a^2$ if $a = b$

$$\therefore \frac{(5\oplus 7)+(4\oplus 4)}{3(5\oplus 5)-(15\oplus 11)-3}$$

$$= \frac{(5+7)+4^2}{3\times 5^2-2\times 15-3}$$

$$= \frac{12+16}{75-30-3} = \frac{28}{42} = \frac{2}{3}$$

3. (3) Given $a \circledast b = a+b$ when $a > 0, b > 0$

$a \circledast b = \sqrt{a^2+b^2}$; for other values of a and b
Expression,

$$= \frac{8 \circledast (7-13)-(3 \circledast 1)}{(3-6) \circledast (9-5)}$$

$$= \frac{8 \circledast (-6)-(3+1)}{(-3) \circledast (-4)}$$

$$= \frac{\sqrt{(8)^2+(-6)^2}-4}{\sqrt{(-3)^2+(-4)^2}}$$

$$= \frac{\sqrt{64+36}-4}{\sqrt{9+16}}$$

$$= \frac{\sqrt{100}-4}{\sqrt{25}} = \frac{10-4}{5} = \frac{6}{5}$$

4. (2) $(a-b)^2 = a^2-2ab+b^2$
$x^4-2x^2+k=(x^2)^2-2.x^2.1+k$
$\therefore k=(1)^2=1$

5. (3) $x = \sqrt[3]{a+\sqrt{a^2+b^3}} + \sqrt[3]{a-\sqrt{a^2+b^3}}$

Cubing both sides,

$$x^3 = \left(\sqrt[3]{a+\sqrt{a^2+b^3}}\right)^3 + \left(\sqrt[3]{a-\sqrt{a^2+b^3}}\right)^3 + 3\left(\sqrt[3]{a+\sqrt{a^2+b^3}}\right)\left(\sqrt[3]{a-\sqrt{a^2+b^3}}\right)\left(\sqrt[3]{a+\sqrt{a^2+b^3}}+\sqrt[3]{a-\sqrt{a^2+b^3}}\right)$$

$$= a+\sqrt{a^2+b^3}+a-\sqrt{a^2+b^3} + 3\left(\frac{a+\sqrt{a^2+b^3}}{a-\sqrt{a^2+b^3}}\times\right)^{\frac{1}{3}}x$$

$$= 2a+3\left(a^2-a^2-b^3\right)^{\frac{1}{3}}x$$

$$= 2a+(-3bx)$$

$\therefore x^3+3bx=2a$

6. (3) Let $\frac{1}{3}=a, \frac{1}{4}=b$ and $\frac{1}{5}=c$

$\therefore$ Expression

$$= \frac{a^3+b^3+c^3-3abc}{a^2+b^2+c^2-ab-ac-bc}$$

$$= \frac{(a+b+c)(a^2+b^2+c^2-ab-ac-bc)}{a^2+b^2+c^2-ab-ac-bc} = a+b+c$$

$$= \frac{1}{3}+\frac{1}{4}+\frac{1}{5} = \frac{20+15+12}{60} = \frac{47}{60}$$

7. (4) $x^m \times x^n = 1$
$\Rightarrow x^{m+n} = x^0$
$\Rightarrow m+n=0$
$\Rightarrow m=-n$

8. (2) $(a+b)^2 = a^2+2ab+b^2$
$\therefore 4x^2+8x+4=(2x)^2+2\times 2x\times 2+(2)^2=(2x+2)^2$
$\therefore$ Required number $= 4$

9. (2) $x+\frac{1}{x} = 2N$

$\therefore$ Mean of x^2 and $\frac{1}{x^2}$

$$= \frac{x^2+\frac{1}{x^2}}{2}$$

$$= \frac{\left(x+\frac{1}{x}\right)^2-2}{2} = \frac{(2N)^2-2}{2}$$

$$= \frac{4N^2-2}{2} = 2N^2-1$$

10. (4) $3a^2+3b^2+3c^2=(a+b+c)^2$
$\Rightarrow 3a^2+3b^2+3c^2=a^2+b^2+c^2+2ab+2bc+2ac$
$\Rightarrow 3a^2+3b^2+3c^2-a^2-b^2-c^2-2ab-2bc-2ac=0$
$\Rightarrow 2a^2+2b^2+2c^2-2ab-2bc-2ac=0$
$\Rightarrow a^2+b^2-2ab+b^2+c^2-2bc+a^2+c^2-2ac=0$
$\Rightarrow (a-b)^2+(b-c)^2+(c-a)^2=0$
$\Rightarrow a-b=0 \Rightarrow a=b$
$b-c=0 \Rightarrow b=c$
$c-a=0 \Rightarrow c=a$
$\therefore a=b=c$

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TEST YOURSELF

1. If $x^2 - 3x + 1 = 0$, find the value of $x^3 + \frac{1}{x^3}$.
(1) 18 (2) 16
(3) 27 (4) 23

2. If $a^2 + b^2 + c^2 = 2(2a - 3b - 5c) - 38$, find the value of $(a - b - c)$.
(1) 9 (2) 10
(3) 11 (4) 12

3. If $a + b + c = 0$, then
$$\frac{2a^2}{b^2+c^2-a^2} + \frac{2b^2}{c^2+a^2-b^2} + \frac{2c^2}{a^2+b^2-c^2} + 3 = ?$$
(1) 3 (2) – 4
(3) 0 (4) – 3

4. What are the factors of the following expression ?
$$a^2 + \frac{1}{a^2} - 13a + \frac{13}{a} + 34 :$$
(1) $\left(a - \frac{1}{a} + 4\right)\left(a - \frac{1}{a} - 9\right)$
(2) $\left(a - \frac{1}{a} - 4\right)\left(a - \frac{1}{a} + 9\right)$
(3) $\left(a + \frac{1}{a} - 4\right)\left(a - \frac{1}{a} + 9\right)$
(4) $\left(a + \frac{1}{a} - 4\right)\left(a + \frac{1}{a} + 9\right)$

5. If $2x - \frac{1}{3x} = 5$, find the value of $\left(27x^3 - \frac{1}{8x^3}\right)$.
(1) $\frac{3645}{8}$ (2) $\frac{3465}{8}$
(3) $\frac{3645}{4}$ (4) 459

6. Resolve into factors :
$(x - 1)(x + 1)(x + 3)(x + 5) + 7$
(1) $(x + 2 + \sqrt{2})(x + 2 - \sqrt{2})$
$(x + 2 + 2\sqrt{2})(x + 2 - 2\sqrt{2})$
(2) $(x - 2 + \sqrt{2})(x - 2 - \sqrt{2})$
$(x + 2 + 2\sqrt{2})(x + 2 - 2\sqrt{2})$
(3) $(x - 2 - \sqrt{2})(x + 2 + \sqrt{2})$
$(x - 2 - 2\sqrt{2})(x - 2 - 2\sqrt{2})$
(4) None of these

7. If $a + b + c = 0$, then
$$\frac{bc}{bc-a^2} + \frac{ca}{ca-b^2} + \frac{ab}{ab-c^2} = ?$$
(1) 1 (2) –1
(3) 0 (4) 2

8. If $a = 2 + \sqrt{3}$, find the value of $\frac{a^3}{a^6 + 3a^3 + 1}$.
(1) 55 (2) $\frac{1}{55}$
(3) $\frac{1}{40}$ (4) $\frac{3}{55}$

9. p and q are positive numbers satisfying $3p + 2pq = 4$ and $5q + pq = 3$. Find the value of p.
(1) 1 or $-\frac{9}{5}$ (2) $\frac{1}{2}$ or $-\frac{20}{3}$
(3) 1 or $-\frac{20}{3}$ (4) $\frac{1}{2}$ or $-\frac{9}{5}$

10. If $a + b + c = 5$, $ab + bc + ca = 7$ and $abc = 3$, find the value of
$$\left(\frac{a}{b} + \frac{b}{a}\right) + \left(\frac{b}{c} + \frac{c}{b}\right) + \left(\frac{c}{a} + \frac{a}{c}\right)$$
(1) $8\frac{2}{3}$ (2) $7\frac{2}{3}$
(3) $9\frac{2}{3}$ (4) $8\frac{1}{3}$

11. If $\frac{a}{b+c} + \frac{b}{c+a} + \frac{c}{a+b} = 1$ then
$$\frac{a^2}{b+c} + \frac{b^2}{c+a} + \frac{c^2}{a+b} = ?$$
(1) 1 (2) –1
(3) 0 (4) 2

12. If $a = 7 + 4\sqrt{3}$, find the value of $\frac{3a^6 + 2a^4 + 4a^3 + 2a^2 + 3}{a^4 + a^3 + a^2}$.
(1) $\frac{8138}{17}$ (2) $\frac{8138}{15}$
(3) $\frac{8238}{15}$ (4) $\frac{8338}{15}$

13. If $x\frac{x-bc}{b+c} + \frac{x-ca}{c+a} + \frac{x-ab}{a+b} = a+b+c$ what is the value of x?
(1) ab (2) $ab + bc$
(3) $bc + ca$ (4) $ab + bc + ca$

14. If $x^4 + \frac{1}{x^4} = 47$, what will be the value of $x^3 + \frac{1}{x^3}$?
(1) 18 (2) 17
(3) 19 (4) 20

15. If $x = \frac{1}{2 - \sqrt{3}}$, what will be the value of $x^3 - 2x^2 - 7x + 5$?
(1) 0 (2) 2
(3) 3 (4) 4

16. If $\frac{5 + 2\sqrt{3}}{7 + 4\sqrt{3}} = a + b\sqrt{3}$, the values of a and b respectively are :
(1) $a = -11$, $b = 6$
(2) $a = 11$, $b = -6$
(3) $a = 6$, $b = 11$
(4) $a = -6$, $b = -11$

17. If $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$; $a + b \neq 0$; then $x = ?$
(1) $x = -a$ (2) $x = -b$
(3) $x = -a$ or $-b$ (4) $x = a$ or b

18. For what value of 'a', the polynomial $2x^3 + ax^2 + 11x + a + 3$, is exactly divisible by $(2x - 1)$?
(1) 7 (2) –7
(3) 5 (4) –5

19. If $a + b + c = 15$ and $a^2 + b^2 + c^2 = 83$, then $a^3 + b^3 + c^3 - 3abc = ?$
(1) 160 (2) 175
(3) 180 (4) 100

20. What will be the value of $(x - a)^3 + (x - b)^3 + (x - c)^3 - 3(x - a)(x - b)(x - c)$ if $a + b + c = 3x$?
(1) 1 (2) 3
(3) 0 (4) 5

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21. If $p = 2 - a$, then $a^3 + 6ap + p^3 - 8 = ?$

(1) 0 (2) 8

(3) 6 (4) 5

22. If $4x^2 + 4y^2 + 4z^2 = 12x + 12y - 18$ then $x + y + z = ?$

(1) 3 (2) 4

(3) $\frac{3}{2}$ (4) 2

23. For what value of k, the system of equations

$5x + 2y = k$

$10x + 4y = 3$ has infinite solutions?

(1) $\frac{3}{2}$ (2) $\frac{1}{2}$

(3) $\frac{5}{2}$ (4) 2

24. ₹120 is divided between x, y and z, so that x's share is ₹20 more than y's and ₹20 less than z's. What is y's share?

(1) ₹25 (2) ₹20

(3) ₹30 (4) None of these

SHORT ANSWERS

1. (1)	2. (2)	3. (3)	4. (2)
5. (1)	6. (1)	7. (1)	8. (2)
9. (3)	10. (1)	11. (3)	12. (2)
13. (4)	14. (1)	15. (3)	16. (2)
17. (3)	18. (2)	19. (3)	20. (3)
21. (1)	22. (1)	23. (1)	24. (2)

EXPLANATIONS

1. (1) $x^2 - 3x + 1 = 0$

$\Rightarrow x^2 + 1 = 3x$

$\Rightarrow \frac{x^2+1}{x} = 3$

$\Rightarrow x + \frac{1}{x} = 3$

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 3 = 27$

$\Rightarrow x^3 + \frac{1}{x^3} = 27 - 9 = 18$

2. (2) $a^2 + b^2 + c^2 = 4a - 6b - 10c - 38$

$\Rightarrow a^2 + b^2 + c^2 - 4a + 6b + 10c + 38 = 0$

$\Rightarrow a^2 - 4a + 4 + b^2 + 6b + 9 + c^2 + 10c + 25 = 0$

$\Rightarrow (a-2)^2 + (b+3)^2 + (c+5)^2 = 0$

$\therefore a - 2 = 0 \Rightarrow a = 2$

$b + 3 = 0 \Rightarrow b = -3$

$c + 5 = 0 \Rightarrow c = -5$

$\therefore a - b - c = 2 + 3 + 5 = 10$

3. (3) If $a + b + c = 0$

$a + b = -c$

On squaring both sides,

$\Rightarrow a^2 + b^2 + 2ab = c^2$

Similarly, $a^2 = b^2 + c^2 + 2ac$

$b^2 = a^2 + c^2 + 2ac$

$\therefore$ Expression $= \frac{2a^2}{b^2+c^2-a^2} + \frac{2b^2}{c^2+a^2-b^2} + \frac{2c^2}{a^2+b^2-c^2} + 3$

L.H.S. $= \frac{2a^2}{b^2+c^2-a^2} + 1 + \frac{2b^2}{c^2+a^2-b^2} + 1 + \frac{2c^2}{a^2+b^2-c^2} + 1$

$= \frac{a^2+b^2+c^2}{b^2+c^2-a^2} + \frac{a^2+b^2+c^2}{c^2+a^2-b^2} + \frac{a^2+b^2+c^2}{a^2+b^2-c^2} = (a^2 + b^2 + c^2)$

$\left[\frac{1}{b^2+c^2-b^2-c^2-2bc} + \frac{1}{c^2+a^2-c^2-a^2-2ac} + \frac{1}{a^2+b^2-a^2-b^2-2ab}\right]$

$= (a^2 + b^2 + c^2)\left(\frac{1}{-2bc} - \frac{1}{2ac} - \frac{1}{2ab}\right) = (a^2 + b^2 + c^2)\left(\frac{-a-b-c}{2abc}\right) = 0$

4. (2) $a^2 + \frac{1}{a^2} - 13\left(a - \frac{1}{a}\right) + 34$

$= \left(a - \frac{1}{a}\right)^2 + 2 - 13\left(a - \frac{1}{a}\right) + 34$

$= \left(a - \frac{1}{a}\right)^2 - 13\left(a - \frac{1}{a}\right) + 36$

Let $\left(a - \frac{1}{a}\right) = x$

$\therefore$ Expression $= x^2 - 13x + 36$

$= x^2 - 9x - 4x + 36 = x(x-9) - 4(x-9)$

$= (x-4)(x-9)$

$= \left(a - \frac{1}{a} - 4\right)\left(a - \frac{1}{a} - 9\right)$

5. (1) $2x - \frac{1}{3x} = 5$

On multiplying both sides by $\frac{3}{2}$,

$3x - \frac{1}{2x} = \frac{15}{2}$

On cubing both sides,

$27x^3 - \frac{1}{8x^3} - 3 \cdot 3x \cdot \frac{1}{2x}\left(3x - \frac{1}{2x}\right) = \frac{3375}{8}$

$\Rightarrow 27x^3 - \frac{1}{8x^3} - \frac{9}{2} \times \frac{15}{2} = \frac{3375}{8}$

$\Rightarrow 27x^3 - \frac{1}{8x^3} = \frac{3375}{8} + \frac{135}{4}$

$= \frac{3375 + 270}{8} = \frac{3645}{8}$

6. (1) $(x-1)(x+5)(x+1)(x+3) + 7$

$= (x^2 + 5x - x - 5)(x^2 + 3x + x + 3) + 7$

$= (x^2 + 4x - 5)(x^2 + 3x + x + 3) + 7$

Putting $x^2 + 4x = y$, we have,

Expression $= (y-5)(y+3) + 7$

$= y^2 - 5y + 3y - 15 + 7$

$= y^2 - 2y - 8$

$= y^2 - 4y + 2y - 8$

$= y(y-4) + 2(y-4)$

$= (y+2)(y-4)$

Now,

$y + 2 = x^2 + 4x + 2$

$= x^2 + 4x + 4 - 2$

$= (x+2)^2 - \left(\sqrt{2}\right)^2$

$= \left(x + 2 + \sqrt{2}\right)\left(x + 2 - \sqrt{2}\right)$

Again, $y - 4$

$= x^2 + 4x - 4$

$= x^2 + 4x + 4 - 8$

$= (x+2)^2 - (2\sqrt{2})^2$

$= \left(x + 2 + 2\sqrt{2}\right)\left(x + 2 - 2\sqrt{2}\right)$

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$\therefore$ Factorisation is

$= (x+2+\sqrt{2})(x+2-\sqrt{2})$

$(x+2+2\sqrt{2})(x+2-2\sqrt{2})$

7. (1) $a+b+c=0$

$\Rightarrow a=-b-c$

$\Rightarrow a^2=-ab-ac$

$\therefore bc-a^2=bc+ab+ac$

Similarly,

$ca-b^2=ca+ab+bc$

$ab-c^2=ab+bc+ca$

$$\therefore \frac{bc}{bc-a^2}+\frac{ca}{ca-b^2}+\frac{ab}{ab-c^2}$$

$$=\frac{bc}{ab+bc+ca}+\frac{ca}{ab+bc+ca}+\frac{ab}{ab+bc+ca}$$

$$=\frac{ab+bc+ca}{ab+bc+ca}=1$$

8. (2) $a=2+\sqrt{3}$

$$\therefore \frac{1}{a}=\frac{1}{2+\sqrt{3}}$$

$$=\frac{2-\sqrt{3}}{(2+\sqrt{3})(2-\sqrt{3})}=\frac{2-\sqrt{3}}{4-3}$$

$=2-\sqrt{3}$

Now,

$$\frac{a^3}{a^6+3a^3+1}=\frac{1}{a^3+3+\frac{1}{a^3}}$$

[Dividing numerator and denominator by a^3]

$$=\frac{1}{a^3+\frac{1}{a^3}+3}$$

$$=\frac{1}{\left(a+\frac{1}{a}\right)^3-3\left(a+\frac{1}{a}\right)+3}$$

$$=\frac{1}{(4)^3-3(4)+3}$$

$$=\frac{1}{64-12+3}=\frac{1}{55}$$

9. (3) $3p+2pq=4$

$\Rightarrow p(3+2q)=4$

$$\Rightarrow p=\frac{4}{3+2q} \quad \ldots..(i)$$

Now, putting the value of p in $5q+pq=3$, we get

$$5q+\frac{4}{3+2q}(q)=3$$

$$\Rightarrow \frac{15q+10q^2+4q}{3+2q}=3$$

$\Rightarrow 19q+10q^2=9+6q$

$\Rightarrow 10q^2+13q-9=0$

$\Rightarrow 10q^2+18q-5q-9=0$

$\Rightarrow 2q(5q+9)-1(5q+9)=0$

$\Rightarrow (2q-1)(5q+9)=0$

$$\Rightarrow q=\frac{1}{2} \text{ or } -\frac{9}{5}$$

Putting $q=\frac{1}{2}$ in (i),

$$p=\frac{4}{3+2\times\frac{1}{2}}=1$$

Putting $q=-\frac{9}{5}$

$$p=\frac{4}{3+2\left(-\frac{9}{5}\right)}=\frac{4\times5}{15-18}$$

$$=-\frac{20}{3}$$

10. (1) $a+b+c=5$;

$ab+bc+ca=7$

$abc=3$

$a^2+b^2+c^2=(a+b+c)^2-2(ab+bc+ca)$

$=25-2\times7=11$.

Clearly, $a=b=1, c=3$

$a=c=1, b=3$

$b=c=1, a=3$

$\therefore$

$$\left(\frac{a}{b}+\frac{b}{a}\right)+\left(\frac{b}{c}+\frac{c}{b}\right)+\left(\frac{c}{a}+\frac{a}{c}\right)$$

$$=(1+1)+\left(\frac{1}{3}+3\right)+\left(3+\frac{1}{3}\right)$$

$$=8+\frac{1}{3}+\frac{1}{3}=8\frac{2}{3}$$

11. (3) $\frac{a}{b+c}=1-\frac{b}{c+a}-\frac{c}{a+b}$

$$\therefore \frac{a^2}{b+c}=a-\frac{ab}{c+a}-\frac{ac}{a+b}$$

$$\frac{b}{a+c}=1-\frac{a}{b+c}-\frac{c}{a+b}$$

$$\therefore \frac{b^2}{a+c}=b-\frac{ab}{b+c}-\frac{bc}{a+b}$$

$$\frac{a}{a+b}=1-\frac{a}{b+c}-\frac{b}{c+a}$$

$$\therefore \frac{c^2}{a+c}=c-\frac{ac}{b+c}-\frac{bc}{c+a}$$

$$\therefore \frac{a^2}{b+c}+\frac{b^2}{a+c}+\frac{c^2}{a+b}$$

$$=a+b+c-\left(\frac{ab}{c+a}+\frac{bc}{c+a}\right)-\left(\frac{ac}{a+b}+\frac{bc}{a+b}\right)-\left(\frac{ab}{b+c}+\frac{ac}{b+c}\right)$$

$$=a+b+c-b\left(\frac{a+c}{c+a}\right)-c\left(\frac{a+b}{a+b}\right)-a\left(\frac{b+c}{b+c}\right)$$

$=a+b+c-b-c-a=0$

12. (2) $a=7+4\sqrt{3}$

$$\therefore \frac{1}{a}=\frac{1}{7+4\sqrt{3}}$$

$$=\frac{1}{7+4\sqrt{3}}\times\frac{7-4\sqrt{3}}{7-4\sqrt{3}}$$

$$=\frac{7-4\sqrt{3}}{49-48}=7-4\sqrt{3}$$

Expression

$$=\frac{3a^6+2a^4+4a^3+2a^2+3}{a^4+a^3+a^2}$$

$$=\frac{3a^3+2a+4+\frac{2}{a}+\frac{3}{a^3}}{a+1+\frac{1}{a}}$$

[Dividing numerator and denominator by a^2]

$$=\frac{3\left(a^3+\frac{1}{a^3}\right)+2\left(a+\frac{1}{a}\right)+4}{\left(a+\frac{1}{a}\right)+1}$$

$$=\frac{3\left(\left(a+\frac{1}{a}\right)^3-3\left(a+\frac{1}{a}\right)\right)+2\left(a+\frac{1}{a}\right)+4}{\left(a+\frac{1}{a}\right)+1}$$

$$=\frac{3\left((14)^3-3\times14\right)+2\times14+4}{14+1}$$

$$=\frac{3\times2702+28+4}{15}=\frac{8138}{15}$$

13. (4) $\frac{x-bc}{b+c}+\frac{x-ca}{c+a}+\frac{x-ab}{a+b}$

$=a+b+c$

$$\Rightarrow \frac{x-bc}{b+c}-a+\frac{x-ca}{c+a}-b+\frac{x-ab}{a+b}-c=0$$

$$\Rightarrow \frac{x-bc-ab-ac}{b+c}+\frac{x-ca-bc-ab}{c+a}+\frac{x-ab-ac-bc}{a+b}=0$$

$\Rightarrow x-bc-ab-ac=0$

$\Rightarrow x=ab+bc+ac$

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14. (1) $x^4 + \frac{1}{x^4} = 47$

$\Rightarrow (x^2)^2 + \left(\frac{1}{x^2}\right)^2 = 47$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 - 2 = 47$

$[\because a^2 + b^2 = (a+b)^2 - 2ab]$

$\Rightarrow \left(x^2 + \frac{1}{x^2}\right)^2 = 47 + 2 = 49$

$\Rightarrow x^2 + \frac{1}{x^2} = \sqrt{49} = 7$

Again, $\left(x + \frac{1}{x}\right)^2 - 2 = 7$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = 7 + 2 = 9$

$\Rightarrow x + \frac{1}{x} = \sqrt{9} = 3$

On cubing both sides,

$\left(x + \frac{1}{x}\right)^3 = 3^3$

$\Rightarrow x^3 + \frac{1}{x^3} + 3\left(x + \frac{1}{x}\right) = 27$

$\Rightarrow x^3 + \frac{1}{x^3} + 3 \times 3 = 27$

$\Rightarrow x^3 + \frac{1}{x^3} = 27 - 9 = 18$

15. (3) $x = \frac{1}{2-\sqrt{3}}$

$= \frac{1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$

$= \frac{2+\sqrt{3}}{2^2 - (\sqrt{3})^2} = \frac{2+\sqrt{3}}{4-3}$

$= 2 + \sqrt{3}$

$\Rightarrow x - 2 = \sqrt{3}$

On squaring both sides,

$\Rightarrow (x-2)^2 = (\sqrt{3})^2$

$\Rightarrow x^2 - 4x + 4 = 3$

$\Rightarrow x^2 - 4x + 1 = 0$

$x^2 - 4x + 1 \overline{)\, x^3 - 2x^2 - 7x + 5 \,(x + 2}$

$\underline{x^3 - 4x^2 + x}$

$2x^2 - 8x + 5$

$\underline{2x^2 - 8x + 2}$

3

$\therefore x^3 - 2x^2 - 7x + 5 = (x^2 - 4x + 1)(x + 2) + 3 = 0 + 3 = 3$

16. (2) Expression $= \frac{5+2\sqrt{3}}{7+4\sqrt{3}}$

$= \frac{5+2\sqrt{3}}{7+4\sqrt{3}} \times \frac{7-4\sqrt{3}}{7-4\sqrt{3}}$

Rationlising the denominator

$= \frac{5\times7 - 5\times4\sqrt{3} + 2\sqrt{3}\times7 - 2\sqrt{3}\times4\sqrt{3}}{7^2 - (4\sqrt{3})^2}$

$= \frac{35 - 20\sqrt{3} + 14\sqrt{3} - 24}{49 - 48}$

$= 11 - 6\sqrt{3}$

$\therefore \frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a + b\sqrt{3}$

$\Rightarrow a + b\sqrt{3} = 11 - 6\sqrt{3}$

$\Rightarrow a = 11, b = -6$

17. (3) $\frac{1}{a+b+x} - \frac{1}{x} = \frac{1}{a} + \frac{1}{b}$

$\Rightarrow \frac{x - (a+b+x)}{x(a+b+x)} = \frac{a+b}{ab}$

$\Rightarrow \frac{-(a+b)}{x(a+b+x)} = \frac{a+b}{ab}$

$\Rightarrow -ab(a+b) = (a+b)x(a+b+x)$

$\Rightarrow (a+b)[x(a+b+x) + ab] = 0$

$\Rightarrow x(a+b+x) + ab = 0$

$[\because a + b \neq 0]$

$\Rightarrow x^2 + ax + bx + ab = 0$

$\Rightarrow x(x+a) + b(x+a) = 0$

$\Rightarrow (x+a)(x+b) = 0$

$\Rightarrow x = -a$ or, $-b$

18. (2) Let, $P(x) = 2x^3 + ax^2 + 11x + a + 3$

$(2x-1)$ is its factor.

$\therefore P\left(\frac{1}{2}\right) = 0$

$\Rightarrow 2 \times \left(\frac{1}{2}\right)^3 + a \times \left(\frac{1}{2}\right)^2 + 11 \times \frac{1}{2} + a + 3 = 0$

$\Rightarrow \frac{1}{4} + \frac{a}{4} + \frac{11}{2} + a + 3 = 0$

$\Rightarrow \frac{1 + a + 22 + 4a + 12}{4} = 0$

$\Rightarrow \frac{5a + 35}{4} = 0$

$\Rightarrow 5a + 35 = 0 \Rightarrow 5a = -35$

$\Rightarrow a = -7$

19. (3) $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

Now, $(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 15^2 = 83 + 2(ab + bc + ca)$

$\Rightarrow 225 = 83 + 2(ab + bc + ca)$

$\Rightarrow 142 = 2(ab + bc + ca)$

$\Rightarrow ab + bc + ca = \frac{142}{2} = 71$

$\therefore a^3 + b^3 + c^3 - 3abc = 15 \times (83 - 71) = 15 \times 12 = 180$

20. (3) $x - a + x - b + x - c$

$= 3x - (a + b + c) = 0$

$\therefore (x-a)^3 + (x-b)^3 + (x-c)^3 - 3(x-a)(x-b)(x-c) = 0$

$[\because a^3 + b^3 + c^3 - 3abc = 0$ when $a + b + c = 0$

21. (1) $p = 2 - a \Rightarrow a + p - 2 = 0$

$\therefore a^3 + 6ap + p^3 - 8$

$= a^3 + p^3 + (-2)^3 - 3ap(-2)$

$= (a + p - 2)\{a^2 + p^2 + (-2)^2 - ap - p(-2) - a(-2)\}$

$= (a + p - 2)(a^2 + p^2 + 4 - ap + 2p + 2a) = 0$

22. (1) $4x^2 + 4y^2 + 4z^2 - 12x - 12y + 18 = 0$

$\Rightarrow (2x)^2 - 2 \times 2x \times 3 + 9 + (2y)^2 - 2 \times 2y \times 3 + 9 + 4z^2 = 0$

$\Rightarrow (2x-3)^2 + (2y-3)^2 + 4z^2 = 0$

$\Rightarrow 2x - 3 = 0$

$\Rightarrow x = \frac{3}{2}$;

$2y - 3 = 0$

$\Rightarrow y = \frac{3}{2}, z = 0$

$\therefore x + y + z = \frac{3}{2} + \frac{3}{2} + 0$

$= \frac{6}{2} = 3$

[If $x^2 + y^2 + z^2 = 0 \Rightarrow x = 0, y = 0, z = 0$]

23. (1) $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ will have infinite solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{5}{10} = \frac{2}{4} = \frac{-k}{-3}$

$\Rightarrow \frac{1}{2} = \frac{k}{3} \Rightarrow k = \frac{3}{2}$

24. (2) x = Rs. $(y + 20)$

z = Rs. $(y + 40)$

$\therefore y + y + 20 + y + 40 = 120$

$\Rightarrow 3y = 60$

$\Rightarrow y$ = Rs. 20

□□□

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18 TRIGONOMETRY

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. In circular measure, the value of the angle 11°15′ is

(1) $\frac{\pi^c}{16}$ (2) $\frac{\pi^c}{8}$

(3) $\frac{\pi^c}{4}$ (4) $\frac{\pi^c}{12}$

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

2. In a triangle ABC, $\angle ABC = 75°$ and $\angle ACB = \frac{\pi^c}{4}$. The circular measure of $\angle BAC$ is

(1) $\frac{5\pi}{12}$ radian (2) $\frac{\pi}{3}$ radian

(3) $\frac{\pi}{6}$ radian (4) $\frac{\pi}{2}$ radian

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

3. The circular measure of an angle of an isosceles triangle is $\frac{5\pi}{9}$. Circular measure of one of the other angles must be

(1) $\frac{5\pi}{18}$ (2) $\frac{5\pi}{9}$

(3) $\frac{2\pi}{9}$ (4) $\frac{4\pi}{9}$

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

4. The degree measure of 1 radian (taking $\pi = \frac{22}{7}$) is

(1) 57°61′22″ (approx.)
(2) 57°16′22″ (approx.)
(3) 57°22′16″ (approx.)
(4) 57°32′16″ (approx.)

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

5. $\left(\frac{3\pi}{5}\right)$ radians is equal to

(1) 100° (2) 120°
(3) 108° (4) 180°

(SSC Graduate Level Tier-I Exam. 19.05.2013)

6. If the sum of two angles is 135° and their difference is $\frac{\pi}{12}$, then the circular measure of the greater angle is

(1) $\frac{2\pi}{3}$ (2) $\frac{3\pi}{5}$

(3) $\frac{5\pi}{12}$ (4) $\frac{\pi}{3}$

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

7. If $0 \le \theta \le \frac{\pi}{2}$ and $\sec^2\theta + \tan^2\theta = 7$, then θ is

(1) $\frac{5\pi}{12}$ radian (2) $\frac{\pi}{3}$ radian

(3) $\frac{\pi}{5}$ radian (4) $\frac{\pi}{6}$ radian

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

8. If the sum and difference of two angles are $\frac{22}{9}$ radian and 36° respectively, then the value of smaller angle in degree taking the value of π as $\frac{22}{7}$ is :

(1) 52° (2) 60°
(3) 56° (4) 48°

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

TYPE–II

1. The minimum value of $2\sin^2\theta + 3\cos^2\theta$ is

(1) 0 (2) 3
(3) 2 (4) 1

(SSC CPO (SI, ASI & Intelligence Officer) Exam 28.08.2011 (Paper-I)

2. If $\text{cosec } 39° = x$, the value of $\frac{1}{\text{cosec}^2 51°} + \sin^2 39° + \tan^2 51° - \frac{1}{\sin^2 51° \sec^2 39°}$ is

(1) $\sqrt{x^2-1}$ (2) $\sqrt{1-x^2}$
(3) $x^2 - 1$ (4) $1 - x^2$

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

3. The value of $\tan 4° . \tan 43° . \tan 47° . \tan 86°$ is

(1) 2 (2) 3
(3) 1 (4) 4

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I) & (SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting) (North Zone)

4. If $\frac{\tan\theta + \cot\theta}{\tan\theta - \cot\theta} = 2$, $(0 \le \theta \le 90°)$, then the value of $\sin\theta$ is

(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$

(3) $\frac{1}{2}$ (4) 1

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

5. If $\cos x + \cos y = 2$, the value of $\sin x + \sin y$ is

(1) 0 (2) 1
(3) 2 (4) –1

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

6. The value of $\tan 1° \tan 2° \tan 3° \ldots\ldots \tan 89°$ is :

(1) 1 (2) 0

(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL DEO & LDC Exam. 11.12.2011) (Ist Sitting) (Delhi) & (FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting) & (SSC GL Tier-I Exam. 21.04.2013) (Ist Sitting) & (SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

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7. The measure of the angles of a triangle are in the ratio 2 : 7 : 11. Measures of angles are
(1) 16°, 56°, 88°
(2) 18°, 63°, 99°
(3) 20°, 70°, 90°
(4) 25°, 175°, 105°
(SSC CPO S.I. Exam. 07.09.2003)

8. The angles of a triangle are $(x + 5)°$, $(2x - 3)°$ and $(3x + 4)°$. The value of x is
(1) 30 (2) 31
(3) 29 (4) 28
(FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

9. The value of cot 10° . cot 20° . cot 60° . cot 70° . cot 80° is
(1) 1 (2) –1
(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

10. If θ be an acute angle and $7\sin^2\theta + 3\cos^2\theta = 4$, then the value of tan θ is
(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$
(3) 1 (4) 0
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

11. The value of $\sin^2 1° + \sin^2 5° + \sin^2 9° + ... + \sin^2 89°$ is
(1) $11\frac{1}{2}$ (2) $11\sqrt{2}$
(3) 11 (4) $\frac{11}{\sqrt{2}}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

12. The numerical value of $\cot 18° \left(\cot 72° \cos^2 22° + \frac{1}{\tan 72° \sec^2 68°}\right)$ is
(1) 1 (2) $\sqrt{2}$
(3) 3 (4) $\frac{1}{\sqrt{3}}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

13. If $\tan 15° = 2 - \sqrt{3}$, the value of $\tan 15° \cot 75° + \tan 75° \cot 15°$ is
(1) 14 (2) 12
(3) 10 (4) 8
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

14. If x, y are acute angles, $0 < x + y < 90°$ and $\sin(2x - 20°) = \cos(2y + 20°)$, then the value of $\tan(x + y)$ is :
(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{\sqrt{3}}{2}$
(3) $\sqrt{3}$ (4) 1
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

15. If ∠A and ∠B are complementary to each other, then the value of $\sec^2 A + \sec^2 B - \sec^2 A \cdot \sec^2 B$ is
(1) 1 (2) –1
(3) 2 (4) 0
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

16. $\sin^2 5° + \sin^2 6° + ... + \sin^2 84° + \sin^2 85° = ?$
(1) $39\frac{1}{2}$ (2) $40\frac{1}{2}$
(3) 40 (4) $39\frac{1}{\sqrt{2}}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

17. $\sin^2 5° + \sin^2 10° + \sin^2 15° + ... + \sin^2 85° + \sin^2 90°$ is equal to
(1) $7\frac{1}{2}$ (2) $8\frac{1}{2}$
(3) 9 (4) $9\frac{1}{2}$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone) & (SSC CHSL DEO & LDC Exam. 21.10.2012) (IInd Sitting)

18. The value of $\frac{\sin 39°}{\cos 51°} + 2\tan 11° \tan 31° \tan 45° \tan 59° \tan 79° - 3(\sin^2 21° + \sin^2 69°)$ is :
(1) 2 (2) –1
(3) 1 (4) 0
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

19. If $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$ and $0° < \theta < 90°$, then the value of θ is :
(1) 30° (2) 45°
(3) 60° (4) None of these
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

20. If $A = \tan 11° \tan 29°$, $B = 2\cot 61° \cot 79°$, then :
(1) A = 2B (2) A = – 2B
(3) 2A = B (4) 2A = – B
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

21. If $\sin 17° = \frac{x}{y}$, then the value of $(\sec 17° - \sin 73°)$ is
(1) $\frac{y^2}{x\sqrt{y^2 - x^2}}$
(2) $\frac{x^2}{y\sqrt{y^2 - x^2}}$
(3) $\frac{x^2}{y\sqrt{x^2 - y^2}}$
(4) $\frac{y^2}{x\sqrt{x^2 - y^2}}$
(FCI Assistant Grade-III Exam, 05.02.2012 (Paper-I) East Zone (IInd Sitting) & (SSC Graduate Level Tier-II Exam. 16.09.2012)

22. If $0° < \theta < 90°$, the value of $\sin\theta + \cos\theta$ is
(1) equal to 1
(2) greater than 1
(3) less than 1
(4) equal to 2
(SSC Graduate Level Tier-II Exam. 16.09.2012)

23. The expression $\frac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$ is equal to
(1) tan 33° cot 57°
(2) tan 57° cot 37°
(3) tan 33° cot 53°
(4) tan 53° cot 37°
(SSC Graduate Level Tier-II Exam. 16.09.2012)

24. The value of $\frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$ is :
(1) 0 (2) 1
(3) $\sqrt{3} - 1$ (4) –1
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

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24. The value of
$\cot\theta.\tan(90°-\theta) - \sec(90°-\theta)\operatorname{cosec}\theta + (\sin^2 25° + \sin^2 65°) + \sqrt{3}(\tan 5° \tan 15°. \tan 30°. \tan 75°. \tan 85°)$ is :
(1) 1 (2) –1
(3) 2 (4) 0
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

25. If $\sin(3x-20°) = \cos(3y+20°)$, then the value of $(x+y)$ is
(1) 20° (2) 30°
(3) 40° (4) 45°
(SSC CHSL DEO & LDC Exam. 26.10.2012 (Ist Sitting)

27. If $\cos\theta \operatorname{cosec} 23° = 1$, the value of θ is
(1) 23° (2) 37°
(3) 63° (4) 67°
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

28. If $2(\cos^2\theta - \sin^2\theta) = 1$, θ is a positive acute angle, then the value of θ is
(1) 60° (2) 30°
(3) 45° (4) $22\frac{1}{2}°$
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

29. The value of $(\tan 35° \tan 45° \tan 55°)$ is
(1) $\frac{1}{2}$ (2) 2
(3) 0 (4) 1
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

30. If $\sec(7\theta + 28°) = \operatorname{cosec}(30° - 3\theta)$ then the value of θ is
(1) 8° (2) 5°
(3) 60° (4) 9°
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

31. If $\tan\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \sqrt{3}$, the value of $\cos\theta$ is :
(1) 0 (2) $\frac{1}{\sqrt{2}}$
(3) $\frac{1}{2}$ (4) 1
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

32. If $7\sin^2\theta + 3\cos^2\theta = 4$ $(0° \le \theta \le 90°)$, then value of θ is
(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$
(3) $\frac{\pi}{6}$ (4) $\frac{\pi}{4}$
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

33. If $\sec\theta = x + \frac{1}{4x}$ $(0° < \theta < 90°)$, then $\sec\theta + \tan\theta$ is equal to
(1) $\frac{x}{2}$ (2) $2x$
(3) x (4) $\frac{1}{2x}$
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

34. The value of
$\cos 1° \cos 2° \cos 3° \ldots\ldots$
$\cos 177° \cos 178° \cos 179°$ is :
(1) 0 (2) $\frac{1}{2}$
(3) 1 (4) $\frac{1}{\sqrt{2}}$
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

35. The value of
$(\sin^2 25° + \sin^2 65°)$ is :
(1) $\frac{\sqrt{3}}{2}$ (2) 1
(3) 0 (4) $\frac{2}{\sqrt{3}}$
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

36. If $\sec\theta + \tan\theta = \sqrt{3}$ $(0° \le \theta \le 90°)$, then $\tan 3\theta$ is
(1) undefined (2) $\frac{1}{\sqrt{3}}$
(3) $\frac{1}{\sqrt{2}}$ (4) $\sqrt{3}$
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

37. If $\sin(60° - \theta) = \cos(\psi - 30°)$, then the value of $\tan(\psi - \theta)$ is (assume that θ and ψ are both positive acute angles with $\theta < 60°$ and $\psi > 30°$).
(1) $\frac{1}{\sqrt{3}}$ (2) 0
(3) $\sqrt{3}$ (4) 1
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

38. If $a\sin\theta + b\cos\theta = c$ then the value of $a\cos\theta - b\sin\theta$ is :
(1) $\pm\sqrt{-a^2+b^2+c^2}$
(2) $\pm\sqrt{a^2+b^2-c^2}$
(3) $\pm\sqrt{a^2-b^2-c^2}$
(4) $\pm\sqrt{a^2-b^2+c^2}$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

39. If $\sin(A - B) = \frac{1}{2}$ and $\cos(A + B) = \frac{1}{2}$ where $A > B > 0$ and $A + B$ is an acute angle, then the value B is
(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{12}$
(3) $\frac{\pi}{4}$ (4) $\frac{\pi}{2}$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

40. Maximum value of $(2\sin\theta + 3\cos\theta)$ is
(1) 2 (2) $\sqrt{13}$
(3) $\sqrt{15}$ (4) 1
(SSC Graduate Level Tier-I Exam. 21.04.2013)

41. The value of
$152(\sin 30° + 2\cos^2 45° + 3\sin 30° + 4\cos^2 45° + \ldots. + 17\sin 30° + 18\cos^2 45°)$ is
(1) an integer but not a perfect square
(2) a rational number but not an integer
(3) a perfect square of an integer
(4) irrational
(SSC Graduate Level Tier-I Exam. 21.04.2013)

42. Evaluate : $3\cos 80° \operatorname{cosec} 10° + 2\cos 59° \operatorname{cosec} 31°$
(1) 1 (2) 3
(3) 2 (4) 5
(SSC Graduate Level Tier-I Exam. 19.05.2013)

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43. $\sin^2\theta - 3\sin\theta + 2 = 0$ will be true if
(1) $0 \le \theta < 90$ (2) $0 < \theta < 90$
(3) $\theta = 0°$ (4) $\theta = 90°$
(SSC Graduate Level Tier-I Exam. 19.05.2013)

44. If $\tan\alpha = n\tan\beta$ and $\sin\alpha = m\sin\beta$, then $\cos^2\alpha$ is
(1) $\frac{m^2}{n^2+1}$ (2) $\frac{m^2}{n^2}$
(3) $\frac{m^2-1}{n^2-1}$ (4) $\frac{m^2+1}{n^2+1}$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

45. If $\tan\theta = \frac{3}{4}$ and θ is acute, then $\operatorname{cosec}\theta$
(1) $\frac{4}{5}$ (2) $\frac{5}{3}$
(3) 2 (4) $\frac{1}{2}$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

46. If $\operatorname{cosec}\theta - \cot\theta = \frac{7}{2}$, the value of $\operatorname{cosec}\theta$ is :
(1) $\frac{47}{28}$ (2) $\frac{51}{28}$
(3) $\frac{53}{28}$ (4) $\frac{49}{28}$
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

47. If $x\sin 45° = y\operatorname{cosec} 30°$, then $\frac{x^4}{y^4}$ is equal to
(1) 4^3 (2) 6^3
(3) 2^3 (4) 8^3
(SSC Graduate Level Tier-II Exam. 29.09.2013)

48. If $5\tan\theta = 4$, then $\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta}$ is equal to
(1) $\frac{2}{3}$ (2) $\frac{1}{4}$
(3) $\frac{1}{6}$ (4) $\frac{1}{3}$
(SSC CHSL DEO & LDC Exam. 20.10.2013)

49. $2\operatorname{cosec}^2 23°\cot^2 67° - \sin^2 23° - \sin^2 67° - \cot^2 67°$ is equal to
(1) 1 (2) $\sec^2 23°$
(3) $\tan^2 23°$ (4) 0
(SSC CHSL, DEO & LDC Exam. 20.10.2013)

50. The equation
$$\cos^2\theta = \frac{(x+y)^2}{4xy}$$
is only possible when
(1) $x = -y$ (2) $x > y$
(3) $x = y$ (4) $x < y$
(SSC CHSL DEO & LDC Exam. 20.10.2013)

51. The value of $\operatorname{cosec}^2 18° - \frac{1}{\cot^2 72°}$ is
(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{\sqrt{2}}{3}$
(3) $\frac{1}{2}$ (4) 1
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

52. If $\alpha + \beta = 90°$, then the value of $(1-\sin^2\alpha)(1-\cos^2\alpha)\times(1+\cot^2\beta)(1+\tan^2\beta)$ is
(1) 1 (2) –1
(3) 0 (4) 2
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

53. $\frac{2\sin 68°}{\cos 22°} - \frac{2\cot 15°}{5\tan 75°} - \frac{3\tan 45°\cdot\tan 20°\cdot\tan 40°\cdot\tan 50°\cdot\tan 70°}{5}$
is equal to
(1) –1 (2) 0
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

54. The value of $\tan 10°\tan 15°\tan 75°\tan 80°$ is
(1) 0 (2) 1
(3) –1 (4) 2
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

55. The minimum value of $4\tan^2\theta + 9\cot^2\theta$ is equal to
(1) 0 (2) 5
(3) 12 (4) 13
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

56. If $\sin 7x = \cos 11x$, then the value of $\tan 9x + \cot 9x$ is
(1) 1 (2) 2
(3) 3 (4) 4
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

57. If $\tan^2\alpha = 1 + 2\tan^2\beta$ (α, β are positive acute angles), then $\sqrt{2}\cos\alpha - \cos\beta$ is equal to
(1) 0 (2) $\sqrt{2}$
(3) 1 (4) –1
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

58. The product $\cos1°\cos2°\cos3°\cos4°$ .... $\cos100°$ is equal to
(1) –1 (2) $\frac{1}{4}$
(3) 1 (4) 0
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

59. If $2(\cos^2\theta - \sin^2\theta) = 1$ (θ is a positive acute angle), then $\cot\theta$ is equal to
(1) $-\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$
(3) 1 (4) $\sqrt{3}$
(SSC CHSL DEO & LDC Exam. 20.10.2013)

60. If $\tan(2\theta + 45°) = \cot 3\theta$ where $(2\theta + 45°)$ and 3θ are acute angles, then the value of θ is
(1) 5° (2) 9°
(3) 12° (4) 15°
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

61. If θ be acute angle and $\cos\theta = \frac{15}{17}$, then the value of $\cot(90° - \theta)$ is
(1) $\frac{2\sqrt{8}}{15}$ (2) $\frac{8}{15}$
(3) $\frac{\sqrt{2}}{17}$ (4) $\frac{8\sqrt{2}}{17}$
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

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62. If $\sec^2\theta + \tan^2\theta = \frac{7}{12}$, then $\sec^4\theta - \tan^4\theta =$

(1) $\frac{7}{12}$ (2) $\frac{1}{2}$

(3) $\frac{5}{12}$ (4) 1

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

63. If $0 < x < \frac{\pi}{2}$ and $\sec x = \operatorname{cosec} y$, then the value of $\sin(x + y)$ is :

(1) 0 (2) 1

(3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{3}}$

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

64. If A, B and C be the angles of a triangle, then out of the following, the incorrect relation is :

(1) $\sin\frac{A+B}{2} = \cos\frac{C}{2}$

(2) $\cos\left(\frac{A+B}{2}\right) = \sin\frac{C}{2}$

(3) $\tan\left(\frac{A+B}{2}\right) = \sec\frac{C}{2}$

(4) $\cot\left(\frac{A+B}{2}\right) = \tan\frac{C}{2}$

FCI Assistant Grade-III. Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

65. If $\sin\alpha + \cos\beta = 2$ $(0° \le \beta < \alpha \le 90°)$, then $\sin\left(\frac{2\alpha+\beta}{3}\right) =$

(1) $\sin\frac{\alpha}{2}$ (2) $\cos\frac{\alpha}{3}$

(3) $\sin\frac{\alpha}{3}$ (4) $\cos\frac{2\alpha}{3}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

66. If $\cos^4\theta - \sin^4\theta = \frac{2}{3}$, then the value of $2\cos^2\theta - 1$ is

(1) 0 (2) 1

(3) $\frac{2}{3}$ (4) $\frac{3}{2}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

67. If $\sin\alpha \sec(30° + \alpha) = 1$ $(0 < \alpha < 60°)$, then the value of $\sin\alpha + \cos 2\alpha$ is

(1) 1 (2) $\frac{2+\sqrt{3}}{2\sqrt{3}}$

(3) 0 (4) $\sqrt{2}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

68. If $\tan\theta = 1$, then the value of $\frac{8\sin\theta + 5\cos\theta}{\sin^3\theta - 2\cos^3\theta + 7\cos\theta}$ is

(1) 2 (2) $2\frac{1}{2}$

(3) 3 (4) $\frac{4}{5}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

69. If θ be a positive acute angle satisfying $\cos^2\theta + \cos^4\theta = 1$, then the value of $\tan^2\theta + \tan^4\theta$ is

(1) $\frac{3}{2}$ (2) 1

(3) $\frac{1}{2}$ (4) 0

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

70. If $\tan\theta = \frac{4}{3}$, then the value of $\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$ is

(1) 0.5 (2) –0.5

(3) 3.0 (4) –3.0

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71. The simplified value of $(\sec A - \cos A)^2 + (\operatorname{cosec} A - \sin A)^2 - (\cot A - \tan A)^2$ is

(1) 0 (2) $\frac{1}{2}$

(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

72. If θ be acute and $\tan\theta + \cot\theta = 2$, then the value of $\tan^5\theta + \cot^{10}\theta$ is

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

73. If $\sin\theta - \cos\theta = \frac{7}{13}$ and $0 < \theta < 90°$, then the value of $\sin\theta + \cos\theta$ is

(1) $\frac{17}{13}$ (2) $\frac{13}{17}$

(3) $\frac{1}{13}$ (4) $\frac{1}{17}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

74. If $2\cos\theta - \sin\theta = \frac{1}{\sqrt{2}}$, $(0° < \theta < 90°)$ the value of $2\sin\theta + \cos\theta$ is

(1) $\frac{1}{\sqrt{2}}$ (2) $\sqrt{2}$

(3) $\frac{3}{\sqrt{2}}$ (4) $\frac{\sqrt{2}}{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

75. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$, then the value of $\sin^4\theta - \cos^4\theta$ is

(1) $\frac{1}{5}$ (2) $\frac{2}{5}$

(3) $\frac{3}{5}$ (4) $\frac{4}{5}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

76. If $\sec^2\theta + \tan^2\theta = 7$, then the value of θ when $0° \le \theta \le 90°$, is

(1) 60° (2) 30°

(3) 0° (4) 90°

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

77. The simplified value of $(\sec x \sec y + \tan x \tan y)^2 - (\operatorname{sex} x \tan y + \tan x \sec y)^2$ is :

(1) –1 (2) 0

(3) $\sec^2 x$ (4) 1

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

78. If $\sin\theta + \operatorname{cosec}\theta = 2$, then value of $\sin^{100}\theta + \operatorname{cosec}^{100}\theta$ is equal to :

(1) 1 (2) 2

(3) 3 (4) 100

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79. If $A = \sin^2\theta + \cos^4\theta$, for any value of θ, then the value of A is

(1) $1 \le A \le 2$ (2) $\frac{3}{4} \le A \le 1$

(3) $\frac{13}{16} \le A \le 1$ (4) $\frac{3}{4} \le A \le \frac{13}{16}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

80. If $\sin\theta + \text{cosec}\theta = 2$, then the value of $\sin^2\theta + \text{cosec}^2\theta$ when $0° \le \theta \le 90°$, is

(1) 0 (2) 1
(3) 10 (4) 2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone) & (SSC GL Tier-I 19.05.2013) (Ist Sitting)

81. If $\tan 2\theta \cdot \tan 4\theta = 1$, then the value of $\tan 3\theta$ is

(1) $\sqrt{3}$ (2) 0

(3) 1 (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

82. If $\cos^2\alpha + \cos^2\beta = 2$, then the value of $\tan^3\alpha + \sin^3\beta$ is :

(1) -1 (2) 0

(3) 1 (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

83. If θ is a positive acute angle and $\tan 2\theta \tan 3\theta = 1$, then the value of $(2\cos^2\frac{5\theta}{2} - 1)$ is

(1) $-\frac{1}{2}$ (2) 1

(3) 0 (4) $\frac{1}{2}$

(SSC Graduate Level Tier-II Exam. 16.09.2012)

84. In a right-angled triangle XYZ, right-angled at Y, if $XY = 2\sqrt{6}$ and $XZ - YZ = 2$, then $\sec X + \tan X$ is

(1) $\frac{1}{\sqrt{6}}$ (2) $\sqrt{6}$

(3) $2\sqrt{6}$ (4) $\frac{\sqrt{6}}{2}$

(SSC Graduate Level Tier-II Exam. 16.09.2012)

85. The minimum value of $\sin^2\theta + \cos^2\theta + \sec^2\theta + \text{cosec}^2\theta + \tan^2\theta + \cot^2\theta$ is

(1) 1 (2) 3
(3) 5 (4) 7

(SSC Graduate Level Tier-II Exam. 16.09.2012)

86. If $2\sin\left(\frac{\pi x}{2}\right) = x^2 + \frac{1}{x^2}$, then the value of $\left(x - \frac{1}{x}\right)$ is

(1) -1 (2) 2
(3) 1 (4) 0

(SSC Graduate Level Tier-II Exam. 16.09.2012)

87. If $\cos\theta + \sec\theta = 2$, the value of $\cos^6\theta + \sec^6\theta$ is

(1) 4 (2) 8
(3) 1 (4) 2

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

88. The numerical value of

$$\frac{5}{\sec^2\theta} + \frac{2}{1+\cot^2\theta} + 3\sin^2\theta \text{ is :}$$

(1) 5 (2) 2
(3) 3 (4) 4

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

89. The numerical value of

$$\left(\frac{1}{\cos\theta} + \frac{1}{\cot\theta}\right)\left(\frac{1}{\cos\theta} - \frac{1}{\cot\theta}\right)$$

is

(1) 0 (2) -1
(3) $+1$ (4) 2

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

90. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{5}{4}$, the value of $\frac{\tan^2\theta + 1}{\tan^2\theta - 1}$ is

(1) $\frac{25}{16}$ (2) $\frac{41}{9}$

(3) $\frac{41}{40}$ (4) $\frac{40}{41}$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

91. If $\tan 7\theta \tan 2\theta = 1$, then the value of $\tan 3\theta$ is

(1) $\sqrt{3}$ (2) $-\frac{1}{\sqrt{3}}$

(3) $\frac{1}{\sqrt{3}}$ (4) $-\sqrt{3}$

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

92. The value of

$$\left(2\cos^2\theta - 1\right)\left(\frac{1+\tan\theta}{1-\tan\theta} + \frac{1-\tan\theta}{1+\tan\theta}\right) \text{ is}$$

(1) 4 (2) 1
(3) 3 (4) 2

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

93. If $\sec\theta + \tan\theta = 2$, then the value of $\sec\theta$ is

(1) $\frac{4}{5}$ (2) 5

(3) $\frac{5}{4}$ (4) $\sqrt{2}$

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

94. If $\text{cosec}\theta - \sin\theta = l$ and $\sec\theta - \cos\theta = m$, then the value of $l^2m^2(l^2 + m^2 + 3)$ is

(1) -1 (2) 0
(3) 1 (4) 2

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

95. If $\frac{2\sin\theta - \cos\theta}{\cos\theta + \sin\theta} = 1$, then value of $\cot\theta$ is :

(1) $\frac{1}{2}$ (2) $\frac{1}{3}$

(3) 3 (4) 2

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

96. If $\tan\theta = 2$, then the value of $\frac{8\sin\theta + 5\cos\theta}{\sin^3\theta + 2\cos^3\theta + 3\cos\theta}$ is

(1) $\frac{21}{5}$ (2) $\frac{8}{5}$

(3) $\frac{7}{5}$ (4) $\frac{16}{5}$

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

97. If $\tan\theta + \cot\theta = 2$, then the value of $\tan^{100}\theta + \cot^{100}\theta$ is

(1) 2 (2) 0

(3) 1 (4) $\sqrt{3}$

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

98. $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta}$ is equal to

(1) $1 - \tan\theta - \cot\theta$
(2) $1 + \tan\theta - \cot\theta$
(3) $1 - \tan\theta + \cot\theta$
(4) $1 + \tan\theta + \cot\theta$

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

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99. If $\sin\theta + \text{cosec}\,\theta = 2$, then the value of $\sin^9\theta + \text{cosec}^9\theta$ is :
(1) 3 (2) 2
(3) 4 (4) 1
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

100. If $\sec\theta + \tan\theta = 2 + \sqrt{5}$, then the value of $\sin\theta + \cos\theta$ is :
(1) $\frac{3}{\sqrt{5}}$ (2) $\sqrt{5}$
(3) $\frac{7}{\sqrt{5}}$ (4) $\frac{1}{\sqrt{5}}$
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

101. The value of $(1 + \cot\theta - \text{cosec}\,\theta)(1 + \tan\theta + \sec\theta)$ is equal to
(1) 1 (2) 2
(3) 0 (4) –1
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

102. If $\tan\theta + \cot\theta = 2$, then the value of $\tan^n\theta + \cot^n\theta$ ($0° < \theta < 90°$, n is an integer) is
(1) 2 (2) 2^n
(3) $2n$ (4) 2^{n+1}
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

103. If $\frac{\sin\theta}{x} = \frac{\cos\theta}{y}$, then $\sin\theta - \cos\theta$ is equal to
(1) $x - y$ (2) $x + y$
(3) $\frac{x-y}{\sqrt{x^2+y^2}}$ (4) $\frac{y-x}{\sqrt{x^2+y^2}}$
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

104. If $x = a\sec\theta\cos\phi$, $y = b\sec\theta\sin\phi$, $z = c\tan\theta$, then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}$ is :
(1) 1 (2) 4
(3) 9 (4) 0
(SSC Graduate Level Tier-I Exam. 21.04.2013)

105. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{5}{3}$, then $\sin\theta$ is equal to :
(1) $\frac{1}{4}$ (2) $\frac{1}{3}$
(3) $\frac{2}{3}$ (4) $\frac{3}{4}$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

106. If $\cos x + \cos^2 x = 1$, the numerical value of $(\sin^{12}x + 3\sin^{10}x + 3\sin^8 x + \sin^6 x - 1)$ is :
(1) –1 (2) 2
(3) 0 (4) 1
(SSC Graduate Level Tier-I Exam. 21.04.2013)

107. If $(1 + \sin\alpha)(1 + \sin\beta)(1 + \sin\gamma) = (1 - \sin\alpha)(1 - \sin\beta)(1 - \sin\gamma)$, then each side is equal to
(1) $\pm\cos\alpha\cos\beta\cos\gamma$
(2) $\pm\sin\alpha\sin\beta\sin\gamma$
(3) $\pm\sin\alpha\cos\beta\cos\gamma$
(4) $\pm\sin\alpha\sin\beta\cos\gamma$
(SSC Graduate Level Tier-I Exam. 21.04.2013)

108. The numerical value of $\frac{1}{1+\cot^2\theta} + \frac{3}{1+\tan^2\theta} + 2\sin^2\theta$ will be
(1) 2 (2) 5
(3) 6 (4) 3
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

109. The value of $\frac{4}{1+\tan^2\alpha} + \frac{3}{1+\cot^2\alpha} + 3\sin^2\alpha$ is
(1) 4 (2) –1
(3) 2 (4) 3
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

110. The value of $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x)$ is
(1) 14 (2) 11
(3) 12 (4) 13
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

111. The value of $\sec\theta\left(\frac{1+\sin\theta}{\cos\theta} + \frac{\cos\theta}{1+\sin\theta}\right) - 2\tan^2\theta$ is
(1) 4 (2) 1
(3) 2 (4) 0
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

112. If $\tan\theta + \cot\theta = 2$, then the value of $\tan^2\theta + \cot^2\theta$ is
(1) 2 (2) 1
(3) $\sqrt{2}$ (4) 0
(SSC Graduate Level Tier-I Exam. 19.05.2013)

113. The eliminant of θ from $x\cos\theta - y\sin\theta = 2$ and $x\sin\theta + y\cos\theta = 4$ will give
(1) $x^2 + y^2 = 20$
(2) $3x^2 + y^2 = 20$
(3) $x^2 - y^2 = 20$
(4) $3x^2 - y^2 = 10$
(SSC Graduate Level Tier-I Exam. 19.05.2013)

114. The value of $\left[\frac{\cos^2 A(\sin A + \cos A)}{\text{cosec}^2 A(\sin A - \cos A)} + \frac{\sin^2 A(\sin A - \cos A)}{\sec^2 A(\sin A + \cos A)}\right]$ $(\sec^2 A - \text{cosec}^2 A)$
(1) 1 (2) 3
(3) 2 (4) 4
(SSC Graduate Level Tier-I Exam. 19.05.2013)

115. The value of $\frac{1}{\text{cosec}\,\theta - \cot\theta} - \frac{1}{\sin\theta}$ is
(1) 1 (2) $\cot\theta$
(3) $\text{cosec}\,\theta$ (4) $\tan\theta$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

116. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then $\cos\theta - \sin\theta$ is
(1) $\sqrt{2}\tan\theta$ (2) $-\sqrt{2}\cos\theta$
(3) $-\sqrt{2}\sin\theta$ (4) $\sqrt{2}\sin\theta$
(SSC Graduate Level Tier-I Exam. 19.05.2013 (Ist Sitting) & (SSC GL Tier-II Exam. 29.09.2013)

117. If $\cos^4\theta - \sin^4\theta = \frac{2}{3}$, then the value of $1 - 2\sin^2\theta$ is
(1) $\frac{4}{3}$ (2) 0
(3) $\frac{2}{3}$ (4) $\frac{1}{3}$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting

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118. The value of
$\frac{1}{(1+\tan^2\theta)}+\frac{1}{(1+\cot^2\theta)}$ is
(1) $\frac{1}{4}$ (2) 1
(3) $\frac{5}{4}$ (4) $\frac{4}{3}$
(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)

119. If $\sin\theta-\cos\theta=\frac{1}{2}$ then value of $\sin\theta+\cos\theta$ is :
(1) – 2 (2) ±2
(3) $\frac{\sqrt{7}}{2}$ (4) 2
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

120. The value of $\frac{\sin A}{1+\cos A}+\frac{\sin A}{1-\cos A}$ is
$(0°<A<90°)$
(1) 2 cosec A (2) 2 sec A
(3) 2 sin A (4) 2 cos A
(SSC Graduate Level Tier-II Exam. 29.09.2013)

121. If $r\sin\theta=1$, $r\cos\theta=\sqrt{3}$, then the value of $\left(\sqrt{3}\tan\theta+1\right)$ is
(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$
(3) 1 (4) 2
(SSC Graduate Level Tier-II Exam. 29.09.2013)

122. If $x\cos\theta-y\sin\theta=\sqrt{x^2+y^2}$ and
$\frac{\cos^2\theta}{a^2}+\frac{\sin^2\theta}{b^2}=\frac{1}{x^2+y^2}$,
then the correct relation is
(1) $\frac{x^2}{b^2}-\frac{y^2}{a^2}=1$
(2) $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$
(3) $\frac{x^2}{b^2}+\frac{y^2}{a^2}=1$
(4) $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$
(SSC CHSL DEO & LDC Exam. 20.10.2013)

123. If $\tan\theta-\cot\theta=0$, find the value of $\sin\theta+\cos\theta$.
(1) 0 (2) 1
(3) $\sqrt{2}$ (4) 2
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

124. The greatest value of $\sin^4\theta+\cos^4\theta$ is
(1) 2 (2) 3
(3) $\frac{1}{2}$ (4) 1
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

125. If $3\sin\theta+5\cos\theta=5$, then $5\sin\theta-3\cos\theta$ is equal to
(1) ± 3 (2) ± 5
(3) 1 (4) ± 2
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

126. If $\sin\theta+\sin^2\theta=1$, then the value of $\cos^2\theta+\cos^4\theta$ is
(1) 2 (2) 4
(3) 0 (4) 1
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

127. If $\tan\theta+\cot\theta=2$ then the value of θ is
(1) 45° (2) 60°
(3) 90° (4) 30°
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

128. If $\cos\pi x=x^2-x+\frac{5}{4}$, the value of x will be
(1) 0 (2) 1
(3) –1 (4) None of the above
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

129. The numerical value of
$1+\frac{1}{\cot^2 63°}-\sec^2 27°$
$+\frac{1}{\sin^2 63°}-\text{cosec}^2 27°$ is
(1) 1 (2) 2
(3) –1 (4) 0
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

130. If $x=\frac{\cos\theta}{1-\sin\theta}$, then $\frac{\cos\theta}{1+\sin\theta}$ is equal to
(1) $x-1$ (2) $\frac{1}{x}$
(3) $\frac{1}{x+1}$ (4) $\frac{1}{1-x}$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

131. In Δ ABC, $\angle B=90°$ and AB : BC = 2 : 1. The value of $\sin A+\cot C$ is
(1) $3+\sqrt{5}$ (2) $\frac{2+\sqrt{5}}{2\sqrt{5}}$
(3) $2+\sqrt{5}$ (4) $3\sqrt{5}$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

132. If $\sin\frac{\pi x}{2}=x^2-2x+2$, then the value of x is
(1) 0 (2) 1
(3) –1 (4) None of these
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

133. The value of
$\frac{\sin 43°}{\cos 47°}+\frac{\cos 19°}{\sin 71°}-8\cos^2 60°$ is
(1) 0 (2) 1
(3) 2 (4) –1
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

134. The value of
$\left(\sin^2 7\frac{1°}{2}+\sin^2 82\frac{1°}{2}\right.$
$\left.+\tan^2 2°.\tan^2 88°\right)$ is
(1) 1 (2) 2
(3) 0 (4) 4
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

135. Find the value of $1-2\sin^2\theta+\sin^4\theta$.
(1) $\sin^4\theta$ (2) $\cos^4\theta$
(3) $\text{cosec}^4\theta$ (4) $\sec^4\theta$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

136. The simplest value of cot 9° cot 27° cot 63° cot 81° is
(1) 0 (2) 1
(3) –1 (4) $\sqrt{3}$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

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137. If $(1+\sin A)(1+\sin B)(1+\sin C) = (1-\sin A)(1-\sin B)(1-\sin C)$, $0 < A, B, C < \frac{\pi}{2}$ then each side is equal to
(1) $\sin A \sin B \sin C$
(2) $\cos A \cos B \cos C$
(3) $\tan A \tan B \tan C$
(4) 1
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

138. The value of θ, which satisfies the equation $\tan^2\theta + 3 = 3\sec\theta$, $0° \le \theta < 90°$ is
(1) 15° or 0° (2) 30° or 0°
(3) 45° or 0° (4) 60° or 0°
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

139. If $\sin\theta = 0.7$, then $\cos\theta$, $0 \le \theta < 90°$, is
(1) 0.3 (2) $\sqrt{0.49}$
(3) $\sqrt{0.51}$ (4) $\sqrt{0.9}$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

140. The value of $\sin^2 65° + \sin^2 25° + \cos^2 35° + \cos^2 55°$ is
(1) 0 (2) 1
(3) 2 (4) $\frac{1}{2}$
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014

141. If $x \sin 60°.\tan 30° = \sec 60°.\cot 45°$, then the value of x is
(1) 2 (2) $2\sqrt{3}$
(3) 4 (4) $4\sqrt{3}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

142. If $\theta = 60°$, then $\frac{1}{2}\sqrt{1+\sin\theta} + \frac{1}{2}\sqrt{1-\sin\theta}$ is equal to
(1) $\cot\frac{\theta}{2}$ (2) $\sec\frac{\theta}{2}$
(3) $\sin\frac{\theta}{2}$ (4) $\cos\frac{\theta}{2}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

143. If $\frac{2\tan^2 30°}{1-\tan^2 30°} + \sec^2 45° - \sec^2 0° = x\sec 60°$, then the value of x is
(1) 2 (2) 1
(3) 0 (4) –1
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

144. If $\tan\theta = \frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$, then $\sin\alpha + \cos\alpha$ is
(1) $\pm\sqrt{2}\sin\theta$ (2) $\pm\sqrt{2}\cos\theta$
(3) $\pm\frac{1}{\sqrt{2}}\sin\theta$ (4) $\pm\frac{1}{\sqrt{2}}\cos\theta$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

145. If $7\sin^2\theta + 3\cos^2\theta = 4$, $(0° < \theta < 90°)$, then the value of $\tan\theta$ is
(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{1}{2}$
(3) 1 (4) $\sqrt{3}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

146. If $\tan 9° = \frac{p}{q}$, then the value of $\frac{\sec^2 81°}{1+\cot^2 81°}$ is
(1) $\frac{q}{p}$ (2) 1
(3) $\frac{p^2}{q^2}$ (4) $\frac{q^2}{p^2}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

147. If $\sec\theta + \tan\theta = 5$, then the value of $\frac{\tan\theta + 1}{\tan\theta - 1}$ is
(1) $\frac{11}{7}$ (2) $\frac{13}{7}$
(3) $\frac{15}{7}$ (4) $\frac{17}{7}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

148. If $\tan^2\theta = 1 - e^2$, then the value of $\sec\theta + \tan^3\theta\,\mathrm{cosec}\theta$ is
(1) $(2+e^2)^{\frac{3}{2}}$ (2) $(2-e^2)^{\frac{1}{2}}$
(3) $(2+e^2)^{\frac{1}{2}}$ (4) $(2-e^2)^{\frac{3}{2}}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

149. Which one of the following is true for $0° < \theta < 90°$?
(1) $\cos\theta \le \cos^2\theta$ (2) $\cos\theta > \cos^2\theta$
(3) $\cos\theta < \cos^2\theta$ (4) $\cos\theta \ge \cos^2\theta$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

150. If $x \sin 60° \tan 30° - \tan^2 45° = \mathrm{cosec}\,60° \cot 30° - \sec^2 45°$, then $x =$
(1) 2 (2) –2
(3) 6 (4) –4
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

151. If $x = a\sec\alpha\cos\beta$, $y = b\sec\alpha\sin\beta$, $z = c\tan\alpha$, then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}$ is
(1) 2 (2) 0
(3) 1 (4) –1
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

152. If $\frac{\cos\alpha}{\cos\beta} = a$ and $\frac{\sin\alpha}{\sin\beta} = b$, then the value of $\sin^2\beta$ in terms of a and b is
(1) $\frac{a^2+1}{a^2-b^2}$ (2) $\frac{a^2-b^2}{a^2+b^2}$
(3) $\frac{a^2-1}{a^2-b^2}$ (4) $\frac{a^2-1}{a^2+b^2}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

153. The value of $\frac{\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$ is
(1) $\frac{64}{\sqrt{3}}$ (2) $\frac{55}{12}$
(3) $\frac{67}{12}$ (4) $\frac{67}{10}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

154. The value of $\sin^2 30° \cos^2 45° + 5\tan^2 30° + \frac{3}{2}\sin^2 90° - 3\cos^2 90°$ is
(1) $3\frac{7}{24}$ (2) $3\frac{3}{24}$
(3) $3\frac{1}{24}$ (4) $3\frac{5}{24}$
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155. If $\cos^2\theta - \sin^2\theta = \frac{1}{3}$, where $0 \le \theta \le \frac{\pi}{2}$, then the value of $\cos^4\theta - \sin^4\theta$ is

(1) $\frac{1}{3}$ (2) $\frac{2}{3}$

(3) $\frac{1}{9}$ (4) $\frac{2}{9}$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

156. If $\tan\theta = \frac{1}{\sqrt{11}}$ and $0 < \theta < \frac{\pi}{2}$, then the value of $\frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta}$ is

(1) $\frac{3}{4}$ (2) $\frac{4}{5}$

(3) $\frac{5}{6}$ (4) $\frac{6}{7}$

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157. The value of

$$\frac{1}{\sqrt{2}}\sin\frac{\pi}{6}\cos\frac{\pi}{4} - \cot\frac{\pi}{3}\sec\frac{\pi}{6} + \frac{5\tan\frac{\pi}{4}}{12\sin\frac{\pi}{2}}$$

is equal to

(1) 0 (2) 1

(3) 2 (4) $\frac{3}{2}$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

158. If $\sin\theta = \frac{3}{5}$, then the value of $\frac{\tan\theta + \cos\theta}{\cot\theta + \text{cosec}\,\theta}$ is equal to

(1) $\frac{29}{60}$ (2) $\frac{31}{60}$

(3) $\frac{34}{60}$ (4) $\frac{37}{60}$

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159. If $a\cos\theta + b\sin\theta = p$ and $a\sin\theta - b\cos\theta = q$, then the relation between a, b, p and q is

(1) $a^2 - b^2 = p^2 - q^2$

(2) $a^2 + b^2 = p^2 + q^2$

(3) $a + b = p + q$

(4) $a - b = p - q$

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

160. If $(\sin\alpha + \text{cosec}\,\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$, then the value of k is

(1) 1 (2) 7

(3) 3 (4) 5

(SSC CGL Tier-I Exam. 19.10.2014)

161. If $\sin 21° = \frac{x}{y}$, then $\sec 21° - \sin 69°$ is equal to

(1) $\frac{x^2}{y\sqrt{y^2 - x^2}}$ (2) $\frac{y^2}{x\sqrt{y^2 - x^2}}$

(3) $\frac{x^2}{y\sqrt{x^2 - y^2}}$ (4) $\frac{y^2}{x\sqrt{x^2 - y^2}}$

(SSC CGL Tier-I Exam. 19.10.2014)

162. If $\sec\alpha + \tan\alpha = 2$, then the value of $\sin\alpha$ is

(assume that $0 < \alpha < 90°$)

(1) 0.4 (2) 0.5

(3) 0.6 (4) 0.8

(SSC CGL Tier-I Exam. 19.10.2014)

163. If $3\sin\theta + 5\cos\theta = 5$, then the value of $5\sin\theta - 3\cos\theta$ will be

(1) ± 3 (2) ± 5

(3) ± 2 (4) ± 1

(SSC CGL Tier-I Exam. 19.10.2014)

164. If θ is an acute angle and $\tan\theta + \cot\theta = 2$, then the value of $\tan^5\theta + \cot^5\theta$ is

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CGL Tier-I Exam. 19.10.2014)

165. The simple value of $\tan 1°$. $\tan 2°$. $\tan 3°$..... $\tan 89°$ is

(1) $\frac{1}{2}$ (2) 0

(3) 1 (4) $\frac{2}{3}$

(SSC CGL Tier-I Exam. 19.10.2014)

166. If $x\sin^2 60° - \frac{3}{2}\sec 60° \tan^2 30° + \frac{4}{5}\sin^2 45° \tan^2 60° = 0$ then x is

(1) $-\frac{1}{15}$ (2) -4

(3) $-\frac{4}{15}$ (4) -2

(SSC CGL Tier-I Exam. 26.10.2014)

167. If $7\sin\alpha = 24\cos\alpha$; $0 < \alpha < \frac{\pi}{2}$, then the value of $14\tan\alpha - 75\cos\alpha - 7\sec\alpha$ is equal to

(1) 3 (2) 4

(3) 1 (4) 2

(SSC CGL Tier-I Exam. 26.10.2014)

168. The value of x which satisfies the equation $2\,\text{cosec}^2 30° + x\sin^2 60° - \frac{3}{4}\tan^2 30° = 10$ is

(1) 2 (2) 3

(3) 0 (4) 1

(SSC CGL Tier-I Exam. 26.10.2014)

169. If $2\sin\theta + \cos\theta = \frac{7}{3}$ then the value of $(\tan^2\theta - \sec^2\theta)$ is

(1) 0 (2) -1

(3) $\frac{3}{7}$ (4) $\frac{7}{3}$

(SSC CGL Tier-I Exam. 26.10.2014)

170. If $29\tan\theta = 31$, then the value of $\frac{1 + 2\sin\theta\cos\theta}{1 - 2\sin\theta\cos\theta}$ is equal to

(1) 810 (2) 900

(3) 540 (4) 490

(SSC CGL Tier-I Exam. 26.10.2014)

171. ABCD is a rectangle of which AC is a diagonal. The value of $(\tan^2\angle CAD + 1)\sin^2\angle BAC$ is

(1) 2 (2) $\frac{1}{4}$

(3) 1 (4) 0

(SSC CGL Tier-II Exam. 21.09.2014)

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172. If $\tan x = \sin 45° \cdot \cos 45° + \sin 30°$ then the value of x is
(1) 30° (2) 45°
(3) 60° (4) 90°
(SSC CGL Tier-II Exam. 21.09.2014)

173. For any real values of θ, $\sqrt{\frac{\sec\theta - 1}{\sec\theta + 1}} = ?$
(1) $\cot\theta - \operatorname{cosec}\theta$
(2) $\sec\theta - \tan\theta$
(3) $\operatorname{cosec}\theta - \cot\theta$
(4) $\tan\theta - \sec\theta$
(SSC CGL Tier-II Exam. 21.09.2014)

174. If the sum and difference of two angles are 135° and $\frac{\pi}{12}$ respectively, then the value of the angles in degree measure are
(1) 70°, 65° (2) 75°, 60°
(3) 45°, 90° (4) 80°, 55°
(SSC CGL Tier-II Exam. 21.09.2014)

175. In a ΔABC, $\angle B = \frac{\pi}{3}$, $\angle C = \frac{\pi}{4}$ and D divides BC internally in the ratio 1 : 3 then $\frac{\sin\angle BAD}{\sin\angle CAD}$ is equal to
(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{\sqrt{3}}$
(3) $\frac{1}{\sqrt{6}}$ (4) $\sqrt{6}$
(SSC CGL Tier-II Exam. 21.09.2014)

176. If $\sin 3A = \cos(A - 26°)$, where 3A is an acute angle then the value of A is
(1) 29° (2) 26°
(3) 23° (4) 28°
(SSC CGL Tier-II Exam. 21.09.2014)

177. Value of $\sec^2\theta - \frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta}$ is
(1) 1 (2) 2
(3) –1 (4) 0
(SSC CGL Tier-II Exam. 21.09.2014)

178. If $x = a(\sin\theta + \cos\theta)$, $y = b(\sin\theta - \cos\theta)$ then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ is
(1) 0 (2) 1
(3) 2 (4) –2
(SSC CGL Tier-II Exam. 21.09.2014)

179. If $\sin 5\theta = \cos 20°$ ($0° < \theta < 90°$) then the value of θ is
(1) 4° (2) 22°
(3) 10° (4) 14°
(SSC CGL Tier-II Exam. 21.09.2014)

180. If $0° < \theta < 90°$ and $2\sec\theta = 3\operatorname{cosec}^2\theta$, then θ is
(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$
(3) $\frac{\pi}{3}$ (4) $\frac{\pi}{5}$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

181. $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$ is equal to
(1) $2\cos\theta$ (2) $2\sin\theta$
(3) $2\cot\theta$ (4) $2\sec\theta$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

182. If $\cos\theta = \frac{3}{5}$, then the value of $\sin\theta \cdot \sec\theta \cdot \tan\theta$ is
(1) $\frac{9}{16}$ (2) $\frac{16}{9}$
(3) $\frac{3}{4}$ (4) $\frac{4}{3}$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

183. If $0° < A < 90°$, then the value of $\tan^2 A + \cot^2 A - \sec^2 A \operatorname{cosec}^2 A$ is
(1) 0 (2) 1
(3) 2 (4) –2
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

184. If α and β are positive acute angles, $\sin(4\alpha - \beta) = 1$ and $\cos(2\alpha + \beta) = \frac{1}{2}$, then the value of $\sin(\alpha + 2\beta)$ is
(1) 0 (2) 1
(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{1}{\sqrt{2}}$
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

185. If θ is a positive acute angle and $\operatorname{cosec}\theta = \sqrt{3}$, then the value of $\cot\theta - \operatorname{cosec}\theta$ is
(1) $\frac{3\sqrt{2} - \sqrt{3}}{3}$ (2) $\frac{\sqrt{2}(3 + \sqrt{3})}{3}$
(3) $\frac{\sqrt{2}(3 - \sqrt{3})}{3}$ (4) $\frac{3\sqrt{2} + \sqrt{3}}{3}$
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

186. If θ is a positive acute angle and $4\cos^2\theta - 4\cos\theta + 1 = 0$, then the value of $\tan(\theta - 15°)$ is equal to
(1) 0 (2) 1
(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$
(SSC CHSL DEO & LDC Exam. 9.11.2014)

187. If $(r\cos\theta - \sqrt{3})^2 + (r\sin\theta - 1)^2 = 0$ then the value of $\frac{r\tan\theta + \sec\theta}{r\sec\theta + \tan\theta}$ is equal to
(1) $\frac{4}{5}$ (2) $\frac{5}{4}$
(3) $\frac{\sqrt{3}}{4}$ (4) $\frac{\sqrt{5}}{4}$
(SSC CHSL DEO & LDC Exam. 9.11.2014)

188. The value of $\frac{\sin 25°\cos 65° + \cos 25°\sin 65°}{\tan^2 70° - \operatorname{cosec}^2 20°}$
(1) –1 (2) 0
(3) 1 (4) 2
(SSC CHSL DEO & LDC Exam. 9.11.2014)

189. If $\sin(\theta + 18°) = \cos 60°$ ($0 < \theta < 90°$), then the value of $\cos 5\theta$ is
(1) $\frac{1}{2}$ (2) 0
(3) $\frac{1}{\sqrt{2}}$ (4) 1
(SSC CHSL DEO & LDC Exam. 16.11.2014)

190. If $\tan\theta = \frac{3}{4}$, then the value of $\frac{4\sin^2\theta - 2\cos^2\theta}{4\sin^2\theta + 3\cos^2\theta}$ is equal to
(1) $\frac{1}{21}$ (2) $\frac{2}{21}$
(3) $\frac{4}{21}$ (4) $\frac{8}{21}$
(SSC CHSL DEO & LDC Exam. 16.11.2014)

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191. If $\frac{\cos\alpha}{\cos\beta} = a$, $\frac{\sin\alpha}{\sin\beta} = b$, then $\sin^2\beta$ is equal to

(1) $\frac{a^2-1}{a^2+b^2}$ (2) $\frac{a^2+1}{a^2-b^2}$

(3) $\frac{a^2-1}{a^2-b^2}$ (4) $\frac{a^2+1}{a^2+b^2}$

(SSC CHSL DEO & LDC Exam. 16.11.2014)

192. Let A, B, C, D be the angles of a quadrilateral. If they are concyclic, then the value of $\cos A + \cos B + \cos C + \cos D$ is

(1) 0 (2) 1

(3) −1 (4) 2

(SSC CHSL DEO & LDC Exam. 16.11.2014)

193. If $\sqrt{3}\tan\theta = 3\sin\theta$, then the value of $(\sin^2\theta - \cos^2\theta)$ is

(1) 1 (2) 3

(3) $\frac{1}{3}$ (4) None

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

194. If $\sin(A+B) = \sin A\cos B + \cos A\sin B$, then the value of $\sin75°$ is

(1) $\frac{\sqrt{3}+1}{\sqrt{2}}$ (2) $\frac{\sqrt{2}+1}{2\sqrt{2}}$

(3) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (4) $\frac{\sqrt{3}+1}{2}$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

195. ABC is a right angled triangle, right angled at B and $\angle A = 60°$ and AB = 20 cm, then the ratio of sides BC and CA is

(1) $\sqrt{3} : 1$ (2) $1 : \sqrt{3}$

(3) $\sqrt{3} : \sqrt{2}$ (4) $\sqrt{3} : 2$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

196. If $\tan 2\theta \cdot \tan 3\theta = 1$, where $0° < \theta < 90°$ then the value of θ is

(1) $22\frac{1}{2}°$ (2) 18°

(3) 24° (4) 30°

97. If $\cos^2\alpha - \sin^2\alpha = \tan^2\beta$, then the value of $\cos^2\beta - \sin^2\beta$ is

(1) $\cot^2\alpha$ (2) $\cot^2\beta$

(3) $\tan^2\alpha$ (4) $\tan^2\beta$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

198. If $\tan(A+B) = \sqrt{3}$ and $\tan(A-B) = \frac{1}{\sqrt{3}}$, $\angle A + \angle B < 90°$, $A \geq B$, then $\angle A$ is

(1) 90° (2) 30°

(3) 45° (4) 60°

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

199. The value of $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$ is equal to

(1) $\sin\theta$ (2) $\cos\theta$

(3) $\tan\theta$ (4) $\cot\theta$

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

200. If $r\sin\theta = \frac{7}{2}$ and $r\cos\theta = \frac{7\sqrt{3}}{2}$, then value of r is

(1) 4 (2) 3

(3) 5 (4) 7

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

201. If $\theta + \phi = \frac{\pi}{2}$ and $\sin\theta = \frac{1}{2}$, then the value of $\sin\phi$ is

(1) 1 (2) $\frac{1}{\sqrt{2}}$

(3) $\frac{1}{2}$ (4) $\frac{\sqrt{3}}{2}$

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

202. If $0° < \theta < 90°$ and $2\sin^2\theta + 3\cos\theta = 3$, then the value of θ is

(1) 30° (2) 60°

(3) 45° (4) 75°

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

203. The value of θ $(0 \leq \theta \leq 90°)$ satisfying $2\sin^2\theta = 3\cos\theta$ is

(1) 60° (2) 30°

(3) 90° (4) 45°

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 587 TL 9)

204. If $a(\tan\theta + \cot\theta) = 1$, $\sin\theta + \cos\theta = b$ with $0° < \theta < 90°$, then a relation between a and b is

(1) $b^2 = 2(a+1)$

(2) $b^2 = 2(a-1)$

(3) $2a = b^2 - 1$

(4) $2a = b^2 + 1$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

205. If A is an acute angle and $\cot A + \operatorname{cosec} A = 3$, then the value of $\sin A$ is

(1) 1 (2) $\frac{3}{5}$

(3) $\frac{4}{5}$ (4) 0

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 21.06.2015 IInd Sitting)

206. The simplest value of $\sin^2x + 2\tan^2x - 2\sec^2x + \cos^2x$ is

(1) 1 (2) 0

(3) −1 (4) 2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

207. If $x = a\sec\theta$ and $y = b\tan\theta$ then $\frac{a^2}{x^2} - \frac{b^2}{y^2} = ?$

(1) 1 (2) 2

(3) 3 (4) 4

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

208. The value of $\sin^21° + \sin^22° + \sin^23° + \ldots\ldots + \sin^289°$ is

(1) 22 (2) 44

(3) $22\frac{1}{2}$ (4) $44\frac{1}{2}$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

209. The value of $\frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta}$ is equal to

(1) -1 (2) 1

(3) 2 (4) 0

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

210. If $\sin 17° = \frac{x}{y}$, then $\sec 17° - \sin 73°$ is equal to

(1) $\frac{y}{\sqrt{y^2-x^2}}$ (2) $\frac{y^2}{(x\sqrt{y^2-x^2})}$

(3) $\frac{x}{(y\sqrt{y^2-x^2})}$ (4) $\frac{x^2}{(y\sqrt{y^2-x^2})}$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

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211. If θ is a positive acute angle and $\text{cosec}\,\theta + \cot\theta = \sqrt{3}$, then the value of $\text{cosec}\,\theta$ is

(1) $\frac{1}{\sqrt{3}}$ (2) $\sqrt{3}$

(3) $\frac{2}{\sqrt{3}}$ (4) 1

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

212. If $\cos\alpha + \sec\alpha = \sqrt{3}$, then the value of $\cos^3\alpha + \sec^3\alpha$ is

(1) 2 (2) 1

(3) 0 (4) 4

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

213. If $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$, then the value of $\cot\theta$ is

(1) $\sqrt{2}+1$ (2) $\sqrt{2}-1$

(3) $\sqrt{3}-1$ (4) $\sqrt{3}+1$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

214. If $\cos^4\theta - \sin^4\theta = \frac{2}{3}$, then the value of $1 - 2\sin^2\theta$ is

(1) $\frac{2}{3}$ (2) $\frac{3}{2}$

(3) 1 (4) 0

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, Ist Sitting TF No. 333 LO 2)

215. The value of $\frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$ is equal to

(1) −1 (2) 0

(3) 1 (4) 2

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, Ist Sitting TF No. 333 LO 2)

216. If $\sin\theta + \cos\theta = p$ and $\sec\theta + \text{cosec}\,\theta = q$, then the value of $q(p^2 - 1)$ is

(1) 1 (2) p

(3) $2p$ (4) 2

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, Ist Sitting TF No. 333 LO 2)

217. If $\sin(3\alpha - \beta) = 1$ and $\cos(2\alpha+\beta) = \frac{1}{2}$, then the value of $\tan\alpha$ is

(1) 0 (2) $\frac{1}{\sqrt{3}}$

(3) 1 (4) $\sqrt{3}$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, Ist Sitting TF No. 333 LO 2)

218. If $\sin(60° - x) = \cos(y + 60°)$, then the value of $\sin(x - y)$ is

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$

(3) $\frac{\sqrt{3}}{2}$ (4) 1

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

219. If $x = a\sec\theta$, $y = b\tan\theta$, then $\frac{x^2}{a^2} - \frac{y^2}{b^2}$ is

(1) −1 (2) 0

(3) 1 (4) 2

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

220. a, b, c are the lengths of three sides of a triangle ABC. If a, b, c are related by the relation $a^2 + b^2 + c^2 = ab + bc + ca$, then the value of $\sin^2A + \sin^2B + \sin^2C$ is

(1) $\frac{3}{4}$ (2) $\frac{3\sqrt{3}}{2}$

(3) $\frac{3}{2}$ (4) $\frac{9}{4}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

221. If $a\sin\theta + b\cos\theta = c$, then $a\cos\theta - b\sin\theta$ is equal to

(1) $\pm\sqrt{a+b-c}$

(2) $\pm\sqrt{a^2+b^2+c^2}$

(3) $\pm\sqrt{a^2+b^2-c^2}$

(4) $\pm\sqrt{c^2+a^2-b^2}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

222. If $\sin\theta + \cos\theta = \sqrt{2}\sin(90° - \theta)$, then the value of $\cot\theta$ is

(1) $-\sqrt{2}-1$ (2) $\sqrt{2}-1$

(3) $\sqrt{2}+1$ (4) $-\sqrt{2}+1$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

223. If θ is a positive acute angle and $3(\sec^2\theta + \tan^2\theta) = 5$, then the value of $\cos 2\theta$ is

(1) $\frac{1}{2}$ (2) $\frac{1}{\sqrt{2}}$

(3) $\frac{\sqrt{3}}{2}$ (4) 1

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

224. If $x\cos^2 30°.\sin 60° = \frac{\tan^2 45°.\sec 60°}{\text{cosec}\,60°}$ then the value of x is

(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{1}{\sqrt{2}}$

(3) $2\frac{2}{3}$ (4) $\frac{1}{2}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

225. If $\tan\alpha = 2$, then the value of $\frac{\text{cosec}^2\alpha - \sec^2\alpha}{\text{cosec}^2\alpha + \sec^2\alpha}$ is

(1) $-\frac{15}{9}$ (2) $-\frac{3}{5}$

(3) $\frac{3}{5}$ (4) $\frac{17}{5}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

226. If $\sin(\theta + 30°) = \frac{3}{\sqrt{12}}$, then the value of $\cos^2\theta$ is

(1) $\frac{1}{4}$ (2) $\frac{\sqrt{3}}{2}$

(3) $\frac{3}{4}$ (4) $\frac{1}{2}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

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227. If $0 \le \theta \le 90°$ and $4\cos^2\theta - 4\sqrt{3}\cos\theta + 3 = 0$ then the value of θ is
(1) 30° (2) 45°
(3) 90° (4) 60°
(SSC CGL Tier-II Exam, 12.04.2015 TF No. 567 TL 9)

228. If $\sec\theta - \cos\theta = \frac{3}{2}$ where θ is a positive acute angle, then the value of $\sec\theta$ is
(1) $-\frac{1}{2}$ (2) 1
(3) 2 (4) 0
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

229. If $\tan(5x - 10°) = \cot(5y + 20°)$, the value of $(x + y)$ is
(1) 15° (2) 16°
(3) 24° (4) 20°
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

230. If $\sin\theta + \sin^2\theta = 1$, then the value of $\cos^{12}\theta + 3\cos^{10}\theta + 3\cos^8\theta + \cos^6\theta - 1$ is
(1) 1 (2) 2
(3) 3 (4) 0
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

231. The value of $\tan 11° \tan 17° \tan 79° \tan 73°$ is
(1) $\frac{1}{2}$ (2) 0
(3) 1 (4) $\frac{1}{\sqrt{2}}$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

232. If for any acute angle A, $\sin A + \sin^2 A = 1$, then the value of $\cos^2 A + \cos^4 A$ is
(1) –1 (2) 1
(3) 2 (4) 0
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

233. The value of $(1 + \sec 20° + \cot 70°)(1 - \operatorname{cosec} 20° + \tan 70°)$ is equal to
(1) 0 (2) 1
(3) 2 (4) – 1
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

234. If $0° < A < 90°$, the value of $\frac{\tan A - \sec A - 1}{\tan A + \sec A + 1}$ is
(1) $\frac{\sin A - 1}{\cos A}$ (2) $\frac{1 - \sin A}{\cos A}$
(3) $\frac{1 - \cos A}{\sin A}$ (4) $\frac{\sin A + 1}{\cos A}$
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

235. If α is an cute angle and $2\sin\alpha + 15\cos^2\alpha = 7$ then the value of $\cot\alpha$ is
(1) $\frac{4}{3}$ (2) $\frac{4}{5}$
(3) $\frac{5}{4}$ (4) $\frac{3}{4}$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (1st Sitting) TF No. 8037731)

236. If $\sin(A - B) = \sin A\cos B - \cos A\sin B$, then $\sin 15°$ will be
(1) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (2) $\frac{\sqrt{3}}{2\sqrt{2}}$
(3) $\frac{\sqrt{3}-1}{-\sqrt{2}}$ (4) $\frac{\sqrt{3}-1}{2\sqrt{2}}$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (1st Sitting) TF No. 8037731)

237. If $\sec x + \cos x = 2$, then the value of $\sec^{16} x + \cos^{16} x$ will be
(1) $\sqrt{3}$ (2) 2
(3) 1 (4) 0
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

238. If $\sin^4\theta + \cos^4\theta = 2\sin^2\theta\cos^2\theta$, θ is an acute angle, then the value of $\tan\theta$ is
(1) 1 (2) 2
(3) $\sqrt{2}$ (4) 0
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

239. The maximum value of $\sin^4\theta + \cos^4\theta$ is
(1) $\frac{1}{3}$ (2) 1
(3) 2 (4) 3
(SSC CGL Tier-I Exam, 09.08.2015 (1st Sitting) TF No. 1443088)

240. Find the value of $\tan 4° \tan 43° \tan 47° \tan 86°$
(1) $\frac{2}{3}$ (2) 1
(3) $\frac{1}{2}$ (4) 2
(SSC CGL Tier-I Exam, 09.08.2015 (1st Sitting) TF No. 1443088)

241. If $x\cos\theta - \sin\theta = 1$, then $x^2 + (1 + x^2)\sin\theta$ equals
(1) 2 (2) 1
(3) – 1 (4) 0
(SSC CGL Tier-I Exam, 09.08.2015 (1st Sitting) TF No. 1443088)

242. If $\sin\theta + \sin^2\theta = 1$ then $\cos^2\theta + \cos^4\theta$ is equal to
(1) None (2) 1
(3) $\frac{\sin\theta}{\cos^2\theta}$ (4) $\frac{\cos^2\theta}{\sin\theta}$
(SSC CGL Tier-I Exam, 09.08.2015 (1st Sitting) TF No. 1443088)

243. The numerical value of $\frac{\cos^2 45°}{\sin^2 60°} + \frac{\cos^2 60°}{\sin^2 45°} - \frac{\tan^2 30°}{\cot^2 45°} - \frac{\sin^2 30°}{\cot^2 30°}$ is
(1) $1\frac{1}{4}$ (2) $\frac{3}{4}$
(3) $\frac{1}{4}$ (4) $\frac{1}{2}$
(SSC CGL Tier-I Exam, 09.08.2015 (1st Sitting) TF No. 1443088)

244. The value of $\tan 1°\tan 2°\tan 3° \ldots\ldots \tan 89°$ is
(1) 1 (2) –1
(3) 0
(4) None of the options
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

245. If $\frac{\cos\alpha}{\sin\beta} = n$ and $\frac{\cos\alpha}{\cos\beta} = m$, then the vlaue of $\cos^2\beta$ is
(1) $\frac{m^2}{m^2+n^2}$ (2) $\frac{1}{m^2+n^2}$
(3) $\frac{n^2}{m^2+n^2}$ (4) 0
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

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246. If $0° \le A \le 90°$, the simplified form of the given expression $\sin A \cos A (\tan A - \cot A)$ is
(1) 1 (2) $1 - 2\sin^2 A$
(3) $2\sin^2 A - 1$ (4) $1 - \cos^2 A$
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

247. If θ is an acute angle and $\tan^2\theta + \frac{1}{\tan^2\theta} = 2$, then the value of θ is :
(1) 60° (2) 45°
(3) 15° (4) 30°
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

248. If $\tan\theta + \cot\theta = 5$, then $\tan^2\theta + \cot^2\theta$ is
(1) 23 (2) 25
(3) 26 (4) 24
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239376)

249. The value of $\sin^2 22° + \sin^2 68° + \cot^2 30°$ is
(1) 4 (2) 3
(3) $\frac{3}{4}$ (4) $\frac{5}{4}$
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

250. The minimum value of $2\sin^2\theta + 3\cos^2\theta$ is
(1) 3 (2) 4
(3) 2 (4) 1
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

251. If θ be acute angle and $\tan(4\theta - 50°) = \cot(50° - \theta)$, then the value of θ in degrees is :
(1) 20 (2) 50
(3) 40 (4) 30
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

252. If $5\sin\theta = 3$, the numerical velue of $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta}$ is
(1) $\frac{1}{2}$ (2) $\frac{1}{5}$
(3) $\frac{1}{3}$ (4) $\frac{1}{4}$
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

253. If $\sec\theta + \tan\theta = p$, $(p \ne 0)$ then $\sec\theta$ is equal to
(1) $\left(p - \frac{1}{p}\right), p \ne 0$
(2) $2\left(p - \frac{1}{p}\right), p \ne 0$
(3) $\left(p + \frac{1}{p}\right), p \ne 0$
(4) $\frac{1}{2}\left(p + \frac{1}{p}\right), p \ne 0$
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

254. If $1 + \cos^2\theta = 3\sin\theta\cos\theta$, then the integral value of $\cot\theta\left(0 < \theta < \frac{\pi}{2}\right)$ is
(1) 1 (2) 2
(3) 0 (4) 3
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

255. The value of the following is :
$3(\sin^4\theta + \cos^4\theta) + 2(\sin^6\theta + \cos^6\theta) + 12\sin^2\theta\cos^2\theta$
(1) 0 (2) 3
(3) 2 (4) 5
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

256. If $\sec\theta + \tan\theta = 2 + \sqrt{5}$, then the value of $\sin\theta$ is
$(0° \le \theta \le 90°)$
(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{2}{\sqrt{5}}$
(3) $\frac{1}{\sqrt{5}}$ (4) $\frac{4}{5}$
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

257. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 2\frac{51}{79}$ then the value of $\sin\theta$ is
(1) $\frac{39}{72}$ (2) $\frac{65}{144}$
(3) $\frac{35}{72}$ (4) $\frac{91}{144}$
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

258. If $\tan A + \cot A = 2$, then the value of $\tan^{10}A + \cot^{10}A$ is
(1) 4 (2) 2
(3) 2^{10} (4) 1
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

259. The value of $\cos^2 30° + \sin^2 60° + \tan^2 45° + \sec^2 60° + \cos 0°$ is
(1) $4\frac{1}{2}$ (2) $5\frac{1}{2}$
(3) $6\frac{1}{2}$ (4) $7\frac{1}{2}$
(SSC CGL Tier-I Re-Exam, 30.08.2015)

260. If $\cos x + \cos^2 x = 1$, then $\sin^2 x + 2\sin^6 x + \sin^4 x$ is equal to
(1) 0 (2) 3
(3) 2 (4) 1
(SSC CGL Tier-I Re-Exam, 30.08.2015)

261. In ΔABC, $\angle C = 90°$ and $AB = c$, $BC = a$, $CA = b$; then the value of (cosec B – cos A) is
(1) $\frac{c^2}{ab}$ (2) $\frac{b^2}{ca}$
(3) $\frac{a^2}{bc}$ (4) $\frac{bc}{a^2}$
(SSC CGL Tier-I Re-Exam, 30.08.2015)

262. If $\tan\theta - \cot\theta = 0$ and θ is positive acute angle, then the value of $\frac{\tan(\theta + 15°)}{\tan(\theta - 15°)}$ is
(1) 3 (2) $\frac{1}{\sqrt{3}}$
(3) $\frac{1}{3}$ (4) $\sqrt{3}$
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

263. The value of
$\cot 41°, \cot 42°, \cot 43°, \cot 44°, \cot 45°, \cot 46°, \cot 47°, \cot 48°, \cot 49°$
(1) 1 (2) 0
(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{1}{\sqrt{2}}$
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

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264. If $x = a\sin\theta - b\cos\theta$, $y = a\cos\theta + b\sin\theta$, then which of the following is true?

(1) $\frac{x^2}{y^2} + \frac{a^2}{b^2} = 1$

(2) $x^2 + y^2 = a^2 - b^2$

(3) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

(4) $x^2 + y^2 = a^2 + b^2$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

265. If $\sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$, the value of $\sec\theta \cdot \tan\theta$ is

(1) $\frac{2}{3}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\frac{4}{\sqrt{3}}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

266. If $5\cos\theta + 12\sin\theta = 13$, $0° < \theta < 90°$, then the value of $\sin\theta$ is

(1) $\frac{5}{13}$ (2) $-\frac{12}{13}$

(3) $\frac{6}{13}$ (4) $\frac{12}{13}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

267. If $7\sin^2\theta + 3\cos^2\theta = 4$, then the value of $\tan\theta$ is (θ is acute)

(1) $\frac{1}{\sqrt{3}}$ (2) $\frac{1}{\sqrt{2}}$

(3) $\sqrt{3}$ (4) 1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

268. The value of $(\operatorname{cosec} a - \sin a)(\sec a - \cos a)(\tan a + \cot a)$ is

(1) 1 (2) 6

(3) 2 (4) 4

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

269. If $\sin A + \sin^2 A = 1$, then the value of $\cos^2 A + \cos^4 A$ is

(1) 2 (2) $1\frac{2}{3}$

(3) $1\frac{1}{2}$ (4) 1

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

270. If $\tan A = n\tan B$ and $\sin A = m\sin B$, then the value of $\cos^2 A$ is

(1) $\frac{m^2-1}{n^2+1}$ (2) $\frac{m^2+1}{n^2-1}$

(3) $\frac{m^2+1}{n^2+1}$ (4) $\frac{m^2-1}{n^2-1}$

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

271. If $\sin\theta + \cos\theta = \sqrt{2}\sin(90° - \theta)$ then $\cot\theta$ is equal to :

(1) $\sqrt{2}$ (2) 0

(3) $\sqrt{2} - 1$ (4) $\sqrt{2} + 1$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

272. The value of the following is :

$$\frac{(\tan 20°)^2}{(\operatorname{cosec} 70°)^2} + \frac{(\cot 20°)^2}{(\sec 70°)^2} + 2\tan 15°.\tan 45°.\tan 75°$$

(1) 1 (2) 4

(3) 3 (4) 2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

273. The value of the following is

$$\left(\frac{\sin 47°}{\cos 43°}\right)^2 + \left(\frac{\cos 43°}{\sin 47°}\right)^2 - 4\cos^2 45°$$

(1) -1 (2) 0

(3) 1 (4) $\frac{1}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

274. If $0° < \theta < 90°$ and $\operatorname{cosec}\theta = \cot^2\theta$, then the value of the expression $\operatorname{cosec}^4\theta - 2\operatorname{cosec}^3\theta + \cot^2\theta$ is equal to:

(1) 2 (2) 0

(3) 1 (4) 3

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

275. If $4\sin^2\theta - 1 = 0$ and angle θ is less than 90°, the value of $\cos^2\theta + \tan^2\theta$ is :

(Take $0° < \theta < 90°$)

(1) $\frac{17}{15}$ (2) $\frac{13}{12}$

(3) $\frac{11}{9}$ (4) $\frac{12}{11}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

276. Find numerical value of

$$\frac{9}{\operatorname{cosec}^2\theta} + 4\cos^2\theta + \frac{5}{1+\tan^2\theta}.$$

(1) 5 (2) 7

(3) 9 (4) 4

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

277. If $\tan\theta + \sec\theta = 3$, θ being acute, the value of $5\sin\theta$ is :

(1) $\frac{5}{2}$ (2) $\frac{\sqrt{3}}{5}$

(3) $\frac{5}{\sqrt{3}}$ (4) 4

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

278. If $\cos\theta = \frac{p}{\sqrt{p^2+q^2}}$, then the value of $\tan\theta$ is :

(1) $\frac{q}{\sqrt{p^2-q^2}}$ (2) $\frac{q}{p}$

(3) $\frac{p}{p^2+q^2}$ (4) $\frac{q}{\sqrt{p^2+q^2}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

279. If A, B, and C be the angles of a triangle, then out of the following, the incorrect relation is :

(1) $\cos\left(\frac{A+B}{2}\right) = \sin\frac{C}{2}$

(2) $\tan\left(\frac{A+B}{2}\right) = \cot\frac{C}{2}$

(3) $\cot\left(\frac{A+B}{2}\right) = \tan\frac{C}{2}$

(4) $\sin\frac{A+B}{2} = \cos\frac{C}{2}$

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280. The value of the expression $\sin^2 1° + \sin^2 11° + \sin^2 21° + \sin^2 31° + \sin^2 41° + \sin^2 45° + \sin^2 49° + \sin^2 59° + \sin^2 69° + \sin^2 79° + \sin^2 89°$ is :

(1) 0 (2) $5\frac{1}{2}$

(3) 5 (4) $4\frac{1}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

281. If $x = a(\sin\theta + \cos\theta)$ and $y = b(\sin\theta - \cos\theta)$, then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ is :

(1) 4 (2) 3

(3) 1 (4) 2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

282. If $\cos\theta + \sin\theta = m$ and $\sec\theta + \text{cosec}\,\theta = n$ then the value of $n(m^2 - 1)$ is equal to :

(1) 2m (2) mn

(3) 4mn (4) 2n

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

283. If $\frac{x - x\tan^2 30°}{1 + \tan^2 30°} = \sin^2 30° + 4\cot^2 45° - \sec^2 60°$, then the value of x is :

(1) $\frac{1}{4}$ (2) $\frac{1}{5}$

(3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

284. If $\cos A + \sin A = \sqrt{2}\cos A$ then $\cos A - \sin A$ is equal to : (where $0° < A < 90°$)

(1) $\sqrt{2}\sin A$ (2) $2\sin A$

(3) $2\sqrt{\sin A}$ (4) $\sqrt{2\sin A}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

285. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$ then the value of $\sin^4\theta$ is :

(1) $\frac{2}{5}$ (2) $\frac{1}{5}$

(3) $\frac{4}{5}$ (4) $\frac{3}{5}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

286. If $\sin 2\theta = \frac{\sqrt{3}}{2}$ then the value of $\sin 3\theta$ is equal to (Take $0° \le \theta \le 90°$)

(1) $\frac{1}{2}$ (2) 1

(3) 0 (4) $\frac{\sqrt{3}}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

287. Value of the expression :

$\frac{1 + 2\sin 60°\cos 60°}{\sin 60° + \cos 60°} + \frac{1 - 2\sin 60°\cos 60°}{\sin 60° - \cos 60°}$ is

(1) $2\sqrt{3}$ (2) 0

(3) $\sqrt{3}$ (4) 2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

288. If $\alpha + \beta = 90°$, then the expression $\frac{\tan\alpha}{\tan\beta} + \sin^2\alpha + \sin^2\beta$ is equal to :

(1) $\sec^2\beta$ (2) $\tan^2\alpha$

(3) $\tan^2\beta$ (4) $\sec^2\alpha$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

289. The value of x in the equation

$\tan^2\frac{\pi}{4} - \cos^2\frac{\pi}{3} = x\sin\frac{\pi}{4}\cos\frac{\pi}{4}\tan\frac{\pi}{3}$ is :

(1) $\frac{2}{\sqrt{3}}$ (2) $\frac{3\sqrt{3}}{4}$

(3) $\frac{1}{\sqrt{3}}$ (4) $\frac{\sqrt{3}}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

290. If $\sin A - \cos A = \frac{\sqrt{3} - 1}{2}$, then the value of $\sin A \cdot \cos A$ is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{3}{2}$

(3) $\frac{\sqrt{3}}{4}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

291. If $\sin(90° - \theta) + \cos\theta = \sqrt{2}\cos(90° - \theta)$, then the value of $\text{cosec}\,\theta$ is

(1) $\frac{2}{3}$ (2) $\sqrt{\frac{3}{2}}$

(3) $\frac{1}{\sqrt{2}}$ (4) $\frac{1}{\sqrt{3}}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

292. If $\tan\left(\frac{\pi}{2} - \frac{\alpha}{2}\right) = \sqrt{3}$, then the value of $\cos\alpha$ is

(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$

(3) 0 (4) $\frac{\sqrt{3}}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

293. The value of $\cos 1° \cos 2° \cos 3° \ldots \cos 180°$ is

(1) 0 (2) 1

(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{1}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

294. If $\cos 20° = m$ and $\cos 70° = n$, then the value of $m^2 + n^2$ is

(1) 1 (2) $\frac{3}{2}$

(3) $\frac{1}{\sqrt{2}}$ (4) $\frac{1}{2}$

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

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TYPE–III

1. If the angle of elevation of the Sun changes from 30° to 45°, the length of the shadow of a pillar decreases by 20 metres. The height of the pillar is

(1) $20(\sqrt{3}-1)$ m

(2) $20(\sqrt{3}+1)$ m

(3) $10(\sqrt{3}-1)$ m

(4) $10(\sqrt{3}+1)$ m

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 26.06.2011 (Paper-I)

2. One flies a kite with a thread 150 metre long. If the thread of the kite makes an angle of 60° with the horizontal line, then the height of the kite from the ground (assuming the thread to be in a straight line) is

(1) 50 metre (2) $75\sqrt{3}$ metre

(3) $25\sqrt{3}$ metre (4) 80 metre

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

3. The angle of elevation of the top of a tower from two points A and B lying on the horizontal through the foot of the tower are respectively 15° and 30°. If A and B are on the same side of the tower and AB = 48 metre, then the height of the tower is :

(1) $24\sqrt{3}$ metre (2) 24 metre

(3) $24\sqrt{2}$ metre (4) 96 metre

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

4. At a point on a horizontal line through the base of a monument, the angle of elevation of the top of the monument is found to be such that its tangent is $\frac{1}{5}$. On walking 138 metres towards the monument the secant of the angle of elevation is found to be $\frac{\sqrt{193}}{12}$. The height of the monument (in metre) is

(1) 35 (2) 49

(3) 42 (4) 56

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

5. The distance between two pillars of length 16 metres and 9 metres is x metres. If two angles of elevation of their respective top from the bottom of the other are complementary to each other, then the value of x (in metres) is

(1) 15 (2) 16

(3) 12 (4) 9

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

6. The angle of elevation of the top of a building from the top and bottom of a tree are x and y respectively. If the height of the tree is h metre, then (in metre) the height of the building is

(1) $\frac{h\cot x}{\cot x+\cot y}$

(2) $\frac{h\cot y}{\cot x+\cot y}$

(3) $\frac{h\cot x}{\cot x-\cot y}$

(4) $\frac{h\cot y}{\cot x-\cot y}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

7. The angle of elevation of the top of a tower from a point A on the ground is 30°. On moving a distance of 20 metres towards the foot of the tower to a point B, the angle of elevation increases to 60°. The height of the tower is

(1) $\sqrt{3}$ m (2) $5\sqrt{3}$ m

(3) $10\sqrt{3}$ m (4) $20\sqrt{3}$ m

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

8. Two poles of equal height are standing opposite to each other on either side of a road which is 100m wide. From a point between them on road, angle of elevation of their tops are 30° and 60°. The height of each pole (in metre) is

(1) $25\sqrt{3}$ (2) $20\sqrt{3}$

(3) $28\sqrt{3}$ (4) $30\sqrt{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

9. A telegraph post is bent at a point above the ground due to storm. Its top just meets the ground at a distance of $8\sqrt{3}$ metres from its foot and makes an angle of 30°, then the height of the post is :

(1) 16 metres (2) 23 metres

(3) 24 metres (4) 10 metres

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

10. The angle of elevation of the top of a building and the top of the chimney on the roof of the building from a point on the ground are x and 45° respectively. The height of building is h metre. Then the height of the chimney, (in metre) is :

(1) $h\cot x+h$ (2) $h\cot x-h$

(3) $h\tan x-h$ (4) $h\tan x+h$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

11. Two posts are x metres apart and the height of one is double that of the other. If from the mid-point of the line joining their feet, an observer finds the angular elevations of their tops to be complementary, then the height (in metres) of the shorter post is

(1) $\frac{x}{2\sqrt{2}}$ (2) $\frac{x}{4}$

(3) $x\sqrt{2}$ (4) $\frac{x}{\sqrt{2}}$

(SSC Graduate Level Tier-II Exam. 16.09.2012)

12. An aeroplane when flying at a height of 5000m from the ground passes vertically above another aeroplane at an instant, when the angles of elevation of the two aeroplanes from the same point on the ground are 60° and 45° respectively. The vertical distance between the aeroplanes at that instant is

(1) $5000(\sqrt{3}-1)$ m

(2) $5000(3-\sqrt{3})$ m

(3) $5000\left(1-\frac{1}{\sqrt{3}}\right)$ m

(4) 4500 m

(SSC Graduate Level Tier-II Exam. 16.09.2012)

13. A man standing at a point P is watching the top of a tower, which makes an angle of elevation of 30°. The man walks some distance towards the tower and then

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his angle of elevation of the top of the tower is 60°. If the height of the tower is 30 m, then the distance he moves is

(1) 22 m (2) $22\sqrt{3}$ m

(3) 20 m (4) $20\sqrt{3}$ m

(SSC CHSL DEO & LDC Exam. 21.10.2012 (1st Sitting)

14. The distance between two vertical poles is 60 m. The height of one of the poles is double the height of the other. The angle of elevation of the top of the poles from the middle point of the line segment joining their feet are complementary to each other. The height of the poles are :

(1) 10 m and 20 m

(2) 20 m and 40 m

(3) 20.9 m and 41.8 m

(4) $15\sqrt{2}$ m and $30\sqrt{2}$ m

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

15. An aeroplane when flying at a height of 3125m from the ground passes vertically below another plane at an instant when the angle of elevation of the two planes from the same point on the ground are 30° and 60° respectively. The distance between the two planes at that instant is

(1) 6520 m (2) 6000 m

(3) 5000 m (4) 6250 m

(SSC CHSL DEO & LDC Exam. 28.10.2012 (1st Sitting)

16. The shadow of the tower becomes 60 metres longer when the altitude of the sun changes from 45° to 30°. Then the height of the tower is

(1) $20\left(\sqrt{3}+1\right)$ m (2) $24\left(\sqrt{3}+1\right)$ m

(3) $30\left(\sqrt{3}+1\right)$ m (4) $30\left(\sqrt{3}-1\right)$ m

(SSC CHSL DEO & LDC Exam. 28.10.2012 (1st Sitting)

17. A vertical post 15 ft high is broken at a certain height and its upper part, not completely separated, meets the ground at an angle of 30°. Find the height at which the post is broken.

(1) 10ft (2) 5ft

(3) $15\sqrt{3}\left(2-\sqrt{3}\right)$ ft (4) $5\sqrt{3}$ ft

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

18. The shadow of a tower is $\sqrt{3}$ times its height. Then the angle of elevation of the top of the tower is

(1) 45° (2) 30°

(3) 60° (4) 90°

(SSC Graduate Level Tier-I Exam. 11.11.2012 (1st Sitting)

19. A man 6 ft tall casts a shadow 4 ft long, at the same time when a flag pole casts a shadow 50 ft long. The height of the flag pole is

(1) 80 ft (2) 75 ft

(3) 60 ft (4) 70 ft

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

20. The angle of elevation of an aeroplane from a point on the ground is 60°. After 15 seconds flight, the elevation changes to 30°. If the aeroplane is flying at a height of $1500\sqrt{3}$ m, find the speed of the plane

(1) 300 m/sec (2) 200 m/sec

(3) 100 m/sec (4) 150 m/sec

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

21. The angle of elevation of the top of a tower from the point P and Q at distance of 'a' and 'b' respectively from the base of the tower and in the same straight line with it are complementary. The height of the tower is

(1) $\sqrt{ab}$ (2) $\frac{a}{b}$

(3) ab (4) a^2b^2

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

22. The angle of elevation of a tower from a distance 100 m from its foot is 30°. Height of the tower is :

(1) $\frac{100}{\sqrt{3}}$ m (2) $50\sqrt{3}$ m

(3) $\frac{200}{\sqrt{3}}$ m (4) $100\sqrt{3}$ m

(SSC Graduate Level Tier-I Exam. 21.04.2013, 1st Sitting)

23. A kite is flying at a height of 50 metre. If the length of string is 100 metre then the inclination of string to the horizontal ground in degree measure is

(1) 90 (2) 60

(3) 45 (4) 30

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

24. If the angle of elevation of a balloon from two consecutive kilometre-stones along a road are 30° and 60° respectively, then the height of the balloon above the ground will be

(1) $\frac{\sqrt{3}}{2}$ km (2) $\frac{1}{2}$ km

(3) $\frac{2}{\sqrt{3}}$ km (4) $3\sqrt{3}$ km

(SSC Graduate Level Tier-I Exam. 19.05.2013)

25. A vertical stick 12 cm long casts a shadow 8 cm long on the ground. At the same time, a tower casts a shadow 40 m long on the ground. The height of the tower is

(1) 72 m (2) 60 m

(3) 65 m (4) 70 m

(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)

26. A tower standing on a horizontal plane subtends a certain angle at a point 160 m apart from the foot of the tower. On advancing 100 m towards it, the tower is found to subtend an angle twice as before. The height of the tower is

(1) 80 m (2) 100 m

(3) 160 m (4) 200 m

(SSC Graduate Level Tier-II Exam. 29.09.2013

27. The angle of elevation of a tower from a distance 50 m from its foot is 30°. The height of the tower is

(1) $50\sqrt{3}$ m (2) $\frac{50}{\sqrt{3}}$ m

(2) $75\sqrt{3}$ m (4) $\frac{75}{\sqrt{3}}$ m

(SSC Graduate Level Tier-II Exam. 29.09.2013

28. The length of the shadow of a vertical tower on level ground increases by 10 metres when the altitude of the sun changes from 45° to 30°. Then the height of the tower is

(1) $5\sqrt{3}$ metre

(2) $10\left(\sqrt{3}+1\right)$ metre

(3) $5\left(\sqrt{3}+1\right)$ metre

(4) $10\sqrt{3}$ metre

(SSC CHSL DEO & LDC Exam. 20.10.2013)

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29. The elevation of the top of a tower from a point on the ground is 45°. On travelling 60m from the point towards the tower, the elevation of the top becomes 60°. The height of the tower (in metres) is

(1) 30 (2) $30(3-\sqrt{3})$

(3) $30(3+\sqrt{3})$ (4) $30\sqrt{3}$

(SSC 1CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

30. From two points on the ground lying on a straight line through the foot of a pillar, the two angles of elevation of the top of the pillar are complementary to each other. If the distance of the two points from the foot of the pillar are 9 metres and 16 metres and the two points lie on the same side of the pillar, then the height of the pillar is

(1) 5 m (2) 10 m

(3) 7 m (4) 12 m

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

31. From a point P on the ground the angle of elevation of the top of a 10 m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45°. Find the length of the flagstaff.

(Take $\sqrt{3}$ = 1.732)

(1) $10(\sqrt{3}+2)$ m

(2) $10(\sqrt{3}+1)$ m

(3) $10\sqrt{3}$ m

(4) 7.32 m

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

32. The angle of elevation of the top of a vertical tower situated perpendicularly on a plane is observed as 60° from a point P on the same plane. From another point Q, 10m vertically above the point P, the angle of depression of the foot of the tower is 30°. The height of the tower is

(1) 15 m (2) 30 m

(3) 20 m (4) 25 m

(SSC CGL Tier-I Exam. 19.10.2014)

33. From a point 20 m away from the foot of a tower, the angle of elevation of the top of the tower is 30°. The height of the tower is

(1) $10\sqrt{3}$ m (2) $20\sqrt{3}$ m

(3) $\frac{10}{\sqrt{3}}$ m (4) $\frac{20}{\sqrt{3}}$ m

(SSC CGL Tier-I Exam. 20.10.2014)

34. The angle of elevation of a ladder leaning against a house is 60° and the foot of the ladder is 6.5 metres from the house. The length of the ladder is

(1) $\frac{13}{\sqrt{3}}$ metres (2) 13 metres

(3) 15 metres (4) 3.25 metres

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

35. The angle of elevation of sun changes from 30° to 45°, the length of the shadow of a pole decreases by 4 metres, the height of the pole is

(Assume $\sqrt{3}$ = 1.732)

(1) 1.464 m (2) 9.464 m

(3) 3.648 cm (4) 5.464 m

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

36. A vertical pole and a vertical tower are standing on the same level ground. Height of the pole is 10 metres. Fromthe top of the pole the angle of elevation of the top of the tower and angle of depression of the foot of the tower are 60° and 30° respectively. The height of the tower is

(1) 20 m (2) 30 m

(3) 40 m (4) 50 m

(SSC CHSL DEO & LDC Exam. 9.11.2014)

37. The length of the shadow of a vertical tower on level ground increases by 10 metres when the altitude of the sun changes from 45° to 30°. Then the height of the tower is

(1) $5(\sqrt{3}+1)$ metres

(2) $5(\sqrt{3}-1)$ metres

(3) $5\sqrt{3}$ metres

(4) $\frac{5}{\sqrt{3}}$ metres

(SSC CHSL DEO & LDC Exam. 9.11.2014)

38. If a pole of 12 m height casts a shadow of $4\sqrt{3}$ m long on the ground, then the sun's angle of elevation at that instant is

(1) 30° (2) 60°

(3) 45° (4) 90° 16 cm is

(SSC CHSL DEO & LDC Exam. 16.11.2014)

39. The angle of elevation of the top of a tower from a point on the ground is 30° and moving 70 metres towards the tower it becomes 60°. The height of the tower is

(1) 10 metre (2) $\frac{10}{\sqrt{3}}$ metre

(3) $10\sqrt{3}$ metre

(4) $35\sqrt{3}$ metre

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

40. The shadow of a tower standing on a level plane is found to be 30 metre longer when the Sun's altitude changes from 60° to 45°. The height of the tower is

(1) $15(3+\sqrt{3})$ metre

(2) $15(\sqrt{3}+1)$ metre

(3) $15(\sqrt{3}-1)$ metre

(4) $15(3-\sqrt{3})$ metre

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

41. The angle of elevation of the top of a tower of height $100\sqrt{3}$ metre from a point at a distance of 100 metre from the foot of the tower on a horizontal plane is

(1) 45° (2) 60°

(3) 30° (4) $22\frac{1}{2}°$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

42. The shadow of a tower standing on a level plane is found to be 40m longer when the sun's altitude is 45°, than when it is 60°. The height of the tower is

(1) $30(3+\sqrt{3})$ metre

(2) $40(3+\sqrt{3})$ metre

(3) $20(3+\sqrt{3})$ metre

(4) $10(3+\sqrt{3})$ metre

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

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43. From two points on the ground and lying on a straight line through the foot of a pillar, the two angles of elevation of the top of the pillar are complementary to each other. If the distances of the two points from the foot of the pillar are 12 metres and 27 metres and the two points lie on the same side of the pillar, then the height (in metres) of the pillar is
(1) 12 (2) 18
(3) 15 (4) 16
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

44. If the height of a pole is $2\sqrt{3}$ metre and the length of its shadow is 2 metre, then the angle of elevation of the sun is
(1) 90° (2) 45°
(3) 30° (4) 60°
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

45. A 10 metre long ladder is placed against a wall. It is inclined at an angle of 30° to the ground. The distance (in m) of the foot of the ladder from the wall is (Given $\sqrt{3}$ = 1.732)
(1) 8.16 (2) 7.32
(3) 8.26 (4) 8.66
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

46. The angle of elevation of a tower from a distance of 100 metre from its foot is 30°. Then the height of the tower is
(1) $50\sqrt{3}$ metre (2) $100\sqrt{3}$ metre
(3) $\frac{50}{\sqrt{3}}$ metre (4) $\frac{100}{\sqrt{3}}$ metre
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

47. A kite is flying at the height of 75m from the ground. The string makes an angle θ (where $\cot\theta = \frac{8}{15}$) with the level ground. Assuming that there is no slack in the string the length of the string is equal to :
(1) 85 metre (2) 65 metre
(3) 75 metre (4) 40 metre
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

48. Two towers A and B have lengths 45m and 15m respectively. The angle of elevation from the bottom of the tower B to the top of the tower A is 60°. If the angle of elevation from the bottom of tower A to the top of the tower B is θ then value of sinθ is :
(1) $\frac{1}{\sqrt{2}}$ (2) $\frac{1}{2}$
(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{2}{\sqrt{3}}$
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

49. If a 48 m tall building has a shadow of $48\sqrt{3}$ m., then the angle of elevation of the sun is
(1) 15° (2) 60°
(3) 45° (4) 30°
(SSC CGL Tier-I Re-Exam, 30.08.2015)

50. A telegraph post is bent at a point above the ground due to storm. Its top just touches the ground at a distance of $10\sqrt{3}$ metre from its foot and makes an angle of 30° with the horizontal. Then height (in metres) of the telegraph post is
(1) 30 (2) 24
(3) 20 (4) 25
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

51. TF is a tower with F on the ground. The angle of elevation of T from A is $x°$ such that $\tan x° = \frac{2}{5}$ and AF = 200m. The angle of elevation of T from a nearer point B is $y°$ with BF = 80m. The value of $y°$ is
(1) 60° (2) 30°
(3) 75° (4) 45°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

52. If the angle of elevation of the sun changes from 45° to 60°, then the length of the shadow of a pillar decreases by 10 m. The height of the pillar is :
(1) $5\left(3-\sqrt{3}\right)$ metre
(2) $5\left(\sqrt{3}+1\right)$ metre
(3) $15\left(\sqrt{3}+1\right)$ metre
(4) $5\left(3+\sqrt{3}\right)$ metre
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

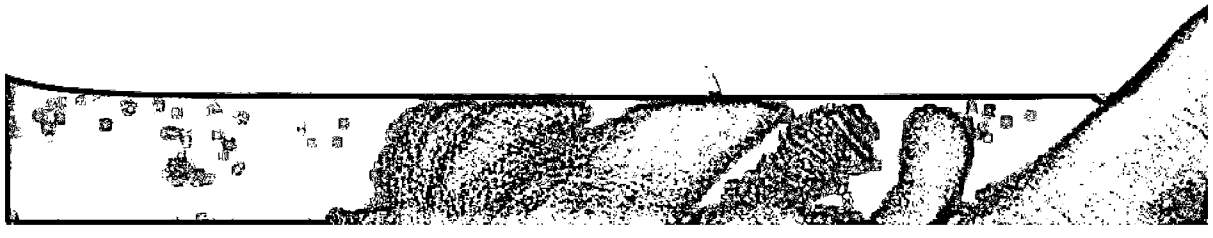
53. The ratio of the length of a rod and its shadow is 1 : $\sqrt{3}$. The angle of elevation of the sun is :
(1) 90° (2) 30°
(3) 45° (4) 60°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

TYPE–IV

1. There are two vertical posts, one on each side of a road, just opposite to each other. One post is 108 metre high. From the top of this post, the angle of depression of the top and foot of the other post are 30° and 60° respectively. The height of the other post (in metre) is
(1) 36 (2) 72
(3) 108 (4) 110
(SSC CHSL DEO & LDC Exam, 11.12.2011 (Ist Sitting (East Zone)

2. There are two temples, one on each bank of a river, just opposite to each other. One temple is 54m high. From the top of this temple, the angles of depression of the top and the foot of the other temple are 30° and 60° respectively. The length of the temple is :
(1) 18 m (2) 36 m
(3) $36\sqrt{3}$ m (4) $18\sqrt{3}$ m
(SSC & LDC Exam. 21.10.2012 (IInd Sitting)

3. The top of two poles of height 24 m and 36 m are connected by a wire. If the wire makes an angle of 60° with the horizontal, then the length of the wire is
(1) 6 m (2) $8\sqrt{3}$ m
(3) 8 m (4) $6\sqrt{3}$ m
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)



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4. From the top of a hill 200 m high, the angle of depression of the top and the bottom of a tower are observed to be 30° and 60°. The height of the tower is (in m) :

(1) $\frac{400\sqrt{3}}{3}$ (2) $166\frac{2}{3}$

(3) $133\frac{1}{3}$ (4) $200\sqrt{3}$

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

5. From a tower 125 metres high, the angle of depression of two objects, which are in horizontal line through the base of the tower, are 45° and 30° and they are on the same side of the tower. The distance (in metres) between the objects is

(1) $125\sqrt{3}$

(2) $125(\sqrt{3}-1)$

(3) $125/(\sqrt{3}-1)$

(4) $125(\sqrt{3}+1)$

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

6. From the top of a tower of height 180 m the angles of depression of two objects on either sides of the tower are 30° and 45°. Then the distance between the objects are

(1) $180\left(3+\sqrt{3}\right)$m

(2) $180\left(3-\sqrt{3}\right)$ m

(3) $180\left(\sqrt{3}-1\right)$ m

(4) $180\left(\sqrt{3}+1\right)$ m

(SSC CGL Tier-II Exam. 21.09.2014)

7. From the peak of a hill which is 300 m high, the angle of depression of two sides of a bridge lying on a ground are 45° and 30° (both ends of the bridge are on the same side of the hill). Then the length of the bridge is

(1) $300(\sqrt{3}-1)$ m

(2) $300(\sqrt{3}+1)$ m

(3) $300\sqrt{3}$ m

(4) $\frac{300}{\sqrt{3}}$ m

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014

8. From an aeroplane just over a river, the angle of depression of two palm trees on the opposite bank of the river are found to be 60° and 30° respectively. If the breadth of the river is 400 metres, then the height of the aeroplane above the river at that instant is

(Assume $\sqrt{3}$ = 1.732)

(1) 173.2 metres

(2) 346.4 metres

(3) 519.6 metres

(4) 692.8 metres

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

9. From the top of a light-house at a height 20 metres above sea-level, the angle of depression of a ship is 30°. The distance of the ship from the foot of the light house is

(1) 20 m (2) $20\sqrt{3}$ m

(3) 30 m (4) $30\sqrt{3}$ m

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

10. From an aeroplane just over a straight road, the angles of depression of two consecutive kilometre stones situated at opposite sides of the aeroplane were found to be 60° and 30° respectively. The height (in km) of the aeroplane from the road at that instant, is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{\sqrt{3}}{3}$

(3) $\frac{\sqrt{3}}{4}$ (4) $\sqrt{3}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

11. From an aeroplane just over a straight road, the angles of depression of two consecutive kilometre stones situated at opposite sides of the aeroplane were found to be 60° and 30° respectively. The height (in km) of the aeroplane from the road at that instant was

(Given $\sqrt{3}$ = 1.732)

(1) 0.433 (2) 8.66

(3) 4.33 (4) 0.866

(SSC CGL Tier-I Re-Exam, 30.08.2015)

12. THe angle of depression of a point situated at a distance of 70 m from the base of a tower is 60°. The height of the tower is :

(1) $35\sqrt{3}$ m (2) $70\sqrt{3}$ m

(3) $\frac{70\sqrt{3}}{3}$ m (4) 70 m

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6036638)

TYPE–V

1. A pole stands vertically, inside a scalene triangular park ABC. If the angle of elevation of the top of the pole from each corner of the park is same, then in Δ ABC, the foot of the pole is at the

(1) centroid (2) circumcentre

(3) incentre (4) orthocentre

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

2. The base of a triangle is $12\sqrt{3}$ cm and two angles at the base are 30° and 60° respectively. The altitude of the triangle is

(1) 12 cm (2) 6 cm

(3) $10\sqrt{3}$ cm (4) 9 cm

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

3. The two banks of a canal are straight and parallel. A, B, C are three persons of whom A stands on one bank and B and C on the opposite banks. B finds the angle ABC is 30°, while C finds that the angle ACB 60°. If B and C are 100 metres apart, the breadth of the canal is

(1) $\frac{25}{\sqrt{3}}$ metres

(2) $20\sqrt{3}$ metres

(3) $25\sqrt{3}$ metres

(4) $\frac{20}{\sqrt{3}}$ metres

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

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4. A person of height 6ft. wants to pluck a fruit which is on a $\frac{26}{3}$ ft. high tree. If the person is standing $\frac{8}{\sqrt{3}}$ ft. away from the base of the tree, then at what angle should he throw a stone so that it hits the fruit ?

(1) 75° (2) 30°

(3) 45° (4) 60°

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

SHORT ANSWERS

TYPE-I

1. (1)	2. (2)	3. (3)	4. (2)
5. (3)	6. (3)	7. (2)	8. (1)

TYPE-II

1. (3)	2. (3)	3. (3)	4. (2)
5. (1)	6. (1)	7. (2)	8. (3)
9. (4)	10. (2)	11. (1)	12. (1)
13. (1)	14. (4)	15. (4)	16. (2)
17. (4)	18. (4)	19. (3)	20. (3)
21. (2)	22. (2)	23. (2)	24. (4)
25. (1)	26. (2)	27. (4)	28. (2)
29. (4)	30. (1)	31. (3)	32. (3)
33. (2)	34. (1)	35. (2)	36. (1)
37. (3)	38. (2)	39. (2)	40. (2)
41. (3)	42. (4)	43. (4)	44. (3)
45. (2)	46. (3)	47. (1)	48. (3)
49. (2)	50. (3)	51. (4)	52. (1)
53. (3)	54. (2)	55. (3)	56. (2)
57. (1)	58. (4)	59. (4)	60. (2)
61. (2)	62. (1)	63. (2)	64. (3)
65. (2)	66. (3)	67. (1)	68. (1)
69. (2)	70. (3)	71. (3)	72. (2)
73. (1)	74. (3)	75. (3)	76. (1)
77. (4)	78. (2)	79. (2)	80. (4)
81. (3)	82. (2)	83. (3)	84. (2)
85. (4)	86. (4)	87. (4)	88. (1)
89. (3)	90. (3)	91. (3)	92. (4)
93. (3)	94. (3)	95. (1)	96. (1)
97. (1)	98. (4)	99. (2)	100. (1)
101. (2)	102. (1)	103. (3)	104. (1)
105. (1)	106. (3)	107. (1)	108. (4)
109. (1)	110. (4)	111. (3)	112. (1)
113. (1)	114. (3)	115. (2)	116. (4)
117. (3)	118. (2)	119. (3)	120. (1)
121. (4)	122. (2)	123. (3)	124. (4)
125. (1)	126. (4)	127. (1)	128. (4)
129. (4)	130. (2)	131. (2)	132. (2)
133. (1)	134. (2)	135. (2)	136. (2)
137. (2)	138. (4)	139. (3)	140. (3)
141. (3)	142. (4)	143. (2)	144. (2)
145. (1)	146. (4)	147. (4)	148. (4)
149. (2)	150. (1)	151. (3)	152. (3)
153. (2)	154. (1)	155. (1)	156. (3)
157. (1)	158. (2)	159. (2)	160. (2)
161. (1)	162. (3)	163. (1)	164. (2)
165. (3)	166. (3)	167. (4)	168. (2)
169. (2)	170. (2)	171. (3)	172. (2)
173. (3)	174. (2)	175. (3)	176. (1)
177. (1)	178. (3)	179. (4)	180. (3)
181. (4)	182. (2)	183. (4)	184. (4)
185. (*)	186. (2)	187. (1)	188. (1)
189. (1)	190. (1)	191. (3)	192. (1)
193. (3)	194. (3)	195. (4)	196. (2)
197. (3)	198. (3)	199. (3)	200. (4)
201. (4)	202. (2)	203. (1)	204. (3)
205. (2)	206. (1)	207. (1)	208. (4)
209. (3)	210. (4)	211. (3)	212. (3)
213. (1)	214. (1)	215. (1)	216. (3)
217. (2)	218. (2)	219. (3)	220. (4)
221. (3)	222. (3)	223. (1)	224. (3)
225. (2)	226. (3)	227. (1)	228. (3)
229. (2)	230. (4)	231. (3)	232. (2)
233. (3)	234. (1)	235. (4)	236. (4)
237. (2)	238. (1)	239. (2)	240. (2)
241. (2)	242. (2)	243. (2)	244. (1)
245. (3)	246. (3)	247. (2)	248. (1)
249. (1)	250. (3)	251. (4)	252. (4)
253. (4)	254. (1)	255. (4)	256. (2)
257. (2)	258. (2)	259. (4)	260. (4)
261. (3)	262. (1)	263. (1)	264. (4)
265. (1)	266. (4)	267. (1)	268. (1)
269. (4)	270. (4)	271. (4)	272. (3)
273. (2)	274. (2)	275. (2)	276. (3)
277. (4)	278. (2)	279. (2)	280. (2)
281. (4)	282. (1)	283. (3)	284. (1)
285. (*)	286. (2)	287. (3)	288. (4)
289. (4)	290. (3)	291. (2)	292. (2)
293. (1)	294. (1)		

TYPE-III

1. (4)	2. (2)	3. (2)	4. (3)
5. (3)	6. (3)	7. (3)	8. (1)
9. (3)	10. (2)	11. (1)	12. (3)
13. (4)	14. (4)	15. (4)	16. (3)
17. (2)	18. (2)	19. (2)	20. (2)
21. (1)	22. (1)	23. (4)	24. (1)
25. (2)	26. (1)	27. (*)	28. (3)
29. (3)	30. (4)	31. (4)	32. (2)
33. (4)	34. (2)	35. (4)	36. (3)
37. (1)	38. (2)	39. (4)	40. (1)
41. (2)	42. (3)	43. (2)	44. (4)
45. (4)	46. (4)	47. (1)	48. (2)
49. (4)	50. (1)	51. (4)	52. (4)
53. (2)			

TYPE-IV

1. (2)	2. (2)	3. (2)	4. (3)
5. (2)	6. (4)	7. (1)	8. (1)
9. (2)	10. (3)	11. (4)	12. (2)

TYPE-V

1. (2)	2. (4)	3. (3)	4. (2)

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EXPLANATIONS

TYPE-I

1. (1) $11°15'$

$= 11° + \frac{15°}{60}$

$= 11° + \frac{1}{4} = \frac{45°}{4}$

[$\because$ $180° = \pi^c$]

$\therefore \frac{45°}{4} = \frac{\pi}{180} \times \frac{45}{4} = \frac{\pi^c}{16}$

2. (2) $\angle ABC = 75°$

[$\because$ $180° = \pi$ radian or π^c]

$75° = \frac{\pi}{180} \times 75 = \frac{5\pi}{12}$ radian

$\therefore \angle BAC = \pi - \frac{\pi}{4} - \frac{5\pi}{12}$

$= \frac{12\pi - 3\pi - 5\pi}{12} = \frac{4\pi}{12}$

$= \frac{\pi}{3}$ radian

3. (3) Sum of remaining two angles

$= \pi - \frac{5\pi}{9} = \frac{4\pi}{9}$

$\therefore$ Each angle $= \frac{1}{2} \times \frac{4\pi}{9} = \frac{2\pi}{9}$

[$\because \Delta$ is isosceles]

4. (2) $\pi =$ radian $= 180°$

$\therefore$ 1 radian $= \frac{180°}{\pi}$

$= \frac{180 \times 7°}{22}$

$= \frac{630}{11} = 57\frac{3}{11}°$

$= 57°\frac{3}{11} \times 60' = 57°\frac{180'}{11}$

$= 57°16'\frac{4}{11} \times 60'' = 57°16'22''$

5. (3) $\because$ π radian $= 180°$

$\therefore \frac{3\pi}{5}$ radian $= \frac{180}{\pi} \times \frac{3\pi}{5}$

$= 108°$

6. (3) Two angles $=$ A and B where A > B.

$\therefore A + B = 135°$

$= \left(\frac{135 \times \pi}{180}\right)$ radian

$\Rightarrow A + B = \left(\frac{3\pi}{4}\right)$ radian ....(i)

$A - B = \frac{\pi}{12}$ ....(ii)

On adding these equations,

$2A = \frac{3\pi}{4} + \frac{\pi}{12}$

$= \frac{9\pi + \pi}{12} = \frac{10\pi}{12} = \frac{5\pi}{6}$

$\therefore A = \frac{5\pi}{12}$ radian

7. (2) $\sec^2\theta + \tan^2\theta = 7$

$\Rightarrow 1 + \tan^2\theta + \tan^2\theta = 7$

$\Rightarrow 2\tan^2\theta = 7 - 1 = 6$

$\Rightarrow \tan^2\theta = 3$

$\Rightarrow \tan\theta = \sqrt{3}$

$= \tan 60°$

$\Rightarrow \theta = 60°$

$\because 180° = \pi$ radian

$\therefore 60° = \frac{\pi}{180} \times 60 = \frac{\pi}{3}$ radian

8. (1) $\because$ π radian $= 180°$

$\therefore \frac{22}{9}$ radian $= \frac{180}{\pi} \times \frac{22}{9}$

$= \frac{180}{22} \times \frac{22 \times 7}{9} = 140°$ ....(i)

According to the question,

$A + B = 140°$

and, $A - B = 36°$ ....(ii)

On adding,

$2A = 176° \Rightarrow A = \frac{176}{2} = 88°$

From equation (i),

$\therefore 88° + B = 140°$

$\Rightarrow B = 140° - 88° = 52°$

TYPE-II

1. (3) $2\sin^2\theta + 3\cos^2\theta$

$= 2\sin^2\theta + 2\cos^2\theta + \cos^2\theta$

$= 2(\sin^2\theta + \cos^2\theta) + \cos^2\theta$

$= 2 + \cos^2\theta$ [$\because \sin^2\theta + \cos^2\theta = 1$]

$\because$ Minimum value of $\cos\theta = -1$

But $\cos^2\theta \geq 0$, when $\theta = 90°$

[$\because \cos 0° = 1$, $\cos 90° = 0$]

$\therefore$ Required minimum value

$= 2 + 0 = 2$

2. (3)

$\frac{1}{\text{cosec}^2 51°} + \sin^2 39° + \tan^2 51° - \frac{1}{\sin^2 51° . \sec^2 39°}$

$= \sin^2 51° + \sin^2 39° + \tan^2(90° - 39°) - \frac{1}{\sin^2(90° - 39°) . \sec^2 39°}$

$= \cos^2 39° + \sin^2 39° + \cot^2 39° - \frac{1}{\cos^2 39° . \sec^2 39°}$

[$\because \sin(90° - \theta) = \cos\theta$

$\tan(90° - \theta) = \cot\theta$]

$= 1 + \cot^2 39° - 1$

$= \text{cosec}^2 39° - 1 = x^2 - 1$

3. (3) $\tan 4° . \tan 43° . \tan 47° . \tan 86°$

$= \tan 4° . \tan 43° . \tan(90° - 43°) . \tan(90° - 4°)$

$= \tan 4° \times \tan 43° \times \cot 43° \times \cot 4° = 1$

[$\tan(90° - \theta) = \cot\theta$; $\tan\theta . \cot\theta = 1$]

4. (2) $\frac{\tan\theta + \cot\theta}{\tan\theta - \cot\theta} = \frac{2}{1}$

By componendo and dividendo,

$\frac{2\tan\theta}{2\cot\theta} = \frac{3}{1}$

$\Rightarrow \frac{\sin\theta}{\cos\theta} . \frac{\sin\theta}{\cos\theta} = 3$

$\Rightarrow \sin^2\theta = 3\cos^2\theta$

$\Rightarrow \sin^2\theta = 3(1 - \sin^2\theta)$

$\Rightarrow 4\sin^2\theta = 3$

$\Rightarrow \sin^2\theta = \frac{3}{4}$

$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2}$

5. (1) $\cos x + \cos y = 2$

$\because \cos x \leq 1$

$\Rightarrow \cos x = 1$; $\cos y = 1$

$\Rightarrow x = y = 0°$ [$\because$ Cos $0° = 1$]

$\therefore \sin x + \sin y = 0$

6. (1) $\tan 1° . \tan 2° . \tan 3° \ldots \tan 45° \ldots \tan 88° \tan 89°$

$= (\tan 1° . \tan 89°)(\tan 2° . \tan 88°) \ldots \tan 45°$

$= (\tan 1° . \cot 1°) . (\tan 2° . \cot 2°) \ldots \tan 45° = 1$

[$\because \tan(90° - \theta) = \cot\theta$, $\tan\theta . \cot\theta = 1$]

7. (2) Let the measure of three angles of triangle are 2x, 7x and 11x respectively.

$\therefore 2x + 7x + 11x = 180°$

$\Rightarrow 20x = 180°$

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$\Rightarrow x = \frac{180}{20} = 9°$

$\therefore$ First angle $= 2x = 2 \times 9 = 18°$
Second angle $= 7x = 7 \times 9 = 63°$
Third angle $= 11x = 11 \times 9 = 99°$

8. (3) Sum of angles of a triangle $= 180°$

$\therefore x + 5 + 2x - 3 + 3x + 4 = 180°$

$\Rightarrow 6x + 6 = 180°$

$\Rightarrow 6x = 180 - 6 = 174°$

$\Rightarrow x = \frac{174}{6} = 29$

9. (4) $\cot 10° . \cot 80° . \cot 20° . \cot 70° . \cot 60°$
$= \cot 10° . \tan 10° . \cot 20° . \tan 20° . \cot 60°$

$[\because \tan(90° - \theta) = \cot\theta$ and $\tan\theta . \cot\theta = 1]$

$= 1 \times 1 \times \frac{1}{\sqrt{3}} \quad \left[\because \cot 60° = \frac{1}{\sqrt{3}}\right]$

$= \frac{1}{\sqrt{3}}$

10. (2) $7\sin^2\theta + 3\cos^2\theta = 4$

$\Rightarrow 7\frac{\sin^2\theta}{\cos^2\theta} + 3 = \frac{4}{\cos^2\theta}$

$= 4\sec^2\theta$

$\Rightarrow 7\tan^2\theta + 3 = 4(1 + \tan^2\theta)$
$\Rightarrow 7\tan^2\theta - 4\tan^2\theta = 4 - 3$
$\Rightarrow 3\tan^2\theta = 1$

$\Rightarrow \tan^2\theta = \frac{1}{3}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$

11. (1) No. of terms in $1 + 5 + 9 + \ldots + 89 = n$

$\therefore a + (n-1)d = t_n$
$\Rightarrow 1 + (n-1)4 = 89$
$\Rightarrow (n-1)4 = 89 - 1 = 88$
$\Rightarrow n - 1 = 22$
$\Rightarrow n = 23$

Now, $\sin^2 1° + \sin^2 89° + \sin^2 5° + \sin^2 85° + \ldots +$ to 22 terms $+ \sin^2 45°$
$= (\sin^2 1° + \cos^2 1°) + (\sin^2 5° + \cos^2 5°) + \ldots +$ to 11 terms $+ \left(\frac{1}{\sqrt{2}}\right)^2 = 11 \times 1 + \frac{1}{2}$

$= 11 + \frac{1}{2} = 11\frac{1}{2}$

$[\sin(90° - \theta) = \cos\theta$ and $\sin^2\theta + \cos^2\theta = 1]$

12. (1) $\cot 18°$

$\left(\cot 72° . \cos^2 22° + \frac{1}{\tan 72° . \sec^2 68°}\right)$
$= \cot 18° . \cot 72° . \cos^2 22° + \frac{\cot 18°}{\tan 72° . \sec^2 68°}$
$= \cot 18° . \tan 18° . \cos^2 22° + \frac{\cot 18°}{\cot 18°} . \cos^2 68°$
$= \cos^2 22° + \cos^2 68°$
$= \cos^2 22° + \sin^2 22° = 1$

$[\because \tan(90° - \theta) = \cot\theta;$ $\sin(90° - \theta) = \cos\theta;$ $\sin^2\theta + \cos^2\theta = 1]$

13. (1) $\tan 15° . \cot 75° + \tan 75° . \cot 15°$
$= \tan 15° . \cot(90° - 15°) + \tan(90° - 15°) . \cot 15°$
$= \tan^2 15° + \cot^2 15° \quad \ldots\ldots(i)$

$[\because \tan(90° - \theta) = \cot\theta$, $\cot(90° - \theta) = \tan\theta]$

$\tan 15° = 2 - \sqrt{3}$

$\therefore \cot 15° = \frac{1}{2 - \sqrt{3}} = \frac{2 + \sqrt{3}}{(2 - \sqrt{3})(2 + \sqrt{3})}$

$= 2 + \sqrt{3}$

$\therefore \tan^2 15° + \cot^2 15° = \left(2 - \sqrt{3}\right)^2 + \left(2 + \sqrt{3}\right)^2$
$= 2(4 + 3) = 14$

14. (4) $\sin(2x - 20°) = \cos(2y + 20°)$

$\Rightarrow \sin(2x - 20°) = \sin(90° - 2y - 20°)$
$\Rightarrow 2x - 20° = 70° - 2y$
$\Rightarrow 2x + 2y = 70 + 20 = 90°$
$\Rightarrow x + y = 45°$
$\therefore \tan(x + y) = \tan 45° = 1$

15. (4) $A + B = 90°$
$\Rightarrow B = 90° - A$
$\therefore \sec^2 A + \sec^2 B - \sec^2 A . \sec^2 B$
$= \sec^2 A + \operatorname{cosec}^2 A - \sec^2 A . \operatorname{cosec}^2 A$

$= \frac{1}{\cos^2 A} + \frac{1}{\sin^2 A} - \frac{1}{\sin^2 A . \cos^2 A}$

$= \frac{\sin^2 A + \cos^2 A - 1}{\sin^2 A . \cos^2 A}$

$= \frac{1 - 1}{\sin^2 A . \cos^2 A} = 0.$

16. (2) Let the number of terms be n, then

By $t_n = a + (n-1)d$
$85 = 5 + (n-1)$
$\Rightarrow n - 1 = 85 - 5 = 80$
$\Rightarrow n = 81$

$\therefore \sin^2 5° + \sin^2 6° + \ldots + \sin^2 45° + \ldots + \sin^2 84° + \sin^2 85°$
$= (\sin^2 5° + \sin^2 85°) + (\sin^2 6° + \ldots + \sin^2 84°) + \ldots\ldots +$ to (40 terms) $+ \sin^2 45°$
$= (\sin^2 5° + \cos^2 5°) + (\sin^2 6° + \ldots + \cos^2 6°) + \ldots\ldots +$ to 40 terms $+ \sin^2 45°$ $\left[\sin(90° - \theta) = \cos\theta$, $\sin^2\theta + \cos^2\theta = 1\right]$

$= 40 + \left(\frac{1}{\sqrt{2}}\right)^2 = 40 + \frac{1}{2} = 40\frac{1}{2}$

17. (4) $\sin\theta = \cos(90° - \theta)$;
$\sin(90° - \theta) = \cos\theta$
$\therefore \sin 85° = \sin(90° - 5°) = \cos 5°$
$\therefore (\sin^2 5° + \sin^2 85°) + (\sin^2 10° + \sin^2 80°) + \ldots\ldots$ to 8 terms $+ \sin^2 45° + \sin^2 90°$

$= 8 \times 1 + \frac{1}{2} + 1 = 9\frac{1}{2}$

18. (4) $\frac{\sin 39°}{\cos 51°} + 2\tan 11° . \tan 79° . \tan 31° . \tan 59° . \tan 45° - 3(\sin^2 21° + \sin^2 69°)$

$= \frac{\sin 39°}{\cos(90° - 39°)} + 2\tan 11° . \tan(90° - 11°) . \tan 31° . \tan(90° - 59°) . 1 - 3(\sin^2 21° + \sin^2(90° - 21°))$

$= \frac{\sin 39°}{\sin 39°} + 2\tan 11° . \cot 11° . \tan 31° . \cot 31° - 3(\sin^2 21° + \cos^2 21°)$
$= 1 + 2 - 3 = 0$

$[\tan\theta . \cot\theta = 1, \sin^2\theta + \cos^2\theta = 1]$

19. (3) $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$

$\Rightarrow \cos^2\theta = 3\cot^2\theta - 3\cos^2\theta$

$\Rightarrow 4\cos^2\theta = 3\cot^2\theta = 3\frac{\cos^2\theta}{\sin^2\theta}$

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$\Rightarrow 4\cos^2\theta - \frac{3\cos^2\theta}{\sin^2\theta} = 0$

$\Rightarrow \cos^2\theta\left(4 - \frac{3}{\sin^2\theta}\right) = 0$

$\therefore 4 - \frac{3}{\sin^2\theta} = 0$ & $\cos^2\theta = 0$

$\Rightarrow 4\sin^2\theta = 3$

$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2} = \sin 60°$

$\Rightarrow \theta = 60°$

$\cos^2\theta = 0 \Rightarrow \theta = 90°$

20. (3) $A = \tan 11° \cdot \tan 29°$

$B = 2\cot 61° \cdot \cot 79°$

$= 2\cot(90° - 29°)\cot(90° - 11°)$

$= 2\tan 29° \cdot \tan 11°$

$[\because \cot(90° - \theta) = \tan\theta]$

$= 2A$

21. (2) $\sin 17° = \frac{x}{y}$

$\cos 17° = \sqrt{1 - \sin^2 17°}$

$= \sqrt{1 - \frac{x^2}{y^2}} = \sqrt{\frac{y^2 - x^2}{y^2}}$

$= \frac{\sqrt{y^2 - x^2}}{y}$

$\therefore \sec 17° = \frac{y}{\sqrt{y^2 - x^2}}$

$\sin 73° = \sin(90° - 17°)$

$= \cos 17°$

$\therefore \sec 17° - \sin 73°$

$= \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$

$= \frac{y^2 - y^2 + x^2}{y\sqrt{y^2 - x^2}} = \frac{x^2}{y\sqrt{y^2 - x^2}}$

22. (2) $Z = \sin\theta + \cos\theta$

$\Rightarrow Z^2 = \sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta$

$= 1 + 2\sin\theta.\cos\theta$

$\because 0 < \theta < 90°$

$\therefore \sin\theta < 1;\ \cos\theta < 1$

$\therefore 2\sin\theta \cdot \cos\theta < 1$

and $2\sin\theta\cos\theta > 1$

$\Rightarrow Z^2 < 2$

$\Rightarrow Z < \sqrt{2}$

23. (2) $\frac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$

$= \frac{\cot 33° + \tan 53°}{\tan 33° + \cot 53°}$

$[\because \tan(90° - \theta) = \cot\theta,\ \cot(90° - \theta) = \tan\theta]$

$= \frac{\frac{1}{\tan 33°} + \tan 53°}{\tan 33° + \frac{1}{\tan 53°}}$

$= \frac{1 + \tan 53° \cdot \tan 33°}{\tan 33° \cdot \tan 53° + 1} \times \frac{\tan 53°}{\tan 33°}$

$= \tan 53° \cdot \cot 33°$

$= \cot 37° \cdot \tan 57°$

24. (4) $\cot 30° = \cot(90° - 60°)$

$= \tan 60°$

$\cot 75° = \cot(90° - 15°) = \tan 15°$

$\therefore \frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$

$= \frac{\tan 60° - \tan 15°}{\tan 15° - \tan 60°} = -1$

25. (1) $\cot\theta.\ \tan(90° - \theta) - \sec(90° - \theta).\ \operatorname{cosec}\theta + (\sin^2 25° + \sin^2 65°) + \sqrt{3}\ (\tan 5°.\ \tan 15°.\ \tan 30°.\ \tan 75°.\ \tan 85°)$

$= \cot\theta.\cot\theta - \operatorname{cosec}\theta.\ \operatorname{cosec}\theta + (\sin^2 25° + \cos^2 25°) + \sqrt{3}$ (tan 5°. cot 5°. tan15°. cot15°. tan30°)

$= (\cot^2\theta - \operatorname{cosec}^2\theta) + (\sin^2 25° + \cos^2 25°) + \sqrt{3} \times \frac{1}{\sqrt{3}}$

$= -1 + 1 + 1 = 1$

[$\sin(90° - \theta) = \cos\theta$; $\operatorname{cosec}^2\theta - \cot^2\theta = 1$; $\tan(90° - \theta) = \cot\theta$; $\sec(90° - \theta) = \operatorname{cosec}\theta$]

26. (2) $\sin(3x - 20°)$

$= \cos(3y + 20°)$

$\Rightarrow \sin(3x - 20°)$

$= \sin(90° - 3y - 20°)$

$= \sin(70° - 3y)$

$\Rightarrow 3x - 20° = 70° - 3y$

$\Rightarrow 3x + 3y = 90°$

$\Rightarrow 3(x + y) = 90°$

$\Rightarrow x + y = 30°$

27. (4) $\cos\theta.\operatorname{cosec}23° = 1$

$\Rightarrow \operatorname{cosec}23° = \frac{1}{\cos\theta} = \sec\theta$

$\Rightarrow \operatorname{cosec}23° = \operatorname{cosec}(90° - \theta)$

$\Rightarrow 23° = 90° - \theta$

$\Rightarrow \theta = 90° - 23° = 67°$

28. (2) $2(\cos^2\theta - \sin^2\theta) = 1$

$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{1}{2}$

$\Rightarrow 1 - 2\sin^2\theta = \frac{1}{2}$

$\Rightarrow 2\sin^2\theta = 1 - \frac{1}{2}$

$\Rightarrow 2\sin^2\theta = \frac{1}{2} \Rightarrow \sin^2\theta = \frac{1}{4}$

$\Rightarrow \sin\theta = \pm\frac{1}{2} = \sin 30°$

$\left[\because \theta \text{ is } +\text{ve angle},\ \therefore \theta \neq \frac{-1}{2}\right]$

$\Rightarrow \theta = 30°$

29. (4) $\tan 35° \cdot \tan 45° \cdot \tan 55°$

$= \tan 35° \cdot 1 \cdot \tan(90° - 35°)$

$= \tan 35° \cdot 1 \cdot \cot 35° = 1.1 = 1$

[$\tan(90° - \theta) = \cot\theta$; $\tan\theta \cdot \cot\theta = 1$]

30. (1) $\sec(7\theta + 28°)$

$= \operatorname{cosec}(30° - 3\theta)$

$\Rightarrow \sec(7\theta + 28°) = \sec(90° - (30° - 3\theta))$

$\Rightarrow 7\theta + 28° = 90° - 30° + 3\theta$

$\Rightarrow 4\theta = 90° - 30° - 28° = 32°$

$\Rightarrow \theta = \frac{32°}{4} = 8°$

31. (3) $\tan\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \sqrt{3}$

$\Rightarrow \cot\frac{\theta}{2} = \sqrt{3} = \cot 30°$

$\Rightarrow \frac{\theta}{2} = 30° \Rightarrow \theta = 60°$

$\therefore \cos\theta = \cos 60° = \frac{1}{2}$

32. (3) $7\sin^2\theta + 3\cos^2\theta = 4$

$\Rightarrow 7\sin^2\theta + 3(1 - \sin^2\theta) = 4$

$\Rightarrow 7\sin^2\theta + 3 - 3\sin^2\theta = 4$

$\Rightarrow 4\sin^2\theta = 4 - 3 = 1$

$\Rightarrow \sin^2\theta = \frac{1}{4}$

$\Rightarrow \sin\theta = \frac{1}{2} = \sin\frac{\pi}{6}$

$\left[\text{Note: } \sin\theta \neq \frac{-1}{2},\ \because 0 < \theta < 90\right]$

$\Rightarrow \theta = \frac{\pi}{6}$

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33. (2) $\sec\theta = \frac{4x^2+1}{4x}$

$\tan\theta = \sqrt{\sec^2\theta - 1}$

$= \sqrt{\left(\frac{4x^2+1}{4x}\right)^2 - 1}$

$= \sqrt{\frac{(4x^2+1)^2 - (4x)^2}{(4x)^2}}$

$= \frac{(2x+1)(2x-1)}{4x} = \frac{4x^2-1}{4x}$

$\therefore \sec\theta + \tan\theta = \frac{4x^2+1}{4x} + \frac{4x^2-1}{4x}$

$= \frac{4x^2+1+4x^2-1}{4x}$

$= \frac{8x^2}{4x} = 2x$

34. (1) $\cos 90° = 0$

$\therefore \cos 1°. \cos 2° \ldots \cos 179° = 0$

35. (2) $\sin^2 25° + \sin^2 65°$

$= \sin^2 25° + \sin^2(90° - 25°)$

$= \sin^2 25° + \cos^2 25° = 1$

36. (1) $\sec\theta + \tan\theta = \sqrt{3}$ .....(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$ ....(ii)

By subtracting (ii) from (i)

$\sec\theta + \tan\theta - \sec\theta + \tan\theta$

$= \sqrt{3} - \frac{1}{\sqrt{3}}$

$\Rightarrow 2\tan\theta = \frac{3-1}{\sqrt{3}}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} = \tan 30°$

$\Rightarrow \theta = 30°$

$\therefore \tan 3\theta = \tan 90° =$ undefined

37. (3) $\sin(60° - \theta) = \cos(\psi - 30°)$

$= \sin(90° - \psi + 30°)$

$= \sin(120° - \psi)$

$\Rightarrow 60° - \theta = 120° - \psi$

$\Rightarrow \psi - \theta = 60°$

$\therefore \tan(\psi - \theta) = \tan 60° = \sqrt{3}$

38. (2) $a\sin\theta + b\cos\theta = c$ ...(i)

$a\cos\theta - b\sin\theta = x$ ...(ii)

Squaring both the equations and adding,

$a^2\sin^2\theta + b^2\cos^2\theta + 2ab\sin\theta.\cos\theta + a^2\cos^2\theta + b^2\sin^2\theta - 2ab\sin\theta.\cos\theta = c^2 + x^2$

$\Rightarrow a^2\sin^2\theta + a^2\cos^2\theta + b^2\cos^2\theta + b^2\sin^2\theta = c^2 + x^2$

$\Rightarrow a^2(\sin^2\theta + \cos^2\theta) + b^2(\cos^2\theta + \sin^2\theta) = c^2 + x^2$

$\Rightarrow a^2 + b^2 = c^2 + x^2$

$\Rightarrow x^2 = a^2 + b^2 - c^2$

$\Rightarrow x = \pm\sqrt{a^2 + b^2 - c^2}$

39. (2) $\sin(A - B) = \frac{1}{2} = \sin 30°$

$\Rightarrow A - B = 30°$

Again, $\cos(A + B) = \frac{1}{2} = \cos 60°$

$\Rightarrow A + B = 60°$

$\therefore A + B + A - B = 30° + 60° = 90°$

$\Rightarrow 2A = 90°$

$\Rightarrow A = 45°$

$\therefore A - B = 30°$

$\Rightarrow B = A - 30° = 45° - 30° = 15°$

$= \frac{15\times\pi}{180} = \frac{\pi}{12}$ radian

40. (2) Maximum value of $a\sin\theta + b\cos\theta = \sqrt{a^2 + b^2}$

$\therefore$ Maximum value of $2\sin\theta + 3\cos\theta = \sqrt{2^2 + 3^2} = \sqrt{13}$

41. (3) $152(\sin 30° + 2\cos^2 45° + 3\sin 30° + 4\cos^2 45° + \ldots + 17\sin 30° + 18\cos^2 45°)$

$= 152\left(\frac{1}{2} + 2\times\frac{1}{2} + 3\times\frac{1}{2} + 4\times\frac{1}{2} + \ldots + 17\times\frac{1}{2} + 18\times\frac{1}{2}\right)$

$= 152\left(\frac{1}{2} + 1 + \frac{3}{2} + 2 + \ldots + \frac{17}{2} + 9\right)$

It is an A.P. whose $a = \frac{1}{2}$, $d = \frac{1}{2}$, $n = 18$

$= 152\left[\frac{18}{2}\left(2\times\frac{1}{2} + (18-1)\frac{1}{2}\right)\right]$

$= 152\left[9\left(1 + \frac{17}{2}\right)\right]$

$= \frac{152\times 9\times 19}{2} = 12996$ and

$\sqrt{12996} = 114$

i.e. a perfect square of an integer.

42. (4) $3\cos 80°.\ \text{cosec}\ 10° + 2\cos 59°.\ \text{cosec}\ 31°$

$= 3\cos(90° - 10°).\ \text{cosec}\ 10° + 2\cos(90° - 31°).\ \text{cosec}\ 31°$

$= 3\sin 10°.\ \text{cosec}\ 10° + 2\sin 31°.\ \text{cosec}\ 31°$

$= 3 + 2 = 5$

[$\because \cos(90° - \theta) = \sin\theta$; $\sin\theta.\ \text{cosec}\theta = 1$]

43. (4) $\sin^2\theta - 3\sin\theta + 2 = 0$

$\Rightarrow \sin^2\theta - 2\sin\theta - \sin\theta + 2 = 0$

$\Rightarrow \sin\theta(\sin\theta - 2) - 1(\sin\theta - 2) = 0$

$\Rightarrow (\sin\theta - 1)(\sin\theta - 2) = 0$

$\Rightarrow \sin\theta = 1 = \sin 90°$

$\Rightarrow \theta = 90°$ and $\sin\theta \neq 2$

44. (3) $\tan\alpha = n\tan\beta$

$\Rightarrow \tan\beta = \frac{1}{n}\tan\alpha$

$\Rightarrow \cot\beta = \frac{n}{\tan\alpha}$ and

$\sin\alpha = m\sin\beta \Rightarrow \sin\beta = \frac{1}{m}\sin\alpha$

$\Rightarrow \text{cosec}\ \beta = \frac{m}{\sin\alpha}$

[$\because \text{cosec}^2\beta - \cot^2\beta = 1$]

$\Rightarrow \frac{m^2}{\sin^2\alpha} - \frac{n^2}{\tan^2\alpha} = 1$

$\Rightarrow \frac{m^2}{\sin^2\alpha} - \frac{n^2\cos^2\alpha}{\sin^2\alpha} = 1$

$\Rightarrow \frac{m^2 - n^2\cos^2\alpha}{\sin^2\alpha} = 1.$

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$\Rightarrow m^2 - n^2\cos^2\alpha = \sin^2\alpha$
$= 1 - \cos^2\alpha$
$\Rightarrow m^2 - 1 = n^2\cos^2\alpha - \cos^2\alpha$
$= (n^2 - 1)\cos^2\alpha$

$\Rightarrow \cos^2\alpha = \dfrac{m^2-1}{n^2-1}$

45. (2) $\tan\theta = \dfrac{3}{4}$

$\therefore \cot\theta = \dfrac{4}{3}$

$\because \operatorname{cosec}^2\theta - \cot^2\theta = 1$

$\Rightarrow \operatorname{cosec}\theta = \sqrt{1+\cot^2\theta}$

$= \sqrt{1+\left(\dfrac{4}{3}\right)^2} = \sqrt{1+\dfrac{16}{9}} = \sqrt{\dfrac{25}{9}}$

$= \dfrac{5}{3}$

46. (3) $\operatorname{cosec}\theta - \cot\theta = \dfrac{7}{2}$ .....(i)

$\operatorname{cosec}^2\theta - \cot^2\theta = 1$
$\Rightarrow (\operatorname{cosec}\theta + \cot\theta)(\operatorname{cosec}\theta - \cot\theta) = 1$
$\Rightarrow \operatorname{cosec}\theta + \cot\theta$

$= \dfrac{1}{\operatorname{cosec}\theta - \cot\theta} = \dfrac{2}{7}$ .....(ii)

On adding both equations,

$2\operatorname{cosec}\theta = \dfrac{7}{2} + \dfrac{2}{7}$

$= \dfrac{49+4}{14} = \dfrac{53}{14}$

$\Rightarrow \operatorname{cosec}\theta = \dfrac{53}{28}$

47. (1) $x\sin 45° = y\operatorname{cosec} 30°$

$\Rightarrow x \times \dfrac{1}{\sqrt{2}} = y \times 2$

$\Rightarrow \dfrac{x}{y} = 2\sqrt{2}$

$\Rightarrow \dfrac{x^4}{y^4} = \left(2\sqrt{2}\right)^4 = 2^4 \times 2^2$

$= 2^6 = 4^3$

48. (3) $5\tan\theta = 4 \Rightarrow \tan\theta = \dfrac{4}{5}$

$\therefore \dfrac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta}$

Dividing numerator and denominator by $\cos\theta$,

$= \dfrac{5.\dfrac{\sin\theta}{\cos\theta} - \dfrac{3\cos\theta}{\cos\theta}}{5\dfrac{\sin\theta}{\cos\theta} + \dfrac{2\cos\theta}{\cos\theta}}$

$= \dfrac{5\tan - 3}{5\tan\theta + 2} = \dfrac{5\times\frac{4}{5} - 3}{5\times\frac{4}{5} + 2}$

$= \dfrac{4-3}{4+2} = \dfrac{1}{6}$

49. (2) $2\operatorname{cosec}^2 23° \times \cot^2 67° - \sin^2 23° - \sin^2 67° - \cot^2 67°$
$= 2.\operatorname{cosec}^2(90° - 67°) \times \cot^2 67° - \sin^2 23° - \sin^2(90° - 23°) - \cot^2 67°$
$= 2\sec^2 67° \times \cot^2 67° - \sin^2 23° - \cos^2 23° - \cot^2 67°$
$= 2\operatorname{cosec}^2 67° - 1 - \cot^2 67°$
$= \operatorname{cosec}^2 67° - 1 + \operatorname{cosec}^2 67° - \cot^2 67°$
$= \operatorname{cosec}^2 67° = \sec^2 23°$

[$\because \sec(90°-\theta) = \operatorname{cosec}\theta$;
$\sin(90°-\theta) = \cos\theta$ &
$\operatorname{cosec}^2(67) - 1 = \cot^2 67$]

50. (3) $\cos^2\theta \le 1$

$\therefore \dfrac{(x+y)^2}{4xy} \le 1$

$\Rightarrow (x+y)^2 - 4xy \le 0$
$\Rightarrow (x-y)^2 \ge 0$
$\Rightarrow x = y$

51. (4) Expression

$= \operatorname{cosec}^2 18° - \dfrac{1}{\cot^2 72°}$

$= \operatorname{cosec}^2 18° - \tan^2 72°$
[$\because \tan\theta . \cot\theta = 1$]
$= \operatorname{cosec}^2 18° - \tan^2(90° - 18°)$
$= \operatorname{cosec}^2 18° - \cot^2 18°$
$= 1$

[$\because \tan(90° - \theta) = \cot\theta$;
$\operatorname{cosec}^2\theta - \cot^2\theta = 1$]

52. (1) $(1 - \sin^2\alpha)(1 - \cos^2\alpha)(1 + \cot^2\beta)(1 + \tan^2\beta)$
$= \cos^2\alpha . \sin^2\alpha . \operatorname{cosec}^2\beta \sec^2\beta$
$= (\cos^2\alpha . \operatorname{cosec}^2\beta)(\sin^2\alpha . \sec^2\beta)$
$= (\cos^2\alpha . \sec^2\alpha)(\sin^2\alpha . \operatorname{cosec}^2\alpha) = 1$

[$\alpha + \beta = 90° \Rightarrow \beta = 90° - \alpha$
$\operatorname{cosec}\beta = \operatorname{cosec}(90° - \alpha)$
$= \sec\alpha$; $\sec\beta = \sec(90° - \alpha)$
$= \operatorname{cosec}\alpha, \sin\alpha . \operatorname{cosec}\alpha$
$= \cos\alpha . \sec\alpha = 1$]

53. (3) $\dfrac{2\sin 68°}{\cos 22°} - \dfrac{2\cot 15°}{5\tan 75°} -$

$\dfrac{3\tan 45°.\tan 20°.\tan 40°}{\tan 50°\tan 70°}$

$= 2\dfrac{\cos 22°}{\cos 22°} - \dfrac{2\tan 75°}{5\tan 75°} -$

$\dfrac{3.\tan 20°.\cot 20°\tan 40°.\cot 40°}{5}$

$= 2 - \dfrac{2}{5} - \dfrac{3}{5}$

$= \dfrac{10-2-3}{5} = 1$

[$\sin(90°-\theta) = \cos\theta$;
$\cot(90°-\theta) = \tan\theta$;
$\tan(90°-\theta) = \cot\theta$]

54. (2) $\tan 10°.\tan 15°.\tan 75°.\tan 80°$
$= (\tan 10°.\tan 80°)(\tan 15°.\tan 75°)$
$= (\tan 10°.\cot 10°)(\tan 15°.\cot 15°)$
$= 1 \times 1 = 1$

[$\tan(90° - \theta) = \cot\theta$;
$\tan\theta . \cot\theta = 1$]

55. (3) $4\tan^2\theta + 9\cot^2\theta$
$= (2\tan\theta - 3\cot\theta)^2 + 2 \times 3 \times 2$
$\therefore$ Minimum value $= 12$
[$\because (2\tan\theta - 3\cot\theta)^2 \ge 0$]

56. (2) $\sin 7x = \cos 11x$
$= \sin(90° - 11x)$
$\Rightarrow 7x = 90° - 11x$
$\Rightarrow 18x = 90°$
$\Rightarrow x = 5°$
$\therefore \tan 9x + \cot 9x$
$= \tan 45° + \cot 45°$
$= 1 + 1 = 2$

57. (1) $\tan^2\alpha = 1 + 2\tan^2\beta$
$\Rightarrow \sec^2\alpha - 1 = 1 + 2(\sec^2\beta - 1)$
$\Rightarrow \sec^2\alpha - 1 = 2\sec^2\beta - 1$

$\Rightarrow \dfrac{1}{\cos^2\alpha} = \dfrac{2}{\cos^2\beta}$

$\Rightarrow \sqrt{2}\cos\alpha = \cos\beta$

$\therefore \sqrt{2}\cos\alpha - \cos\beta = 0$

58. (4) $\cos 1°.\cos 2°.\cos 3° \ldots \cos 90°....\cos 100°$
$= 0$ [$\cos 90° = 0$]

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59. (4) $2(\cos^2\theta - \sin^2\theta) = 1$

$\Rightarrow \cos^2\theta - (1-\cos^2\theta) = \frac{1}{2}$

$\Rightarrow 2\cos^2\theta = 1 + \frac{1}{2} = \frac{3}{2}$

$\Rightarrow \cos^2\theta = \frac{3}{4}$

$\Rightarrow \sec^2\theta = \frac{4}{3}$

$\Rightarrow 1 + \tan^2\theta = \frac{4}{3}$

$\Rightarrow \tan^2\theta = \frac{4}{3} - 1 = \frac{1}{3}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \cot\theta = \sqrt{3}$

60. (2) $\tan(2\theta + 45°) = \cot 3\theta$

$= \tan(90° - 3\theta)$

$\Rightarrow 2\theta + 45° = 90° - 3\theta$

$\Rightarrow 5\theta = 90° - 45° = 45°$

$\therefore \theta = 9°$

61. (2) $\cos\theta = \frac{15}{17}$

$\Rightarrow \sec\theta = \frac{1}{\cos\theta} = \frac{17}{15}$

$\therefore \cot(90° - \theta) = \tan\theta$

$= \sqrt{\sec^2\theta - 1}$

$= \sqrt{\left(\frac{17}{15}\right)^2 - 1} = \sqrt{\frac{289}{225} - 1}$

$= \sqrt{\frac{289 - 225}{225}} = \sqrt{\frac{64}{225}} = \frac{8}{15}$

62. (1) $\sec^2\theta - \tan^2\theta = 1$

$\sec^2\theta + \tan^2\theta = \frac{7}{12}$

$\therefore \sec^4\theta - \tan^4\theta$

$= (\sec^2\theta - \tan^2\theta)(\sec^2\theta + \tan^2\theta)$

$= 1 \times \frac{7}{12} = \frac{7}{12}$

63. (2) $\sec x = \operatorname{cosec} y$

$\Rightarrow \cos x = \sin y$

$\Rightarrow \sin\left(\frac{\pi}{2} - x\right) = \sin y$

$\Rightarrow y = \frac{\pi}{2} - x$

$\Rightarrow x + y = \frac{\pi}{2}$

$\therefore \sin(x + y) = \sin\frac{\pi}{2} = 1$

64. (3) $A + B + C = \pi$

$\Rightarrow \frac{A+B}{2} = \frac{\pi}{2} - \frac{C}{2}$

$\Rightarrow \sin\left(\frac{A+B}{2}\right)$

$= \sin\left(\frac{\pi}{2} - \frac{C}{2}\right) = \cos\frac{C}{2}$

Similarly,

$\cos\left(\frac{A+B}{2}\right) = \sin\frac{C}{2}$

$\cot\left(\frac{A+B}{2}\right) = \tan\frac{C}{2}$

$\tan\left(\frac{A+B}{2}\right) = \cot\frac{C}{2}$

65. (2) $\sin\alpha + \cos\beta = 2$

$\sin\alpha \le 1$; $\cos\beta \le 1$

$\Rightarrow \alpha = 90°$; $\beta = 0°$

$\therefore \sin\left(\frac{2\alpha + \beta}{3}\right) = \sin\left(\frac{180°}{3}\right)$

$= \sin 60° = \frac{\sqrt{3}}{2}$

Also,

$\cos\frac{\alpha}{3} = \cos 30° = \frac{\sqrt{3}}{2}$

66. (3) $\cos^4\theta - \sin^4\theta = \frac{2}{3}$

$\Rightarrow (\cos^2\theta + \sin^2\theta)(\cos^2\theta - \sin^2\theta)$

$= \frac{2}{3}$

$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{2}{3}$

$\Rightarrow 2\cos^2\theta - 1 = \frac{2}{3}$

67. (1) $\frac{\sin\alpha}{\cos(30° + \alpha)} = 1$

$\Rightarrow \frac{\sin\alpha}{\sin(90° - 30 - \alpha)} = 1$

$\Rightarrow \frac{\sin\alpha}{\sin(60° - \alpha)} = 1$

$\Rightarrow \sin\alpha = \sin(60° - \alpha)$

$\Rightarrow 2\alpha = 60° \Rightarrow \alpha = 30°$

$\therefore \sin\alpha + \cos 2\alpha$

$= \sin 30° + \cos 60°$

$= \frac{1}{2} + \frac{1}{2} = 1$

68. (1) $\tan\theta = 1 \Rightarrow \theta = 45°$

$\therefore \frac{8\sin\theta + 5\cos\theta}{\sin^3\theta - 2\cos^3\theta + 7\cos\theta}$

$= \frac{8 \times \frac{1}{\sqrt{2}} + \frac{5}{\sqrt{2}}}{\frac{1}{2\sqrt{2}} - \frac{2}{2\sqrt{2}} + \frac{7}{\sqrt{2}}}$

$= \frac{\frac{13}{\sqrt{2}}}{\frac{13}{2\sqrt{2}}} = \frac{13}{\sqrt{2}} \times \frac{2\sqrt{2}}{13} = 2$

69. (2) $\cos^2\theta + \cos^4\theta = 1$

$\Rightarrow \cos^4\theta = 1 - \cos^2\theta = \sin^2\theta$

$\Rightarrow \tan^2\theta = \cos^2\theta$

$\therefore \tan^2\theta + \tan^4\theta = \cos^2\theta + \cos^4\theta$

$= 1$

70. (3) $\tan\theta = \frac{4}{3}$ (Given)

$\therefore \frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta} = \frac{3\tan\theta + 2}{3\tan\theta - 2}$

[Dividing N^r & D^r by $\cos\theta$]

$= \frac{3 \times \frac{4}{3} + 2}{3 \times \frac{4}{3} - 2} = \frac{4 + 2}{4 - 2} = 3$

71. (3) $(\sec A - \cos A)^2 + (\operatorname{cosec} A - \sin A)^2 - (\cot A - \tan A)^2$

$= \sec^2 A + \cos^2 A - 2\sec A \cos A + \operatorname{cosec}^2 A + \sin^2 A - 2\operatorname{cosec} A \cdot \sin A - \cot^2 A - \tan^2 A + 2\cot A \cdot \tan A$

$= \sec^2 A - \tan^2 A + \cos^2 A + \sin^2 A + \operatorname{cosec}^2 A - \cot^2 A - 2$

$= 3 - 2 = 1$

[$\because \sec A \cdot \cos A = 1$; $\sin A \cdot \operatorname{cosec} A = 1$; $\tan A \cdot \cot A = 1$ etc]

72. (2) $\tan\theta + \cot\theta = 2$

$\Rightarrow \tan\theta + \frac{1}{\tan\theta} = 2$

$\Rightarrow \tan^2\theta + 1 = 2\tan\theta$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta = 1 \Rightarrow \cot\theta = 1$

$\therefore \tan^5\theta + \cot^{10}\theta = 1 + 1 = 2$

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73. (1) $\sin\theta - \cos\theta = \frac{7}{13}$ .....(i)

$\sin\theta + \cos\theta = x$.....(ii)

On squaring both equations and adding,

$2(\sin^2\theta + \cos^2\theta) = \frac{49}{169} + x^2$

$\Rightarrow x^2 = 2 - \frac{49}{169} = \frac{338-49}{169}$

$= \frac{289}{169} \Rightarrow x = \frac{17}{13}$

74. (3) $2\cos\theta - \sin\theta = \frac{1}{\sqrt{2}}$

$2\sin\theta + \cos\theta = x$ (Let)

On squaring and adding,

$4\cos^2\theta + \sin^2\theta - 4\sin\theta \cdot \cos\theta + 4\sin^2\theta + \cos^2\theta + 4\sin\theta\cdot\cos\theta$

$= \frac{1}{2} + x^2$

$\Rightarrow 4(\cos^2\theta + \sin^2\theta) + (\cos^2\theta + \sin^2\theta) = \frac{1}{2} + x^2$

$\Rightarrow \frac{1}{2} + x^2 = 5$

$\Rightarrow x^2 = 5 - \frac{1}{2} = \frac{9}{2} \Rightarrow x = \frac{3}{\sqrt{2}}$

75. (3) $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$

$\Rightarrow \sin\theta + \cos\theta = 3\sin\theta - 3\cos\theta$

$\Rightarrow 4\cos\theta = 2\sin\theta \Rightarrow \tan\theta = 2$

$\therefore \sin^4\theta - \cos^4\theta$

$= (\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta)$

$= \sin^2\theta - \cos^2\theta$

$= \cos^2\theta(\tan^2\theta - 1)$

$= \frac{\tan^2\theta - 1}{\sec^2\theta}$

$= \frac{\tan^2\theta - 1}{1 + \tan^2\theta} = \frac{4-1}{1+4} = \frac{3}{5}$

76. (1) $\sec^2\theta + \tan^2\theta = 7$

$\Rightarrow 1 + \tan^2\theta + \tan^2\theta = 7$

$\Rightarrow 2\tan^2\theta = 7 - 1 = 6$

$\Rightarrow \tan^2\theta = 3 \Rightarrow \tan\theta = \sqrt{3}$

$\Rightarrow \theta = 60°$

7. (4) $(\sec x \cdot \sec y + \tan x \cdot \tan y)^2 - (\sec x \cdot \tan y + \tan x \cdot \sec y)^2$

$= \sec^2 x \cdot \sec^2 y + \tan^2 x \cdot \tan^2 y + 2\sec x \cdot \sec y \cdot \tan x \cdot \tan y - \sec^2 x \cdot \tan^2 y - \tan^2 x \cdot \sec^2 y - 2\sec x \cdot \sec y \cdot \tan x \cdot \tan y$

$= \sec^2 x \cdot \sec^2 y + \tan^2 x \cdot \tan^2 y - \sec^2 x \cdot \tan^2 y - \tan^2 x \cdot \sec^2 y$

$= \sec^2 x \cdot \sec^2 y - \sec^2 x \cdot \tan^2 y - \tan^2 x \cdot \sec^2 y + \tan^2 x \cdot \tan^2 y$

$= \sec^2 x(\sec^2 y - \tan^2 y) - \tan^2 x(\sec^2 y - \tan^2 y)$

$= \sec^2 x - \tan^2 x = 1$

78. (2) $\sin\theta + \operatorname{cosec}\theta = 2$

$\Rightarrow \sin\theta + \frac{1}{\sin\theta} = 2$

$\Rightarrow \sin^2\theta - 2\sin\theta + 1 = 0$

$\Rightarrow (\sin\theta - 1) = 0$

$\Rightarrow \sin\theta = 1 \quad \Rightarrow \operatorname{cosec}\theta = 1$

$\therefore \sin^{100}\theta + \operatorname{cosec}^{100}\theta = 1 + 1 = 2$

79. (2) When $\theta = 0°$

$\sin^2\theta + \cos^4\theta = 1$

When $\theta = 45°$,

$\left[\sin 45° = \frac{1}{\sqrt{2}} \& \cos 45° = \frac{1}{\sqrt{5}}\right]$

$\sin^2\theta + \cos^4\theta = \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$

When $\theta = 30°$,

$\left[\sin 30° = \frac{1}{2} \& \cos 30° = \frac{\sqrt{3}}{2}\right]$

$\sin^2\theta + \cos^4\theta = \frac{1}{4} + \frac{9}{16}$

$= \frac{4+9}{16} = \frac{13}{16}$

Hence, the value of

$A = \sin^2\theta + \cos^4\theta = \frac{13}{16}$

80. (4) $\sin\theta + \operatorname{cosec}\theta = 2$

$\Rightarrow \sin\theta + \frac{1}{\sin\theta} = 2$

$\Rightarrow \sin^2\theta - 2\sin\theta + 1 = 0$

$\Rightarrow (\sin\theta - 1)^2 = 0 \Rightarrow \sin\theta = 1$

$\therefore \sin^5\theta + \operatorname{cosec}^5\theta = 1 + 1 = 2$

81. (3) $\tan 2\theta = \frac{1}{\tan 4\theta} = \cot 4\theta$

$\Rightarrow \tan 2\theta = \tan(90° - 4\theta)$

$\Rightarrow 2\theta = 90° - 4\theta$

$\Rightarrow 6\theta = 90° \Rightarrow \theta = 15°$

$\therefore \tan 3\theta = \tan 45° = 1$

82. (2) $\cos^2\alpha + \cos^2\beta = 2$

$\Rightarrow 1 - \sin^2\alpha + 1 - \sin^2\beta = 2$

$\Rightarrow \sin^2\alpha + \sin^2\beta = 0$

$\Rightarrow \sin^2\alpha = 0 \ \& \ \sin^2\beta = 0$

$\Rightarrow \sin\alpha = \sin\beta = 0$

$\Rightarrow \alpha = \beta = 0$

$\therefore \tan^3\alpha + \sin^3\beta = 0$

83. (3) $\tan 2\theta \cdot \tan 3\theta = 1$

$\Rightarrow \tan 3\theta = \frac{1}{\tan 2\theta} = \cot 2\theta$

$\Rightarrow \tan 3\theta = \tan(90° - 2\theta)$

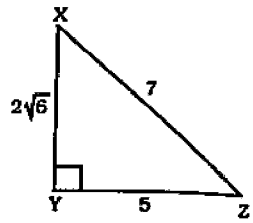
$\Rightarrow 3\theta = 90° - 2\theta \Rightarrow 5\theta = 90°$

$\Rightarrow \theta = 18°$

$\therefore 2\cos^2\frac{5\theta}{2} - 1 = 2\cos^2 45° - 1$

$= 2 \times \frac{1}{2} - 1 = 0$

84. (2)



$XZ - YZ = 2$ .... (i)

$\Rightarrow XY^2 + YZ^2 = XZ^2$

$\Rightarrow \left(2\sqrt{6}\right)^2 = XZ^2 - YZ^2$

$\Rightarrow 24 = (XZ - YZ)(XZ + YZ)$

$\Rightarrow XZ + YZ = 12$ ....(ii)

Adding both the equations,

$2XZ = 14 \Rightarrow XZ = 7$

$\therefore YZ = 7 - 2 = 5$

$\therefore \sec X = \frac{7}{2\sqrt{6}}$

$\& \tan X = \frac{5}{2\sqrt{6}}$

$\therefore \sec X + \tan X = \frac{7}{2\sqrt{6}} + \frac{5}{2\sqrt{6}}$

$= \frac{12}{2\sqrt{6}} = \sqrt{6}$

85. (4) $\sin^2\theta + \cos^2\theta + \sec^2\theta + \operatorname{cosec}^2\theta + \tan^2\theta + \cot^2\theta$

$= 1 + \sec^2\theta - \tan^2\theta + \operatorname{cosec}^2\theta - \cot^2\theta + 2\{\tan^2\theta + \cot^2\theta\}$

$= 3 + 2\{(\tan\theta - \cot\theta)^2 + 2\} > 7$

$[(\tan\theta - \cot\theta)^2 > 0]$

86. (4) $x^2 + \frac{1}{x^2} = 2\sin\left(\frac{\pi x}{2}\right)$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = 2\sin\left(\frac{\pi x}{2}\right)$

$\Rightarrow x - \frac{1}{x} = 0$ $[\because \sin\theta \le 1]$

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87. (4) $\cos\theta + \sec\theta = 2$

$\Rightarrow \cos\theta + \frac{1}{\cos\theta} = 2$

$\Rightarrow \cos^2\theta - 2\cos\theta + 1 = 0$

$\Rightarrow (\cos\theta - 1)^2 = 0$

$\Rightarrow \cos\theta = 1$

$\Rightarrow \sec\theta = 1$

$\therefore \cos^6\theta + \sec^6\theta = 1 + 1 = 2$

88. (1) Expression

$= \frac{5}{\sec^2\theta} + \frac{2}{1+\cot^2\theta} + 3\sin^2\theta$

$= 5\cos^2\theta + \frac{2}{\operatorname{cosec}^2\theta} + 3\sin^2\theta$

$= 5\cos^2\theta + 2\sin^2\theta + 3\sin^2\theta$

$= 5(\cos^2\theta + \sin^2\theta) = 5$

$\left[\because 1 + \cot^2\theta = \operatorname{cosec}^2\theta, \frac{1}{\sec\theta} = \cos\theta; \& \frac{1}{\operatorname{cosec}\theta} = \sin\theta\right]$

89. (3) Expression

$= \left(\frac{1}{\cos\theta} + \frac{1}{\cot\theta}\right)\left(\frac{1}{\cos\theta} - \frac{1}{\cot\theta}\right)$

$= \left(\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}\right)\left(\frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}\right)$

$= \frac{1+\sin\theta}{\cos\theta} \cdot \frac{1-\sin\theta}{\cos\theta}$

$= \frac{1-\sin^2\theta}{\cos^2\theta} = \frac{\cos^2\theta}{\cos^2\theta} = 1$

90. (3) $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{5}{4}$

$\Rightarrow \frac{\cos\theta\left(\frac{\sin\theta}{\cos\theta} + 1\right)}{\cos\theta\left(\frac{\sin\theta}{\cos\theta} - 1\right)} = \frac{5}{4}$

$\Rightarrow \frac{\tan\theta + 1}{\tan\theta - 1} = \frac{5}{4}$

$\Rightarrow 4\tan\theta + 4 = 5\tan\theta - 5$

$\Rightarrow \tan\theta = 9$

$\Rightarrow \frac{2\tan\theta}{2} = \frac{5+4}{5-4}$

(By componendo and dividendo)

$\therefore \frac{\tan^2\theta + 1}{\tan^2\theta - 1} = \frac{(9)^2 + 1}{(9)^2 - 1} = \frac{81+1}{81-1}$

$= \frac{82}{80} = \frac{41}{40}$

91. (3) $\tan 7\theta \cdot \tan 2\theta = 1$

$\Rightarrow \tan 7\theta = \frac{1}{\tan 2\theta} = \cot 2\theta$

$\Rightarrow \tan 7\theta = \tan(90^\circ - 2\theta)$

$\Rightarrow 7\theta = 90^\circ - 2\theta$

$\Rightarrow 9\theta = 90^\circ \Rightarrow \theta = 10^\circ$

$\therefore \tan 3\theta = \tan 30^\circ = \frac{1}{\sqrt{3}}$

92. (4) $(2\cos^2\theta - 1)$

$\left(\frac{1+\tan\theta}{1-\tan\theta} + \frac{1-\tan\theta}{1+\tan\theta}\right)$

$= (2\cos^2\theta - 1)$

$\left(\frac{(1+\tan\theta)^2 + (1-\tan\theta)^2}{1-\tan^2\theta}\right)$

$= (2\cos^2\theta - 1)$

$\left(2\left(\frac{1+\tan^2\theta}{1-\tan^2\theta}\right)\right)$

$= \frac{2\sec^2\theta(2\cos^2\theta - 1)}{1 - \frac{\sin^2\theta}{\cos^2\theta}}$

$= \frac{2\sec^2\theta(2\cos^2\theta - 1)}{\frac{\cos^2\theta - \sin^2\theta}{\cos^2\theta}}$

$= \frac{2\sec^2\theta \cdot \cos^2\theta(2\cos^2\theta - 1)}{2\cos^2\theta - 1}$

$= 2$

93. (3) $\sec\theta + \tan\theta = 2$ .....(i)

$\therefore \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{2}$ .....(ii)

By adding equations (i) and (ii),

$\therefore \sec\theta + \tan\theta + \sec\theta - \tan\theta$

$= 2 + \frac{1}{2} = \frac{5}{2}$

$\Rightarrow 2\sec\theta = \frac{5}{2} \Rightarrow \sec\theta = \frac{5}{4}$

94. (3) $(l^2.m^2)(l^2 + m^2 + 3)$

$= (\operatorname{cosec}\theta - \sin\theta)^2 (\sec\theta - \cos\theta)^2$

$[(\operatorname{cosec}\theta - \sin\theta)^2 + (\sec\theta - \cos\theta)^2 + 3]$

$= \left(\frac{1}{\sin\theta} - \sin\theta\right)^2 \left(\frac{1}{\cos\theta} - \cos\theta\right)^2$

$\left\{\left(\frac{1}{\sin\theta} - \sin\theta\right)^2 + \left(\frac{1}{\cos\theta} - \cos\theta\right)^2 + 3\right\}$

$= \left(\frac{1-\sin^2\theta}{\sin\theta}\right)^2 \left(\frac{1-\cos^2\theta}{\cos\theta}\right)^2$

$\left\{\left(\frac{1-\sin^2\theta}{\sin\theta}\right)^2 + \left(\frac{1-\cos^2\theta}{\cos\theta}\right)^2 + 3\right\}$

$= \left(\frac{\cos^2\theta}{\sin\theta}\right)^2 \left(\frac{\sin^2\theta}{\cos\theta}\right)^2$

$\left\{\left(\frac{\cos^2\theta}{\sin\theta}\right)^2 + \left(\frac{\sin^2\theta}{\cos\theta}\right)^2 + 3\right\}$

$= \frac{\cos^4\theta}{\sin^2\theta} \times \frac{\sin^4\theta}{\cos^2\theta}$

$\left\{\frac{\cos^4\theta}{\sin^2\theta} + \frac{\sin^4\theta}{\cos^2\theta} + 3\right\}$

$= \cos^2\theta \times \sin^2\theta$

$\left\{\frac{\cos^6\theta + \sin^6\theta + 3\cos^2\theta.\sin^2\theta}{\cos^2\theta.\sin^2\theta}\right\}$

$= \cos^6\theta + \sin^6\theta + 3\cos^2\theta \cdot \sin^2\theta$

$= \{(\cos^2\theta + \sin^2\theta)^3 - 3\cos^2\theta \cdot \sin^2\theta (\cos^2\theta + \sin^2\theta)\} + 3\cos^2\theta \cdot \sin^2\theta$

$[\because a^3 + b^3 = (a+b)^3 - 3ab(a+b)]$

$= 1 - 3\cos^2\theta \cdot \sin^2\theta + 3\cos^2\theta \cdot \sin^2\theta = 1$

95. (1) $\frac{2\sin\theta - \cos\theta}{\cos\theta + \sin\theta} = 1$

Dividing numerator and denominator by $\sin\theta$,

$\frac{2 - \cot\theta}{\cot\theta + 1} = 1$

$\Rightarrow 2 - \cot\theta = \cot\theta + 1$

$\Rightarrow 2\cot\theta = 1$

$\Rightarrow \cot\theta = \frac{1}{2}$

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96. (1) Expression

$$= \frac{8\sin\theta + 5\cos\theta}{\sin^3\theta + 2\cos^3\theta + 3\cos\theta}$$

Dividing numerator and denominator by $\cos\theta$,

$$= \frac{8\tan\theta + 5}{\tan\theta.\sin^2\theta + 2\cos^2\theta + 3}$$

$$= \frac{8\tan\theta + 5}{2\sin^2\theta + 2\cos^2\theta + 3}$$

$$= \frac{8\tan\theta + 5}{2(\sin^2\theta + \cos^2\theta) + 3}$$

$$= \frac{8\times 2 + 5}{5} = \frac{21}{5}$$

97. (1) $\tan\theta + \cot\theta = 2$

$$\Rightarrow \tan\theta + \frac{1}{\tan\theta} = 2$$

$\Rightarrow \tan^2\theta + 1 = 2\tan\theta$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta = 1$

$$\therefore \cot\theta = \frac{1}{\tan\theta} = 1$$

$\therefore \tan^{100}\theta + \cot^{100}\theta = 1 + 1 = 2$

98. (4) Expression

$$= \frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta}$$

$$= \frac{\tan\theta}{1-\frac{1}{\tan\theta}} + \frac{\frac{1}{\tan\theta}}{1-\tan\theta}$$

$$= \frac{\tan^2\theta}{\tan\theta - 1} + \frac{1}{\tan\theta(1-\tan\theta)}$$

$$= \frac{\tan^2\theta}{\tan\theta - 1} - \frac{1}{\tan\theta(\tan\theta - 1)}$$

$$= \frac{\tan^3\theta - 1}{\tan\theta(\tan\theta - 1)}$$

$$= \frac{(\tan\theta - 1)(\tan^2\theta + \tan\theta + 1)}{\tan\theta(\tan\theta - 1)}$$

$$= \frac{\tan^2\theta + \tan\theta + 1}{\tan\theta}$$

$= \tan\theta + \cot\theta + 1$

99. (2) $\sin\theta + \operatorname{cosec}\theta = 2$

$$\Rightarrow \sin\theta + \frac{1}{\sin\theta} = 2$$

$\Rightarrow \sin^2\theta - 2\sin\theta + 1 = 0$

$\Rightarrow (\sin\theta - 1)^2 = 0$

$\Rightarrow \sin\theta = 1$

$\therefore \operatorname{cosec}\theta = 1$

$\therefore \sin^9\theta + \operatorname{cosec}^9\theta = 1 + 1 = 2$

100. (1) $\sec\theta + \tan\theta = 2 + \sqrt{5}$

$$\therefore \sec\theta - \tan\theta = \frac{1}{\sqrt{5}+2}$$

$$\left[\because \sec^2\theta - \tan^2\theta = 1\right]$$

$$= \frac{\sqrt{5}-2}{(\sqrt{5}+2)(\sqrt{5}-2)} = \sqrt{5} - 2$$

On adding,

$2\sec\theta = 2 + \sqrt{5} + \sqrt{5} - 2 = 2\sqrt{5}$

$\Rightarrow \sec\theta = \sqrt{5} \Rightarrow \cos\theta = \frac{1}{\sqrt{5}}$

On subtracting,

$2\tan\theta = 2 + \sqrt{5} - \sqrt{5} + 2 = 4$

$\Rightarrow \tan\theta = 2$

$$\therefore \frac{\tan\theta}{\sec\theta} = \sin\theta = \frac{2}{\sqrt{5}}$$

$$\therefore \sin\theta + \cos\theta = \frac{2}{\sqrt{5}} + \frac{1}{\sqrt{5}}$$

$$= \frac{3}{\sqrt{5}}$$

101. (2) $(1 + \cot\theta - \operatorname{cosec}\theta)$ $(1 + \tan\theta + \sec\theta)$

$$= \left(1 + \frac{\cos\theta}{\sin\theta} - \frac{1}{\sin\theta}\right)\left(1 + \frac{\sin\theta}{\cos\theta} + \frac{1}{\cos\theta}\right)$$

$$= \frac{\sin\theta + \cos\theta - 1}{\sin\theta} \times \frac{\cos\theta + \sin\theta + 1}{\cos\theta}$$

$$= \frac{(\sin\theta + \cos\theta)^2 - 1}{\sin\theta.\cos\theta}$$

$$= \frac{\sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta - 1}{\sin\theta.\cos\theta}$$

$$= \frac{2\sin\theta.\cos\theta}{\sin\theta.\cos\theta} = 2$$

102. (1) $\tan\theta + \cot\theta = 2$

$$\Rightarrow \tan\theta + \frac{1}{\tan\theta} = 2$$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta - 1 = 0 \Rightarrow \tan\theta = 1$

$\therefore \cot\theta = 1 \Rightarrow \theta = 45°$

$\therefore \tan^n 45° + \cot^n 45° = 1 + 1 = 2$

103. (3) $\frac{\sin\theta}{x} = \frac{\cos\theta}{y} = \frac{1}{k}$

$\Rightarrow x = k\sin\theta;\ y = k\cos\theta$

$\therefore x^2 + y^2$

$= k^2(\sin^2\theta + \cos^2\theta) = k^2$

$\Rightarrow k = \sqrt{x^2 + y^2}$

$\therefore \sin\theta - \cos\theta$

$$= \frac{x}{k} - \frac{y}{k} = \frac{x-y}{k}$$

$$= \frac{x-y}{\sqrt{x^2+y^2}}$$

104. (1) $x = a\sec\theta.\cos\phi;\ y = b\sec\theta.\sin\phi,\ z = c\tan\theta$

$$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}$$

$= \sec^2\theta.\cos^2\phi + \sec^2\theta.\sin^2\phi - \tan^2\theta$

$= \sec^2\theta(\cos^2\phi + \sin^2\phi) - \tan^2\theta$

$= \sec^2\theta - \tan^2\theta = 1$

105. (1) $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{5}{3}$

$\Rightarrow 5\sec\theta - 5\tan\theta$

$= 3\sec\theta + 3\tan\theta$

$\Rightarrow 2\sec\theta = 8\tan\theta$

$$\Rightarrow \frac{\tan\theta}{\sec\theta} = \frac{2}{8} = \frac{1}{4}$$

$$\Rightarrow \frac{\sin\theta}{\cos\theta} \times \cos\theta = \frac{1}{4}$$

$$\Rightarrow \sin\theta = \frac{1}{4}$$

106. (3) $\cos x + \cos^2 x = 1$

$\Rightarrow \cos x = 1 - \cos^2 x = \sin^2 x$ ...(i)

$\therefore \sin^{12}x + 3\sin^{10}x + 3\sin^8 x + \sin^6 x - 1$

$= (\sin^4 x + \sin^2 x)^3 - 1$

$= (\cos^2 x + \sin^2 x)^3 - 1$ [By (i)]

$= 1 - 1 = 0$

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107. (1) $(1+\sin\alpha)(1+\sin\beta)(1+\sin\gamma)=(1-\sin\alpha)(1-\sin\beta)(1-\sin\gamma)=x$

$\therefore x.x=(1+\sin\alpha)(1-\sin\alpha)(1+\sin\beta)(1-\sin\beta)(1+\sin\gamma)(1-\sin\gamma)$

$=(1-\sin^2\alpha)(1-\sin^2\beta)(1-\sin^2\gamma)$

$=\cos^2\alpha.\cos^2\beta.\cos^2\gamma$

$\therefore x=\pm\cos\alpha.\cos\beta.\cos\gamma$

108. (4)

$$\frac{1}{1+\cot^2\theta}+\frac{3}{1+\tan^2\theta}+2\sin^2\theta$$

$$=\frac{1}{\operatorname{cosec}^2\theta}+\frac{3}{\sec^2\theta}+2\sin^2\theta$$

$$=\sin^2\theta+3\cos^2\theta+2\sin^2\theta$$

$$=3(\sin^2\theta+\cos^2\theta)=3$$

109. (1)

$$\frac{4}{1+\tan^2\alpha}+\frac{1}{1+\cot^2\alpha}+3\sin^2\alpha$$

$$=\frac{4}{\sec^2\alpha}+\frac{1}{\operatorname{cosec}^2\alpha}+3\sin^2\alpha$$

$$=4\cos^2\alpha+\sin^2\alpha+3\sin^2\alpha$$

$$=4(\cos^2\alpha+\sin^2\alpha)=4$$

110. (4) $3(\sin x-\cos x)^4+6(\sin x+\cos x)^2+4(\sin^6 x+\cos^6 x)$

$=3(\sin^2x+\cos^2x-2\sin x.\cos x)^2+6(\sin^2x+\cos^2x+2\sin x.\cos x)+4[(\sin^2x+\cos^2x)^3-3\sin^2x.\cos^2x(\sin^2x+\cos^2x)]$

$=3(1-2\sin x\cos x)^2+6(1+2\sin x.\cos x)+4[1-3\sin^2x\cos^2x]$

$=3(1+\sin^2x.\cos^2x-4\sin x\cos x)+6(1+2\sin x\cos x)+4(1-3\sin^2x\cos^2x)$

$=3+6+4=13$

111. (3) Expression

$$=\sec\theta\left(\frac{1+\sin\theta}{\cos\theta}+\frac{\cos\theta}{1+\sin\theta}\right)-2\tan^2\theta$$

$$=\frac{1+\sin^2\theta+2\sin\theta+\cos^2\theta}{\cos^2\theta(1+\sin\theta)}-2\tan^2\theta$$

$$=\frac{2+2\sin\theta}{\cos^2\theta(1+\sin\theta)}-2\tan^2\theta$$

$$=\frac{2}{\cos^2\theta}-2\tan^2\theta$$

$$=2\sec^2\theta-2\tan^2\theta$$

$$=2(\sec^2\theta-\tan^2\theta)=2$$

112. (1) $\tan\theta+\cot\theta=2$

On squaring both sides,

$$(\tan\theta+\cot\theta)^2=4$$

$$\Rightarrow\tan^2\theta+\cot^2\theta+2\tan\theta.\cot\theta=4$$

$$\Rightarrow\tan^2\theta+\cot^2\theta=4-2=2$$

$[\tan\theta.\cot\theta=1]$

113. (1) $x\cos\theta-y\sin\theta=2$

$x\sin\theta+y\cos\theta=4$

On squaring both the equations and adding

$$x^2\cos^2\theta+y^2\sin^2\theta-2xy\sin\theta.\cos\theta+x^2\sin^2\theta+y^2\cos^2\theta+2xy\sin\theta.\cos\theta=4+16$$

$$\Rightarrow x^2(\cos^2\theta+\sin^2\theta)+y^2(\sin^2\theta+\cos^2\theta)=20$$

$$\Rightarrow x^2+y^2=20$$

114. (3) Expression

$$=\left[\frac{\cos^2A(\sin A+\cos A)}{\operatorname{cosec}^2A(\sin A-\cos A)}+\frac{\sin^2A(\sin A-\cos A)}{\sec^2A(\sin A+\cos A)}\right]\times\left(\frac{1}{\cos^2A}-\frac{1}{\sin^2A}\right)$$

$$=\left[\frac{\cos^2A.\sin^2A(\sin A+\cos A)}{\sin A-\cos A}+\frac{\sin^2A.\cos^2A(\sin A-\cos A)}{(\sin A+\cos A)}\right]\left(\frac{\sin^2A-\cos^2A}{\sin^2A.\cos^2A}\right)$$

$$=\left(\frac{\sin A+\cos A}{\sin A-\cos A}+\frac{\sin A-\cos A}{\sin A+\cos A}\right)(\sin^2A-\cos^2A)$$

$$=\left[\frac{(\sin A+\cos A)^2+(\sin A-\cos A)^2}{(\sin A-\cos A)(\sin A+\cos A)}\right](\sin^2A-\cos^2A)$$

$$=2(\sin^2A+\cos^2A)=2$$

115. (2) Expression

$$=\frac{1}{\operatorname{cosec}\theta-\cot\theta}-\frac{1}{\sin\theta}$$

$$=\frac{\operatorname{cosec}^2\theta-\cot^2\theta}{\operatorname{cosec}\theta-\cot\theta}-\operatorname{cosec}\theta$$

$$=\operatorname{cosec}\theta+\cot\theta-\operatorname{cosec}\theta=\cot\theta$$

$[\operatorname{cosec}^2\theta-\cot^2\theta=1\ \&\ \frac{1}{\sin\theta}=\operatorname{cosec}\theta]$

Method-2:

$$\frac{1}{\frac{1}{\sin\theta}-\frac{\cos\theta}{\sin\theta}}-\frac{1}{\sin\theta}$$

$$=\frac{\sin\theta}{1-\cos\theta}-\frac{1}{\sin\theta}=\frac{\sin^2\theta-1+\cos\theta}{\sin\theta(1-\cos\theta)}$$

$$=\frac{1-\cos^2\theta-1+\cos\theta}{\sin\theta(1-\cos\theta)}$$

$$=\frac{\cos\theta(-\cos\theta+1)}{\sin\theta(1-\cos\theta)}=\frac{\cos\theta}{\sin\theta}=\cot\theta.$$

116. (4) $\cos\theta+\sin\theta=\sqrt{2}\cos\theta$

On squaring both sides,

$$\cos^2\theta+\sin^2\theta+2\cos\theta.\sin\theta=2\cos^2\theta$$

$$\Rightarrow\cos^2\theta-\sin^2\theta=2\sin\theta.\cos\theta$$

$$\Rightarrow(\cos\theta+\sin\theta)(\cos\theta-\sin\theta)=2\sin\theta.\cos\theta$$

$$\Rightarrow\sqrt{2}\cos\theta(\cos\theta-\sin\theta)=2\sin\theta.\cos\theta$$

$$\Rightarrow\cos\theta-\sin\theta=\frac{2\sin\theta.\cos\theta}{\sqrt{2}\cos\theta}=\sqrt{2}\sin\theta$$

117. (3) $\cos^4\theta-\sin^4\theta=\frac{2}{3}$

$$\Rightarrow(\cos^2\theta+\sin^2\theta)(\cos^2\theta-\sin^2\theta)=\frac{2}{3}$$

$$\Rightarrow\cos^2\theta-\sin^2\theta=\frac{2}{3}$$

$$\Rightarrow1-\sin^2\theta-\sin^2\theta=\frac{2}{3}$$

$$\Rightarrow1-2\sin^2\theta=\frac{2}{3}$$

118. (2) Expression

$$=\frac{1}{1+\tan^2\theta}+\frac{1}{1+\cot^2\theta}$$

$$=\frac{1}{\sec^2\theta}+\frac{1}{\operatorname{cosec}^2\theta}$$

$$=\cos^2\theta+\sin^2\theta=1$$

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119. (3) $\sin\theta - \cos\theta = \frac{1}{2}$

$\sin\theta + \cos\theta = x$

On squaring and adding,

$2(\sin^2\theta + \cos^2\theta) = \frac{1}{4} + x^2$

$\Rightarrow x^2 = 2 - \frac{1}{4} = \frac{7}{4}$

$\Rightarrow x = \frac{\sqrt{7}}{2}$

120. (1) $\frac{\sin A}{1+\cos A} + \frac{\sin A}{1-\cos A}$

$= \frac{\sin A(1-\cos A) + \sin A(1+\cos A)}{(1+\cos A)(1-\cos A)}$

$= \frac{\sin A - \sin A\cos A + \sin A + \sin A.\cos A}{1-\cos^2 A}$

$= \frac{2\sin A}{\sin^2 A} = 2\,\text{cosec}\,A$

121. (4) $r\sin\theta = 1$

$r\cos\theta = \sqrt{3}$

$\Rightarrow \frac{\sin\theta}{\cos\theta} = \tan\theta = \frac{1}{\sqrt{3}}$

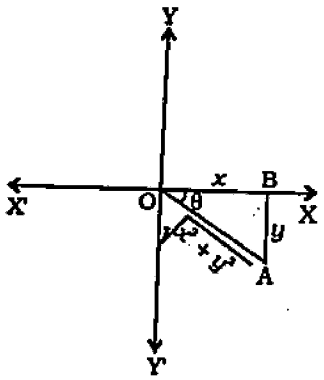
$\therefore \sqrt{3}\tan\theta + 1$

$= \sqrt{3} \times \frac{1}{\sqrt{3}} + 1 = 1 + 1 = 2$

122. (2) According to question,

$x\cos\theta - y\sin\theta = \sqrt{x^2+y^2}$ ...(i)

$\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2} = \frac{1}{x^2+y^2}$ ...(ii)



$\sin\theta = \frac{-y}{\sqrt{x^2+y^2}}$

$\cos\theta = \frac{x}{\sqrt{x^2+y^2}}$

From equation (i)

$\frac{x}{\sqrt{x^2+y^2}}\cos\theta - \frac{y}{\sqrt{x^2+y^2}}.\sin\theta = 1$

$\therefore \frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2} = \frac{1}{x^2+y^2}$

$\Rightarrow \frac{x^2}{(x^2+y^2)a^2} + \frac{y^2}{(x^2+y^2).b^2}$

$= \frac{1}{x^2+y^2}$

$\Rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

123. (3) $\tan\theta - \cot\theta = 0$

$\Rightarrow \tan\theta = \cot\theta = \tan(90° - \theta)$

$\Rightarrow \theta = 90° - \theta \Rightarrow 2\theta = 90° \Rightarrow \theta = 45°$

$\therefore \sin\theta + \cos\theta$

$= \sin 45° + \cos 45°$

$= \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$

124. (4) $\cos^4\theta + \sin^4\theta = (\cos^2\theta + \sin^2\theta)^2 - 2\cos^2\theta\sin^2\theta$

From maximum value,

$2\sin^2\theta.\cos^2\theta = 0$

Hence, $\sin^4\theta + \cos^4\theta$

$= (1)^2 - 0$

$= 1$

125. (1) $3\sin\theta + 5\cos\theta = 5$ ...(i)

$5\sin\theta - 3\cos\theta = x$ ...(ii)

On squaring and adding,

$9\sin^2\theta + 25\cos^2\theta + 25\sin^2\theta + 9\cos^2\theta = 25 + x^2$

$\Rightarrow 9(\sin^2\theta + \cos^2\theta) + 25(\cos^2\theta + \sin^2\theta) = 25 + x^2$

$\Rightarrow 9 + 25 = 25 + x^2$

$\Rightarrow x^2 = 9$

$\Rightarrow x = \pm 3$

126. (4) $\sin\theta + \sin^2\theta = 1$

$\Rightarrow \sin\theta = 1 - \sin^2\theta = \cos^2\theta$

$\therefore \cos^2\theta + \cos^4\theta$

$= \cos^2\theta + (\cos^2\theta)^2$

$= \cos^2\theta + \sin^2\theta = 1$

127. (1) $\tan\theta + \cot\theta = 2$

$\Rightarrow \tan\theta + \frac{1}{\tan\theta} = 2$

$\Rightarrow \frac{\tan^2\theta + 1}{\tan\theta} = 2$

$\Rightarrow \tan^2\theta + 1 = 2\tan\theta$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta - 1 = 0$

$\Rightarrow \tan\theta = 1 = \tan 45°$

$\Rightarrow \theta = 45°$

128. (4) $\cos\pi x = x^2 - x + \frac{5}{4}$

$= x^2 - 2.x.\frac{1}{2} + \frac{1}{4} - \frac{1}{4} + \frac{5}{4}$

$= \left(x - \frac{1}{2}\right)^2 + 1 > 1$

$-1 \le \cos x \le 1$

129. (4) $1 + \frac{1}{\cot^2 63°} - \sec^2 27° + \frac{1}{\sin^2 63°} - \text{cosec}^2 27°$

$= 1 + \tan^2 63° - \sec^2 27° + \text{cosec}^2\,63° - \text{cosec}^2\,27°$

$= 1 + \tan^2(90° - 27°) - \sec^2 27° + \text{cosec}^2(90° - 27°) - \text{cosec}^2\,27°$

$= 1 + \cot^2 27° - \sec^2 27° + \sec^2 27° - \text{cosec}^2\,27°$

$= 1 + \cot^2 27° - \text{cosec}^2\,27°$

$= 1 - 1 = 0$

$[\because \text{cosec}^2\theta - \cot^2\theta = 1]$

130. (2)

$x = \frac{\cos\theta}{1-\sin\theta} = \frac{\cos\theta(1+\sin\theta)}{(1-\sin\theta)(1+\sin\theta)}$

$= \frac{\cos\theta(1+\sin\theta)}{1-\sin^2\theta}$

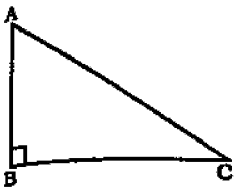
$= \frac{\cos\theta(1+\sin\theta)}{\cos^2\theta}$

$= \frac{1+\sin\theta}{\cos\theta}$

$\therefore \frac{\cos\theta}{1+\sin\theta} = \frac{1}{x}$

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131. (2)



$\frac{AB}{BC} = \frac{2}{1}$

$\Rightarrow AB = 2k,\ BC = k$

$\therefore AC = \sqrt{(2k)^2 + k^2} = \sqrt{5k^2}$

$= \sqrt{5}k$

$\therefore \sin A + \cot C = \frac{BC}{AC} + \frac{BC}{AB}$

$= \frac{k}{\sqrt{5}k} + \frac{k}{2k}$

$= \frac{1}{\sqrt{5}} + \frac{1}{2} = \frac{2+\sqrt{5}}{2\sqrt{5}}$

132. (2) $\sin\frac{\pi x}{2} = x^2 - 2x + 2$

Putting $x = 1$

$\sin\frac{\pi}{2} = 1 - 2 + 2 = 1$

133. (1) Expression

$= \frac{\sin 43^\circ}{\cos 47^\circ} + \frac{\cos 19^\circ}{\sin 71^\circ} - 8\cos^2 60^\circ$

$= \frac{\sin 43^\circ}{\cos(90^\circ - 43^\circ)} + \frac{\cos 19^\circ}{\sin(90^\circ - 19^\circ)} - 8\times\left(\frac{1}{2}\right)^2$

$= \frac{\sin 43^\circ}{\sin 43^\circ} + \frac{\cos 19^\circ}{\cos 19^\circ} - 8\times\frac{1}{4}$

[$\sin(90^\circ - \theta) = \cos\theta$; $\cos(90^\circ - \theta) = \sin\theta$]

$= 1 + 1 - 2 = 0$

134. (2) $\sin^2 7\frac{1}{2}^\circ + \sin^2 82\frac{1}{2}^\circ + \tan^2 2^\circ \cdot \tan^2 88^\circ$

$= \sin^2 7\frac{1}{2}^\circ + \sin^2\left(90^\circ - 7\frac{1}{2}^\circ\right) + \tan^2 2^\circ \cdot \tan^2(90^\circ - 2^\circ)$

$= \sin^2 7\frac{1}{2}^\circ + \cos^2 7\frac{1}{2}^\circ + \tan^2 2^\circ \cdot \cot^2 2^\circ$

[$\because \sin(90^\circ - \theta) = \cos\theta$; $\tan(90^\circ - \theta) = \cot\theta$]

$= 1 + 1 = 2$

135. (2) $1 - 2\sin^2\theta + \sin^4\theta$

$= (1 - \sin^2\theta)^2 = (\cos^2\theta)^2 = \cos^4\theta$

136. (2) Expression

$= \cot 9^\circ \cdot \cot 27^\circ \cdot \cot 63^\circ \cdot \cot 81^\circ$

$= \cot 9^\circ \cdot \cot 27^\circ \cdot \cot(90^\circ - 27^\circ) \cdot \cot(90^\circ - 9^\circ)$

$= \cot 9^\circ \cdot \cot 27^\circ \cdot \tan 27^\circ \cdot \tan 9^\circ$

[$\tan(90^\circ - \theta) = \cot\theta$; $\cot(90^\circ - \theta) = \tan\theta$]

$= \cot\theta \cdot \tan\theta \cdot \cot 27^\circ \tan 27^\circ$

$= 1$ [$\tan\theta \cdot \cot\theta = 1$]

137. (2) $(1 + \sin A)(1 + \sin B)(1 + \sin C) = (1 - \sin A) \cdot (1 - \sin B)(1 - \sin C) = x$ (Let)

$\therefore x \cdot x = (1 + \sin A)(1 + \sin B)(1 + \sin C)(1 - \sin A)(1 - \sin B)(1 - \sin C)$

$\Rightarrow x^2 = (1 - \sin^2 A)(1 - \sin^2 B)(1 - \sin^2 C)$

$\Rightarrow x^2 = \cos^2 A \cdot \cos^2 B \cdot \cos^2 C$

$\Rightarrow x = \pm \cos A \cdot \cos B \cdot \cos C$

$\because 0 < A, B, C < \frac{\pi}{2}$

$\therefore x = \cos A \cdot \cos B \cdot \cos C$

138. (4) $\tan^2\theta + 3 = 3\sec\theta$

$\Rightarrow \sec^2\theta - 1 + 3 = 3\sec\theta$

$\Rightarrow \sec^2\theta - 3\sec\theta + 2 = 0$

$\Rightarrow \sec^2\theta - 2\sec\theta - \sec\theta + 2 = 0$

$\Rightarrow \sec\theta(\sec\theta - 2) - 1(\sec\theta - 2) = 0$

$\Rightarrow (\sec\theta - 2)(\sec\theta - 1) = 0$

$\Rightarrow \sec\theta = 2$ or 1

$\Rightarrow \theta = 60^\circ$ or 0°.

139. (3) $\sin\theta = 0.7$

$\therefore \cos\theta$

$= \sqrt{1 - \sin^2\theta} = \sqrt{1 - (0.7)^2}$

$= \sqrt{1 - 0.49} = \sqrt{0.51}$

140. (3) Expression $= \sin^2 65^\circ + \sin^2 25^\circ + \cos^2 35^\circ + \cos^2 55^\circ$

$= \sin^2 65^\circ + \sin^2(90^\circ - 65^\circ) + \cos^2 35^\circ + \cos^2(90^\circ - 35^\circ)$

$= \sin^2 65^\circ + \cos^2 65^\circ + \cos^2 35^\circ + \sin^2 35^\circ$

$= 1 + 1 = 2$

141. (3) $x \sin 60^\circ \cdot \tan 30^\circ = \sec 60^\circ \cdot \cot 45^\circ$

$\Rightarrow x \times \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{3}} = 2 \times 1$

$\Rightarrow x = 2 \times 2 = 4$

142. (4) $\frac{1}{2}\sqrt{1 + \sin\theta} + \frac{1}{2}\sqrt{1 - \sin\theta}$

$= \frac{1}{2}\left(\sqrt{1 + \sin 60^\circ} + \sqrt{1 - \sin 60^\circ}\right)$

$= \frac{1}{2}\left(\sqrt{1 + \frac{\sqrt{3}}{2}} + \sqrt{1 - \frac{\sqrt{3}}{2}}\right)$

$= \frac{1}{2\sqrt{2}}\left(\sqrt{2 + \sqrt{3}} + \sqrt{2 - \sqrt{3}}\right)$

$= \frac{1}{2\sqrt{2}} \times \frac{1}{2}\left(\sqrt{4 + 2\sqrt{3}} + \sqrt{4 - 2\sqrt{3}}\right)$

$= \frac{1}{4}\left(\sqrt{(\sqrt{3} + 1)^2} + \sqrt{(\sqrt{3} - 1)^2}\right)$

$= \frac{1}{4}(\sqrt{3} + 1 + \sqrt{3} - 1)$

$= \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2} = \cos 30^\circ$

$= \cos\frac{\theta}{2}$

143. (2) $\frac{2\tan^2 30^\circ}{1 - \tan^2 30^\circ} + \sec^2 45^\circ - \sec^2 0^\circ = x\sec 60^\circ$

$\Rightarrow \frac{2\times\left(\frac{1}{\sqrt{3}}\right)^2}{1 - \left(\frac{1}{\sqrt{3}}\right)^2} + \left(\sqrt{2}\right)^2 - 1 = x \times 2$

$\Rightarrow \frac{\frac{2}{3}}{1 - \frac{1}{3}} + 2 - 1 = x \times 2$

$\Rightarrow \frac{2}{3} \times \frac{3}{2} + 1 = x \times 2$

$\Rightarrow 2 = x \times 2 \Rightarrow x = \frac{2}{2} = 1$

144. (2) $\tan\theta = \frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$

$\therefore 1 + \tan^2\theta$

$= 1 + \frac{(\sin\alpha - \cos\alpha)^2}{(\sin\alpha + \cos\alpha)^2}$

$\Rightarrow \sec^2\theta$

$= \frac{(\sin\alpha + \cos\alpha)^2 + (\sin\alpha - \cos\alpha)^2}{(\sin\alpha + \cos\alpha)^2}$

$\Rightarrow \sec^2\theta = \frac{2(\sin^2\alpha + \cos^2\alpha)}{(\sin\alpha + \cos\alpha)^2}$

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$\Rightarrow \frac{1}{\cos^2\theta} = \frac{2}{(\sin\alpha+\cos\alpha)^2}$

$\Rightarrow \frac{1}{\cos\theta} = \frac{\pm\sqrt{2}}{\sin\alpha+\cos\alpha}$

$\Rightarrow \sin\alpha + \cos\alpha = \pm\sqrt{2}\cos\theta$

145. (1) $7\sin^2\theta + 3\cos^2\theta = 4$

On dividing both sides by $\cos^2\theta$

$7\tan^2\theta + 3 = 4\sec^2\theta$

$\Rightarrow 7\tan^2\theta + 3 = 4(1+\tan^2\theta)$

$\Rightarrow 7\tan^2\theta + 3 = 4 + 4\tan^2\theta$

$\Rightarrow 7\tan^2\theta - 4\tan^2\theta = 4 - 3$

$\Rightarrow 3\tan^2\theta = 1$

$\Rightarrow \tan^2\theta = \frac{1}{3}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$

146. (4) $\tan 9^\circ = \frac{p}{q}$

$\therefore \frac{\sec^2 81^\circ}{1+\cot^2 81^\circ} = \frac{\sec^2 81^\circ}{\operatorname{cosec}^2 81^\circ}$

$= \frac{1}{\cos^2 81^\circ} \times \sin^2 81^\circ$

$= \tan^2 81^\circ = \tan^2(90^\circ - 9^\circ)$

$= \cot^2 9^\circ = \frac{q^2}{p^2}$

147. (4) $\sec\theta + \tan\theta = 5$

$\therefore \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{5}$

$\therefore (\sec\theta + \tan\theta) - (\sec\theta - \tan\theta)$

$= 5 - \frac{1}{5} = \frac{25-1}{5}$

$\Rightarrow 2\tan\theta = \frac{24}{5} \Rightarrow \tan\theta = \frac{12}{5}$

$\therefore \frac{\tan\theta+1}{\tan\theta-1} = \frac{\frac{12}{5}+1}{\frac{12}{5}-1} = \frac{12+5}{12-5}$

$= \frac{17}{7}$

148. (4) $\tan^2\theta = 1 - e^2$

$\therefore \sec\theta + \tan^3\theta \cdot \operatorname{cosec}\theta$

$= \sec\theta + \tan^2\theta \cdot \tan\theta \cdot \operatorname{cosec}\theta$

$= \sec\theta + \tan^2\theta \cdot \frac{\sin\theta}{\cos\theta} \cdot \frac{1}{\sin\theta}$

$= \sec\theta + \tan^2\theta \cdot \sec\theta$

$= \sec\theta \cdot (1 + \tan^2\theta)$

$= (1+\tan^2\theta)^{\frac{1}{2}} \cdot (1+\tan^2\theta)$

$= (1+\tan^2\theta)^{\frac{3}{2}} = (1+1-e^2)^{\frac{3}{2}}$

$= (2-e^2)^{\frac{3}{2}}$

149. (2) When $\theta = 60^\circ$

$\cos\theta = \frac{1}{2}$, $\cos^2\theta = \frac{1}{4}$

$\therefore \cos\theta > \cos^2\theta$

150. (1) $x\sin 60^\circ \tan 30^\circ - \tan^2 45^\circ$

$= \operatorname{cosec} 60^\circ \cdot \cot 30^\circ - \sec^2 45^\circ$

$\Rightarrow x \cdot \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{3}} - 1$

$= \frac{2}{\sqrt{3}} \times \sqrt{3} - (\sqrt{2})^2$

$\Rightarrow \frac{x}{2} - 1 = 2 - 2 = 0$

$\Rightarrow \frac{x}{2} = 1 \Rightarrow x = 2$

151. (3) $x = a\sec\alpha \cdot \cos\beta$

$\Rightarrow \frac{x}{a} = \sec\alpha \cdot \cos\beta$

Similarly,

$\frac{y}{b} = \sec\alpha \cdot \sin\beta$, $\frac{z}{c} = \tan\alpha$

$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}$

$= \sec^2\alpha \cdot \cos^2\beta + \sec^2\alpha \cdot \sin^2\beta - \tan^2\alpha$

$= \sec^2\alpha(\cos^2\beta + \sin^2\beta) - \tan^2\alpha$

$= \sec^2\alpha - \tan^2\alpha = 1$

152. (3) $\frac{\cos\alpha}{\cos\beta} = a \Rightarrow \cos\alpha = a\cos\beta$

On squaring both sides,

$\cos^2\alpha = a^2\cos^2\beta$

$\Rightarrow 1 - \sin^2\alpha = a^2(1 - \sin^2\beta)$ ...(i)

Again, $\sin\alpha = b\sin\beta$

$\Rightarrow \sin^2\alpha = b^2\sin^2\beta$

$\therefore$ From equation (i),

$1 - b^2\sin^2\beta = a^2 - a^2\sin^2\beta$

$\Rightarrow a^2\sin^2\beta - b^2\sin^2\beta = a^2 - 1$

$\Rightarrow \sin^2\beta(a^2 - b^2) = a^2 - 1$

$\Rightarrow \sin^2\beta = \frac{a^2-1}{a^2-b^2}$

153. (2) Expression

$= \frac{\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$

$= \left(\frac{1}{2}\right)^2 + 4\left(\frac{2}{\sqrt{3}}\right)^2 - 1$

$[\because \sin^2\theta + \cos^2\theta = 1]$

$= \frac{1}{4} + \frac{16}{3} - 1$

$= \frac{3+64-12}{12} = \frac{55}{12}$

154. (1)

$\sin^2 30^\circ \cos^2 45^\circ + 5\tan^2 30^\circ +$

$\frac{3}{2}\sin^2 90^\circ - 3\cos^2 90^\circ$

$= \left(\frac{1}{2}\right)^2 \times \left(\frac{1}{\sqrt{2}}\right)^2 + 5 \times \left(\frac{1}{\sqrt{3}}\right)^2 +$

$\frac{3}{2} \times 1 - 3 \times 0$

$= \frac{1}{4} \times \frac{1}{2} + 5 \times \frac{1}{3} + \frac{3}{2}$

$= \frac{1}{8} + \frac{5}{3} + \frac{3}{2} = \frac{3+40+36}{24}$

$= \frac{79}{24} = 3\frac{7}{24}$

155. (1) $\cos^2\theta - \sin^2\theta = \frac{1}{3}$

$\cos^4\theta - \sin^4\theta$

$= (\cos^2\theta + \sin^2\theta)(\cos^2\theta - \sin^2\theta$

$= 1 \times \frac{1}{3} = \frac{1}{3}$

156. (3) $\tan\theta = \frac{1}{\sqrt{11}}$; $\cot\theta = \sqrt{11}$

$\therefore \frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta}$

$= \frac{1+\cot^2\theta - (1+\tan^2\theta)}{1+\cot^2\theta + 1 + \tan^2\theta}$

$= \frac{\cot^2\theta - \tan^2\theta}{\cot^2\theta + \tan^2\theta + 2}$

$= \frac{(\sqrt{11})^2 - \left(\frac{1}{\sqrt{11}}\right)^2}{(\sqrt{11})^2 + \left(\frac{1}{\sqrt{11}}\right)^2 + 2}$

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$$= \frac{11-\frac{1}{11}}{11+\frac{1}{11}+2} = \frac{\frac{121-1}{11}}{\frac{121+1+22}{11}}$$

$$= \frac{120}{144} = \frac{5}{6}$$

157. (1) Expression $= \frac{1}{\sqrt{2}} \sin\frac{\pi}{6} \cdot \cos\frac{\pi}{4} - \cot\frac{\pi}{3} \cdot \sec\frac{\pi}{6} + \frac{5\tan\frac{\pi}{4}}{12\sin\frac{\pi}{2}}$

$$= \frac{1}{\sqrt{2}} \times \frac{1}{2} \times \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{3}} \times \frac{2}{\sqrt{3}} + \frac{5\times1}{12\times1}$$

$$= \frac{1}{4} - \frac{2}{3} + \frac{5}{12}$$

$$= \frac{3-8+5}{12} = 0$$

158. (2) $\sin\theta = \frac{3}{5}$

$\therefore \cos\theta = \sqrt{1-\sin^2\theta}$

$$= \sqrt{1-\left(\frac{3}{5}\right)^2} = \sqrt{1-\frac{9}{25}}$$

$$= \sqrt{\frac{16}{25}} = \frac{4}{5}$$

$$\therefore \tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{3}{5}}{\frac{4}{5}} = \frac{3}{4}$$

$$\cot\theta = \frac{1}{\tan\theta} = \frac{4}{3}$$

$$\operatorname{cosec}\theta = \frac{1}{\sin\theta} = \frac{5}{3}$$

$$\therefore \frac{\tan\theta+\cos\theta}{\cot\theta+\operatorname{cosec}\theta} = \frac{\frac{3}{4}+\frac{4}{5}}{\frac{4}{3}+\frac{5}{3}}$$

$$= \frac{\frac{15+16}{20}}{\frac{4+5}{3}}$$

$$= \frac{31}{20} \times \frac{3}{9} = \frac{31}{60}$$

159. (2) $a\cos\theta + b\sin\theta = p$

$a\sin\theta - b\cos\theta = q$

On squaring and adding,

$a^2\cos^2\theta + b^2\sin^2\theta + 2ab\sin\theta\cdot\cos\theta + a^2\sin^2\theta + b^2\cos^2\theta - 2ab\sin\theta\cdot\cos\theta = p^2 + q^2$

$\Rightarrow a^2\cos^2\theta + a^2\sin^2\theta + b^2\sin^2\theta + b^2\cos^2\theta = p^2 + q^2$

$\Rightarrow a^2(\cos^2\theta + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta) = p^2 + q^2$

$\Rightarrow a^2 + b^2 = p^2 + q^2$

160. (2) $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow \sin^2\alpha + \operatorname{cosec}^2\alpha + 2\sin\alpha\cdot\operatorname{cosec}\alpha + \cos^2\alpha + \sec^2\alpha + 2\cos\alpha\cdot\sec\alpha = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow \sin^2\alpha + \cos^2\alpha + 2 + \operatorname{cosec}^2\alpha + \sec^2\alpha + 2 = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow 5 + \operatorname{cosec}^2\alpha + \sec^2\alpha = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow 5 + 1 + \cot^2\alpha + 1 + \tan^2\alpha = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow 7 + \cot^2\alpha + \tan^2\alpha = k + \tan^2\alpha + \cot^2\alpha$

$\Rightarrow k = 7$

161. (1) $\sin 21° = \frac{x}{y}$

$$\cos 21° = \sqrt{1-\sin^2 21°}$$

$$= \sqrt{1-\frac{x^2}{y^2}} = \frac{\sqrt{y^2-x^2}}{y}$$

$$\therefore \sec 21° = \frac{y}{\sqrt{y^2-x^2}}$$

$\therefore \sec 21° - \sin 69°$

$= \sec 21° - \sin(90° - 21°)$

$= \sec 21° - \cos 21°$

$$= \frac{y}{\sqrt{y^2-x^2}} - \frac{\sqrt{y^2-x^2}}{y}$$

$$= \frac{y^2-(y^2-x^2)}{y\sqrt{y^2-x^2}} = \frac{x^2}{y\sqrt{y^2-x^2}}$$

162. (3) $\sec\alpha + \tan\alpha = 2$

$$\Rightarrow \frac{1}{\cos\alpha} + \frac{\sin\alpha}{\cos\alpha} = 2$$

$$\Rightarrow \frac{1+\sin\alpha}{\cos\alpha} = 2$$

$\Rightarrow 1 + \sin\alpha = 2\cos\alpha$

$\Rightarrow (1+\sin\alpha)^2 = 4\cos^2\alpha$

$\Rightarrow 1 + \sin^2\alpha + 2\sin\alpha = 4(1 - \sin^2\alpha)$

$\Rightarrow 1 + \sin^2\alpha + 2\sin\alpha = 4 - 4\sin^2\alpha$

$\Rightarrow 5\sin^2\alpha + 2\sin\alpha + 1 - 4 = 0$

$\Rightarrow 5\sin^2\alpha + 2\sin\alpha - 3 = 0$

$\Rightarrow 5\sin^2\alpha + 5\sin\alpha - 3\sin\alpha - 3 = 0$

$\Rightarrow 5\sin\alpha(\sin\alpha+1) - 3(\sin\alpha+1) = 0$

$\Rightarrow (5\sin\alpha - 3)(\sin\alpha+1) = 0$

$\because \alpha < 90°$,

$\therefore 5\sin\alpha - 3 = 0$

$\Rightarrow 5\sin\alpha = 3$

$$\Rightarrow \sin\alpha = \frac{3}{5} = 0.6$$

163. (1) $3\sin\theta + 5\cos\theta = 5$ --- (i)

$5\sin\theta - 3\cos\theta = x$ (let)-- (ii)

On squaring and adding both the equations,

$(3\sin\theta + 5\cos\theta)^2 + (5\sin\theta - 3\cos\theta)^2 = 5^2 + x^2$

$\Rightarrow 9\sin^2\theta + 25\cos^2\theta + 30\sin\theta\cdot\cos\theta + 25\sin^2\theta + 9\cos^2\theta - 30\sin\theta\cdot\cos\theta = 25 + x^2$

$\Rightarrow 9\sin^2\theta + 9\cos^2\theta + 25\cos^2\theta + 25\sin^2\theta = 25 + x^2$

$\Rightarrow 9(\sin^2\theta + \cos^2\theta) + 25(\cos^2\theta + \sin^2\theta) = 25 + x^2$

$\Rightarrow 9 + 25 = 25 + x^2$

$\Rightarrow x^2 = 9 \Rightarrow x = \pm 3$

164. (2) $\tan\theta + \cot\theta = 2$

$$\Rightarrow \tan\theta + \frac{1}{\tan\theta} = 2$$

$$\Rightarrow \frac{\tan^2\theta+1}{\tan\theta} = 2$$

$\Rightarrow \tan^2\theta + 1 = 2\tan\theta$

$\Rightarrow \tan^2\theta - 2\tan\theta + 1 = 0$

$\Rightarrow (\tan\theta - 1)^2 = 0$

$\Rightarrow \tan\theta - 1 = 0 \Rightarrow \tan\theta = 1$

$$\therefore \cot\theta = \frac{1}{\tan\theta} = 1$$

$\therefore \tan^5\theta + \cot^5\theta = 1 + 1 = 2$

165. (3) $\tan 1°\cdot\tan 2°\cdot\tan 3°\ldots\tan 89°$

$= (\tan 1°\cdot\tan 89°)(\tan 2°\cdot\tan 88°)\ldots\tan 45°$

$= (\tan 1°\cdot\tan(90° - 1°))$

$(\tan 2°\tan(90° - 2°)\ldots\tan 45°$

$= (\tan 1°\cdot\cot 1°)$

$(\tan 2°\cdot\cot 2°)\ldots\tan 45°$

$= 1.1..1. = 1$

$[\tan(90° - \theta) = \cot\theta]$

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166. (3) $x\sin^2 60° - \frac{3}{2}\sec 60° . \tan^2 30°$

$+ \frac{4}{5}\sin^2 45° . \tan^2 60° = 0$

$\Rightarrow x . \left(\frac{\sqrt{3}}{2}\right)^2 - \frac{3}{2} \times 2 . \left(\frac{1}{\sqrt{3}}\right)^2$

$+ \frac{4}{5} \times \left(\frac{1}{\sqrt{2}}\right)^2 \times (\sqrt{3})^2 = 0$

$\Rightarrow \frac{3x}{4} - \frac{3}{2} \times 2 \times \frac{1}{3} + \frac{4}{5} \times \frac{1}{2} \times 3 = 0$

$\Rightarrow \frac{3x}{4} - 1 + \frac{6}{5} = 0$

$\Rightarrow \frac{3x}{4} = 1 - \frac{6}{5} = \frac{5-6}{5} = \frac{-1}{5}$

$\Rightarrow x = -\frac{1}{5} \times \frac{4}{3} = \frac{-4}{15}$

167. (4) $7\sin\alpha = 24\cos\alpha$

$\Rightarrow \frac{\sin\alpha}{\cos\alpha} = \frac{24}{7} \Rightarrow \tan\alpha = \frac{24}{7}$

$\therefore \sec\alpha = \sqrt{1+\tan^2\alpha} = \sqrt{1+\left(\frac{24}{7}\right)^2}$

$= \sqrt{1+\frac{576}{49}} = \sqrt{\frac{49+576}{49}}$

$= \sqrt{\frac{625}{49}} = \frac{25}{7}$

$\therefore \cos\alpha = \frac{1}{\sec\alpha} = \frac{7}{25}$

$\therefore 14\tan\alpha - 75\cos\alpha - 7\sec\alpha$

$= 14 \times \frac{24}{7} - 75 \times \frac{7}{25} - 7 \times \frac{25}{7}$

$= 48 - 21 - 25 = 2$

168. (2) $2\,\text{cosec}^2 30° + x\sin^2 60° - \frac{3}{4}\tan^2 30° = 10$

$\Rightarrow 2 \times (2)^2 + x \times \left(\frac{\sqrt{3}}{2}\right)^2 - \frac{3}{4} \times \left(\frac{1}{\sqrt{3}}\right)^2 = 10$

$\Rightarrow 8 + \frac{3x}{4} - \frac{3}{4} \times \frac{1}{3} = 10$

$\Rightarrow \frac{3x}{4} = 10 + \frac{1}{4} - 8$

$\Rightarrow \frac{3x}{4} = \frac{9}{4} \Rightarrow 3x = 9$

$\Rightarrow x = \frac{9}{3} = 3$

169. (2) $\tan^2\theta - \sec^2\theta = -(\sec^2\theta - \tan^2\theta) = -1.$

170. (2) $29\tan\theta = 31 \Rightarrow \tan\theta = \frac{31}{29}$

$\text{Expression} = \frac{1+2\sin\theta.\cos\theta}{1-2\sin\theta\cos\theta}$

$= \frac{\sin^2\theta+\cos^2\theta+2\sin\theta.\cos\theta}{\sin^2\theta+\cos^2\theta-2\sin.\cos\theta}$

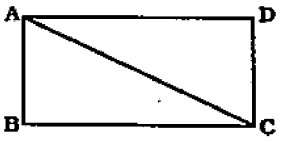
$= \frac{(\sin\theta+\cos\theta)^2}{(\sin\theta-\cos\theta)^2}$

$= \left(\frac{\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}-\frac{\cos\theta}{\cos\theta}}\right)^2 = \left(\frac{\tan\theta+1}{\tan\theta-1}\right)^2$

$= \left(\frac{\frac{31}{29}+1}{\frac{31}{29}-1}\right)^2 = \left(\frac{\frac{31+29}{29}}{\frac{31-29}{29}}\right)^2$

$= \left(\frac{60}{2}\right)^2 = (30)^2 = 900.$

171. (3)



$\angle ACD = 45°$

$\angle BAC = 45°$

$\therefore (\tan^2\angle CAD + 1).\sin^2\angle BAC$

$= (\tan^2 45° + 1)\sin^2 45°$

$= (1+1) \times \left(\frac{1}{\sqrt{2}}\right)^2 = 2 \times \frac{1}{2} = 1$

172. (2) $\tan x = \sin 45°.\cos 45° + \sin 30°$

$= \frac{1}{\sqrt{2}} . \frac{1}{\sqrt{2}} + \frac{1}{2} = \frac{1}{2} + \frac{1}{2} = 1$

$\therefore \tan x = \tan 45° \Rightarrow x = 45°$

173. (3) $\sqrt{\frac{\sec\theta-1}{\sec\theta+1}} = \sqrt{\frac{\frac{1}{\cos\theta}-1}{\frac{1}{\cos\theta}+1}}$

$= \sqrt{\frac{\frac{1-\cos\theta}{\cos\theta}}{\frac{1+\cos\theta}{\cos\theta}}}$

$= \sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \sqrt{\frac{(1-\cos\theta)(1-\cos\theta)}{(1+\cos\theta)(1-\cos\theta)}}$

(Rationalising the numerator and the denominator)

$= \sqrt{\frac{(1-\cos\theta)^2}{1-\cos^2\theta}} = \sqrt{\frac{(1-\cos\theta)^2}{\sin^2\theta}}$

$= \frac{1-\cos\theta}{\sin\theta} = \frac{1}{\sin\theta} - \frac{\cos\theta}{\sin\theta}$

$= \text{cosec}\theta - \cot\theta.$

174. (2) Let the angles be A and B where $A > B$

$\therefore A + B = 135°$

and, $A - B$

$= \frac{\pi}{12} = \frac{\pi}{12} \times \frac{180°}{\pi} = 15°$

On adding

$A + B + A - B$

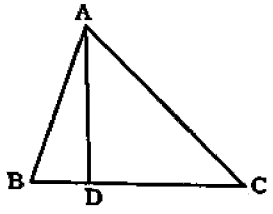
$= 135° + 15° = 150°$

$\Rightarrow 2A = 150° \Rightarrow A = \frac{150}{2} = 75°$

$\therefore A + B = 135°$

$\Rightarrow B = 135° - 75° = 60°$

175. (3)



$\angle B = \frac{\pi}{3}, \angle = \frac{\pi}{4}$

and $\frac{BD}{DC} = \frac{1}{3}$

From ΔABD,

$\frac{BD}{\sin BAD} = \frac{AD}{\sin ABD}$

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$\Rightarrow \frac{BD}{\sin BAD} = \frac{AD}{\sin\frac{\pi}{3}}$

$\Rightarrow \frac{BD}{\sin BAD} = \frac{AD}{\frac{\sqrt{3}}{2}}$

$\Rightarrow AD = \frac{\sqrt{3}}{2}\cdot\frac{BD}{\sin BAD}$ ...(i)

From ΔADC,

$\frac{CD}{\sin DAC} = \frac{AD}{\sin ACD}$

$\Rightarrow \frac{CD}{\sin DAC} = \frac{AD}{\sin\frac{\pi}{4}}$

$\Rightarrow AD = \frac{1}{\sqrt{2}}\cdot\frac{CD}{\sin DAC}$ ...(ii)

From equations (i) and (ii),

$\frac{\sqrt{3}}{2}\cdot\frac{BD}{\sin BAD} = \frac{1}{\sqrt{2}}\cdot\frac{CD}{\sin DAC}$

$\Rightarrow \frac{\sin BAD}{\sin DAC} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{\sqrt{2}}}\times\frac{BD}{CD}$

$\Rightarrow \frac{\sin BAD}{\sin DAC} = \frac{\sqrt{3}}{2}\times\sqrt{2}\times\frac{1}{3}$

$= \frac{1}{\sqrt{2}\times\sqrt{3}} = \frac{1}{\sqrt{6}}$

176. (1) $\sin 3A = \cos(A - 26°)$
$\Rightarrow \cos(90° - 3A) = \cos(A - 26°)$
$\Rightarrow 90° - 3A = A - 26°$
$\Rightarrow 90° + 26° = 3A + A$
$\Rightarrow 4A = 116$

$\Rightarrow A = \frac{116}{4} = 29°$

177. (1) $\sec^2\theta - \frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta}$

$= \sec^2\theta - \frac{\sin^2\theta(1 - 2\sin^2\theta)}{\cos^2\theta(2\cos^2\theta - 1)}$

$= \sec^2\theta - \frac{\sin^2\theta(1 - 2(1 - \cos^2\theta))}{\cos^2\theta(2\cos^2\theta - 1)}$

$= \sec^2\theta - \tan^2\theta\frac{(2\cos^2\theta - 1)}{2\cos^2\theta - 1}$

$= \sec^2\theta - \tan^2\theta = 1$

178. (3) $x = a(\sin\theta + \cos\theta)$ and $y = b(\sin\theta - \cos\theta)$

$\Rightarrow \frac{x}{a} = \sin\theta + \cos\theta$ and

$\frac{y}{b} = \sin\theta - \cos\theta$

$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2} = (\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$
$= \sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta + \sin^2\theta + \cos^2\theta - 2\sin\theta.\cos\theta$
$= 2(\sin^2\theta + \cos^2\theta) = 2$

179. (4) $\sin 5\theta = \cos 20°$
$\Rightarrow \sin 5\theta = \sin(90 - 20)$
$= \sin 70°$
$\Rightarrow 5\theta = 70°$

$\Rightarrow \theta = \frac{70}{5} = 14°$

180. (3) $2\sec\theta = 3\operatorname{cosec}^2\theta$

$\Rightarrow \frac{2}{\cos\theta} = \frac{3}{\sin^2\theta} = \frac{3}{1 - \cos^2\theta}$
$\Rightarrow 2 - 2\cos^2\theta = 3\cos\theta$
$\Rightarrow 2\cos^2\theta + 3\cos\theta - 2 = 0$
$\Rightarrow 2\cos^2\theta + 4\cos\theta - \cos\theta - 2 = 0$
$\Rightarrow 2\cos\theta(\cos\theta + 2) - 1(\cos\theta + 2) = 0$
$\Rightarrow (2\cos\theta - 1)(\cos\theta + 2) = 0$
$\therefore 2\cos\theta - 1 = 0$ as $\cos\theta + 2 \neq 0$

$\Rightarrow \cos\theta = \frac{1}{2} = \cos 60°$ or $\cos\frac{\pi}{3}$

$\Rightarrow \theta = \frac{\pi}{3}$

181. (4) Expression

$= \sqrt{\frac{1 + \sin\theta}{1 - \sin\theta}} + \sqrt{\frac{1 - \sin\theta}{1 + \sin\theta}}$

$= \sqrt{\frac{(1 + \sin\theta)(1 + \sin\theta)}{(1 - \sin\theta)(1 + \sin\theta)}} + \sqrt{\frac{(1 - \sin\theta)(1 - \sin\theta)}{(1 + \sin\theta)(1 - \sin\theta)}}$

$= \sqrt{\frac{(1 + \sin\theta)^2}{1 - \sin^2\theta}} + \sqrt{\frac{(1 - \sin\theta)^2}{1 - \sin^2\theta}}$

$= \sqrt{\frac{(1 + \sin\theta)^2}{\cos^2\theta}} + \sqrt{\frac{(1 - \sin\theta)^2}{\cos^2\theta}}$

$= \frac{1 + \sin\theta}{\cos\theta} + \frac{1 - \sin\theta}{\cos\theta}$

$= \frac{1 + \sin\theta + 1 - \sin\theta}{\cos\theta} = \frac{2}{\cos\theta}$

$= 2\sec\theta$

182. (2) $\cos\theta = \frac{3}{5}$

$\therefore \sec\theta = \frac{5}{3}$

$\therefore \tan\theta = \sqrt{\sec^2\theta - 1}$

$= \sqrt{\left(\frac{5}{3}\right)^2 - 1}$

$= \sqrt{\frac{25}{9} - 1} = \sqrt{\frac{25 - 9}{9}} = \sqrt{\frac{16}{9}}$

$= \frac{4}{3}$

$\therefore \sin\theta.\sec\theta.\tan\theta = \frac{\sin\theta}{\cos\theta}.\tan\theta$

$= \tan^2\theta = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$

183. (4) $\tan^2A + \cot^2A - \sec^2A.\operatorname{cosec}^2A$
$= \tan^2A + \cot^2A - (1 + \tan^2A)(1 + \cot^2A)$
$= \tan^2A + \cot^2A - (1 + \tan^2A + \cot^2A + \cot^2A.\tan^2A)$
$= \tan^2A + \cot^2A - 1 - \tan^2A - \cot^2A - \cot^2A.\tan^2A$
$= -1 - 1 = -2$
[$\tan A.\cot A = 1$]

184. (4) $\sin(4\alpha - \beta) = 1 = \sin 90°$
$\Rightarrow 4\alpha - \beta = 90°$ ...(i)

$\cos(2\alpha + \beta) = \frac{1}{2} = \cos 60°$

$\Rightarrow 2\alpha + \beta = 60°$ ...(ii)

On adding equations (i) and (ii),
$4\alpha - \beta + 2\alpha + \beta = 90° + 60°$

$\Rightarrow 6\alpha = 150° \Rightarrow \alpha = \frac{150}{6} = 25°$

From equation (ii),
$2 \times 25 + \beta = 60°$
$\Rightarrow \beta = 60° - 50° = 10°$
$\therefore \sin(\alpha + 2\beta)$
$= \sin(25 + 2 \times 10)$

$= \sin 45° = \frac{1}{\sqrt{2}}$



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185. (*) $\operatorname{cosec}\theta = \sqrt{3}$

$\cot\theta = \sqrt{\operatorname{cosec}^2\theta - 1}$

$= \sqrt{(\sqrt{3})^2 - 1} = \sqrt{3-1} = \sqrt{2}$

$\therefore \cot\theta - \operatorname{cosec}\theta = \sqrt{2} - \sqrt{3}$

$= \frac{3(\sqrt{2}-\sqrt{3})}{3} = (\sqrt{2}-\sqrt{3})$

186. (2) $4\cos^2\theta - 4\cos\theta + 1 = 0$

$\Rightarrow (2\cos\theta - 1)^2 = 0$

$\Rightarrow 2\cos\theta - 1 = 0$

$\Rightarrow 2\cos\theta = 1$

$\Rightarrow \cos\theta = \frac{1}{2} = \cos 60°$

$\Rightarrow \theta = 60°$

$\therefore \tan(\theta - 15°) = \tan(60° - 15°) = \tan 45° = 1$

187. (1) $(r\cos\theta - \sqrt{3})^2 + (r\sin\theta - 1)^2 = 0$

$\Rightarrow r\cos\theta - \sqrt{3} = 0$ and $r\sin\theta - 1 = 0$

$\Rightarrow r\cos\theta = \sqrt{3}$ and $r\sin\theta = 1$

$\therefore r^2\cos^2\theta + r^2\sin^2\theta = 3 + 1$

$\Rightarrow r^2(\sin^2\theta + \cos^2\theta) = 4$

$\Rightarrow r^2 = 4 \Rightarrow r = 2$

$\therefore \tan\theta = \frac{r\sin\theta}{r\cos\theta} = \frac{1}{\sqrt{3}}$

and $r\cos\theta = \sqrt{3} \Rightarrow \cos\theta = \frac{\sqrt{3}}{r}$

$\Rightarrow \sec\theta = \frac{r}{\sqrt{3}}$

$\therefore \frac{r\tan\theta + \sec\theta}{r\sec\theta + \tan\theta} = \frac{\frac{r}{\sqrt{3}} + \frac{r}{\sqrt{3}}}{\frac{r^2}{\sqrt{3}} + \frac{1}{\sqrt{3}}}$

$= \frac{r\left(\frac{2}{\sqrt{3}}\right)}{\frac{r^2+1}{\sqrt{3}}}$

$= \frac{2r}{r^2+1} = \frac{2\times 2}{4+1} = \frac{4}{5}$

188. (1)

$$\frac{\sin 25°\cos 65° + \cos 25°\sin 65°}{\tan^2 70° - \operatorname{cosec}^2 20°}$$

$$= \frac{\sin 25°\cos(90°-25°) + \cos 25°\sin(90°-25°)}{\tan^2 70° - \operatorname{cosec}^2(90°-70°)}$$

$$\left[\because \begin{matrix}\sin(90°-\theta) = \cos\theta \\ \cos(90°-\theta) = \sin\theta \\ \operatorname{cosec}(90°-\theta) = \sec\theta\end{matrix}\right]$$

$$= \frac{\sin 25°\sin 25° + \cos 25°.\cos 25°}{\tan^2 70° - \sec^2 70°}$$

$$= \frac{\sin^2 25° + \cos^2 25°}{\tan^2 70° - \sec^2 70°}$$

$$= \frac{1}{-1} = -1$$

$$\left[\because \begin{matrix}\sec^2\theta - \tan^2\theta = 1 \\ \sin^2\theta + \cos^2\theta = 1\end{matrix}\right]$$

189. (1) $\sin(\theta + 18°) = \cos 60°$

$= \cos(90° - 30°) = \sin 30°$

$\Rightarrow \theta + 18° = 30°$

$\Rightarrow \theta = 30° - 18° = 12°$

$\therefore \cos 5\theta = \cos 60° = \frac{1}{2}$

190. (1) $\tan\theta = \frac{3}{4} \Rightarrow \tan^2\theta = \frac{9}{16}$

Expression

$$= \frac{4\sin^2\theta - 2\cos^2\theta}{4\sin^2\theta + 3\cos^2\theta}$$

$$= \frac{4\frac{\sin^2\theta}{\cos^2\theta} - 2\frac{\cos^2\theta}{\cos^2\theta}}{4\frac{\sin^2\theta}{\cos^2\theta} + 3\frac{\cos^2\theta}{\cos^2\theta}}$$

$$= \frac{4\tan^2\theta - 2}{4\tan^2\theta + 3}$$

$$= \frac{4\times\frac{9}{16} - 2}{4\times\frac{9}{16} + 3}$$

$$= \frac{\frac{9}{4} - 2}{\frac{9}{4} + 3} = \frac{9-8}{9+12} = \frac{1}{21}$$

191. (3) $\frac{\cos\alpha}{\cos\beta} = a$

$\Rightarrow \frac{\cos^2\alpha}{\cos^2\beta} = a^2$

$\Rightarrow \frac{1-\sin^2\alpha}{1-\sin^2\beta} = a^2$

$\Rightarrow 1 - \sin^2\alpha = a^2(1 - \sin^2\beta)$

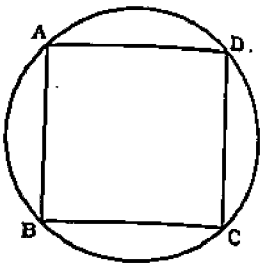
$\Rightarrow 1 - b^2\sin^2\beta = a^2 - a^2\sin^2\beta$

$\Rightarrow 1 - a^2 = b^2\sin^2\beta - a^2\sin^2\beta$

$\Rightarrow 1 - a^2 = (b^2 - a^2)\sin^2\beta$

$\Rightarrow \sin^2\beta = \frac{1-a^2}{b^2-a^2} = \frac{a^2-1}{a^2-b^2}$

192. (1)



ABCD is a concyclic quadrilateral.

$\angle A + \angle C = \angle B + \angle D = 180°$

$\therefore \angle A = 180° - \angle C$

$\therefore \cos A = \cos(180° - C)$

$= -\cos C$

and $\cos B = -\cos D$

$\therefore \cos A + \cos B + \cos C + \cos D$

$= \cos A + \cos B - \cos A - \cos B = 0$

193. (3) $\sqrt{3}\tan\theta = 3\sin\theta$

$\Rightarrow \sqrt{3}\frac{\sin\theta}{\cos\theta} = 3\sin\theta$

$\Rightarrow \sqrt{3} = 3\cos\theta$

$\Rightarrow \cos\theta = \frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}}$

$\therefore \sin\theta = \sqrt{1 - \cos^2\theta}$

$= \sqrt{1 - \frac{1}{3}} = \sqrt{\frac{2}{3}}$

$\therefore \sin^2\theta - \cos^2\theta = \left(\sqrt{\frac{2}{3}}\right)^2 - \left(\frac{1}{\sqrt{3}}\right)^2$

$= \frac{2}{3} - \frac{1}{3} = \frac{1}{3}$

194. (3) $A = 45°$, $B = 30°$ (let)

$\therefore \sin(A+B) = \sin A.\cos B + \cos A.\sin B$

$\Rightarrow \sin(45° + 30°)$

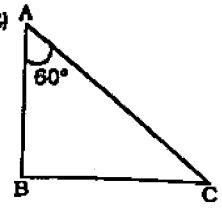
$= \sin 45°.\cos 30° + \cos 45°.\sin 30°$

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \frac{\sqrt{3}}{2\sqrt{2}} + \frac{1}{2\sqrt{2}} = \frac{\sqrt{3}+1}{2\sqrt{2}}$

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195. (4)



$\angle B = 90°$

$\angle A = 60°$

$\angle C = 180° - 90° - 60° = 30°$

$\cos C = \frac{BC}{CA}$

$\Rightarrow \cos 30° = \frac{BC}{CA}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{BC}{CA} = \sqrt{3}:2$

196. (2) $\tan 2\theta \cdot \tan 3\theta = 1$

$\Rightarrow \tan 3\theta = \frac{1}{\tan 2\theta} = \cot 2\theta$

$\Rightarrow \tan 3\theta = \tan(90° - 2\theta)$

$\Rightarrow 3\theta = 90° - 2\theta$

$\Rightarrow 3\theta + 2\theta = 5\theta = 90°$

$\Rightarrow \theta = \frac{90°}{5} = 18°$

197. (3) $\cos^2\alpha - \sin^2\alpha = \tan^2\beta$

$\Rightarrow \cos^2\alpha - (1 - \cos^2\alpha) = \tan^2\beta$

$\Rightarrow 2\cos^2\alpha - 1 = \tan^2\beta$

$\Rightarrow 2\cos^2\alpha = 1 + \tan^2\beta = \sec^2\beta$

$\Rightarrow \cos^2\beta = \frac{1}{2\cos^2\alpha}$

$\sin^2\beta = 1 - \cos^2\beta$

$= 1 - \frac{1}{2\cos^2\alpha}$

$= \frac{2\cos^2\alpha - 1}{2\cos^2\alpha}$

$\therefore \cos^2\beta - \sin^2\beta$

$= \frac{1}{2\cos^2\alpha} - \frac{2\cos^2\alpha - 1}{2\cos^2\alpha}$

$= \frac{1 - 2\cos^2\alpha + 1}{2\cos^2\alpha}$

$= \frac{2(1 - \cos^2\alpha)}{2\cos^2\alpha} = \frac{\sin^2\alpha}{\cos^2\alpha}$

$= \tan^2\alpha$

Note : It is an identity.

198. (3) $\tan(A + B) = \sqrt{3} = \tan 60°$

$\Rightarrow A + B = 60°$ ...(i)

$\tan(A - B) = \frac{1}{\sqrt{3}} = \tan 30°$

$\Rightarrow A - B = 30°$ ...(ii)

$\therefore A + B + A - B = 60° + 30°$

$\Rightarrow 2A = 90°$

$\Rightarrow A = \frac{90°}{2} = 45°$

199. (3) Expression

$= \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$

$= \frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$

$= \frac{\sin\theta}{\cos\theta} \cdot \frac{(1 - 2(1 - \cos^2\theta))}{(2\cos^2\theta - 1)}$

$= \tan\theta \frac{(1 + 2\cos^2\theta - 2)}{(2\cos^2\theta - 1)}$

$= \tan\theta \cdot \frac{2\cos^2\theta - 1}{2\cos^2\theta - 1} = \tan\theta$

200. (4) $r\sin\theta = \frac{7}{2}$ ...(i)

$r\cos\theta = \frac{7\sqrt{3}}{2}$ ...(ii)

On squaring both equations and adding,

$r^2\sin^2\theta + r^2\cos^2\theta = \left(\frac{7}{2}\right)^2 + \left(\frac{7\sqrt{3}}{2}\right)^2$

$\Rightarrow r^2(\sin^2\theta + \cos^2\theta) = \frac{47}{4} + \frac{147}{4}$

$\Rightarrow r^2 = \frac{49 + 147}{4} = \frac{196}{4} = 49$

$\therefore r = \sqrt{49} = 7$

201. (4) $\sin\theta = \frac{1}{2} = \sin 30° = \sin\frac{\pi}{6}$

$\Rightarrow \theta = \frac{\pi}{6}$

[$\because 180° = \pi$ radian]

$\therefore \theta + \phi = \frac{\pi}{2} \Rightarrow \frac{\pi}{6} + \phi = \frac{\pi}{2}$

$\Rightarrow \phi = \frac{\pi}{2} - \frac{\pi}{6} = \frac{3\pi - \pi}{6}$

$= \frac{2\pi}{6} = \frac{\pi}{3}$

$\therefore \sin\phi = \sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$

202. (2) $2\sin^2\theta + 3\cos\theta = 3$

$\Rightarrow 2(1 - \cos^2\theta) + 3\cos\theta = 3$

$\Rightarrow 2 - 2\cos^2\theta + 3\cos\theta = 3$

$\Rightarrow 2\cos^2\theta - 3\cos\theta + 1 = 0$

$\Rightarrow 2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$

$\Rightarrow 2\cos\theta(\cos\theta - 1) - 1(\cos\theta - 1) = 0$

$\Rightarrow (2\cos\theta - 1)(\cos\theta - 1) = 0$

$\Rightarrow 2\cos\theta - 1 = 0 \Rightarrow 2\cos\theta = 1$

$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

or, $\cos\theta - 1 = 0 \Rightarrow \cos\theta = 1$

$\Rightarrow \theta = 0°$

203. (1) $2\sin^2\theta = 3\cos\theta$

$\Rightarrow 2(1 - \cos^2\theta) = 3\cos\theta$

$\Rightarrow 2 - 2\cos^2\theta = 3\cos\theta$

$\Rightarrow 2\cos^2\theta + 3\cos\theta - 2 = 0$

$\Rightarrow 2\cos^2\theta + 4\cos\theta - \cos\theta - 2 = 0$

$\Rightarrow 2\cos\theta(\cos\theta + 2) - 1(\cos\theta + 2) = 0$

$\Rightarrow (2\cos\theta - 1)(\cos\theta + 2) = 0$

$\Rightarrow 2\cos\theta - 1 = 0$ because $\cos\theta + 2 \neq 0$

$\Rightarrow 2\cos\theta = 1$

$\Rightarrow \cos\theta = \frac{1}{2} = \cos 60°$

$\Rightarrow \theta = 60°$

204. (3) $a(\tan\theta + \cot\theta) = 1$

$\Rightarrow a\left(\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}\right) = 1$

$\Rightarrow a\left(\frac{\sin^2\theta + \cos^2\theta}{\sin\theta.\cos\theta}\right) = 1$

$\Rightarrow \sin\theta \cdot \cos\theta = a$ ....(i)

$\sin\theta + \cos\theta = b$

On squaring both sides,

$\sin^2\theta + \cos^2\theta + 2\sin\theta \cdot \cos\theta = b^2$

$\Rightarrow 1 + 2a = b^2$

$\Rightarrow 2a = b^2 - 1$

205. (2) $\operatorname{cosec}^2 A - \cot^2 A = 1$

$(\operatorname{cosec} A + \cot A)(\operatorname{cosec} A - \cot A) = 1$

$\operatorname{cosec} A - \cot A = \frac{1}{3}$

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$\text{cosec } A + \cot A = 3$

On adding,

$2 \text{ cosec } A = \frac{1}{3} + 3$

$= \frac{1+9}{3} = \frac{10}{3}$

$\Rightarrow \text{cosec } A = \frac{10}{3 \times 2} = \frac{5}{3}$

$\therefore \sin A = \frac{3}{5}$

206. (1) $\sin^2 x + 2\tan^2 x - 2\sec^2 x + \cos^2 x$
$= \sin^2 x + \cos^2 x - 2\sec^2 x + 2\tan^2 x$
$= 1 - 2[\sec^2 x - \tan^2 x]$
$= 1 - 2 = -1$
$[\sec^2 x - \tan^2 x = 1, \sin^2 x + \cos^2 x = 1]$

207. (1) $x = a \sec\theta$

$\Rightarrow \frac{x}{a} = \sec\theta$

Again, $y = b\tan\theta$

$\Rightarrow \frac{y}{b} = \tan\theta$

$\therefore \frac{x^2}{a^2} - \frac{y^2}{b^2}$
$= \sec^2\theta - \tan^2\theta = 1$

208. (4) $\sin^2 1° + \sin^2 2° + \sin^2 3° + ... + \sin^2 89°$
$= (\sin^2 1° + \sin^2 89°) + (\sin^2 2° + \sin^2 88°) + ... \text{ to } 44 \text{ terms} + \sin^2 45°$
$= (\sin^2 1° + \sin^2(90° - 1°) + (\sin^2 2° + \sin^2(90° - 2°) + ...\text{to } 44 \text{ terms} + \left(\frac{1}{\sqrt{2}}\right)^2$
$= (\sin^2 1° + \cos^2 1°) + (\sin^2 2° + \cos^2 2°) + ...\text{to } 44 \text{ terms} + \frac{1}{2}$
$[\sin(90° - \theta) = \cos\theta]$
$= 1 + 1 + ...\text{to } 44 \text{ terms} + \frac{1}{2}$
$[\sin^2\theta + \cos^2\theta = 1]$
$= 44 + \frac{1}{2} = 44\frac{1}{2}$

209. (3) $\frac{\cos^3\theta + \sin^3\theta}{\cos\theta + \sin\theta} + \frac{\cos^3\theta - \sin^3\theta}{\cos\theta - \sin\theta}$
$= \frac{(\cos\theta + \sin\theta)(\cos^2\theta + \sin^2\theta - \cos\theta.\sin\theta)}{\cos\theta + \sin\theta}$
$+ \frac{(\cos\theta - \sin\theta)(\cos^2\theta + \sin^2\theta + \cos\theta.\sin\theta)}{(\cos\theta - \sin\theta)}$
$= \cos^2\theta + \sin^2\theta - \cos\theta . \sin\theta + \cos^2\theta + \sin^2\theta + \cos\theta . \sin\theta$
$= 1 + 1 = 2$

210. (4) $\sin 17° = \frac{x}{y}$
$\sin 73° = \sin(90° - 17°)$
$= \cos 17°$
$\therefore \cos 17° = \sqrt{1 - \sin^2 17°}$
$= \sqrt{1 - \frac{x^2}{y^2}} = \sqrt{\frac{y^2 - x^2}{y^2}}$
$= \frac{\sqrt{y^2 - x^2}}{y}$
$\therefore \sec 17° = \frac{y}{\sqrt{y^2 - x^2}}$
$\therefore \sec 17° - \sin 73°$
$= \sec 17° - \cos 17°$
$= \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$
$= \frac{y^2 - (y^2 - x^2)}{y\sqrt{y^2 - x^2}}$
$= \frac{y^2 - y^2 + x^2}{y\sqrt{y^2 - x^2}}$
$= \frac{x^2}{y\sqrt{y^2 - x^2}}$

211. (3) $\text{cosec}\theta + \cot\theta = \sqrt{3}$ ...(i)
$\text{cosec}^2\theta - \cot^2\theta = 1$
$\Rightarrow (\text{cosec}\theta + \cot\theta)(\text{cosec}\theta - \cot\theta) = 1$
$\Rightarrow \text{cosec}\theta - \cot\theta = \frac{1}{\sqrt{3}}$ ...(ii)
$\therefore \text{cosec}\theta + \cot\theta + \text{cosec}\theta - \cot\theta = \sqrt{3} + \frac{1}{\sqrt{3}}$
$\Rightarrow 2\,\text{cosec}\theta = \frac{3+1}{\sqrt{3}}$
$\Rightarrow \text{cosec}\theta = \frac{4}{2\sqrt{3}} = \frac{2}{\sqrt{3}}$

212. (3) $\cos\alpha + \sec\alpha = \sqrt{3}$
$\therefore \cos^3\alpha + \sec^3\alpha = (\cos\alpha + \sec\alpha)^3 - 3\cos\alpha . \sec\alpha (\cos\alpha + \sec\alpha)$
$= \left(\sqrt{3}\right)^3 - 3 \times \sqrt{3}$
$= 3\sqrt{3} - 3\sqrt{3} = 0$

213. (1) $\sin\theta + \cos\theta = \sqrt{2}\cos\theta$
$\Rightarrow \sqrt{2}\cos\theta - \cos\theta = \sin\theta$
$\Rightarrow \cos\theta\left(\sqrt{2} - 1\right) = \sin\theta$
$\Rightarrow \frac{\cos\theta}{\sin\theta} = \frac{1}{\sqrt{2} - 1}$
$= \frac{\sqrt{2} + 1}{(\sqrt{2} - 1)(\sqrt{2} + 1)} = \sqrt{2} + 1$
$\cot\theta = \sqrt{2} + 1$

214. (1) $\cos^4\theta - \sin^4\theta = \frac{2}{3}$
$\Rightarrow (\cos^2\theta + \sin^2\theta)(\cos^2\theta - \sin^2\theta) = \frac{2}{3}$
$[\because \cos^2\theta + \sin^2\theta = 1]$
$\Rightarrow \cos^2\theta - \sin^2\theta = \frac{2}{3}$
$\Rightarrow 1 - \sin^2\theta - \sin^2\theta = \frac{2}{3}$
$\Rightarrow 1 - 2\sin^2\theta = \frac{2}{3}$

215. (1) $\frac{\cot 30° - \cot 75°}{\tan 15° - \tan 60°}$
$= \frac{\cot(90° - 60°) - \cot(90° - 15°)}{\tan 15° - \tan 60°}$
$= \frac{\tan 60° - \tan 15°}{\tan 15° - \tan 60°} = -1$

216. (3) $\sin\theta + \cos\theta = p$
$\sec\theta + \text{cosec}\,\theta = q$
$\Rightarrow \frac{1}{\cos\theta} + \frac{1}{\sin\theta} = q$
$\Rightarrow \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} = q$
$\therefore q(p^2 - 1) = \left(\frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta}\right)((\sin\theta + \cos\theta)^2 - 1)$
$= \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} . (\sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta - 1)$
$= \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} . 2\sin\theta . \cos\theta$
$= 2p$

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217. (2) $\sin(3\alpha-\beta)=1=\sin 90°$

$\Rightarrow 3\alpha-\beta=90°$ ... (i)

$\cos(2\alpha+\beta)=\frac{1}{2}=\cos 60°$

$\Rightarrow 2\alpha+\beta=60°$ .... (ii)

By adding both equations,

$3\alpha+2\alpha=90°+60°$

$\Rightarrow 5\alpha=150$

$\Rightarrow \alpha=\frac{150}{5}=30°$

$\therefore \tan\alpha=\tan 30°=\frac{1}{\sqrt{3}}$

218. (2) $\sin(60°-x)=\cos(y+60°)$

$\Rightarrow \sin(60°-x)=\sin(90°-y-60°)$

[$\because \sin(90°-\theta)=\cos\theta$]

$\Rightarrow 60°-x$

$=90°-y-60°=30°-y$

$\Rightarrow x-y=60°-30°$

$\Rightarrow x-y=30°$

$\therefore \sin(x-y)=\sin 30°=\frac{1}{2}$

219. (3) $x=a\sec\theta \Rightarrow \frac{x}{a}=\sec\theta$

and, $y=b\tan\theta \Rightarrow \frac{y}{b}=\tan\theta$

$\therefore \frac{x^2}{a^2}-\frac{y^2}{b^2}=\sec^2\theta-\tan^2\theta=1$

220. (4) $a^2+b^2+c^2=ab+bc+ca$

$\Rightarrow 2a^2+2b^2+2c^2=2ab+2bc+2ca$

$\Rightarrow a^2+b^2+b^2+c^2+c^2+a^2-2ab-2bc-2ca=0$

$\Rightarrow a^2+b^2-2ab+b^2+c^2-2bc+c^2+a^2-2ca=0$

$\Rightarrow (a-b)^2+(b-c)^2+(c-a)^2=0$

$\Rightarrow a-b=0 \Rightarrow a=b$

$b-c=0 \Rightarrow b=c$

$c-a=0 \Rightarrow c=a$

$\therefore$ ΔABC is an equilateral triangle.

$\therefore \angle A=\angle B=\angle C=60°$

$\therefore \sin^2A+\sin^2B+\sin^2C$

$=3\sin^2A=3\times\sin^2 60°$

$=3\times\left(\frac{\sqrt{3}}{2}\right)^2$

$=\frac{3\times 3}{4}=\frac{9}{4}$

221. (3) $a\sin\theta+b\cos\theta=c$ .... (i)

$a\cos\theta-b\sin\theta=x$ (let) ... (ii)

On squaring equations (i) and (ii) and adding,

$a^2\sin^2\theta+b^2\cos^2\theta+2ab\sin\theta.\cos\theta+a^2\cos^2\theta+b^2\sin^2\theta-2ab\sin\theta.\cos\theta=c^2+x^2$

$\Rightarrow a^2(\sin^2\theta+\cos^2\theta)+b^2(\cos^2\theta+\sin^2\theta)=c^2+x^2$

$\Rightarrow a^2+b^2=c^2+x^2$

$\Rightarrow x^2=a^2+b^2-c^2$

$\Rightarrow x=\pm\sqrt{a^2+b^2-c^2}$

222. (3) $\sin\theta+\cos\theta=\sqrt{2}\sin(90°-\theta)$

$\Rightarrow \sin\theta+\cos\theta=\sqrt{2}\cos\theta$

$\Rightarrow \sin\theta=\sqrt{2}\cos\theta-\cos\theta$

$\Rightarrow \sin\theta=\cos\theta(\sqrt{2}-1)$

$\Rightarrow \frac{\cos\theta}{\sin\theta}=\frac{1}{\sqrt{2}-1}$

$\Rightarrow \cot\theta=\frac{1}{\sqrt{2}-1}$

$\Rightarrow \cot\theta=\frac{1}{\sqrt{2}-1}\times\frac{(\sqrt{2}+1)}{(\sqrt{2}+1)}$

$=\frac{\sqrt{2}+1}{2-1}=\sqrt{2}+1$

223. (1) $3(\sec^2\theta+\tan^2\theta)=5$

$\Rightarrow \sec^2\theta+\tan^2\theta=\frac{5}{3}$

$\Rightarrow \sec^2\theta+\sec^2\theta-1=\frac{5}{3}$

$\Rightarrow 2\sec^2\theta=\frac{5}{3}+1=\frac{8}{3}$

$\Rightarrow \sec^2\theta=\frac{4}{3} \Rightarrow \sec\theta=\frac{2}{\sqrt{3}}$

$\Rightarrow \cos\theta=\frac{\sqrt{3}}{2}=\cos 30°$

$\Rightarrow \theta=30°$

$\therefore \cos 2\theta=\cos 60°=\frac{1}{2}$

224. (3) $x.\cos^2 30°.\sin 60°$

$=\frac{\tan^2 45°.\sec 60°}{\operatorname{cosec} 60°}$

$\Rightarrow x\left(\frac{\sqrt{3}}{2}\right)^2\cdot\frac{\sqrt{3}}{2}=\frac{1\times 2}{\sqrt{3}}$

$\Rightarrow x\times\frac{3}{4}\times\frac{\sqrt{3}}{2}=\sqrt{3}$

$\Rightarrow x=\frac{\sqrt{3}\times 8}{3\sqrt{3}}=\frac{8}{3}=2\frac{2}{3}$

225. (2) $\tan\alpha=2$

$\therefore \frac{\operatorname{cosec}^2\alpha-\sec^2\alpha}{\operatorname{cosec}^2\alpha+\sec^2\alpha}$

$=\frac{1+\cot^2\alpha-1-\tan^2\alpha}{1+\cot^2\alpha+1+\tan^2\alpha}$

$=\frac{\cot^2\alpha-\tan^2\alpha}{\cot^2\alpha+\tan^2\alpha+2}$

$=\frac{\frac{1}{4}-4}{\frac{1}{4}+4+2}=\frac{\frac{1-16}{4}}{\frac{1+16+8}{4}}$

$=\frac{-15}{25}=\frac{-3}{5}$

226. (3) $\sin(\theta+30°)=\frac{3}{\sqrt{12}}$

$=\frac{3}{2\sqrt{3}}=\frac{\sqrt{3}}{2}$

$\Rightarrow \sin(\theta+30°)=\sin 60°$

$\Rightarrow \theta+30°=60°$

$\Rightarrow \theta=60-30=30°$

$\therefore \cos^2\theta=\cos^2 30°$

$=\left(\frac{\sqrt{3}}{2}\right)^2=\frac{3}{4}$

227. (1) $4\cos^2\theta-4\sqrt{3}\cos\theta+3=0$

$\Rightarrow (2\cos\theta)^2-2.2\cos\theta.\sqrt{3}+(\sqrt{3})^2=0$

$\Rightarrow (2\cos\theta-\sqrt{3})^2=0$

$\Rightarrow 2\cos\theta-\sqrt{3}=0$

$\Rightarrow 2\cos\theta=\sqrt{3}$

$\Rightarrow \cos\theta=\frac{\sqrt{3}}{2}=\cos 30°$

$\Rightarrow \theta=30°$

228. (3) $\sec\theta-\cos\theta=\frac{3}{2}$

$\Rightarrow \sec\theta-\frac{1}{\sec\theta}=\frac{3}{2}$

$\Rightarrow \frac{\sec^2\theta-1}{\sec\theta}=\frac{3}{2}$

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$\Rightarrow 2\sec^2\theta - 2 = 3\sec\theta$
$\Rightarrow 2\sec^2\theta - 3\sec\theta - 2 = 0$
$\Rightarrow 2\sec^2\theta - 4\sec\theta + \sec\theta - 2 = 0$
$\Rightarrow 2\sec\theta(\sec\theta - 2) + 1(\sec\theta - 2) = 0$
$\Rightarrow (2\sec\theta + 1)(\sec\theta - 2) = 0$
$\Rightarrow \sec\theta = 2$ because $2\sec\theta + 1 \neq 0$ θ is positive acute angle.

229. (2) $\tan(5x - 10°) = \cot(5y + 20°)$
$\Rightarrow \tan(5x - 10°) = \tan(90° - (5y + 20°))$
$\Rightarrow 5x - 10° = 90° - 5y - 20°$
$\Rightarrow 5x + 5y = 70° + 10°$
$\Rightarrow 5(x + y) = 80°$
$\Rightarrow x + y = \frac{80°}{5} = 16°$

230. (4) $\sin\theta + \sin^2\theta = 1$
$\Rightarrow \sin\theta = 1 - \sin^2\theta = \cos^2\theta$
Now, $\cos^{12}\theta + 3\cos^{10}\theta + 3\cos^8\theta + \cos^6\theta - 1$
$= (\cos^4\theta + \cos^2\theta)^3 - 1$
$= (\sin^2\theta + \cos^2\theta)^3 - 1 = 1 - 1 = 0$

231. (3) $\tan 11°.\tan 17°.\tan 79°.\tan 73°$
$= \tan 11°.\tan 17°.\tan(90° - 11°).\tan(90° - 17°)$
$= \tan 11°.\tan 17°.\cot 11°.\cot 17°$
$= \tan 11°.\cot 11°.\tan 17°.\cot 17°$
$= 1 \times 1 = 1$
[$\because \tan(90° - \theta) = \cot\theta$; $\tan\theta.\cot\theta = 1$]

232. (2) $\sin A + \sin^2 A = 1$
$\Rightarrow \sin A = 1 - \sin^2 A = \cos^2 A$
$\therefore \cos^2 A + \cos^4 A$
$= \cos^2 A + (\cos^2 A)^2$
$= \cos^2 A + \sin^2 A = 1$

233. (3) $(1 + \sec 20° + \cot 70°)(1 - \operatorname{cosec} 20° + \tan 70°)$
$= (1 + \sec 20° + \tan 20°)(1 - \operatorname{cosec} 20° + \cot 20°)$
[$\because \tan(90° - \theta) = \cot\theta$; $\cot(90° - \theta) = \tan\theta$]

$= \left(1 + \frac{1}{\cos 20°} + \frac{\sin 20°}{\cos 20°}\right)\left(1 - \frac{1}{\sin 20°} + \frac{\cos 20°}{\sin 20°}\right)$

$= \frac{\cos 20° + 1 + \sin 20°}{\cos 20°} \cdot \frac{\sin 20° - 1 + \cos 20°}{\sin 20°}$

$= \frac{(\cos 20° + \sin 20°)^2 - 1}{\sin 20°.\cos 20°}$

$= \frac{\cos^2 20° + \sin^2 20° + 2\sin 20°.\cos 20° - 1}{\sin 20°.\cos 20°}$

$= \frac{1 + 2\sin 20°.\cos 20° - 1}{\sin 20°.\cos 20°} = 2$

234. (1) $\frac{\tan A - \sec A - 1}{\tan A + \sec A + 1}$

$= \frac{\tan A - \sec A - (\sec^2 A - \tan^2 A)}{\tan A + \sec A + 1}$

$= \frac{(\tan A - \sec A) - (\sec A - \tan A)(\sec A + \tan A)}{\tan A + \sec A + 1}$

$= \frac{(\tan A - \sec A) + (\tan A - \sec A)(\sec A + \tan A)}{\tan A + \sec A + 1}$

$= \frac{(\tan A - \sec A)(1 + \sec A + \tan A)}{\tan A + \sec A + 1}$

$= \tan A - \sec A = \frac{\sin A}{\cos A} - \frac{1}{\cos A}$

$= \frac{\sin A - 1}{\cos A}$

235. (4) $2\sin\alpha + 15\cos^2\alpha = 7$
$\Rightarrow 2\sin\alpha + 15(1 - \sin^2\alpha) = 7$
$\Rightarrow 2\sin\alpha + 15 - 15\sin^2\alpha = 7$
$\Rightarrow 15\sin^2\alpha - 2\sin\alpha - 15 + 7 = 0$
$\Rightarrow 15\sin^2\alpha - 2\sin\alpha - 8 = 0$
$\Rightarrow 15\sin^2\alpha - 12\sin\alpha + 10\sin\alpha - 8 = 0$
$\Rightarrow 3\sin\alpha(5\sin\alpha - 4) + 2(5\sin\alpha - 4) = 0$
$\Rightarrow (3\sin\alpha + 2)(5\sin\alpha - 4) = 0$

$\Rightarrow 5\sin\alpha - 4 = 0 \Rightarrow \sin\alpha = \frac{4}{5}$

$\sin\alpha \neq -\frac{2}{3}$ because α is acute angle.

$\therefore \operatorname{cosec}\alpha = \frac{1}{\sin\alpha} = \frac{5}{4}$

$\therefore \cot\alpha = \sqrt{\operatorname{cosec}^2\alpha - 1}$

$= \sqrt{\left(\frac{5}{4}\right)^2 - 1} = \sqrt{\frac{25}{16} - 1}$

$= \sqrt{\frac{25 - 16}{16}} = \sqrt{\frac{9}{16}} = \frac{3}{4}$

236. (4) Let, $A = 45°$
$B = 30°$
$\sin(A - B)$
$= \sin A.\cos B - \cos A.\sin B$
$\Rightarrow \sin(45° - 30°)$
$= \sin 45°.\cos 30° - \cos 45°.\sin 30°$
$\Rightarrow \sin 15°$

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \frac{\sqrt{3}}{2\sqrt{2}} - \frac{1}{2\sqrt{2}} = \frac{\sqrt{3} - 1}{2\sqrt{2}}$

237. (2) $\sec x + \cos x = 2$

$\Rightarrow \frac{1}{\cos x} + \cos x = 2$

$\Rightarrow \frac{1 + \cos^2 x}{\cos x} = 2$

$\Rightarrow \cos^2 x + 1 = 2\cos x$
$\Rightarrow \cos^2 x - 2\cos x + 1 = 0$
$\Rightarrow (\cos x - 1)^2 = 0 \Rightarrow \cos x - 1 = 0$
$\Rightarrow \cos = 1$
$\therefore \sec x = 1$
$\therefore \sec^{16} x + \cos^{16} x = 1 + 1 = 2$

238. (1) $\sin^4\theta + \cos^4\theta = 2\sin^2\theta.\cos^2\theta$
$\Rightarrow \sin^4\theta + \cos^4\theta - 2\sin^2\theta.\cos^2\theta = 0$
$\Rightarrow (\sin^2\theta - \cos^2\theta)^2 = 0$
$\Rightarrow \sin^2\theta - \cos^2\theta = 0$
$\Rightarrow \sin^2\theta = \cos^2\theta$
$= \tan^2\theta = 1 \Rightarrow \tan\theta = +1$
$\because \theta$ is acute angle.

239. (2) Expression
$= \sin^4\theta + \cos^4\theta$
$= (\sin^2\theta)^2 + (\cos^2\theta)^2$
$= (\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta.\cos^2\theta.$
$= 1 - 2\sin^2\theta.\cos^2\theta.$

$= 1 - \frac{4\sin^2\theta.\cos^2\theta}{2}$
[$\because \sin 2\theta = 2\sin\theta.\cos\theta$]

$= 1 - \frac{\sin^2 2\theta}{2}$

$= 1 - \frac{1 - \cos 4\theta}{4}$
[$\because 1 - \cos 2\theta = 2\cos^2\theta$]

$= 1 - \frac{1}{4} + \frac{\cos 4\theta}{4}$

$= 1 - \frac{1}{4} + \frac{1}{4} = 1$
$(\cos 4\theta \leq 1)$

OR

The value of $\sin^4\theta + \cos^4\theta$ will be maximum if $\theta = 0°$
$\therefore$ Required value $= (\sin 0)^4 + (\cos 0)^4 = 0 + 1 = 1$

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240. (2) $\tan 86° = \cot (90° - 86°)$
$= \cot 4°$.
$\tan 47° = \cot (90° - 47°)$
$= \cot 43°$
$\therefore (\tan 4°. \tan 86°) (\tan 43°.\tan 47°)$
$= (\tan 4° : \cot 4°) (\tan 43°.\cot 43°)$
$= 1$ ($\because \tan\theta . \cot\theta = 1$)

241. (2) $x\cos\theta - \sin\theta = 1$
$\Rightarrow x\cos\theta = 1 + \sin\theta$

$$\Rightarrow x = \frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}$$

$\Rightarrow x = \sec\theta + \tan\theta$ --- (i)
$\because \sec^2\theta - \tan^2\theta = 1$
$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$$\Rightarrow \sec\theta - \tan\theta = \frac{1}{x} \quad \text{(ii)}$$

From equation (i) + (ii),

$$2\sec\theta = x + \frac{1}{x} = \frac{x^2+1}{x}$$

$$\Rightarrow \sec\theta = \frac{x^2+1}{2x}$$

From equation (i) – (ii),

$$2\tan\theta = x - \frac{1}{x} = \frac{x^2-1}{x}$$

$$\therefore \tan\theta = \frac{x^2-1}{2x}$$

$$\therefore \sin\theta = \frac{\tan\theta}{\sec\theta}$$

$$= \frac{x^2-1}{2x} \times \frac{2x}{x^2+1} = \frac{x^2-1}{x^2+1}$$

$\therefore$ Expression $= x^2 - (1 + x^2) \sin\theta$

$$= x^2 - (1 + x^2) \times \frac{x^2-1}{x^2+1}$$

$= x^2 - x^2 + 1 = 1$

Note : In the original equation $x^2 + (1 + x^2) \sin\theta$ has been given that seems incorrect.

242. (2) $\sin\theta + \sin^2\theta = 1$
$\Rightarrow \sin\theta = 1 - \sin^2\theta = \cos^2\theta$
$\therefore \cos^2\theta + \cos^4\theta$
$= \cos^2\theta + (\cos^2\theta)^2$
$= \cos^2\theta + \sin^2\theta = 1$

243. (2) $\dfrac{\cos^2 45°}{\sin^2 60°} + \dfrac{\cos^2 60°}{\sin^2 45°} - \dfrac{\tan^2 30°}{\cot^2 45°} - \dfrac{\sin^2 30°}{\cot^2 30°}$

$$= \frac{\left(\frac{1}{\sqrt{2}}\right)^2}{\left(\frac{\sqrt{3}}{2}\right)^2} + \frac{\left(\frac{1}{2}\right)^2}{\left(\frac{1}{\sqrt{2}}\right)^2} - \frac{\left(\frac{1}{\sqrt{3}}\right)^2}{(1)^2} - \frac{\left(\frac{1}{2}\right)^2}{\left(\sqrt{3}\right)^2}$$

$$= \frac{1}{2} \times \frac{4}{3} + \frac{1}{4} \times 2 - \frac{1}{3} \times 1 - \frac{1}{4\times 3}$$

$$= \frac{2}{3} + \frac{1}{2} - \frac{1}{3} - \frac{1}{12}$$

$$= \frac{8+6-4-1}{12} = \frac{9}{12} = \frac{3}{4}$$

244. (1) $\tan (90° - \theta) = \cot\theta$
$\tan\theta.\cot\theta = 1$
$\tan 89° = \tan (90° - 1°)$
$= \cot 1°$.
$\tan 88° = \tan (90° - 2°)$
$= \cot 2°$.
$\therefore$ Expression $= (\tan 1°.\tan 89°)$
$(\tan 2°.\tan 88°)$ ---- $\tan 45°$
$= (\tan 1°.\cot 1°). (\tan 2°.\cot 2°)$ - — $\tan 45°$
$= 1.1$ ----$1 = 1$

245. (3) $\dfrac{\cos\alpha}{\sin\beta} = n$ and $\dfrac{\cos\alpha}{\cos\beta} = m$

$\Rightarrow \cos\alpha = n\sin\beta$ and
$\cos\alpha = m\cos\beta$.
$\therefore n^2\sin^2\beta = m^2\cos^2\beta$
$\Rightarrow n^2(1 - \cos^2\beta) = m^2\cos^2\beta$
$\Rightarrow n^2 - n^2\cos^2\beta = m^2\cos^2\beta$
$\Rightarrow m^2\cos^2\beta + n^2\cos^2\beta = n^2$
$\Rightarrow \cos^2\beta (m^2 + n^2) = n^2$

$$\Rightarrow \cos^2\beta = \frac{n^2}{m^2+n^2}$$

246. (3)
$\sin A. \cos A (\tan A - \cot A)$

$$= \sin A. \cos A \left(\frac{\sin A}{\cos A} - \frac{\cos A}{\sin A}\right)$$

$$= \sin A. \cos A \left(\frac{\sin^2 A - \cos^2 A}{\sin A.\cos A}\right)$$

$= \sin^2 A - \cos^2 A$
$= \sin^2 A - (1 - \sin^2 A)$
$= \sin^2 A - 1 + \sin^2 A$
$= 2\sin^2 A - 1$

247. (2) $\tan^2\theta + \dfrac{1}{\tan^2\theta} = 2$

$$\Rightarrow \frac{\tan^4\theta + 1}{\tan^2\theta} = 2$$

$\Rightarrow \tan^4\theta + 1 = 2\tan^2\theta$
$\Rightarrow \tan^4\theta - 2\tan^2\theta + 1 = 0$
$\Rightarrow (\tan^2\theta - 1)^2 = 0$
$\Rightarrow \tan^2\theta - 1 = 0$
$\Rightarrow \tan^2\theta = 1$
$\Rightarrow \tan\theta = 1 = \tan 45°$
$\Rightarrow \theta = 45°$ $\because \theta$ is an acute angle

248. (1) $\tan\theta + \cot\theta = 5$
On squaring both sides,
$(\tan\theta + \cot\theta)^2 = 5^2$
$\Rightarrow \tan^2\theta + \cot^2\theta + 2\tan\theta.\cot\theta$
$= 25$
$\Rightarrow \tan^2\theta + \cot^2\theta = 25 - 2 = 23$
[$\because \tan\theta.\cot\theta = 1$]

249. (1) $\sin^2 22° + \sin^2 68° + \cot^2 30°$
$= \sin^2 22° + \sin^2 (90° - 22°) + \left(\sqrt{3}\right)^2$
$= \sin^2 22° + \cos^2 22° + 3$
[$\because \sin^2\theta + \cos^2\theta = 1$]
$= 1 + 3 = 4$

250. (3) $2\sin^2\theta + 3\cos^2\theta$
$= 2\sin^2\theta + 2\cos^2\theta + \cos^2\theta$
$= 2(\sin^2\theta + \cos^2\theta) + \cos^2\theta$
$= 2 + \cos^2\theta$
$\therefore$ Minimum value $= 2 + 0 = 2$
because $\cos^2\theta \geq 0$

251. (4) $\tan (4\theta - 50°) = \cot (50° - \theta)$
$\Rightarrow \tan (4\theta - 50°)$
$= \tan [90° - (50° - \theta)]$
$\Rightarrow 4\theta - 50° = 90° - (50° - \theta)$
$\Rightarrow 4\theta - 50° = 90° - 50° + \theta$
$\Rightarrow 4\theta - 50° = 40° + \theta$
$\Rightarrow 4\theta - \theta = 40° + 50°$

$$\Rightarrow 3\theta = 90° \Rightarrow \theta = \frac{90°}{3} = 30°$$

252. (4) $5\sin\theta = 3 \Rightarrow \sin\theta = \dfrac{3}{5}$

$$\text{Expression} = \frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta}$$

$$= \frac{\frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}}{\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}} = \frac{\frac{1-\sin\theta}{\cos\theta}}{\frac{1+\sin\theta}{\cos\theta}}$$

$$= \frac{1-\sin\theta}{1+\sin\theta} = \frac{1-\frac{3}{5}}{1+\frac{3}{5}} = \frac{5-3}{5+3}$$

$$= \frac{2}{8} = \frac{1}{4}$$

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253. (4) $\sec\theta + \tan\theta = p$ .....(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{p}$ .....(ii)

On adding both the equations,

$2\sec\theta = p + \frac{1}{p}$

$\Rightarrow \sec\theta = \frac{1}{2}\left(p + \frac{1}{p}\right)$

254. (1) $1 + \cos^2\theta = 3\sin\theta \cdot \cos\theta$

Dividing both sides by $\sin^2\theta$,

$\frac{1}{\sin^2\theta} + \frac{\cos^2\theta}{\sin^2\theta} = \frac{3\sin\theta\cos\theta}{\sin^2\theta}$

$\Rightarrow \operatorname{cosec}^2\theta + \cot^2\theta = 3\cot\theta$

$\Rightarrow 1 + \cot^2\theta + \cot^2\theta = 3\cot\theta$

$\Rightarrow 2\cot^2\theta - 3\cot\theta + 1 = 0$

$\Rightarrow 2\cot^2\theta - 2\cot\theta - \cot\theta + 1 = 0$

$\Rightarrow 2\cot^2\theta(\cot\theta - 1) - 1(\cot\theta - 1) = 0$

$\Rightarrow (2\cot\theta - 1)(\cot\theta - 1) = 0$

$\Rightarrow \cot\theta = \frac{1}{2}$ or 1

255. (4) Expression

$= 3(\sin^4\theta + \cos^4\theta) + 2(\sin^6\theta + \cos^6\theta) + 12\sin^2\theta \cdot \cos^2\theta$

$= 3\{(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta \cdot \cos^2\theta\}$

$+ 2\{(\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta \cdot \cos^2\theta(\sin^2\theta + \cos^2\theta)\} + 12\sin^2\theta \cdot \cos^2\theta$

$[\because a^2 + b^2 = (a+b)^2 - 2ab$; $a^3 + b^3 = (a+b)^3 - 3ab(a+b)]$

$= 3(1 - 2\sin^2\theta \cdot \cos^2\theta) + 2(1 - 3\sin^2\theta \cdot \cos^2\theta) + 12\sin^2\theta \cdot \cos^2\theta = 3 - 6\sin^2\theta \cdot \cos^2\theta + 2 - 6\sin^2\theta\cos^2\theta + 12\sin^2\theta \cdot \cos^2\theta = 5$

256. (2) $\sec\theta + \tan\theta = 2 + \sqrt{5}$

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{\sqrt{5}+2}$

$= \frac{1}{\sqrt{5}+2} \times \frac{\sqrt{5}-2}{\sqrt{5}-2} = \frac{\sqrt{5}-2}{5-4}$

$= \sqrt{5} - 2$

$\therefore \sec\theta + \tan\theta + \sec\theta - \tan\theta$

$= 2 + \sqrt{5} + \sqrt{5} - 2$

$\Rightarrow 2\sec\theta = 2\sqrt{5}$

$\Rightarrow \sec\theta = \sqrt{5}$ ....(i)

Again,

$\sec\theta + \tan\theta - (\sec\theta - \tan\theta)$

$= 2 + \sqrt{5} - \sqrt{5} + 2$

$\Rightarrow 2\tan\theta = 4 \Rightarrow \tan\theta = 2$ ....(ii)

$\therefore \sin\theta = \frac{\tan\theta}{\sec\theta} = \frac{2}{\sqrt{5}}$

257. (2) $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 2\frac{51}{79}$

$= \frac{158 + 51}{79} = \frac{209}{79}$

By componendo and dividendo,

$\frac{\sec\theta + \tan\theta + \sec\theta - \tan\theta}{\sec\theta + \tan\theta - \sec\theta + \tan\theta}$

$= \frac{209 + 79}{209 - 79}$

$\Rightarrow \frac{2\sec\theta}{2\tan\theta} = \frac{288}{130}$

$\Rightarrow \frac{\sec\theta}{\tan\theta} = \frac{144}{65}$

$\therefore \sin\theta = \frac{\tan\theta}{\sec\theta} = \frac{65}{144}$

258. (2) $\tan A + \cot A = 2$

$\Rightarrow \tan A + \frac{1}{\tan A} = 2$

$\Rightarrow \frac{\tan^2 A + 1}{\tan A} = 2$

$\Rightarrow \tan^2 A + 1 = 2\tan A$

$\Rightarrow \tan^2 A - 2\tan A + 1 = 0$

$\Rightarrow (\tan A - 1)^2 = 0$

$\Rightarrow \tan A - 1 = 0 \quad \Rightarrow \tan A = 1$

$\Rightarrow \cot A = 1$

$\therefore \tan^{10} A + \cot^{10} A = 1 + 1 = 2$

259. (4) $\cos^2 30° + \sin^2 60° + \tan^2 45° + \sec^2 60° + \cos 0°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 + (1)^2 + (2)^2 + 1$

$= \frac{3}{4} + \frac{3}{4} + 1 + 4 + 1$

$= 6 + \frac{3+3}{4}$

$= 6 + \frac{6}{4} = 6 + \frac{3}{2} = \frac{12+3}{2}$

$= \frac{15}{2} = 7\frac{1}{2}$

260. (4) $\cos x + \cos^2 x = 1$

$\Rightarrow \cos x = 1 - \cos^2 x$

$= \sin^2 x$ ..... (i)

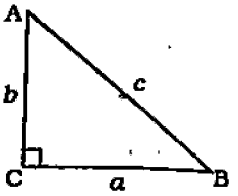
$\therefore \sin^6 x + 2\sin^6 x + \sin^4 x$

$= (\sin^4 x + \sin^2 x)^2$

$= ((\cos x)^2 + \sin^2 x)^2$

$= (\cos^2 x + \sin^2 x)^2 = 1$

261. (3)



In ΔABC,

$AB^2 = AC^2 + BC^2$

$\Rightarrow c^2 = a^2 + b^2$ ..... (i)

From ΔABC,

$\operatorname{cosec} B = \frac{AB}{AC} = \frac{c}{b}$ ..... (ii)

$\cos A = \frac{AC}{AB} = \frac{b}{c}$

$\therefore \operatorname{cosec} B - \cos A = \frac{c}{b} - \frac{b}{c}$

$= \frac{c^2 - b^2}{bc} = \frac{a^2}{bc}$

262. (1) $\tan\theta - \cot\theta = 0$

$\Rightarrow \tan\theta = \cot\theta$

$\Rightarrow \tan\theta = \tan(90° - \theta)$

$\Rightarrow \theta = 90° - \theta$

$\Rightarrow 2\theta = 90°$

$\Rightarrow \theta = 45°$

$\therefore \frac{\tan(\theta + 15°)}{\tan(\theta - 15°)}$

$= \frac{\tan(45° + 15°)}{\tan(45° - 15°)} = \frac{\tan 60°}{\tan 30°}$

$= \frac{\sqrt{3}}{\frac{1}{\sqrt{3}}} = \sqrt{3} \times \sqrt{3} = 3$

263. (1) Expression $= (\cot 41° \cdot \cot 49°) \cdot (\cot 42° \cdot \cot 48°)(\cot 43° \cdot \cot 47°) \cdot (\cot 44° \cdot \cot 46°) \cdot \cot 45°$

$= \cot 41° \cdot \tan(90° - 49°) \cdot \cot 42° \cdot \tan(90° - 48°) \cdot \cot 43° \cdot \tan(90° - 47°) \cdot \cot 44° \cdot \tan(90° - 46°) \cdot 1$

$= (\cot 41° \cdot \tan 41°)(\cot 42° \cdot \tan 42°) \cdot (\cot 43° \cdot \tan 43°) \cdot (\cot 44° \cdot \tan 44°) \cdot 1 = 1$

$[\because \tan(90° - \theta) = \cot\theta;$

$\tan\theta \cdot \cot\theta = 1]$

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264. (4) $x = a\sin\theta - b\cos\theta$ --- (i)
$y = a\cos\theta + b\sin\theta$ - (ii)
On squaring and adding both the equations,
$x^2 + y^2 = (a\sin\theta - b\cos\theta)^2 + (a\cos\theta + b\sin\theta)^2$
$= a^2\sin^2\theta + b^2\cos^2\theta - 2ab\sin\theta\cos\theta + a^2\cos^2\theta + b^2\sin^2\theta + 2ab\sin\theta\cos\theta$
$= a^2(\sin^2\theta + \cos^2\theta) + b^2(\cos^2\theta + \sin^2\theta)$
$= a^2 + b^2$
$[\because \sin^2\theta + \cos^2\theta = 1]$

265. (1) $\sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$ ....(i)
$\because \sec^2\theta - \tan^2\theta = 1$
$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$
$\Rightarrow \sec\theta + \tan\theta = \sqrt{3}$ ....(ii)
On adding equations (i) and (ii),
$2\sec\theta = \sqrt{3} + \frac{1}{\sqrt{3}}$
$= \frac{3+1}{\sqrt{3}} = \frac{4}{\sqrt{3}}$
$\Rightarrow \sec\theta = \frac{2}{\sqrt{3}}$
Again, by equation (ii) – (i),
$2\tan\theta = \sqrt{3} - \frac{1}{\sqrt{3}}$
$= \frac{3-1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$
$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$
$\therefore \sec\theta \cdot \tan\theta$
$= \frac{2}{\sqrt{3}} \times \frac{1}{\sqrt{3}} = \frac{2}{3}$

266. (4) $5\cos\theta + 12\sin\theta = 13$
$\Rightarrow \frac{5}{13}\cos\theta + \frac{12}{13}\sin\theta = 1$
$\because \sin^2\theta + \cos^2\theta = 1$
$\therefore \sin\theta = \frac{12}{13}, \cos\theta = \frac{5}{13}$

267. (1) $7\sin^2\theta + 3\cos^2\theta = 4$
On dividing both sides by $\cos^2\theta$,
$7\frac{\sin^2\theta}{\cos^2\theta} + \frac{3\cos^2\theta}{\cos^2\theta} = \frac{4}{\cos^2\theta}$
$\Rightarrow 7\tan^2\theta + 3 = 4\sec^2\theta$
$\Rightarrow 7\tan^2\theta + 3 = 4(1 + \tan^2\theta)$
$\Rightarrow 7\tan^2\theta + 3 = 4 + 4\tan^2\theta$
$\Rightarrow 7\tan^2\theta - 4\tan^2\theta = 4 - 3$
$\Rightarrow 3\tan^2\theta = 1 \Rightarrow \tan^2\theta = \frac{1}{3}$
$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$

268. (1) Expression
$= (\operatorname{cosec}\alpha - \sin\alpha)(\sec\alpha - \cos\alpha)(\tan\alpha + \cot\alpha)$
$= \left(\frac{1}{\sin\alpha} - \sin\alpha\right)\left(\frac{1}{\cos\alpha} - \cos\alpha\right)\left(\frac{\sin\alpha}{\cos\alpha} + \frac{\cos\alpha}{\sin\alpha}\right)$
$= \left(\frac{1-\sin^2\alpha}{\sin\alpha}\right)\left(\frac{1-\cos^2\alpha}{\cos\alpha}\right)\cdot\frac{\sin^2\alpha + \cos^2\alpha}{\cos\alpha\sin\alpha}$
$= \frac{\cos^2\alpha}{\sin\alpha} \times \frac{\sin^2\alpha}{\cos\alpha} \times \frac{1}{\cos\alpha\sin\alpha}$
$= 1$

269. (4) $\sin A + \sin^2 A = 1$
$\Rightarrow \sin A = 1 - \sin^2 A = \cos^2 A$
$\therefore \cos^2 A + \cos^4 A$
$= \cos^2 A + (\cos^2 A)^2$
$= \cos^2 A + \sin^2 A = 1$

270. (4) $\tan A = n\tan B$
$\Rightarrow \tan B = \frac{1}{n}\tan A$
$\Rightarrow \cot B = \frac{n}{\tan A}$
and, $\sin A = m\sin B$
$\Rightarrow \sin B = \frac{1}{m}\sin A$
$\Rightarrow \operatorname{cosec} B = \frac{m}{\sin A}$
$\because \operatorname{cosec}^2 B - \cot^2 B = 1$
$\Rightarrow \frac{m^2}{\sin^2 A} - \frac{n^2}{\tan^2 A} = 1$
$\Rightarrow \frac{m^2}{\sin^2 A} - \frac{n^2\cos^2 A}{\sin^2 A} = 1$
$\Rightarrow \frac{m^2 - n^2\cos^2 A}{\sin^2 A} = 1$
$\Rightarrow m^2 - n^2\cos^2 A = \sin^2 A$
$\Rightarrow m^2 - n^2\cos^2 A = 1 - \cos^2 A$
$\Rightarrow m^2 - 1 = n^2\cos^2 A - \cos^2 A$
$\Rightarrow m^2 - 1 = (n^2 - 1)\cos^2 A$
$\Rightarrow \cos^2 A = \frac{m^2 - 1}{n^2 - 1}$

271. (4) $\sin\theta + \cos\theta = \sqrt{2}\sin(90° - \theta)$
$\Rightarrow \sin\theta + \cos\theta = \sqrt{2}\cos\theta$
$\Rightarrow \sqrt{2}\cos\theta - \cos\theta = \sin\theta$
$\Rightarrow \cos\theta(\sqrt{2} - 1) = \sin\theta$
$\Rightarrow \frac{\cos\theta}{\sin\theta} = \frac{1}{\sqrt{2} - 1}$
$\Rightarrow \cot\theta = \frac{1}{\sqrt{2} - 1} \times \frac{\sqrt{2} + 1}{\sqrt{2} + 1}$
$= \frac{\sqrt{2} + 1}{2 - 1} = \sqrt{2} + 1$

272. (3) $\tan 20° = \tan(90° - 70°)$
$= \cot 70°$
$\therefore \cot 20° = \tan 70°$
$\tan 15° = \tan(90° - 75°)$
$= \cot 75°$
$\therefore$ Expression $= \cot^2 70° \cdot \sin^2 70° + \tan^2 70° \cdot \cos^2 70° + 2\cot 75° \cdot \tan 75° \cdot \tan 45°$
$= \frac{\cos^2 70°}{\sin^2 70°} \cdot \sin^2 70° + \frac{\sin^2 70°}{\cos^2 70°} \cdot \cos^2 70° + 2 \times 1 \times 1$
$= \cos^2 70° + \sin^2 70° + 2$
$= 1 + 2 = 3$
$[\because \sin\theta \cdot \operatorname{cosec}\theta = 1; \cos\theta \cdot \sec\theta = 1; \tan\theta \cdot \cot\theta = 1]$

273. (2) $\sin 47° = \sin(90° - 43°)$
$= \cos 43°$
$\therefore \left(\frac{\sin 47°}{\cos 43°}\right)^2 + \left(\frac{\cos 43°}{\sin 47°}\right)^2 - 4\cos^2 45°$
$= \left(\frac{\cos 43°}{\cos 43°}\right)^2 + \left(\frac{\sin 47°}{\sin 47°}\right)^2 - 4 \times \left(\frac{1}{\sqrt{2}}\right)^2$
$[\because \sin(90° - \theta) = \cos\theta, \cos(90° - \theta) = \sin\theta]$
$= 1 + 1 - 4 \times \frac{1}{2} = 2 - 2 = 0$

274. (2) $\operatorname{cosec}\theta = \cot^2\theta$
$\Rightarrow \operatorname{cosec}\theta = \operatorname{cosec}^2\theta - 1$
$\Rightarrow \operatorname{cosec}^2\theta - \operatorname{cosec}\theta = 1$ .....(i)
Expression
$= \operatorname{cosec}^4\theta - 2\operatorname{cosec}^3\theta + \cot^2\theta$

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$= \text{cosec}^4\theta - \text{cosec}^3\theta - \text{cosec}^3\theta + \text{cosec}\theta$

$= \text{cosec}^2\theta\,(\text{cosec}^2\theta - \text{cosec}\theta) - \text{cosec}\theta\,(\text{cosec}^2\theta - 1)$

$= \text{cosec}^2\theta - \text{cosec}^2\theta = 0$

275. (2) $4\sin^2\theta - 1 = 0$

$\Rightarrow 4\sin^2\theta = 1$

$\Rightarrow \sin^2\theta = \frac{1}{4}$

$\Rightarrow \sin\theta = \frac{1}{2}\ (\because \theta < 90°)$

$\therefore \sin\theta = \sin 30° \Rightarrow \theta = 30°$

$\therefore \cos^2\theta + \tan^2\theta$

$= \cos^2 30° + \tan^2 30°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{\sqrt{3}}\right)^2 = \frac{3}{4} + \frac{1}{3}$

$= \frac{9+4}{12} = \frac{13}{12}$

276. (3)

$$\frac{9}{\text{cosec}^2\theta} + 4\cos^2\theta + \frac{5}{1+\tan^2\theta}$$

$= 9\sin^2\theta + 4\cos^2\theta + \frac{5}{\sec^2\theta}$

$= 9\sin^2\theta + 4\cos^2\theta + 5\cos^2\theta$

$= 9\sin^2\theta + 9\cos^2\theta$

$= 9(\sin^2\theta + \cos^2\theta) = 9 \times 1 = 9$

277. (4) $\tan\theta + \sec\theta = 3$ .....(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \frac{1}{3}$ .... (ii)

On adding equations (i) and (ii),

$2\sec\theta = 3 + \frac{1}{3} = \frac{10}{3}$

On subtracting equation (ii) from (i),

$2\tan\theta = 3 - \frac{1}{3}$

$= \frac{9-1}{3} = \frac{8}{3}$

$\therefore \sin\theta = \frac{\tan\theta}{\sec\theta}$

$= \frac{8}{3} \times \frac{3}{10} = \frac{4}{5}$

$\therefore 5\sin\theta = 5 \times \frac{4}{5} = 4$

278. (2) $\cos\theta = \frac{p}{\sqrt{p^2+q^2}}$

$\therefore \sin\theta = \sqrt{1-\cos^2\theta}$

$= \sqrt{1 - \frac{p^2}{p^2+q^2}}$

$= \sqrt{\frac{p^2+q^2-p^2}{p^2+q^2}} = \frac{q}{\sqrt{p^2+q^2}}$

$\therefore \tan\theta = \frac{\sin\theta}{\cos\theta}$

$= \frac{q}{\sqrt{p^2+q^2}} \times \frac{\sqrt{p^2+q^2}}{p} = \frac{q}{p}$

279. (2) In a triangle ABC,

$A + B + C = 180°$

$\Rightarrow \frac{A}{2} + \frac{B}{2} + \frac{C}{2} = 90°$

$\Rightarrow \frac{A+B}{2} = 90° - \frac{C}{2}$

$\Rightarrow \tan\left(\frac{A+B}{2}\right)$

$= \tan\left(90° - \frac{C}{2}\right) = \cot\frac{C}{2}$

280. (2) $\sin 89° = \sin(90° - 1°)$

$= \cos 1°$

$\sin 79° = \sin(90° - 11°)$

$= \cos 11°$

$\sin 69° = \sin(90° - 21°)$

$= \cos 21°$

$\sin 59° = \sin(90° - 31°)$

$= \cos 31°$

$\sin 49° = \sin(90° - 41°)$

$= \cos 41°$

$\therefore$ Expression

$= (\sin^2 1° + \cos^2 1°) + (\sin^2 11° + \cos^2 11°) + (\sin^2 21° + \cos^2 21°) + (\sin^2 31° + \cos^2 31°) + (\sin^2 41° + \cos^2 41°) + \sin^2 45°$

$= 5 + \left(\frac{1}{\sqrt{2}}\right)^2 = 5 + \frac{1}{2} = 5\frac{1}{2}$

$[\because \sin^2\theta + \cos^2\theta = 1]$

281. (4) $x = a(\sin\theta + \cos\theta)$

$\Rightarrow \frac{x}{a} = \sin\theta + \cos\theta$

and, $y = b(\sin\theta - \cos\theta)$

$\Rightarrow \frac{y}{b} = \sin\theta - \cos\theta$

$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2}$

$= (\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$

$= 2(\sin^2\theta + \cos^2\theta) = 2$

$[\because (a+b)^2 + (a-b)^2 = 2(a^2+b^2)]$

282. (1) $\cos\theta + \sin\theta = m$ ... (i)

$\sec\theta + \text{cosec}\theta = n$

$\Rightarrow \frac{1}{\cos\theta} + \frac{1}{\sin\theta} = n$

$\Rightarrow \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} = n$ ... (ii)

$\therefore n(m^2 - 1) = \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta}$

$[(\sin\theta + \cos\theta)^2 - 1]$

$= \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta}(\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta - 1)$

$= \frac{\sin\theta + \cos\theta}{\sin\theta.\cos\theta} \times 2\sin\theta.\cos\theta$

$[\because \sin^2\theta + \cos^2\theta = 1]$

$= 2(\sin\theta + \cos\theta) = 2m$

283. (3) $\frac{x - x\tan^2 30°}{1 + \tan^2 30°}$

$= \sin^2 30° + 4\cot^2 45° - \sec^2 60°$

$\Rightarrow \frac{x - x \times \left(\frac{1}{\sqrt{3}}\right)^2}{1 + \left(\frac{1}{\sqrt{3}}\right)^2}$

$= \left(\frac{1}{2}\right)^2 + 4 \times (1)^2 - (2)^2$

$\Rightarrow \frac{x - \frac{x}{3}}{1 + \frac{1}{3}} = \frac{1}{4} + 4 - 4$

$\Rightarrow \frac{3x - x}{3+1} = \frac{1}{4}$

$\Rightarrow 2x = \frac{1}{4} \times 4 = 1$

$\Rightarrow x = \frac{1}{2}$

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284. (1) $\cos A + \sin A$

$= \sqrt{2}\ \cos A$ — (i)

$\cos A - \sin A = x$ (let) — (ii)

On squaring both equation and adding

$\cos^2 A + \sin^2 A + 2\sin A \cdot \cos A + \cos^2 A + \sin^2 A - 2\sin A \cos A = 2\cos^2 A + x^2$

$\Rightarrow 2(\cos^2 A + \sin^2 A)$

$= 2\cos^2 A + x^2$

$\Rightarrow x^2 + 2\cos^2 A = 2$

$\Rightarrow x^2 = 2 - 2\cos^2 A$

$= 2(1 - \cos^2 A) = 2\sin^2 A$

$\therefore x = \sqrt{2}\ \sin A$

285. (*) $\dfrac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \dfrac{3}{1}$

By componendo and dividendo,

$$\frac{\sin\theta + \cos\theta + \sin\theta - \cos\theta}{\sin\theta + \cos\theta - \sin\theta + \cos\theta}$$

$$= \frac{3+1}{3-1}$$

$$\Rightarrow \frac{2\sin\theta}{2\cos\theta} = \frac{4}{2}$$

$\Rightarrow \tan\theta = 2$

$$\therefore \cot\theta = \frac{1}{2}$$

$$\therefore \operatorname{cosec}\theta = \sqrt{1+\cot^2\theta}$$

$$= \sqrt{1+\frac{1}{4}} = \sqrt{\frac{5}{4}} = \frac{\sqrt{5}}{2}$$

$$\therefore \sin\theta = \frac{2}{\sqrt{5}}$$

$$\sin^4\theta = \frac{16}{25}$$

286. (2) $\sin 2\theta = \dfrac{\sqrt{3}}{2} = \sin 60°$

$\Rightarrow 2\theta = 60° \Rightarrow \theta = 30°$

$\therefore \sin 3\theta = \sin 90° = 1$

287. (3) Expression

$$= \frac{1+2\times\frac{\sqrt{3}}{2}\times\frac{1}{2}}{\frac{\sqrt{3}}{2}+\frac{1}{2}} + \frac{1-2\times\frac{\sqrt{3}}{2}\times\frac{1}{2}}{\frac{\sqrt{3}}{2}-\frac{1}{2}}$$

$$= \frac{1+\frac{\sqrt{3}}{2}}{\frac{\sqrt{3}+1}{2}} + \frac{1-\frac{\sqrt{3}}{2}}{\frac{\sqrt{3}-1}{2}}$$

$$= \frac{2+\sqrt{3}}{\sqrt{3}+1} + \frac{2-\sqrt{3}}{\sqrt{3}-1}$$

$$= \frac{(2+\sqrt{3})(\sqrt{3}-1)+(\sqrt{3}+1)(2-\sqrt{3})}{(\sqrt{3}+1)(\sqrt{3}-1)}$$

$$= \frac{2\sqrt{3}-2+3-\sqrt{3}+2\sqrt{3}-3+2-\sqrt{3}}{3-1}$$

$$= \frac{4\sqrt{3}-2\sqrt{3}}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

288. (4) $\alpha + \beta = 90°$

$\Rightarrow \alpha = 90° - \beta$

$\Rightarrow \tan\alpha = \tan(90° - \beta) = \cot\beta.$

$\sin\alpha = \sin(90° - \beta) = \cos\beta$

$\therefore$ Expression

$$= \frac{\cot\beta}{\tan\beta} + \cos^2\beta + \sin^2\beta$$

$= \cot^2\beta + 1$

$= \operatorname{cosec}^2\beta = \operatorname{cosec}^2(90° - \alpha)$

$= \sec^2\alpha$

289. (4) $\tan^2\dfrac{\pi}{4} - \cos^2\dfrac{\pi}{3}$

$= x \sin\dfrac{\pi}{4} \cdot \cos\dfrac{\pi}{4} \cdot \tan\dfrac{\pi}{3}$

$$\Rightarrow 1 - \left(\frac{1}{2}\right)^2 = x \cdot \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} \times \sqrt{3}$$

$$\Rightarrow 1 - \frac{1}{4} = x \times \frac{\sqrt{3}}{2}$$

$$\Rightarrow \frac{4-1}{4} = x \times \frac{\sqrt{3}}{2}$$

$$\Rightarrow x = \frac{3}{4} \times \frac{2}{\sqrt{3}} = \frac{\sqrt{3}}{2}$$

290. (3) $\sin A - \cos A = \dfrac{\sqrt{3}-1}{2}$

On squaring both sides,

$\sin^2 A + \cos^2 A - 2\sin A \cdot \cos A$

$= \dfrac{1}{4}\left[(\sqrt{3})^2 + (1)^2 - 2\sqrt{3}\right]$

$\Rightarrow 1 - 2\sin A \cos A$

$= \dfrac{1}{4}(4 - 2\sqrt{3})$

$\Rightarrow 1 - 2\sin A \cos A = \dfrac{2-\sqrt{3}}{2}$

$\Rightarrow 2 - 4\sin A \cos A = 2 - \sqrt{3}$

$\Rightarrow 4\sin A \cdot \cos A = 2 - 2 + \sqrt{3} = \sqrt{3}$

$\Rightarrow \sin A \cdot \cos A = \dfrac{\sqrt{3}}{4}$

291. (2) $\sin(90° - \theta) + \cos\theta$

$= \sqrt{2}\ \cos(90° - \theta)$

$\Rightarrow \cos\theta + \cos\theta = \sqrt{2}\ \sin\theta$

$\Rightarrow 2\cos\theta = \sqrt{2}\sin\theta$

$$\Rightarrow \frac{\cos\theta}{\sin\theta} = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$$

$$\Rightarrow \cot\theta = \frac{1}{\sqrt{2}}$$

$\because \operatorname{cosec}^2\theta = 1 + \cot^2\theta$

$$= 1 + \left(\frac{1}{\sqrt{2}}\right)^2 = 1 + \frac{1}{2}$$

$$\Rightarrow \operatorname{cosec}^2\theta = \frac{3}{2}$$

$$\Rightarrow \operatorname{cosec}\theta = \sqrt{\frac{3}{2}}$$

292. (2) $\tan\left(\dfrac{\pi}{2} - \dfrac{\alpha}{2}\right) = \sqrt{3}$

$\Rightarrow \cot\dfrac{\alpha}{2} = \sqrt{3} = \cot 30°$

$\Rightarrow \dfrac{\alpha}{2} = 30° \Rightarrow \alpha = 60°$

$\therefore \cos\alpha = \cos 60° = \dfrac{1}{2}$

293. (1) $\because \cos 90° = 0$

$\therefore \cos 1° \cdot \cos 2° \ldots \cos 180° = 0$

294. (1) $\cos 20° = m$ and $\cos 70° = n$

$\therefore m^2 + n^2 = \cos^2 20° + \cos^2 70°$

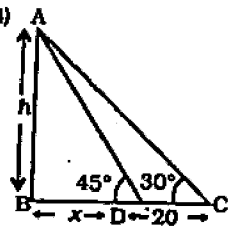
$= \cos^2(90° - 70°) + \cos^2 70°$

$\Rightarrow \sin^2 70° + \cos^2 70° = 1$

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TYPE-III

1. (4)



Let AB be a pillar of height h meter
If BD = length of shadow = x
and DC = 20 m
then, BC = BD + DC
$\Rightarrow$ BC = $(x + 20)$ metre
From Δ ABD,

$$\tan 45° = \frac{h}{x} \Rightarrow h = x \quad \ldots(i)$$

From Δ ABC,

$$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+20}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{h+20} \Rightarrow \sqrt{3}h = h + 20$$

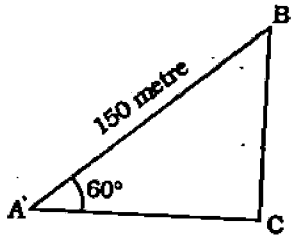
[From (i)]

$$\Rightarrow (\sqrt{3}-1)h = 20 \Rightarrow h = \frac{20}{\sqrt{3}-1}$$

$$= \frac{20}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$= \frac{20(\sqrt{3}+1)}{2} = 10(\sqrt{3}+1) \text{ metre}$$

2. (2) AB = Length of the thread = 150 metre
$\angle BAC = 60°$

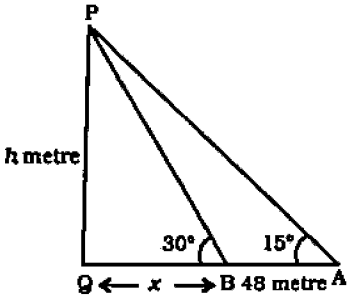


In ΔABC,

$$\sin 60° = \frac{BC}{AB} \Rightarrow \frac{\sqrt{3}}{2} = \frac{BC}{150}$$

$$\Rightarrow BC = 150 \times \frac{\sqrt{3}}{2} = 75\sqrt{3} \text{ metre}$$

3. (2)



Tower = PQ = h metre
QB = x metre
From ΔAPQ,

$$\tan 15° = \frac{h}{x+48}$$

$$2 - \sqrt{3} = \frac{h}{x+48} \quad \ldots(i)$$

[$\because$ tan 15° = tan (45° − 30°)

$$= \frac{\tan 45° - \tan 30°}{1 + \tan 45° \tan 30°} = \frac{1 - \frac{1}{\sqrt{3}}}{1 + \frac{1}{\sqrt{3}}}$$

or $\frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$

$= \frac{4 - 2\sqrt{3}}{2} = 2 - \sqrt{3}$]

From ΔPQB,

$$\tan 30° = \frac{h}{x}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x}$$

$$\Rightarrow \sqrt{3}h = x \quad \ldots(ii)$$

$$\Rightarrow 2 - \sqrt{3} = \frac{h}{\sqrt{3}h + 48}$$

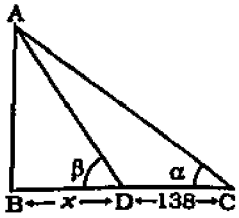
$$\Rightarrow 2\sqrt{3}h - 3h + (2 - \sqrt{3})48 = h$$

$$\Rightarrow h + 3h - 2\sqrt{3}h = (2 - \sqrt{3}) \times 48$$

$$\Rightarrow 2h(2 - \sqrt{3}) = 48 \times (2 - \sqrt{3})$$

$$\Rightarrow h = \frac{48}{2} = 24 \text{ metre}$$

4. (3)



AB = monument = h metre
DC = 138 metre
BD = x metre

$$\tan \alpha = \frac{1}{5}$$

$$\sec \beta = \frac{\sqrt{193}}{12}$$

$$\therefore \tan \beta = \sqrt{\sec^2 \beta - 1}$$

$$= \sqrt{\frac{193}{144} - 1} = \sqrt{\frac{193-144}{144}}$$

$$= \sqrt{\frac{49}{144}} = \frac{7}{12}$$

$\therefore$ From ΔABC,

$$\tan \alpha = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{5} = \frac{h}{x+138}$$

$$\Rightarrow h = \frac{x+138}{5}$$

$$\Rightarrow 5h = x + 138 \quad \ldots(i)$$

From ΔABD,

$$\tan \beta = \frac{h}{x} \Rightarrow \frac{7}{12} = \frac{h}{x}$$

$$\Rightarrow x = \frac{12h}{7} \quad \ldots(ii)$$

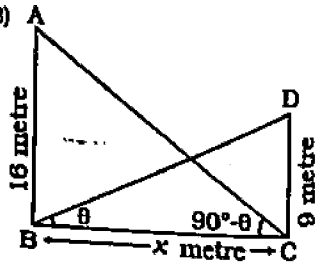
$$\therefore 5h = \frac{12h}{7} + 138 \text{ (By (i) \& (ii))}$$

$$\Rightarrow 35h - 12h = 138 \times 7$$

$$\Rightarrow 23h = 138 \times 7$$

$$\Rightarrow h = \frac{138 \times 7}{23} = 42 \text{ metre}$$

5. (3)



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From ΔABC,

$$\tan(90^\circ - \theta) = \frac{16}{x}$$

$$\Rightarrow \cot\theta = \frac{16}{x} \quad .....(i)$$

From ΔBCD,

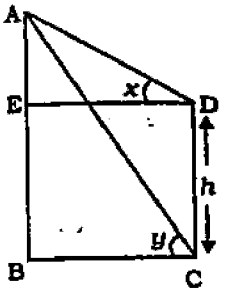
$$\tan\theta = \frac{9}{x} \quad .....(ii)$$

$$\therefore \tan\theta \cdot \cot\theta = \frac{9}{x} \times \frac{16}{x}$$

$$\Rightarrow x^2 = 16 \times 9 \ [\because \tan\theta \cot\theta = 1]$$

$$\Rightarrow x = 4 \times 3 = 12 \text{ metre}$$

6. (3)



CD = tree = h metre

Let AB = building = a metre

& BC = ED = b metre

$\therefore$ From ΔAED,

$$\tan x = \frac{AE}{ED}$$

$$\Rightarrow \tan x = \frac{a-h}{b}$$

$$\Rightarrow b = (a-h)\cot x \quad ...(i)$$

From ΔABC,

$$\tan y = \frac{AB}{BC}$$

$$\Rightarrow \tan y = \frac{a}{b}$$

$$\Rightarrow b = a\cot y \quad ...(ii)$$

From equations (i) and (ii),

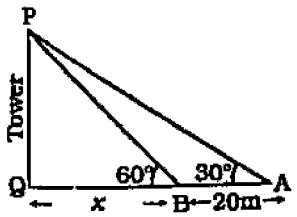
$$(a-h)\cot x = a\cot y$$

$$\Rightarrow a\cot x - h\cot x = a\cot y$$

$$\Rightarrow h\cot x = a(\cot x - \cot y)$$

$$\Rightarrow a = \frac{h\cot x}{\cot x - \cot y}$$

7. (3)



Let PQ = h metre and BQ = x metre.

From ΔAPQ,

$$\tan 30^\circ = \frac{h}{x+20}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+20}$$

$$\Rightarrow \sqrt{3}h = x + 20 \quad .....(i)$$

From ΔPQB,

$$\tan 60^\circ = \frac{PQ}{BQ} = \frac{h}{x}$$

$$\Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow h = \sqrt{3}x$$

$$\Rightarrow x = \frac{1}{\sqrt{3}}h \quad .....(ii)$$

$$\therefore \sqrt{3}h = \frac{1}{\sqrt{3}}h + 20$$

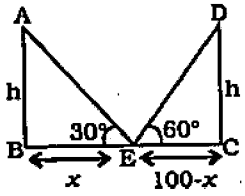
[From equation (i) and (ii)]

$$\Rightarrow 3h - h = 20\sqrt{3}$$

$$\Rightarrow 2h = 20\sqrt{3}$$

$$\therefore h = 10\sqrt{3} \text{ metre}$$

8. (1)



AB = CD = h metre (Height of pole)

From ΔABE,

$$\tan 30^\circ = \frac{h}{x}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x} \Rightarrow \sqrt{3}h = x \quad ...(i)$$

From ΔDEC,

$$\tan 60^\circ = \frac{h}{100-x}$$

$$\Rightarrow \sqrt{3} = \frac{h}{100-x}$$

$$\Rightarrow \sqrt{3}(100-x) = h$$

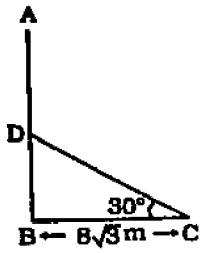
$$\Rightarrow \sqrt{3}(100 - \sqrt{3}h) = h$$

[From equation (i)]

$$\Rightarrow 100\sqrt{3} - 3h = h \Rightarrow 4h = 100\sqrt{3}$$

$$\Rightarrow h = 25\sqrt{3} \text{ metre}$$

9. (3)



AB = Telegraph post = h metre

Telegraph post bends at point D.

DB = x metre

$\therefore$ AD = CD = $(h-x)$ metre

BC = $8\sqrt{3}$ metre

From, ΔDBC,

$$\sin 30^\circ = \frac{DB}{DC}$$

$$\Rightarrow \frac{1}{2} = \frac{x}{h-x} \Rightarrow 2x = h - x$$

$$\Rightarrow 3x = h \quad ..... (i)$$

Again,

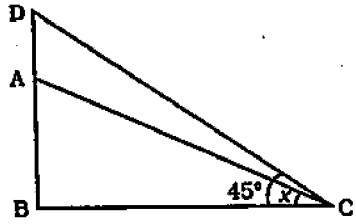
$$\tan 30^\circ = \frac{DB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{x}{8\sqrt{3}}$$

$$\Rightarrow x = 8 \text{ metre}$$

$\therefore$ $h = 3 \times 8 = 24$ metre

10. (2)



AB = Buidling

= h metre

AD = Chimney = y metre

From ΔBCD,

$$\tan 45^\circ = \frac{BD}{BC} \Rightarrow 1 = \frac{h+y}{BC}$$

$$\Rightarrow BC = h + y \quad ... (i)$$

From ΔABC,

$$\tan x = \frac{AB}{BC} \Rightarrow \tan x = \frac{h}{BC}$$

$$\Rightarrow BC = h\cot x \quad ...(ii)$$

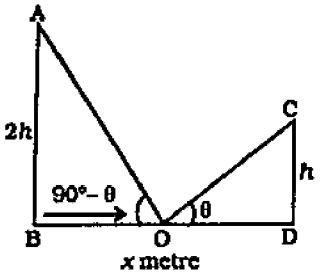
From equations (i) and (ii),

$$h + y = h\cot x$$

$$\Rightarrow y = (h\cot x - h) \text{ metre}$$

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11. (1) CD = h metre, AB = 2h metre



$OB = OD = \frac{x}{2}$ metre

From ΔOCD,

$$\tan\theta = \frac{h}{\frac{x}{2}} = \frac{2h}{x} \quad \ldots(i)$$

From ΔOAB,

$$\tan(90° - \theta) = \frac{AB}{BO}$$

$$\Rightarrow \cot\theta = \frac{\frac{2h}{x}}{2} = \frac{4h}{x} \quad \ldots(ii)$$

Multiplying both equations,

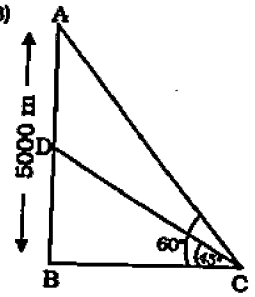
$$\tan\theta.\cot\theta = \frac{2h}{x} \times \frac{4h}{x}$$

$$\Rightarrow x^2 = 8h^2 \quad [\because \tan\theta\cot\theta = 1]$$

$$\Rightarrow h^2 = \frac{x^2}{8}$$

$$\Rightarrow h = \frac{x}{2\sqrt{2}} \text{ metre}$$

12. (3)



$\angle ACB = 60°$
$\angle DCB = 45°$
AB = 5000 metre
AD = x metre
∴ From ΔABC,

$$\tan 60° = \frac{AB}{BC}$$

$$\Rightarrow \sqrt{3} = \frac{5000}{BC}$$

$$\Rightarrow BC = \frac{5000}{\sqrt{3}} \text{ metre}$$

From ΔDBC,

$$\tan 45° = \frac{DB}{BC}$$

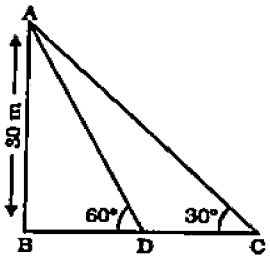
$$\Rightarrow DB = BC = \frac{5000}{\sqrt{3}}$$

$$\therefore AD = AB - BD$$

$$= 5000 - \frac{5000}{\sqrt{3}}$$

$$= 5000\left(1 - \frac{1}{\sqrt{3}}\right) \text{m}$$

13. (4)



AB = Tower = 30 metre
CD = x metre
$\angle ACB = 30°$
$\angle ADB = 60°$
From ΔABD,

$$\tan 60° = \frac{AB}{BD}$$

$$\Rightarrow \sqrt{3} = \frac{30}{BD}$$

$$\Rightarrow BD = \frac{30}{\sqrt{3}} = 10\sqrt{3} \text{ metre}$$

From ΔABC,

$$\tan 30° = \frac{AB}{BC}$$

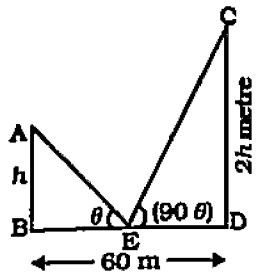
$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{30}{10\sqrt{3} + x} \quad \ldots$$

$$\Rightarrow 10\sqrt{3} + x = 30\sqrt{3}$$

$$\Rightarrow x = 30\sqrt{3} - 10\sqrt{3}$$

$$= 20\sqrt{3} \text{ metre}$$

14. (4)



BE = DE = 30 metre
$\angle AEB = \theta \therefore \angle CED = 90° - \theta$
From Δ ABE,

$$\tan\theta = \frac{AB}{BE}$$

$$\Rightarrow \tan\theta = \frac{h}{30}$$

$$\Rightarrow h = 30\tan\theta \quad \ldots(i)$$

From Δ CDE,

$$\tan(90° - \theta) = \frac{2h}{30}$$

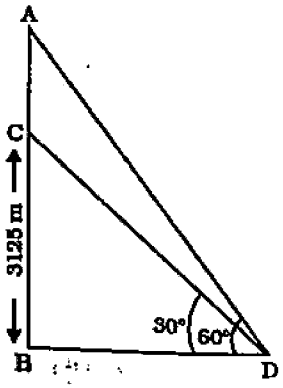
$$\Rightarrow \cot\theta = \frac{h}{15} \Rightarrow h = 15\cot\theta \quad \ldots(ii)$$

By multiplying both equations,
$h^2 = 30 \times 15 \times \tan\theta.\cot\theta$
$\Rightarrow h^2 = 30 \times 15$
$[\because \tan\theta . \cot\theta = 1]$

$$\Rightarrow h = 15\sqrt{2} \text{ metre} = AB$$

$$\Rightarrow 2h = 30\sqrt{2} \text{ metre} = CD$$

15. (4)



A and C ⇒ position of planes
BC = 3125m
Let AC = x metre
In ΔABD,

$$\tan 60° = \frac{AB}{BD}$$

$$\Rightarrow \sqrt{3} = \frac{3125 + x}{BD}$$

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$\Rightarrow BD = \dfrac{3125+x}{\sqrt{3}}$

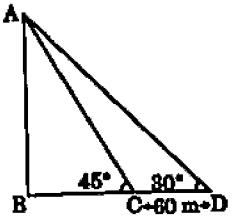
In ΔBCD,

$\tan 30° = \dfrac{BC}{BD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{3125}{\frac{3125+x}{\sqrt{3}}}$

$\Rightarrow 3(3125) = 3125 + x$
$\Rightarrow 9375 = 3125 + x$
$\Rightarrow x = 9375 - 3125$
$x = 6250$ metre

16. (3)



AB = Tower = h metre
$\angle ADB = 30°$
$\angle ACB = 45°$
CD = 60 metre
BC = x metre
From ΔABC,

$\tan 45° = \dfrac{AB}{BC}$

$\Rightarrow 1 = \dfrac{h}{x} \Rightarrow h = x$

From ΔABD,

$\tan 30° = \dfrac{AB}{BD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{h}{x+60}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{h}{h+60}$

$\Rightarrow \sqrt{3}h = h + 60$

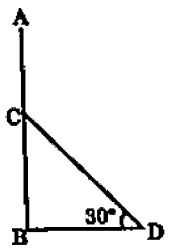
$\Rightarrow \sqrt{3}h - h = 60$

$\Rightarrow h(\sqrt{3}-1) = 60$

$\Rightarrow h = \dfrac{60}{\sqrt{3}-1} = \dfrac{60(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$

$= 30(\sqrt{3}+1)$ metre

17. (2)



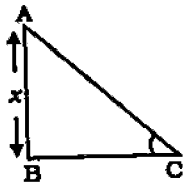
AB = Post = 15 feet
The post breaks at point C.
BC = x feet
$\Rightarrow$ AC = CD = (15 – x) feet
$\angle CDB = 30°$
From ΔBCD,

$\sin 30° = \dfrac{BC}{CD}$

$\Rightarrow \dfrac{1}{2} = \dfrac{x}{15-x}$

$\Rightarrow 2x = 15 - x$
$\Rightarrow 3x = 15 \Rightarrow x = 5$ feet

18. (2)



AB = Tower = x units
BC = Shadow = $\sqrt{3}x$ units

$\tan(ACB) = \dfrac{AB}{BC}$

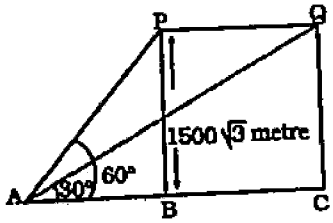
$= \dfrac{x}{\sqrt{3}x} = \dfrac{1}{\sqrt{3}} = \tan 30°$

$\therefore \angle ACB = 30°$

19. (2) $\dfrac{6}{4} = \dfrac{h}{50}$ (Assuming 'h' be the height of flag pole)

$\Rightarrow h = \dfrac{50 \times 6}{4} = 75$ feet

20. (2)



P & Q are the positions of the plane.
$\angle PAB = 60°$; $\angle QAB = 30°$

PB = $1500\sqrt{3}$ metre
In ΔABP,

$\tan 60° = \dfrac{BP}{AB}$

$\Rightarrow \sqrt{3} = \dfrac{1500\sqrt{3}}{AB}$

$\Rightarrow$ AB = 1500 metre
In ΔACQ,

$\tan 30° = \dfrac{CQ}{AC}$

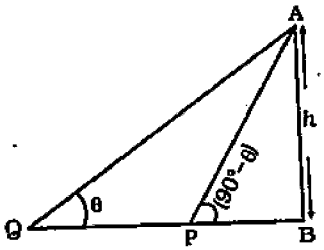
$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{1500\sqrt{3}}{AC}$

= AC = $1500 \times 3 = 4500$ metre
PQ = BC = AC – AB
= 4500 – 1500 = 3000 metre
$\Rightarrow$ 3000 m travelled in 15 sec.

$\therefore$ Speed of plane = $\dfrac{3000}{15}$

= 200 metre/second

21. (1)



AB = Tower = h units
Let, $\angle AQB = \theta$ $\therefore \angle APB = 90° - \theta$
PB = a; BQ = b
From ΔAQB,

$\tan\theta = \dfrac{AB}{BQ}$

$\Rightarrow \tan\theta = \dfrac{h}{b}$ ...(i)

From ΔAPB

$\tan(90°-\theta) = \dfrac{h}{PB}$

$\Rightarrow \cot\theta = \dfrac{h}{a}$ ...(ii)

By multiplying (i) & (ii)

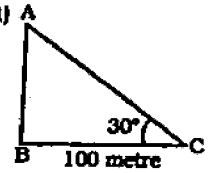
$\tan\theta.\cot\theta = \dfrac{h}{b} \times \dfrac{h}{a}$

$\Rightarrow h^2 = ab$

$\Rightarrow h = \sqrt{ab}$

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22. (1)



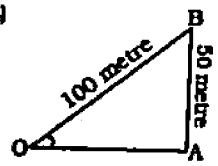
AB = Tower = h metre
$\angle ACB = 30°$;
BC = 100 metre

$\therefore \tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{100}$

$\Rightarrow h = \frac{100}{\sqrt{3}}$ metre

23. (4)

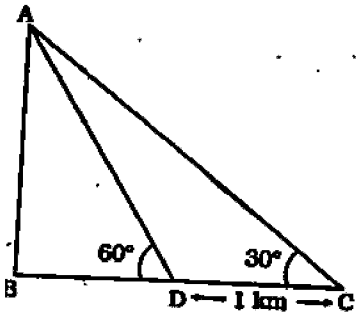


AB = Height of kite
= 50 metre
OB = length of thread
= 100 metre

$\therefore \sin BOA = \frac{AB}{OB} = \frac{50}{100} = \frac{1}{2}$

$\therefore \angle BOA = 30°$

24. (1)



AB = Height of balloon = h km
BD = x km, CD = 1 km
From ΔABD,

$\tan 60° = \frac{AB}{BD}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ km .....(i)

From ΔABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{\frac{h}{\sqrt{3}}+1}$ [By (i)]

$\Rightarrow \sqrt{3}h = \frac{h}{\sqrt{3}} + 1$

$\Rightarrow \sqrt{3}h - \frac{h}{\sqrt{3}} = 1$

$\Rightarrow \frac{3h-h}{\sqrt{3}} = 1$

$\Rightarrow 2h = \sqrt{3}$

$\Rightarrow h = \frac{\sqrt{3}}{2}$ km

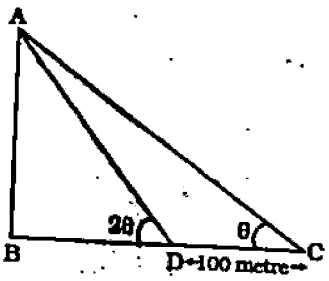
25. (2) $\frac{\text{Height of tower}}{\text{Length of stick}}$

$= \frac{\text{Length of shadow of tower}}{\text{Length of shadow of stick}}$

$\Rightarrow \frac{h}{12} = \frac{40}{8}$

$\Rightarrow h = \frac{40 \times 12}{8} = 60$ metre

26. (1)



AB = Tower = h metre
CD = 100 metre; BC = 160 metre
$\angle ACB = \theta$ $\therefore \angle ADB = 2\theta$
In ΔABC,

$\tan\theta = \frac{AB}{BC} \Rightarrow \tan\theta = \frac{h}{160}$ ....(i)

In ΔABD,

$\tan 2\theta = \frac{AB}{BD} = \frac{h}{60}$

$\Rightarrow \frac{2\tan\theta}{1-\tan^2\theta} = \frac{h}{60}$

$\Rightarrow \frac{2 \times \frac{h}{160}}{1 - \frac{h^2}{160 \times 160}} = \frac{h}{60}$

$\Rightarrow \frac{1}{80\left(1 - \frac{h^2}{160 \times 160}\right)} = \frac{1}{60}$

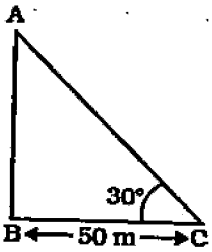
$\Rightarrow 4\left(1 - \frac{h^2}{160 \times 160}\right) = 3$

$\Rightarrow \frac{h^2}{160 \times 160} = 1 - \frac{3}{4} = \frac{1}{4}$

$\Rightarrow h^2 = 6400$

$\Rightarrow h = \sqrt{6400} = 80$ metre

27. (2)



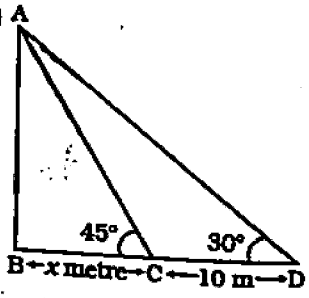
AB = Tower = h metre
BC = 50 metre
$\angle ACB = 30°$

$\therefore \tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{50}$

$\Rightarrow AB = \frac{50}{\sqrt{3}}$ metre

28. (3)



AB = Tower = h metre
$\angle BDA = 30°$
$\angle ACB = 45°$

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CD = 10 metre

From ΔABC,

$\tan 45° = \frac{AB}{BC} \Rightarrow 1 = \frac{h}{x} \Rightarrow h = x$

From ΔABD,

$\tan 30° = \frac{AB}{BD} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+10}$

$\Rightarrow \sqrt{3}h = h + 10 \quad [\because h = x]$

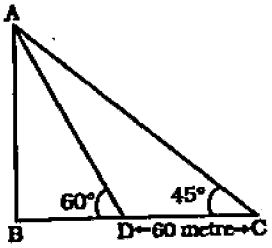
$\Rightarrow \sqrt{3}h - h = 10$

$\Rightarrow h(\sqrt{3} - 1) = 10$

$\Rightarrow h = \frac{10}{\sqrt{3}-1} = \frac{10}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{10(\sqrt{3}+1)}{2} = 5(\sqrt{3}+1)$ metre

29. (3)



AB = tower = h metre

$\angle ACB = 45°$, $\angle ADB = 60°$

CD = 60 metre, BD = x metre

From ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{h}{x+60}$

$\Rightarrow h = x + 60$ .....(i)

From ΔABD,

$\tan 60° = \frac{AB}{BD}$

$\Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow h = \sqrt{3}x$

$\Rightarrow h = \sqrt{3}.(h - 60)$

$\Rightarrow \sqrt{3}h - h = 60\sqrt{3}$

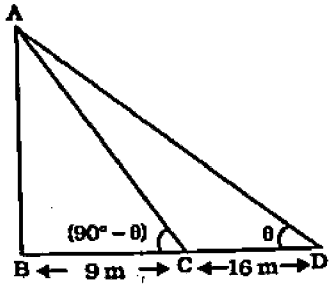
$\Rightarrow h(\sqrt{3} - 1) = 60\sqrt{3}$

$\Rightarrow h = \frac{60\sqrt{3}}{\sqrt{3}-1} = \frac{60\sqrt{3}(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$

$= 30\sqrt{3}(\sqrt{3}+1)$

$= 30(3 + \sqrt{3})$ metre

30. (4)



AB = Pole = h metre

BC = 9 metre BD = 16 metre

$\angle ADB = \theta$;

$\therefore \angle ACB = 90° - \theta$

From ΔABC,

$\tan(90° - \theta) = \frac{AB}{BC}$

$\Rightarrow \cot\theta = \frac{h}{9}$ ...(i)

ΔABD from,

$\Rightarrow \tan\theta = \frac{h}{16}$ ...(ii)

By multiplying (i) & (ii)

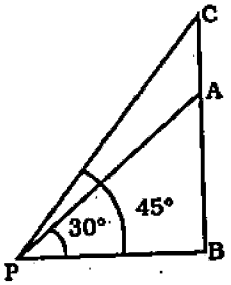
$\tan\theta \cdot \cot\theta = \frac{h}{9} \times \frac{h}{16}$

$\Rightarrow \frac{h^2}{144} = 1$

$\Rightarrow h^2 = 144$

$\Rightarrow h = \sqrt{144} = 12$ metre

31. (4)



AC = Flag

AB = building = 10 metre

$\angle APB = 30°$; $\angle CPB = 45°$

In Δ APB,

$\tan 30° = \frac{AB}{PB}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{10}{PB}$

$\Rightarrow PB = 10\sqrt{3}$ metre

In Δ PBC,

$\tan 45° = \frac{BC}{PB}$

$\Rightarrow 1 = \frac{AB + AC}{PB}$

$\Rightarrow PB = AB + AC$

$\Rightarrow 10\sqrt{3} = 10 + AC$

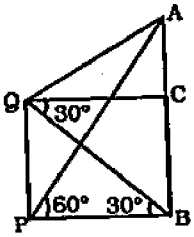
$\Rightarrow AC = 10\sqrt{3} - 10$

$= 10(\sqrt{3} - 1)$ metre

$= 10(1.732 - 1)$ metre

$= 10 \times 0.732 = 7.32$ metre

32. (2)



AB = Tower = h metre

PQ = 10 metre

$\angle APB = 60°$,

$\angle CQB = \angle QBP = 30°$

In Δ PBQ,

$\tan 30° = \frac{PQ}{PB} \Rightarrow \frac{1}{\sqrt{3}} = \frac{10}{PB}$

$\Rightarrow PB = 10\sqrt{3}$ metre

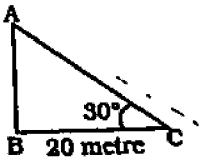
In Δ APB,

$\tan 60° = \frac{AB}{PB}$

$\Rightarrow \sqrt{3} = \frac{h}{10\sqrt{3}}$

$\Rightarrow h = \sqrt{3} \times 10\sqrt{3} = 30$ metre

33. (4)



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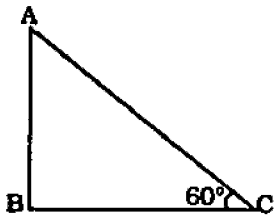
AB = Tower, BC = 20 metre
In Δ ABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AB}{20}$

$\Rightarrow AB = \frac{20}{\sqrt{3}}$ metre

34. (2)

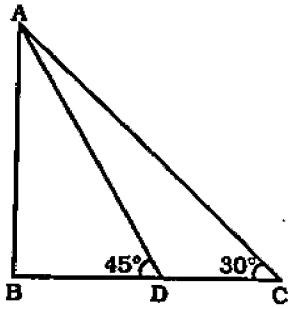


AB = house, AC = ladder
In ΔABC,

$\cos 60° = \frac{BC}{AC} \Rightarrow \frac{1}{2} = \frac{6.5}{AC}$

$\Rightarrow AC = 2 \times 6.5$
= 13 metre

35. (4)



$\angle ACB = 30°$
$\angle ADB = 45°$
CD = 4 metre
AB = pole = h metre
BD = x metre
From ΔABD,

$\tan 45° = \frac{AB}{BD}$

$\Rightarrow 1 = \frac{h}{x} \Rightarrow h = x$ ...(i)

From ΔABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+4}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{h+4} \Rightarrow h+4$

$= \sqrt{3}h$

$\Rightarrow \sqrt{3}h - h = 4$

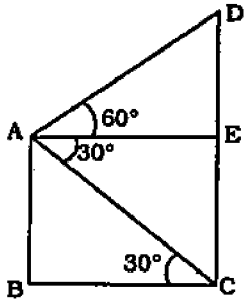
$\Rightarrow h(\sqrt{3} - 1) = 4$

$\Rightarrow h = \frac{4}{\sqrt{3}-1} = \frac{4(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$

$= \frac{4(\sqrt{3}+1)}{3-1} = 2(\sqrt{3}+1)$

= 2 (1.732 + 1)
= 2 × 2.732
= 5.464 metre

36. (3)



AB = Pole = 10 metre
CD = Tower = h metre (let)
$\angle DAE = 60°$
$\angle EAC = \angle ACB = 30°$
From ΔABC,

$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{10}{BC}$

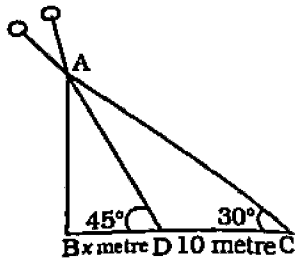
$\Rightarrow BC = 10\sqrt{3}$ metre

$\therefore AE = 10\sqrt{3}$ metre
From Δ ADE,

$\tan 60° = \frac{DE}{AE} \Rightarrow \sqrt{3} = \frac{DE}{10\sqrt{3}}$

$\Rightarrow DE = 10\sqrt{3} \times \sqrt{3}$
= 30 metre
$\therefore$ CD = Heigth of tower
= CE + ED = 10 + 30
= 40 metre

37. (1)



AB = Tower = h metre
BD = Shadow = x metre
$\angle ADB = 45°$
$\angle ACB = 30°$
In Δ ABD,

$\tan 45° = \frac{AB}{BD} \Rightarrow 1 = \frac{AB}{BD} = \frac{h}{x}$

$\Rightarrow h = x$ ..... (i)

In Δ ABC,

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+10}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{h+10}$

$\Rightarrow \sqrt{3}h = h + 10$

$\Rightarrow \sqrt{3}h - h = 10$

$\Rightarrow h(\sqrt{3} - 1) = 10$

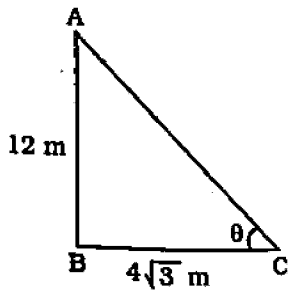
$\Rightarrow h = \frac{10}{\sqrt{3}-1}$

$= \frac{10}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{10(\sqrt{3}+1)}{3-1}$

= 5 ($\sqrt{3}$ +1) metre

38. (2)



AB = pole = 12 metre
Shadow = BC = $4\sqrt{3}$ metre

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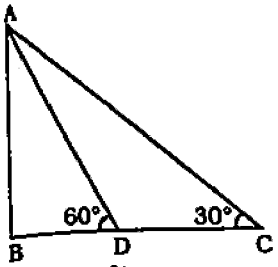
From ΔABC,

$\tan\theta = \frac{AB}{BC} = \frac{12}{4\sqrt{3}} = \sqrt{3}$

$\Rightarrow \tan\theta = \tan 60°$

$\Rightarrow \theta = 60°$

39. (4)



AB = Height of tower = h metre (let)

CD = 70 metre

BD = x metre (let)

In ΔABC,

$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+70}$

$\Rightarrow \sqrt{3}h = x + 70$

$\Rightarrow x = \sqrt{3}h - 70$ ...(i)

In ΔABD,

$\tan 60° = \frac{h}{x}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ ...(ii)

From equations (i) and (ii),

$\sqrt{3}h - 70 = \frac{h}{\sqrt{3}}$

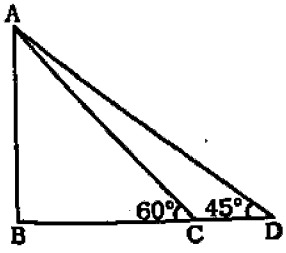
$\Rightarrow \sqrt{3}h - \frac{h}{\sqrt{3}} = 70$

$\Rightarrow \frac{3h-h}{\sqrt{3}} = 70$

$\Rightarrow 2h = 70\sqrt{3}$

$\Rightarrow h = \frac{70\sqrt{3}}{2} = 35\sqrt{3}$ metre

40. (1)



AB = Tower = h metre (let)

CD = 30 metre

BC = x metre (let)

From ΔABC,

$\tan 60° = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow h = \sqrt{3}x$ metre ...(i)

From ΔABD,

$\tan 45° = \frac{AB}{BD} \Rightarrow 1 = \frac{h}{x+30}$

$\Rightarrow h = x + 30$

$\Rightarrow h = \frac{h}{\sqrt{3}} + 30$

$\Rightarrow \sqrt{3}h = h + 30\sqrt{3}$

$\Rightarrow \sqrt{3}h - h = 30\sqrt{3}$

$\Rightarrow h(\sqrt{3}-1) = 30\sqrt{3}$

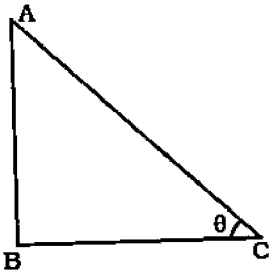
$\Rightarrow h = \frac{30\sqrt{3}}{\sqrt{3}-1} = \frac{30\sqrt{3}(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$

$= \frac{30\sqrt{3}(\sqrt{3}+1)}{3-1}$

$= 15\sqrt{3}(\sqrt{3}+1)$

$= 15(3+\sqrt{3})$ metre

41. (2)



AB = Tower = $100\sqrt{3}$ metre

BC = 100 metre

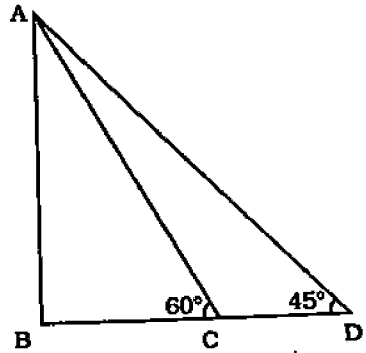
From ΔABC,

$\tan\theta = \frac{AB}{BC}$

$\Rightarrow \tan\theta = \frac{100\sqrt{3}}{100} = \sqrt{3}$

$\Rightarrow \tan\theta = \tan 60° \Rightarrow \theta = 60°$

42. (3)



$\angle ACB = 60°$; BC = x metre

CD = 40 metre, AB = Tower = h metre

From ΔABC,

$\tan 60° = \frac{AB}{BC} \Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow h = \sqrt{3}x$ ...(i)

From ΔABD,

$\tan 45° = \frac{AB}{BD}$

$\Rightarrow 1 = \frac{h}{x+40}$

$\Rightarrow h = x + 40 = \frac{h}{\sqrt{3}} + 40$

$\Rightarrow h - \frac{h}{\sqrt{3}} = 40$

$\Rightarrow \frac{\sqrt{3}h - h}{\sqrt{3}} = 40$

$\Rightarrow (\sqrt{3}-1)h = 40\sqrt{3}$

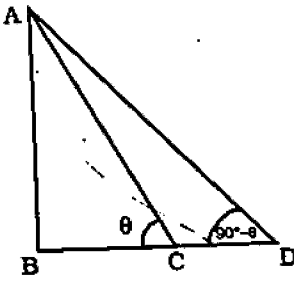
$\Rightarrow h = \frac{40\sqrt{3}}{\sqrt{3}-1}$

$= \frac{40\sqrt{3}(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$

$= \frac{40\sqrt{3}(\sqrt{3}+1)}{3-1}$

$= 20(3+\sqrt{3})$ metre

43. (2)



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Let, $\angle ACB = \theta$
$\therefore \angle ADB = 90° - \theta$
BC = 12 metre,
BD = 27 metre
AB = Pillar = h metre
From ΔABC,

$$\tan\theta = \frac{AB}{BC} = \frac{h}{12} \quad \ldots(i)$$

From ΔABD

$$\tan(90° - \theta) = \frac{AB}{BD}$$

$$\Rightarrow \cot\theta = \frac{h}{27} \quad \ldots(ii)$$

$$\therefore \tan\theta . \cot\theta = \frac{h}{12} \times \frac{h}{27}$$

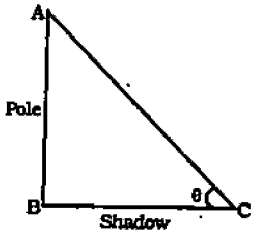
$$\Rightarrow h^2 = 12 \times 27$$

$$\Rightarrow h = \sqrt{12 \times 27}$$

$$= \sqrt{2\times2\times3\times3\times3\times3}$$

$$= 2 \times 3 \times 3 = 18 \text{ metre}$$

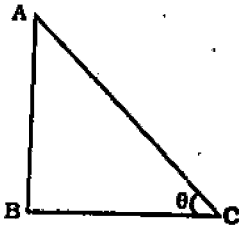
44. (4)



$$\tan\theta = \frac{AB}{BC} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

$$\Rightarrow \tan\theta = \tan 60° \Rightarrow \theta = 60°$$

45. (4)



AC = ladder = 10 metre
BC = ?
$\angle ABC = \theta = 30°$
From ΔABC,

$$\cos\theta = \frac{BC}{AC}$$

$$\Rightarrow \cos 30° = \frac{BC}{10}$$

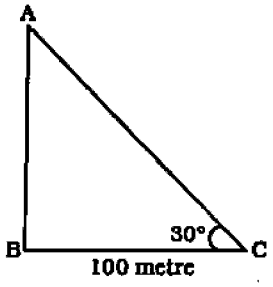
$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{BC}{10}$$

$$\Rightarrow BC = \frac{10\sqrt{3}}{2} = 5\sqrt{3}$$

$$= 5 \times 1.732$$

$$= 8.660 \text{ metre}$$

46. (4)



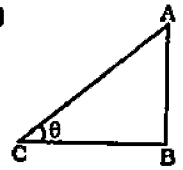
AB = Tower = h metre
From ΔABC,

$$\tan 30° = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{100}$$

$$\Rightarrow h = \frac{100}{\sqrt{3}} \text{ metre}$$

47. (1)



A = Position of kite
AC = length of string
AB = 75 metre

$$\cot\theta = \frac{8}{15}$$

$$\therefore \operatorname{cosec}\theta = \sqrt{1 + \cot^2\theta}$$

$$= \sqrt{1 + \left(\frac{8}{15}\right)^2} = \sqrt{1 + \frac{64}{225}}$$

$$= \sqrt{\frac{225 + 64}{225}} = \sqrt{\frac{289}{225}} = \frac{17}{15}$$

$$\therefore \sin\theta = \frac{15}{17}$$

From ΔABC

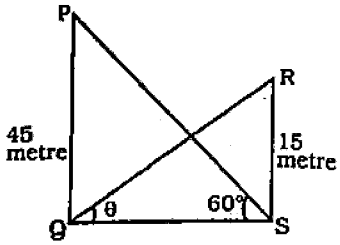
$$\sin\theta = \frac{AB}{AC}$$

$$\Rightarrow \frac{15}{17} = \frac{75}{AC}$$

$$\Rightarrow AC \times 15 = 17 \times 15$$

$$\Rightarrow AC = \frac{17 \times 75}{15} = 85 \text{ metre}$$

48. (2)



PQ = Tower A = 45 metre
RS = Tower B = 15 metre,
QS = x metre (let)
$\angle PSQ = 60°$; $\angle RQS = \theta$
From ΔPQS,

$$\tan\theta\, 60° = \frac{PQ}{QS}$$

$$\Rightarrow \sqrt{3} = \frac{45}{x} \Rightarrow \sqrt{3}\, x = 45$$

$$\Rightarrow x = \frac{45}{\sqrt{3}} = 15\sqrt{3} \text{ metre}$$

From ΔRSQ,

$$\tan\theta = \frac{RS}{QS} = \frac{15}{15\sqrt{3}}$$

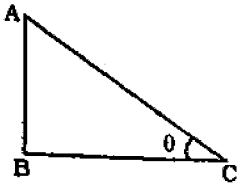
$$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$$

$$\Rightarrow \tan\theta = \tan 30°$$

$$\Rightarrow \theta = 30°$$

$$\therefore \sin\theta = \sin 30° = \frac{1}{2}$$

49. (4)



AB = Building = 48 metre
BC = Shadow = $48\sqrt{3}$ metre
$\angle ACB = \theta$ = ?

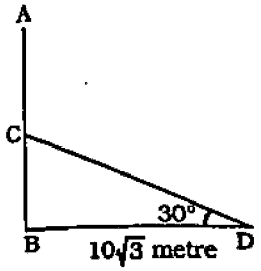
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$\therefore \tan\theta = \frac{AB}{BC} = \frac{48}{48\sqrt{3}}$

$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}} = \tan 30°$

$\Rightarrow \theta = 30°$

50. (1)



AB = Telegraph post
AC = CD = bent part
BD = $10\sqrt{3}$ metre
In Δ BCD,

$\tan 30° = \frac{BC}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{BC}{10\sqrt{3}}$

$\Rightarrow BC = \frac{1}{\sqrt{3}} \times 10\sqrt{3}$

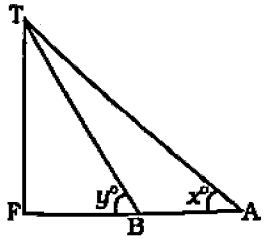
= 10 metre
Again,

$\sin 30° = \frac{BC}{CD}$

$\Rightarrow \frac{1}{2} = \frac{10}{CD}$

$\Rightarrow$ CD = 20 metre
$\therefore$ AB = BC + CD
= (10 + 20) metre
= 30 metre

51. (4)



TF = Tower = h metre
$\angle TAF = x°$; $\angle TBF = y°$,
BF = 80 metre
In ΔAFT,

$\tan x° = \frac{TF}{AF}$

$\Rightarrow \frac{2}{5} = \frac{h}{200}$

$\Rightarrow h = \frac{2}{5} \times 200$

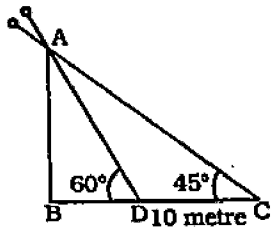
= 80 metre
In ΔBFT,

$\tan y° = \frac{TF}{FB}$

$\Rightarrow \tan y° = \frac{80}{80} = 1$

$\Rightarrow \tan y° = \tan 45°$
$\Rightarrow y = 45°$

52. (4)



AB = Height of pillar
= h metre (let)
CD = 10 metre
$\angle ACB = 45°$
$\angle ADB = 60°$
BD = x metre (let)
From ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{h}{x+10}$

$\Rightarrow h = (x + 10)$ metre (i)

From ΔABD,

$\tan 60° = \frac{AB}{BD}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ metre (ii)

From equation (i),

$h = \frac{h}{\sqrt{3}} + 10$

$\Rightarrow h - \frac{h}{\sqrt{3}} = 10$

$\Rightarrow \frac{\sqrt{3}h - h}{\sqrt{3}} = 10$

$\Rightarrow h(\sqrt{3} - 1) = 10\sqrt{3}$

$\Rightarrow h = \frac{10\sqrt{3}}{\sqrt{3} - 1}$

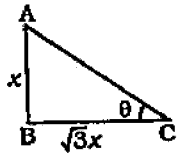
$= \frac{10\sqrt{3}(\sqrt{3} + 1)}{(\sqrt{3} - 1)(\sqrt{3} + 1)}$

$= \frac{10\sqrt{3}(\sqrt{3} + 1)}{3 - 1}$

$= 5\sqrt{3}(\sqrt{3} + 1)$

$= 5(3 + \sqrt{3})$ metre

53. (2)



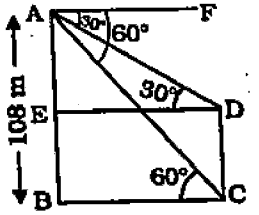
$\frac{AB}{BC} = \frac{1}{\sqrt{3}}$

$\tan\theta = \frac{AB}{BC} = \frac{1}{\sqrt{3}}$

$\Rightarrow \tan\theta = \tan 30°$
$\Rightarrow \theta = 30°$

TYPE-IV

1. (2)



[**Note :** Interior alternate angles are equal]
AB = 108 m
CD = x metre
From Δ ABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{108}{BC}$

$\Rightarrow BC = \frac{108}{\sqrt{3}} = 36\sqrt{3}$ m

From Δ AED,

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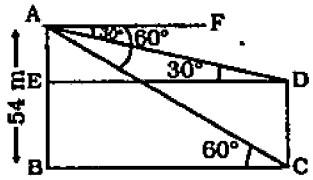
$\tan 30° = \frac{AE}{ED}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{108 - x}{36\sqrt{3}}$

$\Rightarrow 108 - x = 36$

$\Rightarrow x = 108 - 36 = 72$ m

2. (2)



AB = temple = 54 metre
CD = temple = h metre
BC = width of river
= x metre
From ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{54}{x} \Rightarrow x = \frac{54}{\sqrt{3}}$

$= 18\sqrt{3}$ metre
From ΔADE,

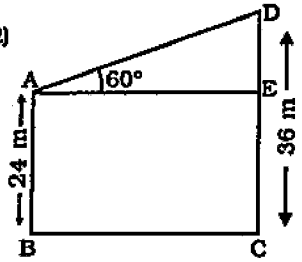
$\tan 30° = \frac{AE}{DE}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{54 - h}{18\sqrt{3}}$

$\Rightarrow 54 - h = 18$

$\Rightarrow h = 54 - 18 = 36$ metre

3. (2)



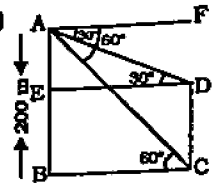
DE = 36 – 24 = 12 metre
From Δ ADE,

$\sin 60° = \frac{DE}{AD}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{12}{AD}$.

$\Rightarrow AD = \frac{12 \times 2}{\sqrt{3}} = 8\sqrt{3}$ metre

4. (3)



AB = Hill = 200 metre
$\angle ADE = 30°$
$\angle ACB = 60°$
DE = BC = x metre
From ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{200}{x}$

$\Rightarrow x = \frac{200}{\sqrt{3}}$ metre

From ΔAED,

$\tan 30° = \frac{AE}{DE}$

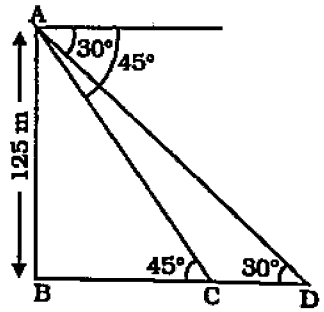
$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AE}{\frac{200}{\sqrt{3}}}$

$\Rightarrow AE = \frac{200}{3}$ metre

$\therefore CD = 200 - \frac{200}{3} = \frac{400}{3}$

$= 133\frac{1}{3}$ metre

5. (2)



AB = Tower = 125 metre
BC = x metre, BD = y metre
From ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{125}{x} \Rightarrow x = 125$ metre

From Δ ABD,

$\tan 30° = \frac{AB}{BD}$

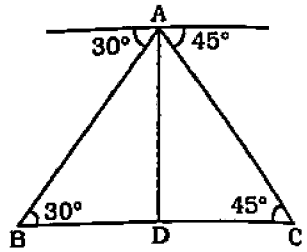
$\Rightarrow \frac{1}{\sqrt{3}} = \frac{125}{y}$

$\Rightarrow y = 125\sqrt{3}$ metre

$\therefore CD = y - x = 125\sqrt{3} - 125$

$= 125(\sqrt{3} - 1)$ metre

6. (4)



AD is tower and B and C are two objects,
$\angle ABD = 30°$ and $\angle ACD = 45°$
AD = 180 metre
From ΔABD,

$\tan 30° = \frac{AD}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{180}{BD}$

$\Rightarrow BD = 180\sqrt{3}$ metre

From ΔADC,

$\tan 45° = \frac{AD}{DC}$

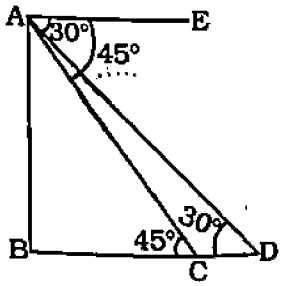
$\Rightarrow 1 = \frac{180}{DC} \Rightarrow DC = 180$ metre

$\therefore BC = BD + DC$

$= 180\sqrt{3} + 180$

$= 180(\sqrt{3} + 1)$ metre

7. (1)



AB = hill = 300 metre
CD = bridge = x metre

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In ΔABC,

$\tan 45° = \frac{AB}{BC}$

$\Rightarrow 1 = \frac{300}{BC}$

$\Rightarrow BC = 300$ metre

In ΔABD,

$\tan 30° = \frac{AB}{BD}$

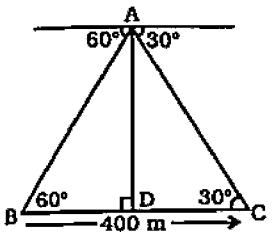
$\Rightarrow \frac{1}{\sqrt{3}} = \frac{300}{300 + x}$

$\Rightarrow 300 + x = 300\sqrt{3}$

$\Rightarrow x = 300\sqrt{3} - 300$

$= 300(\sqrt{3} - 1)$ metre

8. (1)



BC = River = 400 metre

AD = Height of plane = h metre

BD = x metre (let)

$\therefore$ CD = $(400 - x)$ metre

From ΔABD,

$\tan 60° = \frac{AD}{BD}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow h = \sqrt{3}\,x$ metre

$\Rightarrow x = \frac{h}{\sqrt{3}}$ metre ...(i)

From ΔACD,

$\tan 30° = \frac{AD}{CD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{400 - x}$

$\Rightarrow \sqrt{3}h = 400 - x$

$\Rightarrow \sqrt{3}h = 400 - \frac{h}{\sqrt{3}}$

[From equation (i)]

$\Rightarrow \sqrt{3}h + \frac{h}{\sqrt{3}} = 400$

$\Rightarrow \frac{3h + h}{\sqrt{3}} = 400$

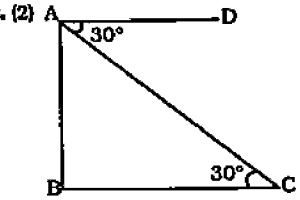
$\Rightarrow 4h = 400\sqrt{3}$

$\Rightarrow h = \frac{400\sqrt{3}}{4}$

$= 100\sqrt{3}$ metre

$= 100 \times 1.732 = 173.2$ metre

9. (2)



AB = Height of light house

= 20 metre

= 20 metre

$\angle DAC = \angle ACB = 30°$

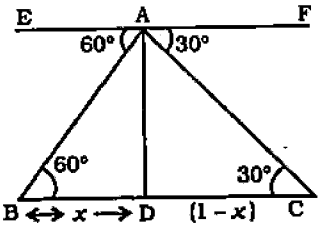
In ΔABC

$\tan 30° = \frac{AB}{BC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{20}{BC}$

$\Rightarrow BC = 20\sqrt{3}$ metre

10. (3)



A = Position of aeroplane

B and C are km stones,

$\angle ABD = 60°$, $\angle ACD = 30°$

BD = x km.

$\therefore$ CD = $(1 - x)$ km.

In ΔABD,

$\tan 60° = \frac{AD}{BD}$

$\Rightarrow \sqrt{3} = \frac{AD}{x}$

$\Rightarrow AD = \sqrt{3}\,x$ km. ...(i)

In ΔACD,

$\tan 30° = \frac{AD}{CD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AD}{1 - x}$

$\Rightarrow AD = \frac{1 - x}{\sqrt{3}}$ km. ...(ii)

$\therefore$ From equations (i) and (ii),

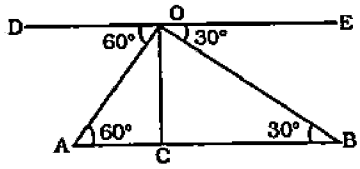
$\sqrt{3}\,x = \frac{1 - x}{\sqrt{3}}$

$\Rightarrow 3x = 1 - x$

$\Rightarrow 4x = 1 \Rightarrow x = \frac{1}{4}$ km.

$\therefore AD = \sqrt{3}\,x = \frac{\sqrt{3}}{4}$ km.

11. (4)



OC = Height of plane = h km (let)

$\angle DOA = \angle OAC = 60°$;

$\angle BOE = \angle OBC = 30°$

AB = 2 km.

AC = x km (let)

$\therefore$ BC = $(2 - x)$ km.

From, ΔOAC

$\tan 60° = \frac{OC}{AC}$

$\Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow x = \frac{h}{\sqrt{3}}$ km. ....(i)

From ΔOBC,

$\tan 30° = \frac{OC}{CB}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{2 - x}$

$\Rightarrow \sqrt{3}\,h = 2 - \frac{h}{\sqrt{3}}$

[From equation (i)]

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$\Rightarrow \sqrt{3}h + \frac{h}{\sqrt{3}} = 2$

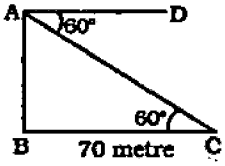
$\Rightarrow \frac{3h+h}{\sqrt{3}} = 2$

$\Rightarrow 4h = 2\sqrt{3}$

$\Rightarrow h = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2}$ km.

$= \frac{1.732}{2} = 0.866$ km.

12. (2)



AB = Tower = h metre (let)
$\angle DAC = \angle ACB = 60°$
BC = 70 metre
In ΔABC,

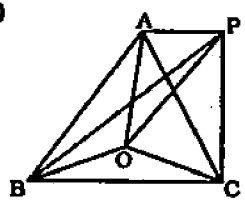
$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{h}{70}$

$\Rightarrow h = 70\sqrt{3}$ metre

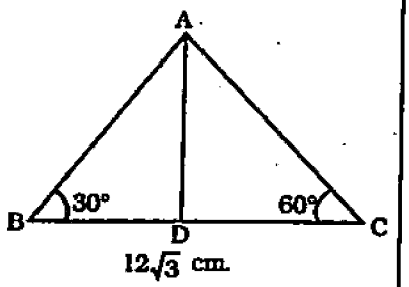
TYPE-V

1. (2)



AP = CP = BP
It is possible only when
OA = OB = OC i.e. radii of circum circle. or, (circumcentre)

2. (4)



BD = x cm. (let)

$\therefore$ CD = $(12\sqrt{3} - x)$ cm.

$\angle ADB = \angle ADC = 90°$
From ΔABD,

$\tan 30° = \frac{AD}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AD}{x}$

$\Rightarrow AD = \frac{x}{\sqrt{3}}$ .... (i)

From ΔACD,

$\tan 60° = \frac{AD}{CD}$

$\Rightarrow \sqrt{3} = \frac{AD}{12\sqrt{3} - x}$

$\Rightarrow AD = \sqrt{3}(12\sqrt{3} - x)$

$= 36 - \sqrt{3}x$ .... (ii)

$\therefore \frac{x}{\sqrt{3}} = 36 - \sqrt{3}x$

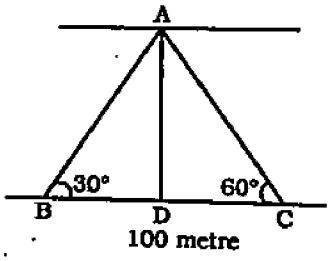
$\Rightarrow x = 36\sqrt{3} - 3x$

$\Rightarrow 4x = 36\sqrt{3}$

$\Rightarrow x = \frac{36\sqrt{3}}{4} = 9\sqrt{3}$

$\therefore AD = \frac{x}{\sqrt{3}} = \frac{9\sqrt{3}}{\sqrt{3}} = 9$ cm.

3. (3)



BD = x metre (let)
$\therefore$ CD = $(100 - x)$ metre
$AD \perp BC$; AD = y metre
From ΔABD,

$\tan 30° = \frac{AD}{BD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{y}{x}$

$\Rightarrow x = \sqrt{3}y$ ....(i)

From ΔACD

$\tan 60° = \frac{y}{100 - x}$

$\Rightarrow \sqrt{3} = \frac{y}{100 - x}$

$\Rightarrow y = 100\sqrt{3} - \sqrt{3}x$

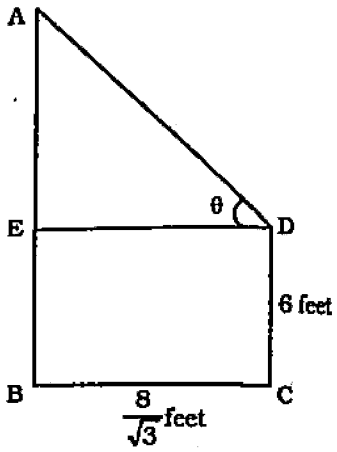
$\Rightarrow y = 100\sqrt{3} - \sqrt{3} \times \sqrt{3}y$

$\Rightarrow y = 100\sqrt{3} - 3y$

$\Rightarrow 4y = 100\sqrt{3}$

$\Rightarrow y = 25\sqrt{3}$ metre

4. (2)



AB = Tree = $\frac{26}{3}$ feet
BE = CD = 6 feet

$AE = AB - BE = \frac{26}{3} - 6$

$= \frac{26-18}{3} = \frac{8}{3}$ feet

$DE = BC = \frac{8}{\sqrt{3}}$ feet

From ΔAED,

$\tan\theta = \frac{AE}{ED} = \frac{\frac{8}{3}}{\frac{8}{\sqrt{3}}}$

$= \frac{8}{3} \times \frac{\sqrt{3}}{8} = \frac{1}{\sqrt{3}}$

$\therefore \tan\theta = \tan 30° \Rightarrow \theta = 30°$

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TEST YOURSELF

1. If $\sec\theta + \tan\theta = \sqrt{2}$, find the value of $\sin\theta$.

(1) $\frac{1}{2}$ (2) $\frac{1}{4}$

(3) $\frac{1}{\sqrt{2}}$ (4) $\frac{1}{3}$

2. If $\sin A = \frac{3}{5}$ and $\cos B = \frac{12}{13}$, what is the value of $\frac{\tan A - \tan B}{1 + \tan A \tan B}$; it being given that A and B are acute angles?

(1) $\frac{15}{63}$ (2) $\frac{19}{63}$

(3) $\frac{17}{65}$ (4) $\frac{16}{63}$

3. Find the value of $\sin^2 1° + \sin^2 3° + \sin^2 5° + \ldots\ldots \sin^2 87° + \sin^2 89°$.

(1) $23\frac{1}{2}$ (2) $22\frac{1}{2}$

(3) $11\frac{1}{2}$ (4) $12\frac{1}{2}$

4. To a man standing at the mid point of the line joining the feet of two vertical poles of same height, the angle of elevation of the tip of each pole is 30°. When the man advances a distance of 40 metres towards one pole, the angle of elevation of the tip of this pole is 60°. What is the distance between the two poles?

(1) 120 metre (2) 110 metre

(3) 130 metre (4) 115 metre

5. If α be an acute angle and $a\sin\alpha - b\cos\alpha = 0$, what will be the values of $\sin\alpha$ and $\cos\alpha$ in terms of a and b?

(1) $\frac{b}{\sqrt{a^2+b^2}}, \frac{a}{\sqrt{a^2+b^2}}$

(2) $\frac{-b}{\sqrt{a^2+b^2}}, \frac{a}{\sqrt{a^2+b^2}}$

(3) $\frac{b}{\sqrt{a^2+b^2}}, \frac{-a}{\sqrt{a^2+b^2}}$

(4) $\frac{b^2}{\sqrt{a^2+b^2}}, \frac{a^2}{\sqrt{a^2+b^2}}$

6. Find the simplest numerical value of $3(\sin x - \cos x)^4 + 4(\sin^6 x + \cos^6 x) + 6(\sin x + \cos x)^2$

(1) 12 (2) 10

(3) 21 (4) 13

7. If $3\cos\theta + 4\sin\theta = 5$, then $\tan\theta = ?$

(1) $\frac{4}{3}$ (2) $\frac{3}{4}$

(3) $\frac{3}{5}$ (4) $\frac{5}{3}$

8. The angular elevation of the top of a tower from a distant point on the horizontal ground is observed to be 30° and proceeding 30 metres from the point towards the foot of the tower it is observed to be 45°. Find the height of the tower.

(1) 15 metre

(2) $15\sqrt{3}$ metre

(3) $15(\sqrt{3}+1)$ metre

(4) None of these

9. If $\tan\theta = \frac{a}{b}$, find the value of $\frac{a\sin^3\theta - b\cos^3\theta}{a\sin^3\theta + b\cos^3\theta}$.

(1) $\frac{a^4-b^4}{a^4+b^4}$ (2) $\frac{a^4+b^4}{a^4-b^4}$

(3) $\frac{a^3-b^3}{a^3+b^3}$ (4) $\frac{a^3+b^3}{a^3-b^3}$

10. If $0° < \theta < 90°$, and $\tan^2\theta - (\sqrt{3}+1)\tan\theta + \sqrt{3} = 0$, then $\theta = ?$

(1) 30° (2) 45°

(3) 60° (4) 45° or 60°

11. If $4x^2 - 4x\sec\theta + 1 = 0$, then $\sec\theta + \tan\theta = ?$

(1) $2x$ (2) $\frac{1}{2x}$

(3) $3x$ (4) $2x$ or $\frac{1}{2x}$

12. If $\cos\theta + \sec\theta = 2$, then $\cos^5\theta + \sec^5\theta = ?$

(1) 1 (2) 2

(3) –1 (4) –2

13. If $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$, then $\cos\theta + \sin\theta = ?$

(1) $2\cos\theta$ (2) $2\sin\theta$

(3) $\sqrt{2}\cos\theta$ (4) None of these

14. The shadow of a vertical tower becomes 30 metres longer when the altitude of the sun changes from 60° to 45°. Find the height of the tower.

(1) $15\sqrt{3}$ metres

(2) $15(3+\sqrt{3})$ metres

(3) $15(3-\sqrt{3})$ metres

(4) $12(3+\sqrt{3})$ metres

15. Evaluate:

$\frac{\sec 39°}{\operatorname{cosec} 51°} + \frac{2}{\sqrt{3}}(\tan 17° \cdot \tan 38° \cdot \tan 60° \cdot \tan 52° \cdot \tan 73° - 3(\sin^2 31° + \sin^2 59°)$

(1) 2 (2) 3

(3) 0 (4) –2

16. If $\frac{\cos\alpha}{\cos\beta} = m$ and $\frac{\cos\alpha}{\sin\beta} = n$, then $(m^2 + n^2)\cos^2\beta = ?$

(1) 1 (2) $2n^2$

(3) $n^2 + 3$ (4) n^2

17. If α, β and γ each is positive acute angle, and $\sin(\alpha+\beta-\gamma) = \frac{1}{2}$, $\cos(\beta+\gamma-\alpha) = \frac{1}{2}$ and $\tan(\gamma+\alpha-\beta) = 1$ then $2\alpha + \beta = ?$

(1) 105° (2) 115°

(3) 110° (4) 120°

18. Evaluate:

$\frac{\tan^2 60° + 4\cos^2 45° + 3\sec^2 30° + 5\cos^2 90°}{\operatorname{cosec} 30° + \sec 60° - \cot^2 30°}$

(1) 4 (2) 9

(3) 7 (4) 1

19. If $A + B = 90°$, then

$\sqrt{\frac{\tan A \cdot \tan B + \tan A \cdot \cot B}{\sin A \cdot \sec B} - \frac{\sin^2 B}{\cos^2 A}} = ?$

(1) $2\tan A$ (2) $\tan A$

(3) $\tan^2 A$ (4) $2\cot^2 B$

20. $\frac{\sin A - \sin B}{\cos A + \cos B} + \frac{\cos A - \cos B}{\sin A + \sin B} = ?$

(1) 1 (2) $\cos A$

(3) $\sin A$ (4) 0

21. $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1 = ?$

(1) 1 (2) 0

(3) –1 (4) 2

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22. If $\sin\theta + \sin^2\theta + \sin^3\theta = 1$, then, $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = ?$

(1) 2 (2) 3

(3) 4 (4) 0

23. The shadow of a vertical tower increases 10 metre, when the altitude of the sun changes from 45° to 30°. What is the height of tower ? ($\pi = 1.73$)

(1) 12.65 metre (2) 13.65 metre

(3) 14.65 metre (4) 16.65 metre

24. The angle of elevation of an aeroplane from a point A on the ground is 60°. After a straight flight of the plane for 30 seconds, the angle of elevation becomes 30°. If the palne flies at a constant height of $3600\sqrt{3}$ metre, what is the speed of plane ?

(1) 864 kmph (2) 846 kmph

(3) 684 kmph (4) None of these

SHORT ANSWERS

1. (4)	2. (4)	3. (2)	4. (1)
5. (1)	6. (4)	7. (1)	8. (3)
9. (1)	10. (4)	11. (4)	12. (2)
13. (3)	14. (2)	15. (3)	16. (4)
17. (4)	18. (2)	19. (2)	20. (4)
21. (2)	22. (3)	23. (2)	24. (1)

EXPLANATIONS

1. (4) $\sec\theta + \tan\theta = \sqrt{2}$ ....(i)

$\because \sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\Rightarrow \sec\theta - \tan\theta = \dfrac{1}{\sqrt{2}}$ ....(ii)

On adding (i) and (ii),

$2\sec\theta = \sqrt{2} + \dfrac{1}{\sqrt{2}}$

$\Rightarrow \sec\theta = \dfrac{3}{2\sqrt{2}}$

On subtracting equation (ii) from (i),

$2\tan\theta = \sqrt{2} - \dfrac{1}{\sqrt{2}} = \dfrac{1}{\sqrt{2}}$

$\Rightarrow \tan\theta = \dfrac{1}{2\sqrt{2}}$

$\therefore \sin\theta = \dfrac{\tan\theta}{\sec\theta} = \dfrac{\frac{1}{2\sqrt{2}}}{\frac{3}{2\sqrt{2}}} = \dfrac{1}{3}$

2. (4) $\sin A = \dfrac{3}{5}$

$\therefore \cos A = \sqrt{1-\sin^2 A}$

$= \sqrt{1-\dfrac{9}{25}}$

$= \sqrt{\dfrac{25-9}{25}} = \sqrt{\dfrac{16}{25}} = \dfrac{4}{5}$

$\cos B = \dfrac{12}{13}$

$\sin B = \sqrt{1-\cos^2 B} = \sqrt{1-\left(\dfrac{12}{13}\right)^2}$

$= \sqrt{1-\dfrac{144}{169}} = \sqrt{\dfrac{169-144}{169}} = \sqrt{\dfrac{25}{169}} = \dfrac{5}{13}$

$\therefore \tan A = \dfrac{\sin A}{\cos A} = \dfrac{\frac{3}{5}}{\frac{4}{5}} = \dfrac{3}{4}$

$\tan B = \dfrac{\sin B}{\cos B} = \dfrac{\frac{5}{13}}{\frac{12}{13}} = \dfrac{5}{12}$

$\therefore \dfrac{\tan A - \tan B}{1 + \tan A.\tan B} = \dfrac{\frac{3}{4} - \frac{5}{12}}{1 + \frac{3}{4}\cdot\frac{5}{12}}$

$= \dfrac{\frac{9-5}{12}}{1+\frac{5}{16}}$

$= \dfrac{\frac{1}{3}}{\frac{21}{16}} = \dfrac{1}{3} \times \dfrac{16}{21} = \dfrac{16}{63}$

3. (2) $\sin 89° = \sin(90° - 1°)$

$= \cos 1°$

$\sin 87° = \sin(90° - 3°)$

$= \cos 3°$

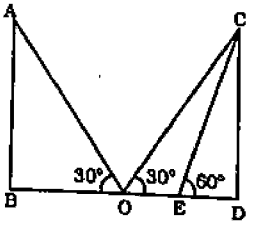
$\therefore \sin^2 1° + \sin^2 3° + ... + \sin^2 45° + ... + \sin^2 87° + \sin^2 89°$

$= (\sin^2 1° + \sin^2 89°) + (\sin^2 3° + \sin^2 87°) + ... \text{ to 22 terms} + \sin^2 45°$

$= (\sin^2 1° + \cos^2 1°) + (\sin^2 3° + \cos^2 3°) + ... \text{ to 22 terms} + \dfrac{1}{2}$

$= 22 + \dfrac{1}{2} = 22\dfrac{1}{2}$

4. (1)



AB = CD = pole = h metre

BO = OD = x metre

OE = 40 metre

ED = $(x - 40)$ metre

In Δ OCD,

$\tan 30° = \dfrac{CD}{OD}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{h}{x}$

$\Rightarrow \sqrt{3}h = x$ ....(i)

In Δ CDE,

$\tan 60° = \dfrac{CD}{DE}$

$\Rightarrow \sqrt{3} = \dfrac{h}{x-40}$

$\Rightarrow \sqrt{3}(x-40) = h$

$\Rightarrow \sqrt{3}(x-40) = \dfrac{x}{\sqrt{3}}$

$\Rightarrow 3(x-40) = x$

$\Rightarrow 3x - 120 = x$

$\Rightarrow 2x = 120 \Rightarrow x = 60$

$\therefore$ BD = $2 \times 60 = 120$ metre

5. (1) $a\sin\alpha = b\cos\alpha$

$\Rightarrow a^2\sin^2\alpha = b^2\cos^2\alpha$

$\Rightarrow a^2\sin^2\alpha = b^2(1 - \sin^2\alpha)$

$\Rightarrow a^2\sin^2\alpha + b^2\sin^2\alpha = b^2$

$\Rightarrow \sin^2\alpha(a^2 + b^2) = b^2$

$\Rightarrow \sin^2\alpha = \dfrac{b^2}{a^2+b^2}$

$\Rightarrow \sin\alpha = \dfrac{b}{\sqrt{a^2+b^2}}$

Again,

$a^2\sin^2\alpha = b^2\cos^2\alpha$

$\Rightarrow a^2(1 - \cos^2\alpha) = b^2\cos^2\alpha$

$\Rightarrow a^2 = (a^2 + b^2)\cos^2\alpha$

$\Rightarrow \cos^2\alpha = \dfrac{a^2}{a^2+b^2}$

$\Rightarrow \cos\alpha = \dfrac{a}{\sqrt{a^2+b^2}}$

6. (4) $3(\sin x - \cos x)^4$

$= 3(\sin^2 x + \cos^2 x - 2\sin x.\cos x)^2$

$= 3(1 - 2\sin x.\cos x)^2$

$= 3(1 + 4\sin^2 x.\cos^2 x - 4\sin x.\cos x)$

$4(\sin^6 x + \cos^6 x)$

$= 4[(\sin^2 x + \cos^2 x)^3 - 3\sin^2 x.\cos^2 x(\sin^2 x + \cos^2 x)]$

$[a^3 + b^3 = (a+b)^3 - 3ab(a+b)]$

$= 4(1 - 3\sin^2 x.\cos^2 x)$

$= 6(\sin x + \cos x)^2$

$= 6(\sin^2 x + \cos^2 x + 2\sin x.\cos x)$

$= 6(1 + 2\sin x.\cos x)$

$\therefore$ Expression

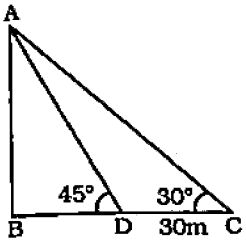
$= 3(1 + 4\sin^2 x.\cos^2 x - 4\sin x.\cos x) + 4(1 - 3\sin^2 x.\cos^2 x) + 6(1 + 2\sin x.\cos x)$

$= 3 + 4 + 6 = 13$

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7. (1) $3\cos\theta + 4\sin\theta = 5$
Dividing by $\cos\theta$,
$3 + 4\tan\theta = 5\sec\theta$
On squaring,
$9 + 16\tan^2\theta + 24\tan\theta = 25(1+\tan^2\theta)$
$\Rightarrow 9\tan^2\theta - 24\tan\theta + 16 = 0$
$\Rightarrow (3\tan\theta - 4)^2 = 0$
$\Rightarrow 3\tan\theta = 4$
$\Rightarrow \tan\theta = \frac{4}{3}$

8. (3)



AB = tower = h metre
$BD = x$ metre
From ΔABC,
$\tan 30° = \frac{AB}{BC}$
$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+30}$
$\Rightarrow \sqrt{3}h = x + 30$ ....(i)
From ΔABD,
$\tan 45° = \frac{AB}{BD}$
$\Rightarrow h = x$ .....(ii)
From equation (i)
$\Rightarrow \sqrt{3}h = h + 30$
$\Rightarrow (\sqrt{3}-1)h = 30$
$\Rightarrow h = \frac{30}{\sqrt{3}-1} = \frac{30}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$
$= \frac{30(\sqrt{3}+1)}{2} = 15(\sqrt{3}+1)$ metre

9. (1) $\tan\theta = \frac{a}{b}$.
Expression
$= \frac{a\sin^3\theta - b\cos^3\theta}{a\sin^3\theta + b\cos^3\theta}$
Dividing numerator and denominator by $\cos^3\theta$,
$= \frac{a\tan^3\theta - b}{a\tan^3\theta + b} = \frac{a \times \frac{a^3}{b^3} - b}{a \times \frac{a^3}{b^3} + b}$
$= \frac{a^4 - b^4}{a^4 + b^4}$

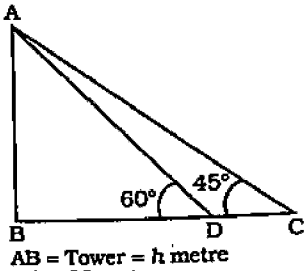
10. (4)
$\tan^2\theta - \sqrt{3}\tan\theta - \tan\theta + \sqrt{3} = 0$
$= \tan\theta(\tan\theta - \sqrt{3}) - 1(\tan\theta - \sqrt{3}) = 0$
$= (\tan\theta - 1)(\tan\theta - \sqrt{3}) = 0$
$= \tan\theta = 1 = \tan 45°$
$= \theta = 45°$
Again,
$\tan\theta - \sqrt{3} = 0$
$\Rightarrow \tan\theta = \sqrt{3} = \tan 60°$
$\Rightarrow \theta = 60°$.

11. (4) $4x^2 - 4x\sec\theta + 1 = 0$
$= 4x\sec\theta = 4x^2 + 1$
$= \sec\theta = \frac{4x^2+1}{4x}$
$\therefore \tan\theta = \sqrt{\sec^2\theta - 1}$
$= \sqrt{\left(\frac{(4x^2+1)}{4x}\right)^2 - 1}$
$= \sqrt{\frac{16x^4 + 8x^2 + 1 - 16x^2}{16x^2}}$
$= \pm\frac{4x^2-1}{4x}$
$\therefore \sec\theta + \tan\theta$
$= \frac{4x^2+1}{4x} + \frac{4x^2-1}{4x}$
$= \frac{4x^2+1+4x^2-1}{4x} = \frac{8x^2}{4x}$
$= 2x$
or, $\sec\theta + \tan\theta$
$= \frac{4x^2+1}{4x} - \frac{4x^2-1}{4x}$
$= \frac{4x^2+1-4x^2+1}{4x}$
$= \frac{2}{4x} = \frac{1}{2x}$

12. (2) $\cos\theta + \sec\theta = 2$
$\Rightarrow \cos\theta + \frac{1}{\cos\theta} = 2$
$\Rightarrow \cos^2\theta - 2\cos\theta + 1 = 0$
$\Rightarrow (\cos\theta - 1)^2 = 0$
$\Rightarrow \cos\theta = 1$
$\therefore \cos^5\theta + \sec^5\theta = 1 + 1 = 2$

13. (3) $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$ ..(i)
$\cos\theta + \sin\theta = x$ ....(ii)
On squaring both the equations and adding,
$2(\cos^2\theta + \sin^2\theta) = 2\sin^2\theta + x^2$
$\Rightarrow x^2 = 2 - 2\sin^2\theta = 2(1 - \sin^2\theta)$
$= 2\cos^2\theta$
$\Rightarrow x = \sqrt{2}\cos\theta$

14. (2)



AB = Tower = h metre
DC = 30 metre
$BD = x$ metre
From ΔABC,
$\tan 45° = \frac{AB}{BC} \Rightarrow 1 = \frac{h}{x+30}$
$\Rightarrow h = x + 30$ .....(i)
From ΔABD,
$\tan 60° = \frac{AB}{BD} \Rightarrow \sqrt{3} = \frac{h}{x}$
$h = \sqrt{3}x$
$\Rightarrow x = \frac{h}{\sqrt{3}}$ ...(ii)
$\therefore h = x + 30$
$\Rightarrow h = \frac{h}{\sqrt{3}} + 30$
$\Rightarrow (\sqrt{3}-1)h = 30\sqrt{3}$
$\Rightarrow h = \frac{30\sqrt{3}}{\sqrt{3}-1}$
$= \frac{30\sqrt{3}(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$
$= 15(3+\sqrt{3})$ metre

15. (3) $\frac{\sec 39°}{\sec(90°-51°)} + \frac{2}{\sqrt{3}}\tan 17° \cdot \tan 38° \cdot \tan 60° \cdot \cot(90° - 52°) \cdot \cot(90° - 73°) - 3(\sin^2 31° + \cos^2(90° - 59°)$
$= \frac{\sec 39°}{\sec 39°} + \frac{2}{\sqrt{3}} \cdot \tan 17° \cdot \tan 38° \times \sqrt{3} \cdot \cot 38° \cdot \cot 17° - 3(\sin^2 31° + \cos^2 31°)$
$= 1 + \frac{2}{\sqrt{3}} \times \sqrt{3}(\tan 17° \cdot \cot 17°) \cdot (\tan 38° \cdot \cot 38°) - 3 \times 1$
$= 1 + 2 - 3 = 0$
$\tan\theta \cdot \cot\theta = 1$

[$\tan(90° - \theta) = \cot\theta$;
$\cot(90° - \theta) = \tan\theta$;
$\sec(90° - \theta) = \operatorname{cosec}\theta$]

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16. (4) $(m^2 + n^2)\cos^2\beta$

$$= \left(\frac{\cos^2\alpha}{\cos^2\beta} + \frac{\cos^2\alpha}{\sin^2\beta}\right)\cos^2\beta$$

$$= \left(\frac{\cos^2\alpha.\sin^2\beta + \cos^2\alpha.\cos^2\beta}{\cos^2\beta.\sin^2\beta}\right)\cos^2\beta$$

$$= \cos^2\alpha.\cos^2\beta\left(\frac{\sin^2\beta + \cos^2\beta}{\cos^2\beta.\sin^2\beta}\right)$$

$$= \frac{\cos^2\alpha}{\sin^2\beta} = \left(\frac{\cos\alpha}{\sin\beta}\right)^2 = n^2$$

17. (4) $\sin(\alpha + \beta - \gamma) = \frac{1}{2}$,

$\cos(\beta + \gamma - \alpha) = \frac{1}{2}$

and $\tan(\gamma + \alpha - \beta) = 1$

$\Rightarrow \sin(\alpha + \beta - \gamma) = \sin 30°$,

$\cos(\beta + \gamma - \alpha) = \cos 60°$ and $\tan(\gamma + \alpha - \beta) = \tan 45°$

$\Rightarrow \alpha + \beta - \gamma = 30°$ .....(i)

$\beta + \gamma - \alpha = 60°$ .....(ii)

$\gamma + \alpha - \beta = 45°$ .....(iii)

By equations (i) + (ii) and equations (i) + (iii).

$2\beta = 90°$ and $2\alpha = 75°$

$\Rightarrow \beta = 45°$ and $2\alpha = 75°$

$\Rightarrow 2\alpha + \beta = 75° + 45° = 120°$

18. (2)

$$\frac{\tan^2 60° + 4\cos^2 45° + 3\sec^2 30° + 5\cos^2 90°}{\operatorname{cosec} 30° + \sec 60° - \cot^2 30°}$$

$$= \frac{(\sqrt{3})^2 + 4\times\left(\frac{1}{\sqrt{2}}\right)^2 + 3\left(\frac{2}{\sqrt{3}}\right)^2 + 5\times 0}{2 + 2 - (\sqrt{3})^2}$$

$$= \frac{3 + 4\times\frac{1}{2} + \frac{3\times 4}{3} + 0}{4 - 3}$$

$= 3 + 2 + 4 = 9$

19. (2) $A + B = 90° \Rightarrow B = 90° - A$

$$\therefore \sqrt{\frac{\tan A.\tan B + \tan A.\cot B}{\sin A.\sec B} - \frac{\sin^2 A}{\cos^2 A}}$$

$$= \sqrt{\frac{\tan A\tan(90°-A) + \tan A.\cot(90°-A)}{\sin A\sec(90°-A)} - \frac{\sin^2(90°-A)}{\cos^2 A}}$$

$$= \sqrt{\frac{\tan A.\cot A + \tan A.\tan A}{\sin A.\operatorname{cosec} A} - \frac{\cos^2 A}{\cos^2 A}}$$

$$= \sqrt{1 + \tan^2 A - 1} = \sqrt{\tan^2 A} = \tan A$$

20. (4) $\frac{\sin A - \sin B}{\cos A + \cos B} + \frac{\cos A - \cos B}{\sin A + \sin B}$

$$= \frac{(\sin A - \sin B)(\sin A + \sin B) + (\cos A + \cos B)(\cos A - \cos B)}{(\cos A + \cos B)(\sin A + \sin B)}$$

$$= \frac{\sin^2 A - \sin^2 B + \cos^2 A - \cos^2 B}{(\cos A + \cos B)(\sin A + \sin B)}$$

$$= \frac{(\sin^2 A + \cos^2 A) - (\sin^2 B + \cos^2 B)}{(\cos A + \cos B)(\sin A + \sin B)}$$

$$= \frac{1 - 1}{(\cos A + \cos B)(\sin A + \sin B)}$$

$= 0$

21. (2) $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1$

$= 2[(\sin^2\theta)^3 + (\cos^2\theta)^3] - 3[(\sin^2\theta)^2 + (\cos^2\theta)^2] + 1$

$= 2(\sin^2\theta + \cos^2\theta)(\sin^4\theta + \cos^4\theta - \sin^2\theta.\cos^2\theta) - 3[(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta.\cos^2\theta] + 1$

$[\because a^3 + b^3 = (a + b)(a^2 - ab + b^2)$; $a^2 + b^2 = (a + b)^2 - 2ab]$

$= 2\sin^4\theta + 2\cos^4\theta - 2\sin^2\theta.\cos^2\theta - 3 + 6\sin^2\theta.\cos^2\theta + 1$

$= 2[(\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta.\cos^2\theta] - 3 + 4\sin^2\theta.\cos^2\theta + 1$

$= 2 - 4\sin^2\theta.\cos^2\theta - 3 + 4\sin^2\theta\cos^2\theta + 1$

$= 2 - 3 + 1 = 0$

22. (3) $\sin\theta + \sin^2\theta + \sin^3\theta = 1$

$\Rightarrow \sin\theta + \sin^3\theta = 1 - \sin^2\theta$

$\Rightarrow \sin\theta(1 + \sin^2\theta) = \cos^2\theta$

$\Rightarrow \sin^2\theta(1 + \sin^2\theta)^2 = \cos^4\theta$

$\Rightarrow (1 - \cos^2\theta)[1 + (1 - \cos^2\theta)]^2 = \cos^4\theta$

$\Rightarrow (1 - \cos^2\theta)(2 - \cos^2\theta)^2 = \cos^4\theta$

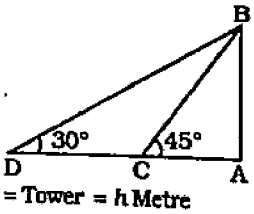
$\Rightarrow (1 - \cos^2\theta)(4 - 4\cos^2\theta + \cos^4\theta) = \cos^4\theta$

$\Rightarrow 4 - 4\cos^2\theta + \cos^4\theta - 4\cos^2\theta + 4\cos^4\theta - \cos^6\theta = \cos^4\theta$

$\Rightarrow -\cos^6\theta + 4\cos^4\theta - 8\cos^2\theta + 4 = 0$

$\Rightarrow \cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = 4$

23. (2)



AB = Tower = h Metre

CD = 10 metre, AC = x metre (let)

$\angle BCA = 45°$, $\angle BDA = 30°$

In ΔACB,

$\tan 45° = \frac{AB}{AC}$

$\Rightarrow 1 = \frac{h}{x}$

$\Rightarrow h = x$ —(i)

In ΔDAB,

$\tan 30° = \frac{AB}{AD}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x + 10}$

$\Rightarrow x + 10 = \sqrt{3}h$

$\Rightarrow h + 10 = \sqrt{3}h$

$\Rightarrow h(\sqrt{3} - 1) = 10$

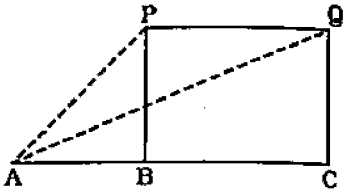
$\Rightarrow h = \frac{10}{\sqrt{3} - 1}$

$= \frac{10}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1}$

$= \frac{10(\sqrt{3} + 1)}{2} = 5(1.73 + 1)$

$= 13.65$ metre

24. (1)



P and Q = Positions of plane

$\angle PAB = 60°$, $\angle QAB = 30°$, PB = $3600\sqrt{3}$ metre

In ΔABP,

$\tan 60° = \frac{BP}{AB}$

$\Rightarrow \sqrt{3} = \frac{3600\sqrt{3}}{AB}$

$\Rightarrow AB = 3600$ metre

In ΔACQ,

$\tan 30° = \frac{CQ}{AC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{3600\sqrt{3}}{AC}$

$\Rightarrow AC = 3600 \times 3$

$= 10800$ metre

$\therefore PQ = BC = AC - AB$

$= 10800 - 3600$

$= 7200$ metre

This distance is covered in 30 seconds.

$\therefore$ Speed of plane $= \frac{7200}{30}$

$= 240$ m/sec.

$= \left(240 \times \frac{18}{5}\right)$ kmph

$= 864$ kmph

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19 GEOMETRY

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. The in-radius of an equilateral triangle is of length 3 cm. Then the length of each of its medians is

(1) 12 cm (2) $\frac{9}{2}$ cm

(3) 4 cm (4) 9 cm

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

2. If the orthocentre and the centroid of a triangle are the same, then the triangle is :
(1) Scalene
(2) Right angled
(3) Equilateral
(4) Obtuse angled

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

3. If in a triangle, the circumcentre, incentre, centroid and orthocentre coincide, then the triangle is
(1) Acute angled (2) Isosceles
(3) Right angled (4) Equilateral

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

4. In a triangle, if three altitudes are equal, then the triangle is
(1) Obtuse (2) Equilateral
(3) Right (4) Isosceles

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

5. If ABC is an equilateral triangle and D is a point on BC such that AD ⊥ BC, then
(1) AB : BD = 1 : 1
(2) AB : BD = 1 : 2
(3) AB : BD = 2 : 1
(4) AB : BD = 3 : 2

(SSC Graduate Level Tier-II Exam. 29.09.2013

6. The side QR of an equilateral triangle PQR is produced to the point S in such a way that QR = RS and P is joined to S. Then the measure of ∠PSR is
(1) 30° (2) 15°
(3) 60° (4) 45°

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

7. If the circumradius of an equilateral triangle be 10 cm, then the measure of its in-radius is
(1) 5 cm. (2) 10 cm.
(3) 20 cm. (4) 15 cm.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

8. If the incentre of an equilateral triangle lies inside the triangle and its radius is 3 cm, then the side of the equilateral triangle is
(1) $9\sqrt{3}$ cm (2) $6\sqrt{3}$ cm
(3) $3\sqrt{3}$ cm (4) 6 cm

(SSC Graduate Level Tier-II Exam.16.09.2012)

9. In a triangle, if orthocentre, circumcentre, incentre and centroid coincide, then the triangle must be
(1) obtuse angled
(2) isosceles
(3) equilateral
(4) right-angled

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

10. If ABC is an equilateral triangle and P, Q, R respectively denote the middle points of AB, BC, CA then.
(1) PQR must be an equilateral triangle
(2) PQ + QR + PR = AB
(3) PQ + QR + PR = 2 AB
(4) PQR must be a right angled triangle

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

11. Let ABC be an equilateral triangle and AX, BY, CZ be the altitudes. Then the right statement out of the four given responses is
(1) AX = BY = CZ
(2) AX ≠ BY = CZ
(3) AX = BY ≠ CZ
(4) AX ≠ BY ≠ CZ

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

12. ABC is an equilateral triangle and CD is the internal bisector of ∠C. If DC is produced to E such that AC = CE, then ∠CAE is equal to
(1) 45° (2) 75°
(3) 30° (4) 15°

(SSC CGL Tier-I Exam. 26.10.2014)

13. G is the centroid of the equilateral Δ ABC. If AB = 10 cm then length of AG is
(1) $\frac{5\sqrt{3}}{3}$ cm (2) $\frac{10\sqrt{3}}{3}$ cm
(3) $5\sqrt{3}$ cm (4) $10\sqrt{3}$ cm

(SSC CGL Tier-II Exam. 21.09.2014)

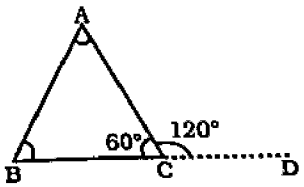
14. The radius of the incircle of the equilateral triangle having each side 6 cm is
(1) $2\sqrt{3}$ cm (2) $\sqrt{3}$ cm
(3) $6\sqrt{3}$ cm (4) 2 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

15. If the three medians of a triangle are same then the triangle is
(1) equilateral (2) isosceles
(3) right-angled (4) obtuse-angle

(SSC CHSL DEO & LDC Exam. 9.11.2014)

16. If in a triangle ABC as drawn in the figure, AB = AC and ∠ACD = 120°, then ∠A is equal to



(1) 50° (2) 60°
(3) 70° (4) 80°

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

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17. The side BC of a triangle ABC is extended to D. If $\angle ACD = 120°$ and $\angle ABC = \frac{1}{2}\angle CAB$, then the value of $\angle ABC$ is
(1) 80° (2) 40°
(3) 60° (4) 20°
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

18. For an equilateral triangle, the ratio of the in-radius and the ex-radius is
(1) 1 : 2 (2) 1 : $\sqrt{2}$
(3) 1 : 3 (4) 1 : $\sqrt{3}$
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

19. If the three angles of a triangle are :
$(x + 15°)$, $\left(\frac{6x}{5} + 6°\right)$ and $\left(\frac{2x}{3} + 30°\right)$, then the triangle is :
(1) isosceles (2) right angled
(3) equilateral (4) scalene
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

20. Let ABC be an equilateral triangle and AD perpendicular to BC. Then
$AB^2 + BC^2 + CA^2 = ?$
(1) $2AD^2$ (2) $3AD^2$
(3) $4AD^2$ (4) $5AD^2$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

21. The centroid of an equilateral triangle ABC is G and AB = 10 cm. The length of AG (in cm) is :
(1) $3\frac{1}{3}$ (2) $\frac{10}{\sqrt{3}}$
(3) $\frac{10\sqrt{3}}{3}$ (4) $\frac{\sqrt{3}}{3}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

22. Let AX ⊥ BC of an equilateral triangle ABC. Then the sum of the perpendicular distances of the sides of ΔABC from any point inside the triangle is :
(1) Equal to BC
(2) Equal to AX
(3) Less than AX
(4) Greater than AX
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE–II

1. If ΔABC is an isosceles triangle with $\angle C = 90°$ and AC = 5 cm, then AB is :
(1) 5 cm (2) 10 cm
(3) $5\sqrt{2}$ cm (4) 2.5 cm
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

2. ABC is an isosceles triangle such that AB = AC and $\angle B = 35°$. AD is the median to the base BC. Then $\angle BAD$ is:
(1) 70° (2) 35°
(3) 110° (4) 55°
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

3. ABC is an isosceles triangle with AB = AC. A circle through B touching AC at the middle point intersects AB at P. Then AP : AB is :
(1) 4 : 1 (2) 2 : 3
(3) 3 : 5 (4) 1 : 4
(SSC Graduate Level Tier-I Exam. 21.04.2013)

4. In an isosceles triangle, if the unequal angle is twice the sum of the equal angles, then each equal angle is
(1) 120° (2) 60°
(3) 30° (4) 90°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

5. Δ ABC is an isosceles triangle and $\overline{AB} = \overline{AC} = 2a$ unit, $\overline{BC} = a$ unit. Draw $\overline{AD} \perp \overline{BC}$, and find the length of $\overline{AD}$.
(1) $\sqrt{15}\,a$ unit (2) $\frac{\sqrt{15}}{2}a$ unit
(3) $\sqrt{17}\,a$ unit (4) $\frac{\sqrt{17}}{2}a$ unit
(SSC Graduate Level Tier-II Exam. 29.09.2013

6. An isosceles triangle ABC is right-angled at B. D is a point inside the triangle ABC. P and Q are the feet of the perpendiculars drawn from D on the side AB and AC respectively of Δ ABC. If AP = a cm, AQ = b cm and $\angle BAD = 15°$, sin 75° =
(1) $\frac{2b}{\sqrt{3}\,a}$ (2) $\frac{a}{2b}$
(3) $\frac{\sqrt{3}a}{2b}$ (4) $\frac{2a}{\sqrt{3}\,b}$
(SSC Graduate Level Tier-II Exam. 29.09.2013

7. ABC is an isosceles triangle with AB = AC. The side BA is produced to D such that AB = AD. If $\angle ABC = 30°$, then $\angle BCD$ is equal to
(1) 45° (2) 90°
(3) 30° (4) 60°
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

8. In a triangle ABC, AB = AC, $\angle BAC = 40°$ Then the external angle at B is :
(1) 90° (2) 70°
(3) 110° (4) 80°
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

9. If Δ FGH is isosceles and FG < 3 cm, GH = 8 cm, then of the following, the true relation is,
(1) GH = FH (2) GF = GH
(3) FH > GH (4) GH < GF
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

10. If angle bisector of a triangle bisect the opposite side, then what type of triangle is it ?
(1) Right angled (2) Scalene
(3) Similar (4) Isosceles
(SSC CGL Tier-I Exam, 19.10.2014 (Ist Sitting)

11. ABC is an isosceles triangle such that AB = AC and AD is the median to the base BC with $\angle ABC = 35°$. Then $\angle BAD$ is
(1) 35° (2) 55°
(3) 70° (4) 110°
(SSC CGL Tier-II Exam. 21.09.2014)

12. In Δ ABC, BD and CE are perpendicular to AC and AB respectively. If BD = CE, then Δ ABC is
(1) Equilateral (2) Isosceles
(3) Right-angled (4) Scalene
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

13. In an isosceles triangle, if the vertex angle is twice the sum of the base angles, then the measure of the half of the vertex angle of the triangle is
(1) 60° (2) 70°
(3) 80° (4) 50°
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

14. ΔABC is an isosceles triangle with AB = AC = 10 cm, AD = 8 cm is the median on BC from A. The length of BC is
(1) 8 cm (2) 12 cm
(3) 10 cm (4) 6 cm
(SSC CGL Tier-I Re-Exam, 30.08.2015

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TYPE–III

1. The sides of a triangle are in the ratio 3 : 4 : 6. The triangle is :
(1) acute-angled
(2) right-angled
(3) obtuse-angled
(4) either acute-angled or right-angled
(SSC CPO Sub-Inspector Exam. 16.12.2007)

2. O and C are respectively the orthocentre and circumcentre of an acute-angled triangle PQR. The points P and O are joined and produced to meet the side QR at S. If $\angle PQS = 60°$ and $\angle QCR = 130°$, then $\angle RPS =$
(1) 30° (2) 35°
(3) 100° (4) 60°
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

3. In Δ ABC, AD is the internal bisector of ∠A, meeting the side BC at D. If BD = 5 cm, BC = 7.5 cm, then AB : AC is
(1) 2 : 1 (2) 1 : 2
(3) 4 : 5 (4) 3 : 5
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

4. If the circumcentre of a triangle lies outside it, then the triangle is
(1) Equilateral
(2) Acute angled
(3) Right angled
(4) Obtuse angled
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

5. Taking any three of the line segments out of segments of length 2 cm, 3 cm, 5 cm and 6 cm, the number of triangles that can be formed is :
(1) 3 (2) 2
(3) 1 (4) 4
(SSC Graduate Level Tier-I Exam. 21.04.2013)

6. If the length of the sides of a triangle are in the ratio 4 : 5 : 6 and the inradius of the triangle is 3 cm, then the altitude of the triangle corresponding to the largest side as base is :
(1) 7.5 cm (2) 6 cm
(3) 10cm (4) 8 cm
(SSC Graduate Level Tier-I Exam. 21.04.2013)

7. ABC is a triangle. The bisectors of the internal angle ∠B and external angle ∠C intersect at D. If ∠BDC= 50°, then ∠A is
(1) 100° (2) 90°
(3) 120° (4) 60°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

8. In a triangle ABC, the side BC is extended up to D. Such that CD = AC, if ∠BAD = 109° and ∠ACB = 72° then the value of ∠ABC is
(1) 35° (2) 60°
(3) 40° (4) 45°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

9. The sum of three altitudes of a triangle is
(1) equal to the sum of three sides
(2) less than the sum of sides
(3) greater than the sum of sides
(4) twice the sum of sides
(SSC Graduate Level Tier-I Exam. 19.05.2013)

10. I is the incentre of Δ ABC, ∠ABC = 60° and ∠ACB = 50°. Then ∠ BIC is :
(1) 55° (2) 125°
(3) 70° (4) 65°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

11. I is the incentre of a triangle ABC. If ∠ABC = 65° and ∠ACB = 55°, then the value of ∠BIC is
(1) 130° (2) 120°
(3) 140° (4) 110°
(SSC Graduate Level Tier-II Exam.16.09.2012)

12. If two angles of a triangle are 21° and 38°, then the triangle is
(1) Right-angled triangle
(2) Acute-angled triangle
(3) Obtuse-angled triangle
(4) Isosceles triangle
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

13. In ΔABC, ∠C is an obtuse angle. The bisectors of the exterior angles at A and B meet BC and AC produced at D and E respectively. If AB = AD = BE, then ∠ACB =
(1) 105° (2) 108°
(3) 110° (4) 135°
(SSC CGL Tier-I Exam. 19.10.2014)

14. A man goes 24 m due west and then 10 m due north. Then the distance of him from the starting point is
(1) 17 m (2) 26 m
(3) 28 m (4) 34 m
(SSC CGL Tier-II Exam. 21.09.2014)

15. The perpendiculars drawn from the vertices to the opposite sides of a triangle, meet at the point whose name is
(1) incentre
(2) circumcentre
(3) centroid
(4) orthocentre
(SSC CHSL DEO & LDC Exam. 20.10.2013)

16. If in Δ ABC, ∠ABC = 5 ∠ACB and ∠BAC = 3 ∠ACB, then ∠ABC = ?
(1) 130° (2) 80°
(3) 100° (4) 120°
(SSC CHSL DEO & LDC Exam. 20.10.2013)

17. The exterior angles obtained on producing the base BC of a triangle ABC in both ways are 120° and 105°, then the vertical ∠A of the triangle is of measure
(1) 36° (2) 40°
(3) 45° (4) 55°
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

18. If AD, BE and CF are medians of ΔABC, then which one of the following statements is correct ?
(1) (AD + BE + CF) < AB + BC + CA
(2) AD+BE + CF > AB + BC + CA
(3) AD+BE + CF = AB + BC + CA
(4) AD+BE+CF= $\sqrt{2}$ (AB+BC+ CA)
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

19. In ΔABC, the internal bisectors of ∠ABC and ∠ACB meet at I and ∠BAC = 50°. The measure of ∠BIC is
(1) 105° (2) 115°
(3) 125° (4) 130°
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

20. AD is the median of a triangle ABC and O is the centroid such that AO = 10 cm. The length of OD (in cm) is
(1) 4 (2) 5
(3) 6 (4) 8
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)



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21. O is the incentre of ΔABC and $\angle A = 30°$, then $\angle BOC$ is
(1) 100° (2) 105°
(3) 110° (4) 90°
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

22. Let O be the in-centre of a triangle ABC and D be a point on the side BC of ΔABC, such that $OD \perp BC$. If $\angle BOD = 15°$, then $\angle ABC =$
(1) 75° (2) 45°
(3) 150° (4) 90°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

23. In a triangle ABC, incentre is O and $\angle BOC = 110°$, then the measure of $\angle BAC$ is :
(1) 20° (2) 40°
(3) 55° (4) 110°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. The equidistant point from the vertices of a triangle is called its :
(1) Centroid (2) Incentre
(3) Circumcentre (4) Orthocentre
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

25. O is the in-centre of the ΔABC, if $\angle BOC = 116°$, then $\angle BAC$ is
(1) 42° (2) 62°
(3) 58° (4) 52°
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

26. The external bisector of $\angle B$ and $\angle C$ of ΔABC (where AB and AC extended to E and F respectively) meet at point P. If $\angle BAC = 100°$, then the measure of $\angle BPC$ is
(1) 50° (2) 80°
(3) 40° (4) 100°
FCI Assistant Grade-III Exam. 25.03.2012 (Paper-I) North Zone (Ist Sitting)

27. The points D and E are taken on the sides AB and AC of ΔABC such that $AD = \frac{1}{3}AB$, $AE = \frac{1}{3}AC$. If the length of BC is 15 cm, then the length of DE is :
(1) 10 cm (2) 8 cm
(3) 6 cm (4) 5 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

28. D is any point on side AC of ΔABC. If P, Q, X, Y are the mid-points of AB, BC, AD and DC respectively, then the ratio of PX and QY is
(1) 1 : 2 (2) 1 : 1
(3) 2 : 1 (4) 2 : 3
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

29. In ΔABC, PQ is parallel to BC. If AP : PB = 1 : 2 and AQ = 3 cm; AC is equal to
(1) 6 cm (2) 9 cm
(3) 12 cm (4) 8 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

30. In a triangle ABC, AB + BC = 12 cm, BC + CA = 14 cm and CA + AB = 18 cm. Find the radius of the circle (in cm) which has the same perimeter as the triangle.
(1) $\frac{5}{2}$ (2) $\frac{7}{2}$
(3) $\frac{9}{2}$ (4) $\frac{11}{2}$
(SSC Graduate Level Tier-II Exam.16.09.2012)

31. If I be the incentre of ΔABC and $\angle B = 70°$ and $\angle C = 50°$, then the magnitude of $\angle BIC$ is
(1) 130° (2) 60°
(3) 120° (4) 105°
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

32. For a triangle ABC, D, E, F are the mid-points of its sides. If ΔABC = 24 sq. units then ΔDEF is
(1) 4 sq. units (2) 6 sq. units
(3) 8 sq. units (4) 12 sq. units
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

33. Angle between the internal bisectors of two angles of a triangle $\angle B$ and $\angle C$ is 120°, then $\angle A$ is
(1) 20° (2) 30°
(3) 60° (4) 90°
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

34. BE and CF are two medians of ΔABC and G the centroid. FE cuts AG at O. If OG = 2 cm, then the length of AO is
(1) 2 cm (2) 4 cm
(3) 6 cm (4) 8 cm
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

35. The angles of a triangle are in the ratio 2 : 3 : 7. The measure of the smallest angle is
(1) 30° (2) 60°
(3) 45° (4) 90°
(SSC CGL Tier-I Re-Exam. (2013)

36. In a ΔABC, AB = BC, $\angle B = x°$ and $\angle A = (2x - 20)°$. Then $\angle B$ is
(1) 54° (2) 30°
(3) 40° (4) 44°
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

37. If AD is the median of the triangle ABC and G be the centroid, then the ratio of AG : AD is
(1) 1 : 3 (2) 2 : 1
(3) 3 : 2 (4) 2 : 3
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

38. In a triangle ABC, median is AD and centroid is O. AO = 10 cm. The length of OD (in cm) is
(1) 6 (2) 4
(3) 5 (4) 3.3
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

39. In a ΔABC, $\angle A + \angle B = 118°$, $\angle A + \angle C = 96°$. Find the value of $\angle A$.
(1) 36° (2) 40°
(3) 30° (4) 34°
(SSC CGL Tier-I Exam. 26.10.2014)

40. In ΔABC, if $AD \perp BC$, then $AB^2 + CD^2$ is equal to
(1) $2BD^2$ (2) $BD^2 + AC^2$
(3) $2AC^2$ (4) None of these
(SSC CGL Tier-I Exam. 26.10.2014)

41. In a triangle ABC, $\angle A + \frac{1}{2}\angle B + \angle C = 140°$, then $\angle B$ is
(1) 50° (2) 80°
(3) 40° (4) 60°
(SSC CGL Tier-II Exam. 21.09.2014)

42. In a ΔABC, $\angle A + \angle B = 70°$ and $\angle B + \angle C = 130°$, value of $\angle A$ is
(1) 20° (2) 50°
(3) 110° (4) 30°
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

43. In a ΔABC, if $2\angle A = 3\angle B = 6\angle C$, value of $\angle B$ is
(1) 60° (2) 30°
(3) 45° (4) 90°
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

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44. If in a triangle ABC, D and E are on the sides AB and AC, such that, DE is parallel to BC and $\frac{AD}{BD} = \frac{3}{5}$. If AC = 4 cm, then AE is

(1) 1.5 cm (2) 2.0 cm
(3) 1.8 cm (4) 2.4 cm

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

45. AD is the median of a triangle ABC and O is the centroid such that AO = 10 cm. Length of OD (in cm) is

(1) 2 (2) 4
(3) 5 (4) 7

(SSC CHSL DEO & LDC Exam. 16.11.2014)

46. The measure of the angle between the internal and external bisectors of an angle is

(1) 60° (2) 70°
(3) 80° (4) 90°

(SSC CHSL DEO & LDC Exam. 16.11.2014)

47. The internal bisectors of the angles B and C of a triangle ABC meet at I. If $\angle BIC = \frac{\angle A}{2} + X$, then X is equal to

(1) 60° (2) 30°
(3) 90° (4) 45°

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

48. In a ΔABC, the medians AD, BE and CF meet at G, then which of the following is true ?

(1) $AD + BE + CF > \frac{1}{2}(AB + BC + AC)$
(2) $2(AD + BE + CF) > (AB + BC + AC)$
(3) $3(AD + BE + CF) > 4(AB + BC + AC)$
(4) $AB + BC + AC > AD + BE + CF$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

49. In ΔABC, D is the mid-point of BC. Length AD is 27 cm. N is a point in AD such that the length of DN is 12 cm. The distance of N from the centroid of ΔABC is equal to

(1) 3 cm (2) 6 cm
(3) 9 cm (4) 15 cm

SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

50. In a Δ ABC, $\frac{AB}{AC} = \frac{BD}{DC}$, $\angle B = 70°$ and $\angle C = 50°$, then $\angle BAD = ?$

(1) 60° (2) 20°
(3) 30° (4) 50°

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

51. In a Δ ABC, AD, BE and CF are three medians. The perimeter of Δ ABC is always

(1) equal to $(\overline{AD} + \overline{BE} + \overline{CF})$
(2) greater than $(\overline{AD} + \overline{BE} + \overline{CF})$
(3) less than $(\overline{AD} + \overline{BE} + \overline{CF})$
(4) None of these

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

52. In a Δ ABC, $\overline{AD}$, $\overline{BE}$ and $\overline{CF}$ are three medians. Then the ratio $(\overline{AD} + \overline{BE} + \overline{CF})$: $(\overline{AB} + \overline{AC} + \overline{BC})$ is

(1) equal to $\frac{3}{4}$
(2) less than $\frac{3}{4}$
(3) greater than $\frac{3}{4}$
(4) equal to $\frac{1}{2}$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

53. In ΔABC, $\angle A < \angle B$. The altitude to the base divides vertex angle C into two parts C_1 and C_2, with C_2 adjacent to BC. Then

(1) $C_1 + C_2 = A + B$
(2) $C_1 - C_2 = A - B$
(3) $C_1 - C_2 = B - A$
(4) $C_1 + C_2 = B - A$

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

54. If O is the in-centre of ΔABC; if $\angle BOC = 120°$, then the measure of $\angle BAC$ is

(1) 30° (2) 60°
(3) 150° (4) 75°

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

55. In Δ ABC, $\angle B = 60°$, $\angle C = 40°$, AD is the bisector of $\angle A$ and AE is drawn perpendicular on BC from A. Then the measure of $\angle EAD$ is

(1) 40° (2) 30°
(3) 10° (4) 60°

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

56. If the sides of a triangle are extended in both the sides then the sum of the exterior angles so formed in both sides is

(1) 360° (2) 540°
(3) 720° (4) 180°

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

57. In ΔABC, $\angle A = 90°$, BP and CQ are two medians. Then the value of $\frac{BP^2 + CQ^2}{BC^2}$ is

(1) $\frac{4}{5}$ (2) $\frac{5}{4}$
(3) $\frac{3}{4}$ (4) $\frac{3}{5}$

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

58. In Δ ABC, AB = AC, O is a point on BC such that BO = CO and OD is perpendicular to AB and OE is perpendicular to AC. If $\angle BOD = 30°$ then measure of $\angle AOE$ is

(1) 45° (2) 60°
(3) 75° (4) 30°

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

59. O is the orthocentre of ΔABC. Then $\angle BOC + \angle BAC$ is equal to

(1) 120° (2) 135°
(3) 180° (4) 90°

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

60. ABC is a triangle and the sides AB, BC and CA are produced to E, F and G respectively. If $\angle CBE = \angle ACF = 130°$ then the value of $\angle GAB$ is

(1) 100° (2) 130°
(3) 80° (4) 90°

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

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61. The measures of two angles of a triangle are in the ratio 4 : 5. If the sum of these two measures is equal to the measure of the third angle, find the smallest angle.
(1) 10° (2) 50°
(3) 90° (4) 40°
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

62. Internal bisectors of ∠Q and ∠R of ΔPQR intersect at O. If ∠ROQ = 96° then the vlaue of ∠RPQ is
(1) 36° (2) 24°
(3) 12° (4) 6°
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

63. G is the centroid of ΔABC. The medians AD and BE intersect at right angles. If the lengths of AD and BE are 9 cm and 12 cm respectively; then the length of AB (in cm) is
(1) 9.5 (2) 10
(3) 11 (4) 10.5
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

64. In ΔABC, D and E are two mid points of sides AB and AC respectively. If ∠BAC = 40° and ∠ABC = 65° then ∠CED is :
(1) 130° (2) 75°
(3) 125° (4) 105°
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

65. O is the incentre of ΔPQR and ∠QPR = 50°, then the measure of ∠QOR is :
(1) 125° (2) 100°
(3) 130° (4) 115°
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

66. The internal bisectors of the ∠B and ∠C of the ΔABC, intersect at O. If ∠A = 100°, then the measure of ∠BOC is :
(1) 140° (2) 120°
(3) 110° (4) 130°
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

67. In Δ ABC ∠BAC = 90° and AD ⊥ BC. If BD = 3 cm and CD = 4 cm, then the length of AD is
(1) 3.5 cm (2) 5 cm
(3) $2\sqrt{3}$ cm (4) 6 cm
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

68. AD is perpendicular to the internal bisector of ∠ABC of Δ ABC. DE is drawn through D and parallel to BC to meet AC at E. If the length of AC is 12 cm, then the length of AE (in cm.) is
(1) 3 (2) 8
(3) 4 (4) 6
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

69. What is the position of the circumcentre of an obtuse-angled triangle?
(1) It lies inside the triangle.
(2) It lies outside the triangle.
(3) It is the mid-point of the largest side.
(4) It is the vertex opposite to the largest side.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

70. In ΔABC, the external bisectors of the angles ∠B and ∠C meet at the point O. If ∠A = 70°, then the measure of ∠BOC is :
(1) 55° (2) 75°
(3) 60° (4) 50°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

71. E is the mid-point of the median AD of ΔABC. BE is joined and produced to meet AC at F. F divides AC in the ratio :
(1) 2 : 3 (2) 2 : 1
(3) 1 : 3 (4) 3 : 2
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

72. In Δ ABC, the internal bisectors of ∠B and ∠C meet at point O. If ∠A = 80°, then ∠BOC is equal to :
(1) 100° (2) 120°
(3) 130° (4) 140°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

73. The sides of a triangle are in the ratio of 7 : 9 : 12. The difference between the lengths of largest and smallest sides is 15 cm. The length of the largest side would be :
(1) 36 cm (2) 12 cm
(3) 60 cm (4) 24 cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

74. In ΔABC, $\angle B = 60°$, and $\angle C = 40°$, AD and AE are respectively the bisector of $\angle A$ and perpendicular on BC. The measure of $\angle EAD$ is :
(1) 11° (2) 10°
(3) 12° (4) 9°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

75. The side BC of a triangle ABC is produced to D. If ∠ACD = 112° and $\angle B = \frac{3}{4}\angle A$, then the measure of ∠B is
(1) 30° (2) 48°
(3) 45° (4) 64°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–IV

1. Two medians AD and BE of ΔABC intersect at G at right angles. If AD = 9 cm and BE = 6 cm, then the length of BD (in cm) is
(1) 10 (2) 6
(3) 5 (4) 3
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

2. In ΔABC, $\angle BAC = 90°$ and $AB = \frac{1}{2}BC$. Then the measure of ∠ACB is :
(1) 60° (2) 30°
(3) 45° (4) 15°
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

3. If the length of the three sides of a triangle are 6 cm, 8 cm and 10 cm, then the length of the median to its greatest side is
(1) 8 cm (2) 6 cm
(3) 5 cm (4) 4.8 cm
(SSC Data Entry Operator Exam. 31.08.2008)

4. The length of the three sides of a right angled triangle are $(x-2)$ cm, x cm and $(x+2)$ cm respectively. Then the value of x is
(1) 10 (2) 8
(3) 4 (4) 0
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

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5. Suppose ΔABC be a right-angled triangle where ∠A = 90° and AD ⊥ BC. If Δ ABC = 40 cm², ΔACD = 10 cm² and $\overline{AC}$ = 9 cm, then the length of BC is
(1) 12 cm (2) 18 cm
(3) 4 cm (4) 6 cm
(SSC Graduate Level Tier-II Exam.18.09.2012)

6. In a triangle ABC, ∠BAC = 90° and AD is perpendicular to BC. If AD = 6 cm and BD = 4 cm, then the length of BC is
(1) 8 cm (2) 10 cm
(3) 9 cm (4) 13 cm
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

7. In a right angled ΔABC, ∠ABC = 90°; BN is perpendicular to AC, AB = 6 cm, AC = 10 cm. Then AN : NC is
(1) 3 : 4 (2) 9 :16
(3) 3 : 16 (4) 1 : 4
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

8. For a triangle, base is $6\sqrt{3}$ cm and two base angles are 30° and 60°. Then height of the triangle is
(1) $3\sqrt{3}$ cm (2) 4.5 cm
(3) $4\sqrt{3}$ cm (4) $2\sqrt{3}$ cm
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

9. ABC is a right angled triangle, right angled at C and p is the length of the perpendicular from C on AB. If a, b and c are the length of the sides BC, CA and AB respectively, then
(1) $\frac{1}{p^2} = \frac{1}{b^2} - \frac{1}{a^2}$
(2) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$
(3) $\frac{1}{p^2} + \frac{1}{a^2} = -\frac{1}{b^2}$
(4) $\frac{1}{p^2} = \frac{1}{a^2} - \frac{1}{b^2}$
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

10. In ΔABC, ∠A = 90° and AD ⊥ BC where D lies on BC. If BC = 8 cm, AC = 6 cm, then ΔABC : ΔACD =?
(1) 4 : 3 (2) 25 : 16
(3) 16 : 9 (4) 25 : 9
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

11. If the median drawn on the base of a triangle is half its base, the triangle will be:
(1) right-angled
(2) acute-angled
(3) obtuse-angled
(4) equilateral
(SSC Graduate Level Tier-I Exam. 21.04.2013)

12. In a right-angled triangle ABC, ∠ ABC = 90°, AB = 5 cm and BC = 12 cm. The radius of the circum-circle of the triangle ABC is
(1) 7.5 cm (2) 6 cm
(3) 6.5 cm (4) 7 cm
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

13. In a right-angled triangle, the product of two sides is equal to half of the square of the third side i.e., hypotenuse. One of the acute angle must be
(1) 60° (2) 30°
(3) 45° (4) 15°
(SSC Graduate Level Tier-II Exam. 29.09.2013

14. A point D is taken from the side BC of a right-angled triangle ABC, where AB is hypotenuse. Then
(1) $AB^2 + CD^2 = BC^2 + AD^2$
(2) $CD^2 + BD^2 = 2\,AD^2$
(3) $AB^2 + AC^2 = 2\,AD^2$
(4) $AB^2 = AD^2 + BD^2$
(SSC Graduate Level Tier-II Exam. 29.09.2013

15. D and E are two points on the sides AC and BC respectively of Δ ABC such that DE = 18 cm, CE = 5 cm and ∠DEC = 90°. If tan ∠ABC = 3.6, then AC : CD =
(1) BC : 2 CE (2) 2 CE : BC
(3) 2 BC : CE (4) CE : 2 BC
(SSC Graduate Level Tier-II Exam. 29.09.2013

16. BL and CM are medians of ΔABC right-angled at A and BC = 5 cm. If BL = $\frac{3\sqrt{5}}{2}$ cm, then the length of CM is
(1) $2\sqrt{5}$ cm (2) $5\sqrt{2}$ cm
(3) $10\sqrt{2}$ cm (4) $4\sqrt{5}$ cm
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

17. The ortho centre of a right angled triangle lies
(1) outside the triangle
(2) at the right angular vertex
(3) on its hypotenuse
(4) within the triangle
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

18. If the measures of the sides of triangle are $(x^2 - 1)$, $(x^2 + 1)$ and $2x$ cm, then the triangle would be
(1) equilateral
(2) acute-angled
(3) isosceles
(4) right-angled
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

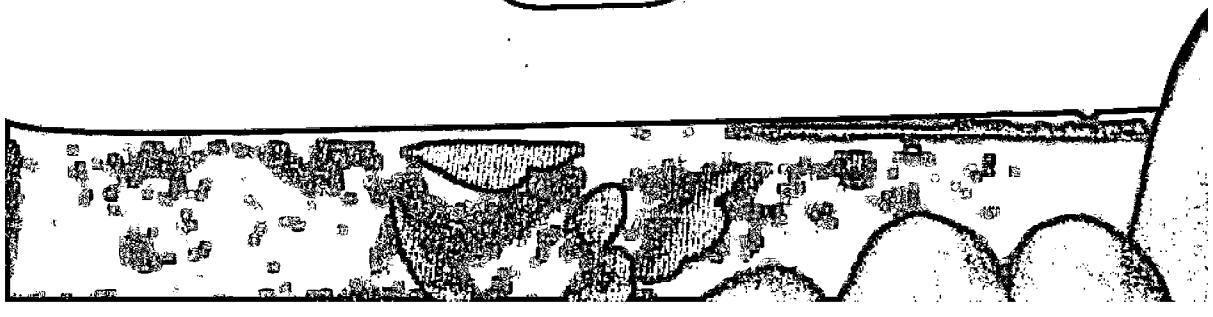
19. If each angle of a triangle is less than the sum of the other two, then the triangle is
(1) obtuse angled
(2) right angled
(3) acute angled
(4) equilateral
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

20. ABC is a right-angled triangle with AB = 6 cm and BC = 8 cm. A circle with centre O has been inscribed inside ΔABC. The radius of the circle is
(1) 1 cm (2) 2 cm
(3) 3 cm (4) 4 cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

21. If the sides of a right angled triangle are three consecutive integers, then the length of the smallest side is
(1) 3 units (2) 2 units
(3) 4 units (4) 5 units
(SSC CHSL DEO & LDC Exam. 9.11.2014)

22. The angle in a semi-circle is
(1) a reflex angle
(2) an obtuse angle
(3) an acute angle
(4) a right angle
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

23. In Δ ABC, ∠BAC = 90° and D is the mid-point of BC. Then which of the following relations is true?
(1) AD = BD = CD
(2) AD = BD = 2CD
(3) AD = 2BD = CD
(4) 2AD = BD = CD
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)



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24. If the sides of a triangle are in the ratio $3 : 1\frac{1}{4} : 3\frac{1}{4}$, then the triangle is
(1) Right triangle
(2) Obtuse triangle
(3) Equiangular triangle
(4) Acute triangle
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

25. A ship after sailing 12 km towards south from a particular place covered 5 km more towards east. Then the straightway distance of the ship from that place is
(1) 11 km (2) 18 km
(3) 15 km (4) 13 km
(SSC CGL Tier-I Exam. 09.06.2015 (1st Sitting) TF No. 1443068)

26. If the measure of three angles of a triangle are in the ratio 2 : 3 : 5, then the triangle is :
(1) right angled
(2) isosceles
(3) obtuse angled
(4) equilateral
(SSC CGL Tier-I Exam. 16.06.2015 (1st Sitting) TF No. 3196279)

27. ΔABC is a right angled triangle with AB = 6 cm, AC = 8 cm, $\angle BAC = 90°$. Then the radius of the incircle is
(1) 4 cm. (2) 2 cm.
(3) 6 cm. (4) 3 cm.
(SSC CGL Tier-I Re-Exam, 30.06.2015)

28. In ΔABC, AD $\perp$ BC and $AD^2 = BD.DC$. The measure of $\angle BAC$ is:
(1) 60° (2) 75°
(3) 90° (4) 45°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

29. $\angle A$ of ΔABC is a right angle. AD is perpendicular on BC. If BC = 14 cm and BD = 5 cm, then measure of AD is :
(1) $2\sqrt{5}$ cm. (2) $\sqrt{5}$ cm.
(3) $3\sqrt{5}$ cm. (4) $3.5\sqrt{5}$ cm.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

30. In ΔABC, $\angle B = 90°$, AB = 8 cm and BC = 15 cm, then $\sin C = ?$
(1) $\frac{15}{17}$ (2) $\frac{8}{17}$
(3) $\frac{15}{8}$ (4) $\frac{8}{15}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

31. In ΔABC, AB = BC = k, AC $= \sqrt{2}$ k, then ΔABC is a :
(1) Isosceles triangle
(2) Right-angled triangle
(3) Equilateral triangle
(4) Right isosceles triangle
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–V

1. In Δ ABC and Δ DEF, AB = DE and BC = EF. Then one can infer that $\Delta ABC \cong \Delta DEF$, when
(1) $\angle BAC = \angle EDF$
(2) $\angle ACB = \angle EDF$
(3) $\angle ACB = \angle DFE$
(4) $\angle ABC = \angle DEF$
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

2. In ΔPQR, S and T are points on sides PR and PQ respectively such that $\angle PQR = \angle PST$. If PT = 5 cm, PS = 3 cm and TQ = 3 cm, then length of SR is
(1) 5 cm (2) 6 cm
(3) $\frac{31}{3}$ cm (4) $\frac{41}{3}$ cm
(SSC CGL Tier-I Exam. 19.10.2014)

3. The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If PQ = 10 cm, then AB is
(1) 15 cm (2) 12 cm
(3) 14 cm (4) 26 cm
(SSC CHSL DEO & LDC Exam. 9.11.2014)

4. In ΔABC, two points D and E are taken on the lines AB and BC respectively in such a way that AC is parallel to DE. Then ΔABC and ΔDBE are
(1) similar only if D lies outside the line segment AB
(2) congruent only if D lies outside the line segment AB
(3) always similar
(4) always congruent
(SSC CHSL DEO Exam. 02.11.2014 (1st Sitting)

5. Inside a triangle ABC, a straight line parallel to BC intersects AB and AC at the point P and Q respectively. If AB = 3 PB, then PQ : BC is
(1) 1 : 3 (2) 3 : 4
(3) 1 : 2 (4) 2 : 3
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

6. In ΔABC, D and E are points on AB and AC respectively such that DE || BC and DE divides the ΔABC into two parts of equal areas. Then ratio of AD and BD is
(1) 1 : 1 (2) $1 : \sqrt{2}-1$
(3) $1 : \sqrt{2}$ (4) $1 : \sqrt{2}+1$
(SSC Graduate Level Tier-II Exam.16.09.2012)

7. In ΔABC, DE $\parallel$ AC. D and E are two points on AB and CB respectively. If AB = 10 cm and AD = 4 cm, then BE : CE is
(1) 2 : 3 (2) 2 : 5
(3) 5 : 2 (4) 3 : 2
(SSC Graduate Level Tier-I Exam. 19.05.2013)

8. For a triangle ABC, D and E are two points on AB and AC such that $AD = \frac{1}{4}$ AB, $AE = \frac{1}{4}$ AC. If BC = 12 cm, then DE is
(1) 5 cm (2) 4 cm
(3) 3 cm (4) 6 cm
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

9. In triangle ABC a straight line parallel to BC intersects AB and AC at D and E respectively. If AB = 2AD then DE : BC is
(1) 2 : 3 (2) 2 : 1
(3) 1 : 2 (4) 1 : 3
(SSC CGL Tier-II Exam. 21.09.2014)

10. In a Δ ABC, D and E are two points on AB and AC respectively such that DE || BC, DE bisects the ΔABC in two equal areas. Then the ratio DB : AB is
(1) 1 : $\sqrt{2}$ (2) 1 : 2
(3) $(\sqrt{2}-1) : \sqrt{2}$ (4) $\sqrt{2} : 1$
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

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11. In ΔABC, E and D are points on sides AB and AC respectively such that ∠ABC = ∠ADE. If AE = 3 cm, AD = 2 cm and EB = 2 cm, then length of DC is
(1) 4 cm (2) 4.5 cm
(3) 5.0 cm (4) 5.5 cm
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

12. Δ ABC and Δ DEF are similar. Also ∠A = ∠D and ∠B = ∠E. If 4AB = DE and BC = 12 cm, then EF is equal to
(1) 3 cm (2) 24 cm
(3) 16 cm (4) 48 cm
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

13. In Δ ABC the straight line parallel to the side BC meets AB and AC at the points P and Q respectively. If AP = QC, the length of AB is 12 units and the length of AQ is 2 units, then the length (in units) of CQ is
(1) 4 (2) 6
(3) 8 (4) 10
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

14. ABC is a triangle in which DE || BC and AD : DB = 5 : 4. Then DE : BC is
(1) 4 : 5 (2) 4 : 9
(3) 9 : 5 (4) 5 : 9
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

15. If in a triangle ABC, BE and CF are two medians perpendicular to each other and if AB = 19cm and AC = 22 cm then the length of BC is
(1) 19.5 cm (2) 26 cm
(3) 20.5 cm (4) 13 cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 21.06.2015 (Ist Sitting) TF No. 8037731)

16. The medians CD and BE of a triangle ABC interest each other at O. The ratio ΔODE : ΔABC is equal to
(1) 12 : 1 (2) 4 : 3
(3) 3 : 4 (4) 1 : 12
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–VI

1. Q is a point in the interior of a rectangle ABCD. If QA = 3 cm, QB = 4 cm and QC = 5 cm, then the length of QD (in cm) is
(1) $3\sqrt{2}$ (2) $5\sqrt{2}$
(3) $\sqrt{34}$ (4) $\sqrt{41}$
(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)

2. ABCD is a rectangle where the ratio of the length of AB and BC is 3 : 2. If P is the mid-point of AB, then the value of sin ∠CPB is
(1) $\frac{3}{5}$ (2) $\frac{2}{5}$
(3) $\frac{3}{4}$ (4) $\frac{4}{5}$
(SSC Graduate Level Tier-II Exam. 29.09.2013)

3. If the opposite sides of a quadrilateral and also its diagonals are equal, then each of the angles of the quadrilateral is
(1) 90° (2) 120°
(3) 100° (4) 60°
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

TYPE–VII

1. Inside a square ABCD, Δ BEC is an equilateral triangle. If CE and BD intersect at O, then ∠BOC is equal to
(1) 60° (2) 75°
(3) 90° (4) 120°
(SSC Graduate Level Tier-II Exam. 29.09.2013)

2. A square is inscribed in a quarter-circle in such a manner that two of its adjacent vertices lie on the two radii at an equal distance from the centre, while the other two vertices lie on the circular arc. If the square has sides of length x, then the radius of the circle is
(1) $\sqrt{2}x$ (2) $\frac{16x}{\pi+4}$
(3) $\frac{2x}{\sqrt{\pi}}$ (4) $\frac{\sqrt{5}x}{\sqrt{2}}$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

TYPE–VIII

1. Each interior angle of a regular polygon is three times its exterior angle, then the number of sides of the regular polygon is :
(1) 9 (2) 8
(3) 10 (4) 7
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

2. In a regular polygon, the exterior and interior angles are in the ratio 1 : 4. The number of sides of the polygon is
(1) 10 (2) 12
(3) 15 (4) 16
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

3. The difference between the exterior and interior angles at a vertex of a regular polygon is 150°. The number of sides of the polygon is
(1) 10 (2) 15
(3) 24 (4) 30
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

4. Each interior angle of a regular polygon is 144°. The number of sides of the polygon is
(1) 8 (2) 9
(3) 10 (4) 11
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

5. If the sum of the interior angles of a regular polygon be 1080°, the number of sides of the polygon is
(1) 6 (2) 8
(3) 10 (4) 12
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

6. The number of sides in two regular polygons are in the ratio 5 : 4 and the difference between each interior angle of the polygons is 6°. Then the number of sides are
(1) 15, 12 (2) 5, 4
(3) 10, 8 (4) 20, 16
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

7. Each internal angle of regular polygon is two times its external angle. Then the number of sides of the polygon is :
(1) 8 (2) 6
(3) 5 (4) 7
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone) & (SSC CHSL DEO & LDC Exam. 27.10.2013)



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8. Ratio of the number of sides of two regular polygons is 5 : 6 and the ratio of their each interior angle is 24 : 25. Then the number of sides of these two polygons are
(1) 20, 24 (2) 15, 18
(3) 10, 12 (4) 5, 6
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

9. Measure of each interior angle of a regular polygon can never be :
(1) 150° (2) 105°
(3) 108° (4) 144°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

10. The sum of all interior angles of a regular polygon is twice the sum of all its exterior angles. The number of sides of the polygon is
(1) 10 (2) 8
(3) 12 (4) 6
(SSC Graduate Level Tier-II Exam.16.09.2012)

11. The ratio between the number of sides of two regular polygons is 1 : 2 and the ratio between their interior angles is 2 : 3. The number of sides of these polygons is respectively
(1) 6, 12 (2) 5, 10
(3) 4, 8 (4) 7, 14
(SSC Graduate Level Tier-II Exam.16.09.2012)

12. There are two regular polygons with number of sides equal to $(n-1)$ and $(n+2)$. Their exterior angles differ by 6°. The value of n is
(1) 14 (2) 12
(3) 13 (4) 11
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

13. If each interior angle of a regular polygon is 150°, the number of sides of the polygon is
(1) 8 (2) 10
(3) 15 (4) None of these
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

14. The sum of interior angles of a regular polygon is 1440°. The number of sides of the polygon is
(1) 10 (2) 12
(3) 6 (4) 8
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting and SSC CHSL DEO & LDC Exam. 9.11.2014)

15. Among the angles 30°, 36°, 45°, 50° one angle cannot be an exterior angle of a regular polygon. The angle is
(1) 30° (2) 36°
(3) 45° (4) 50°
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

16. If the sum of interior angles of a regular polygon is equal to two times the sum of exterior angles of that polygon, then the number of sides of that polygon is
(1) 5 (2) 6
(3) 7 (4) 8
(SSC CGL Tier-I Exam. 19.10.2014)

17. An interior angle of a regular polygon is 5 times its exterior angle. Then the number of sides of the polygon is
(1) 14 (2) 16
(3) 12 (4) 18
(SSC CGL Tier-II Exam. 21.09.2014)

18. The interior angle of a regular polygon is 140°. The number of sides of that polygon is
(1) 9 (2) 8
(3) 7 (4) 6
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

19. In a regular polygon if one of its internal angle is greater than the external angle by 132°, then the number of sides of the polygon is
(1) 14 (2) 12
(3) 15 (4) 16
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

20. If the ratio of an external angle and an internal angle of a regular polygon is 1 : 17, then the number of sides of the regular polygon is
(1) 20 (2) 18
(3) 36 (4) 12
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

21. The sum of all internal angles of a regular polygon whose one external angle is 20° is
(1) 6400° (2) 3200°
(3) 2880° (4) 1440°
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

22. The sum of the internal angles of a regular polygon is 1440° The number of sides is
(1) 8 (2) 10
(3) 12 (4) 6
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

23. The ratio of each interior angle to each exterior angle of a regular polygon is 3 : 1. The number of sides of the polygon is
(1) 9 (2) 7
(3) 6 (4) 8
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

24. PQRST is a cyclic pentagon and PT is a diameter, then $\angle PQR + \angle RST$ is equal to
(1) 180° (2) 270°
(3) 216° (4) 144°
(SSC CGL Tier-I Re-Exam, 30.08.2015)

25. The interior angle of a regular polygon exceeds its exterior angle by 108°. The number of the sides of the polygon is
(1) 12 (2) 16
(3) 14 (4) 10
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

26. Measure of each interior angle of a regular hexagon is :
(1) 100° (2) 60°
(3) 45° (4) 120°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

27. If the sum of all interior angles of a regular polygon is 14 right angles, then its number of sides is
(1) 8 (2) 9
(3) 7 (4) 6
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

28. The measure of each interior angle of a regular polygon with 8 sides is
(1) 135° (2) 120°
(3) 100° (4) 45°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–IX

1. The length of the diagonal BD of the parallelogram ABCD is 18 cm. If P and Q are the centroid of the Δ ABC and Δ ADC respectively then the length of the line segment PQ is
(1) 4 cm (2) 6 cm
(3) 9 cm (4) 12 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

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2. The side AB of a parallelogram ABCD is produced to E in such way that BE = AB. DE intersects BC at Q. The point Q divides BC in the ratio
(1) 1 : 2 (2) 1 : 1
(3) 2 : 3 (4) 2 : 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

3. In a parallelogram PQRS, angle P is four times of angle Q, then the measure of ∠R is
(1) 144° (2) 36°
(3) 72° (4) 130°
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

TYPE–X

1. ABCD is a cyclic parallelogram. The angle ∠B is equal to :
(1) 30° (2) 60°
(3) 45° (4) 90°
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

2. ABCD is a cyclic trapezium such that AD||BC, if ∠ABC = 70°, then the value of ∠BCD is:
(1) 60° (2) 70°
(3) 40° (4) 80°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

3. ABCD is a cyclic trapezium whose sides AD and BC are parallel to each other. If ∠ABC = 72°, then the measure of the ∠BCD is
(1) 162° (2) 18°
(3) 108° (4) 72°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

4. If an exterior angle of a cyclic quadrilateral be 50°, then the interior opposite angle is :
(1) 130° (2) 40°
(3) 50° (4) 90°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

5. ABCD is a cyclic quadrilateral and O is the centre of the circle. If ∠COD = 140° and ∠BAC = 40°, then the value of ∠BCD is equal to
(1) 70° (2) 90°
(3) 60° (4) 80°
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

6. ABCD is a cyclic trapezium with AB ∥ DC and AB = diameter of the circle. If ∠CAB = 30°, then ∠ADC is
(1) 60° (2) 120°
(3) 150° (4) 30°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

7. ABCD is a cyclic quadrilateral. AB and DC are produced to meet at P. If ∠ADC = 70° and ∠DAB = 60°, then the ∠PBC + ∠PCB is
(1) 130° (2) 150°
(3) 155° (4) 180°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

8. A cyclic quadrilateral ABCD is such that AB = BC, AD = DC, AC ⊥ BD, ∠CAD = θ. Then the angle ∠ABC =
(1) θ (2) $\frac{\theta}{2}$
(3) 2θ (4) 3θ
(SSC Graduate Level Tier-I Exam. 19.05.2013)

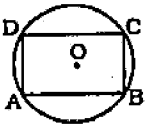
9. The diagonals AC and BD of a cyclic quadrilateral ABCD intersect each other at the point P. Then, it is always true that
(1) BP . AB = CD . CP
(2) AP . CP = BP . DP
(3) AP . BP = CP . DP
(4) AP . CD = AB . CP
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

10. A quadrilateral ABCD circumscribes a circle and AB = 6 cm, CD = 5 cm and AD = 7 cm. The length of side BC is
(1) 4 cm (2) 5 cm
(3) 3 cm (4) 6 cm
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

11. In a cyclic quadrilateral ABCD $m\angle A + m\angle B + m\angle C + m\angle D = ?$
(1) 90° (2) 360°
(3) 180° (4) 120°
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

12. ABCD is a cyclic quadrilateral. The side AB is extended to E in such a way that BE = BC. If ∠ADC = 70°, ∠BAD = 95°, then ∠DCE is equal to
(1) 140° (2) 120°
(3) 165° (4) 110°
(SSC CGL Tier-I Exam. 19.10.2014)

13. In a cyclic quadrilateral $\angle A + \angle C = \angle B + \angle D = ?$



(1) 270° (2) 360°
(3) 90° (4) 180°
(SSC CGL Tier-I Exam. 26.10.2014)

14. If ABCD be a cyclic quadrilateral in which ∠A = $4x°$, ∠B = $7x°$, ∠C = $5y°$, ∠D = $y°$, then $x : y$ is
(1) 3 : 4 (2) 4 : 3
(3) 5 : 4 (4) 4 : 5
(SSC CGL Tier-II Exam. 21.09.2014)

15. ABCD is a cyclic quadrilateral and AD is a diameter. If ∠DAC = 55° then value of ∠ABC is
(1) 55° (2) 35°
(3) 145° (4) 125°
(SSC CGL Tier-II Exam. 21.09.2014)

16. The point of intersection of the diagonals AC and BD of the cyclic quadrilateral ABCD is P. If ∠APB = 64° and ∠CBD = 28°, the measure of ∠ADB is
(1) 32° (2) 36°
(3) 56° (4) 28°
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

17. ABCD is a cyclic quadrilateral. Diagonals AC and BD meets at P. If ∠APB = 110° and ∠CBD = 30°, then ∠ADB measures
(1) 55° (2) 30°
(3) 70° (4) 80°
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

18. ABCD is a cyclic quadrilateral. AB and DC when produced meet at P, if PA = 8 cm, PB = 6 cm, PC = 4 cm, then the length (in cm) of PD is
(1) 8 cm (2) 6 cm
(3) 10 cm (4) 12 cm
(SSC CGL Tier-II Exam 25.10.2015, TF No. 1099685

19. The three successive angles of a cyclic quadrilateral are in the ratio 1 : 3 : 4, find the measure of the fourth angle?
(1) 72° (2) 108°
(3) 36° (4) 30°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2011 (Ist Sitting) TF No. 1375232

20. If ABCD is a cyclic quadrilateral with $\angle A = 50°$, $\angle B = 80°$, then $\angle C$ and $\angle D$ are
(1) 100°, 130° (2) 115°, 115°
(3) 110°, 120° (4) 130°, 100°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–XI

1. ABCD is a rhombus. A straight line through C cuts AD produced at P and AB produced at Q. If $DP = \frac{1}{2}$ AB, then the ratio of the length of BQ and AB is
(1) 2 : 1 (2) 1 : 2
(3) 1 : 1 (4) 3 : 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

2. In a quadrilateral *ABCD*, with unequal sides if the diagonals *AC* and *BD* intersect at right angles, then
(1) $AB^2 + BC^2 = CD^2 + DA^2$
(2) $AB^2 + CD^2 = BC^2 + DA^2$
(3) $AB^2 + AD^2 = BC^2 + CD^2$
(4) $AB^2 + BC^2 = 2(CD^2 + DA^2)$
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

3. The ratio of the angles $\angle A$ and $\angle B$ of a non-square rhombus ABCD is 4 : 5, then the value of $\angle C$ is :
(1) 50° (2) 45°
(3) 80° (4) 95°
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

4. ABCD is a rhombus whose side AB = 4 cm and $\angle ABC = 120°$, then the length of diagonal BD is equal to :
(1) 1 cm (2) 2 cm
(3) 3 cm (4) 4 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

5. ABCD is a rhombus. AB is produced to F and BA is produced to E such that AB = AE = BF. Then :
(1) ED > CF
(2) ED ⊥ CF
(3) $ED^2 + CF^2 = EF^2$
(4) ED ∥ CF
(SSC Graduate Level Tier-I Exam. 21.04.2013)

6. ABCD is a trapezium whose side $\overline{AD}$ is parallel to $\overline{BC}$. Diagonals $\overline{AC}$ and $\overline{BD}$ intersect at O. If $\overline{AO} = 3$, $\overline{CO} = x - 3$, $\overline{BO} = 3x - 19$ and $\overline{DO} = x - 5$, the value(s) of x will be :
(1) 7, 6 (2) 12, 6
(3) 7, 10 (4) 8, 9
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

7. In a quadrilateral ABCD, the bisectors of $\angle A$ and $\angle B$ meet at O. If $\angle C = 70°$ and $\angle D = 130°$, then measure of $\angle AOB$ is
(1) 40° (2) 60°
(3) 80° (4) 100°
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

8. ABCD is a trapezium where AD ∥ BC. The diagonal AC and BD intersect each other at the point O. If AO = 3, CO = $x - 3$, BO = $3x - 19$ and DO = $x - 5$, the value of x is
(1) – 8, 9 (2) 8, – 9
(3) – 8, – 9 (4) 8, 9
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

9. If PQRS is a rhombus and $\angle SPQ = 50°$, then $\angle RSQ$ is
(1) 55° (2) 65°
(3) 75° (4) 45°
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4238378)

10. ABCD is a cyclic trapezium whose sides AD and BC are parallel to each other. If $\angle ABC = 75°$ then the measure of $\angle BCD$ is :
(1) 75° (2) 95°
(3) 45° (4) 105°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

11. If ABCD be a rhombus, AC is its smallest diagonal and $\angle ABC = 60°$, find length of a side of the rhombus when AC = 6 cm.
(1) 6 cm. (2) 3 cm.
(3) $6\sqrt{2}$ cm. (4) $3\sqrt{3}$ cm.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

12. AB is a diameter of a circle having centre at O. PQ is a chord which does not intersect AB. Join AP and BQ. If $\angle BAP = \angle ABQ$, then ABQP is a :
(1) cyclic square
(2) cyclic trapezium
(3) cyclic rhombus
(4) cyclic rectangle
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

TYPE–XII

1. Two equal circles of radius 4 cm intersect each other such that each passes through the centre of the other. The length of the common chord is :
(1) $2\sqrt{3}$ cm (2) $4\sqrt{3}$ cm
(3) $2\sqrt{2}$ cm (4) 8 cm
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

2. One chord of a circle is known to be 10.1 cm. The radius of this circle must be:
(1) 5 cm
(2) greater than 5 cm
(3) greater than or equal to 5 cm
(4) less than 5 cm
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

3. The length of the chord of a circle is 8 cm and perpendicular distance between centre and the chord is 3 cm. Then the radius of the circle is equal to :
(1) 4 cm (2) 5 cm
(3) 6 cm (4) 8 cm
(FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 28.10.2012) (Ist Sitting)

4. The length of a chord of a circle is equal to the radius of the circle. The angle which this chord subtends in the major segment of the circle is equal to
(1) 30° (2) 45°
(3) 60° (4) 90°
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone) & (SSC GL Exam. 11.11.2012 (Ist Sitting)

5. AB = 8 cm and CD = 6 cm are two parallel chords on the same side of the centre of a circle. The distance between them is 1 cm. The radius of the circle is
(1) 5 cm (2) 4 cm
(3) 3 cm (4) 2 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

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6. The length of two chords AB and AC of a circle are 8 cm and 6 cm and $\angle BAC = 90°$, then the radius of circle is
(1) 25 cm (2) 20 cm
(3) 4 cm (4) 5 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

7. The distance between two parallel chords of length 8 cm each in a circle of diameter 10 cm is
(1) 6 cm (2) 7 cm
(3) 8 cm (4) 5·5 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

8. The length of the common chord of two intersecting circles is 24 cm. If the diameter of the circles are 30 cm and 26 cm, then the distance between the centre (in cm) is
(1) 13 (2) 14
(3) 15 (4) 16
(SSC Graduate Level Tier-II Exam.16.09.2012)

9. In a circle of radius 21 cm, an arc subtends an angle of 72° at the centre. The length of the arc is
(1) 21.6 cm (2) 26.4 cm
(3) 13.2 cm (4) 19.8 cm
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

10. A unique circle can always be drawn through x number of given non-collinear points, then x must be :
(1) 2 (2) 3
(3) 4 (4) 1
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

11. Two parallel chords are drawn in a circle of diameter 30 cm. The length of one chord is 24 cm and the distance between the two chords is 21 cm. The length of the other chord is
(1) 10 cm (2) 18 cm
(3) 12 cm (4) 16 cm
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

12. If two equal circles whose centres are O and O′, intersect each other at the point A and B, OO′ = 12 cm and AB = 16 cm, then the radius of the circle is
(1) 10 cm (2) 8 cm
(3) 12 cm (4) 14 cm
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

13. Chords AB and CD of a circle intersect externally at P. If AB = 6 cm, CD = 3 cm and PD = 5 cm, then the length of PB is
(1) 5 cm (2) 7.35 cm
(3) 6 cm (4) 4 cm
(SSC Delhi Police & I. (SI) Exam. 19.06.2012)

14. A circle (with centre at O) is touching two intersecting lines AX and BY. The two points of contact A and B subtend an angle of 65° at any point C on the circumference of the circle. If P is the point of intersection of the two lines, then the measure of $\angle APO$ is
(1) 25° (2) 65°
(3) 90° (4) 40°
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

15. AB and CD are two parallel chords on the opposite sides of the centre of the circle. If $\overline{AB}$ = 10 cm, $\overline{CD}$ = 24 cm and the radius of the circle is 13 cm, the distance between the chords is
(1) 17 cm (2) 15 cm
(3) 16 cm (4) 18 cm
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

16. AB and CD are two parallel chords of a circle such that AB = 10 cm and CD = 24 cm. If the chords are on the opposite sides of the centre and distance between them is 17 cm, then the radius of the circle is :
(1) 11 cm (2) 12 cm
(3) 13 cm (4) 10 cm
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

17. A chord AB of a circle C_1 of radius $\left(\sqrt{3}+1\right)$ cm touches a circle C_2 which is concentric to C_1. If the radius of C_2 is $\left(\sqrt{3}-1\right)$ cm., the length of AB is :
(1) $2\sqrt[4]{3}$ cm (2) $8\sqrt{3}$ cm
(3) $4\sqrt[4]{3}$ cm (4) $4\sqrt{3}$ cm
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

18. The length of the common chord of two circles of radii 30 cm and 40 cm whose centres are 50 cm apart, is (in cm)
(1) 12 (2) 24
(3) 36 (4) 48
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

19. Chords AB and CD of a circle intersect at E and are perpendicular to each other. Segments AE, EB and ED are of lengths 2 cm, 6 cm and 3 cm respectively. Then the length of the diameter of the circle (in cm) is
(1) $\sqrt{65}$ (2) $\frac{1}{2}\sqrt{65}$
(3) 65 (4) $\frac{65}{2}$
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

20. Two circles with centre P and Q intersect at B and C. A, D are points on the circle such that A, C, D are collinear. If $\angle APB = 130°$, and $\angle BQD = x°$, then the value of x is
(1) 65 (2) 130
(3) 195 (4) 135
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

21. Two circles of same radius 5 cm, intersect each other at A and B. If AB = 8 cm, then the distance between the centre is :
(1) 6 cm (2) 8 cm
(3) 10 cm (4) 4 cm
(SSC Graduate Level Tier-I Exam. 21.04.2013)

22. AB is the chord of a circle with centre O and DOC is a line segment originating from a point D on the circle and intersecting AB produced at C such that BC = OD. If $\angle BCD = 20°$, then $\angle AOD = ?$
(1) 20° (2) 30°
(3) 40° (4) 60°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

23. In a circle of radius 17 cm, two parallel chords of length 30 cm and 16 cm are drawn. If both the chords are on the same side of the centre, then the distance between the chords is
(1) 9 cm (2) 7 cm
(3) 23 cm (4) 11 cm
(SSC Graduate Level Tier-I Exam. 21.04.2013)

24. A square ABCD is inscribed in a circle of unit radius. Semicircles are described on each side as a diameter. The area of the region bounded by the four semicircles and the circle is
(1) 1 sq. unit (2) 2 sq. unit
(3) 1.5 sq. unit (4) 2.5 sq. unit
(SSC Graduate Level Tier-I Exam. 21.04.2013)



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25. Two circles touch each other internally. Their radii are 2 cm and 3 cm. The biggest chord of the greater circle which is outside the inner circle is of length

(1) $2\sqrt{2}$ cm (2) $3\sqrt{2}$ cm

(3) $2\sqrt{3}$ cm (4) $4\sqrt{2}$ cm

(SSC Graduate Level Tier-I Exam. 21.04.2013)

26. Two circles touch each other externally. The distance between their centre is 7 cm. If the radius of one circle is 4 cm, then the radius of the other circle is

(1) 3.5 cm (2) 3 cm

(3) 4 cm (4) 2 cm

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

27. A, B and C are the three points on a circle such that the angles subtended by the chords AB and AC at the centre O are 90° and 110° respectively. ∠BAC is equal to

(1) 70° (2) 80°

(3) 90° (4) 100°

(SSC Graduate Level Tier-I Exam. 19.05.2013)

28. N is the foot of the perpendicular from a point P of a circle with radius 7 cm, on a diameter AB of the circle. If the length of the chord PB is 12 cm, the distance of the point N from the point B is

(1) $6\frac{5}{7}$ cm (2) $12\frac{2}{7}$ cm

(3) $3\frac{5}{7}$ cm (4) $10\frac{2}{7}$ cm

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

29. A, B, C, D are four points on a circle. AC and BD intersect at a point E such that ∠BEC = 130° and ∠ECD = 20°. ∠BAC is

(1) 120° (2) 90°

(3) 100° (4) 110°

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

30. If two concentric circles are of radii 5 cm and 3 cm, then the length of the chord of the larger circle which touches the smaller circle is

(1) 6 cm (2) 7 cm

(3) 10 cm (4) 8 cm

(SSC Graduate Level Tier-II Exam. 29.09.2013

31. A chord 12 cm long is drawn in a circle of diameter 20 cm. The distance of the chord from the centre is

(1) 8 cm (2) 6 cm

(3) 10 cm (4) 16 cm

(SSC CHSL DEO & LDC Exam. 20.10.2013)

32. If the chord of a circle is equal to the radius of the circle, then the angle subtended by the chord at a point on the minor arc is

(1) 150° (2) 60°

(3) 120° (4) 30°

(SSC CHSL DEO & LDC Exam. 10.11.2013 (IInd Sitting)

33. The angle subtended by a chord at its centre is 60°, then the ratio between chord and radius is

(1) 1 : 2 (2) 1 : 1

(3) $\sqrt{2}$:1 (4) 2 : 1

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

34. Each of the circles of equal radii with centres A and B pass through the centre of one another circle they cut at C and D then ∠DBC is equal to

(1) 60° (2) 100°

(3) 120° (4) 140°

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

35. For a triangle circumcentre lies on one of its sides. The triangle is

(1) right angled

(2) obtused angled

(3) isosceles

(4) equilateral

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

36. The three equal circles touch each other externally. If the centres of these circles be A, B, C then ABC is

(1) a right angle triangle

(2) an equilateral triangle

(3) an isosceles triangle

(4) a scalene triangle

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

37. In a right angled triangle, the circumcentre of the triangle lies

(1) inside the triangle

(2) outside the triangle

(3) on midpoint of the hypotenuse

(4) on one vertex

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

38. 'O' is the centre of the circle, AB is a chord of the circle, OM ⊥ AB. If AB = 20 cm, OM = $2\sqrt{11}$ cm, then radius of the circle is

(1) 15 cm (2) 12 cm

(3) 10 cm (4) 11 cm

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

39. In ΔABC, ∠ABC = 70°, ∠BCA = 40°. O is the point of intersection of the perpendicular bisectors of the sides, then the angle ∠BOC is

(1) 100° (2) 120°

(3) 130° (4) 140°

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

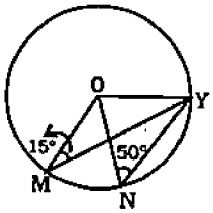
40. A, B, C are three points on the circumference of a circle and if $\overline{AB} = \overline{AC} = 5\sqrt{2}$ cm and ∠BAC = 90°, find the radius.

(1) 10 cm (2) 5 cm

(3) 20 cm (4) 15 cm

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

41. In the given figure, ∠ ONY = 50° and ∠ OMY = 15°. Then the value of the ∠ MON is



(1) 30° (2) 40°

(3) 20° (4) 70°

(SSC CGL Tier-I Exam. 26.10.2014)

42. Two chords of lengths a metre and b metre subtend angles 60° and 90° at the centre of the circle respectively. Which of the following is true ?

(1) $b = \sqrt{2}a$ (2) $a = \sqrt{2}b$

(3) $a = 2b$ (4) $b = 2a$

(SSC CGL Tier-II Exam. 21.09.2014)

43. Two chords AB and CD of a circle with centre O, intersect each other at P. If ∠AOD = 100° and ∠BOC = 70°, then the value of ∠APC is

(1) 80° (2) 75°

(3) 85° (4) 95°

(SSC CGL Tier-II Exam. 21.09.2014)

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44. Chords AC and BD of a circle with centre O intersect at right angles at E. If $\angle OAB = 25°$, then the value of $\angle EBC$ is
(1) 30° (2) 25°
(3) 20° (4) 15°
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

45. Two circles touch externally at P. QR is a common tangent of the circles touching the circles at Q and R. Then measure of $\angle QPR$ is
(1) 60° (2) 30°
(3) 90° (4) 45°
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

46. Two circles intersect each other at the points A and B. A straight line parallel to AB intersects the circles at C, D, E and F. If CD = 4.5 cm, then the measure of EF is
(1) 1.50 cm (2) 2.25 cm
(3) 4.50 cm (4) 9.00 cm
(SSC CHSL DEO & LDC Exam. 9.11.2014)

47. Two circles C_1 and C_2 touch each other internally at P. Two lines PCA and PDB meet the circles C_1 in C, D and C_2 in A, B respectively. If $\angle BDC = 120°$, then the value of $\angle ABP$ is equal to
(1) 60° (2) 80°
(3) 100° (4) 120°
(SSC CHSL DEO & LDC Exam. 16.11.2014)

48. Two circles having radii r units intersect each other in such a way that each of them passes through the centre of the other. Then the length of their common chord is
(1) $\sqrt{2}r$ units (2) $\sqrt{3}r$ units
(3) $\sqrt{5}r$ units (4) r units
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

49. Two circles with centres A and B of radii 5 cm and 3 cm respectively touch each other internally. If the perpendicular bisector of AB meets the bigger circle in P and Q, then the value of PQ is
(1) $\sqrt{6}$ cm (2) $2\sqrt{6}$ cm
(3) $3\sqrt{6}$ cm (4) $4\sqrt{6}$ cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

50. Two parallel chords of a circle of diameter 20 cm are 12 cm and 16 cm long. If the chords are in the same side of the centre, then the distance between them is
(1) 28 cm (2) 2 cm
(3) 4 cm (4) 8 cm
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

51. Chords AB and CD of a circle intersect at E. If AE = 9 cm, BE = 12 cm and CE = 3DE, then the length of DE (in cm) is
(1) $\frac{9}{4}$ (2) 4
(3) 6 (4) 7
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

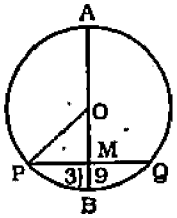
52. Let O be the centre of a circle. A, B, C and D are four points on the circumference of the circle in the given order, such that $\angle AOC = 130°$. Then the measure of $\angle ABC$ and $\angle ADC$ are respectively.
(1) 65°, 115° (2) 65°, 65°
(3) 115°, 65° (4) 115°, 115°
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

53. Chords PQ and RS of a circle, when produced, meet at a point O. If PQ = 6 cm, OQ = 8 cm and OS = 7 cm, then length (in cm) of the chord RS is
(1) 10 (2) 12
(3) 16 (4) 9
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

54. Three circles of radius 6 cm each touches each other externally. Then the distance of the centre of one circle from the line joining the centres of other two circles is equal to
(1) $6\sqrt{5}$ cm (2) $6\sqrt{3}$ cm
(3) $6\sqrt{2}$ cm (4) $6\sqrt{7}$ cm
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

55. Two circles of radii 10 cm and 8 cm intersect and the length of the common chord is 12 cm. Then the distance between their centres is
(1) 10 cm (2) 8 cm
(3) 13.3 cm (4) 15 cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

56. In a given circle, the chord PQ is of length 18 cm. AB is the perpendicular bisector of PQ at M. If MB = 3 cm, then the length of AB is



(1) 27 cm. (2) 30 cm.
(3) 28 cm. (4) 25 cm.
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

57. Two chords of length a unit and b unit of a circle make angles 60° and 90° at the centre of a circle respectively, then the correct relation is
(1) $b = \frac{3}{2}a$ (2) $b = \sqrt{2}a$
(3) $b = 2a$ (4) $b = \sqrt{3}a$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

58. AB and CD are two parallel chords of a circle lying on the opposite side of the centre and the distance between them is 17 cm. The length of AB and CD are 10 cm and 24 cm respectively. The radius (in cm) of the circle is :
(1) 13 (2) 9
(3) 18 (4) 15
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

59. The distance between the centres of the two circles of radii r_1 and r_2 is d. They will touch each other internally if
(1) $d = r_1$ or r_2 (2) $d = r_1 + r_2$
(3) $d = r_1 - r_2$ (4) $d = \sqrt{r_1 r_2}$
(SSC CGL Tier-I Re-Exam, 30.08.2015)

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60. In a circle with centre O, AB and CD are two diameters perpendicular to each other. The length of chord AC is

(1) 2 AB (2) $\sqrt{2}$ AB

(3) $\frac{1}{2}$ AB (4) $\frac{1}{\sqrt{2}}$ AB

(SSC CGL Tier-I Re-Exam, 30.08.2015)

61. AB is the diameter of a circle with centre O. P be a point on it. If ∠ POA = 120°. Then, ∠ PBO = ?

(1) 60° (2) 120°
(3) 45° (4) 50°

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

62. In a circle with centre at O (0, 0) and radius 5 cm, AB is a chord of length 8 cm. If OM is perpendicular to AB, then the length of OM is:

(1) 2.5 cm. (2) 3 cm.
(3) 4 cm. (4) 1 cm.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

TYPE–XIII

1. The radius of two concentric circles are 9 cm and 15 cm. If the chord of the greater circle be a tangent to the smaller circle, then the length of that chord is

(1) 24 cm (2) 12 cm
(3) 30 cm (4) 18 cm

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

2. If a chord of a circle of radius 5 cm is a tangent to another circle of radius 3 cm, both the circles being concentric, then the length of the chord is

(1) 10 cm (2) 12.5 cm
(3) 8 cm (4) 7 cm

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

3. The tangents are drawn at the extremities of diameter *AB* of a circle with centre *P*. If a tangent to the circle at the point *C* intersects the other two tangents at *Q* and *R*, then the measure of the ∠*QPR* is

(1) 45° (2) 60°
(3) 90° (4) 180°

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

4. *AB* is a chord to a circle and *PAT* is the tangent to the circle at *A*. If ∠*BAT* = 75° and ∠*BAC* = 45°, *C* being a point on the circle, then ∠*ABC* is equal to

(1) 40° (2) 45°
(3) 60° (4) 70°

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

5. The tangents at two points A and B on the circle with centre O intersects at P : If in quadrilateral PAOB, ∠AOB: ∠APB = 5 : 1, then measure of ∠APB is :

(1) 30° (2) 60°
(3) 45° (4) 15°

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

6. Two circles touch each other externally at point A and PQ is a direct common tangent which touches the circles at P and Q respectively. Then ∠PAQ =

(1) 45° (2) 90°
(3) 80° (4) 100°

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

7. PR is tangent to a circle, with centre O and radius 4 cm, at point Q. If ∠POR = 90°, OR = 5 cm and OP = $\frac{20}{3}$ cm, then (in cm) the length of PR is :

(1) 3 (2) $\frac{16}{3}$

(3) $\frac{23}{3}$ (4) $\frac{25}{3}$

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

8. Two circles touch each other externally at P. AB is a direct common tangent to the two circles, A and B are point of contact and ∠ PAB = 35°. Then ∠ABP is

(1) 35° (2) 55°
(3) 65° (4) 75°

(SSC Graduate Level Tier-II Exam.16.09.2012)

9. If the radii of two circles be 6 cm and 3 cm and the length of the transverse common tangent be 8 cm, then the distance between the two centres is

(1) $\sqrt{145}$ cm (2) $\sqrt{140}$ cm

(3) $\sqrt{150}$ cm (4) $\sqrt{135}$ cm

(SSC Graduate Level Tier-II Exam.16.09.2012)

10. The distance between the centre of two equal circles, each of radius 3 cm, is 10 cm. The length of a transverse common tangent is

(1) 8 cm (2) 10 cm
(3) 4 cm (4) 6 cm

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

11. The radii of two circles are 5cm and 3cm, the distance between their centre is 24 cm. Then the length of the transverse common tangent is

(1) 16 cm (2) $15\sqrt{2}$ cm

(3) $16\sqrt{2}$ cm (4) 15 cm

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

12. P and Q are two points on a circle with centre at O. R is a point on the minor arc of the circle, between the points P and Q. The tangents to the circle at the points P and Q méet each other at the point S. If ∠PSQ = 20°, then ∠PRQ = ?

(1) 80° (2) 200°
(3) 160° (4) 100°

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

13. Two circles intersect at A and B. P is a point on produced BA. PT and PQ are tangents to the circles. The relation of PT and PQ is

(1) PT = 2PQ (2) PT < PQ
(3) PT > PQ (4) PT = PQ

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

14. The length of the tangent drawn to a circle of radius 4 cm from a point 5 cm away from the centre of the circle is

(1) 3 cm (2) $4\sqrt{2}$ cm

(3) $5\sqrt{2}$ cm (4) $3\sqrt{2}$ cm

(SSC Graduate Level Tier-I Exam. 19.05.2013)

15. From a point P, two tangents PA and PB are drawn to a circle with centre O. If OP is equal to diameter of the circle, then ∠APB is

(1) 45° (2) 90°
(3) 30° (4) 60°

(SSC CHSL DEO & LDC Exam. 20.10.2013)

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16. The radii of two concentric circles are 13 cm and 8 cm. AB is a diameter of the bigger circle and BD is a tangent to the smaller circle touching it at D and the bigger circle at E. Point A is joined to D. The length of AD is
(1) 20 cm (2) 19 cm
(3) 18 cm (4) 17 cm
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

17. PQ is a chord of length 8 cm, of a circle with centre O and of radius 5 cm. The tangents at P and Q intersect at a point T. The length of TP is
(1) $\frac{20}{3}$ cm (2) $\frac{21}{4}$ cm
(3) $\frac{10}{3}$ cm (4) $\frac{15}{4}$ cm
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

18. The minimum number of common tangents drawn to two circles when both the circles touch each other externally is
(1) 1 (2) 2
(3) 3 (4) 0
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

19. The length of a tangent from an external point to a circle is $5\sqrt{3}$ unit. If radius of the circle is 5 units, then the distance of the point from the circle is
(1) 5 units (2) 15 units
(3) -5 units (4) -15 units
(SSC CGL Tier-I Exam, 19.10.2014)

20. Two circles are of radii 7 cm and 2 cm their centres being 13cm apart. Then the length of direct common tangent to the circles between the points of contact is
(1) 12 cm (2) 15 cm
(3) 10 cm (4) 5 cm
(SSC CGL Tier-I Exam. 19.10.2014)

21. The radius of a circle is 6 cm. The distance of a point lying outside the circle from the centre is 10 cm. The length of the tangent drawn from the outside point to the circle is
(1) 5 cm (2) 6 cm
(3) 7 cm (4) 8 cm
(SSC CGL Tier-II Exam. 21.09.2014)

22. DE is a tangent to the circumcircle of ΔABC at the vertex A such that DE || BC. If AB = 17 cm, then the length of AC is equal to
(1) 16.0 cm (2) 16.8 cm
(3) 17.3 cm (4) 17 cm
(SSC CHSL DEO & LDC Exam. 16.11.2014)

23. The distance between the centres of two circles with radii 9 cm and 16 cm is 25 cm. The length of the segment of the tangent between them is
(1) 24 cm (2) 25 cm
(3) $\frac{50}{3}$ cm (4) 12 cm
(SSC CHSL DEO & LDC Exam. 16.11.2014)

24. ST is a tangent to the circle at P and QR is a diameter of the circle. If $\angle RPT = 50°$, then the value of $\angle SPQ$ is
(1) 40° (2) 60°
(3) 80° (4) 100°
(SSC CHSL DEO Exam. 02.11.2014 (1st Sitting)

25. If PA and PB are two tangents to a circle with centre O such that $\angle AOB = 110°$, then $\angle APB$ is
(1) 90° (2) 70°
(3) 60° (4) 55°
(SSC CHSL DEO Exam. 02.11.2014 (1st Sitting)

26. Two circles with radii 25 cm and 9 cm touch each other externally. The length of the direct common tangent is
(1) 34 cm (2) 30 cm
(3) 36 cm (4) 32 cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

27. In a circle with centre O, AB is a chord, and AP is a tangent to the circle. If $\angle AOB = 140°$, then the measure of $\angle PAB$ is
(1) 35° (2) 55°
(3) 70° (4) 75°
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

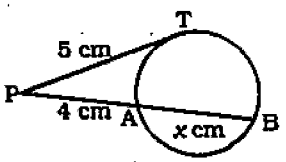
28. If two circles of radii 9 cm and 4 cm touch externally, then the length of a common tangent is
(1) 5 cm (2) 7 cm
(3) 8 cm (4) 12 cm
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

29. AB is a diameter of a circle with centre O. The tangents at C meets AB produced at Q. If $\angle CAB = 34°$, then measure of $\angle CBA$ is
(1) 56° (2) 34°
(3) 68° (4) 124°
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

30. Let P and Q be two points on a circle with centre O. If two tangents of the circle through P and Q meet at A with $\angle PAQ = 48°$, then $\angle APQ$ is
(1) 96° (2) 48°
(3) 66° (4) 60°
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

31. The distance between the centres of two circles having radii 8 cm and 3 cm, is 13 cm. The length (in cm) of the direct common tangent of the two circles is
(1) 15 (2) 16
(3) 18 (4) 12
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

32. In the given figure, PAB is a secant and PT is a tangent to the circle from P. If PT = 5 cm, PA = 4 cm and AB = x cm, then x is



(1) $\frac{4}{9}$ cm (2) $\frac{9}{4}$ cm
(3) 5 cm (4) $\frac{2}{3}$ cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

33. Two circles of diameters 10 cm and 6 cm have the same centre. A chord of the larger circle is a tangent of the smaller one. The length of the chord is
(1) 4 cm. (2) 8 cm.
(3) 6 cm. (4) 10 cm.
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

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34. Two circles with their centres at O and P and radii 8 cm and 4 cm respectively touch each other externally. The length of their common tangent is

(1) 8.5 cm. (2) $\frac{8}{\sqrt{2}}$ cm.

(3) $8\sqrt{2}$ cm. (4) 8 cm.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

35. A tangent is drawn to a circle of radius 6 cm from a point situated at a distance of 10 cm from the centre of the circle. The length of the tangent will be

(1) 7 cm (2) 4 cm
(3) 5 cm (4) 8 cm

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

36. XY and XZ are tangents to a circle, ST is another tangent to the circle at the point R on the circle, which intersects XY and XZ at S and T respectively. If XY = 15 cm and TX = 9 cm, then RT is

(1) 4.5 cm (2) 7.5 cm
(3) 6 cm (4) 3 cm

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

37. AC is transverse common tangent to two circles with centres P and Q and radii 6 cm and 3 cm at the point A and C respectively. If AC cuts PQ at the point B and AB = 8cm then the length of PQ is :

(1) 13 cm (2) 12 cm
(3) 10 cm (4) 15 cm

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

38. A point Q is 13 cm from the centre of a circle. The length of the tangent drawn from Q to a circle is 12 cm. The distance of Q from the nearest point of the circle is

(1) 7 cm (2) 8 cm
(3) 5 cm (4) 12 cm

(SSC CGL Tier-I Re-Exam, 30.08.2015)

39. A and B are centres of two circles of radii 11 cm and 6 cm, respectively. PQ is a direct common tangent to the circles. If $\overline{AB}$ = 13 cm, then length of $\overline{PQ}$ will be

(1) 8.5 cm (2) 13 cm
(3) 12 cm (4) 17 cm

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

40. AB and AC are tangents to a circle with centre O. A is the external point of the circle. The line AO intersect the chord BC at D. The measure of the ∠BDO is

(1) 60° (2) 90°
(3) 45° (4) 75°

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

41. The distance between the centres of two circles of radii 6 cm and 3 cm is 15 cm. The length of the transverse common tangent to the circles is :

(1) 12 cm (2) $6\sqrt{6}$ cm

(3) $7\sqrt{6}$ cm (4) 18 cm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

42. Two circles of radii 5 cm and 3cm touch externally, then the ratio in which the direct common tangent to the circles divides externally the line joining the centers of the circles is:

(1) 5 : 3 (2) 3 : 5
(3) 2.5 : 1.5 (4) 1.5 : 2.5

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

43. The distance between centres of two circles of radii 3 cm and 8 cm is 13 cm. If the points of contact of a direct common tangent to the circles are P and Q, then the length of the line segment PQ is :

(1) 11.9 cm (2) 12 cm
(3) 11.58 cm (4) 11.5 cm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–XIV

1. AC is the diameter of a circumcircle of ΔABC. Chord ED is parallel to the diameter AC. If ∠CBE = 50°, then the measure of ∠DEC is

(1) 50° (2) 90°
(3) 60° (4) 40°

(SSC CHSL DEO & LDC Exam, 28.10.2012, Ist Sitting)

2. The length of the two sides forming the right angle of a right-angled triangle are 6 cm and 8 cm. The length of its circum-radius is :

(1) 5 cm (2) 7 cm
(3) 6 cm (4) 10 cm

(SSC CHSL DEO & LDC Exam, 04.11.2012, Ist Sitting)

3. The length of radius of a circumcircle of a triangle having sides 3cm, 4cm and 5cm is :

(1) 2 cm (2) 2.5 cm
(3) 3 cm (4) 1.5 cm

(SSC CHSL DEO & LDC Exam, 04.11.2012, Ist Sitting)

4. I and O are respectively the in-centre and circumcentre of a triangle ABC. The line AI produced intersects the circumcircle of Δ ABC at the point D. If ∠ABC = x°, ∠BID = y° and ∠BOD = z°, then $\frac{z+x}{y}$ =

(1) 3 (2) 1
(3) 2 (4) 4

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

5. The radius of the circumcircle of a right angled triangle is 15 cm and the radius of its inscribed circle is 6 cm. Find the sides of the triangle.

(1) 30, 40, 41 (2) 18, 24, 30
(3) 30, 24, 25 (4) 24, 36, 20

(SSC Graduate Level Tier-I Exam. 21.04.2013)

6. If the ΔABC is right angled at B, find its circumradius if the sides AB and BC are 15 cm and 20 cm respectively.

(1) 25 cm (2) 20 cm
(3) 15 cm (4) 12.5 cm

(SSC Constable (GD) Exam. 12.05.2013)

7. If the circumradius of an equilateral triangle ABC be 8 cm, then the height of the triangle is

(1) 16 cm (2) 6 cm
(3) 8 cm (4) 12 cm

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

8. Triangle PQR circumscribes a circle with centre O and radius r cm such that ∠PQR = 90°. If PQ = 3 cm, QR = 4 cm, then the value of r is :

(1) 2 (2) 1.5
(3) 2.5 (4) 1

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

9. The radius of two concentric circles are 17cm and 10cm. A straight line ABCD intersects the larger circle at the point A and D and intersects the smaller circle at the points B and C. If BC = 12 cm, then the length of AD (in cm) is :

(1) 20 (2) 24
(3) 30 (4) 34

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

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10. P and Q are centre of two circles with radii 9 cm and 2 cm respectively, where PQ = 17 cm. R is the centre of another circle of radius x cm, which touches each of the above two circles externally. If $\angle PRQ = 90°$, then the value of x is
(1) 4 cm (2) 6 cm
(3) 7 cm (4) 8 cm
(SSC GL Tier-II Exam. 16.09.2012) & (SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 10.11.2013 (Ist Sitting)

11. O is the circumcentre of ΔABC, given $\angle BAC = 85°$ and $\angle BCA = 55°$, find $\angle OAC$.
(1) 40° (2) 50°
(3) 60° (4) 80°
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

12. In a ΔPQR, $\angle RPQ = 90°$, $\overline{PR}$ = 6 cm and $\overline{PQ}$ = 8 cm, then the radius of the circumcircle of ΔPQR is
(1) 5 cm (2) 3 cm
(3) 4 cm (4) 4.5 cm
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

13. ABC is an equilateral triangle and O is its circumcentre, then the $\angle AOC$ is
(1) 100° (2) 110°
(3) 120° (4) 130°
(SSC CGL Tier-I Exam. 19.10.2014)

14. The circumcentre of a triangle ABC is O. If $\angle BAC = 85°$ and $\angle BCA = 75°$, then the value of $\angle OAC$ is
(1) 40° (2) 60°
(3) 70° (4) 90°
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

15. If AB = 5 cm, AC = 12 cm and $AB \perp AC$, then the radius of the circumcircle of ΔABC is
(1) 6.5 cm, (2) 6 cm
(3) 5 cm (4) 7 cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

16. In a circle if PQ is the diameter of the circle and R is on the circumference of the circle such that $\angle PQR = 30°$, then $\angle RPQ$ = ?
(1) 90° (2) 60°
(3) 30° (4) 45°
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

17. The radii of two concentric circles are 17 cm and 25 cm. A straight line PQRS intersects the larger circle at the points P and S and intersects the smaller circle at the points Q and R. If QR = 16 cm, then the length (in cm.) of PS is
(1) 41 (2) 32
(3) 33 (4) 40
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

18. In ΔABC, the bisector of $\angle BAC$ intersects BC at D and the circumcircle of ΔABC at E. If AB : AD = 3 : 5, then AE : AC is
(1) 5 : 3 (2) 3 : 2
(3) 2 : 3 (4) 3 : 5
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

19. 'O' is the circumcentre of triangle ABC. If $\angle BAC = 50°$ then $\angle OBC$ is
(1) 50° (2) 100°
(3) 130° (4) 40°
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

20. The chord of a circle is equal to its radius. The angle subtended by this chord at the minor arc of the circle is
(1) 75° (2) 60°
(3) 150° (4) 120°
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

21. ABC is a cyclic triangle and the bisectors of $\angle BAC$, $\angle ABC$ and $\angle BCA$ meet the circle at P, Q, and R respectively. Then the angle $\angle RQP$ is
(1) $90°-\frac{B}{2}$ (2) $90°+\frac{B}{2}$
(3) $90°+\frac{C}{2}$ (4) $90°-\frac{A}{2}$
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

22. O is the circumcentre of ΔABC. If $\angle BAC = 85°$, $\angle BCA = 75°$, then $\angle OAC$ is equal to :
(1) 60° (2) 70°
(3) 50° (4) 40°
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

23. O is the circumcentre of the triangle ABC and $\angle BAC = 85°$, $\angle BCA = 75°$, then the value of $\angle OAC$ is
(1) 55° (2) 150°
(3) 20° (4) 70°
(SSC CGL Tier-I Re-Exam, 30.08.2015)

24. If O is the circumcentre of a triangle ABC lying inside the triangle, then $\angle OBC + \angle BAC$ is equal to
(1) 90° (2) 60°
(3) 110° (4) 120°
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

TYPE–XV

1. Ashok has drawn an angle of measure 45°27' when he was asked to draw an angle of 45°. The percentage error in his drawing is
(1) 0.5% (2) 1.0%
(3) 1.5% (4) 2.0%
(SSC CPO S.I. Exam. 05.09.2004)

2. Two line segments PQ and RS intersect at X in such a way that XP = XR. If $\angle PSX = \angle RQX$, then one must have
(1) PR = QS
(2) PS = RQ
(3) $\angle XSQ = \angle XRP$
(4) ar(ΔPXR) = ar(ΔQXS)
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

3. Two chords AB and CD of circle whose centre is O, meet at the point P and $\angle AOC = 50°$, $\angle BOD = 40°$. Then the value of $\angle BPD$ is
(1) 60° (2) 40°
(3) 45° (4) 75°
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

4. A straight line parallel to BC of ΔABC intersects AB and AC at points P and Q respectively. AP = QC, PB = 4 units and AQ = 9 units, then the length of AP is :
(1) 25 units (2) 3 units
(3) 6 units (4) 6.5 units
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

5. In a ΔABC, $\overline{AB}^2 + \overline{AC}^2 = \overline{BC}^2$ and $\overline{BC} = \sqrt{2}\,\overline{AB}$, then $\angle ABC$ is :
(1) 30° (2) 45°
(3) 60° (4) 90°
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

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6. Two chords AB and CD of a circle with centre O intersect each other at the point P. If $\angle AOD = 20°$ and $\angle BOC = 30°$, then $\angle BPC$ is equal to:
(1) 50° (2) 20°
(3) 25° (4) 30°
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

7. ABCD is a quadrilateral inscribed in a circle with centre O. If $\angle COD = 120°$ and $\angle BAC = 30°$, then $\angle BCD$ is :
(1) 75° (2) 90°
(3) 120° (4) 60°
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

8. If ΔABC is similar to ΔDEF, such that $\angle A = 47°$ and $\angle E = 63°$ then $\angle C$ is equal to :
(1) 40° (2) 70°
(3) 65° (4) 37°
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

9. The internal bisectors of $\angle ABC$ and $\angle ACB$ of ΔABC meet each other at O. If $\angle BOC = 110°$, then $\angle BAC$ is equal to
(1) 40° (2) 55°
(3) 90° (4) 110°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

10. In ΔABC, $\angle B = 60°$ and $\angle C = 40°$. If AD and AE be respectively the internal bisector of $\angle A$ and perpendicular on BC, then the measure of $\angle DAE$ is
(1) 5° (2) 10°
(3) 40° (4) 60°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

11. A circle (with centre at O) is touching two intersecting lines AX and BY. The two points of contact A and B subtend an angle of 65° at any point C on the circumference of the circle. If P is the point of intersection of the two lines, then the measure of $\angle APO$ is
(1) 25° (2) 65°
(3) 90° (4) 40°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

12. Internal bisectors of $\angle B$ and $\angle C$ of ΔABC intersect at O. If $\angle BOC = 102°$, then the value of $\angle BAC$ is
(1) 12° (2) 24°
(3) 48° (4) 60°
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

13. The angle between the external bisectors of two angles of a triangle is 60°. Then the third angle of the triangle is
(1) 40° (2) 50°
(3) 60° (4) 80°
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

14. I is the incentre of ΔABC. If $\angle ABC = 60°$, $\angle BCA = 80°$, then the $\angle BIC$ is
(1) 90° (2) 100°
(3) 110° (4) 120°
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

15. In ΔABC, draw $BE \perp AC$ and $CF \perp AB$ and the perpendicular BE and CF intersect at the point O. If $\angle BAC = 70°$, then the value of $\angle BOC$ is
(1) 125° (2) 55°
(3) 150° (4) 110°
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

16. O is the centre and arc ABC subtends an angle of 130° at O. AB is extended to P. Then $\angle PBC$ is
(1) 75° (2) 70°
(3) 65° (4) 80°
(SSC Delhi Police Sub-Inspector (SI) Exam. 19.08.2012)

17. Internal bisectors of angles $\angle B$ and $\angle C$ of a triangle ABC meet at O. If $\angle BAC = 80°$, then the value of $\angle BOC$ is
(1) 120° (2) 140°
(3) 110° (4) 130°
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012) & (SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

18. In triangle PQR, points A, B and C are taken on PQ, PR and QR respectively such that QC=AC and CR = CB. If $\angle QPR = 40°$, then $\angle ACB$ is equal to :
(1) 140° (2) 40°
(3) 70° (4) 100°
(SSC CHSL DEO & LDC Exam. 21.10.2012, IInd Sitting)

19. Two chords AB, CD of a circle with centre O intersect each other at P. $\angle ADP = 23°$ and $\angle APC = 70°$, then the $\angle BCD$ is
(1) 45° (2) 47°
(3) 57° (4) 67°
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

20. In a ΔABC $\angle A : \angle B : \angle C = 2 : 3 : 4$. A line CD drawn $\parallel$ to AB, then the $\angle ACD$ is :
(1) 40° (2) 60°
(3) 80° (4) 20°
(SSC Graduate Level Tier-I Exam. 21.04.2013)

21. In triangle ABC, $\angle BAC = 75°$, $\angle ABC = 45°$. $\overline{BC}$ is produced to D. If $\angle ACD = x°$, then $\frac{x}{3}$% of 60° is
(1) 30° (2) 48°
(3) 15° (4) 24°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

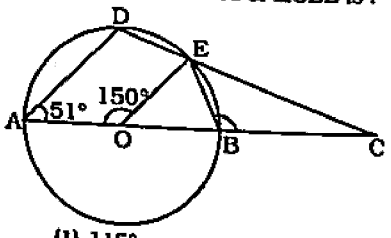
22. In a ΔABC, AB = AC and BA is produced to D such that AC = AD. Then the $\angle BCD$ is
(1) 100° (2) 60°
(3) 80° (4) 90°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

23. In ΔABC, $\angle A + \angle B = 65°$, $\angle B + \angle C = 140°$, then find $\angle B$.
(1) 40° (2) 25°
(3) 35° (4) 20°
(SSC Graduate Level Tier-I Exam. 19.05.2013)

24. In a triangle ABC, $\angle A = 90°$, $\angle C = 55°$, $\overline{AD} \perp \overline{BC}$. What is the value of $\angle BAD$?
(1) 35° (2) 60°
(3) 45° (4) 55°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

25. If O be the circumcentre of a triangle PQR and $\angle QOR = 110°$, $\angle OPR = 25°$, then the measure of $\angle PRQ$ is
(1) 65° (2) 50°
(3) 55° (4) 60°
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

26. In the following figure, AB be diameter of a circle whose centre is O. If $\angle AOE = 150°$, $\angle DAO = 51°$ then the measure of $\angle CBE$ is :



(1) 115° (2) 110°
(3) 105° (4) 120°
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

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27. In a triangle ABC, BC is produced to D so that CD = AC. If $\angle BAD = 111°$ and $\angle ACB = 80°$, then the measure of $\angle ABC$ is :
(1) 31° (2) 33°
(3) 35° (4) 29°
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

28. In ΔABC, $\angle A + \angle B = 145°$ and $\angle C + 2\angle B = 180°$. State which one of the following relations is true ?
(1) CA = AB (2) CA < AB
(3) BC > AB (4) CA > AB
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

29. $\angle A$, $\angle B$, $\angle C$ are three angles of a triangle. If $\angle A - \angle B = 15°$, $\angle B - \angle C = 30°$, then $\angle A$, $\angle B$ and $\angle C$ are
(1) 80°, 60°, 40° (2) 70°, 50°, 60°
(3) 80°, 65°, 35° (4) 80°, 55°, 45°
(SSC Graduate Level Tier-II Exam. 29.09.2013)

30. All sides of a quadrilateral ABCD touch a circle. If AB = 6 cm, BC = 7.5 cm, CD = 3 cm, then DA is
(1) 3.5 cm (2) 4.5 cm
(3) 2.5 cm (4) 1.5 cm
(SSC Graduate Level Tier-II Exam. 29.09.2013)

31. D is a point on the side BC of a triangle ABC such that $AD \perp BC$. E is a point on AD for which AE : ED = 5 : 1. If $\angle BAD = 30°$ and $\tan(\angle ACB) = 6\tan(\angle DBE)$, then $\angle ACB$ =
(1) 30° (2) 45°
(3) 60° (4) 15°
(SSC Graduate Level Tier-II Exam. 29.09.2013)

32. In ΔABC $\angle A = \angle B = 60°$, $AC = \sqrt{13}$ cm. The lines AD and BD intersect at D with $\angle D = 90°$. If DB = 2 cm, then the length of AD is
(1) 3 cm (2) 3.5 cm
(3) 4 cm (4) 4.7 cm
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

33. Two supplementary angles are in the ratio 2 : 3. The angles are
(1) 33°, 57° (2) 66°, 114°
(3) 72°, 108° (4) 36°, 54°
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

34. If the angles of a triangle ABC are in the ratio 2 : 3 : 1, then the angles $\angle A$, $\angle B$ and $\angle C$ are
(1) $\angle A = 60°$, $\angle B = 90°$, $\angle C = 30°$
(2) $\angle A = 40°$, $\angle B = 120°$, $\angle C = 20°$
(3) $\angle A = 20°$, $\angle B = 60°$, $\angle C = 60°$
(4) $\angle A = 45°$, $\angle B = 90°$, $\angle C = 45°$
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

35. A tree of hight 'h' metres is broken by a storm in such a way that its top touches the ground at a distance of 'x' metres from its root. Find the height at which the tree is broken. (Here $h > x$)
(1) $\frac{h^2 + x^2}{2h}$ metre
(2) $\frac{h^2 - x^2}{2h}$ metre
(3) $\frac{h^2 + x^2}{4h}$ metre
(4) $\frac{h^2 - x^2}{4h}$ metre
(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

36. Two poles of height 7 metre and 12 metre stand on a plane ground. If the distance between their feet is 12 metre, the distance between their top will be
(1) 15 metre (2) 13 metre
(3) 19 metre (4) 17 metre
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

37. The measure of an angle whose supplement is three times as large as its complement, is
(1) 75° (2) 30°
(3) 45° (4) 60°
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

38. If two supplementary angles differ by 44°, then one of the angles is
(1) 68° (2) 65°
(3) 102° (4) 72°
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239376)

39. If D, E and F are the mid points of BC, CA and AB respectively of the ΔABC then the ratio of area of the parallelogram DEFB and area of the trapezium CAFD is :
(1) 2 : 3 (2) 3 : 4
(3) 1 : 2 (4) 1 : 3
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

40. The three angles of a triangle are in the ratio 3 : 4 : 5. Then the angles respectively are :
(1) 45°, 60°, 75° (2) 60°, 45°, 75°
(3) 60°, 75°, 45° (4) 75°, 60°, 45°
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

41. If the complement of an angle is one-fourth of its supplementary angle, then the angle is
(1) 60° (2) 30°
(3) 90° (4) 120°
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

42. If the ratio of the angles of a quadrilateral is 2 : 7 : 2 : 7, then it is a
(1) trapezium (2) parallelogram
(3) square (4) rhombus
(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

SHORT ANSWERS

TYPE-I

1. (4)	2. (3)	3. (4)	4. (2)
5. (3)	6. (1)	7. (1)	8. (2)
9. (3)	10. (1)	11. (1)	12. (4)
13. (2)	14. (2)	15. (1)	16. (2)
17. (2)	18. (1)	19. (3)	20. (4)
21. (3)	22. (2)		

TYPE-II

1. (3)	2. (4)	3. (4)	4. (3)
5. (2)	6. (3)	7. (2)	8. (3)
9. (1)	10. (4)	11. (2)	12. (2)
13. (1)	14. (2)		

TYPE-III

1. (3)	2. (2)	3. (1)	4. (4)
5. (2)	6. (1)	7. (1)	8. (1)
9. (2)	10. (2)	11. (2)	12. (3)
13. (2)	14. (2)	15. (4)	16. (3)
17. (3)	18. (1)	19. (2)	20. (2)
21. (2)	22. (3)	23. (2)	24. (3)
25. (4)	26. (3)	27. (4)	28. (2)

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29. (2)	30. (2)	31. (3)	32. (2)
33. (3)	34. (3)	35. (1)	36. (4)
37. (4)	38. (3)	39. (4)	40. (2)
41. (2)	42. (2)	43. (1)	44. (1)
45. (3)	46. (4)	47. (3)	48. (4)
49. (1)	50. (3)	51. (2)	52. (*)
53. (3)	54. (2)	55. (3)	56. (3)
57. (2)	58. (2)	59. (3)	60. (1)
61. (4)	62. (3)	63. (2)	64. (4)
65. (4)	66. (1)	67. (3)	68. (4)
69. (2)	70. (1)	71. (2)	72. (3)
73. (1)	74. (2)	75. (2)	

TYPE-IV

1. (3)	2. (2)	3. (3)	4. (2)
5. (2)	6. (4)	7. (2)	8. (2)
9. (2)	10. (3)	11. (1)	12. (3)
13. (3)	14. (1)	15. (3)	16. (1)
17. (2)	18. (4)	19. (3)	20. (2)
21. (1)	22. (4)	23. (1)	24. (1)
25. (4)	26. (1)	27. (2)	28. (3)
29. (3)	30. (2)	31. (2)	

TYPE-V

1. (4)	2. (3)	3. (1)	4. (3)
5. (4)	6. (2)	7. (4)	8. (3)
9. (3)	10. (3)	11. (4)	12. (4)
13. (1)	14. (4)	15. (3)	16. (4)

TYPE-VI

1. (1)	2. (4)	3. (1)	

TYPE-VII

1. (2)	2. (4)	-	

TYPE-VIII

1. (2)	2. (1)	3. (3)	4. (3)
5. (2)	6. (1)	7. (2)	8. (3)
9. (2)	10. (4)	11. (3)	12. (3)
13. (4)	14. (1)	15. (4)	16. (2)
17. (3)	18. (1)	19. (3)	20. (3)
21. (3)	22. (2)	23. (4)	24. (2)
25. (4)	26. (4)	27. (2)	28. (1)

TYPE-IX

1. (2)	2. (2)	3. (1)	

TYPE-X

1. (4)	2. (2)	3. (4)	4. (3)
5. (1)	6. (2)	7. (1)	8. (3)
9. (2)	10. (1)	11. (2)	12. (1)
13. (4)	14. (2)	15. (3)	16. (2)
17. (4)	18. (4)	19. (1)	20. (4)

TYPE-XI

1. (1)	2. (2)	3. (3)	4. (4)
5. (2)	6. (4)	7. (4)	8. (4)
9. (2)	10. (1)	11. (1)	12. (2)

TYPE-XII

1. (2)	2. (2)	3. (2)	4. (1)
5. (1)	6. (4)	7. (1)	8. (2)
9. (2)	10. (2)	11. (2)	12. (1)
13. (2)	14. (1)	15. (1)	16. (3)
17. (3)	18. (4)	19. (1)	20. (2)
21. (1)	22. (3)	23. (2)	24. (2)
25. (4)	26. (2)	27. (2)	28. (4)
29. (4)	30. (4)	31. (1)	32. (2)
33. (2)	34. (3)	35. (1)	36. (2)
37. (3)	38. (2)	39. (4)	40. (2)
41. (4)	42. (1)	43. (4)	44. (2)
45. (3)	46. (3)	47. (1)	48. (2)
49. (4)	50. (2)	51. (3)	52. (2)
53. (4)	54. (2)	55. (3)	56. (2)
57. (2)	58. (1)	59. (3)	60. (4)
61. (1)	62. (2)		

TYPE-XIII

1. (1)	2. (3)	3. (3)	4. (3)
5. (1)	6. (2)	7. (4)	8. (2)
9. (1)	10. (1)	11. (3)	12. (4)
13. (4)	14. (1)	15. (4)	16. (2)
17. (1)	18. (3)	19. (1)	20. (1)
21. (4)	22. (4)	23. (1)	24. (1)
25. (2)	26. (2)	27. (3)	28. (4)
29. (1)	30. (3)	31. (4)	32. (2)
33. (2)	34. (3)	35. (4)	36. (3)
37. (4)	38. (2)	39. (3)	40. (2)
41. (1)	42. (1)	43. (2)	

TYPE-XIV

1. (4)	2. (1)	3. (2)	4. (1)
5. (2)	6. (4)	7. (4)	8. (4)
9. (3)	10. (2)	11. (2)	12. (1)
13. (3)	14. (3)	15. (1)	16. (2)
17. (4)	18. (4)	19. (4)	20. (3)
21. (1)	22. (2)	23. (4)	24. (1)

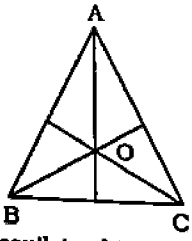
TYPE-XV

1. (2)	2. (2)	3. (3)	4. (3)
5. (2)	6. (3)	7. (2)	8. (2)
9. (1)	10. (2)	11. (1)	12. (2)
13. (3)	14. (3)	15. (4)	16. (3)
17. (4)	18. (4)	19. (2)	20. (2)
21. (4)	22. (4)	23. (2)	24. (4)
25. (4)	26. (3)	27. (4)	28. (4)
29. (3)	30. (4)	31. (3)	32. (1)
33. (3)	34. (1)	35. (2)	36. (2)
37. (3)	38. (1)	39. (1)	40. (1)
41. (1)	42. (2)		

EXPLANATIONS

TYPE-I

1. (4)



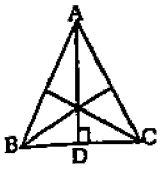
In equilateral triangle centroid, incentre, orthocentre coincide at the same point.

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$\therefore \frac{\text{Height}}{3} = \text{in radius}$

$\therefore$ Height = Median = 3 × 3 = 9 cm.

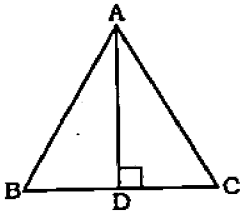
2. (3) In equilateral triangle orthocentre and centroid lie at the same point.



3. (4) In an equilateral triangle, centroid, incentre etc lie at the same point.

4. (2) Triangle will be equilateral.

5. (3)

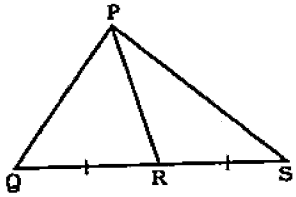


Let AB = 2x units

$\Rightarrow$ BD = DC = x units

$\therefore$ AB : BD = 2 : 1

6. (1)



$\angle PRQ = 60°$

$\angle PRS = 180° - 60° = 120°$;

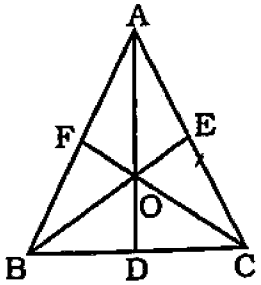
$\Rightarrow \angle PSR + \angle RPS = 60°$

As RS = PR

$\therefore \angle PSR = \angle RPS$

$\therefore \angle PSR = \frac{60°}{2} = 30°$

7. (1)



Let AB = x cm.

$\therefore BD = \frac{x}{2}$

$AD = \sqrt{x^2 - \frac{x^2}{4}} = \frac{\sqrt{3}}{2}x$ cm.

$\therefore OD = \frac{1}{3} \times \frac{\sqrt{3}}{2}x = \frac{x}{2\sqrt{3}}$ cm.

$OB = \sqrt{BD^2 + OD^2}$

$= \sqrt{\frac{x^2}{4} + \frac{x^2}{12}} = \sqrt{\frac{4x^2}{12}} = \frac{x}{\sqrt{3}}$ cm.

$\therefore \frac{x}{\sqrt{3}} = 10 \Rightarrow x = 10\sqrt{3}$ cm.

Hence,

$OD = \frac{x}{2\sqrt{3}} = \frac{10\sqrt{3}}{2\sqrt{3}} = 5$ cm.

8. (2) In radius = $\frac{\text{Side}}{2\sqrt{3}}$

$\Rightarrow 3 = \frac{\text{Side}}{2\sqrt{3}} \Rightarrow$ Side = $3 \times 2\sqrt{3}$

$= 6\sqrt{3}$ cm

9. (3) In an equilateral triange, orthocentre, cirum-centre, incentre and centroid coincide.

10. (1) The line segments joining the mid points of the sides of a triangle form four triangles, each of which is similar to the original triangle.

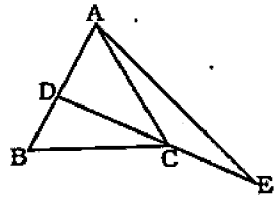
11. (1) In an equilateral ΔABC,

$\angle A = \angle B = \angle C = 60°$

AB = BC = CA

$\therefore$ AX = BY = CZ

12. (4)



$\angle BCD = \angle DCA = 30°$

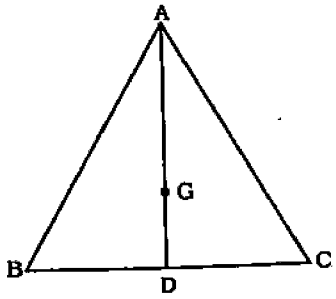
$\angle DCE = 180°$

$\therefore \angle ACE = 180° - 30° = 150°$

AC = CE

$\therefore \angle CAE = \angle CEA = \frac{30°}{2} = 15°$

13. (2)



AB = 10 cm

BD = 5 cm

$\angle ADB = 90°$

$\therefore AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{10^2 - 5^2} = \sqrt{100 - 25}$

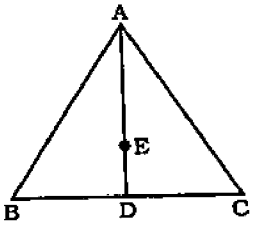
$= \sqrt{75}$

$= 5\sqrt{3}$ cm

$AG = \frac{2}{3}AD = \frac{2}{3} \times 5\sqrt{3}$

$= \frac{10\sqrt{3}}{3}$ cm

14. (2)



E = In-centre, AD $\perp$ BC

AB = 6 cm, BD = 3 cm

$\angle ADB = 90°$

$\therefore AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{6^2 - 3^2} = \sqrt{36 - 9}$

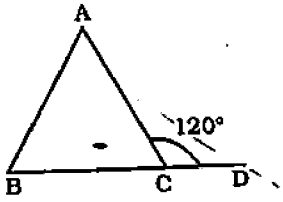
$= \sqrt{27} = 3\sqrt{3}$ cm

$\therefore$ In-radius = $\frac{1}{3}AD$

$= \frac{1}{3} \times 3\sqrt{3} = \sqrt{3}$ cm

15. (1) The medians of an equilateral triangle are equal.

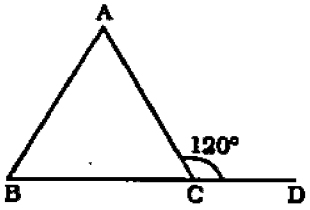
16. (2)



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$\angle ACB = 180° - 120° = 60°$
$AB = AC$
$\therefore \angle ABC = \angle ACB = 60°$
$\therefore \angle BAC = 60°$

17. (2)



$\angle CAB = 2\angle ABC$
$\angle ACB + \angle ACD = 180°$
$\Rightarrow \angle ACB + 120° = 180°$
$\Rightarrow \angle ACB = 180° - 120° = 60°$
$\therefore \angle A + \angle B = 180° - 60° = 120°$
$\Rightarrow 2\angle B + \angle B = 120°$
$\Rightarrow 3\angle B = 120°$

$$\Rightarrow \angle B = \frac{120°}{3} = 40°$$

18. (1) In-radius $= \frac{\text{Side}}{2\sqrt{3}}$

Circum-radius $= \frac{\text{Side}}{\sqrt{3}}$

$$\therefore \text{Required ratio} = \frac{\text{Side}}{2\sqrt{3}} : \frac{\text{Side}}{\sqrt{3}}$$

$= \sqrt{3} : 2\sqrt{3} = 1 : 2$

19. (3) Sum of all angles of a triangle $= 180°$

$$\therefore x + 15° + \frac{6x}{5} + 6° + \frac{2x}{3} + 30° = 180°$$

$$\Rightarrow x + \frac{6x}{5} + \frac{2x}{3} + 51° = 180°$$

$$\Rightarrow \frac{15x + 18x + 10x}{15} = 180° - 51° = 129°$$

$\Rightarrow 43x = 129 \times 15$

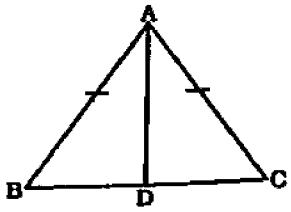
$$\Rightarrow x = \frac{129 \times 15}{43} = 45°$$

$\therefore$ The angles of triangle are :
$x + 15° = 45° + 15° = 60°$

$$\frac{6x}{5} + 6° = \frac{6 \times 45}{5} + 6° = 60°$$

and $\frac{2x}{3} + 30° = \frac{2 \times 45}{3} + 30°$
$= 60°$
It is an equilateral triangle.

20. (4)



$AD \perp BC$
$\therefore BD = DC$

$$AD = \frac{\sqrt{3}}{2} AB = \frac{\sqrt{3}}{2} BC$$

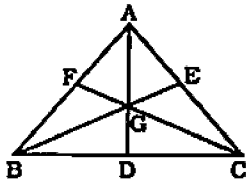
$$= \frac{\sqrt{3}}{2} AC$$

$$\Rightarrow AB = \frac{2}{\sqrt{3}} AD = BC = AC$$

$\therefore AB^2 + BC^2 + AC^2$

$$= \left(\frac{4}{3} + \frac{4}{3} + \frac{4}{3}\right) AD^2 = 4AD^2$$

21. (3)

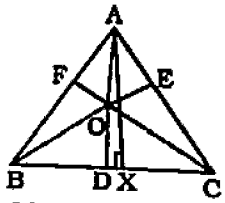


$BD = DC = 5$ cm
$\angle ADB = 90°$
$\therefore AB^2 = BD^2 + AD^2$
$\Rightarrow 10^2 = 5^2 + AD^2$
$\Rightarrow 100 = 25 + AD^2$
$\Rightarrow AD^2 = 100 - 25 = 75$
$\therefore AD = \sqrt{75} = 5\sqrt{3}$

$$\therefore AG = \frac{2}{3} AD = \frac{2}{3} \times 5\sqrt{3}$$

$$= \frac{10\sqrt{3}}{3} \text{ cm.}$$

22. (2)



Let O be a point inside the triangle.
$OD \perp BC$, $OE \perp AC$
and $OF \perp AB$
$AB = BC = CA$
Area of (Δ OAB + Δ OBC + Δ OAC) = Area of Δ ABC

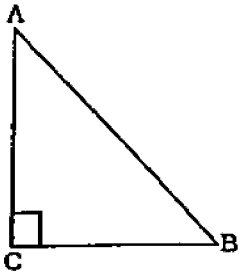
$$\Rightarrow \frac{1}{2} AB \times OF + \frac{1}{2} BC \times OD + \frac{1}{2} \times AC \times OE$$

$$= \frac{1}{2} \times BC \times AX$$

$\Rightarrow OF + OD + OE = AX$

TYPE-II

1. (3)

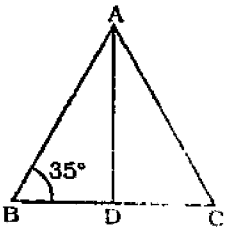


$AC = BC = 5$ cm

$$\therefore AB = \sqrt{AC^2 + BC^2}$$

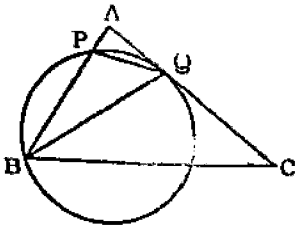
$$= \sqrt{5^2 + 5^2} = \sqrt{50} = 5\sqrt{2} \text{ cm}$$

2. (4)



$AB = AC$
$\Rightarrow \angle ABC = \angle ACB = 35°$
Now, $\angle ADB = 90°$
$\therefore \angle BAD = 55°$

3. (4)



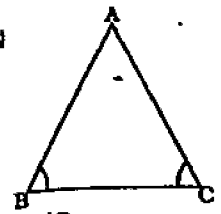
Let $AB = AC = 2x$
$\Rightarrow AQ = QC = x$
$\because$ AB is a secant.
$\Rightarrow AP \times AB = AQ^2$
$\Rightarrow AP \times 2x = x^2$

$$\Rightarrow AP = \frac{x}{2}$$

$$\therefore \frac{AP}{AB} = \frac{x}{2 \times 2x} = \frac{1}{4} \text{ or } 1 : 4$$

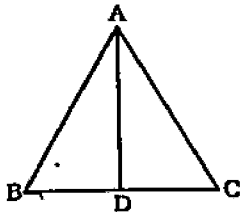
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4. (3)



$\angle B = \angle C$
$\therefore \angle A = 2(\angle B + \angle C)$
$\Rightarrow \angle A = 4\angle C$
$\therefore 4\angle C + \angle C + \angle C = 180°$.
$\Rightarrow 6\angle C = 180°$
$\Rightarrow \angle C = 30°$

5. (2)



$AB = AC = 2a$ units
$BC = a$ units

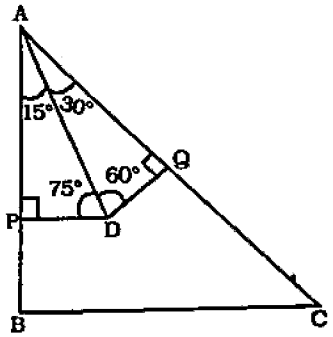
$BD = DC = \frac{a}{2}$ units

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{4a^2 - \frac{a^2}{4}} = \sqrt{\frac{15a^2}{4}}$

$= \frac{\sqrt{15}}{2}a$ units

6. (3)



From ΔAQD,

$\sin 60° = \frac{AQ}{AD}$

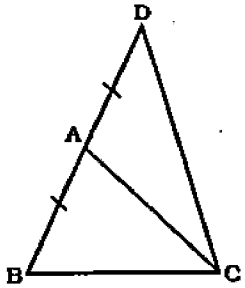
$\Rightarrow \frac{\sqrt{3}}{2} = \frac{b}{AD}$

$\Rightarrow AD = \frac{2b}{\sqrt{3}}$

From ΔAPD,

$\sin 75° = \frac{AP}{AD} = \frac{a}{\frac{2b}{\sqrt{3}}} = \frac{\sqrt{3}a}{2b}$

7. (2)

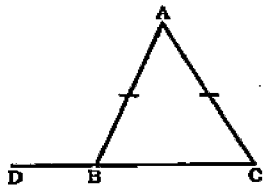


$AB = AC = AD$
$\Rightarrow \angle ABC = \angle ACB = 30°$
$\Rightarrow \angle BAC = 180° - 60° = 120°$
Now, $\angle DAC = 180° - 120° = 60°$
$\Rightarrow \angle ADC + \angle ACD = 120°$

$\therefore \angle ACD = \frac{120°}{2} = 60°$

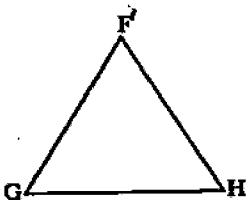
$\therefore \angle BCD = \angle ACB + \angle ACD$
$= 30° + 60° = 90°$

8. (3)



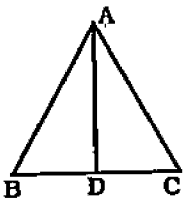
$\angle ABC = \angle ACB$ [$\because AB = AC$]
$\angle BAC = 40°$
$\Rightarrow \angle ABC + \angle ACB = 140°$
$\Rightarrow \angle ABC = 70°$
$\therefore \angle ABD = 180° - 70° = 110°$

9. (1)



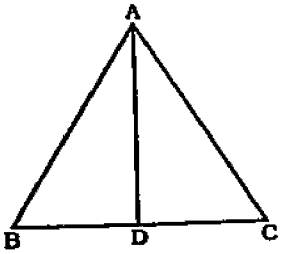
$FG < 3$ cm
$GH = 8$ cm
Clearly, $FH = GH$
The sum of two sides of a triangle is greater than its third side.

10. (4)



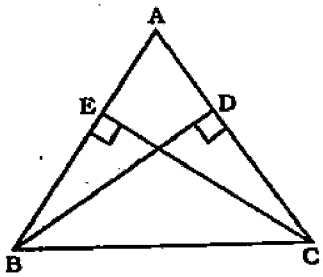
$AB = AC$
$BD = DC$
$\angle ADB = 90°$
The triangle will be either isosceles or equilateral.

11. (2)



$BD = DC$
$AB = AC$
$\therefore \angle ADB = \angle ADC = 90°$
$\angle ABC = 35°$
In ΔABD,
$\angle BAD + \angle ABD = 90°$
$\therefore \angle BAD = 90° - 35° = 55°$

12. (2)

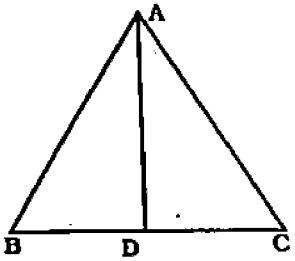


Area of $\Delta ABC = \frac{1}{2} AB \times CE$

$= \frac{1}{2} AC \times BD$

$\Rightarrow AB = AC$ [$\because BD = CE$]
$\therefore \Delta ABC$ is an isosceles triangle.

13. (1)

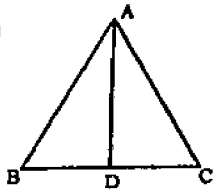


In ΔABC,
$AB = AC$
$\therefore \angle ABC = \angle ACB = x°$
$\therefore \angle BAC = 4x$
$\therefore 4x + x + x = 180°$
$\Rightarrow 6x = 180° \Rightarrow x = 30°$
$\therefore \angle BAC = 4 \times 30° = 120°$

$\angle BAD = \frac{1}{2} \angle BAC = 60°$.

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14. (2)



D, is the mid-point of BC.
AB = AC = 10 cm.
AD ⊥ BC
From ΔABD,

$BD = \sqrt{AB^2 - AD^2}$

$= \sqrt{10^2 - 8^2} = \sqrt{100 - 64}$

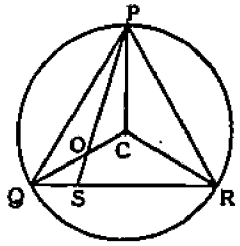
$= \sqrt{36} = 6$ cm.

∴ BC = 2 BD = 2 × 6 = 12 cm.

TYPE-III

1. (3) Let the sides of the triangle be 3x, 4x and 6x units.
Clearly, $(3x)^2 + (4x)^2 < (6x)^2$
∴ The triangle will be obtuse angled.

2. (2)

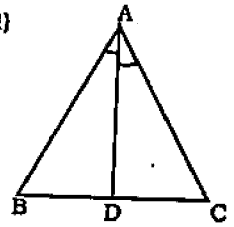


∠PQS = 60°
∠QCR = 130°

∴ $\angle QPR = \frac{1}{2} \times 130° = 65°$

⇒ ∠QRP = 180° − 60° − 65° = 55°
⇒ ∠PCQ = 110°
∴ In Δ QCR,
QC = CR
⇒ ∠CQR = ∠CRQ = 25°
[∵ ∠CQR + ∠CRQ = 50°]
∴ ∠PQC = ∠QPC = 35°
[∵ ∠PQC + ∠QPC = 70°]
Similarly, ∠CPR = 30°
∴ ∠RPS = 35°

3. (1)



AD is the internal bisector of ∠A.

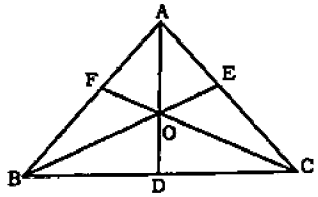
∴ $\frac{AB}{AC} = \frac{BD}{DC} = \frac{5}{7.5 - 5}$

$= \frac{5}{2.5} = 2 : 1$

4. (4) The right bisectors of the sides of a triangle meet at a point. The point of intersection is called circum-centre. For an obtuse angled triangle, circum-centre lies outside the triangle.

5. (2) The sum of two sides of a triangle should be greater than the third side.
(3, 5, 6) and (2, 5, 6)

6. (1)



Let AB = 4x, BC = 5x, CA = 6x
ΔOBA + Δ BOC + ΔAOC
= ΔABC

$\Rightarrow \frac{1}{2} \times 4x \times 3 + \frac{1}{2} \times 5x \times 3$

$+ \frac{1}{2} \times 6x \times 3 = \frac{1}{2} \times 6x \times h$

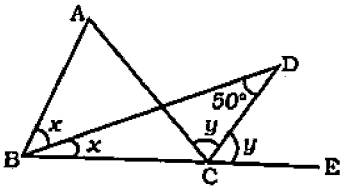
$\Rightarrow 6x + \frac{15x}{2} + 9x = 3xh$

$\Rightarrow 12 + 15 + 18 = 6h$

$\Rightarrow 45 = 6h$

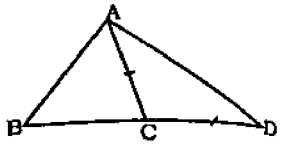
$\Rightarrow h = \frac{15}{2} = 7.5$ cm

7. (1)



[Exterior angle is sum of opp. interior angles]
∠ACE = ∠BAC + ∠ABC
⇒ 2y = ∠A + 2x
Similarly,
∠DCE = ∠DBC + ∠BDC
⇒ y = 50° + x
⇒ ∠A = 2y − 2x
= 100 + 2x − 2x = 100°

8. (1)

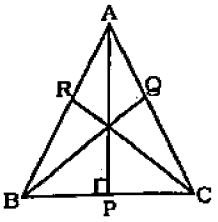


∠ACD = 180° − ∠ACB (Linear Pair)
= 180° − 72° = 108°

$\angle CAD = \angle ADC = \frac{72}{2} = 36°$

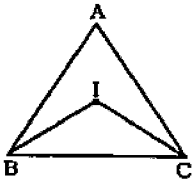
∴ ∠ABC = 180° − 109° − 36°
= 35°

9. (2)



AP < AB
BQ < BC
CR < AC
∴ AP + BQ + CR < AB + BC + AC
⇒ The sum of three altitudes of a triangle is less than the sum of sides.

10. (2)



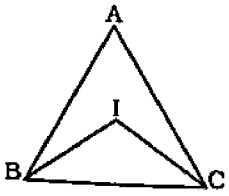
∠ABC = 60°, ACB = 50°

$\angle IBC = \frac{1}{2} \angle ABC = 30°$

$\angle ICB = \frac{1}{2} \angle ACB = 25°$

∴ ∠BIC = 180° − 30° − 25° = 125°

11. (2)



$\angle IBC = \frac{1}{2} \angle ABC = \frac{65}{2} = 32.5°$

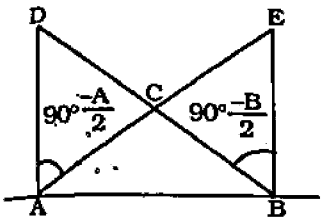
$\angle ICB = \frac{1}{2} \angle ACB = \frac{55}{2} = 27.5°$

∴ ∠BIC = 180° − 32.5° − 27.5°
= 120°

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12. (3) Third angle of triangle
$= 180° - (21° + 38°)$
$= 180° - 59° = 121° > 90°$
i.e., obtuse angle

13. (2)



$\angle DAC = \frac{1}{2}(180° - A)$

$= 90° - \angle\frac{A}{2}$

In ΔADB,
$\angle DAB + \angle ADB + \angle DBA = 180°$

$\Rightarrow 90° - \angle\frac{A}{2} + \angle A + 2\angle B = 180°$

$[\because AD = AB \Rightarrow \angle ADB = \angle DBA = \angle B]$

$\Rightarrow 90° + \angle\frac{A}{2} + 2\angle B = 180°$

$\Rightarrow \angle A + 4\angle B = 180°$ ....(i)

In ΔABE,
$AB = BE \therefore \angle BAE = \angle AEB$
$\therefore \angle ABE + \angle BAE + \angle BEA = 180°$

$90° - \frac{B}{2} + \angle B + 2\angle A = 180°$

$\Rightarrow 90° + \frac{\angle B}{2} + 2\angle A = 180°$

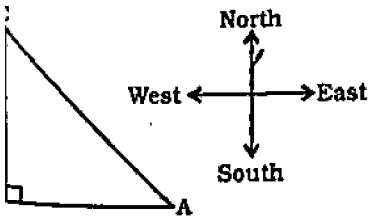
$\Rightarrow \angle B + 4\angle A = 180°$ ....(ii)

From equations (i) and (ii),
$\angle A + 4\angle B = 4\angle A + \angle B$
$\Rightarrow 3\angle A = 3\angle B$
$\Rightarrow \angle A = \angle B$
$\therefore \angle A + 4\angle B = 180°$
$\Rightarrow 5\angle B = 180°$

$\Rightarrow \angle B = \frac{180}{5} = 36° = \angle A$

$\therefore \angle ACB = 180° - 36° - 36°$
$= 180° - 72° = 108°$

14. (2)



$\angle ABC = 90°$
AB = 24 metre, BC = 10metre

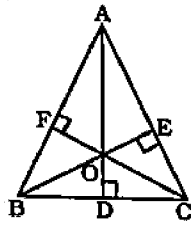
$\therefore AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{24^2 + 10^2}$

$= \sqrt{576 + 100} = \sqrt{676}$

= 26 metre

15. (4)



O = Orthocentre

16. (3) $\angle ABC + \angle ACB + \angle BAC = 180°$

$\Rightarrow \angle ABC + \frac{1}{5}\angle ABC + \frac{3}{5}\angle ABC = 180°$

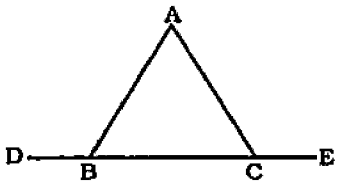
$\Rightarrow \angle ABC + \frac{4}{5}\angle ABC = 180°$

or $\frac{9}{5}\angle ABC = 180°$

$\Rightarrow 9\angle ABC = 180 \times 5$

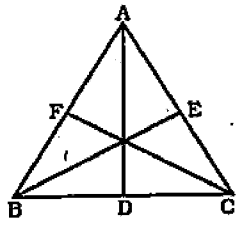
$\Rightarrow \angle ABC = 100°$

17. (3)



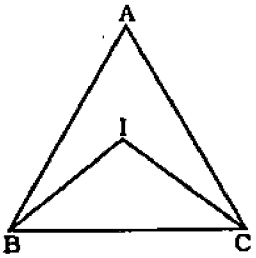
$\angle ABD = 120°$
$\therefore \angle ABC = 180° - 120° = 60°$
$\angle ACE = 105°$
$\therefore \angle ACB = 180° - 105° = 75°$
$\therefore \angle BAC = 180° - 60° - 75° = 45°$

18. (1)



Points D, E, F are midpoints of BC, CA and AB respectively.
Any two sides of a triangle are together greater than twice the median drawn to the third side.
$\therefore AB + AC > 2AD$
$AB + BC > 2BE$
$BC + CA > 2CF$
On adding,
$2(AB + BC + CA) > 2(AD + BE + CF)$
$\Rightarrow AB + BC + CA > AD + BE + CF$

19. (2)



$\angle B + \angle C = 180 - 50 = 130°$
In ΔBIC,
$\angle IBC + \angle ICB + \angle BIC = 180°$

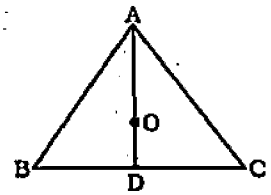
$\Rightarrow \frac{\angle B}{2} + \frac{\angle C}{2} + \angle BIC = 180°$

$\Rightarrow \angle BIC = 180° - \frac{1}{2}(\angle B + \angle C)$

$= 180° - \frac{130}{2}$

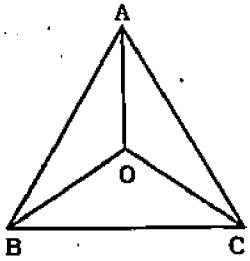
$= 180° - 65° = 115°$

20. (2) D, is the mid-point of side BC. Point O is the centroid that divides AD in the ratio 2 : 1.



AO = 10 cm
$\therefore$ OD = 5 cm.

21. (2)



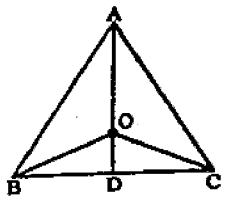
$\angle BAC = 30°$

Now, $\angle BOC = 90° + \frac{1}{2}\angle BAC$

$= 90° + 15° = 105°$

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22. (3)



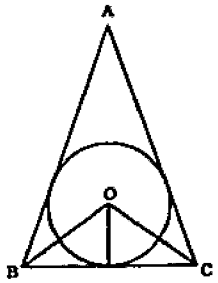
BO is the internal bisector of $\angle B$

$\angle ODB = 90°$; $\angle BOD = 15°$

$\therefore \angle OBD = 180° - 90° - 15° = 75°$

$\Rightarrow \angle ABC = 2 \times 75° = 150°$

23. (2)



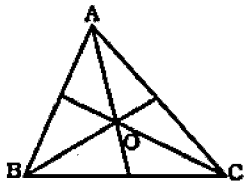
$\angle BOC = 90° + \frac{\angle A}{2}$

$\Rightarrow 110 = 90° + \frac{\angle A}{2}$

$\Rightarrow \angle A = 2 \times 20 = 40°$

24. (3) The right bisectors of sides meet at a point called circumcentre.

25. (4)



The point of intersection of internal bisectors of a triangle is called in-centre.

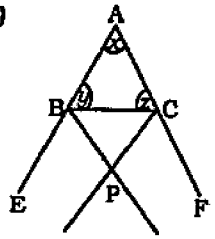
$\angle BOC = 90° + \frac{\angle A}{2}$

$\Rightarrow 116° = 90° + \frac{\angle A}{2}$

$\Rightarrow \frac{\angle A}{2} = 116 - 90° = 26°$

$\therefore \angle A = 26 \times 2 = 52°$

26. (3)



In ΔABC,

$\angle A = x$, $\angle B = y$; $\angle C = z$

In ΔPBC,

$\angle PBC + \angle PCB + \angle BPC = 180°$

$\Rightarrow \frac{1}{2}\angle EBC + \frac{1}{2}\angle FCB + \angle BPC = 180°$

$\Rightarrow \angle EBC + \angle FCB + 2\angle BPC = 360°$

$\Rightarrow (180° - y) + (180° - z) + 2\angle BPC = 360°$

$\Rightarrow 360° - (y + z) + 2\angle BPC = 360°$

$\Rightarrow 2\angle BPC = y + z$

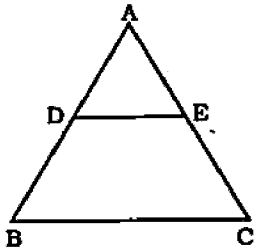
$\Rightarrow 2\angle BPC = 180° - x$

$= 180° - \angle BAC$

$\therefore \angle BPC = 90° - \frac{1}{2}\angle BAC$

$= 90° - 50° = 40°$

27. (4)

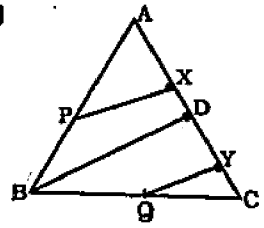


$\frac{AD}{AB} = \frac{AE}{AC} = \frac{1}{3}$

$\therefore \frac{DE}{BC} = \frac{1}{3}$

$\Rightarrow DE = \frac{15}{3} = 5$ cm

28. (2)

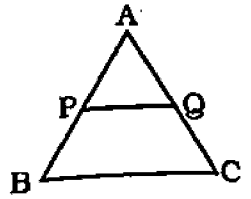


PX || BD and $PX = \frac{1}{2}BD$

QY || BD and $QY = \frac{1}{2}BD$

$\therefore$ PX : QY = 1 : 1

29. (2)



$\frac{AP}{PB} = \frac{AQ}{QC} = \frac{1}{2}$

$\Rightarrow \frac{QC}{AQ} = \frac{2}{1} \Rightarrow \frac{QC + AQ}{AQ} = \frac{3}{1}$

$\Rightarrow AC = 3AQ = 9$ cm

30. (2) AB + BC = 12

BC + CA = 14

CA + AB = 18

$\therefore$ 2 (AB + BC + CA)

$= 12 + 14 + 18 = 44$

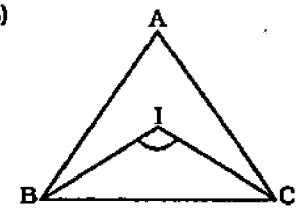
$\Rightarrow$ AB + BC + CA = 22

$\therefore 2\pi r = 22$

$\Rightarrow 2 \times \frac{22}{7} \times r = 22$

$\Rightarrow r = \frac{7}{2}$ cm

31. (3)



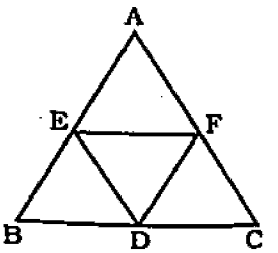
$\angle IBC = \frac{70°}{2} = 35°$;

$\angle ICB = \frac{50°}{2} = 25°$;

$\therefore \angle BIC = 180° - 35° - 25°$

$= 180° - 60° = 120°$

32. (2)

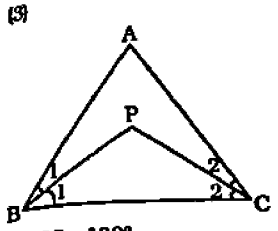


$\Delta DEF = \frac{1}{4}\Delta ABC$

$= \frac{1}{4} \times 24 = 6$ sq. units

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3. (3)



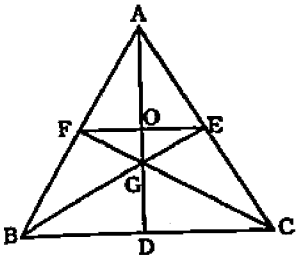
$\angle BPC = 120°$

$\therefore \angle PBC + \angle PCB = 180° - 120° = 60°$

$\therefore \angle ABC + \angle ACB = 2 \times 60° = 120°$

$\therefore \angle A = 180 - 120 = 60°$

4. (3)



$OG = \frac{1}{3} AO$

$\Rightarrow AO = 3 \times OG$

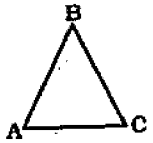
$= 3 \times 2 = 6$ cm

35. (1) The amallest angle

$= \frac{2}{(2+3+7)} \times 180°$

$= \frac{2}{12} \times 180° = 30°$

36. (4)



$AB = BC$

$\therefore \angle BAC = \angle BCA$

$\therefore \angle A + \angle B + \angle C = 180°$

$\Rightarrow 2\angle A + \angle B = 180°$

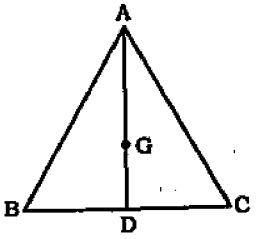
$\Rightarrow 2(2x - 20) + x = 180°$

$\Rightarrow 4x - 40 + x = 180°$

$\Rightarrow 5x = 180 + 40 = 220°$

$\Rightarrow x = 220 \div 5 = 44° = \angle B$

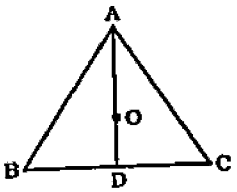
37. (4)



$AG = \frac{2}{3} AD$

$\Rightarrow \frac{AG}{AD} = \frac{2}{3} = 2:3$

38. (3)



$AO = 2\ OD$

$\Rightarrow OD = \frac{AO}{2} = \frac{10}{2} = 5$ cm

39. (4) In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\angle A + \angle B = 118°$

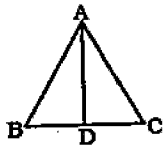
$\therefore \angle C = 180° - 118° = 62°$

$\therefore \angle A + \angle C = 96°$

$\Rightarrow \angle A + 62° = 96°$

$\Rightarrow \angle A = 96° - 62° = 34°$

40. (2)



In ΔABD,

$AB^2 = AD^2 + BD^2$

In ΔADC,

$AC^2 = AD^2 + CD^2$

$\therefore AB^2 + CD^2 = AD^2 + BD^2 + CD^2$

$= AD^2 + CD^2 + BD^2$

$= AC^2 + BD^2$

41. (2) $\angle A + \angle B + \angle C = 180°$ ...(i)

$\angle A + \frac{\angle B}{2} + \angle C = 140°$ ...(ii)

By equation (i) – (ii),

$\frac{\angle B}{2} = 180° - 140°$

$\Rightarrow \frac{\angle B}{2} = 40°$

$\Rightarrow \angle B = 80°$

42. (2) In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\angle A + \angle B = 70°$

$\angle B + \angle C = 130°$

$\therefore \angle A = (\angle A + \angle B + \angle C) - (\angle B + \angle C)$

$= 180 - 130° = 50°$

43. (1) $2\angle A = 3\angle B = 6\angle C$

$\Rightarrow \frac{2\angle A}{6} = \frac{3\angle B}{6} = \frac{6\angle C}{6}$

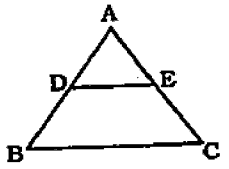
$\Rightarrow \frac{\angle A}{3} = \frac{\angle B}{2} = \frac{\angle C}{1}$

$\Rightarrow \angle A : \angle B : \angle C = 3:2:1$

$\therefore \angle B = \left(\frac{2}{1+2+3}\right) \times 180°$

$= \frac{2}{6} \times 180° = 60°$

44. (1)



DE || BC $\therefore \frac{AD}{AB} = \frac{AE}{AC}$

$\frac{AD}{BD} = \frac{3}{5} \Rightarrow \frac{BD}{AD} = \frac{5}{3}$

$\Rightarrow \frac{BD}{AD} + 1 = \frac{5}{3} + 1$

$\Rightarrow \frac{BD + AD}{AD} = \frac{5+3}{3}$

$\Rightarrow \frac{AB}{AD} = \frac{8}{3}$

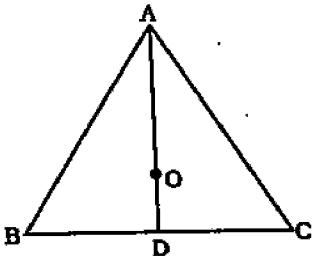
$\Rightarrow \frac{AD}{AB} = \frac{3}{8}$

$\therefore \frac{AD}{AB} = \frac{AE}{AC}$

$\Rightarrow \frac{3}{8} = \frac{AE}{4} \Rightarrow AE = \frac{3 \times 4}{8}$

$= 1.5$ cm.

45. (3)



Point 'O' is centroid and AD is median.

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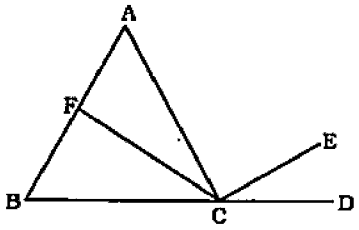
$\therefore AO = \frac{2}{3}AD$

$\Rightarrow 10 = \frac{2}{3}AD$

$\Rightarrow AD = \frac{10 \times 3}{2} = 15$ cm

$\therefore OD = \frac{1}{3}AD = \frac{15}{3} = 5$ cm

46. (4)



$\angle ACF = \angle FCB = \frac{\angle C}{2}$

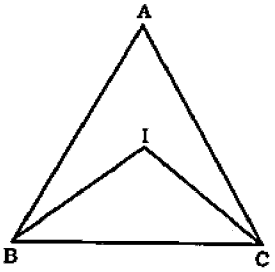
$\angle ACE = \angle ECD = \frac{180° - \angle C}{2}$

$= 90° - \frac{\angle C}{2}$

$\therefore \angle FCE = \angle FCA + \angle ACE$

$= \frac{\angle C}{2} + 90° - \frac{\angle C}{2} = 90°$

47. (3)



In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\therefore \angle B + \angle C = 180° - \angle A$

$\therefore \frac{1}{2}(\angle B + \angle C) = 90° - \frac{\angle A}{2}$

In ΔBIC,

$\frac{\angle B}{2} + \frac{\angle C}{2} + \angle BIC = 180°$

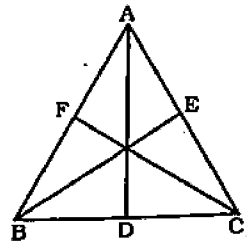
$\therefore 90° - \frac{\angle A}{2} + \angle BIC = 180°$

$\Rightarrow \angle BIC = 180° - 90° + \frac{\angle A}{2}$

$= 90° + \frac{\angle A}{2}$

$\therefore X = 90°$

48. (4) In any triangle the sum of the squares of any two sides is equal to twice the square of half of the third side together with twice the square of the median bisecting it.



$\therefore AB^2 + AC^2 = 2(AD^2 + BD^2)$

$\Rightarrow AB^2 + AC^2 = 2(AD^2 + \frac{BC^2}{4})$

$\Rightarrow 2(AB^2 + AC^2) = 4AD^2 + BC^2$

Similarly,

$2(AB^2 + BC^2) = 4BE^2 + AC^2$

$2(AC^2 + BC^2) = 4CF^2 + AB^2$

On adding all three,

$4(AB^2 + BC^2 + AC^2) = 4(AD^2 + BE^2 + CF^2) + BC^2 + AC^2 + AB^2$

$\Rightarrow 3(AB^2 + BC^2 + AC^2) = 4(AD^2 + BE^2 + CF^2)$

Again,

$AB + AC > 2AD$

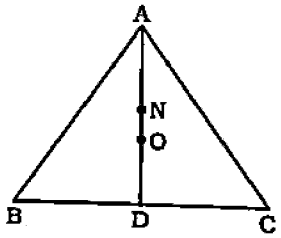
$AB + BC > 2BE$

$BC + AC > 2CF$

$\therefore 2(AB + BC + AC) > 2(AD + BE + CF)$

$\Rightarrow AB + BC + AC > AD + BE + CF$

49. (1)



$AD = 27$ cm

Centroid = O

$\therefore OD = \frac{1}{3}AD$

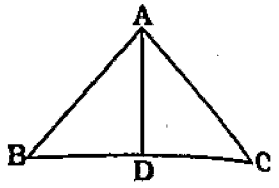
$= \frac{1}{3} \times 27 = 9$ cm

$ND = 12$ cm

$\therefore ON = DN - OD$

$= 12 - 9 = 3$ cm

50. (3)



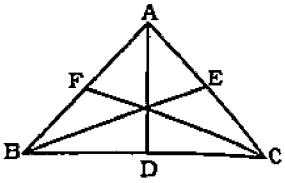
$\frac{AB}{AC} = \frac{BD}{DC}$

$\therefore$ AD is the bisector of $\angle A$.

$\therefore \angle BAD = \frac{1}{2}(\angle BAC)$

$= \frac{180 - 70 - 50}{2} = \frac{60}{2} = 30°$

51. (2)



We know that sum of any two sides of a triangle is greater than twice the medlun bisecting the third side.

Here, D, E and F are the mid-point of the sides BC, AC and AB.

$\therefore AB + AC > 2AD$

$AB + BC > 2BE$

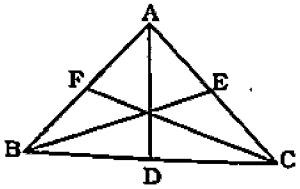
$BC + AC > 2CF$

Adding all three,

$2(AB + BC + AC) > 2(AD + BE + CF)$

$\Rightarrow AB + BC + AC > AD + BE + CF$

52. (*) In any triangle, the sum of the squares of any two sides is equal to twice the square of half of the third side together with twice the square of the median bisecting it.



$\therefore AB^2 + AC^2 = 2(AD^2 + BD^2)$

$\Rightarrow AB^2 + AC^2 = 2\left(AD^2 + \frac{BC^2}{4}\right)$

$\Rightarrow 2(AB^2 + AC^2) = 4AD^2 + BC^2$

Similarly,

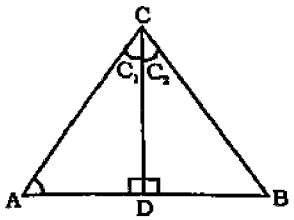
$2(AB^2 + BC^2) = 4BE^2 + AC^2$

$2(AC^2 + BC^2) = 4CF^2 + AB^2$

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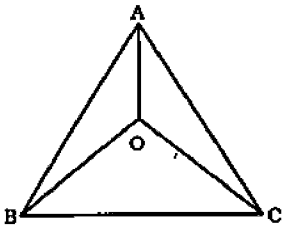
On adding all three,
$4(AB^2 + BC^2 + AC^2)$
$= 4(AD^2 + BE^2 + CF^2)$
$+ BC^2 + AC^2 + AB^2$
$\Rightarrow 3(AB^2 + BC^2 + AC^2)$
$= 4(AD^2 + BE^2 + CF^2)$

53. (3)



$\angle BAC < \angle CBA$
$\angle CDA = \angle CDB = 90°$; $\angle C_1 > \angle C_2$
$\angle A + \angle C_1 = 90°$
$\angle B + \angle C_2 = 90°$
$\therefore \angle A + \angle C_1 = \angle B + \angle C_2$
$\therefore \angle B - \angle A = \angle C_1 - \angle C_2$

54. (2)



BO, CO and AO are internal bisectors of $\angle B$, $\angle C$ and $\angle A$ respectively.

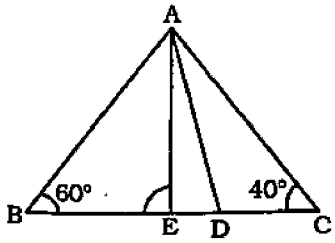
$$\therefore \angle BOC = 90° + \frac{\angle A}{2}$$

$$\Rightarrow 120° = 90° + \frac{\angle A}{2}$$

$$\Rightarrow \frac{\angle A}{2} = 120° - 90° = 30°$$

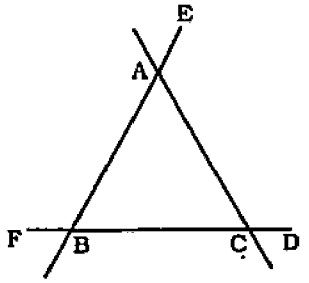
$\therefore \angle A = 30 \times 2 = 60°$

55. (3)



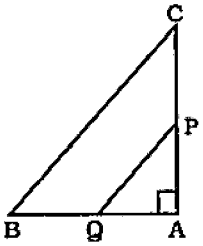
$\angle BAC = 180° - 60° - 40° = 80°$
$\angle BAD = \angle DAC = 40°$
In ΔABE,
$\angle BAE = 90° - 60° = 30°$
$\angle EAD = 40° - 30° = 10°$

56. (3)



$\angle ABC + \angle BCA + \angle BAC = 180°$
Again, $\angle ACB + \angle ACD = 180°$
$\angle ABC + \angle ABF = 180°$
$\angle BAC + \angle EAC = 180°$
$\therefore \angle ACD + \angle ABF + \angle CAE$
$= 540 - 180° = 360°$
$\therefore$ Required answer
$= 2 \times 360° = 720°$

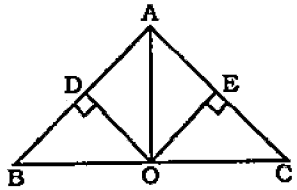
57. (2)



In ΔAQC,
$\angle A = 90°$
$\Rightarrow CQ^2 = AC^2 + QA^2$
$\Rightarrow 4CQ^2 = 4AC^2 + 4QA^2$
$\Rightarrow 4CQ^2 = 4AC^2 + (2QA)^2$
$\Rightarrow 4CQ^2 = 4AC^2 + AB^2$
$[\because AB = 2QA]$
In ΔBPA,
$BP^2 = BA^2 + AP^2$
$\Rightarrow 4BP^2 = 4BA^2 + 4AP^2$
$\Rightarrow 4BP^2 = 4BA^2 + AC^2$
$[\because AC = 2AP]$
$\therefore 4CQ^2 + 4BP^2 = 4AC^2 + AB^2 + 4AB^2 + AC^2$
$\Rightarrow 4(CQ^2 + BP^2) = 5(AC^2 + AB^2)$
$= 5BC^2$

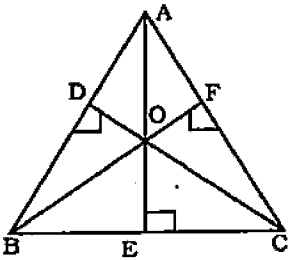
$$\Rightarrow \frac{BP^2 + CQ^2}{BC^2} = \frac{5}{4}$$

58. (2)



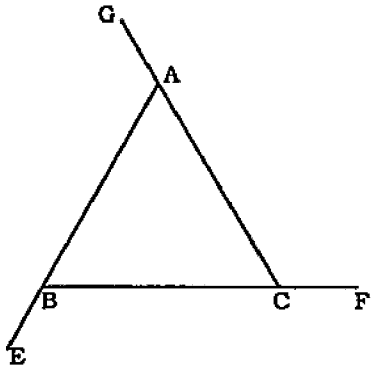
$\angle BDO = 90°$
$\angle BOD = 30°$
$\therefore \angle DBO = 60°$
$\angle B = \angle C = 60°$
$\therefore \angle EOC = 30°$
AO is bisector of BC.
$\therefore \angle DOE = 120°$
$\therefore \angle AOE = \angle AOD = 60°$

59. (3)



$\therefore \angle BOC = 180° - \angle A$
$\Rightarrow \angle BOC + \angle BAC = 180°$

60. (1)



$\angle CBE = 130°$
$\therefore \angle ABC = 180° - 130° = 50°$
$\angle ACF = 130°$
$\therefore \angle ACB = 180° - 130° = 50°$
$\therefore \angle BAC = 180° - 50° - 50° = 80°$
$\therefore \angle GAB = 180° - 80° = 100°$

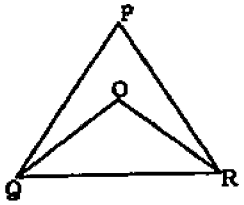
61. (4) Two angles of triangle
$= 4x$ and $5x$ (let)
According to the question,
$2(4x + 5x) = 180°$
$\Rightarrow 18x = 180°$

$$\Rightarrow x = \frac{180°}{18} = 10°$$

$\therefore$ The smallest angle
$= 4x = 4 \times 10 = 40°$

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62. (3)



$\angle ROQ = 96°$

In ΔOQR

$\angle OQR + \angle ORQ + \angle QOR = 180°$

$\Rightarrow \frac{1}{2}\angle PQR + \frac{1}{2}\angle PRQ + 96° = 180°$

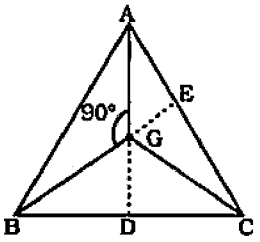
$\Rightarrow \frac{1}{2}(\angle PQR + \angle PRQ) = 180° - 96° = 84°$

$\Rightarrow \angle PQR + \angle PRQ = 2 \times 84° = 168°$

In ΔPQR,

$\therefore \angle QPR = 180° - 168° = 12°$

63. (2)



$AD = 9$ cm.

$\therefore AG = \frac{2}{3} \times 9 = 6$ cm.

$BE = 12$ cm.

$\therefore BG = \frac{2}{3} \times 12 = 8$ cm.

$\angle AGB = 90°$

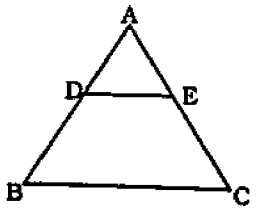
$\therefore$ From ΔABG,

$AB = \sqrt{AG^2 + BG^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm.

4. (4)



$\angle BAC = 40°$,

$\angle ABC = 65°$

$\therefore \angle ACB = 180° - 40° - 65°$

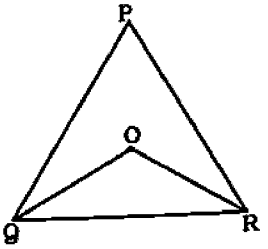
$= 75°$

$DE \parallel BC$

$\therefore \angle AED = \angle ACB = 75°$

$\therefore \angle CED = 180° - 75° = 105°$

65. (4)



$\angle QPR = 50°$

$\therefore \angle PQR + \angle PRQ = 180° - 50° = 130°$

$\therefore \frac{1}{2}\angle PQR + \frac{1}{2}\angle PRQ = 65°$

The point of intersection of internal bisectors of angles is in-centre.

$\therefore \angle OQR = \frac{1}{2}\angle PQR$;

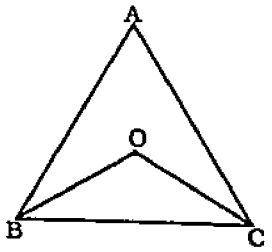
$\angle ORQ = \frac{1}{2}\angle PRQ$

In ΔOQR,

$\angle OQR + \angle QOR + \angle ORQ = 180°$

$\Rightarrow \angle QOR = 180° - 65° = 115°$

66. (1)



$\angle OBC = \frac{1}{2}\angle ABC$;

$\angle OCB = \frac{1}{2}\angle ACB$

From ΔOBC,

$\angle OBC + \angle OCB + \angle BOC = 180°$

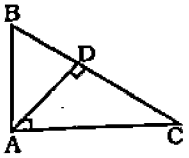
$\frac{1}{2}(\angle ABC + \angle ACB) + \angle BOC = 180°$

$\Rightarrow \frac{1}{2}(180° - \angle BAC) + \angle BOC = 180°$

$\Rightarrow \frac{1}{2}(180° - 100) + \angle BOC = 180°$

$\Rightarrow \angle BOC = 180° - 40° = 140°$

67. (3)



$BD = 3$ cm

$CD = 4$ cm

In ΔABC,

$AB^2 + AC^2 = 7^2$

$\Rightarrow AB^2 + AC^2 = 49$ ....(i)

In ΔABD,

$AB^2 = AD^2 + 3^2 = AD^2 + 9$ ....(ii)

In ΔADC,

$AC^2 = AD^2 + 16$ ....(iii)

On adding equations (ii) and (iii),

$AB^2 + AC^2 = AD^2 + 9 + AD^2 + 16$

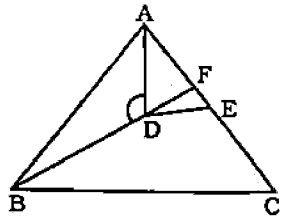
$\Rightarrow 49 = 2AD^2 + 25$

$\Rightarrow 2AD^2 = 49 - 25 = 24$

$\Rightarrow AD^2 = 12$

$\Rightarrow AD = \sqrt{12} = 2\sqrt{3}$ cm.

68. (4)



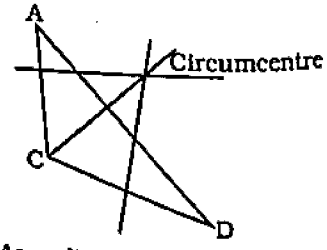
$DE \parallel BC$

and E is the mid-point of AC.

$\therefore AE = \frac{1}{2}AC$

$= \frac{1}{2} \times 12 = 6$ cm.

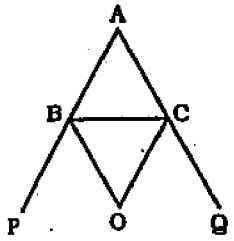
69. (2)



According to question, circumcentre lies outside the triangle.

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70. (1)



The sides AB and AC of a triangle ΔABC are produced to P and Q respectively. If the bisectors of ∠PBC and ∠QCB interest at O, then

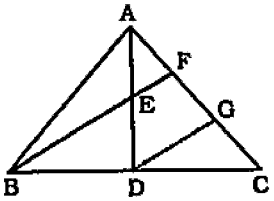
$\angle BOC = 90° - \frac{1}{2}\angle A$

Here, $\angle A = 70°$

$\therefore \angle BOC = 90° - \frac{70°}{2}$

$= 90° - 35° = 55°$

71. (2)



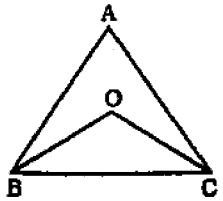
AD is the median.
E is the mid-point of AD.
DG || BF
In ΔBCF,
D is the mid-point of BC and DG || BF.
$\therefore$ G is the mid-point of CF.
$\therefore$ FG = GC
In ΔADG,
EF || DG
E is the mid-point of AD.
$\therefore$ AF = FG
$\therefore$ AF = FG = GC

$AF = \frac{1}{3}AC$

$FC = \frac{2}{3}AC$

$\therefore$ FC : AF = 2 : 1

72. (3)



$\angle OBC = \frac{1}{2}\angle ABC$

$\angle OCB = \frac{1}{2}\angle ACB$

$\therefore \angle OBC + \angle OCB$

$= \frac{1}{2}(\angle ABC + \angle ACB)$

$= \frac{1}{2}(180° - \angle BAC)$

$= \frac{1}{2}(180° - 80°)$

$= \frac{100°}{2} = 50°$

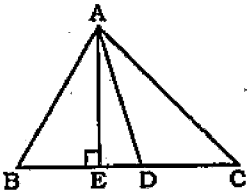
$\therefore$ In ΔOBC,
$\angle BOC$
$= 180° - (\angle OBC + \angle OCB)$
$= 180° - 50° = 130°$

73. (1) Let the sides of the triangle be $7x$, $9x$ and $12x$ cm.
According to the question,
$12x - 7x = 15$

$\Rightarrow 5x = 15 \Rightarrow x = \frac{15}{5} = 3$

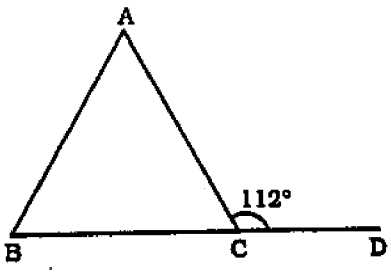
$\therefore$ Largest side = $12x$
$= 12 \times 3 = 36$ cm.

74. (2)



$\angle B + \angle C = 60° + 40° = 100°$
$\therefore \angle A = 180° - 100° = 80°$
$\therefore \angle BAD = 40°$
In Δ ABE,
$\angle AEB = 90°$
$\therefore \angle BAE = 180° - 90° - 60°$
$= 30°$
$\therefore \angle EAD = \angle BAD - \angle BAE$
$= 40° - 30° = 10°$

75. (2)



Exterior angle of a triangle is equal to the sum of remaining two interior angles.

$\therefore \angle A + \angle B = 112°$

$\therefore \frac{4}{3}\angle B + \angle B = 112°$

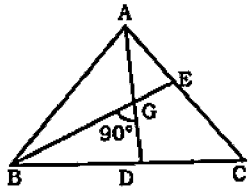
$\Rightarrow \frac{4\angle B + 3\angle B}{3} = 112$

$\Rightarrow \frac{7\angle B}{3} = 112$

$\Rightarrow \angle B = \frac{112 \times 3}{7} = 48°$

TYPE-IV

1. (3)



AD = 9 cm.

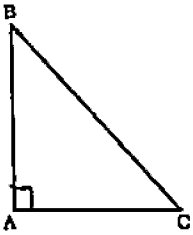
$\Rightarrow GD = \frac{1}{3} \times 9 = 3$ cm

BE = 6 cm

$\Rightarrow BG = \frac{2}{3} \times 6 = 4$ cm

$\therefore BD = \sqrt{3^2 + 4^2} = \sqrt{9+16}$
$= 5$ cm.

2. (2)



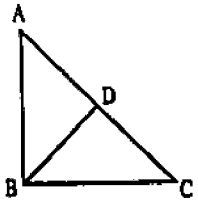
If AB = x; BC = $2x$ units

$\Rightarrow AC = \sqrt{4x^2 - x^2} = \sqrt{3}x$

$\therefore \sin\angle ACB = \frac{AB}{BC} = \frac{1}{2} = \sin 30°$

$\therefore \angle ACB = 30°$

3. (3)

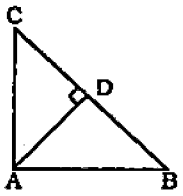


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Here, $6^2 + 8^2 = 10^2$
$\therefore$ ΔABC is a right angled triangle.
AC = 10 cm
Point D is the mid-point of side BC.
Point D is equidistant from the vertices A, B and C.
$\therefore$ AD = BD = CD = 5 cm

4. (2) In a right angled triangle,
(Hypotenuse)^2
= (Perpendicular)^2 + (Base)^2
$\Rightarrow (x+2)^2 = (x-2)^2 + x^2$
$\Rightarrow x^2 + 4x + 4 = x^2 - 4x + 4 + x^2$
$\Rightarrow x^2 - 8x = 0$
$\Rightarrow x(x-8) = 0 \Rightarrow x = 8$

5. (2) In ΔACD and ΔABC,
$\angle CDA = \angle CAB = 90°$
$\angle C$ is common.
$\therefore$ $\Delta ACD \sim \Delta ABC$

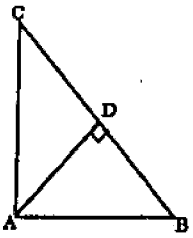


$$\therefore \frac{\Delta ACD}{\Delta ABC} = \frac{AC^2}{BC^2}$$

$$\Rightarrow \frac{10}{40} = \frac{9^2}{BC^2}$$

$$\Rightarrow BC^2 = 4 \times 9^2$$
$\therefore$ BC = 2 × 9 = 18 cm

3. (4)



$\angle BAC = 90°$

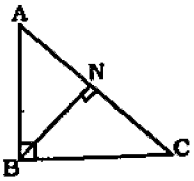
$$AB = \sqrt{AD^2 + BD^2}$$

$= \sqrt{36+16} = \sqrt{52}$ cm
ΔABD and ΔABC are similar.

$$\therefore \frac{AB}{BC} = \frac{BD}{AB}$$
$\Rightarrow AB^2 = BC \times BD$
$\Rightarrow 52 = BC \times 4$

$$\Rightarrow BC = \frac{52}{4} = 13 \text{ cm}$$

7. (2)



$$BC = \sqrt{10^2 - 6^2} = \sqrt{100 - 36}$$

$$= \sqrt{64} = 8 \text{ cm}$$
Area of ΔABC,

$$= \frac{1}{2} \times BC \times AB$$

$$= \frac{1}{2} \times 8 \times 6 = 24 \text{ sq.cm}$$

Again, $\frac{1}{2} AC \times BN = 24$

$$\Rightarrow \frac{1}{2} \times 10 \times BN = 24$$

$$\Rightarrow BN = \frac{24}{5}$$

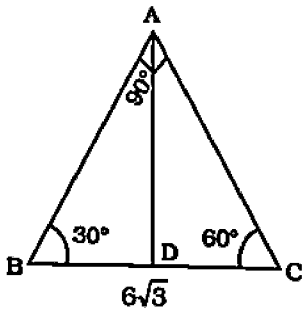
$$\therefore NC = \sqrt{BC^2 - BN^2}$$

$$= \sqrt{64 - \frac{576}{25}} = \frac{32}{5} \text{ cm}$$

$$AN = 10 - \frac{32}{5} = \frac{50-32}{5} = \frac{18}{5}$$

$$\therefore AN : NC = \frac{18}{5} : \frac{32}{5} = 9 : 16$$

8. (2)



$$\sin 30° = \frac{AC}{BC}$$

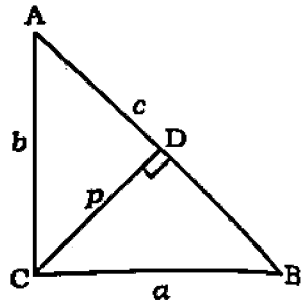
$$\Rightarrow \frac{1}{2} = \frac{AC}{6\sqrt{3}} \Rightarrow AC = 3\sqrt{3}$$

Also, $\sin 60° = \frac{AD}{AC}$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{AD}{3\sqrt{3}}$$

$$\Rightarrow AD = \frac{3\sqrt{3} \times \sqrt{3}}{2} = 4.5 \text{ cm}$$

9. (2)



BC = a, AC = b

$$\therefore AB = \sqrt{AC^2 + BC^2} = \sqrt{b^2 + a^2}$$
Area of ΔABC

$$= \frac{1}{2} :: BC \times AC$$

$$= \frac{1}{2} ab$$

Again, area of ΔABC

$$= \frac{1}{2} \times AB \times CD$$

$$= \frac{1}{2} \times \sqrt{a^2 + b^2} \times p$$

$$\therefore \frac{1}{2} ab = \frac{1}{2} \sqrt{a^2 + b^2} \times p$$

$$\Rightarrow ab = \sqrt{a^2 + b^2} \times p$$
On squaring both sides,

$$a^2 b^2 = (a^2 + b^2) p^2$$

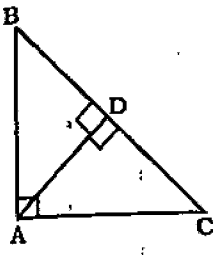
$$\Rightarrow \frac{1}{p^2} = \frac{a^2 + b^2}{a^2 b^2}$$

$$\Rightarrow \frac{1}{p^2} = \frac{a^2}{a^2 b^2} + \frac{b^2}{a^2 b^2}$$

$$\Rightarrow \frac{1}{p^2} = \frac{1}{b^2} + \frac{1}{a^2} = \frac{1}{a^2} + \frac{1}{b^2}$$

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10. (3)

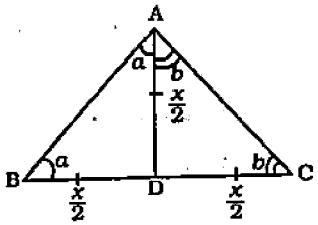


In
ΔABC, $AD \perp BC$
$\Rightarrow \Delta BAC \sim \Delta ADC$ ∴ Ratio of area of triangles = ratio of square of their corresponding sides Hence,

$$\frac{ar(BAC)}{ar(ADC)} = \frac{BC^2}{AC^2} = \frac{64}{36}$$

$$= \frac{16}{9} = 16:9$$

11. (1)

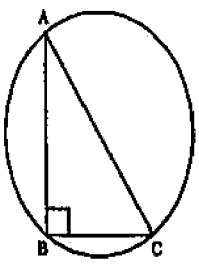


I ~ ΔABC, Let $BC = x$ Since AD is the median, ∴ $BD = DC = \frac{x}{2}$

Also, $AD = \frac{1}{2} BC = \frac{1}{2} x$ or $\frac{x}{2}$

In ΔABD, $AD = BD \Rightarrow \angle BAD = \angle ABD$ Similarly in
ΔADC, $\angle DAC = \angle ACD$,
$\angle A = a + b$.
Thus, $a + b + a + b = 180°$
$\Rightarrow a + b = 90° \Rightarrow \angle A = 90°$

12. (3)

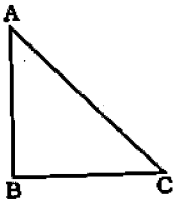


AC = Diameter of circum circle
$= \sqrt{5^2 + 12^2} = 13$ cm

∴ Circum-radius $= \frac{13}{2}$

$= 6.5$ cm

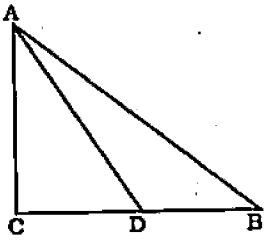
13. (3)



$$AB \times BC = \frac{AC^2}{2}$$

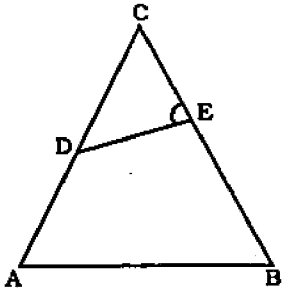
$\Rightarrow AC^2 = 2\,AB \times BC$
$\Rightarrow AB^2 + BC^2 = 2\,AB \times BC$
$\Rightarrow (AB - BC)^2 = 0$
$\Rightarrow AB = BC$
$\therefore \angle BAC = \angle ACB = 45°$

14. (1)



In ΔABC, $AC^2 + BC^2 = AB^2$
In ΔACD, $AD^2 = AC^2 + CD^2$
$\Rightarrow AD^2 - CD^2 = AC^2$
$\therefore AB^2 + AC^2$
$= AC^2 + BC^2 + AD^2 - CD^2$
$\Rightarrow AB^2 = BC^2 + AD^2 - CD^2$
$\Rightarrow AB^2 + CD^2 = BC^2 + AD^2$

15. (3)



$\angle DEC = 90°$
DE = 18 cm
CE = 5 cm

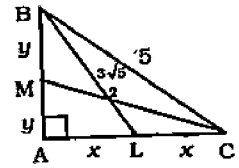
$$\therefore \tan C = \frac{DE}{CE} = \frac{18}{5} = 3.6$$

$\tan \angle ABC = 3.6$
$\Rightarrow \angle C = \angle B$
$\therefore AC = AB$
$\angle C + \angle D = 90°$
$\Rightarrow 2\angle C + 2\angle D = 180°$
$\angle C + \angle A + \angle B = 180°$
$\Rightarrow 2C + \angle A = 180°$
$\therefore \angle A = 2\angle D$

$$\therefore \frac{AC}{CB} = \frac{2CD}{CE}$$

$$\Rightarrow \frac{AC}{CD} = \frac{2CB}{CE} \text{ or } 2BC\ CE$$

16. (1)



Since BL is the Median $AL = LC = x$ (say). Since CM is the Median, $BM = MA = y$ (say)
$AB^2 + AC^2 = 25$ ...(i)

$$\Rightarrow \left(\frac{3\sqrt{5}}{2}\right)^2 = (2y)^2 + x^2$$

$$\Rightarrow \frac{9 \times 5}{4} = 4y^2 + x^2$$

$$\Rightarrow 4y^2 = \frac{45}{4} - x^2 \quad \text{...(ii)}$$

In ΔABC, $BC^2 = AB^2 + AC^2$
$\Rightarrow 25 = (2y)^2 + (2x)^2$
$25 = 4y^2 + 4x^2 \Rightarrow 25$

$$= \frac{45}{4} - x^2 + 4x^2$$

$$3x^2 = \frac{55}{4} \Rightarrow x^2 = \frac{55}{12}$$

Put in (ii) $\Rightarrow 4y^2 = \frac{45}{4} - \frac{55}{12}$

$$= \frac{135 - 55}{12}$$

$$\Rightarrow 4y^2 = \frac{80}{12} \Rightarrow y^2 = \frac{80}{12 \times 4} = \frac{5}{3}$$

Now, CM

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$= \sqrt{y^2 + 4x^2} = \sqrt{\frac{5}{3} + 4\left(\frac{55}{12}\right)}$

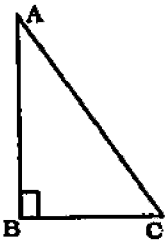
$= \sqrt{\frac{5}{3} + \frac{55}{3}} = \sqrt{\frac{60}{3}}$

$= \sqrt{20} = 2\sqrt{5}$ cm.

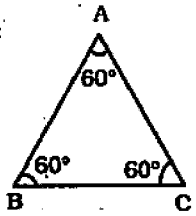
17. (2) When orthocentre lies at right angular vertex, then the triangle is right angled.

18. (4) $(2x)^2 + (x^2 - 1)^2$
$= 4x^2 + x^4 - 2x^2 + 1$
$= x^4 + 2x^2 + 1 = (x^2 + 1)^2$
It is a right angled triangle.

19. (3)

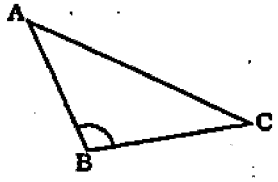


In right angled Δ ABC,
$\angle B = \angle A + \angle C$

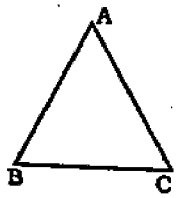


In an equilateral triangle ABC,

$\angle B = \frac{\angle A + \angle C}{2}$

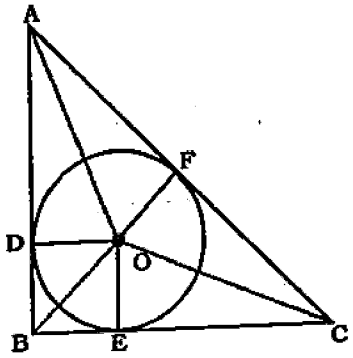


In obtuse angled triangle,
$\angle B > \angle A + \angle C$



In acute angled triangle ABC,
$\angle A < \angle B + \angle C$
$\angle B < \angle A + \angle C$

20. (2)



$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64} = \sqrt{100} = 10$ cm

OD = OE = OF = radii
= r cm
∴ Area of [ΔAOB + ΔBOC + ΔAOC]
= ΔABC

$\Rightarrow \frac{1}{2} \times 6 \times r + \frac{1}{2} \times 8 \times r +$ ..

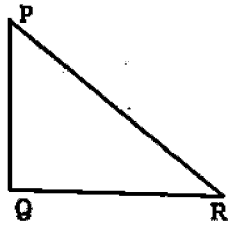
$\frac{1}{2} \times 10 \times r = \frac{1}{2} \times 8 \times 6$

$\Rightarrow 3r + 4r + 5r = 24$

$\Rightarrow 12r = 24$

$\Rightarrow r = \frac{24}{12} = 2$ cm

21. (1) In right angled triangle PQR,



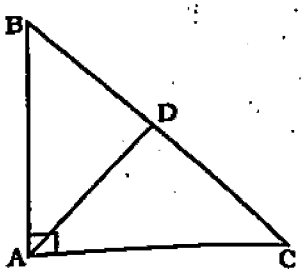
$PQ^2 + QR^2 = PR^2$

Here, $3^2 + 4^2 = 5^2$

∴ The smallest side = 3 units

22. (4) Angle in a semi-circle is a right angle.

23. (1)



$BD = DC = \frac{1}{2} BC$

$\therefore AC^2 = AD^2 + CD^2$
$AB^2 = AD^2 + BD^2$
$= AD^2 + CD^2$

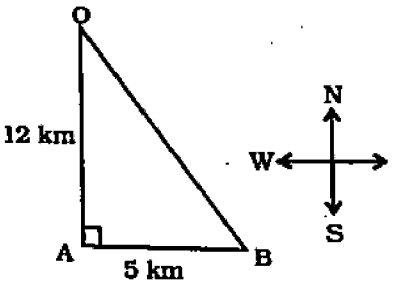
On adding,
$AB^2 + AC^2 = 2AD^2 + 2CD^2$
$\Rightarrow BC^2 = 2AD^2 + 2CD^2$
$\Rightarrow 4CD^2 = 2AD^2 + 2CD^2$
$\Rightarrow AD^2 = CD^2$
$\Rightarrow AD = CD = BD$

Mid point on the hypotenuse of right angled triangle is equidis tant from the vertices.

24. (1) Ratio of sides = $3 : \frac{5}{4} : \frac{13}{4}$

= 12 : 5 : 13
$5^2 + 12^2 = 13^2$
It is a right angled triangle.

25. (4)



$\therefore OB = \sqrt{OA^2 + AB^2}$

$= \sqrt{12^2 + 5^2}$

$= \sqrt{144 + 25} = \sqrt{169} = 13$ k

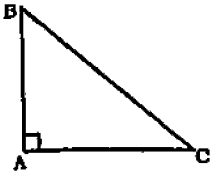
26. (1) Angles of triangle = $2x^\circ$, 3 and $5x^\circ$ (let)
$\therefore 2x^\circ + 3x^\circ + 5x^\circ = 180^\circ$
$\Rightarrow 10x^\circ = 180^\circ$

$\Rightarrow x^\circ = \frac{180}{10} = 18^\circ$

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Angles of triangle = $2x = 2 \times 18 = 36°$,
$3x = 3 \times 18 = 54°$,
$5x = 5 \times 18 = 90°$,
Hence, it is a right angled triangle.

27. (2)



$\angle BAC = 90°$
From ΔABC,

$BC = \sqrt{AB^2 + AC^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm.

$\therefore$ Semi-perimeter of $\Delta ABC = s$

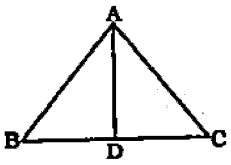
$= \frac{6+8+10}{2} = \frac{24}{2} = 12$ cm.

Area of $\Delta ABC = \frac{1}{2} \times AC \times AB =$

$\frac{1}{2} \times 8 \times 6 = 24$ sq. cm.

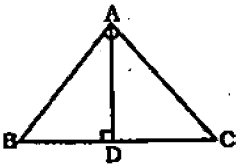
$\therefore$ In-radius $= \frac{\Delta}{s} = \frac{24}{12} = 2$ cm.

28. (3)



In right angled Δ ABD and ΔADC,
$AB^2 = AD^2 + BD^2$
and, $AC^2 = AD^2 + DC^2$
On adding,
$AB^2 + AC^2 = 2AD^2 + BD^2 + CD^2$
$\Rightarrow AB^2 + AC^2 = 2BD \times CD + BD^2 + CD^2$
$[\because AD^2 = BD \times CD]$
$\Rightarrow AB^2 + AC^2 = (BD + CD)^2$
$= BC^2$
$\therefore \angle BAC = 90°$

29. (3)



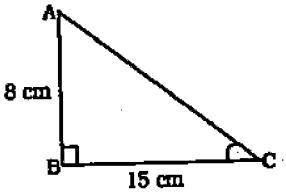
In ΔABC and ΔDAC,
$\angle ADC = \angle BAC$, $\angle C = \angle C$
By AA – similarity criterion,
$\Delta ABC \sim \Delta DAC$

$\therefore \frac{AB}{DA} = \frac{BC}{AC} = \frac{AC}{DC}$

$\Rightarrow \frac{CB}{CA} = \frac{CA}{CD}$

$\Rightarrow CA^2 = CB \times CD$
$= BC(BC - BD)$
$= 14 \times (14 - 5) = 14 \times 9$
$= 126$ sq. cm.
$\therefore$ From ΔADC
$CA^2 = AD^2 + C'D^2$
$\Rightarrow 126 = AD^2 + 9^2$
$\Rightarrow AD^2 = 126 - 81 = 45$
$\Rightarrow AD = \sqrt{45} = 3\sqrt{5}$ cm.

30. (2)



$\therefore AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{8^2 + 15^2}$

$= \sqrt{64 + 225}$

$= \sqrt{289} = 17$ cm.

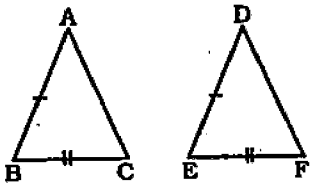
$\therefore \sin C = \frac{AB}{AC} = \frac{8}{17}$

31. (2) $AB = BC = k$,

$AC = \sqrt{2}\,k$
$AB^2 + BC^2 = k^2 + k^2$
$= 2k^2 = AC^2$
$\therefore \Delta ABC$ is a right angled triangle.

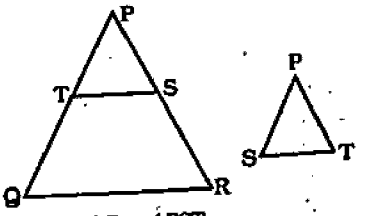
TYPE-V

1. (4)



Two triangles are congruent if two sides and the included angle of one are equal to the corresponding sides and the included angle of the other triangle. (SAS criterion).

2. (3)



$\angle PQR = \angle PST$
$\angle P = \angle P$
$\therefore \Delta PST$ and ΔPQR are similar.

$\therefore \frac{PQ}{PS} = \frac{PR}{PT}$

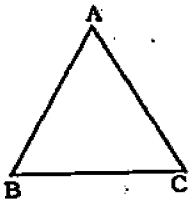
$\Rightarrow \frac{8}{3} = \frac{PR}{5}$

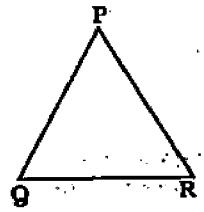
$\Rightarrow PR = \frac{8 \times 5}{3} = \frac{40}{3}$

$\therefore SR = PR - PS = \frac{40}{3} - 3$

$= \frac{40 - 9}{3} = \frac{31}{3}$ cm.

3. (1)





In similar triangles ΔABC and ΔPQR,

$\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$

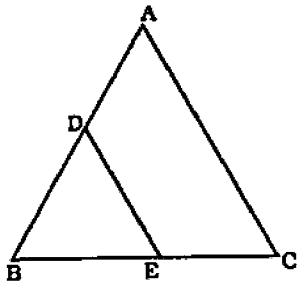
$= \frac{AB + BC + AC}{PQ + QR + PR}$

$\Rightarrow \frac{AB}{10} = \frac{36}{24} = \frac{3}{2}$

$\Rightarrow AB = \frac{3}{2} \times 10 = 15$ cm

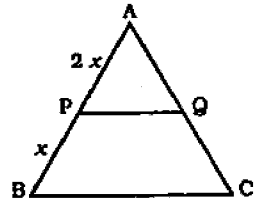
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4. (3)



In ΔABC and ΔDBE,
$DE \parallel AC$
$\therefore \angle BAC = \angle BDE$
$\angle BCA = \angle BED$
$\therefore$ By AA-similarity
$\Delta ABC \sim \Delta DBE$

5. (4)

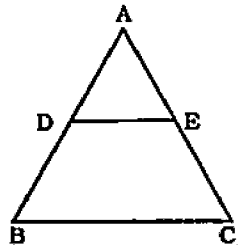


In ΔABC, $PQ \parallel BC$
$\Rightarrow \Delta APQ \sim ABC$

$$\Rightarrow \frac{AP}{AB} = \frac{PQ}{BC} = \frac{2x}{3x} = \frac{2}{3} = 2:3$$

[Let $PB = x \Rightarrow AB = 3x$ and $AP = 3x - x = 2x$]

6. (2)



$DE \parallel BC$
$\angle ADE = \angle ABC$
$\angle AED = \angle ACB$
$\therefore \Delta ADE \sim \Delta ABC$

Now, $\frac{\square BDEC}{\Delta ADE} = \frac{1}{1}$

[DE divides Δ into two equal parts]

$$\Rightarrow \frac{\square BDEC}{\Delta ADE} + 1 = 1 + 1$$

$$\Rightarrow \frac{\Delta ABC}{\Delta ADE} = 2 = \frac{AB^2}{AD^2}$$

$$\Rightarrow \frac{AB}{AD} = \sqrt{2}$$

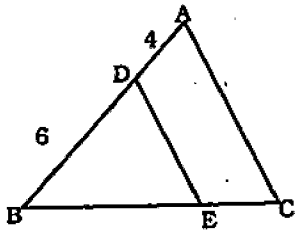
$$\Rightarrow \frac{AB}{AD} - 1 = \sqrt{2} - 1$$

$$\Rightarrow \frac{BD}{AD} = \sqrt{2} - 1$$

$$\Rightarrow \frac{AD}{BD} = \frac{1}{\sqrt{2} - 1}$$

or $1 : \sqrt{2} - 1$

7. (4)



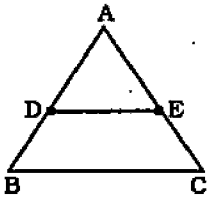
$DE \parallel AC$
$\Delta BDE \sim \Delta BAC$

$$\Rightarrow \frac{BD}{DA} = \frac{BE}{EC}$$

$$\Rightarrow \frac{6}{4} = \frac{BE}{EC}$$

$\Rightarrow BE : CE = 3 : 2$

8. (3)



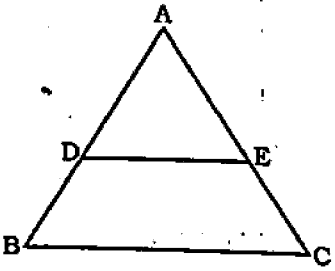
$$\frac{AD}{AE} = \frac{AB}{AC}$$

$\Delta ADE \sim \Delta ABC$

$$\therefore DE = \frac{1}{4}BC$$

$$= \frac{1}{4} \times 12 = 3 \text{ cm}$$

9. (3)



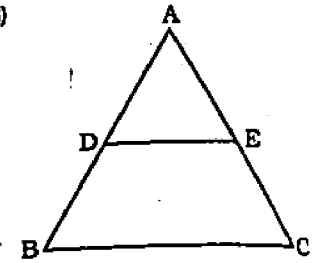
$$\frac{AB}{AD} = \frac{2}{1}$$

$\Delta ADE \sim \Delta ABC$

$$\frac{AB}{AD} = \frac{BC}{DE} = \frac{2}{1}$$

$$\therefore \frac{DE}{BC} = \frac{1}{2} = 1:2$$

10. (3)



$\Delta ADE = \square BDEC$ (Given)
$\Rightarrow \Delta 2ADE = \Delta ABC$
$DE \parallel BC$
$\therefore \Delta ADE \sim \Delta ABC$

$$\therefore \frac{\Delta ADE}{\Delta ABC} = \frac{1}{2} = \frac{AD^2}{AB^2}$$

$$\Rightarrow \frac{AB}{AD} = \sqrt{2}$$

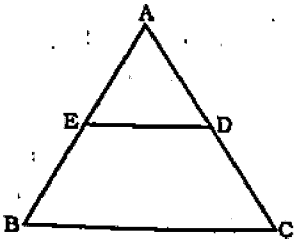
$$\Rightarrow \frac{AB}{AD} - 1 = \sqrt{2} - 1$$

$$\Rightarrow \frac{AB - AD}{AD} = \sqrt{2} - 1$$

$$\Rightarrow \frac{BD}{AD} = \sqrt{2} - 1$$

$$\therefore \frac{BD}{AB} = \frac{BD}{AD} \times \frac{AD}{AB} = \frac{\sqrt{2} - 1}{\sqrt{2}}$$

11. (4)



In ΔADE and ΔABC,
$\angle ABC = \angle ADE$
$\angle A = \angle A$
$\therefore \Delta ABC \sim \Delta ADE$

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$\therefore \frac{AB}{AD} = \frac{BC}{DE} = \frac{AC}{AE}$

$\therefore \frac{AE+EB}{AD} = \frac{AC}{AE}$

$\Rightarrow \frac{3+2}{2} = \frac{AC}{3}$

$\Rightarrow \frac{5}{2} = \frac{AC}{3}$

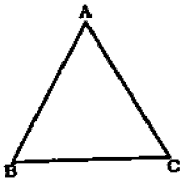
$\Rightarrow 2AC = 5 \times 3 \Rightarrow AC = \frac{15}{2}$

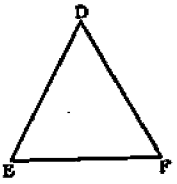
$\therefore DC = AC - AD$

$= \frac{15}{2} - 2 = \frac{15-4}{2} = \frac{11}{2}$

$= 5.5$ cm

12. (4)





$\Delta ABC \sim \Delta DEF$ and $4AB = DE$

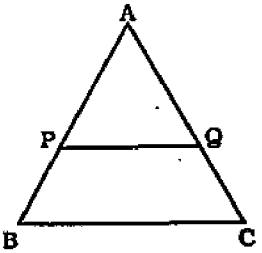
$\Rightarrow \frac{AB}{DE} = \frac{1}{4}$

$\therefore \frac{AB}{DE} = \frac{BC}{EF}$

$\Rightarrow \frac{1}{4} = \frac{12}{EF}$

$\Rightarrow EF = 48$ cm.

13. (1)



$\angle P = \angle B$

$\angle Q = \angle C$

$\therefore$ By AA — similarity,

$\Delta APQ \sim \Delta ABC$

$\therefore \frac{AP}{AB} = \frac{AQ}{AC}$

$\Rightarrow \frac{AB}{AP} = \frac{AC}{AQ}$

$\Rightarrow \frac{AB}{AP} - 1 = \frac{AC}{AQ} - 1$

$= \frac{AC - AQ}{AQ}$

$\Rightarrow \frac{AB}{AP} - 1 = \frac{QC}{AQ}$

$\Rightarrow \frac{12}{QC} - 1 = \frac{QC}{2}$

$\Rightarrow \frac{12}{x} - 1 = \frac{x}{2}$ $(QC = x)$

$\Rightarrow \frac{12-x}{x} = \frac{x}{2}$

$\Rightarrow x^2 + 2x - 24 = 0$

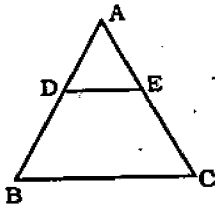
$\Rightarrow x^2 + 6x - 4x - 24 = 0$

$\Rightarrow x(x+6) - 4(x+6) = 0$

$\Rightarrow (x-4)(x+6) = 0$

$\Rightarrow x = 4$ because $x \neq -6$

14. (4)



DE || BC

$\therefore \angle ADE = \angle ABC$

$\angle AED = \angle ACB$

By AA – similarly,

$\Delta ADE \sim \Delta ABC$

$\therefore \frac{AB}{AD} = \frac{BC}{DE}$

$\therefore \frac{DB}{AD} = \frac{4}{5}$

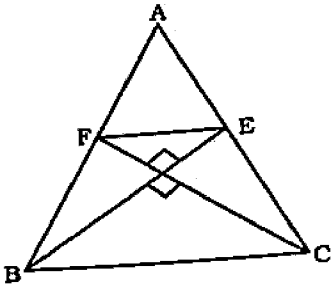
$\Rightarrow \frac{DB}{AD} + 1 = \frac{4}{5} + 1$

$\Rightarrow \frac{DB+AD}{AD} = \frac{4+5}{5}$

$\Rightarrow \frac{AB}{AD} = \frac{9}{5} = \frac{BC}{DE}$

$\therefore \frac{DE}{BC} = \frac{5}{9} = 5:9$

15. (3)



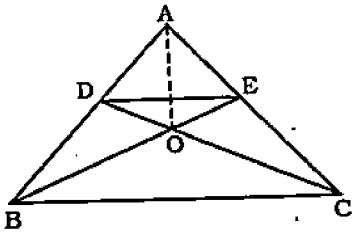
FE||BC

$\Delta AFE \sim \Delta ABC$

$BC = \frac{1}{2}(AB + AC)$

$= \frac{1}{2}(19 + 22) = 20.5$ cm

16. (4)



In ΔADE and ΔABC,

$\angle ADE = \angle ABC$

$\angle AED = \angle ACB$

$\therefore \Delta AED \sim \Delta ABC$

$\therefore \frac{AD}{AB} = \frac{DE}{BC}$

$\frac{AD}{DB} = 1$

$\Rightarrow \frac{DB}{AD} + 1 = 2$

$\Rightarrow \frac{DB+AD}{AD} = 2$

$\Rightarrow \frac{AB}{AD} = 2 \Rightarrow \frac{AD}{AB} = \frac{1}{2}$

$\Rightarrow \frac{DE}{BC} = \frac{1}{2}$

$\therefore \frac{\Delta ODE}{\Delta BOC} = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$

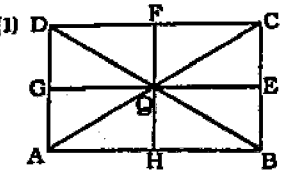
$\therefore \frac{\Delta ODE}{\Delta ABC} = \frac{1}{12} = 1:12$

$[\because S\,\Delta BOC = \Delta ABC$

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TYPE-VI

1. (1)



Using Pythagoras theorem,

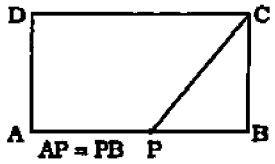
$QD^2 + QB^2 = QA^2 + QC^2$

$\Rightarrow QD^2 + 16 = 9 + 25$

$\Rightarrow QD^2 = 34 - 16 = 18$

$\Rightarrow QD = \sqrt{18} = 3\sqrt{2}$ cm

2. (4)



Let $AB = 3x$ units

$BC = 2x$ units

$\Rightarrow PB = \frac{3}{2}x$ units

$CP = \sqrt{PB^2 + BC^2}$

$= \sqrt{\frac{9x^2}{4} + 4x^2}$

$= \sqrt{\frac{25x^2}{4}} = \frac{5x}{2}$ units

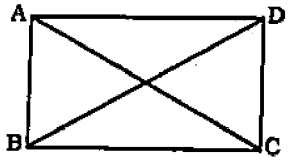
$\therefore \sin \angle CPB = \frac{BC}{CP}$

$= \frac{2x}{\frac{5x}{2}} = \frac{4}{5}$

Take $AB = 6x$ and $BC = 4x \Rightarrow BP = 3x \Rightarrow CP = 5x$ and

$\sin \angle BPC = \frac{BC}{CP} = \frac{4x}{5x} = \frac{4}{5}$

3. (1)



$AB = CD$

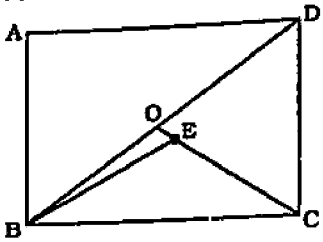
$BC = AD$

$AC = BD$

It will be a rectangle and each angle will be a right angle.

TYPE-VII

1. (2)



$\angle ABC = 90°$

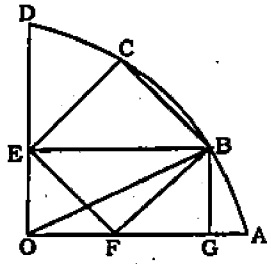
$\Rightarrow \angle OBC = 45°$ [$\because \angle ABC = 2\angle OBC$]

$\angle OCB = 60°$

[$\because \Delta BEC$ is equilateral]

$\therefore \angle BOC = 180° - 60° - 45° = 75°$

2. (4)



$OE = OF$

$EF = x$ units

$\therefore$ From ΔOEF,

$2OE^2 = EF^2$

$\Rightarrow \sqrt{2} \times OE = EF = x$

$\Rightarrow OE = \frac{x}{\sqrt{2}}$

BE = diagonal of square EFBC

$= \sqrt{2}\ x$

$\therefore OB = \sqrt{OE^2 + EB^2}$

$= \sqrt{\left(\frac{x}{\sqrt{2}}\right)^2 + \left(\sqrt{2}x\right)^2}$

$= \sqrt{\frac{x^2}{2} + 2x^2}$

$= \sqrt{\frac{x^2 + 4x^2}{2}}$

$= \sqrt{\frac{5x^2}{2}} = \frac{\sqrt{5}x}{\sqrt{2}}$ unitsz

TYPE-VIII

1. (2) If the number of sides of regular polygon be n, then

$\frac{(2n-4)90°}{n} = \frac{360°}{n} \times 3$

$\Rightarrow 2n - 4 = 4 \times 3$

$\Rightarrow 2n = 12 + 4 = 16$

$\therefore n = 8$

2. (1) Let the exterior angle be x, then interior angle will be $4x$.

$\therefore x + 4x = 180°$

[$\because$ Interior angle + Exterior angle = 180°]

$\Rightarrow x = \frac{180}{5} = 36°$

$\therefore$ Interior angle $= 4x$

$= 4 \times 36° = 144°$

Interior angle of a polygon

$= \frac{2n-4}{n} \times 90°$

$144° = \frac{2n-4}{n} \times 90°$

$\Rightarrow 144°n = 180°n - 360°$

$\Rightarrow 180°n - 144n = 360°$

$\Rightarrow 36°n = 360°$

$\therefore n = \frac{360°}{36°} = 10$

3. (3) Let the number of sides of polygon be n. Then

$\therefore \frac{(2n-4)}{n} \times 90° - \frac{360}{n} = 150$

$\Rightarrow \frac{(2n-4) \times 3}{n} - \frac{12}{n} = 5$

$\Rightarrow \frac{6n - 12 - 12}{n} = 5$

$\Rightarrow 6n - 24 = 5n$

$\Rightarrow n = 24$

4. (3) If the number of sides of the polygon be n, then

$\left(\frac{2n-4}{n}\right) \times 90° = 144°$

$\Rightarrow \frac{(2n-4)5}{n} = 8$

$\Rightarrow 10n - 20 = 8n$

$\Rightarrow 2n = 20 \Rightarrow n = 10$

5. (2) Sum of the interior angles of a regular polygon of n sides

$= (2n - 4) \times 90°$

$\therefore (2n - 4) \times 90° = 1080°$

$\Rightarrow 2n - 4 = 1080 \div 90 = 12$

$\therefore 2n = 12 + 4 = 16$

$\Rightarrow n = 8$

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6. (1) Let the number of sides be $5x$ and $4x$ respectively.

$$\therefore \frac{(2\times 5x-4)90^\circ}{5x} - \frac{(2\times 4x-4)\times 90^\circ}{4x} = 6^\circ$$

$$\left[\text{Each interior angle} = \left(\frac{2n-4}{n}\right)\times 90^\circ\right]$$

$\Rightarrow (10x-4)\times 360^\circ - (8x-4)\times 450^\circ = 20x\times 6^\circ$

$\Rightarrow (10x-4)\times 12 - (8x-4)15 = 4x$

$\Rightarrow 120x - 48 - 120x + 60 = 4x$

$\Rightarrow 4x = 12 \Rightarrow x = 3$

$\therefore$ Number of sides $= 15$ and 12

7. (2) Let the number of sides of regular polygon be n.

$$\therefore \left(\frac{2n-4}{n}\right)\times 90^\circ = 2\times\frac{360}{n}$$

$\Rightarrow (2n-4) = 8$

$\Rightarrow 2n = 12 \Rightarrow n = 6$

8. (3) Let the number of sides be $5x$ and $6x$ respectively.

Then, $\dfrac{(2\times 5x-4)\div 5x}{(2\times 6x-4)\div 6x} = \dfrac{24}{25}$

$$\frac{\frac{10x-4}{5x}}{\frac{12x-4}{6x}} = \frac{24}{25}$$

$$\left[\text{Each interior angle} = \frac{(2n-4)90^\circ}{n}\right]$$

$$\Rightarrow \frac{5x-2}{5}\times\frac{6}{6x-2} = \frac{24}{25}$$

$$\Rightarrow \frac{5x-2}{6x-2} = \frac{4}{5}$$

$\Rightarrow 25x - 10 = 24x - 8$

$\Rightarrow x = 10 - 8 = 2$

$\therefore$ Number of sides $= 10$ and 12.

9. (2) Check through options

Each interior angle

$$= \left(\frac{2n-4}{n}\right)\times 90^\circ$$

If measure of each angle $= 105^\circ$

then, $\dfrac{(2n-4)\times 90^\circ}{n} = 105^\circ$

$\Rightarrow (2n-4)\times 6 = 7n$

$\Rightarrow 12n - 24 = 7n$

$\Rightarrow 5n = 24$

$\Rightarrow n = \dfrac{24}{5}$ which is impossible.

10. (4) Sum of interior angles $= (2n-4)\times 90^\circ$

Sum of exterior angles $= 360^\circ$

$\therefore (2n-4)\times 90^\circ = 360^\circ \times 2$

$\Rightarrow 2n - 4 = 2\times 360^\circ \div 90 = 8$

$\Rightarrow 2n - 4 = 8 \Rightarrow 2n = 12 \Rightarrow n = 6$

11. (3) Each interior angle

$$= \frac{(2n-4)\times 90^\circ}{n}$$

$$\therefore \frac{\frac{(2n-4)\times 90^\circ}{n}}{\frac{(4n-4)\times 90^\circ}{2n}} = \frac{2}{3}$$

[$\because$ Ratio of number of sides is 1 : 2]

$$\Rightarrow \frac{(2n-4)\times 2}{4n-4} = \frac{2}{3}$$

$$\Rightarrow \frac{2n-4}{4n-4} = \frac{1}{3}$$

$\Rightarrow 6n - 12 = 4n - 4$

$\Rightarrow 6n - 4n = 12 - 4 = 8$

$\Rightarrow 2n = 8 \Rightarrow n = 4$

$\therefore$ No. of sides $= 4, 8$

12. (3) $\dfrac{360^\circ}{n-1} - \dfrac{360^\circ}{n+2} = 6^\circ$

$$\Rightarrow 360^\circ\left(\frac{n+2-n+1}{(n-1)(n+2)}\right) = 6^\circ$$

$\Rightarrow (n-1)(n+2) = 180^\circ$

$n^2 + n - 2 = 180$

$n^2 + n - 182^\circ = 0$

$n^2 + 14n - 13n - 182 = 0$

$n(n+14) - 13(n+14) = 0$

$(n+14)(n-13) = 0$

$n = 13, -14$ [$\because n \neq -14$]

13. (4) If the number of sides of regular polygon be n, then

$$\frac{(2n-4)\times 90^\circ}{n} = 150^\circ$$

$\Rightarrow 3(2n-4) = 5n$

$\Rightarrow 6n - 12 = 5n \Rightarrow n = 12$.

14. (1) If the number of sides of regular polygon be n, then

$(2n-4)\times 90^\circ = 1440^\circ$

$$\Rightarrow 2n - 4 = \frac{1440}{90} = 16$$

$\Rightarrow 2n - 4 = 16$

$\Rightarrow 2n = 20$

$\Rightarrow n = 10$

15. (4) Sum of exterior angles of a regular polygon $= 360^\circ$

But $\dfrac{360^\circ}{50} = 7.2 \neq$ a whole number.

16. (2) Number of sides of regular polygon $= n$ (let)

Sum of interior angles $= (2n-4)\times 90^\circ$

Sum of exterior angles $= 360^\circ$

$\therefore (2n-4)\times 90^\circ = 2\times 360^\circ$

$$\Rightarrow 2n - 4 = \frac{2\times 360^\circ}{90} = 8$$

$\Rightarrow 2n - 4 = 8$

$\Rightarrow 2n = 8 + 4 = 12$

$$\Rightarrow n = \frac{12}{2} = 6$$

17. (3) If the number of sides of regular polygon be n, then

Each interior angle

$$= \frac{(2n-4)\times 90^\circ}{n}$$

and each exterior angle $= \dfrac{360^\circ}{n}$

$$\therefore \frac{(2n-4)}{n}\times 90^\circ = \frac{5\times 360^\circ}{n}$$

$\Rightarrow (2n-4) = 5\times 4$

$\Rightarrow 2n - 4 = 20$

$\Rightarrow 2n = 20 + 4 = 24$

$$\Rightarrow n = \frac{24}{2} = 12.$$

18. (1) An interior angle of a regular polygon

$$= \frac{(2n-4)\times 90^\circ}{n}$$

Where n = number of sides

$$\therefore \frac{(2n-4)90^\circ}{n} = 140$$

$\Rightarrow 9(2n-4) = 14n$

$\Rightarrow 18n - 36 = 14n$

$\Rightarrow 18n - 14n = 36$

$\Rightarrow 4n = 36 \Rightarrow n = \dfrac{36}{4} = 9$

19. (3) Number of sides of regular polygon $= n$

$$\therefore \frac{(2n-4)\times 90^\circ}{n} - \frac{360^\circ}{n} = 132^\circ$$

$\Rightarrow 180n - 360 - 360 = 132n$

$\Rightarrow 180n - 132n = 720$

$\Rightarrow 48n = 720$

$$\Rightarrow n = \frac{720}{48} = 15$$

20. (3) Number of sides of regula polygon $= n$ (let)

According to question,

$$\frac{\text{Exterior angle}}{\text{Interior angle}} = \frac{1}{17}$$

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$$\Rightarrow \frac{\frac{360}{n}}{\frac{(2n-4)\times 90}{n}} = \frac{1}{17}$$

$$\Rightarrow \frac{360}{(2n-4)\times 90} = \frac{1}{17}$$

$$\Rightarrow \frac{4}{2n-4} = \frac{1}{17}$$

$\Rightarrow 2n - 4 = 4 \times 17$

$\Rightarrow 2n - 4 = 68$

$\Rightarrow 2n = 68 + 4 = 72$

$$\Rightarrow n = \frac{72}{2} = 36$$

21. (3) Number of sides of a regular polygon (n)

$$= \frac{360}{20} = 18$$

$\therefore$ Sum of all interior angles

$= (2n - 4) \times 90°$

$= (2 \times 18 - 4) \times 90°$

$= 32 \times 90° = 2880°$

22. (2) Let the number of sides of regular polygon be n.

$\therefore$ Sum of all interior angles

$= (2n - 4) \times 90°$

$\Rightarrow (2n - 4) \times 90° = 1440°$

$\Rightarrow (2n - 4) = 1440° \div 90° = 16$

$\Rightarrow 2n - 4 = 16$

$\Rightarrow 2n = 16 + 4 = 20$

$\Rightarrow n = 20 \div 2 = 10$

23. (4) Number of sides of polygon $= n$ (let).

According to the question,

$$\frac{(2n-4)\times 90°}{n} : \frac{360°}{n} = \frac{3}{1}$$

$$\Rightarrow \frac{(2n-4)\times 90°}{360°} = \frac{3}{1}$$

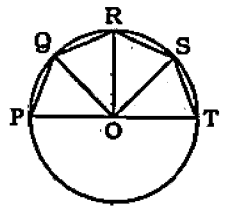
$$\Rightarrow \frac{2n-4}{4} = \frac{3}{1}$$

$\Rightarrow 2n - 4 = 4 \times 3 = 12$

$\Rightarrow 2n = 12 + 4 = 16$

$$\Rightarrow n = \frac{16}{2} = 8$$

24. (2)



Sum of interior angles of a pentagon

$= (2n - 4) \times 90°$

$= (2 \times 5 - 4) \times 90° = 540°$

If $PQ = QR = RS = ST$

$\therefore \angle POQ = \angle QOR = \angle ROS$

$$= \angle SOT = \frac{180°}{4} = 45°.$$

$\therefore OP = OQ = OR = OS = OT$ = radii

$$\therefore \angle OPQ = \frac{180° - 45°}{2} = \frac{135°}{2}$$

$\therefore \angle PQR + \angle RST$

$$= 4 \times \frac{135°}{2} = 270°.$$

25. (4) Let the number of sides of regular polygon be n.

According to the question,

$$\frac{(2n-4)\times 90°}{n} - \frac{360°}{n} = 108$$

$$\Rightarrow \frac{(2n-4)\times 5}{n} - \frac{20}{n} = 6$$

$\Rightarrow 10n - 20 - 20 = 6n$

$\Rightarrow 10n - 6n = 40$

$\Rightarrow 4n = 40 \Rightarrow n = 40 \div 4 = 10$

26. (4) Each interior angle of regular polygon of n sides

$$= \left(\frac{2n-4}{n}\right)\times 90°$$

Here, $n = 6$

$\therefore$ Required answer

$$= \left(\frac{2\times 6-4}{6}\right)\times 90°$$

$$= \frac{8}{6}\times 90° = 120°$$

27. (2) Sum of all interior angles of a regular polygon of n sides $= (2n - 4)$ right angles

$\therefore 2n - 4 = 14$

$\Rightarrow 2n = 14 + 4 = 18$

$$\Rightarrow n = \frac{18}{2} = 9$$

28. (1) Required interior angle

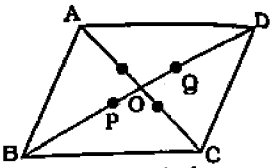
$$= \frac{(2n-4)\times 90°}{n}$$

$$= \frac{(2\times 8-4)}{8} \times 90°$$

$$= \frac{12\times 90°}{8} = 135°$$

TYPE-IX

1. (2)



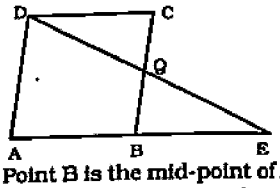
Centroid is the point where medians intersect. Diagonals of parallelogram bisect each other.

$$OP = \frac{1}{3}\times 9 = 3 \text{ cm}$$

$$OQ = \frac{1}{3}\times 9 = 3\text{cm}$$

$\therefore PQ = 6\text{cm}$

2. (2) $AD \parallel BC \Rightarrow AD \parallel BQ$



Point B is the mid-point of AE.

$\therefore$ Q is the mid-point of DE.

In Δs DQC and BQE,

$\angle DQC = \angle BQE$

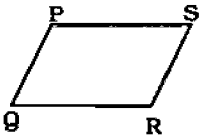
$\angle DCQ = \angle QBE$

$\angle CDQ = \angle QEB$

$\therefore$ Both triangles Δ DQC and Δ BQE are similar.

$$\therefore \frac{DQ}{QE} = \frac{CQ}{BQ} = 1 : 1$$

3. (1)



$\angle SPQ + \angle PQR = 180°$

$\Rightarrow 4\angle PQR + \angle PQR = 180°$

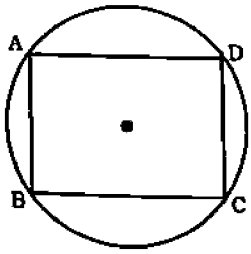
$\Rightarrow 5\angle PQR = 180°$

$$\Rightarrow \angle PQR = \frac{180°}{5} = 36°$$

$\therefore \angle SRQ = 180° - 36° = 144°$

TYPE-X

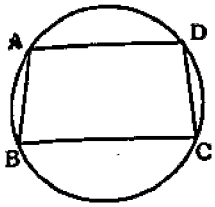
1. (4)



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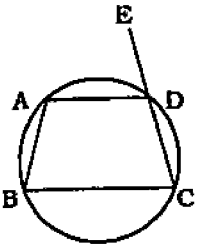
ABCD is a cyclic parallelogram.
$\therefore \angle B + \angle D = 180°$
$\Rightarrow 2\angle B = 180°$
$\Rightarrow \angle B = 90°$

2. (2)



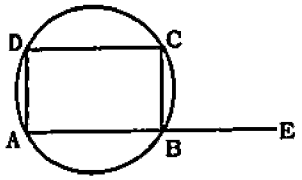
$\angle ABC + \angle CDA = 180°$
$\Rightarrow \angle CDA = 180° - 70° = 110°$
$\therefore \angle BCD = 180° - 110° = 70°$

3. (4)



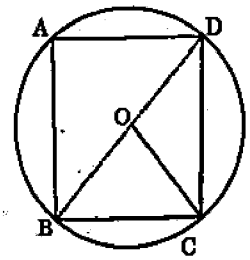
$\angle ABC + \angle CDA = 180°$
$\Rightarrow \angle CDA = 180° - 72° = 108°$
$AD \parallel BC$
$\angle BCD = \angle ADE = \angle ABC = 72°$

4. (3)



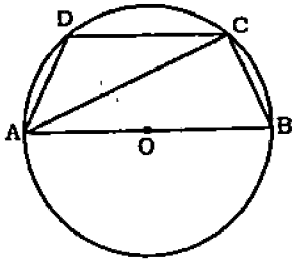
$\angle ABC + \angle ADC = 180°$
$\angle CBE = 50°$
$\therefore \angle ABC = 180° - 50° = 130°$
$\therefore \angle ADC = 180° - 130° = 50°$

5. (1) The angle subtended at the centre by an arc is twice to that of angle subtended at the circumference.



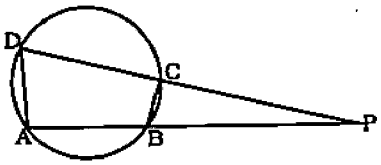
$\therefore \angle CAD = \frac{1}{2} \angle COD = 70°$
$\therefore \angle BAD = 70° + 40° = 110°$
$\therefore \angle BCD = 180° - 110° = 70°$

6. (2)



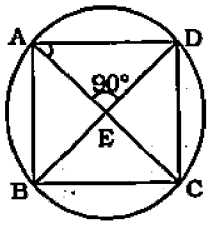
$\angle ACB = 90°$
(Angle of semi-circle)
$\angle CAB = 30°$
$\therefore \angle CBA = 180° - 90° - 30° = 60°$
Again, $\angle ADC + \angle ABC = 180°$
$\therefore \angle ADC = 180° - 60° = 120°$

7. (1)



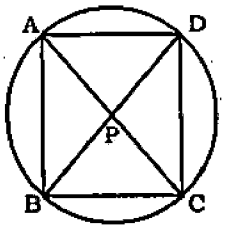
$\angle ADC = 70°$
$\angle ABC = 180° - 70° = 110°$
$\Rightarrow \angle PBC = 70°$
$\angle BCD = 180° - 60° = 120°$
$\Rightarrow \angle PCB = 60°$
$\therefore \angle PBC + \angle PCB = 70° + 60°$
$= 130°$

8. (3)



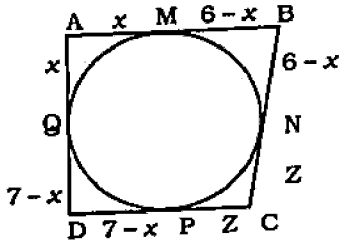
$\angle B + \angle D = 180°$
and $\angle A + \angle C = 180°$
$\Rightarrow \angle BAC = \angle BCA$
$\angle DAC = \angle DCA$
$\therefore \angle DAB = \angle DCB = 90°$
$\angle DAC = \theta$
$\therefore \angle ADE = 90° - \theta = \angle CDE$
$\therefore \angle ABC = 180° - 2(90° - \theta)$
$= 180° - 180° + 2\theta = 2\theta$

9. (2)



$\therefore AP \cdot PC = BP \cdot DP$. (Theorem)

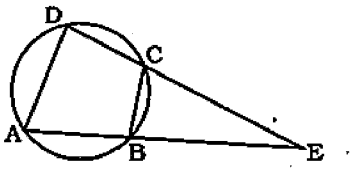
10. (1)



We know tangents drawn to a circle from same external point are equal $\Rightarrow AM = AQ = x$ (say)
$\therefore MB = BN = 6 - x$, $QD = DP = 7 - x$,
Let $NC = PC = Z$
Now $7 - x + z = 5$ (Consider side DC)
$BC = 6 - x + z = (7 - x + z) - 1$
$= 5 - 1 = 4$

11. (2) The sum of opposite angles of a concyclic quadrilateral is 180°.

12. (1)

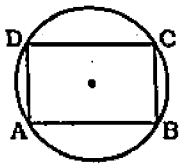


In concyclic quadrilateral ABCD
$\angle ADC + \angle ABC = 180°$
$\Rightarrow 70° + \angle ABC = 180°$
$\therefore \angle ABC = 180° - 70° = 110°$
$\therefore \angle CBE = 180° - 110° = 70°$
$BC = BE$

$\therefore \angle BCE = \angle BEC = \frac{110}{2} = 55$

$\angle BAD = 95°$
$\therefore \angle BAD + \angle BCD = 180°$
$\Rightarrow \angle BCD = 180° - 95° = 85°$
$\therefore \angle DCE = \angle BCD + \angle BCE$
$= 85° + 55° = 140°$

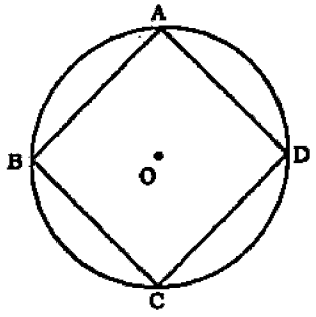
13. (4)



The sum of opposite angles of concyclic quadrilateral
$= 180°$
$\therefore \angle A + \angle C = \angle B + \angle D = 18($

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14. (2)



The sum of opposite angles of a concyclic quadrilateral is 180°.

$\therefore \angle A + C = 180°$

$\Rightarrow 4x + 5y = 180°$ ...(i)

$\angle B + \angle D = 180°$

$\Rightarrow 7x + y = 180°$ ...(ii)

By equation (ii) × 5 – (i),

$35x + 5y = 900°$

$4x + 5y = 180°$

$- \quad - \quad -$

$31x = 720$

$x = \frac{720}{31}$

From equation (ii),

$7x + y = 180°$

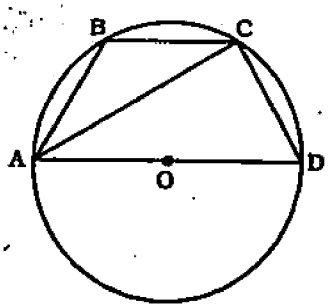
$\Rightarrow 7 \times \frac{720}{31} + y = 180°$

$\Rightarrow y = 180 - \frac{5040}{31}$

$= \frac{5580 - 5040}{31} = \frac{540}{31}$

$\therefore x : y = \frac{720}{31} : \frac{540}{31} = 4 : 3$

15. (3)



In ΔACD

$\angle DAC = 55°$

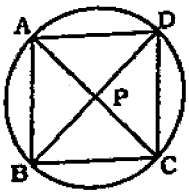
$\angle ACD = 90°$

$\angle D = 180° - 55° - 90° = 35°$

$\therefore \angle ABC + \angle ADC = 180°$

$\Rightarrow \angle ABC = 180° - 35° = 145°$

16. (2)



$\angle APB = 64°$

$\angle CBD = 28°$

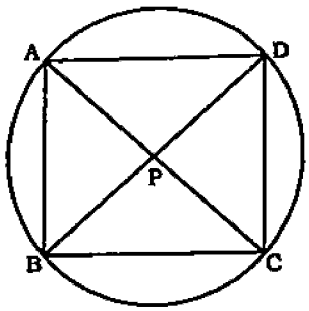
$\angle CBD = \angle CAD = 28°$

$\angle APD = 180° - 64° = 116°$

$\therefore \angle ADB = 180° - 116° - 28°$

$= 180° - 144° = 36°$

17. (4)



$\angle APB = 110° = \angle CPD$

$\therefore \angle APD = 180° - 110° = 70°$

$= \angle BPC$

$\therefore \angle PCB = 180° - 70° - 30°$

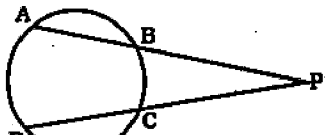
$= 80°$

Angles subtended by same arcs at the circumference are equal.

$\therefore \angle ACB$ or $\angle PCB = \angle ADB$

$= 80°$

18. (4)



Clearly,

$AP \times BP = PD \times PC$

$\Rightarrow 8 \times 6 = PD \times 4$

$\Rightarrow PD = \frac{8 \times 6}{4} = 12$ cm.

19. (1) The sum of opposite angles of a concyclic quadrilateral is 180°.

$\angle A : \angle B : \angle C = 1 : 3 : 4$

$\therefore \angle A : \angle C = 1 : 4$

$\angle A = \frac{1}{5} \times 180° = 36°$

$\angle C = \frac{4}{5} \times 180° = 144°$

$\therefore \angle B = 3 \times 36° = 108°$

$\therefore \angle D = 180° - 108° = 72°$

20. (4) In a concyclic quadrilateral ABCD,

$\angle A + \angle C = 180°$

$\Rightarrow 50° + \angle C = 180°$

$\Rightarrow \angle C = 180° - 50° = 130°$

Again,

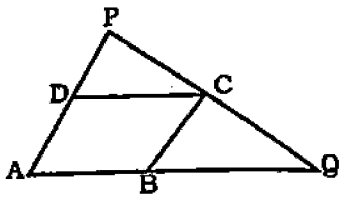
$\angle B + \angle D = 180°$

$\Rightarrow 80° + \angle D = 180°$

$\Rightarrow \angle D = 180° - 80° = 100°$

TYPE-XI

1. (1)



$AB = BC = CD = DA$

[ABCD is a rhombus]

$DP = \frac{1}{2}AB = \frac{1}{2}BC = \frac{1}{2}CD$

$= \frac{1}{2}DA$

In Δs APQ and BCQ,

$\angle P = \angle QCB$; $\angle A = \angle QBC$; $\angle Q = Q$

$\therefore \Delta APQ$ and ΔBCQ are similar.

$\therefore \frac{AB + BQ}{BQ} = \frac{AD + DP}{BC}$

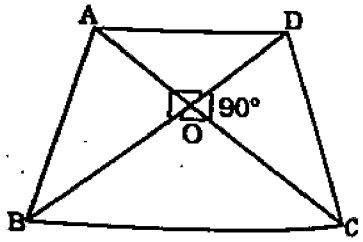
$\Rightarrow \frac{AB}{BQ} + 1 = \frac{\frac{3}{2}BC}{BC} = \frac{3}{2}$

$\Rightarrow \frac{AB}{BQ} = \frac{3}{2} - 1 = \frac{1}{2}$

$\Rightarrow \frac{BQ}{AB} = \frac{2}{1}$

$\Rightarrow 2 : 1$

2. (2)



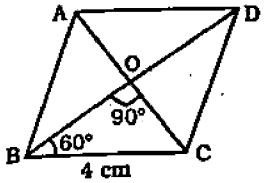
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$OB^2+OC^2=BC^2$
$OC^2+OD^2=CD^2$
$OD^2+OA^2=AD^2$
$OA^2+OB^2=AB^2$ } Pythagoras theorem

$\therefore$ $2(OB^2+OA^2+OD^2+OC^2)$
$= AB^2+BC^2+CD^2+DA^2$
$\Rightarrow 2(AB^2+CD^2)$
$= AB^2+BC^2+CD^2+DA^2$
$\Rightarrow AB^2+CD^2=BC^2+DA^2$

3. (3) $4x+5x=180°$
$\Rightarrow 9x=180°$
$\Rightarrow x=20°$
$\therefore \angle C=4x=80°$

4. (4)



From ΔBOC,

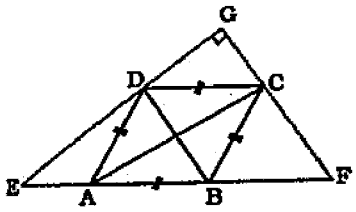
$\cos 60° = \frac{BO}{4}$

$\Rightarrow BO = \frac{1}{2}\times 4$

$= 2$ cm

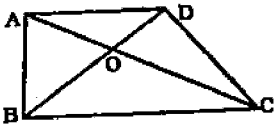
$\therefore BD = 2\times 2 = 4$ cm

5. (2) We know that diagonals of a rhombus are perpendicular bisector of each other.



$\therefore OA = OC$; $OB = OD$
$\angle AOD = \angle COD = 90°$
$\angle AOB = \angle COB = 90°$
In ΔBDE, $OA \parallel DE$
$\Rightarrow OC \parallel DG$
In ΔCFA,
$OB \parallel CF$
$\Rightarrow OD \parallel GC$
In quadrilateral DOCG
$OC \parallel DG$ and
$\Rightarrow OD \parallel GC$
$\therefore$ DOCG is a parallelogram.
$\therefore \angle DGC = \angle DOC$
$\Rightarrow \angle DGC = 90°$
$EG \perp GF$ or $ED \perp CF$

6. (4)

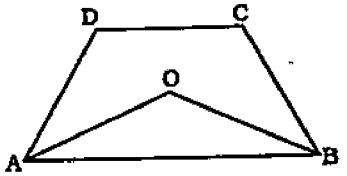


Clearly,
$\Delta AOD \sim \Delta BOC$

$\therefore \frac{BO}{OC} = \frac{OD}{OA}$

$\Rightarrow \frac{3x-19}{x-3} = \frac{x-5}{3}$
$\Rightarrow 9x-57 = x^2-8x+15$
$\Rightarrow x^2-17x+72=0$
$\Rightarrow x^2-8x-9x+72=0$
$\Rightarrow x(x-8)-9(x-8)=0$
$\Rightarrow (x-8)(x-9)=0$
$\Rightarrow x=8$ or 9

7. (4)



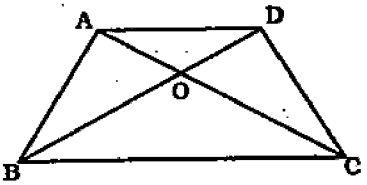
$\angle A+\angle B+\angle C+\angle D=360°$
$\Rightarrow \angle A+\angle B+70°+130°=360°$
$\Rightarrow \angle A+\angle B=360°-70°-130°=160°$
In ΔAOB,
$\angle OAB+\angle OBA+\angle AOB=180°$

$\Rightarrow \frac{\angle A}{2}+\frac{\angle B}{2}+\angle AOB=180°$

$\Rightarrow \frac{1}{2}(\angle A+\angle B)+\angle AOB=180°$

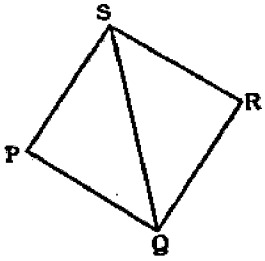
$\Rightarrow \frac{1}{2}\times 160°+\angle AOB=180°$
$\Rightarrow \angle AOB=180°-80°=100°$

8. (4)



$AO\times BO = OD\times OC$
$\Rightarrow 3(3x-19)=(x-5)(x-3)$
$\Rightarrow 9x-57=x^2-8x+15$
$\Rightarrow x^2-17x+72=0$
$\Rightarrow x^2-9x-8x+72=0$
$\Rightarrow x(x-9)-8(x-9)=0$
$\Rightarrow (x-8)(x-9)=0$
$\Rightarrow x=8$ or 9

9. (2)



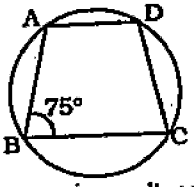
In the rhombus PQRS,
$PQ = QR = RS = SP$
$\angle SPQ = 50°$

$\therefore \angle PSQ = \angle PQS = \frac{180°-50°}{2}$

$= \frac{130°}{2} = 65°$

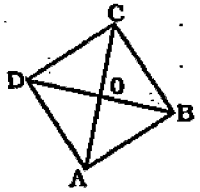
$\angle PSR = 180°-50° = 130°$
$\angle RSQ = 130°-65° = 65°$

10. (1)



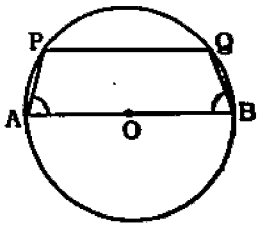
ABCD is a concyclic quadrilateral.
$AD \parallel BC$
$\therefore \angle DAB+\angle ABC=180°$
$\Rightarrow \angle DAB=180°-75°=105°$
Sum of the opposite of a concyclic quadrilateral $= 180°$
$\therefore \angle BAD+\angle BCD=180°$
$\Rightarrow 105°+\angle BCD=180°$
$\Rightarrow \angle BCD=180°-105°=75°$

11. (1)



$\angle ABC = 60°$
$AB = BC$
$\therefore \angle BAC = \angle BCA = 60°$
$\therefore \Delta ABC$ is an equilateral triangle.

12. (2)

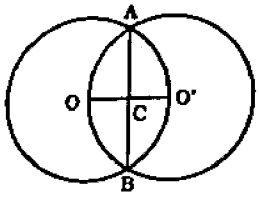


$\angle PAB = \angle ABQ$
$\therefore PQ \parallel AB$

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TYPE-XII

1. (2)



OC = 2cm
OA = 4cm

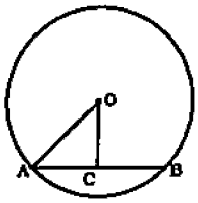
$\therefore AC = \sqrt{4^2 - 2^2} = \sqrt{16-4}$

$= \sqrt{12} = 2\sqrt{3}$

$\therefore AB = 4\sqrt{3}$ cm

2. (2) The largest chord of a circle is its diameter.

3. (2)



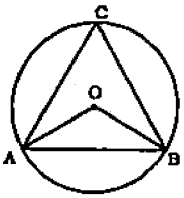
AC = CB = 4 cm
OC = 3 cm

$\therefore OA = \sqrt{OC^2 + CA^2}$

$= \sqrt{3^2 + 4^2}$

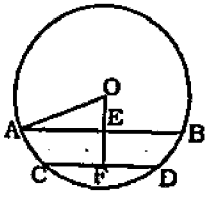
$= \sqrt{9+16} = \sqrt{25} = 5$ cm

4. (1)



AO = OB = AB
$\Rightarrow \angle AOB = 60°$
[$\because \Delta AOB$ is equilateral]
$\therefore \angle ACB = 30°$

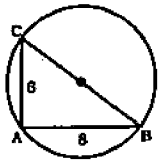
5. (1)



Let OE = x cm
then OF = (x+1) cm
OA = OC = r cm
AE = 4 cm; CF = 3 cm

From ΔOAE,
$OA^2 = AE^2 + OE^2$
$\Rightarrow r^2 = 16 + x^2$
$\Rightarrow x^2 = r^2 - 16$ .....(i)
From ΔOCF,
$(x+1)^2 = r^2 - 9$ ..... (ii)
By equation (ii) – (i),
$(x+1)^2 - x^2 = r^2 - 9 - r^2 + 16$
$\Rightarrow 2x + 1 = 7 \Rightarrow x = 3$cm
$\therefore$ From equation (i),
$9 = r^2 - 16 \Rightarrow r^2 = 25$
$\Rightarrow r = 5$ cm

6. (4)



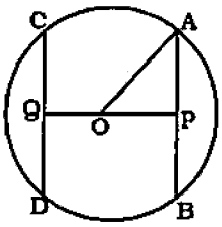
$\angle BAC = 90°$
As, BC is the diameter of the circle.

$\therefore BC = \sqrt{AB^2 + AC^2}$

$= \sqrt{8^2 + 6^2} = \sqrt{64+36}$

$= \sqrt{100} = 10$ cm
$\therefore$ Radius of the circle = 5 cm

7. (1)



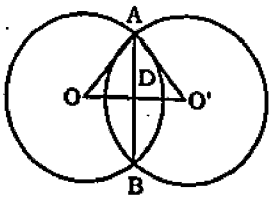
AB = CD
OP = OQ
From ΔOAP,

$OP = \sqrt{OA^2 - AP^2} = \sqrt{5^2 - 4^2}$

$= \sqrt{25-16}$

$= \sqrt{9} = 3$cm.
$\therefore QP = 2 \times OP = 6$ cm.

8. (2)



$OD = \sqrt{15^2 - 12^2}$

$= \sqrt{225-144}$

$= \sqrt{81} = 9$

$O'D = \sqrt{13^2 - 12^2}$

$= \sqrt{169-144} = \sqrt{25} = 5$
$\therefore OO' = 9 + 5 = 14$ cm

9. (2) $\theta = 72° = 72 \times \frac{\pi}{180}$ radians

$= \frac{2\pi}{5}$ radians

$\therefore \theta = \frac{l}{r}$

$l \rightarrow$ length of arc

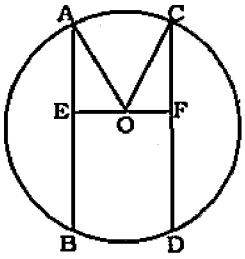
$\Rightarrow l = \theta.r = \frac{2\pi}{5} \times 21$

$= \frac{2}{5} \times \frac{22}{7} \times 21$

$= \frac{132}{5} = 26.4$ cm.

10. (2) One and only circle can pass through three non-collinear points.

11. (2)



AB = 24 cm
$\Rightarrow$ AE = EB = 12 cm

$OE = \sqrt{OA^2 - AE^2}$

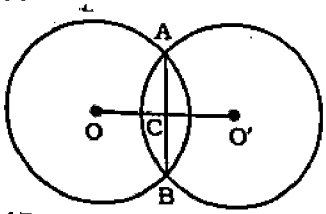
$= \sqrt{15^2 - 12^2}$

$= \sqrt{225-144} = \sqrt{81}$

= 9 cm
$\therefore OF = 21 - 9 = 12$ cm

Also, $CF = \sqrt{15^2 - 12^2} = 9$ cm
$\therefore CD = 2 \times 9 = 18$ cm

12. (1)



AB = 16 cm
AC = BC = 8 cm
OC = CO' = 6 cm

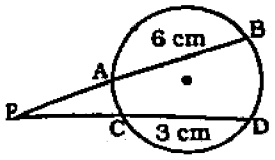
$\therefore OA = \sqrt{OC^2 + CA^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36+64}$

$= \sqrt{100} = 10$ cm

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13. (2)



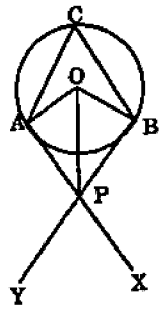
AB = 6 cm; CD = 3 cm
PD = 5 cm; PB = ?
PA × PB = PC × PD
$\Rightarrow (PB - 6)\, PB = 2 \times 5$
$\Rightarrow PB^2 - 6PB - 10 = 0$

$$\Rightarrow PB = \frac{6 \pm \sqrt{36+40}}{2}$$

$$= \frac{6 \pm \sqrt{76}}{2}$$

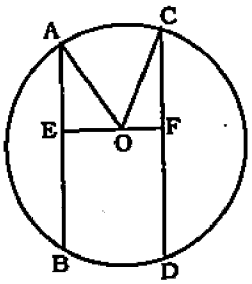
$$= \frac{6+8.7}{2} = 7.35$$

14. (1)



$\angle ACB = 65°$
$\angle AOB = 2 \times 65° = 130°$
$\angle OAP = 90°$; $\angle AOP = 65°$
$\therefore \angle APO = 180° - 90° - 65°$
$= 25°$

15. (1)



OE ⊥ AB and OF ⊥ CD
AE = EB = 5 cm
CF = FD = 12 cm
AO = OC = 13 cm
From Δ AOE,

$$OE = \sqrt{13^2 - 5^2} = \sqrt{169-25}$$

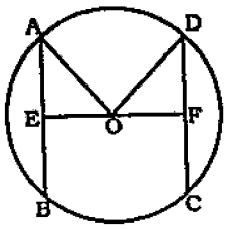
$$= \sqrt{144} = 12 \text{ cm}$$

From Δ COF,

$$OF = \sqrt{13^2 - 12^2} = \sqrt{25} = 5 \text{ cm}$$

$\therefore EF = OE + OF = 17$ cm

16. (3)

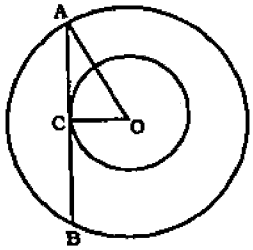


AB = 10 cm, AE = 5 cm
Let OE = x
CD = 24 cm, DF = 12 cm
OF = $17 - x$
OA = OD
$\Rightarrow 5^2 + x^2 = 12^2 + (17 - x)^2$
$\Rightarrow 25 + x^2 = 144 + 289 - 34x + x^2$
$\Rightarrow 34x = 408$

$$\Rightarrow x = \frac{408}{34} = 12$$

$$\therefore OA = \sqrt{5^2 + 12^2} = 13 \text{ cm}$$

17. (3)



$OC = \sqrt{3} - 1$

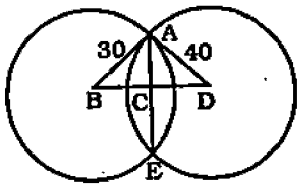
$OA = \sqrt{3} + 1$

$$AC = \sqrt{\left(\sqrt{3}+1\right)^2 - \left(\sqrt{3}-1\right)^2}$$

$$= \sqrt{4\sqrt{3}} = 2\sqrt[4]{3}$$

$$\therefore AB = 2AC = 4.\sqrt[4]{3} \text{ cm}$$

18. (4)

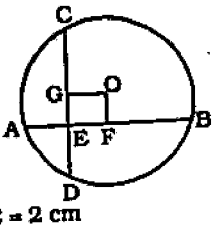


$BC = x \Rightarrow CD = 50 - x$
$AC^2 = 30^2 - x^2 = 40^2 - (50 - x)^2$
$\Rightarrow 900 - x^2 = 1600 - 2500 + 100x - x^2$
$\Rightarrow 100x = 1800$
$\Rightarrow x = 18$

$$\therefore AC = \sqrt{30^2 - 18^2} = \sqrt{48 \times 12}$$

$= 24$
$\therefore AE = 2 \times 24 = 48$ cm

19. (1)



AE = 2 cm
EB = 6 cm
ED = 3 cm
$\therefore AE \times EB = DE \times EC$

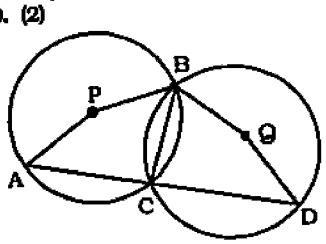
$$\Rightarrow EC = \frac{2 \times 6}{3} = 4 \text{ cm}$$

$\therefore$ Diameter

$$= \sqrt{7^2 + 4^2} = \sqrt{49+16}$$

$$= \sqrt{65} \text{ cm}$$

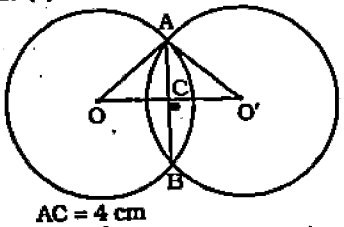
20. (2)



$$\therefore \angle BCA = \frac{130°}{2} = 65°$$

[$\because \angle APB = 130°$]
$\Rightarrow \angle BCD = 180° - 65° = 115°$
$\Rightarrow$ Ext. $\angle BQD = 2 \times 115° = 230°$
$\therefore \angle BQD = 360° - 230° = 130°$

21. (1)

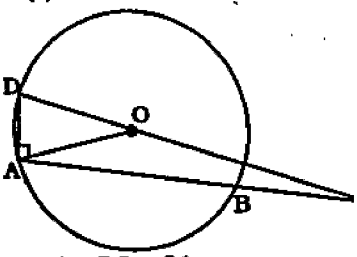


AC = 4 cm
OA = 5 cm

$$OC = \sqrt{5^2 - 4^2} = 3 \text{ cm}$$

$OO' = 2 \times 3 = 6$ cm

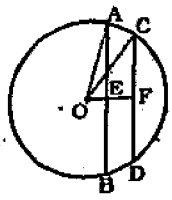
22. (3)



BC = DO = OA
$\angle DAB = 90°$
$\angle DOA = 2 \times \angle DCA$
or $2\ \angle BCD = 40°$

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23. (2)



AE = 15 cm [∵ AB = 30 cm]
OA = 17 cm

$\therefore OE = \sqrt{17^2 - 15^2}$

$= \sqrt{(17+15)(17-15)}$

$= \sqrt{32 \times 2} = 8$ cm

Again, CF = 8 cm
OC = 17 cm

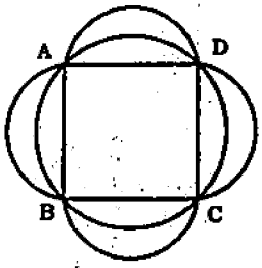
$\therefore OF = \sqrt{17^2 - 8^2}$

$= \sqrt{(17+8)(17-8)}$

$= \sqrt{25 \times 9} = 15$ cm

∴ Distance between chords
= EF = 15 − 8 = 7 cm

24. (2)



BD = 2 units

$AB = \sqrt{2}$ units

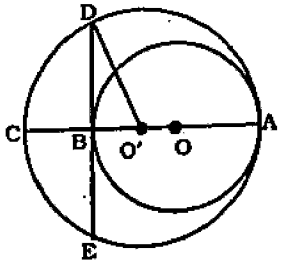
Area of square = 2 square units
Area of four semicircles

$= 4 \times \frac{\pi r^2}{2}$

$= \frac{4 \times \pi \times \frac{1}{2}}{2}$

= π sq. units
∴ Required area
= 2 + π − π = 2 sq. units.

25. (4)

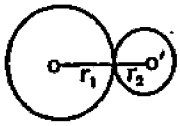


O'A = 3 cm
OA = 2 cm
CA = 6 cm
O'D = 3 cm
O'B = 1 cm

$BD = \sqrt{3^2 - 1} = 2\sqrt{2}$

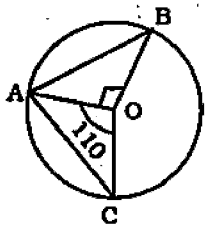
∴ $DE = 4\sqrt{2}$ cm

26. (2)



OO' = 7 cm
⇒ $r_1 + r_2 = 7$
⇒ $4 + r_2 = 7$
⇒ $r_2 = 7 - 4 = 3$ cm

27. (2)

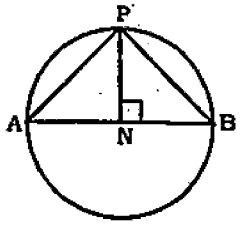


[∵ BOC is not a straight line]
∠AOB = 90° ; OA = OB = r
∴ ∠BAO = ∠ABO = 45°
∴ ∠AOC = 110° ; OA = OC = r

$\therefore \angle OAC = \angle OCA = \frac{70}{2} = 35°$

∴ ∠BAC = 45° + 35° = 80°

28. (4)



AB = 14 cm, PB = 12 cm
∠APB = 90°
(angle in the semi circle)

$\therefore AP = \sqrt{14^2 - 12^2}$

$= \sqrt{(14+12)(14-12)}$

$= \sqrt{26 \times 2} = \sqrt{52}$

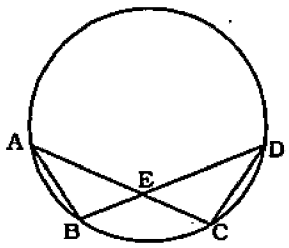
Let AN = $x \Rightarrow$ NB = $14 - x$
In Δ APN, $PN^2 = AP^2 - AN^2$
$= 52 - x^2$ ...(i)
In ΔPNB, $PN^2 = PB^2 - NB^2 = 12^2 - (14 - x)^2$ ...(ii)
From (i) and (ii)
$52 - x^2 = 144 - (14 - x)^2$
$52 - x^2 = 144 - (196 + x^2 - 28x)$
$\Rightarrow 52 - x^2 = 144 - 196 - x^2 + 28x$
$52 = -52 + 28x$

$\Rightarrow 28x = 104 \Rightarrow x = \frac{104}{28} = \frac{26}{7}$

$NB = 14 - x$

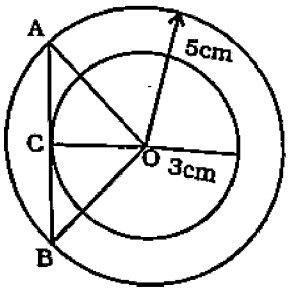
$= 14 - \frac{26}{7} = \frac{72}{7} = 10\frac{2}{7}$ cm

29. (4)



Given, ∠BEC = 130°
⇒ ∠DEC = 180° − 130° = 50°
∴ ∠EDC = 180° − 50° − 20°
= 110°
∴ ∠BAC = ∠EDC = 110°
(Angles on the same arc)

30. (4)



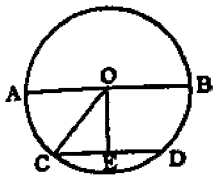
OC = 3 cm
OA = 5 cm

$AC = \sqrt{5^2 - 3^2} = 4$

∴ AB = 2 AC = 8 cm

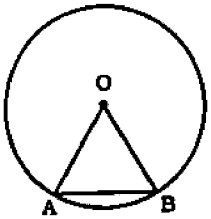
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31. (1)



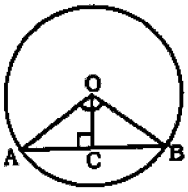
OC = radius = 10 cm
CE = ED = 6 cm
$\therefore$ OE = $\sqrt{OC^2 - CE^2}$
= $\sqrt{10^2 - 6^2}$ = $\sqrt{100 - 36}$
= $\sqrt{64}$ = 8 cm

32. (2)



OA = OB = AB
$\therefore$ ΔOAB is an equilateral triangle.
Hence, $\angle$AOB = 60°

33. (2)



OA = OB = r units
$\angle$AOC = 30°; AC = CB
In Δ AOC,

$$\sin AOC = \frac{AC}{OA}$$

$$\Rightarrow \sin 30° = \frac{AC}{r}$$

$$\Rightarrow \frac{1}{2} = \frac{AC}{r}$$

$$\Rightarrow AC = \frac{r}{2}$$

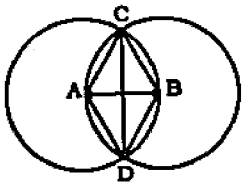
$$\Rightarrow AB = 2 \times \frac{r}{2} = r \text{ units}$$

$\therefore$ Required ratio = 1 : 1

Second Method

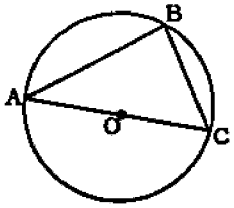
OA = OB
$\therefore$ $\angle$OAB = $\angle$OBA = 60°
$\therefore$ ΔOAB is an equilateral triangle.
$\therefore$ OA = OB = AB

34. (3)



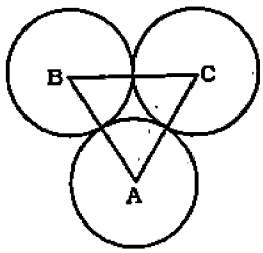
In Δ ABD,
AD = BD = AB = radius
In Δ ACB,
AC = CB = AB = radius
$\therefore$ $\angle$DBC = 60° + 60° = 120°

35. (1)



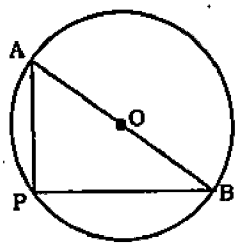
$\angle$ABC = 90°
Δ ABC is a right angled triangle and 'O' is the circumcentre.

36. (2)



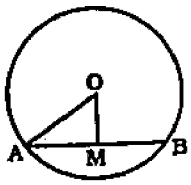
Radius of each circle = r units
$\therefore$ AB = BC = CA = 2r units
Hence, ABC is an equilateral triangle.

37. (3)



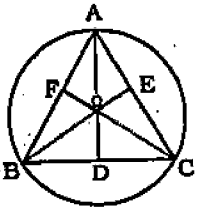
$\angle$APB = 90°
AB = Diameter = hypotenuse of ΔAPB
The angle of a semi-circle is a right angle.

38. (2)



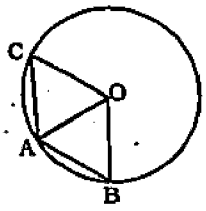
AB = 20 cm.
AM = MB = 10 cm.
OM = 2 $\sqrt{11}$ cm.
$\therefore$ Radius OA = $\sqrt{OM^2 + AM^2}$
= $\sqrt{(2\sqrt{11})^2 + 10^2}$
= $\sqrt{4 \times 11 + 100}$ = $\sqrt{44 + 100}$
= $\sqrt{144}$ = 12 cm.

39. (4)



OA = OB = OC
= Circum – radius
In Δ ABC,
$\angle$A = 180° – 70° – 40°
= 180° – 110° = 70°
The angle subtended by an arc at the centre is twice to that at the circumference.
$\therefore$ $\angle$BOC = 2 $\angle$BAC
= 2 × 70 = 140°

40. (2)



In Δs OAB and OCA,
OC = OA = OB = radii
2 $\angle$OAB + $\angle$AOB = 180°
2 $\angle$OAC + $\angle$AOC = 180°
$\therefore$ $\angle$AOB + $\angle$AOC
= 360° – 2 ($\angle$OAB + $\angle$OAC)
= 360° – 2 × 90° = 180°
AB = AC
$\therefore$ $\angle$AOB = 90°
$\angle$OAB = 45°

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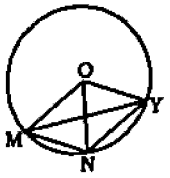
$\therefore \sin OAB = \frac{OB}{AB}$

$\Rightarrow \sin 45° = \frac{OB}{5\sqrt{2}}$

$\Rightarrow OB = 5\sqrt{2} \cdot \sin 45°$

$= 5\sqrt{2} \times \frac{1}{\sqrt{2}} = 5$ cm.

41. (4)



In Δ ONY, ON = OY = radii

$\angle ONY = 50° = \angle OYN$

$\therefore \angle NOY = 180° - 2 \times 50° = 80°$

In Δ OMY,

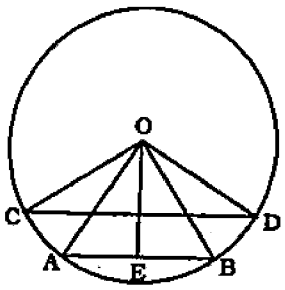
OM = OY = radii

$\therefore \angle OMY = \angle OYN = 15°$

$\therefore \angle MOY = 180° - 2 \times 15° = 150°$

$\therefore \angle MON = 150° - 80° = 70°$

42. (1)



Radius of circle = r units

In Δ OCD, $\angle COD = 90°$

$\therefore CD^2 = OC^2 + OD^2$

$\Rightarrow b^2 = r^2 + r^2 = 2r^2$ ...(i)

In Δ OAB,

$OE \perp AB$

$\angle OAB = 60°$

$AE = \frac{a}{2}$

$\therefore \cos 60° = \frac{AE}{OA}$

$\Rightarrow \frac{1}{2} = \frac{\frac{a}{2}}{r}$

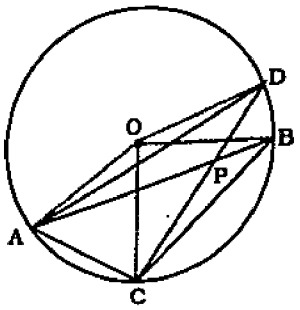
$\Rightarrow \frac{1}{2} = \frac{a}{2r} \Rightarrow a = r$ ...(ii)

From equations (i) and (ii),

$b^2 = 2a^2$

$\Rightarrow b = \sqrt{2}a$

43. (4)



$\angle AOD = 100°$

$\therefore \angle ACD = \angle ACP = \frac{100}{2} = 50°$

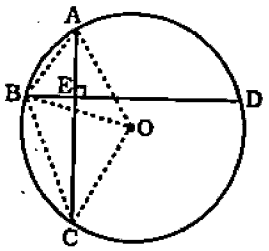
(The angle subtended at the centre is twice to that of angle at the circumference by the same arc)

Again, $\angle BOC = 70°$

$\therefore \angle BAC = \frac{70}{2} = 35° = \angle PAC$

$\therefore \angle APC = 180° - 50° - 35° = 95°$

44. (2)



OA = OB = radii

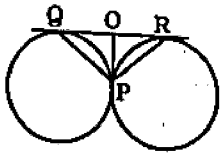
$\angle OAB = \angle OBA = 25°$

$\therefore \angle AOB = 180° - 50° = 130°$

$\therefore \angle BCA = \frac{130°}{2} = 65°$

$\therefore \angle EBC = 90° - 65° = 25°$

45. (3)



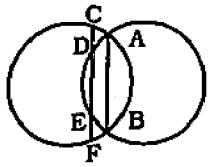
OQ = OP = OR

(Tangents drawn from the same external point)

$\therefore \angle QPO = \angle PQO = \angle OPR = \angle PRO = 45°$ because $\angle POQ = \angle POR = 90°$

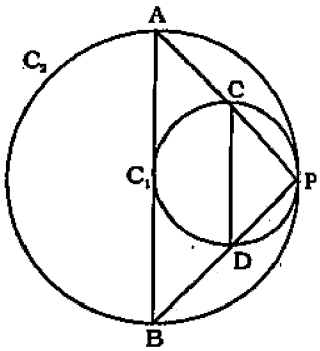
$\therefore \angle QPR = 45° + 45° = 90°$

46. (3)



Clearly, CD = EF = = 4.5 cm.

47. (1)



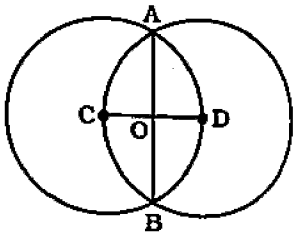
$\angle BDC = 120°$

$\therefore \angle CDP = 180° - 120° = 60°$

$CD \parallel AB$

$\therefore \angle ABP = 60° = \angle CDP$

48. (2)



$CO = OD = \frac{r}{2}$ units

AC = r units

In ΔAOC,

$OA = \sqrt{AC^2 - OC^2}$

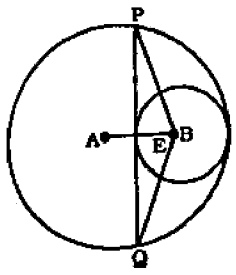
$= \sqrt{r^2 - \frac{r^2}{4}} = \sqrt{\frac{3r^2}{4}} = \frac{\sqrt{3}r}{2}$

$\therefore AB = 2OA = 2 \times \frac{\sqrt{3}r}{2}$

$= \sqrt{3}r$ units

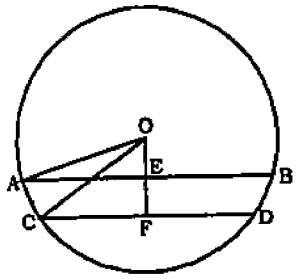
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49. (4)



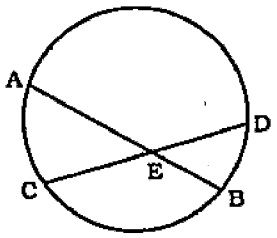
In ΔPBE,
$PB = 5$ cm
$BE = 1$ cm
$PE = \sqrt{PB^2 - BE^2}$
$= \sqrt{25-1} = \sqrt{24} = 2\sqrt{6}$ cm
$\therefore PQ = 2PE = 4\sqrt{6}$ cm

50. (2)



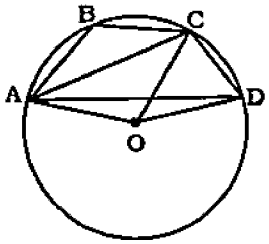
$OA = OC =$ radius $= 10$ cm
$AB = 16$ cm
$CD = 12$ cm
In ΔOAE,
$\angle OEA = 90°$
$\therefore AE = EB = 8$ cm
$\therefore OE = \sqrt{OA^2 - AE^2}$
$= \sqrt{10^2 - 8^2} = \sqrt{100-64}$
$= \sqrt{36} = 6$ cm
In ΔOFC,
$\angle OFC = 90°$
$\therefore CF = FD = 6$ cm
$\therefore OF = \sqrt{OC^2 - OF^2}$
$= \sqrt{10^2 - 6^2} = \sqrt{100-36}$
$= \sqrt{64} = 8$ cm
$\therefore$ Required distance $= EF$
$= OF - OE$
$= 8 - 6 = 2$ cm

51. (3)



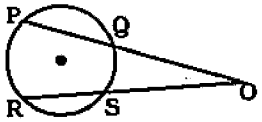
By theorem,
$CE \times ED = AE \times EB$
$\Rightarrow 3\,DE \times DE = 9 \times 12$
$\Rightarrow DE^2 = \frac{9\times12}{3} = 36$
$\Rightarrow DE = \sqrt{36} = 6$ cm.

52. (2)



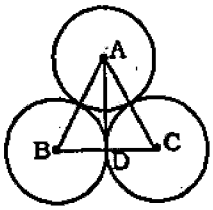
Angle subtended by an arc at the centre is twice to that subtended at the circumference.
$\therefore \angle ABC = \angle ADC = 130° \div 2 = 65°$

53. (4)



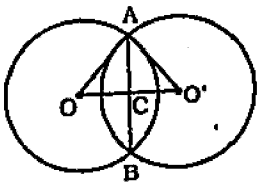
$OP \times OQ = OS \times OR$
$\Rightarrow (6+8) \times 8 = 7 \times OR$
$\Rightarrow OR = \frac{14\times8}{7} = 16$ cm.
$\therefore RS = OR - OS$
$= 16 - 7 = 9$ cm.

54. (2)



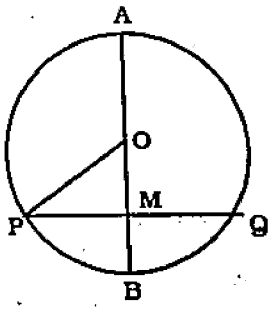
ABC will be an equilateral triangle whose each side = 12 cm.
$AD \perp BC$
$\therefore BD = DC = 6$ cm.
$AD \perp BC$
$\therefore AD = \sqrt{AB^2 - BD^2}$
$= \sqrt{12^2 - 6^2}$
$= \sqrt{(12+6)(12-6)}$
$= \sqrt{18\times6} = 6\sqrt{3}$ cm.

55. (3)



$AB = 12$ cm
$AC = BC = 6$ cm
$OA = 10$ cm
From ΔAOC,
$\therefore OC = \sqrt{OA^2 - AC^2}$
$= \sqrt{10^2 - 6^2} = \sqrt{100-36}$
$= \sqrt{64} = 8$ cm
Again, in $\Delta ACO'$,
$AO' = 8$ cm
$\therefore O'C = \sqrt{8^2 - 6^2}$
$= \sqrt{64-36} = \sqrt{28} = 5.3$ cm
$\therefore OO' = OC + CO'$
$= 8 + 5.3 = 13.3$ cm

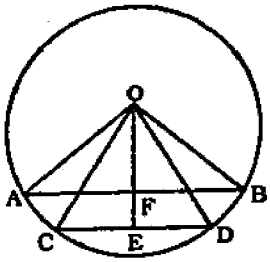
56. (2)



$PQ = 18$ cm
$PM = MQ = 9$ cm
$OP = OB = r$ cm
$MB = 3$ cm
From ΔOPM,
$OP^2 = PM^2 + OM^2$
$\Rightarrow r^2 = 9^2 + (r-3)^2$
$\Rightarrow r^2 = 81 + r^2 - 6r + 9$
$\Rightarrow 81 - 6r + 9 = 0$
$\Rightarrow 6r = 90$
$\Rightarrow r = 15$ cm
$\therefore AB = 30$ cm

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57. (2)



OA = OB = OC = OD = radius(r)
$\angle OAB = 90°$; AB = b, CD = a
From ΔOAB,
$OA^2 + OB^2 = AB^2$
$\Rightarrow r^2 + r^2 = b^2 \Rightarrow 2r^2 = b^2$

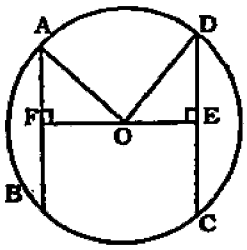
$$\Rightarrow r^2 = \frac{b^2}{2}$$

$$\Rightarrow r = \frac{b}{\sqrt{2}} \quad \text{.....(i)}$$

In ΔOCD,
$\angle COD = 60°$;
$\therefore \angle OCD = \angle ODC = 60°$
$\therefore$ OC = CD
$\Rightarrow r = a$ .....(ii)
From equations (i) and (ii),

$$\frac{b}{\sqrt{2}} = a \Rightarrow b = \sqrt{2}\ a$$

58. (1)



AB = 10 cm.
$\therefore$ AF = FB = 5 cm.
CD = 24 cm.
$\therefore$ CE = DE = 12 cm.
Let OE = x cm
$\therefore$ OF = (17 – x) cm
From ΔODE,

$$OD = \sqrt{OE^2 + DE^2}$$

$$= \sqrt{x^2 + 12^2} \quad \text{..... (i)}$$

From ΔOAF,

$$OA = \sqrt{OF^2 + AF^2}$$

$$= \sqrt{(17-x)^2 + 5^2} \quad \text{..... (ii)}$$

$\because$ OA = OD

$$\therefore \sqrt{x^2 + 12^2} = \sqrt{(17-x)^2 + 5^2}$$

$\Rightarrow x^2 + 144 = 289 - 34x + x^2 + 25$
$\Rightarrow 34x = 289 + 25 - 144 = 170$

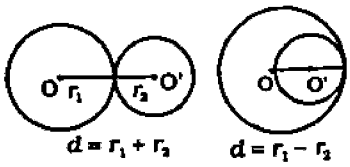
$$\Rightarrow x = \frac{170}{34} = 5$$

$\therefore$ From equation (i),

$$OD = \sqrt{x^2 + 12^2} = \sqrt{5^2 + 144}$$

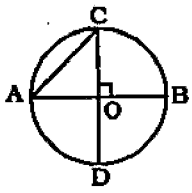
$$= \sqrt{169} = 13 \text{ cm.}$$

59. (3)



$d = r_1 + r_2$ $\quad$ $d = r_1 - r_2$

60. (4)



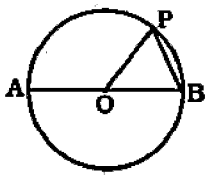
$$OA = OB = OC = \frac{AB}{2}$$

$$\therefore AC = \sqrt{OA^2 + OC^2}$$

$$= \sqrt{\left(\frac{AB}{2}\right)^2 + \left(\frac{AB}{2}\right)^2}$$

$$= \sqrt{\frac{AB^2 + AB^2}{4}} = \sqrt{\frac{AB^2}{2}} = \frac{AB}{\sqrt{2}}$$

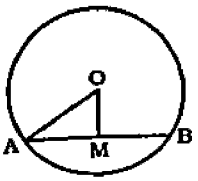
61. (1)



$\angle AOB = 180°$
$\angle AOP = 120°$
$\therefore \angle POB = 180° - 120° = 60°$
OP = OB = radii

$$\therefore \angle OPB = \angle PBO = \frac{120°}{2} = 60°$$

62. (2)



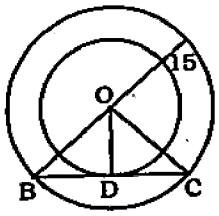
AB = 8 cm
AM = MB = 4 cm
OA = 5 cm
$\therefore$ OM = $\sqrt{OA^2 - AM^2}$

$$= \sqrt{5^2 - 4^2}$$

$$= \sqrt{25 - 16} = \sqrt{9} = 3 \text{ cm}$$

TYPE-XIII

1. (1)

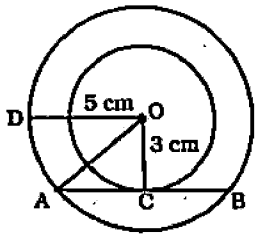


BO = OC = 15 cm.
OD = 9 cm.
$\therefore$ BD = $\sqrt{15^2 - 9^2}$

$$= \sqrt{24 \times 6} = 12 \text{ cm}$$

$\therefore$ BC = 2 × 12 = 24 cm.

2. (3)



AC = $\sqrt{AO^2 - OC^2}$

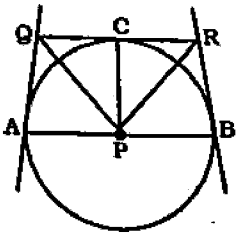
$$= \sqrt{5^2 - 3^2}$$

$$= \sqrt{25 - 9}$$

$$= \sqrt{16} = 4 \text{ cm}$$

$\therefore$ AB = 2 × 4 = 8 cm

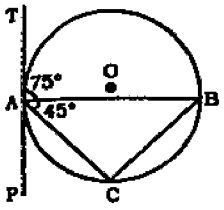
3. (3)



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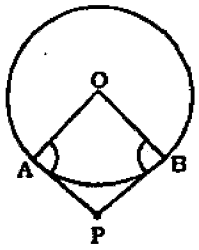
In ΔPCR and ΔRBP,
$PC = PB$ (radii)
$RC = RB$
PR is common.
$\therefore \Delta PCR \cong \Delta RBP$ [By SSS]
$\therefore \angle CPR = \angle RPB$
Similarly, $\angle CPQ = \angle QPA$
$\therefore \angle QPR = 90°$
$[\because \angle APB = 180°]$

4. (3)



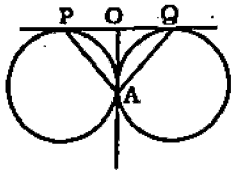
If a line touches a circle and from the point of contact a chord is drawn, the angles which this chord makes with the given line are equal respectively to the angles formed in the corresponding alternate segments.
$\therefore \angle ACB = \angle BAT = 75°$
$\angle ABC = 180° - 45° - 75° = 60°$

5. (1)



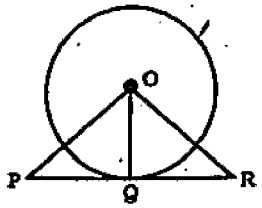
$\angle OAP = \angle OBP = 90°$
$\angle AOB + \angle APB = 180°$
$\Rightarrow 5\angle APB + \angle APB = 180°$
$\Rightarrow 6\angle APB = 180°$
$\Rightarrow \angle APB = 30°$

6. (2)



AO is perpendicular to PQ.
$OA = OP = OQ$.
$\Rightarrow \angle OPA = \angle OAP = \angle OQA$
$= \angle OAQ = 45°$
$\therefore \angle PAQ = 90°$

7. (4)



$OQ \perp PR$
$\therefore$ From ΔOPQ,

$PQ = \sqrt{OP^2 - OQ^2}$

$= \sqrt{\left(\frac{20}{3}\right)^2 - 4^2}$

$= \sqrt{\frac{400}{9} - 16}$

$= \sqrt{\frac{400 - 144}{9}}$

$= \sqrt{\frac{256}{9}} = \frac{16}{3}$ cm

From ΔOQR,

$QR = \sqrt{OR^2 - OQ^2}$

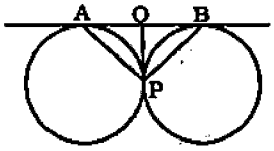
$= \sqrt{5^2 - 4^2} = \sqrt{25 - 16}$

$= \sqrt{9} = 3$ cm

$\therefore PR = PQ + QR$

$= \frac{16}{3} + 3 = \frac{25}{3}$ cm

8. (2)

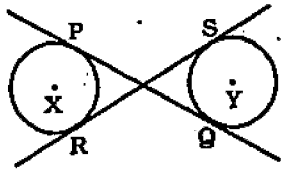


$OA = OP$
$\Rightarrow \angle PAB = \angle OPA = 35°$
$\therefore \angle AOP = 110° \Rightarrow \angle POB = 70°$

$\therefore \angle ABP = \frac{180° - 70°}{2} = \frac{110°}{2}$

$= 55°$

9. (1)

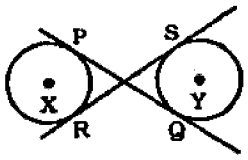


Length of transverse tangent

$= \sqrt{XY^2 - (r_1 + r_2)^2}$

$\Rightarrow 8 = \sqrt{XY^2 - 9^2}$
$\Rightarrow 64 = XY^2 - 81$
$\Rightarrow XY^2 = 64 + 81 = 145$
$\Rightarrow XY = \sqrt{145}$ cm

10. (1)

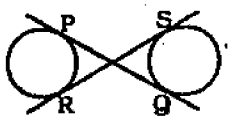


Transverse common tangent

$= \sqrt{\left(\text{Distance between centres}\right)^2 - (r_1 + r_2)^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{16 \times 4} = 8$ cm

11. (3) Transverse common tangent



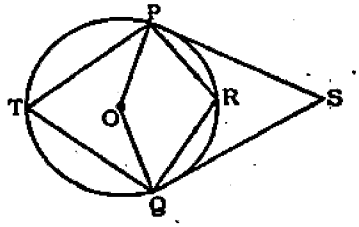
$= \sqrt{d^2 - (r_1 + r_2)^2}$

$= \sqrt{(24)^2 - (5+3)^2}$

$= \sqrt{576 - 64} = \sqrt{512}$

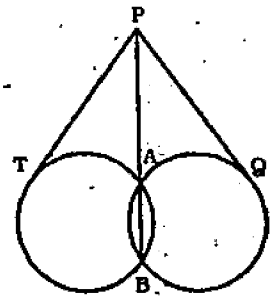
$= 16\sqrt{2}$ cm.

12. (4)



$\angle OPS = \angle OQS = 90°$
$\angle PSQ = 20°$;
$\therefore \angle POQ = 160°$
$[\angle PSQ + \angle POQ = 180°]$
$\Rightarrow \angle PTQ = 80°$
PRQT is a concyclic quadrilateral.
$\therefore \angle PRQ = 180° - 80° = 100°$

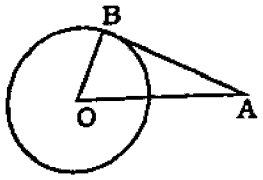
13. (4)



$PT = PQ$
Tangents will be equal.

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14. (1)



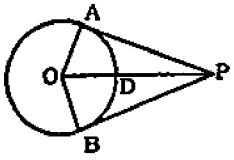
$\angle OBA = 90°$

$OA = 5,\ OB = 4$

$\therefore\ AB = \sqrt{OA^2 - OB^2}$

$= \sqrt{25-16} = \sqrt{9} = 3$ cm

15. (4)



Let $OA = OB = r$

$OP = 2r$

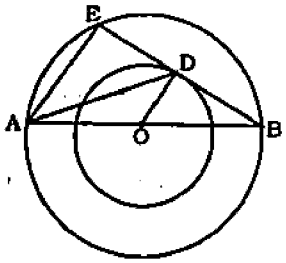
$\Rightarrow AP = PB$

$\sin \angle APO = \dfrac{OA}{OP} = \dfrac{r}{2r} = \dfrac{1}{2}$

$\angle APO = 30°$

$\therefore \angle APB = 60°$

16. (2)



$\angle ODB = 90°$

$OD = 8$ cm

$OB = 13$ cm

$\therefore BD = \sqrt{13^2 - 8^2}$

$= \sqrt{169-64}$

$= \sqrt{105}$ cm

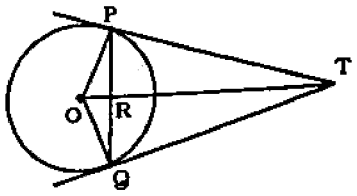
$AE = 16$ cm; $\angle AED = 90°$

$AD = \sqrt{AE^2 + DE^2}$

$AD = \sqrt{256+105} = \sqrt{361}$

$= 19$ cm

17. (1)



OT is the perpendicular bisector of chord PQ.

Let $TR = y$

$\therefore PR = QR = 4$ cm

In right angle ΔORP,

$OP^2 = OR^2 + PR^2$

$\Rightarrow OR^2 = OP^2 - PR^2 = 5^2 - 4^2 = 9$

$\Rightarrow OR = 3$ cm

In right angled ΔPRT and ΔOPT, $TP^2 = TR^2 + PR^2$ and $OT^2 = TP^2 + OP^2$

$\Rightarrow OT^2 = TR^2 + PR^2 + OP^2$

$\Rightarrow (y+3)^2 = y^2 + 16 + 25$

$\Rightarrow 6y = 32 \Rightarrow y = \dfrac{16}{3}$

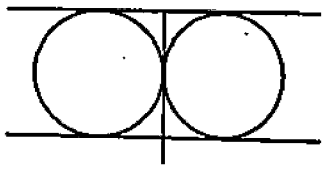
$\therefore TR = \dfrac{16}{3}$

$\therefore TP^2 = TR^2 + PR^2 = \left(\dfrac{16}{3}\right)^2 + 16$

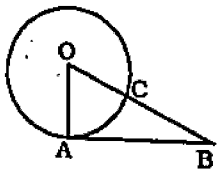
$= \dfrac{256}{9} + 16 = \dfrac{400}{9}$

$\therefore TP = \dfrac{20}{3}$ cm

18. (3)



19. (1)



$AB = 5\sqrt{3}$ units

$OA = 5$ units

$\angle OAB = 90°$

$\therefore OB = \sqrt{AB^2 + OA^2}$

$= \sqrt{(5\sqrt{3})^2 + 5^2}$

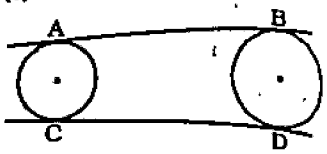
$= \sqrt{75+25}$

$= \sqrt{100} = 10$ units

$\therefore BC = OB - OC$

$= 10 - 5 = 5$ units

20. (1)



Direct common tangent

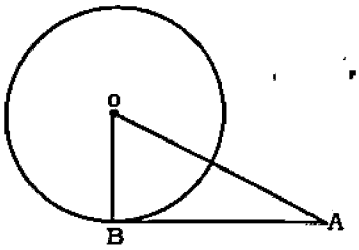
$\sqrt{(\text{Distance between two centres})^2 - (r_1 - r_2)^2}$

$= \sqrt{(C_1C_2)^2 - (r_1 - r_2)^2}$

$= \sqrt{(13)^2 - (7-2)^2}$

$= \sqrt{169-25} = \sqrt{144} = 12$ cm.

21. (4)



$OB = 6$ cm

$OA = 10$ cm

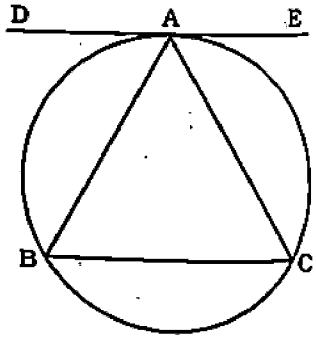
$\angle OBA = 90°$

$\therefore AB = \sqrt{OA^2 - OB^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{100-36}$

$= \sqrt{64} = 8$ cm

22. (4)



$DE \parallel BC$

$\therefore \angle DAB = \angle ABC$

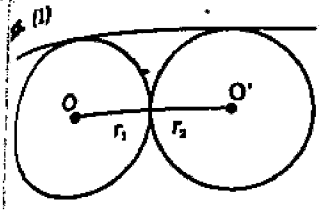
$\angle EAC = \angle ACB$

Hence, $\angle ABC$ is equilateral triangle.

$\therefore$ side $AB = AC = BC = 17$ cm

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(1)



∴ Required length of tangent

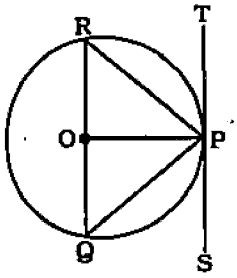
$\sqrt{(\text{Distance between centres})^2 - (r_1 - r_2)^2}$

$= \sqrt{(25)^2 - (16-9)^2}$

$= \sqrt{625 - 49} = \sqrt{576}$

= 24 cm

24. (1)



∠RPT = 50°

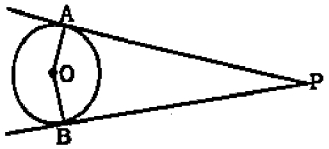
∠RPQ = 90° (Angle of semi circle)

∠TPS = 180°

∴ ∠SPQ = 180° − 50° − 90°

= 40°

25. (2)



∠AOB = 110°

∠OAP = 90°

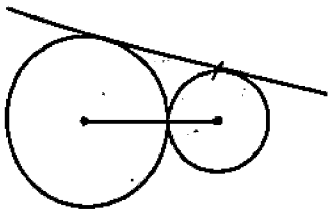
∠OBP = 90°

∴ ∠APB + ∠AOB + ∠OAP + ∠OBP = 360°

⇒ ∠APB + 110° + 90° + 90° = 360°

⇒ ∠APB = 180° − 110° = 70°

26. (2)



r_1 = 25 cm, r_2 = 9 cm

Length of common tangent

$= \sqrt{(\text{distance between centres})^2 - (r_1 - r_2)^2}$

$= \sqrt{(25+9)^2 - (25-9)^2}$

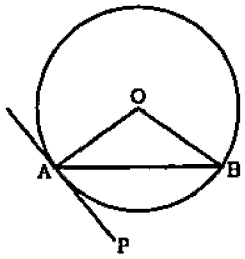
$= \sqrt{(34)^2 - (16)^2}$

$= \sqrt{(34+16)(34-16)}$

$= \sqrt{50 \times 18}$

= 30 cm

27. (3)



In ΔOAB,

OA = OB = radius

∴ ∠OAB = ∠OBA

∴ ∠OAB + ∠OBA + ∠AOB = 180°

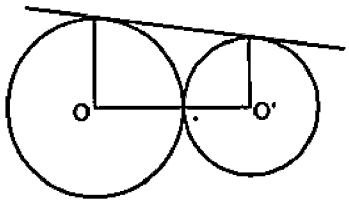
∴ 2∠OAB = 180° − 140° = 40°

$\Rightarrow \angle OAB = \frac{40}{2} = 20°$

∴ ∠PAO = 90°

∴ ∠PAB = 90° − 20° = 70°

28. (4)



OO' = 9 + 4 = 13 cm

∴ Common tangent

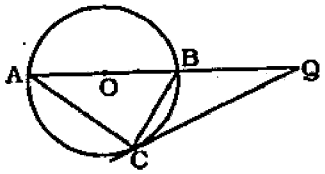
$= \sqrt{(r_1 + r_2)^2 - (r_1 - r_2)^2}$

$= \sqrt{13^2 - (9-4)^2}$

$= \sqrt{13^2 - 5^2} = \sqrt{169 - 25}$

$= \sqrt{144}$ = 12 cm

29. (1)



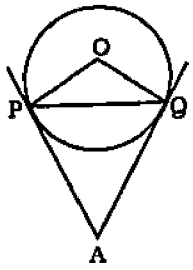
The angle at the circumferenc of a semi-circle is right angle.

∴ ∠ACB = 90°

∠CAB = 34°

∴ ∠CBA = 90° − 34° = 56°

30. (3)



∠PAQ = 48°

AP = AQ = tangents from th same exterior point.

∴ In Δ APQ,

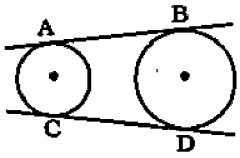
∠APQ = ∠AQP

∴ 2 ∠APQ = 180° − 48° = 132

$\Rightarrow \angle APQ = \frac{132}{2} = 66°$

31. (4) Length of direct common tangent

$\sqrt{(\text{Distance between two centres})^2 - (r_1 - r_2)}$



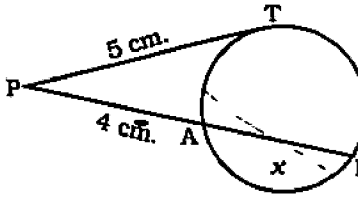
$= \sqrt{13^2 - (8-3)^2}$

$= \sqrt{13^2 - 5^2}$

$= \sqrt{(13+5)(13-5)}$

$= \sqrt{18 \times 8}$ = 12 cm.

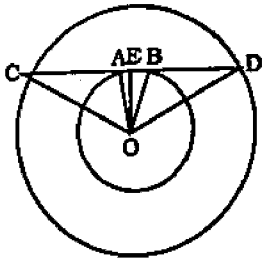
32. (2)



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Secant PB = (4 + x) cm.
∴ PA. PB = PT^2
$\Rightarrow 4(4+x) = 5^2 = 25$
$\Rightarrow 16 + 4x = 25$
$\Rightarrow 4x = 25 - 16 = 9$
$\Rightarrow x = \frac{9}{4}$ cm. ∴ AB = 30 cm

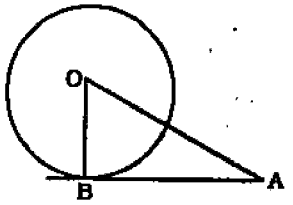
33. (2)



OE ⊥ AB ; OE ⊥ CD
OE = OA = OB = 3 cm
OC = OD = 5 cm
∴ $CE^2 = OC^2 - OE^2$
$\Rightarrow 5^2 - 3^2 = 25 - 9 = 16$
$\Rightarrow CE = \sqrt{16} = 4$ cm
∴ CD = 2CE = 2 × 4 = 8 cm

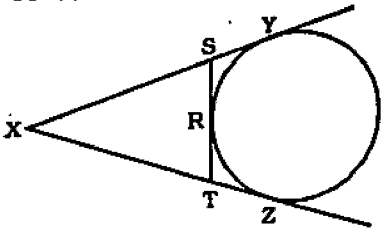
34. (3) Common tangent =
$\sqrt{(\text{Distance between centres})^2 - (r_1 - r_2)^2}$
$= \sqrt{(8+4)^2 - (8-4)^2}$
$= \sqrt{12^2 - 4^2}$
$= \sqrt{144 - 16} = \sqrt{128}$
$= 8\sqrt{2}$ cm

35. (4)



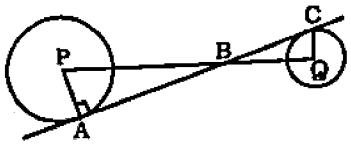
AB is a tangent. OB is radius of circle.
OB ⊥ AB
OB = 6 cm.
OA = 10 cm.
∴ $AB = \sqrt{OA^2 - OB^2}$
$= \sqrt{10^2 - 6^2} = \sqrt{100 - 36}$
$= \sqrt{64} = 8$ cm.

36. (3)



The tangents drawn from an exterior point to a circle are equal.
∴ XY = XZ = 15 cm.
∴ TZ = XZ − TX
= 15 − 9 = 6 cm
Argain, TR = TZ = 6 cm.

37. (4)



In Δ APB and Δ BCQ,
∠PAB = ∠BCQ = 90°
∠PBA = ∠QBC
By AA − similarity,
Δ APB ~ Δ BQC

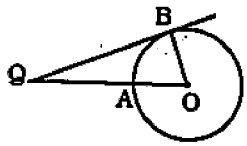
$\therefore \frac{AB}{BC} = \frac{AP}{QC}$

$\Rightarrow \frac{8}{BC} = \frac{6}{3}$

$\Rightarrow BC = \frac{8 \times 3}{6} = 4$ cm.

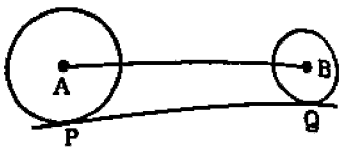
$\therefore PQ = \sqrt{AC^2 + (r_1 + r_2)^2}$
$= \sqrt{(8+4)^2 + (6+3)^2}$
$= \sqrt{12^2 + 9^2} = \sqrt{144 + 81}$
$= \sqrt{225} = 15$ cm.

38. (2)



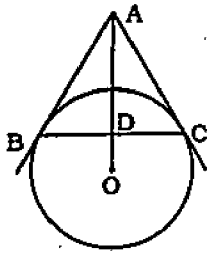
QB = Tangent = 12 cm.
OQ = 13 cm.
∠QBO = 90°
From ΔOQB,
$OB = \sqrt{OQ^2 - QB^2}$
$= \sqrt{13^2 - 12^2} = \sqrt{169 - 144}$
$= \sqrt{25} = 5$ cm.
∴ AQ = Shortest distance
= OQ − OA = 13 − 5 = 8 cm.

39. (3)



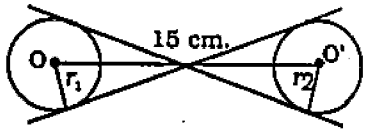
$PQ = \sqrt{AB^2 - (r_1 - r_2)^2}$
$= \sqrt{13^2 - (11-6)^2}$
$= \sqrt{13^2 - 5^2} = \sqrt{169 - 25}$
$= \sqrt{144} = 12$ cm.

40. (2)



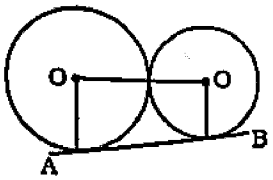
AB = AC = tangents drawn from an exterior point
D is mid-point of BC and AD is perpendicular to BC.
∴ ∠BDO = 90°

41. (1)



Length of common transverse tangent =
$\sqrt{(\text{distance between centres})^2 - (r_1 + r_2)^2}$
$= \sqrt{15^2 - (6+3)^2}$
$= \sqrt{225 - 81}$
$= \sqrt{144} = 12$ cm.

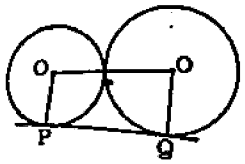
42. (1)



Required ratio = $\frac{r_1}{r_2} = 5:3$

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4. (2)



$PQ = \sqrt{(OO')^2 - (r_2 - r_1)^2}$

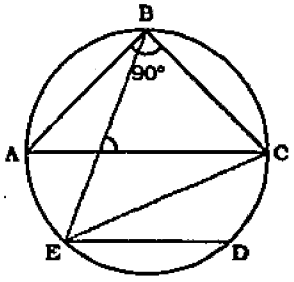
$= \sqrt{(13)^2 - (8-3)^2}$

$= \sqrt{169 - 25}$

$= \sqrt{144} = 12$ cm.

TYPE-XIV

1. (4)



$\angle CBE = 50°$

$\angle BAC + \angle BCA = 90°$

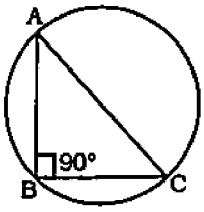
$[\because \angle ABC = 90°]$

$\angle ABE = 90° - 50° = 40°$

$\therefore \angle ABE = \angle ACE = 40°$

$\therefore \angle ACE = \angle DEC = 40°$

2. (1)



$\angle ABC = 90°$

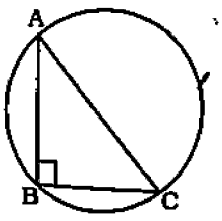
AC = Diameter of circle

$\therefore AC = \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm

$\therefore$ Circum-radius = 5 cm

3. (2)



$3^2 + 4^2 = 5^2$ [Pythagorean Triplet]

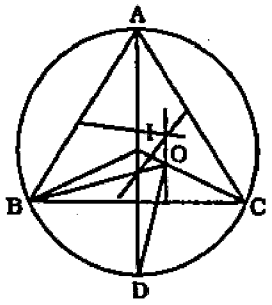
ΔABC is a right angled triangle.

$\angle B = 90°$ = angle at the circumference

Since, Diameter of circle = 5 cm

$\therefore$ Circum-radius = 2.5 cm

4. (1)



OA = OB = OC

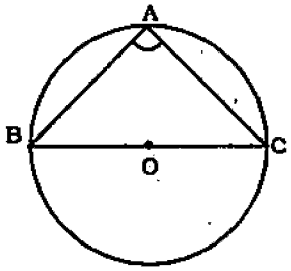
$\angle BID = \angle ABC$

$\Rightarrow x = y$

$\angle BOD = 2\angle BAD$

$\therefore \frac{z+x}{y} = \frac{3y}{y} = 3$

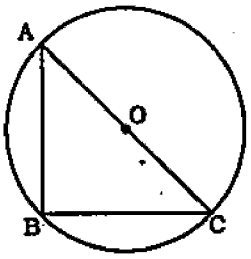
5. (2) Simply, check through options & find Pythagorean Triplet



$18^2 + 24^2 = 30^2$

$\therefore$ Sides = 18, 24, 30

6. (4)



$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{15^2 + 20^2} = \sqrt{225 + 400}$

$= \sqrt{625} = 25$ cm.

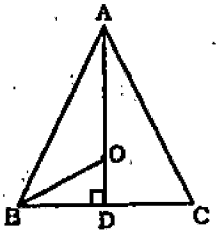
$\angle ABC = 90°$

As, AC = diameter

$\therefore$ Circum radius (OA) $= \frac{25}{2}$

$= 12.5$ cm.

7. (4)

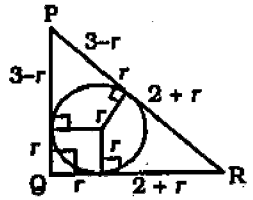


Circum-radius of equilateral triangle $= \frac{2}{3} \times$ height

$\therefore 8 = \frac{2}{3} \times$ height

$\therefore$ Height $= \frac{8 \times 3}{2} = 12$ cm.

8. (4)



$PR^2 = PQ^2 + PR^2$

$= 3^2 + 4^2 = 25$

$\therefore PR = \sqrt{25}$

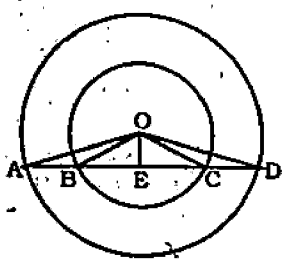
$= 5$ cm

$r = \frac{\text{Area of triangle}}{\text{Semi} - \text{perimeter of triangle}}$

$= \frac{\frac{1}{2} \times 3 \times 4}{\frac{3+4+5}{2}} = \frac{6}{6} = 1$cm

[Or, In the above figure, QR = r + 2 + r = 4 $\Rightarrow$ r = 1

9. (3)



BE = EC = 6 cm, OB = 10 cm, OA = 17 cm

From ΔOBE,

$OE = \sqrt{OB^2 - BE^2}$

$= \sqrt{10^2 - 6^2} = \sqrt{16 \times 4} = 8$ cm

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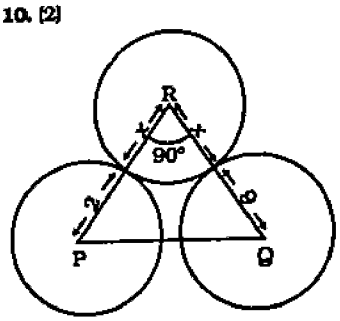
From ΔOAE,

$AE = \sqrt{OA^2 - OE^2}$

$= \sqrt{17^2 - 8^2} = \sqrt{25 \times 9} = 15$ cm

$\therefore AD = 2 \times AE = 2 \times 15 = 30$ cm

10. (2)



$\angle PRQ = 90°$

$PR = 2 + x$

$PQ = 17$

$RQ = 9 + x$

$\therefore PQ^2 = PR^2 + RQ^2$

$\Rightarrow 17^2 = (2 + x)^2 + (9 + x)^2$

$\Rightarrow 289 = 4 + 4x + x^2 + 81 + 18x + x^2$

$\Rightarrow 289 = 2x^2 + 22x + 85$

$\Rightarrow 2x^2 + 22x + 85 - 289 = 0$

$\Rightarrow 2x^2 + 22x - 204 = 0$

$\Rightarrow x^2 + 11x - 102 = 0$

$\Rightarrow x^2 + 17x - 6x - 102 = 0$

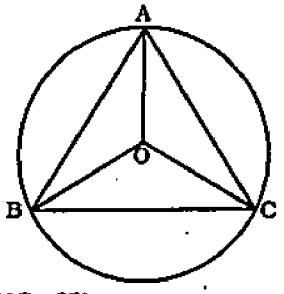
$\Rightarrow x(x + 17) - 6(x + 17) = 0$

$\Rightarrow (x - 6)(x + 17) = 0$

$\Rightarrow x = 6$ as $x \neq -17$

$\therefore x = 6$ cm

11. (2)



$\angle BAC = 85°$

$\therefore \angle BOC = 2 \times 85° = 170°$

$\angle BCA = 55°$

$\therefore \angle AOB = 2 \times 55° = 110°$

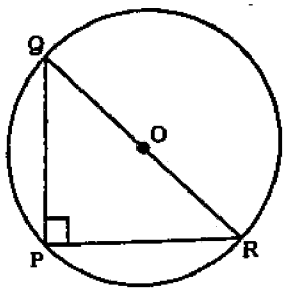
$\therefore \angle AOC = 360° - 170° - 110°$

$= 360° - 280° = 80°$

$\therefore \angle OAC = \angle OCA = \frac{1}{2}(180° - 80°)$

$= \frac{1}{2} \times 100 = 50°$

12. (1)



$\therefore RQ = \sqrt{PR^2 + PQ^2}$

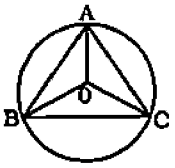
$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm

$\therefore$ Circum-radius $= \frac{10}{2}$

$= 5$ cm

13. (3)



In ΔABC,

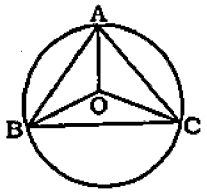
$\angle BAC = 60°, \angle ABC = 60°$

The angle subtended by an arc at the centre is twice to that at the circumference by the same arc.

$\therefore \angle AOC = 2\angle ABC = 120°$

14. (3) $\angle BAC = 85°$

$\therefore \angle BOC = 2 \times 85° = 170°$

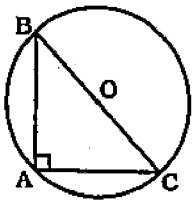


$\Rightarrow \angle OBC = \angle OCB = 5°$

$\therefore \angle OCA = \angle OAC = 75° - 5°$

$= 70°$

15. (1)



$\because BC =$ Diameter

$\therefore BC = \sqrt{AB^2 + AC^2}$

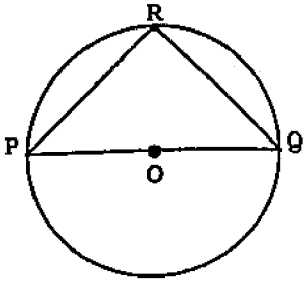
$= \sqrt{5^2 + 12^2} = \sqrt{25 + 144}$

$= \sqrt{169} = 13$ cm

$\therefore OB =$ circum-radius

$= \frac{BC}{2} = \frac{13}{2} = 6.5$ cm

16. (2)



Angle of a semi-circle is a right angle.

$\therefore \angle PRQ = 90°$

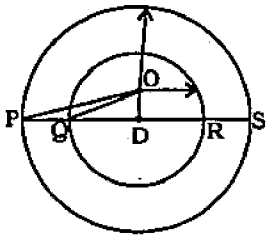
In ΔPQR,

$\angle RPQ + \angle RQP = 90°$

$\Rightarrow \angle RPQ + 30° = 90°$

$\Rightarrow \angle RPQ = 90° - 30° = 60°$

17. (4)



Point 'O' is the centre of circle.

OD is perpendicular on QR.

$QD = DR = 8$ cm.

From ΔOQD,

$OD = \sqrt{OQ^2 - QD^2}$

$= \sqrt{17^2 - 8^2}$

$= \sqrt{(17 + 8)(17 - 8)}$

$= \sqrt{25 \times 9} = 5 \times 3 = 15$ cm.

From ΔOPD,

$PD = \sqrt{OP^2 - OD^2}$

$= \sqrt{25^2 - 15^2}$

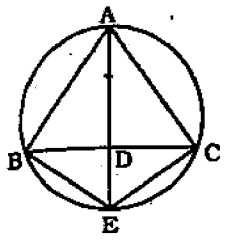
$= \sqrt{(25 + 15)(25 - 15)}$

$= \sqrt{40 \times 10} = 20$ cm.

$\therefore PS = 2PD = 2 \times 20 = 40$ cm

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8. (4)



$\frac{AB}{AC} = \frac{BD}{DC}$

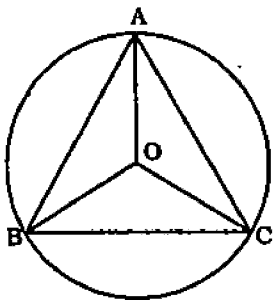
$\angle AEC = \angle CBA$

$\angle BCE = \angle BAE$

$\angle AEB = \angle ACB$

$\therefore$ Ratio will be same.

9. (4)



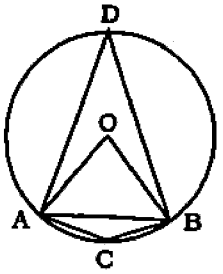
$\angle BAC$ = Angle at circumference $= 50°$

$\angle BOC$ = angle at centre $= 100°$

$OB = OC$ = radius

$\therefore \angle OBC = \angle OCB = \frac{80°}{2} = 40°$

10. (3)



$OA = AB = OB$

$\angle AOB = 60°$

$\therefore \angle ADB = 30°$

Angle subtended at the centre by an arc is twice of that subtended at the circumference.

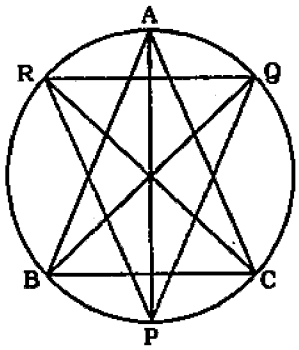
$\square ADBC$ is a cyclic quadrilateral.

$\therefore \angle ADB + \angle ACB = 180°$

$\Rightarrow 30° + \angle ACB = 180°$

$\Rightarrow \angle ACB = 180° - 30° = 150°$

21. (1)



$\angle BQP = \angle BAP$

$\therefore \angle BQP = \frac{\angle A}{2}$

$\angle BQR = \angle BCR$

$\therefore \angle BQR = \frac{1}{2} \angle C$

$\therefore \angle BQP + \angle BQR$

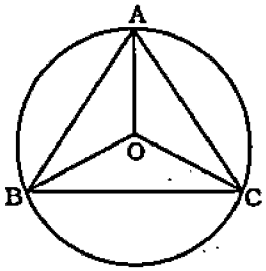
$= \frac{1}{2} [\angle A + \angle C]$

$\Rightarrow \angle PQR = \frac{1}{2} (180° - \angle B)$

$[\because \angle A + \angle B + \angle C = 180°]$

$= 90° - \frac{B}{2}$

22. (2)



In ΔABC,

$\angle BAC = 85°$

$\angle BCA = 75°$

$\therefore \angle ABC = 180° - 85° - 75°$

$= 20°$

The angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.

$\therefore \angle AOC = \angle ABC = 40°$

$\therefore OA = OC$ = radii

In ΔOAC,

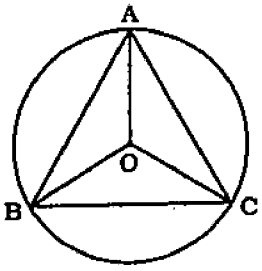
$\angle OAC = \angle OCA$ (The angles at the base of an isosceles triangle are equal)

$\angle OAC + \angle OCA = 180° - 40°$

$= 140°$

$\therefore \angle OAC = \frac{140°}{2} = 70°$

23. (4)



$\angle BAC = 85°$

$\angle BCA = 75°$

$\angle ABC = 180° - 85° - 75°$

$= 20°$

Angle subtended by an arc at the centre is twice to that subtended at any point on the circumference.

$\therefore 2\angle ABC = \angle AOC$

$\therefore \angle OAC = 40°$

In ΔOAC,

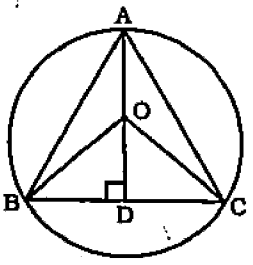
$OA = OC$ = radii

$\therefore \angle OAC = \angle OCA$

$\therefore 2\angle OAC = 180° - 40° = 140°$

$\Rightarrow \angle OAC = \frac{140°}{2} = 70°$

24. (1)



In ΔOBC $\because OB = OC$

$\therefore \angle OBC = \angle OCB$

$\therefore \angle BOC = 180° - 2\angle OBC$

In ΔOBD,

$\angle OBD = \angle OBC = 90° - \angle BOD$

Angle subtended by an arc at the centre is twice to that subtended at the circumference.

$\therefore \angle BAC = \frac{1}{2} \angle BOC$

$= \frac{1}{2} (180° - 2\angle OBC)$

$= 90° - \angle OBC$

$\therefore \angle BAC + \angle OBC = 90°$

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TYPE-XV

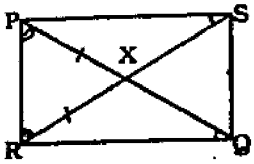
1. (2) Error = 45°27' – 45° = 27'
We have, 60' = 1°

$\Rightarrow 27' = \frac{27°}{60}$

∴ Percentage error

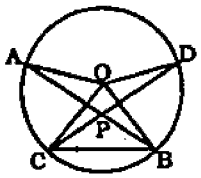
$= \frac{\frac{27}{60}}{45} \times 100 = \frac{2700}{60 \times 45} = 1\%$

2. (2)



XP = XR
∴ ∠XPR = ∠XRP
If ∠PSX = ∠RQX,
then, PS = RQ

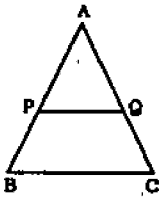
3. (3)



Join CB.
∠AOC + ∠BOD
= 2∠ABC + 2∠BCD
(Exterior angles of triangle)
= 2 (∠ABC + ∠BCD)
= 2∠BPD

∴ $\angle BPD = \frac{1}{2}(50° + 40°) = 45°$

4. (3)



PQ || BC

∴ $\frac{AP}{AB} = \frac{AQ}{AC}$ [By BPT]

$\Rightarrow \frac{AB}{AP} = \frac{AC}{AQ}$

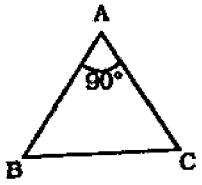
$\Rightarrow \frac{AP + PB}{AP} = \frac{AQ + QC}{AQ}$

$\Rightarrow \frac{PB}{AP} = \frac{QC}{AQ} = \frac{AP}{AQ}$

$\Rightarrow AP^2 = PB.\ AQ = 4 \times 9 = 36$

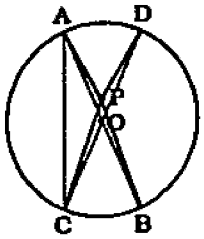
∴ AP = 6 units

5. (2)



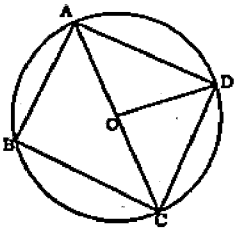
$AB^2 + AC^2 = BC^2 \Rightarrow \angle BAC = 90°$
$\Rightarrow AB^2 + AC^2 = 2AB^2$
$\Rightarrow AB^2 = AC^2$
$\Rightarrow AB = AC$
∴ ∠ABC = ∠ACB = 45°

6. (3)



∠BOC = 2 ∠BAC
∠AOD = 2 ∠DCA
∴ ∠BOC + ∠AOD
= 2 {∠BAC + ∠DCA)
= 2 ∠BPC (Exterior angles' sum)
∴ 2∠BPC = 20° + 30° = 50°
⇒ ∠BPC = 25°

7. (2)

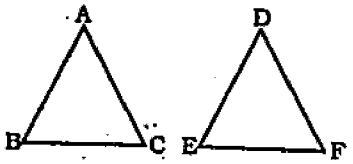


∠COD = 120° [Given]
∠BAC = 30°

$\angle CAD = \frac{1}{2} \times 120° = 60°$

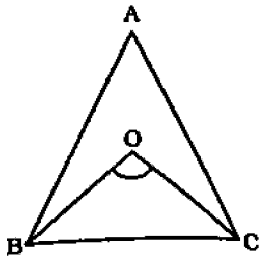
∴ ∠BAD = 90°
∴ ∠BCD = 180° – 90° = 90°

8. (2)



ΔABC ~ ΔDEF
∴ ∠A = 47° = ∠D
∠B = ∠E = 63°
∴ ∠C = 180° – 47° – 63° = 70°

9. (1)



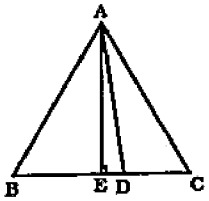
In ΔABC,
∠A + ∠B + ∠C = 180° ... (i)
In ΔOBC,
∠OBC + ∠BOC + ∠OCB = 180°

$\Rightarrow \frac{\angle B}{2} + 110° + \frac{\angle C}{2} = 180°$

$\Rightarrow \frac{\angle B + \angle C}{2} = 180° - 110° = 70°$

⇒ ∠B + ∠C = 140°
∴ ∠A = 180° – 140° = 40°

10. (2)

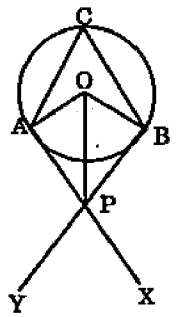


∠A = 180° – 60° – 40° = 80°

$\angle BAD = \frac{80°}{2} = 40°$

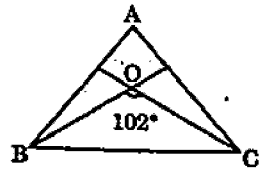
∠BAE = 180° – 60° – 90° = 30°
∴ ∠DAE = 40° – 30° = 10°

11. (1)



∠ACB = 65°
∠AOB = 2 × 65° = 130°
∠OAP = 90°, ∠AOP = 65°
∴ ∠APO = 180° – 90° – 65°
= 25°

12. (2)



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$\angle A + \angle B + \angle C = 180°$

$\Rightarrow \frac{\angle B}{2} + \frac{\angle C}{2} = 90° - \frac{\angle A}{2}$

In ΔBOC,

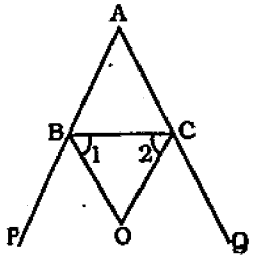
$\angle BOC + \frac{\angle B}{2} + \frac{\angle C}{2} = 180°$

$\Rightarrow 102° + 90° - \frac{\angle A}{2} = 180°$

$\Rightarrow \frac{\angle A}{2} = 102° + 90° - 180° = 12°$

$\therefore \angle A = 24°$

13. (3)



$\angle ABC + \angle CBP = 180°$

$\Rightarrow \angle B + 2\angle 1 = 180°$

$\Rightarrow 2\angle 1 = 180° - \angle B$

$\Rightarrow \angle 1 = 90° - \frac{1}{2}\angle B$

Again, $\angle ACB + \angle QCB = 180°$

$\Rightarrow \angle 2 = 90° - \frac{1}{2}\angle C$

In ΔBOC,

$\angle 1 + \angle 2 + \angle BOC = 180°$

$\Rightarrow 90° - \frac{1}{2}\angle B + \angle 90° - \frac{1}{2}\angle C + \angle BOC = 180°$

$\Rightarrow \angle BOC = \frac{1}{2}(\angle B + \angle C)$

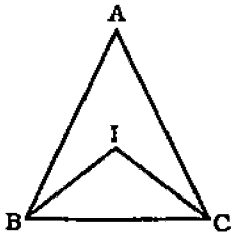
$= \frac{1}{2}(180° - \angle A)$

$\Rightarrow \angle BOC = 90° - \frac{1}{2}\angle A$

$\Rightarrow 60° = 90° - \frac{1}{2}\angle A$

$\therefore \angle A = 60°$

14. (3)



$\angle ABC = 60° \Rightarrow \angle BCA = 80°$

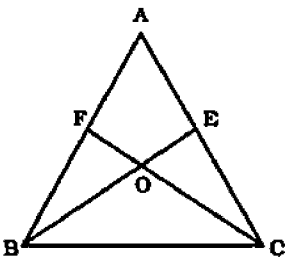
$\angle ABI = \angle IBC = 30°$

$\angle ACI = \angle ICB = 40°$

In ΔBIC,

$\therefore \angle BIC = 180° - 30° - 40° = 110°$

15. (4)



$\angle BAC = 70°$

$\angle ABC + \angle ACB = 110°$ ...(i)

From $\angle BCF$,

$\angle CFB + \angle FBC + \angle FCB = 180°$

$\Rightarrow \angle FBC + \angle FCB = 90°$ ...(ii)

From ΔBCE,

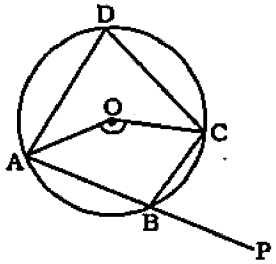
$\angle ECB + \angle EBC = 90°$ ...(iii)

(ii) + (iii) – (i)

$\Rightarrow \angle EBC + \angle FCB = 180° - 110° = 70°$

$\therefore \angle BOC = 180° - 70° = 110°$

16. (3)

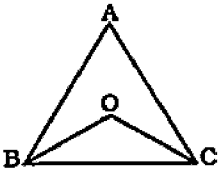


$\angle AOC = 130°$

$\Rightarrow \angle ADC = \frac{1}{2} \times 130° = 65°$

$\angle PBC = \angle ADC = 65°$

17. (4)



$\angle BAC = 80°$

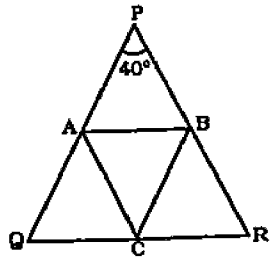
$\therefore \angle B + \angle C = 180° - 80° = 100°$

$\frac{\angle B}{2} + \frac{\angle C}{2} = 50°$

$\Rightarrow \angle OBC + \angle OCB = 50°$

$\therefore \angle BOC = 180° - 50° = 130°$

18. (4)



AC = QC

$\therefore \angle QAC = \angle CQA = x$ (Let)

CR = CB

$\therefore \angle CBR = \angle CRB = y$

$\therefore$ From ΔPQR,

$\angle x + \angle y + 40° = 180°$

$\angle x + \angle y = 140°$ .....(i)

Again,

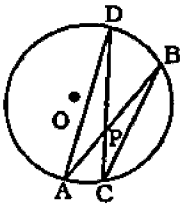
$\angle ACQ + \angle ACB + \angle BCR = 180°$

$\Rightarrow 180° - 2x + \angle ACB + 180° - 2y = 180°$

$\Rightarrow \angle ACB = 2(x + y) - 180°$

$= 2 \times 140 - 180° = 100°$

19. (2)



$\angle APC = 70° = \angle DPB$

$\therefore \angle APD = 180° - 70°$

$= 110° = \angle BPC$

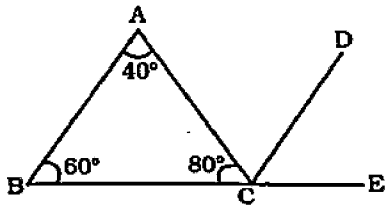
Also, $\angle ADC = \angle ABC = 23°$

$\therefore \angle BCD = 180° - 110° - 23° = 47°$

20. (2) $2x + 3x + 4x = 180°$

$\Rightarrow 9x = 180° \Rightarrow x = 20°$

$\therefore$ Angles of triangle are 40°, 60° and 80°



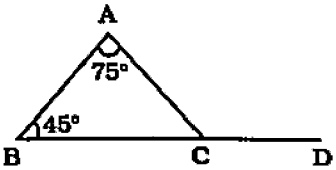
AB || CD

$\angle DCE = \angle ABC = 60°$

$\therefore \angle ACB + \angle ACD + \angle DCE = 180°$

$\Rightarrow \angle ACD = 180° - 120° = 60°$

21. (4)



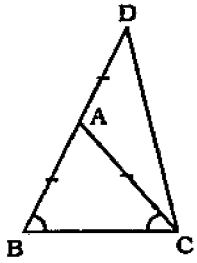
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$\angle ACB = 180° - 75° - 45°$
$= 60°$
$\angle ACD = 180° - 60° = 120° = x$

$\therefore \frac{x}{3}\%$ of $60°$

$= 60 \times \frac{120}{300} = 24°$

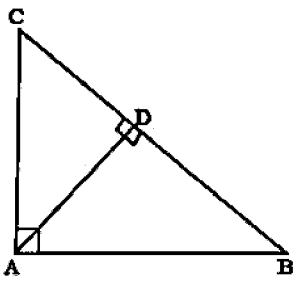
22. (4)



Let $\angle ABC = \angle ACB = x$ [$\because AB = AC$]
$\therefore \angle BAC = 180° - 2x$
$\Rightarrow \angle CAD = 180° - 2x$
Also, $\angle BAD = 180°$
$\therefore 180° = (180° - 2x) \times 2$
$\Rightarrow 180° - 2x = 90°$
$\Rightarrow 2x = 90° = \angle BCD$

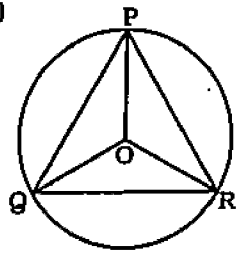
23. (2) $\angle A + \angle B = 65°$
$\therefore \angle C = 180° - 65° = 115°$
$\angle B + \angle C = 140°$
$\therefore \angle B = 140° - 115° = 25°$

24. (4)



$\angle A = 90°$, $\angle C = 55°$,
$\therefore \angle B = 90° - 55° = 35°$
$\angle ADB = 90°$
$\therefore \angle BAD = 90° - 35° = 55°$

25. (4)

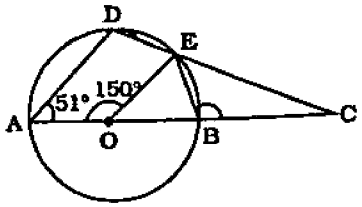


$\angle QOR = 110°$
$\angle OPR = 25°$
$\therefore \angle QPR = 110° \div 2 = 55°$
OR = OP
$\therefore \angle OPR = \angle PRO = 25°$

$\therefore \angle OQR = \angle ORQ = \frac{70}{2} = 35°$

$\therefore \angle PRQ = 25° + 35° = 60°$

26. (3)

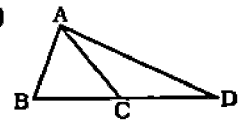


$\angle AOE = 150°$, $\angle DAO = 51°$[Given]
$\angle EOB = 180° - 150° = 30°$
OE = OB

$\therefore \angle OEB = \angle OBE = \frac{150}{2} = 75°$

$\therefore \angle CBE = 180° - 75° = 105°$

27. (4)

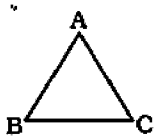


$\angle ACB = 80°$
$\therefore \angle ACD = 180° - 80° = 100°$
$\angle CAD = \angle CDA$ [CD = AC]

$= \frac{80°}{2} = 40°$

$\angle BAC = 111° - 40° = 71°$
$\angle ABC = 180° - 71° - 80° = 29°$

28. (4)



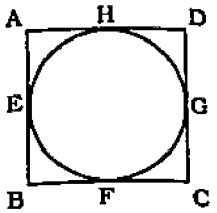
$\angle A + \angle B = 145°$
$\angle C = 180° - 145° = 35°$
$\angle C + 2\angle B = 180°$
$\Rightarrow 2\angle B = 180° - 35° = 145°$

$\Rightarrow \angle B = \frac{145°}{2}$

$\Rightarrow 72.5° = \angle A$
$\Rightarrow \angle B > \angle C$
$\therefore$ AC > AB

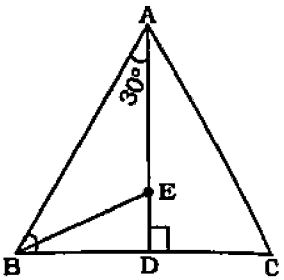
29. (3) $\angle A + \angle B + \angle C = 180°$ ....(i)
$(\angle B - \angle C) - (\angle A - \angle B) = 30° - 15°$
$\Rightarrow 2\angle B - \angle A - \angle C = 15°$ ....(ii)
By adding (i) and (ii),
$3\angle B = 180° + 15° = 195°$
$\Rightarrow \angle B = 65°$
$\angle A - \angle B = 15°$
$\Rightarrow \angle A = 15° + 65° = 80°$
$\angle C = \angle B - 30°$
$= 65° - 30° = 35°$

30. (4)



AE = AH
BE = BF
GC = FC
GD = HD
$\Rightarrow$ AE + BE + GC + GD
= AH + BF + FC + HD
$\Rightarrow$ AB + CD = AD + BC
$\Rightarrow 6 + 3 = AD + 7.5$
$\Rightarrow$ AD = 9 – 7.5 = 1.5 cm

31. (3)



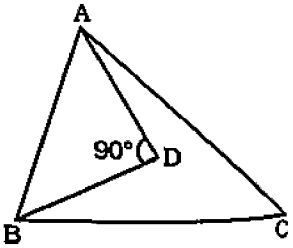
$\angle BAD = 30°$
$\angle ABD = 60°$ [$\because \angle ADB = 90°$]

$$\frac{\tan\angle ACB}{\tan\angle DBE} = \frac{\frac{AD}{DC}}{\frac{DE}{BD}}$$

$$= \frac{AD}{DC} \times \frac{BD}{DE} = 6\frac{BD}{DC}$$

$\therefore 6\frac{BD}{DC} = 6$
$\Rightarrow$ BD = DC
$\Delta ADB \cong \Delta ADC$
$\Rightarrow \angle ABD = \angle ACD = 60°$
$\therefore \angle ACB = 60°$
Hence, ΔABC is an equilateral triangle

32. (1)



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$\angle A = \angle B = \angle C = 60°$

$BC = AB = AC = \sqrt{13}$ cm

$BD = 2$ cm

In ΔABD,

$AB^2 = BD^2 + AD^2$

$\Rightarrow \left(\sqrt{13}\right)^2 = (2)^2 + AD^2$

$\Rightarrow AD^2 = 13 - 4 = 9$

$\Rightarrow AD = \sqrt{9} = 3$ cm

33. (3) The sum of supplementary angles is 180°.

$\therefore 2x + 3x = 180$

$\Rightarrow 5x = 180 \Rightarrow x = \frac{180}{5} = 36$

$\therefore 2x = 2 \times 36 = 72°$

and, $3x = 3 \times 36 = 108°$

34. (1) Sum of three angles of triangle = 180°

$\angle A = 2x°$

$\angle B = 3x°$

$\angle C = x°$

$\Rightarrow 2x° + 3x° + x° = 180°$

$\Rightarrow 6x° = 180°$

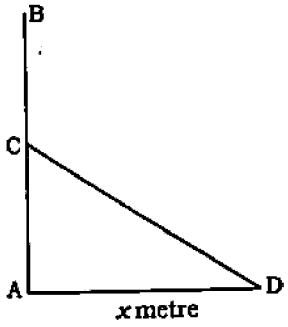
$\Rightarrow x = \frac{180}{6} = 30$

$\therefore \angle A = 2 \times 30° = 60°$

$\angle B = 3x = 3 \times 30 = 90°$

$\angle C = x = 30°$

35. (2)



AB = Height of tree = h metre

AC = Required height = y metre

BC = CD = Broken part of tree = $(h - y)$ metre

$\therefore$ In ΔACD,

$AC^2 + AD^2 = CD^2$

$\Rightarrow y^2 + x^2 = (h - y)^2$

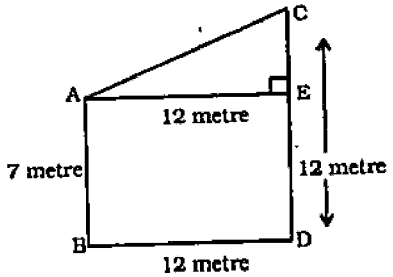
$\Rightarrow y^2 + x^2 = h^2 + y^2 - 2hy$

$\Rightarrow x^2 = h^2 - 2hy$

$\Rightarrow 2hy = h^2 - x^2$

$\Rightarrow y = \frac{h^2 - x^2}{2h}$ metre

36. (2)



AB = 7 metre CD = 12 metre

$\therefore$ CE = CD − DE

= 12 − 7 = 5 metre

$\therefore$ From ΔAEC,

$AC = \sqrt{AE^2 + EC^2}$

$= \sqrt{12^2 + 5^2} = \sqrt{144 + 25}$

$= \sqrt{169} = 13$ metre

37. (3) Let the required angle be $x°$.

According to the question,

$180 - x = 3(90 - x)$

$\Rightarrow 180 - x = 270 - 3x$

$\Rightarrow 3x - x = 270 - 180$

$\Rightarrow 2x = 90 \Rightarrow x = \frac{90}{2} = 45°$

38. (1) Supplementary angles $= x$ and $180° - x$ (let)

According to the question,

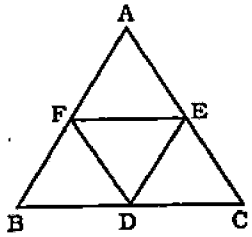
$180° - x - x = 44°$

$\Rightarrow 180° - 2x = 44°$

$\Rightarrow 2x = 180° - 44° = 136°$

$\Rightarrow x = \frac{136°}{2} = 68°$

39. (1)



D and E are midpoints of BC and AC respectively.

$\therefore$ DE || BA $\Rightarrow$ DE || BF.

FE || BD

DF is the diagonal of parallelogram BDEF.

$\therefore$ Area of ΔBDF = Area of ΔDEF

Similarly

DE is the diagonal of parallelogram DCEF.

$\therefore$ Area of ΔDCE = Area of ΔDEF

$\therefore \Delta BDF = \Delta DCE = \Delta AFE$

$= \Delta DEF$

$\therefore$ On adding

$4 \times \Delta DEF = \Delta ABC$

Parallelogram BDEF

$= 2 \times \Delta DEF = \frac{1}{2} \times \Delta ABC$

Quadrilateral CAFD = $\Delta ABC - \Delta BDF$

$= \Delta ABC - \frac{1}{4} \Delta BDF$

$= \frac{3}{4} \times \Delta ABC$

$\therefore$ Required ratio

$= \frac{1}{2} \times \Delta ABC : \frac{3}{4} \Delta ABC = 2 : 3$

40. (1) Angles of ΔABC.

$\because \angle A + \angle B + \angle C = 180°$

A : B : C = 3 : 4 : 5

$\therefore \angle A = \frac{3}{12} \times 180° = 45°$

$\angle B = \frac{4}{12} \times 180° = 60°$

$\angle C = \frac{5}{12} \times 180° = 75°$

41. (1) Let the required angle be $x°$.

According to the question,

$90 - x = \frac{1}{4}(180 - x)$

$\Rightarrow 360 - 4x = 180 - x$

$\Rightarrow 4x - x = 360 - 180$

$\Rightarrow 3x = 180 \Rightarrow x = 60°$

42. (2) The opposite angles of a parallelogram are equal.

$2x + 7x + 2x + 7x = 360°$

$\Rightarrow 18x = 360°$

$\Rightarrow x = 20°$

$\therefore$ One angle $= 2x$

$= 2 \times 20 = 40°$

Second angle $= 7x$

$= 7 \times 20 = 140°$

$\therefore 140 + 40° = 180°$



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TEST YOURSELF

1. PQRS is a rhombus in which $\angle SPQ = 64°$. Equilateral triangles PXQ and QYR are drawn outside the rhombus on sides PQ and QR. Calculate the magnitude of the angle $\angle QXY$.
(1) 26° (2) 28°
(3) 30° (4) 45°

2. ABC is a right angled triangle with a right angle at A. Points D, E are the middle points of AB and AC respectively. Which of the following relations is correct ?
(1) $3(BE^2 + CD^2) = 4BC^2$
(2) $4(BE^2 + CD^2) = 5BC^2$
(3) $4(BE^2 + CD^2) = 3BC^2$
(4) None of these

3. A triangle ABC is inscribed in a circle and the bisectors of the angles A, B and C meet the circumference at P, Q and R respectively. The angles of the triangle PQR respectively are
(1) $90° - \frac{A}{2}, 90° + \frac{A}{2}, 90° + \frac{C}{2}$
(2) $90° + \frac{A}{2}, 90° - \frac{B}{2}, 90° - C$
(3) $90° - \frac{A}{2}, 90° - \frac{B}{2}, 90° - \frac{C}{2}$
(4) None of these

4. PQRS is a cyclic quadrilateral. The bisectors of the angles $\angle P$ and $\angle R$ meet the circle ABCD at A and B respectively. If the radius of the circle be r units, then AB = ?
(1) r (2) 2r
(3) $\frac{2}{3}r$ (4) $\frac{3}{2}r$

5. Two chords AB and CD of a circle with centre O intersect at point P within the circle.
$\angle AOC + \angle BOD$ = ?
(1) $\angle APC$ (2) $2\angle APC$
(3) $\frac{3}{2}\angle APC$ (4) None of these

6. If the ratio of numer of sides of two regular polygons be 2 : 3 and the ratio of their interior angles be 6 : 7, find the number of sides of the two polygons.
(1) 6 and 7 (2) 8 and 9
(3) 6 and 9 (4) 6 and 8

7. In Δ ABC, AB = 6 cms, BC = 10 cms, AC = 8cm and AD $\perp$ BC. Find the value of the ratio of BD : DC.
(1) 3 : 4 (2) 9 : 16
(3) 4 : 5 (4) 16 : 25

8. In Δ ABC, a line parallel to BC intersects AB and AC at D and E. If AE = 3 AD, find the ratio BD : EC.
(1) 1 : 3 (2) 1 : 2
(3) 2 : 3 (4) 3 : 2

9. The angles of a triangle are in the ratio of 1 : 2 : 3. What will be the radian measure of the largest angle of the triangle ?
(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$
(3) $\frac{\pi}{4}$ (4) $\frac{2\pi}{3}$

10. If the internal bisectors of angles $\angle ABC$ and $\angle ACB$ of ΔABC intersect at point O, then $\angle BOC$ = ?
(1) $90° - \frac{\angle A}{2}$ (2) $90° + \frac{\angle A}{2}$
(3) $180 - \frac{\angle A}{2}$ (4) $90° - \angle A$

11. In any triangle PQR, PS is the internal bisector of $\angle QPR$ and PT $\perp$ QR then $\angle TPS$ = ?
(1) $\angle Q - \angle R$ (2) $\frac{1}{2}(\angle Q + \angle R)$
(3) $\frac{1}{2}(\angle Q - \angle R)$ (4) $\angle Q + \angle R$

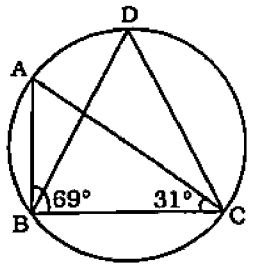
12. In any triangle ABC the internal bisector of $\angle ABC$ and the external bisector of other base angle meet at point E. Then $\angle BEC$ = ?
(1) $\angle A$ (2) $2\angle A$
(3) $\frac{1}{2}\angle A$ (4) $\frac{1}{2}\angle B$

13. ΔABC is an isosceles triangle in which AB = AC. Side BA is extended to D such that AB = AD. What will be the value of $\angle BCD$?
(1) 90° (2) 60°
(3) 30° (4) 45°

14. In any triangle ABC, AD, BE and CF are medians. What is the relation between the perimeter of triangle and sum of all three medians ?
(1) AB + BC + AC < AD + BE + CF
(2) AB + BC + AC > AD + BE + CF
(3) AB + BC + AC $\leq$ AD + BE + CF
(4) AB + BC + AC $\geq$ AD + BE + CF

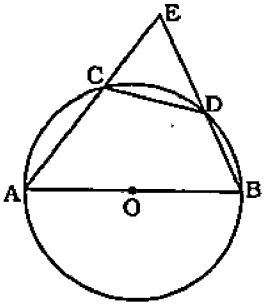
15. Two circles whose radii are 10 cm and 8 cm, intersect each other and their common chord is 12 cm long. What is the distance between their centres ?
(1) 11.27 cm (2) 12.29 cm
(3) 12.27 cm (4) 13.29 cm

16. In the following figure, $\angle ABC = 69°$, $\angle ACB = 31°$ then $\angle BDC$ = ?



(1) 80° (2) 60°
(3) 65° (4) 75°

17. In the following figure, AB is the diameter of circle and CD is a chord equal to the radius. AC and BD when extended meet at E. $\angle AEB$ = ?



(1) 30° (2) 60°
(3) 45° (4) 90°

18. ABC is a right angled triangle in which $\angle C = 90°$. If BC = a, AB = c, CA = b and the length of perpendicular from C to AB be p, then,
$\frac{1}{a^2} + \frac{1}{b^2}$ = ?
(1) $\frac{1}{p}$ (2) $\frac{2}{p^2}$
(3) $\frac{1}{p^2}$ (4) None of these

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19. The centre of a circle of radius 5 cm is 'O'. T is an external point where OT = 13 cm and OT intersects the circle at point E. AB is a tangent at point E. What is the length of AB ?

(1) $\frac{10}{3}$ cm (2) $\frac{20}{3}$ cm

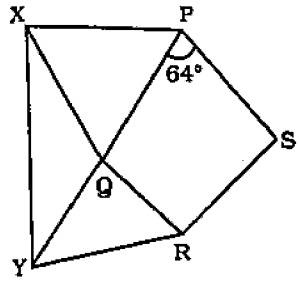
(3) $\frac{40}{3}$ cm (4) $\frac{16}{3}$ cm

SHORT ANSWERS

1. (2)	2. (2)	3. (3)	4. (2)
5. (2)	6. (3)	7. (2)	8. (1)
9. (1)	10. (2)	11. (3)	12. (3)
13. (1)	14. (2)	15. (4)	16. (1)
17. (2)	18. (3)	19. (2)	

EXPLANATIONS

1. (2)



$\angle SPQ = 64°$

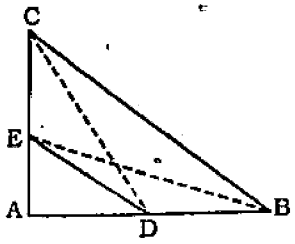
$\angle PQR = 180° - 64° = 116°$

Each angle of equilateral triangle is 60°.

$\therefore \angle XQY = 360° - 116° - 60° - 60° = 124°$

$\therefore \angle QXY = \frac{180°-124°}{2} = \frac{56°}{2} = 28°$

2. (2)



Using Pythagoras theoren.

$BE^2 = AE^2 + AB^2$

$CD^2 = AC^2 + AD^2$

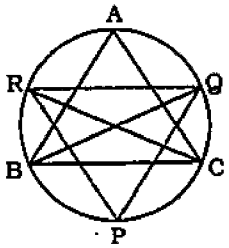
$\therefore BE^2 + CD^2 = AE^2 + AD^2 + AB^2 + AC^2$

$= \left(\frac{AC}{2}\right)^2 + \left(\frac{AB}{2}\right)^2 + AB^2 + AC^2$

$= \frac{AC^2}{4} + \frac{AB^2}{4} + AB^2 + AC^2$

$\Rightarrow 4(BE^2 + CD^2) = 5(AB^2 + AC^2) = 5BC^2$

3. (3)



$\angle BQP = \angle BAP$

$\angle BQP = \frac{\angle A}{2}$

$\angle BQR = \angle BCR$

$\angle BQR = \frac{1}{2}\angle C$

$\therefore \angle PQR = \frac{1}{2}(\angle A + \angle C)$

$= \frac{1}{2}(180° - \angle B) = 90° - \frac{\angle B}{2}$

$\angle APR = \angle ACR$

$\Rightarrow \angle APR = \frac{1}{2}\angle C$

Also, $\angle APR = \angle ABQ$

$\Rightarrow \angle APR = \frac{1}{2}\angle B$

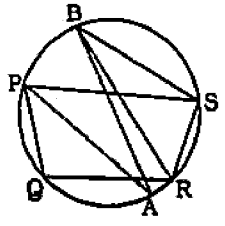
$\therefore \angle APQ + \angle APR = \frac{1}{2}(\angle B + \angle C)$

$\Rightarrow \angle QPR = \frac{1}{2}(180 - \angle A) = 90° - \frac{\angle A}{2}$

Similarly,

$\angle QRP = 90° - \frac{\angle C}{2}$

4. (2)



PQRS is a cyclic quadrilateral.

$\angle P + \angle R = 180°$

$\Rightarrow \frac{1}{2}\angle P + \frac{1}{2}\angle R = 90°$

$\Rightarrow \angle APS + \angle BRS = 90°$ ....(i)

But $\angle BRS$ and $\angle BPS$ are angles in the same segment with chord BS.

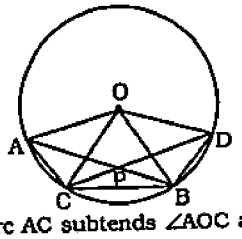
$\therefore \angle BRS = \angle BPS$ .....(ii)

$\therefore \angle APS + \angle BPS = 90°$

$\Rightarrow \angle APB = 90°$

$\therefore$ AB is the diameter.

5. (2)



Arc AC subtends $\angle AOC$ at the centre.

$\angle AOC = 2\angle ABC$

Similarly, $\angle BOD = 2\angle BCD$

On adding, $\angle AOC + \angle BOD = 2(\angle ABC + \angle BCD) = 2\angle APC$

[$\because \angle APC$ is the exterior angle]

6. (3) Each interior angle of a regular polygon of n sides

$= \left(\frac{2n-4}{n}\right)$ right angles

Let the number of sides be $2x$ and $3x$ respectively.

$\therefore \frac{\frac{2\times 2x-4}{2x}}{\frac{2\times 3x-4}{3x}} = \frac{6}{7}$

$\Rightarrow \frac{(4x-4)3}{2(6x-4)} = \frac{6}{7}$

$\Rightarrow \frac{4x-4}{12x-8} = \frac{2}{7}$

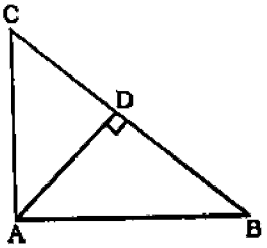
$\Rightarrow \frac{x-1}{3x-2} = \frac{2}{7}$

$\Rightarrow 7x - 7 = 6x - 4$

$\Rightarrow x = 7 - 4 = 3$

$\therefore$ Number of sides = 6 and 9.

7. (2)



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$6^2 + 8^2 = 10^2$

$\therefore \Delta ABC$ is a right angled triangle.

$\Delta ABC = \frac{1}{2} \times$ Base $\times$ Height

$\therefore \frac{1}{2} \times AB \times BC = \frac{1}{2} BC \times AD$

$\Rightarrow 6 \times 8 = 10 \times AD$

$\Rightarrow AD = \frac{24}{5}$ cm

Let $BD = x$ cm.

From ΔABD,

$BD = \sqrt{6^2 - \left(\frac{24}{5}\right)^2}$

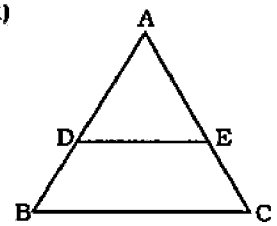
$= \sqrt{36 - \frac{576}{25}} = \sqrt{\frac{900-576}{25}}$

$= \sqrt{\frac{324}{25}} = \frac{18}{5}$ cm

$\therefore CD = 10 - \frac{18}{5} = \frac{32}{5}$

$\therefore BD : CD = \frac{18}{5} : \frac{32}{5} = 9 : 16$

8. (1)



In ΔADE and ΔABC,

$\angle D = \angle B$; $\angle E = \angle C$

$\angle A = \angle A$

$\therefore$ Both triangles are similar.

$\therefore \frac{AD}{AB} = \frac{AE}{AC}$

$\Rightarrow \frac{AB}{AD} = \frac{AC}{AE}$

$\Rightarrow \frac{AB}{AD} - 1 = \frac{AC}{AE} - 1$

$\Rightarrow \frac{BD}{AD} = \frac{EC}{AE}$

$\Rightarrow \frac{BD}{EC} = \frac{AD}{AE} = \frac{1}{3}$

9. (1) Sum of all angles of a traingle $= 180°$

$\therefore$ Sum of ratios

$= 1 + 2 + 3 = 6$

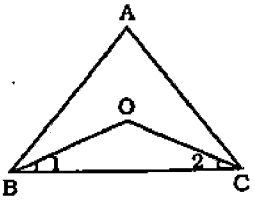
$\therefore$ Largest angle $= \frac{3}{6} \times 180°$

$= 90°$

$\because 180° = \pi$ radian

$\therefore 90° = \frac{\pi}{180} \times 90 = \frac{\pi}{2}$ radian

10. (2)



In ΔBOC,

$\angle 1 + \angle 2 + \angle BOC = 180°$ ...(i)

In ΔABC,

$\angle A + \angle B + \angle C = 180°$

$\Rightarrow \angle A + 2\angle 1 + 2\angle 2 = 180°$

$\Rightarrow \frac{\angle A}{2} + \angle 1 + \angle 2 = 90°$

$\Rightarrow \angle 1 + \angle 2 = 90° - \frac{\angle A}{2}$

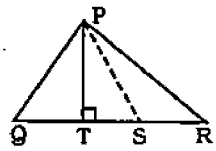
From equation (i)

$90° - \frac{\angle A}{2} + \angle BOC = 180°$

$\Rightarrow \angle BOC = 180° - 90° + \frac{\angle A}{2}$

$= 90° + \frac{\angle A}{2}$

11. (3)



PS. is bisector of $\angle QPR$.

$\therefore \angle QPS = \angle SPR$ .....(i)

In ΔPQT,

$\angle PQT + \angle PTQ + \angle QPT = 180°$

$\Rightarrow \angle PQT + 90° + \angle QPT = 180°$

$\Rightarrow \angle PQT + \angle QPT = 90°$

$\Rightarrow \angle PQT = 90° - \angle QPT$

$\Rightarrow \angle Q = 90° - \angle QPT$ .....(ii)

In ΔPTR,

$\angle PRT + \angle TPR + \angle PTR = 180°$

$\Rightarrow \angle PRT + \angle TPR + 90° = 180°$

$\Rightarrow \angle PRT + \angle TPR = 90°$

$\Rightarrow \angle PRT = 90° - \angle TPR$ ....(iii)

By equation (ii) – (iii),

$\angle Q - \angle R = (90° - \angle QPT) - (90° - \angle TPR)$

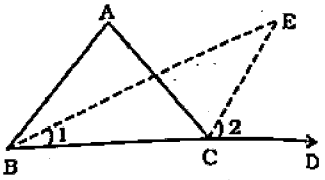
$\Rightarrow \angle Q - \angle R = \angle TPR - \angle QPT$

$\Rightarrow \angle Q - \angle R = (\angle TPS + \angle SPR) (\angle QPS - \angle TPS)$

$\Rightarrow \angle Q - \angle R = 2\angle TPS$

$\Rightarrow \angle TPS = \frac{1}{2}(\angle Q - \angle R)$

12. (3)



Exterior $\angle ACD = \angle A + \angle B$

$\Rightarrow \frac{1}{2}\angle ACD = \frac{1}{2}\angle A + \frac{1}{2}\angle B$

$\Rightarrow \angle 2 = \angle 1 + \frac{1}{2}\angle A$ (i)

In ΔBCE,

$\angle ECD = \angle 1 + \angle E$

$\Rightarrow \angle 2 = \angle 1 + \angle E$ (ii)

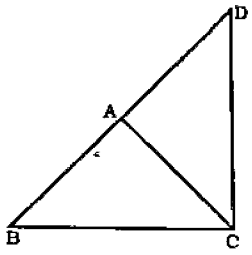
From equations (i) and (ii),

$\angle 1 + \frac{1}{2}\angle A = \angle 1 + \angle E$

$\Rightarrow \frac{1}{2}\angle A = \angle E$

$\Rightarrow \angle E = \frac{1}{2}\angle A$.

13. (1)



In ΔABC,

$AB = AC$

$\Rightarrow \angle ACB = \angle ABC$ ..... (i)

Now, $AB = AD$

$\therefore AD = AC$

In ΔADC,

$AD = AC \Rightarrow \angle ACD = \angle ADC$ ....(ii)

By equations (i) + (ii),

$\angle ACB + \angle ACD = \angle ABC + \angle ADC$

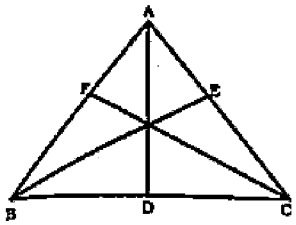
$\Rightarrow \angle BCD = \angle ABC + \angle BDC$

$\Rightarrow \angle BCD + \angle BCD = \angle ABC + \angle BDC + \angle BCD$

$\Rightarrow 2\angle BCD = 180°$

$\Rightarrow \angle BCD = 90°$

14. (2)



We know that the sum of any two sides of a triangle is greater than twice the median bisecting the third side.

AD is the median on BC.

$\therefore$ AB + AC > 2AD

Similarly,

AB + BC > 2BE

BC + AC > 2CF

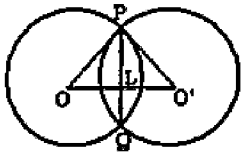
On adding

AB + AC + AB + BC + BC + AC > 2AD + 2BE + 2CF

$\Rightarrow$ 2 (AB + BC + AC) > 2 (AD + BE + CF)

$\Rightarrow$ AB+BC+AC > AD + BE + CF

15. (4)



OP = 10 cm, O'P = 8 cm and PQ = 12 cm ; $PL = \frac{1}{2} PQ$

= 6 cm

In right angled Δ OLP,

$OL = \sqrt{OP^2 - LP^2}$

$= \sqrt{10^2 - 6^2}$

$= \sqrt{64} = 8$ cm

In ΔO'LP,

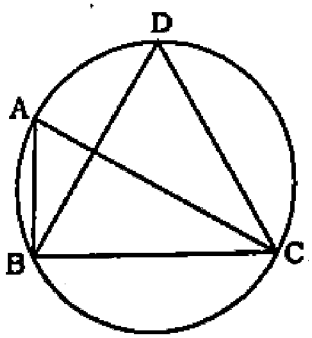
$O'P^2 = O'L^2 + LP^2$

$\Rightarrow O'L = \sqrt{O'P^2 - LP^2}$

$= \sqrt{8^2 - 6^2} = \sqrt{28} = 5.29$ cm

$\therefore$ OO' = OL + LO' = 8 + 5.29 = 13.29 cm

16. (1)



In ΔABC,

$\angle BAC + \angle ABC + \angle ACB = 180°$

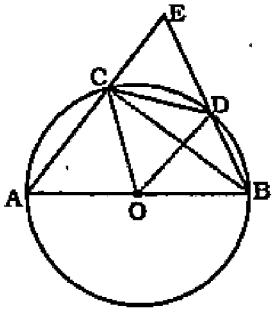
$\Rightarrow \angle BAC + 69° + 31° = 180°$

$\Rightarrow \angle BAC = 180° - 100° = 80°$

Since angles in the same segment are equal.

$\therefore \angle BDC = 80°$

17. (2)



In Δ OCD,

OC = OD = CD

$\therefore$ Δ OCD is an equilateral triangle.

$\therefore \angle COD = 60°$

Now, $\angle CBD = \frac{1}{2} \angle COD$

$\Rightarrow \angle CBD = 30°$

$\angle ACB$ is angle of semi-circle.

$\therefore \angle ACB = 90°$

$\Rightarrow \angle BCE = 180° - \angle ACB$

$= 180° - 90° = 90°$

In ΔBCE,

$\angle BCE = 90°$,

$\angle CBE = \angle CBD = 30°$

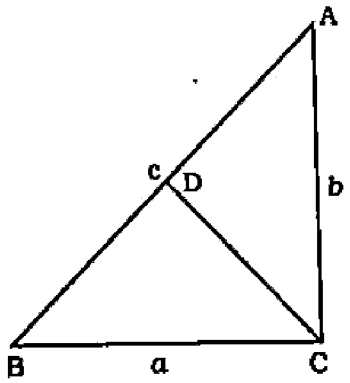
$\therefore \angle BCE + \angle CBE + \angle CEB = 180°$

$\Rightarrow 90° + 30° + \angle CEB = 180°$

$\Rightarrow \angle CEB = 180° - 120° = 60°$

$\Rightarrow \angle AEB = 60°$

18. (3)



Area of $\Delta ABC = \frac{1}{2} \times AB \times CD = \frac{1}{2} cp$

Area of $\Delta ABC = \frac{1}{2} \times BC \times AC = \frac{1}{2} ab$

$\therefore \frac{1}{2} cp = \frac{1}{2} ab$

$\Rightarrow cp = ab$ .... (i)

Again, $AB^2 = BC^2 + AC^2$

$\Rightarrow c^2 = a^2 + b^2$

$\Rightarrow \left(\frac{ab}{p}\right)^2 = a^2 + b^2$

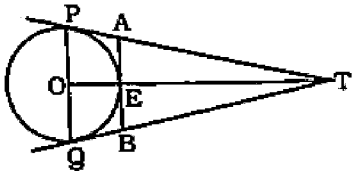
[From equation (i)]

$\Rightarrow \frac{a^2b^2}{p^2} = a^2 + b^2$

$\Rightarrow \frac{1}{p^2} = \frac{a^2 + b^2}{a^2b^2}$

$= \frac{1}{b^2} + \frac{1}{a^2}$

19. (2)



$\angle OPT = 90°$

In ΔOPT,

$OT^2 = OP^2 + PT^2$

$\Rightarrow 13^2 = 5^2 + PT^2$

$\Rightarrow PT^2 = 169 - 25 = 144$

$\Rightarrow PT = \sqrt{144} = 12$ cm.

Tangents drawn from an external point on a circle are equal.

$\therefore$ AP = AE = x (let)

$\Rightarrow$ AT = PT - AP = (12 - x) cm

OE $\perp$ AB

$\Rightarrow \angle OEA = 90°$

$\Rightarrow \angle AET = 90°$

$\therefore AT^2 = AE^2 + ET^2$

$\Rightarrow (12-x)^2 = x^2 + (13-5)^2$

$\Rightarrow 144 - 24x + x^2 = x^2 + 64$

$\Rightarrow 24x = 80$

$\Rightarrow x = \frac{80}{24} = \frac{10}{3}$ cm

Similarly, BE = $\frac{10}{3}$ cm

$\therefore$ AB = AE + BE = $\frac{20}{3}$ cm

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20 MENSURATION

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE -I

1. If the length of the diagonal AC of a square ABCD is 5.2 cm, then the area of the square is :
(1) 15.12 sq.cm
(2) 13.52 sq.cm
(3) 12.62 sq.cm
(4) 10.00 sq.cm.
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. The length of the diagonal of a square is 'a' cm. Which of the following represents the area of the square (in sq. cm.) ?
(1) 2a (2) $\frac{a}{\sqrt{2}}$
(3) $a^2/2$ (4) $a^2/4$
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. The diagonal of a square is $4\sqrt{2}$ cm. The diagonal of another square whose area is double that of the first square is :
(1) $8\sqrt{2}$ cm (2) 16 cm
(3) $\sqrt{32}$ cm (4) 8 cm
SC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (IInd Sitting)

4. The diagonal of a square A is $(a+b)$. The diagonal of a square whose area is twice the area of square A, is
(1) $2(a+b)$ (2) $2(a+b)^2$
(3) $\sqrt{2}(a+b)$ (4) $\sqrt{2}(a-b)$
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

5. The difference of the areas of two squares drawn on two line segments of different lengths is 32 sq.cm. Find the length of the greater line segment if one is longer than the other by 2 cm.
(1) 7 cm (2) 9 cm
(3) 11 cm (4) 16 cm
SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

6. If the diagonals of two squares are in the ratio of 2 : 5, their area will be in the ratio of
(1) $\sqrt{2} : \sqrt{5}$ (2) 2 : 5
(3) 4 : 25 (4) 4 : 5
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

7. The perimeter of five squares are 24 cm, 32 cm, 40 cm, 76 cm and 80 cm respectively. The perimeter of another square equal in area to sum of the areas of these squares is :
(1) 31 cm (2) 62 cm
(3) 124 cm (4) 961 cm
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. The ratio of the area of a square to that of the square drawn on its diagonal is :
(1) 1 : 1 (2) 1 : 2
(3) 1 : 3 (4) 1 : 4
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

9. From four corners of a square sheet of side 4 cm, four pieces, each in the shape of arc of a circle with radius 2 cm, are cut out. The area of the remaining portion is :
(1) $(8-\pi)$ sq.cm.
(2) $(16-4\pi)$ sq.cm.
(3) $(16-8\pi)$ sq.cm.
(4) $(4-2\pi)$sq.cm.
FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

10. The length of diagonal of a square is $15\sqrt{2}$ cm. Its area is
(1) 112.5 cm^2 (2) 450 cm^2
(3) $\frac{225\sqrt{2}}{2}$ cm^2 (4) 225 cm^2

11. A kite in the shape of a square with a diagonal 32 cm attached to an equilateral triangle of the base 8 cm. Approximately how much paper has been used to make it? (Use $\sqrt{3} = 1.732$)
(1) 539.712 cm^2
(2) 538.721 cm^2
(3) 540.712 cm^2
(4) 539.217 cm^2
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

12. The breadth of a rectangular hall is three-fourth of its length. If the area of the floor is 768 sq. m., then the difference between the length and breadth of the hall is:
(1) 8 metres (2) 12 metres
(3) 24 metres (4) 32 metres
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

13. The length of a plot is five times its breadth. A playground measuring 245 square metres occupies half of the total area of the plot. What is the length of the plot?
(1) $35\sqrt{2}$ metres (2) $175\sqrt{2}$ metres
(3) 490 metres (4) $5\sqrt{2}$ metres
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

14. The length of a rectangular garden is 12 metres and its breadth is 5 metres. Find the length of the diagonal of a square garden having the same area as that of the rectangular garden :
(1) $2\sqrt{30}$ m (2) $\sqrt{13}$ m
(3) 13 m (4) $8\sqrt{15}$ m
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

15. A circular wire of diameter 42 cm is folded in the shape of a rectangle whose sides are in the ratio 6 : 5 . Find the area enclosed by the rectangle. (Take $\pi = \frac{22}{7}$)
(1) 540 cm^2 (2) 1080 cm^2
(3) 2160 cm^2 (4) 4320 cm^2
(SSC CGL Prelim Exam. 24.02.200 (Middle Zone) & (SSC CGL Preli Exam. 13.11.2005 (IInd Sittin

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16. A took 15 sec. to cross a rectangular field diagonally walking at the rate of 52 m/min. and B took the same time to cross the same field along its sides walking at the rate of 68 m/min. The area of the field is :
(1) 30 m^2 (2) 40 m^2
(3) 50 m^2 (4) 60 m^2
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

17. The difference between the length and breadth of a rectangle is 23 m. If its perimeter is 206 m, then its area is
(1) 1520 m^2 (2) 2420 m^2
(3) 2480 m^2 (4) 2520 m^2
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

18. There is a rectangular tank of length 180 m and breadth 120 m in a circular field. If the area of the land portion of the field is 40000 m^2, what is the radius of the field ? (Take $\pi = \frac{22}{7}$)
(1) 130 m (2) 135 m
(3) 140 m (4) 145 m
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

19. The length of a rectangular hall is 5m more than its breadth. The area of the hall is 750m^2. The length of the hall is :
(1) 15 m (2) 22.5 m
(3) 25 m (4) 30 m
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

20. If the length and breadth of a rectangle are in the ratio 3 : 2 and its perimeter is 20 cm, then the area of the rectangle (in cm^2) is :
(1) 24 (2) 48
(3) 72 (4) 96
(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

21. A path of uniform width runs round the inside of a rectangular field 38 m long and 32 m wide. If the path occupies 600m^2, then the width of the path is
(1) 30 m (2) 5 m
(3) 18.75 m (4) 10 m
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

22. The length and breadth of a rectangle are increased by 20% and 25% respectively. The increase in the area of the resulting rectangle will be :
(1) 60% (2) 50%
(3) 40% (4) 30%
(SSC CHSL DEO & LDC Exam. 27.11.2010)

23. The length of a room floor exceeds its breadth by 20 m. The area of the floor remains unaltered when the length is decreased by 10 m but the breadth is increased by 5 m. The area of the floor (in square metres) is :
(1) 280 (2) 325
(3) 300 (4) 420
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

24. A street of width 10 metres surrounds from outside a rectangular garden whose measurement is 200 m × 180 m. The area of the path (in square metres) is
(1) 8000 (2) 7000
(3) 7500 (4) 8200
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

25. In measuring the sides of a rectangle, there is an excess of 5% on one side and 2% deficit on the other. Then the error percent in the area is
(1) 3·3% (2) 3·0%
(3) 2·9% (4) 2·7%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 22.02.2011)

26. A lawn is in the form of a rectangle having its breadth and length in the ratio 3 : 4. The area of the lawn is $\frac{1}{12}$ hectare. The breadth of the lawn is
(1) 25 metres (2) 50 metres
(3) 75 metres (4) 100 metres
(SSC Graduate Level Tier-II Exam. 29.09.2013

27. The area of a rectangle is thrice that of a square. The length of the rectangle is 20 cm and the breadth of the rectangle is $\frac{3}{2}$ times that of the side of the square. The side of the square, (in cm) is
(1) 10 (2) 20
(3) 30 (4) 60
(SSC Graduate Level Tier-II Exam. 29.09.2013

28. The length and breadth of a rectangular field are in the ratio 7 : 4. A path 4 m wide running all around outside has an area of 416 m^2 . The breadth (in m) of the field is
(1) 28 (2) 14
(3) 15 (4) 16
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

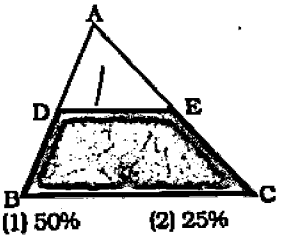
29. ABC is a triangle with base AB. D is a point on AB such that AB = 5 and DB = 3. What is the ratio of the area of ΔADC to the area of ΔABC ?
(1) 3/2 (2) 2/3
(3) 3/5 (4) 2/5
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

30. If the area of a triangle is 1176 cm^2 and base : corresponding altitude is 3 : 4, then the altitude of the triangle is :
(1) 42 cm (2) 52 cm
(3) 54 cm (4) 56 cm
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

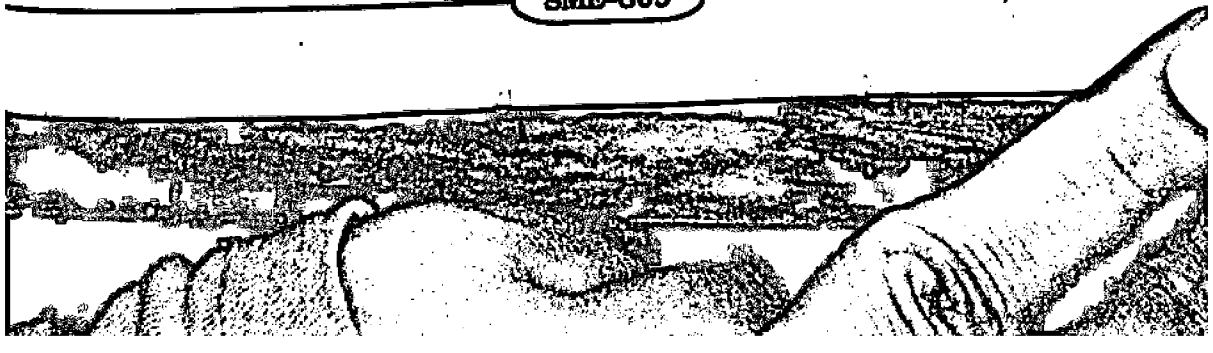
31. The base of a triangle is 15 cm and height is 12 cm. The height of another triangle of double the area having the base 20 cm is :
(1) 9 cm (2) 18 cm
(3) 8 cm (4) 12.5 cm
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

32. The sides of a triangle are 3 cm, 4 cm and 5 cm. The area (in cm^2) of the triangle formed by joining the mid points of this triangle is :
(1) 6 (2) 3
(3) $\frac{3}{2}$ (4) $\frac{3}{4}$
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

33. If D and E are the mid-points of the side AB and AC respectively of the ΔABC in the figure given here, the shaded region of the triangle is what per cent of the whole triangular region?



(1) 50% (2) 25%
(3) 75% (4) 60%
(SSC CGL Prelim Exam. 08.02.200 (First Sittin



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34. The ratio of base of two triangles is $x : y$ and that of their areas is $a : b$. Then the ratio of their corresponding altitudes will be:

(1) $\frac{a}{x} : \frac{b}{y}$ (2) $ax : by$

(3) $ay : bx$ (4) $\frac{x}{a} : \frac{b}{y}$

(SSC CGL Prelim Exam. 06.02.2004 (First Sitting)

35. The diagonal of a right angle isosceles triangle is 5 cm. Its area will be

(1) 5 sq.cm (2) 6.25 sq.cm
(3) 6.50 sq.cm (4) 12.5 sq.cm

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

36. In an isosceles triangle, the measure of each of equal sides is 10 cm and the angle between them is 45°. the area of the triangle is

(1) 25 cm² (2) $\frac{25}{2}\sqrt{2}$ cm²

(3) $25\sqrt{2}$ cm² (4) $25\sqrt{3}$ cm²

(SSC CPO S.I. Exam. 03.09.2006)

37. From a point in the interior of an equilateral triangle, the length of the perpendiculars to the three sides are 6 cm, 8 cm and 10 cm respectively. The area of the triangle is

(1) 48 cm² (2) $16\sqrt{3}$ cm²

(3) $192\sqrt{3}$ cm² (4) 192 cm²

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

38. The area of two equilateral triangles are in the ratio 25 : 36. Their altitudes will be in the ratio :

(1) 36 : 25 (2)25 : 36

(3) 5 : 6 (4) $\sqrt{5} : \sqrt{6}$

(SSC CPO S.I. Exam. 16.12.2007)

39. ABC is an equilateral triangle of side 2 cm. With A, B, C as centre and radius 1 cm three arcs are drawn. The area of the region within the triangle bounded by the three arcs is

(1) $\left(3\sqrt{3} - \frac{\pi}{2}\right)$ cm²

(2) $\left(\sqrt{3} - \frac{3\pi}{2}\right)$ cm²

(3) $\left(\sqrt{3} - \frac{\pi}{2}\right)$ cm²

(4) $\left(\frac{\pi}{2} - \sqrt{3}\right)$ cm²

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

40. The area of a right-angled isosceles triangle having hypotenuse $16\sqrt{2}$ cm is

(1) 144 cm² (2) 128 cm²
(3) 112 cm² (4) 110 cm²

(SSC (South Zone) Investigator Exam. 12.09.2010)

41. The sides of a triangle are in the ratio 2 : 3 : 4. The perimeter of the triangle is 18 cm. The area (in cm²) of the triangle is

(1) 9 (2) 36

(3) $\sqrt{42}$ (4) $3\sqrt{15}$

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

42. If the numerical value of the perimeter of an equilateral triangle is $\sqrt{3}$ times the area of it, then the length of each side of the triangle is

(1) 2 units (2) 3 units
(3) 4 units (4) 6 units

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

43. Each side of an equilateral triangle is 6 cm. Find its area.

(1) $9\sqrt{3}$ sq.cm. (2) $6\sqrt{3}$ sq.cm.

(3) $4\sqrt{3}$ sq.cm. (4) $8\sqrt{3}$ sq.cm.

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

44. If a triangle with base 8 cm has the same area as a circle with radius 8 cm, then the corresponding altitude (in cm) of the triangle is

(1) 12π (2) 20π
(3) 16π (4) 32π

(SSC Data Entry Operator Exam. 02.08.2009)

45. The measures (in cm) of sides of a right angled triangle are given by consecutive integers. Its area (in cm²) is

(1) 9 (2) 8
(3) 5 (4) 6

(SSC Data Entry Operator Exam. 02.08.2009)

46. The area of an equilateral triangle is $4\sqrt{3}$ cm². The length of each side of the triangle is :

(1) 3 cm (2) $2\sqrt{2}$ cm

(3) $2\sqrt{3}$ cm (4) 4 cm

(SSC CHSL DEO & LDC Exam. 27.11.2010)

47. The length of three medians of a triangle are 9 cm, 12 cm and 15 cm. The area (in sq. cm) of the triangle is

(1) 24 (2) 72
(3) 48 (4) 144

(SSC Graduate Level Tier-II Exam.16.09.2012)

48. The area of the triangle formed by the straight line $3x + 2y = 6$ and the co-ordinate axes is

(1) 3 square units
(2) 6 square units
(3) 4 square units
(4) 8 square units

(SSC Graduate Level Tier-II Exam.16.09.2012)

49. The ratio of length of each equal side and the third side of an isosceles triangle is 3 : 4. If the area of the triangle is $18\sqrt{5}$ square units, the third side is

(1) 16 units (2) 5 $\sqrt{10}$ units

(3) 8 $\sqrt{2}$ units (4) 12 units

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

50. The ratio of sides of a triangle is 3 : 4 : 5. If area of the triangle is 72 square unit, then the length of the smallest side is :

(1) $4\sqrt{3}$ unit (2) $5\sqrt{3}$ unit

(3) $6\sqrt{3}$ unit (4) $3\sqrt{3}$ unit

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

51. If the length of each side of an equilateral triangle is increased by 2 unit, the area is found to be increased by $3 + \sqrt{3}$ square unit. The length of each side of the triangle is

(1) $\sqrt{3}$ unit (2) 3 unit

(3) $3\sqrt{3}$ unit (4) $1 + 3\sqrt{3}$ unit

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

52. What is the area of the triangle whose sides are 9cm, 10cm and 11cm?

(1) 30 cm² (2) 60cm²

(3) $30\sqrt{2}$ cm² (4) $60\sqrt{2}$ cm²

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

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53. The area of an isosceles triangle is 4 square unit. If the length of the third side is 2 unit, the length of each equal side is

(1) 4 units (2) $2\sqrt{3}$ units

(3) $\sqrt{17}$ units (4) $3\sqrt{2}$ units

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

54. The ratio of sides of a triangle is 3:4:5 and area of the triangle is 72 square unit. Then the area of an equilateral triangle whose perimeter is same as that of the previous triangle is

(1) $32\sqrt{3}$ square units

(2) $48\sqrt{3}$ square units

(3) 96 square units

(4) $60\sqrt{3}$ square units

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

55. A right angled isosceles triangle is inscribed in a semi-circle of radius 7 cm. The area enclosed by the semi-circle but exterior to the triangle is

(1) 14 cm^2 (2) 28 cm^2

(3) 44 cm^2 (4) 68 cm^2

(SSC Delhi Police S.I. Exam. 19.08.2012)

56. What is the area of a triangle having perimeter 32cm, one side 11cm and difference of other two sides 5cm?

(1) $8\sqrt{30}$ cm^2 (2) $5\sqrt{35}$ cm^2

(3) $6\sqrt{30}$ cm^2 (4) $8\sqrt{2}$ cm^2

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

57. The area (in sq. unit) of the triangle formed in the first quadrant by the line $3x + 4y = 12$ is

(1) 8 (2) 12

(3) 6 (4) 4

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

58. The height of an equilateral triangle is 15 cm. The area of the triangle is

(1) $50\sqrt{3}$ sq. cm.

(2) $70\sqrt{3}$ sq. cm.

(3) $75\sqrt{3}$ sq. cm.

(4) $150\sqrt{3}$ sq. cm.

(SSC Graduate Level Tier-I Exam. 19.05.2013)

59. The area of an equilateral triangle is $9\sqrt{3}$ m^2. The length (in m) of the median is

(1) $2\sqrt{3}$ (2) $3\sqrt{3}$

(3) $3\sqrt{2}$ (4) $2\sqrt{2}$

(SSC Graduate Level Tier-II Exam. 29.09.2013

60. The sides of a triangle are 16 cm, 12 cm and 20 cm. Find the area.

(1) 64 cm^2 (2) 112 cm^2

(3) 96 cm^2 (4) 81 cm^2

(SSC CHSL DEO & LDC Exam. 20.10.2013)

61. 360 sq. cm and 250 sq. cm are the area of two similar triangles. If the length of one of the sides of the first triangle be 8 cm, then the length of the corresponding side of the second triangle is

(1) $6\frac{1}{5}$ cm (2) $6\frac{1}{3}$ cm

(3) $6\frac{2}{3}$ cm (4) 6 cm

(SSC CHSL DEO & LDC Exam. 20.10.2013)

62. The perimeter of an isosceles triangle is 544 cm and each of the equal sides is $\frac{5}{6}$ times the base. What is the area (in cm^2) of the triangle?

(1) 38172 (2) 18372

(3) 31872 (4) 13872

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

63. The altitude drawn to the base of an isosceles triangle is 8 cm and its perimeter is 64 cm. The area (in cm^2) of the triangle is

(1) 240 (2) 180

(3) 360 (4) 120

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

64. The perimeter of a rhombus is 40 m and its height is 5 m. Its area is :

(1) 60 m^2 (2) 50 m^2

(3) 45 m^2 (4) 55m^2

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

65. The area of a field in the shape of a trapezium measures 1440 m^2. The perpendicular distance between its parallel sides is 24 m. If the ratio of the parallel sides is 5 : 3, the length of the longer parallel side is :

(1) 75 m (2) 45 m

(3) 120 m (4) 60 m

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

66. The area of a rhombus is 150 cm^2. The length of one of its diagonals is 10 cm. The length of the other diagonal is :

(1) 25 cm (2) 30 cm

(3) 35 cm (4) 40 cm

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

67. The perimeter of a rhombus is 100 cm. If one of its diagonals is 14 cm, then the area of the rhombus is

(1) 144 cm^2 (2) 225 cm^2

(3) 336 cm^2 (4) 400 cm^2

(SSC Data Entry Operator Exam. 31.08.2008)

68. If the measure of one side and one diagonal of a rhombus are 10 cm and 16 cm respectively, then its area (in cm^2) is :

(1) 60 (2) 64

(3) 96 (4) 100

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

69. The ratio of the length of the parallel sides of a trapezium is 3:2. The shortest distance between them is 15 cm. If the area of the trapezium is 450 cm^2, the sum of the length of the parallel sides is

(1) 15 cm (2) 36 cm

(3) 42 cm (4) 60 cm

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

70. A parallelogram has sides 15 cm and 7 cm long. The length of one of the diagonals is 20 cm. The area of the parallelogram is

(1) 42 cm^2 (2) 60 cm^2

(3) 84 cm^2 (4) 96 cm^2

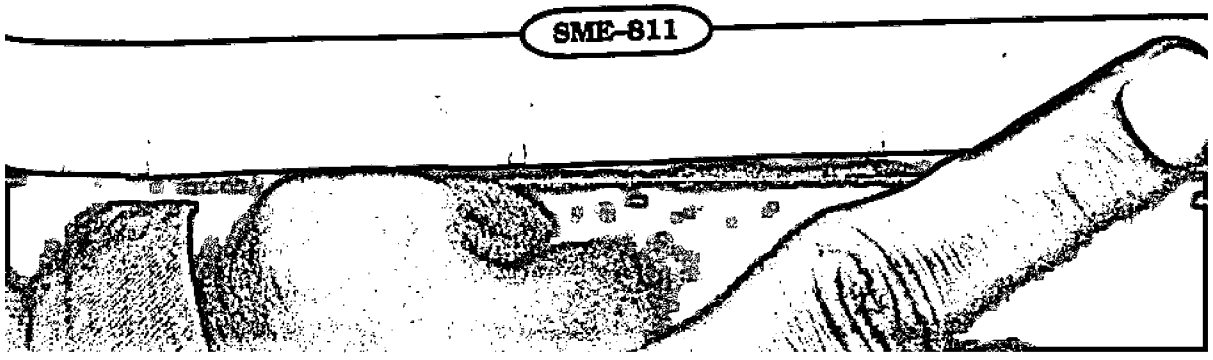
(SSC Multi-Tasking (Non-Technical Staff Exam. 27.02.2011

71. Sides of a parallelogram are in the ratio 5 : 4. Its area is 1000 sq units. Altitude on the greater side is 20 units. Altitude on the smaller side is

(1) 30 units (2) 25 units

(3) 10 units (4) 15 units

(SSC CHSL DEO & LDC Exam 11.12.2011 (Ist Sitting (Delhi Zon



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72. The perimeter of a rhombus is 40 cm and the measure of an angle is 60°, then the area of it is :

(1) $100\sqrt{3}$ cm² (2) $50\sqrt{3}$ cm²

(3) $160\sqrt{3}$ cm² (4) 100 cm²

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

73. The parallel sides of a trapezium are in a ratio 2 : 3 and their shortest distance is 12 cm. If the area of the trapezium is 480 sq. cm., the longer of the parallel sides is of length :

(1) 56 cm (2) 36 cm

(3) 42 cm (4) 48 cm

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

74. If the sum of the length, breadth and height of a rectangular parallelopiped is 24 cm and the length of its diagonal is 15 cm, then its total surface area is

(1) 256 cm² (2) 265 cm²

(3) 315 cm² (4) 351 cm²

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

75. The perimeter of a non-square rhombus is 20 cm. One of its diagonal is 8 cm. The area of the rhombus is

(1) 28 sq cm (2) 20 sq cm

(3) 22 sq cm (4) 24 sq cm

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

76. The perimeter of a rhombus is 100 cm and one of its diagonals is 40 cm. Its area (in cm²) is

(1) 1200 (2) 1000

(3) 600 (4) 500

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

77. In ΔABC, D and E are the points of sides AB and BC respectively such that DE || AC and AD : DB = 3 : 2. The ratio of area of trapezium ACED to that of Δ BED is

(1) 4 : 15 (2) 15 : 4

(3) 4 : 21 (4) 21 : 4

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

78. ABCD is a trapezium in which AB||DC and AB = 2 CD. The diagonals AC and BD meet at O. The ratio of area of triangles AOB and COD is

(1) 1 : 1 (2) $1:\sqrt{2}$

(3) 4 : 1 (4) 1 : 4

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

79. The length of each side of a rhombus is equal to the length of the side of a square whose diagonal is $40\sqrt{2}$ cm. If the length of the diagonals of the rhombus are in the ratio 3 : 4, then its area (in cm²) is

(1) 1550 (2) 1600

(3) 1535 (4) 1536

(SSC CHSL DEO & LDC Exam. 10.11.2013 (IInd Sitting)

80. The area of a regular hexagon of side $2\sqrt{3}$ cm is :

(1) $18\sqrt{3}$ cm² (2) $12\sqrt{3}$ cm²

(3) $36\sqrt{3}$ cm² (4) $27\sqrt{3}$ cm²

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

81. Each side of a regular hexagon is 1 cm. The area of the hexagon is

(1) $\frac{3\sqrt{3}}{2}$ cm² (2) $\frac{3\sqrt{3}}{4}$ cm²

(3) $4\sqrt{3}$ cm² (4) $3\sqrt{2}$ cm²

(SSC CPO S.I. Exam. 05.09.2004)

82. An equilateral triangle of side 6 cm has its corners cut off to form a regular hexagon. Area (in cm²) of this regular hexagon will be

(1) $3\sqrt{3}$ (2) $3\sqrt{6}$

(3) $6\sqrt{3}$ (4) $\frac{5\sqrt{3}}{2}$

(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

83. The ratio of the area of a regular hexagon and an equilateral triangle having same perimeter is

(1) 2: 3 (2) 6: 1

(3) 3: 2 (4) 1: 6

(SSC MTS (Non-Technical Exam. 20.02.2011) & (SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

84. The area of a sector of a circle of radius 5 cm, formed by an arc of length 3.5 cm is :

(1) 8.5 cm² (2) 8.75 cm²

(3) 7.75 cm² (4) 7.50 cm²

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

85. The area (in sq. cm.) of the largest circle that can be drawn inside a square of side 28 cm, is :

(1) 17248 (2) 784

(3) 8624 (4) 616

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

86. If the circumference of a circle increases from 4π to 8π, what change occurs in its area?

(1) It doubles (2) It triples

(3) It quadruples (4) It is halved

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

87. The area of the ring between two concentric circles, whose circumference are 88 cm and 132 cm, is :

(1) 780 cm² (2) 770 cm²

(3) 715 cm² (4) 660 cm²

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

88. Three circles of radius 3.5 cm each are placed in such a way that each touches the other two. The area of the portion enclosed by the circles is

(1) 1.975 cm² (2) 1.967 cm²

(3) 19.67 cm² (4) 21.21 cm²

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

89. The area of a circular garden is 2464 sq.m. How much distance will have to be covered if you like to cross the garden along its diameter ? (Use $\pi = \frac{22}{7}$)

(1) 56 m (2) 48 m

(3) 28 m (4) 24 m

(SSC CPO S.I. Exam. 07.09.2003)

90. Four equal circles each of radius 'a' units touch one another. The area enclosed between them ($\pi = \frac{22}{7}$), in square units, is

(1) $3a^2$ (2) $\frac{6a^2}{7}$

(3) $\frac{41a^2}{7}$ (4) $\frac{a^2}{7}$

(SSC CPO S.I. Exam. 07.09.2003)

91. Three coins of the same size (radius 1 cm) are placed on a table such that each of them touches the other two. The area enclosed by the coins is

(1) $\left(\frac{\pi}{2}-\sqrt{3}\right)$cm²

(2) $\left(\sqrt{3}-\frac{\pi}{2}\right)$cm²

(3) $\left(2\sqrt{3}-\frac{\pi}{2}\right)$cm²

(4) $\left(3\sqrt{3}-\frac{\pi}{2}\right)$cm²

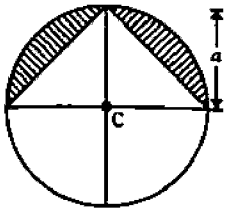
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

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92. The area of the largest triangle, that can be inscribed in a semi-circle of radius r cm, is
(1) $2r$ cm² (2) r^2 cm²
(3) $2r^2$ cm² (4) $\frac{1}{2}r^2$ cm²
(SSC CPO S.I. Exam. 05.09.2004)

93. The area of circle whose radius is 6 cm is trisected by two concentric circles. The radius of the smallest circle is
(1) $2\sqrt{3}$ cm (2) $2\sqrt{6}$ cm
(3) 2 cm (4) 3 cm
(SSC CPO S.I. Exam. 03.09.2006)

94. The area of the shaded region in the figure given below is



(1) $\frac{a^2}{2}\left(\frac{\pi}{2}-1\right)$ sq. units
(2) $a^2(\pi-1)$ sq. units
(3) $a^2\left(\frac{\pi}{2}-1\right)$ sq. units
(4) $\frac{a^2}{2}(\pi-1)$ sq. units
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

95. The area of a circle is increased by 22 cm its radius is increased by 1 cm. The original radius of the circle is
(1) 6 cm (2) 3.2 cm
(3) 3 cm (4) 3.5 cm
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

96. The radius of circle A is twice that of circle B and the radius of circle B is twice that of circle C. Their area will be in the ratio
(1) 16 : 4 : 1 (2) 4 : 2 : 1
(3) 1 : 2 : 4 (4) 1 : 4 : 16
(SSC CPO S.I. Exam. 06.09.2009)

97. The circumference of a circle is 11 cm and the angle of a sector of the circle is 60°. The area of the sector is (use $\pi=\frac{22}{7}$)
(1) $1\frac{29}{48}$ cm² (2) $2\frac{29}{48}$ cm²
(3) $1\frac{27}{48}$ cm² (4) $2\frac{27}{48}$ cm²
(SSC Data Entry Operator Exam. 31.08.2008)

98. A 7 m wide road runs outside around a circular park, whose circumference is 176 m. The area of the road is :
[use $\pi=\frac{22}{7}$]
(1) 1386 m² (2) 1472 m²
(3) 1512 m² (4) 1760 m²
(SSC CHSL DEO & LDC Exam. 27.11.2010)

99. The four equal circles of radius 4 cm drawn on the four corners of a square touch each other externally. Then the area of the portion between the square and the four sectors is
(1) 9 $(\pi-4)$ sq. cm.
(2) 16 $(\pi-4)$ sq. cm.
(3) 9 $(4-\pi)$ sq. cm.
(4) 16 $(4-\pi)$ sq.cm.
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

100. If the four equal circles of radius 3 cm touch each other externally, then the area of the region bounded by the four circles is
(1) $4(9-\pi)$ sq.cm
(2) $9(4-\pi)$ sq.cm
(3) $5(6-\pi)$ sq.cm
(4) $6(5-\pi)$ sq.cm
(SSCCHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

101. The area of a circle is increased by 22 cm² when its radius is increased by 1 cm. The original radius of the circle is
(1) 3 cm (2) 5 cm
(3) 7 cm (4) 9 cm
(SSC Graduate Level Tier-II Exam.16.09.2012)

102. The radii of two circles are 5cm and 12cm. The area of a third circle is equal to the sum of the area of the two circles. The radius of the third circle is :
(1) 13 cm (2) 21 cm
(3) 30 cm (4) 17 cm
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

103. The perimeter of a semicircular path is 36 m. Find the area of this semicircular path.
(1) 42sq.m (2) 54 sq. m
(3) 63 sq.m (4) 77 sq. m
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

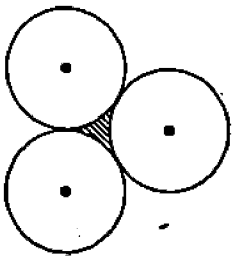
104. The ratio between the area of two circles is 4 : 7. What will be the ratio of their radii?
(1) 2 : $\sqrt{7}$ (2) 4 : 7
(3) 16 : 49 (4) 4 : $\sqrt{7}$
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

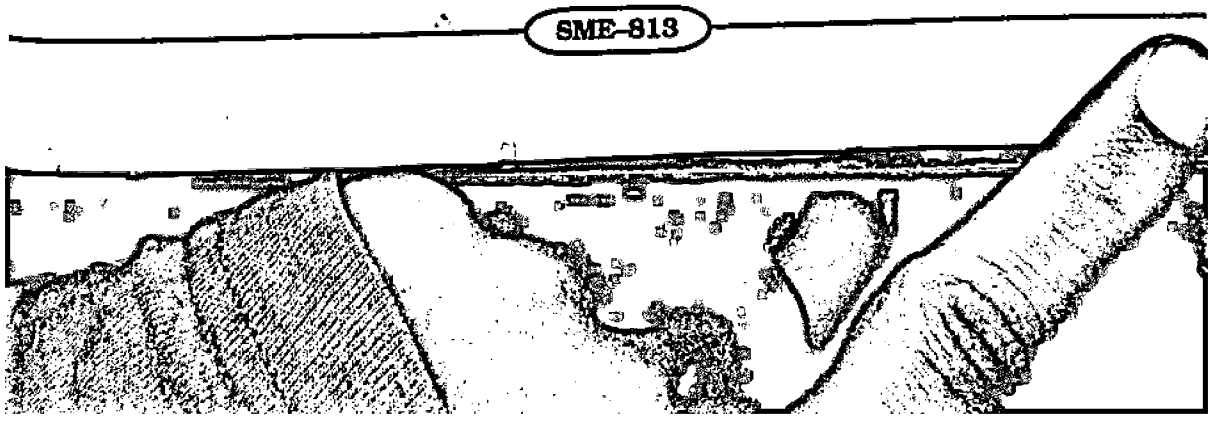
105. Three circles of radius a, b, c touch each other externally. The area of the triangle formed by joining their centre is
(1) $\sqrt{(a+b+c)abc}$
(2) $(a+b+c)\sqrt{ab+bc+ca}$
(3) $ab+bc+ca$
(4) None of the above
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

106. The area of a circle is proportional to the square of its radius. A small circle of radius 3 cm is drawn within a larger circle of radius 5 cm. Find the ratio of the area of the annular zone to the area of the larger circle. (Area of the annular zone is the difference between the area of the larger circle and that of the smaller circle).
(1) 9 : 16 (2) 9 : 25
(3) 16 : 25 (4) 16 : 27
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

107. The diameter of two circles are the side of a square and the diagonal of the square. The ratio of the area of the smaller circle and the larger circle is
(1) 1 : 2 (2) 1 : 4
(3) $\sqrt{2}$: $\sqrt{3}$ (4) 1 : $\sqrt{2}$
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

108. Three circles of equal radius 'a' cm touch each other. The area of the shaded region is :





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(1) $\left(\frac{\sqrt{3}+\pi}{2}\right)a^2$sq.cm

(2) $\left(\frac{6\sqrt{3}-\pi}{2}\right)a^2$sq.cm

(3) $(\sqrt{3}-\pi)a^2$sq.cm

(4) $\left(\frac{2\sqrt{3}-\pi}{2}\right)a^2$sq.cm

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

109. The radii of two circles are 10 cm and 24 cm. The radius of a circle whose area is the sum of the area of these two circles is

(1) 36 cm (2) 17 cm

(3) 34 cm (4) 26 cm

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

110. The area of the greatest circle inscribed inside a square of side 21 cm is (Take $\pi = \frac{22}{7}$)

(1) 344.5 cm^2 (2) 364.5 cm^2

(3) 346.5 cm^2 (4) 366.5 cm^2

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

111. The area of the greatest circle, which can be inscribed in a square whose perimeter is 120 cm, is :

(1) $\frac{22}{7}\times(15)^2$ cm^2

(2) $\frac{22}{7}\times\left(\frac{7}{2}\right)^2$ cm^2

(3) $\frac{22}{7}\times\left(\frac{15}{2}\right)^2$ cm^2

(4) $\frac{22}{7}\times\left(\frac{9}{2}\right)^2$ cm^2

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

112. The area of the incircle of an equilateral triangle of side 42 cm is $\left(\text{Take } \pi = \frac{22}{7}\right)$:

(1) 231 cm^2 (2) 462cm^2

(3) $22\sqrt{3}$ cm^2 (4) 924 cm^2

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

113. The ratio of the area of the in-circle and the circum-circle of a square is

(1) 1 : 2 (2) $\sqrt{2}$: 1

(3) 1 : $\sqrt{2}$ (4) 2: 1

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting, Delhi Zone)

114. The area of an equilateral triangle inscribed in a circle is $4\sqrt{3}$ cm^2. The area of the circle is

(1) $\frac{16}{3}\pi cm^2$ (2) $\frac{22}{3}\pi cm^2$

(3) $\frac{28}{3}\pi cm^2$ (4) $\frac{32}{3}\pi cm^2$

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (IInd Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I)

115. The area of the largest circle, that can be drawn inside a rectangle with sides 18 cm. by 14 cm, is

(1) 49 cm^2 (2) 154 cm^2

(3) 378 cm^2 (4) 1078 cm^2

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

116. A circle is inscribed in an equilateral triangle of side 8 cm. The area of the portion between the triangle and the circle is

(1) 11 cm^2 (2) 10.95 cm^2

(3) 10 cm^2 (4) 10.50 cm^2

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

117. If the difference between areas of the circumcircle and the incircle of an equilateral triangle is 44 cm^2, then the area of the triangle is $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 28 cm^2 (2) $7\sqrt{3}$ cm^2

(3) $14\sqrt{3}$ cm^2 (4) 21 cm^2

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

118. If the area of a circle inscribed in a square is 9π cm^2, then the area of the square is

(1) 24 cm^2 (2) 30 cm^2

(3) 36 cm^2 (4) 81 cm^2

(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

119. The sides of a triangle are 6 cm, 8 cm and 10 cm. The area of the greatest square that can be inscribed in it, is

(1) 18 cm^2 (2) 15 cm^2

(3) $\frac{2304}{49}$ cm^2 (4) $\frac{576}{50}$ cm^2

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

120. The length of a side of an equilateral triangle is 8 cm. The area of the region lying between the circumference and the incircle of the triangle is (Use $\pi = \frac{22}{7}$)

(1) $50\frac{1}{7}$ cm^2 (2) $50\frac{2}{7}$ cm^2

(3) $75\frac{1}{7}$ cm^2 (4) $75\frac{2}{7}$ cm^2

(SSC CPO S.I. Exam. 09.11.2008)

121. The length of each side of an equilateral triangle is $14\sqrt{3}$ cm. The area of the incircle (in cm^2), is

(1) 450 (2) 308

(3) 154 (4) 77

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 Paper-I)

122. The area of a circle inscribed in a square of area 2 m^2 is

(1) $\frac{\pi}{4}m^2$ (2) $\frac{\pi}{2}m^2$

(3) πm^2 (4) $2\pi m^2$

FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

123. Length of the perpendiculars from a point in the interior of an equilateral triangle on its sides are 3 cm, 4 cm and 5 cm. Area of the triangle is

(1) $48\sqrt{3}$ cm^2 (2) $54\sqrt{3}$ cm^2

(3) $72\sqrt{3}$ cm^2 (4) $80\sqrt{3}$ cm^2

(SSC Data Entry Operator Exam. 02.08.2009)

124. The ratio of the areas of the circumcircle and the incircle of an equilateral triangle is

(1) 2 : 1 (2) 4 : 1

(3) 8 : 1 (4) 3 : 2

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

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125. Area of the incircle of an equilateral triangle with side 6 cm is

(1) $\frac{\pi}{2}$ sq. cm. (2) $\sqrt{3}\pi$ sq. cm.

(3) 6π sq. cm. (4) 3π sq. cm.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

126. The area of the square inscribed in a circle of radius 8 cm is

(1) 256 sq. cm (2) 250 sq. cm

(3) 128 sq. cm (4) 125 sq. cm

(SSC Graduate Level Tier-II Exam.16.09.2012)

127. A circle is inscribed in an equilateral triangle and a square is inscribed in that circle. The ratio of the areas of the triangle and the square is

(1) $\sqrt{3} : 4$ (2) $\sqrt{3} : 8$

(3) $3\sqrt{3} : 2$ (4) $3\sqrt{3} : 1$

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

128. The ratio of the area of an equilateral triangle and that of its circumcircle is

(1) $2\sqrt{3} : 2\pi$ (2) $4 : \pi$

(3) $3\sqrt{3} : 4\pi$ (4) $7\sqrt{2} : 2\pi$

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

129. Between a square of perimeter 44 cm and a circle of circumference 44 cm, which figure has larger area and by how much?

(1) Square, 33cm^2

(2) Circle, 33 cm^2

(3) Both have equal area.

(4) Square, 495 cm^2

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

130. The perimeter of a square and a circular field are the same. If the area of the circular field is 3850 sq metres,what is the area (in m^2) of the square?

(1) 4225 (2) 3025

(3) 2500 (4) 2025

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

131. The areas of a square and a rectangle are equal. The length of the rectangle is greater than the length of any side of the square by 5 cm and the breadth is less by 3 cm. Find the perimeter of the rectangle.

(1) 17 cm (2) 26 cm

(3) 30 cm (4) 34 cm

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting))

132. If a wire is bent into the shape of a square, the area of the square is 81 sq. cm. When the wire is bent into a semicircular shape, the area of the semicircle (taking $\pi = \frac{22}{7}$) is :

(1) 154 cm^2 (2) 77 cm^2

(3) 44 cm^2 (4) 22 cm^2

(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Tier-I Exam. 26.06.2011 (IInd Sitting)

133. The perimeter of a rectangle is 160 metre and the difference of two sides is 48 metre. Find the side of a square whose area is equal to the area of this rectangle.

(1) 32 m (2) 8 m

(3) 4 m (4) 16 m

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

134. If the area of a triangle with base 12 cm is equal to the area of a square with side 12 cm, the altitude of the triangle will be

(1) 12 cm (2) 24 cm

(3) 18 cm (4) 36 cm

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

135. The area (in m^2) of the square which has the same perimeter as a rectangle whose length is 48 m and is 3 times its breadth, is :

(1) 1000 (2) 1024

(3) 1600 (4) 1042

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

136. A square and an equilateral triangle are drawn on the same base. The ratio of their area is

(1) 2 : 1 (2) 1 : 1

(3) $\sqrt{3} : 4$ (4) $4 : \sqrt{3}$

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

137. A wire, when bent in the form of a square, encloses a region having area 121 cm^2. If the same wire is bent into the form of a circle, then the area of the circle is $\left(\text{Take}\,\pi = \frac{22}{7}\right)$

(1) 144 cm^2 (2) 180 cm^2

(3) 154 cm^2 (4) 176 cm^2

(SSC CGL Prelim Exam. 27.07.2008 (Ist Sitting) & (SSC HSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

138. A copper wire is bent in the form of an equilateral triangle and has area $121\sqrt{3}$ cm^2. If the same wire is bent into the form of a circle, the area (in cm^2) enclosed by the wire is (Take $\pi = \frac{22}{7}$)

(1) 364.5 (2) 693.5

(3) 346.5 (4) 639.5

(SSC CGL Tier-I Exam. 19.06.2011 (First Sitting)

139. A copper wire is bent in the shape of a square of area 81cm^2. If the same wire is bent in the form of a semicircle, the radius (in cm) of the semicircle is (Take $\pi = \frac{22}{7}$)

(1) 16 (2) 14

(3) 10 (4) 7

(SSC CGL Tier-I Exam. 26.06.2011 (First Sitting)

140. At each corner of a triangular field of sides 26 m, 28 m and 30 m, a cow is tethered by a rope of length 7 m. The area (in m^2) ungrazed by the cows is

(1) 336 (2) 259

(3) 154 (4) 77

(SSC CGL Tier-I Exam. 26.06.2011 (Second Sitting)

141. An equilateral triangle is drawn on the diagonal of a square. The ratio of the area of the triangle to that of the square is

(1) $\sqrt{3} : 2$ (2) $\sqrt{2} : \sqrt{3}$

(3) $2 : \sqrt{3}$ (4) $1 : \sqrt{2}$

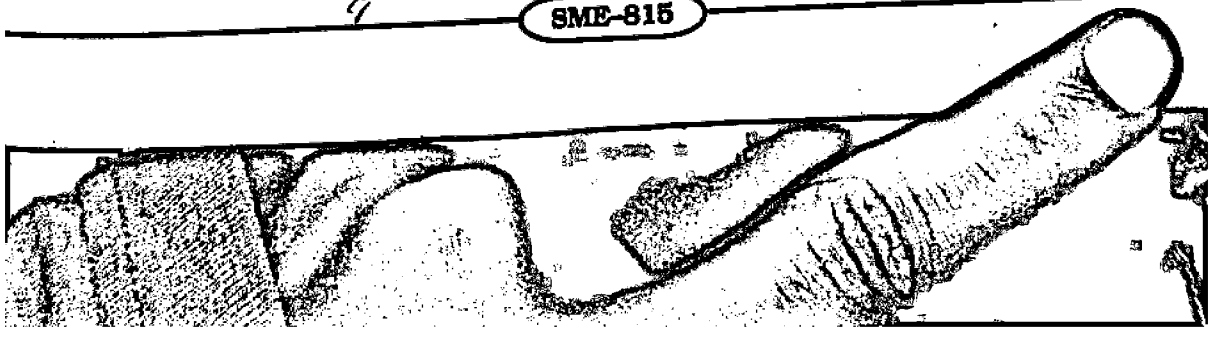
(FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

142. A cow is tied on the corner of a rectangular field of size 30 m ×20 m by a 14m long rope. The area of the region, that she can graze, is (use $\pi = \frac{22}{7}$) :

(1) 350 m^2 (2) 196 m^2

(3) 154 m^2 (4) 22 m^2

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)



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143. A circle and a square have equal areas. The ratio of a side of the square and the radius of the circle is

(1) $1:\sqrt{\pi}$ (2) $\sqrt{\pi}:1$

(3) $1:\pi$ (4) $\pi:1$

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

144. If the perimeters of a rectangle and a square are equal and the ratio of two adjacent sides of the rectangle is 1 : 2 then the ratio of area of the rectangle and that of the square is

(1) 1 : 1 (2) 1 : 2

(3) 2 : 3 (4) 8 : 9

(SSC Graduate Level Tier-I Exam. 21.04.2013)

145. The perimeter of a triangle and an equilateral triangle are same. Also, one of the sides of the rectangle is equal to the side of the triangle. The ratio of the area of the rectangle and the triangle is

(1) $\sqrt{3}:1$ (2) $1:\sqrt{3}$

(3) $2:\sqrt{3}$ (4) $4:\sqrt{3}$

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

146. The radius of a circle is a side of a square. The ratio of the area of the circle and the square is

(1) $1:\pi$ (2) $\pi:1$

(3) $\pi:2$ (4) $2:\pi$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

147. If the length of a rectangle is increased by 25% and the width is decreased by 20%, then the area of the rectangle :

(1) increases by 5%

(2) decreases by 5%

(3) remains unchanged

(4) increases by 10%

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

148. The length of a rectangle is decreased by 10% and its breadth is increased by 10%. By what per cent is its area changed ?

(1) 0% (2) 1%

(3) 5% (4) 100%

(SSC CGL Prelim Exam. 06.02.2004 (Ist Sitting) & (SSC CGL Tier-I Exam. 16.05.2010 (Ist Sitting)

149. The percentage increase in the area of a rectangle, if each of its sides is increased by 20%, is :

(1) 40% (2) 42%

(3) 44% (4) 46%

(SSC CGL Prelim Exam. 09.02.2004 (First Sitting)

150. If the circumference of a circle is reduced by 50%, its area will be reduced by

(1) 12.5% (2) 25%

(3) 50% (4) 75%

(SSC CPO S.I. Exam. 05.09.2004)

151. If the side of a square is increased by 25%, then its area is increased by :

(1) 25% (2) 55%

(3) 40.5% (4) 56.25%

(SSC CPO S.I. Exam. 26.05.2005)

152. If the radius of a circle is increased by 50%, its area is increased by :

(1) 125% (2) 100%

(3) 75% (4) 50%

(SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & (SSC CGL Tier-I Exam. 26.06.2010 (IInd Sitting)

153. If the length of a rectangle is increased by 20% and its breadth is decreased by 20%, then its area

(1) increases by 4%

(2) decreases by 4%

(3) decreases by 1%

(4) remains unchanged

(SSC CPO S.I. Exam. 03.09.2006)

154. If each side of a rectangle is increased by 50%, its area will be increased by

(1) 50% (2) 125%

(3) 100% (4) 250%

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting) & (SSC HSL DEO & LDC Exam. 28.11.2010)

155. If the altitude of a triangle is increased by 10% while its area remains same, its corresponding base will have to be decreased by

(1) 10 % (2) 9 %

(3) $9\frac{1}{11}\%$ (4) $11\frac{1}{9}\%$

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting) & (SSC MTS Exam. 17.03.2013, Kolkata Region)

156. If the circumference of a circle is increased by 50% then the area will be increased by

(1) 50% (2) 75%

(3) 100% (4) 125%

(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

157. The length and breadth of a rectangle are increased by 12% and 15% respectively. Its area will be increased by :

(1) $27\frac{1}{5}\%$ (2) $28\frac{4}{5}\%$

(3) 27% (4) 28%

(SSC CPO S.I. Exam. 16.12.2007)

158. Each side of a rectangular field is diminished by 40%. By how much per cent is the area of the field diminished ?

(1) 32% (2) 64%

(3) 25% (4) 16%

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

159. The length of rectangle is increased by 60%. By what per cent would the breadth to be decreased to maintain the same area ?

(1) $37\frac{1}{2}\%$ (2) 60%

(3) 75% (4) 120%

(SSC CPO S.I. Exam. 06.09.2009) & (SSC MTS Exam. 17.03.2013, Kolkata Region)

160. If each side of a square is increased by 10%, its area will be increased by

(1) 10% (2) 21%

(3) 44% (4) 100%

(SSC CGL Tier-I Exam. 16.05.2010 (IInd Sitting) & (SSC SAS Exam. 26.06.2010 (Paper-I)

161. If the length of a rectangular plot of land is increased by 5% and the breadth is decreased by 10%, how much will its area increase or decrease ?

(1) 6.5% increase

(2) 5.5% decrease

(3) 5.5% increase

(4) 6.5% decrease

(SSC CPO S.I. Exam. 12.12.2010 (Paper-I)

162. The radius of a circle is increased by 1%. How much does the area of the circle increase ?

(1) 1% (2) 1.1%

(3) 2 % (4) 2.01%

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

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163. In measuring the sides of a rectangle, there is an excess of 5% on one side and 2% deficit on the other. Then the error percent in the area is
(1) 3·3% (2) 3·0%
(3) 2·9% (4) 2·7%
(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

164. The length and breadth of a square are increased by 30% and 20% respectively. The area of the rectangle so formed exceeds the area of the square by
(1) 46% (2) 66%
(3) 42% (4) 56%
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

165. If each edge of a cube is increased by 40%, the percentage increase in its surface area is
(1) 40% (2) 60%
(3) 80% (4) 96%
(SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna)

166. If the diameter of a circle is increased by 8%, then its area is increased by :
(1) 16.64% (2) 6.64%
(3) 16% (4) 16.46%
(SSC Multi-Tasking Staff Exam. 10.03.2013)

167. One side of a square is increased by 30%. To maintain the same area, the other side will have to be decreased by
(1) $23\frac{1}{13}\%$ (2) $76\frac{12}{13}\%$
(3) 30% (4) 15%
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting))

168. The length and breadth of a rectangle are doubled. Percentage increase in area is
(1) 150% (2) 200%
(3) 300% (4) 400%
(SSC CHSL DEO & LDC Exam. 20.10.2013)

169. ABC is an equilateral triangle. P and Q are two points on $\overline{AB}$ and $\overline{AC}$ respectively such that $\overline{PQ} \parallel \overline{BC}$. If $\overline{PQ} = 5$ cm, then area of ΔAPQ is :
(1) $\frac{25}{4}$ sq. cm (2) $\frac{25}{\sqrt{3}}$ sq. cm
(3) $\frac{25\sqrt{3}}{4}$ sq. cm (4) $25\sqrt{3}$ sq. cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

170. If area of an equilateral triangle is a and height b, then value of $\frac{b^2}{a}$ is:
(1) 3 (2) $\frac{1}{3}$
(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

171. ABC is an isosceles right angled triangle with $\angle B = 90°$. On the sides AC and AB, two equilateral triangles ACD and ABE have been constructed. The ratio of area of ΔABE and ΔACD is
(1) 1 : 3 (2) 2 : 3
(3) 1 : 2 (4) 1 : $\sqrt{2}$
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

172. Two triangles ABC and DEF are similar to each other in which AB = 10 cm, DE = 8 cm. Then the ratio of the area of triangles ABC and DEF is
(1) 4 : 5 (2) 25 : 16
(3) 64 : 125 (4) 4 : 7
(SSC CHSL DEO & LDC Exam. 04.11.2012, IInd Sitting)

173. If ΔABC is similar to ΔDEF such that BC = 3 cm, EF = 4 cm and area of $\Delta ABC = 54$ cm^2, then the area of ΔDEF is :
(1) 66 cm^2 (2) 78 cm^2
(3) 96 cm^2 (4) 54 cm^2
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

174. The area of two similar triangles ABC and DEF are 20 cm^2 and 45 cm^2 respectively. If AB = 5 cm, then DE is equal to :
(1) 6.5 cm (2) 7.5 cm
(3) 8.5 cm (4) 5.5 cm
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

175. ABCD is a parallelogram. BC is produced to Q such that BC = CQ. Then
(1) area (Δ BCP) = area (Δ DPQ)
(2) area (Δ BCP) > area (Δ DPQ)
(3) area (Δ BCP) < area (Δ DPQ)
(4) area (Δ BCP) + area (Δ DPQ) = area (ΔBCD)
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

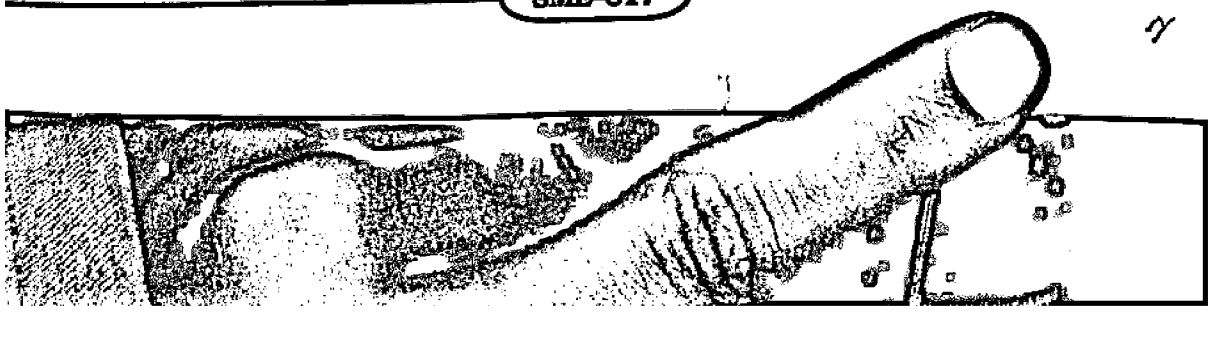
176. The ratio of the length of the parallel sides of a trapezium is 3:2. The shortest distance between them is 15 cm. If the area of the trapezium is 450 cm^2, the sum of the length of the parallel sides is
(1) 15 cm (2) 36 cm
(3) 42 cm (4) 60 cm
(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

177. C_1 and C_2 are two concentric circles with centre at O. Their radii are 12 cm. and 3 cm. respectively. B and C are the point of contact of two tangents drawn to C_2 from a point A lying on the circle C_1. Then, the area of the quadrilateral ABOC is
(1) $\frac{9\sqrt{15}}{2}$ sq. cm.
(2) $12\sqrt{15}$ sq. cm.
(3) $9\sqrt{15}$ sq. cm.
(4) $6\sqrt{15}$ sq. cm.
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

178. From a point P which is at a distance of 13 cm from centre O of a circle of radius 5 cm, in the same plane, a pair of tangents PQ and PR are drawn to the circle. Area of quadrilateral PQOR is
(1) 65 cm^2 (2) 60 cm^2
(3) 30 cm^2 (4) 90 cm^2
(SSC Graduate Level Tier-I Exam. 21.04.2013)

179. In Δ ABC, O is the centroid and AD, BE, CF are three medians and the area of Δ AOE = 15 cm^2, then area of quadrilateral BDOF is
(1) 20 cm^2 (2) 30 cm^2
(3) 40 cm^2 (4) 25 cm^2
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

180. A straight line parallel to the base BC of the triangle ABC intersects AB and AC at the points D and E respectively. If the area of the ΔABE be 36 sq.cm, then the area of the ΔACD is
(1) 18 sq.cm (2) 36 sq.cm
(3) 18 cm (4) 36 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)



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181. If in a Δ ABC, the medians CD and BE intersect each other at O, then the ratio of the areas of Δ ODE and Δ ABC is
(1) 1 : 6 (2) 6 : 1
(3) 1 : 12 (4) 12 : 1
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

182. Three circles of radii 4 cm, 6 cm and 8 cm touch each other pairwise externally. The area of the triangle formed, by the line-segments joining-the centres of the three circles is
(1) 144 $\sqrt{13}$ sq. cm
(2) 12 $\sqrt{105}$ sq. cm
(3) $6\sqrt{6}$ sq. cm
(4) $24\sqrt{6}$ sq. cm
(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

183. Two circles with centre A and B and radius 2 units touch each other externally at 'C'. A third circle with centre 'C' and radius '2' units meets other two at D and E. Then the area of the quadrilateral ABDE is
(1) $2\sqrt{2}$ sq. units
(2) $3\sqrt{3}$ sq. units
(3) $3\sqrt{2}$ sq. units
(4) $2\sqrt{3}$ sq. units
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

184. ABC is a right angled triangle, B being the right angle. Mid-points of BC and AC are respectively B′ and A′. The ratio of the area of the quadrilateral AA′ B′B to the area of the triangle ABC is
(1) 1 : 2 (2) 2 : 3
(3) 3 : 4
(4) None of the above
(SSC Graduate Level Tier-I Exam. 21.04.2013)

185. Two triangles ABC and PQR are congruent. If the area of Δ ABC is 60 sq. cm, then area of Δ PQR will be
(1) 60 sq.cm (2) 30 sq.cm
(3) 15 sq.cm (4) 120 sq.cm
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

186. In ΔPQR, the line drawn from the vertex P intersects QR at a point S. If QR = 4.5 cm and SR = 1.5 cm then the ratios of the area of triangle PQS and triangle PSR is
(1) 4 : 1 (2) 3 : 1
(3) 3 : 2 (4) 2 : 1
(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

187. The difference between the radii of the bigger circle and smaller circle is 14 cm and the difference between their areas is 1056 cm^2. Radius of the smaller circle is
(1) 7 cm (2) 5 cm
(3) 9 cm (4) 3 cm
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

188. ABCD is parallelogram. P and Q are the mid-points of sides BC and CD respectively. If the area of Δ ABC is 12 cm^2, then the area of Δ APQ is
(1) 12 cm^2 (2) 8 cm^2
(3) 9 cm^2 (4) 10 cm^2
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

189. ABC is a right angled triangle. B being the right angle. Mid-points of BC and AC are respectiveely B′ and A′. Area of ΔA′B′C′ is
(1) $\frac{1}{2}$ × area of ΔABC
(2) $\frac{2}{3}$ × area of ΔABC
(3) $\frac{1}{4}$ × area of ΔABC
(4) $\frac{1}{8}$ × area of ΔABC
(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

190. A wire of length 44 cm is first bent to form a circle and then rebent to form a square. The difference of the two enclosed areas is
(1) 44 cm^2 (2) 33 cm^2
(3) 55 cm^2 (4) 66 cm^2
(SSC CGL Tier-I Exam. 19.10.2014)

191. A parallelogram has sides 60 m and 40m and one of its diagonals is 80 m long. Its area is
(1) 500 $\sqrt{15}$ m^2
(2) 600 $\sqrt{15}$ m^2
(3) 400 $\sqrt{15}$ m^2
(4) 450 $\sqrt{15}$ m^2
(SSC CGL Tier-I Exam. 26.10.2014)

192. ∠ACB is an angle in the semicircle of diameter AB = 5 and AC : BC = 3 : 4. The area of the triangle ABC is
(1) $6\sqrt{2}$ sq. cm (2) 4 sq. cm
(3) 12 sq. cm (4) 6 sq. cm
(SSC CGL Tier-I Exam. 26.10.2014)

193. If the lengths of the sides AB, BC and CA of a triangle ABC are 10 cm, 8 cm and 6 cm respectively and if M is the mid - point of BC and MN ∥ AB to cut AC at N, then the area of the trapezium ABMN is equal to
(1) 18 sq. cm. (2) 20 sq. cm.
(3) 12 sq. cm. (4) 16 sq. cm.

194. ABCD is a trapezium with AD and BC parallel sides. E is a point on BC. The ratio of the area of ABCD to that of AED is
(1) $\frac{\overline{AD}}{\overline{BC}}$ (2) $\frac{\overline{BE}}{\overline{EC}}$
(3) $\frac{\overline{AD}+\overline{BE}}{\overline{AD}+\overline{CE}}$ (4) $\frac{\overline{AD}+\overline{BC}}{\overline{AD}}$
(SSC CGL Tier-II Exam. 21.09.2014)

195. In an equilateral triangle of side 24 cm, a circle is inscribed touching its sides. The area of the remaining portion of the triangle is
$(\sqrt{3} = 1.732)$
(1) 98.55 sq cm (2) 100 sq cm
(3) 101 sq cm (4) 95 sq cm
(SSC CGL Tier-II Exam. 21.0.2014)

196. Perimeter of a rhombus is 2p unit and sum of length of diagonals is m unit, then area of the rhombus is
(1) $\frac{1}{4}m^2p$ sq unit
(2) $\frac{1}{4}mp^2$ sq unit
(3) $\frac{1}{4}(m^2 - p^2)$ sq unit
(4) $\frac{1}{4}(p^2 - m^2)$ sq unit
(SSC CGL Tier-II Exam. 21.09.2014)

197. Two sides of a plot measuring 32 m and 24 m and the angle between them is a perfect right angle. The other two sides measure 25 m each and the other three angles are not right angles. The area of the plot in m^2 is
(1) 768 (2) 534
(3) 696.5 (4) 684
(SSC CGL Tier-II Exam. 21.09.2014)

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198. a and b are two sides adjacent to the right angle of a right-angled triangle and p is the perpendicular drawn to the hypotenuse from the opposite vertex. Then p^2 is equal to

(1) $a^2 + b^2$ (2) $\frac{1}{a^2} + \frac{1}{b^2}$

(3) $\frac{a^2b^2}{a^2+b^2}$ (4) $a^2 - b^2$

(SSC CGL Tier-II Exam. 21.09.2014)

199. A is the centre of circle whose radius is 8 and B is the centre of a circle whose diameter is 8. If these two circles touch externally, then the area of the circle with diameter AB is

(1) 36 π (2) 64 π

(3) 144 π (4) 256 π

(SSC CGL Tier-II Exam. 21.09.2014)

200. The length of a rectangle is increased by 10% and breadth decreased by 10%. The area of the new rectangle is

(1) neither increased nor decreased

(2) increased by 1%

(3) decreased by 2%

(4) decreased by 1%

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

201. If the numerical values of the height and the area of an equilateral triangle be same, then the length of each side of the triangle is

(1) 2 units (2) 4 units

(3) 5 units (4) 8 units

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

202. If the length of a side of the square is equal to that of the diameter of a circle, then the ratio of the area of the square and that of the circle is

$\left(\pi = \frac{22}{7}\right)$

(1) 14 : 11 (2) 7 : 11

(3) 11 : 14 (4) 11 : 7

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

203. The median of an equilateral triangle is $6\sqrt{3}$ cm. The area (in cm^2) of the triangle is

(1) 72 (2) 108

(3) $72\sqrt{3}$ (4) $36\sqrt{3}$

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

204. If the numerical value of the circumference and area of a circle is same, then the area is

(1) 6 π sq. unit (2) 4 π sq. unit

(3) 8 π sq. unit (4) 12 π sq. unit

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

205. The area of an equilateral triangle is 48 sq. cm. The length of the side is

(1) $\sqrt{8} \times 4$ cm (2) $4\sqrt{3}$ cm

(3) 8 cm (4) 16 cm

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

206. Area of regular hexagon with side 'a' is

(1) $\frac{3\sqrt{3}}{4}$ a^2 sq. unit

(2) $\frac{12}{2\sqrt{3}}$ a^2 sq. unit

(3) $\frac{9}{2\sqrt{3}}$ a^2 sq. unit

(4) $\frac{6}{\sqrt{2}}$ a^2 sq. unit

(SSC CHSL DEO & LDC Exam. 9.11.2014)

207. The external fencing of a circular path around a circular plot of land is 33 m more than its interior fencing. The width of the path around the plot is

(1) 5.52 m (2) 5.25 m

(3) 2.55 m (4) 2.25 m

(SSC CHSL DEO & LDC Exam. 9.11.2014)

208. In ΔABC, D and E are two points on the sides AB and AC respectively so that DE || BC and $\frac{AD}{BD} = \frac{2}{3}$. Then

$\frac{\text{the area of trapezium DECB}}{\text{the area of } \Delta ABC}$ is equal to

(1) $\frac{5}{9}$ (2) $\frac{21}{25}$

(3) $1\frac{4}{5}$ (4) $5\frac{1}{4}$

(SSC CHSL DEO & LDC Exam. 9.11.2014)

209. The sides of a rhombus are 10 cm each and a diagonal measures 16 cm. Area of the rhombus is

(1) 96 sq.cm (2) 160 sq.cm

(3) 100 sq. cm (4) 40 sq.cm

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

210. The perimeter of a triangle is 54 m and its sides are in the ratio of 5 : 6 : 7. The area of the triangle is

(1) 18 m^2 (2) $54\sqrt{6}$ m^2

(3) $27\sqrt{2}$ m^2 (4) 25 m^2

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

211. The lengths of two parallel sides of a trapezium are 6 cm and 8 cm. If the height of the trapezium be 4 cm, then its area is

(1) 28 cm (2) 28 sq.cm

(3) 30 sq.cm (4) 30 cm

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

212. If a and b are the lengths of the sides of a right triangle whose hypotenuse is 10 and whose area is 20, then the value of $(a + b)^2$ is

(1) 140 (2) 180

(3) 120 (4) 160

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

213. A wire is bent into the form of a circle, whose area is 154 cm^2. If the same wire is bent into the form of an equilateral triangle, the approximate area of the equilateral triangle is

(1) 93.14 cm^2 (2) 90.14 cm^2

(3) 83.14 cm^2 (4) 39.14 cm^2

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

214. If the ratio of the altitudes of two triangles be 3 : 4 and the ratio of their corresponding areas be 4 : 3, then the ratio of their corresponding lengths of bases is

(1) 1 : 1 (2) 16 : 9

(3) 1 : 2 (4) 2 : 1

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

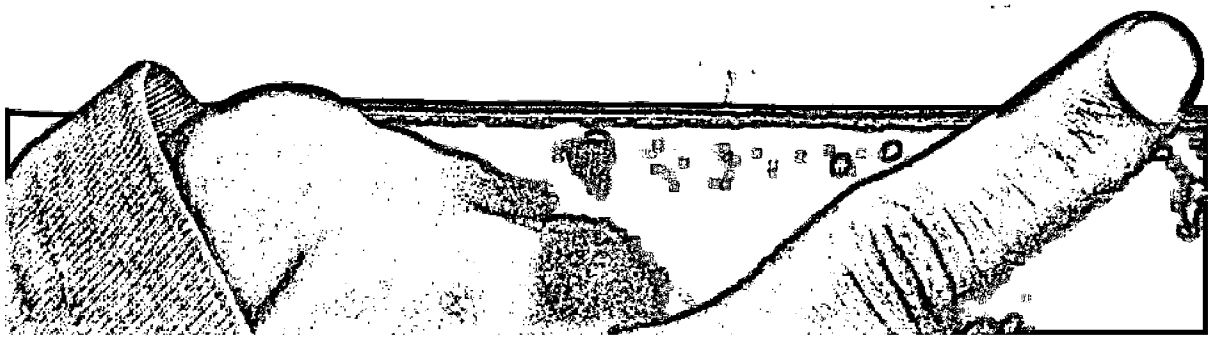
215. Let A be the area of a square whose each side is 10 cm. Let B be the area of a square whose diagonals are 14 cm each. Then (A – B) is equal to

(1) 0 (2) 1

(3) 2 (4) 4

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

216. Two sides of a parallelogram are



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20 cm and 25 cm. If the altitude corresponding to the side of length 25 cm is 10 cm, then the altitude corresponding to the other pair of sides is

(1) 10.5 cm (2) 12 cm
(3) 12.5 cm (4) 10 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

217. If the sides of an equilateral triangle be increased by 1 m its area is increased by $\sqrt{3}$ sq. metre. The length of any of its sides is

(1) 2 metre (2) $\frac{5}{2}$ metre
(3) $\frac{3}{2}$ metre (4) $\sqrt{3}$ metre

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

218. The in-radius of a triangle is 6 cm, and the sum of the lengths of its sides is 50 cm. The area of the triangle (in square cm.) is

(1) 150 (2) 50
(3) 300 (4) 56

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

219. One of the angles of a right-angled triangle is 15°, and the hypotenuse is 1 metre. The area of the triangle (in square cm.) is

(1) 1220 (2) 1200
(3) 1250 (4) 1215

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

220. If for an isosceles triangle the length of each equal side is 'a' units and that of the third side is 'b' units, then its area will be

(1) $\frac{a}{4}\sqrt{4b^2-a^2}$ square units

(2) $\frac{a}{2}\sqrt{2a^2-b^2}$ square units

(3) $\frac{b}{4}\sqrt{4a^2-b^2}$ square units

(4) $\frac{b}{2}\sqrt{a^2-2b^2}$ square units

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

221. The outer and inner diameter of a circular path be 728 metre and 700 metre respectively. The breadth of the path is

(1) 7 metre (2) 28 metre
(3) 14 metre (4) 20 metre

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

222. The area of the parallelogram whose length is 30 cm, width is 20 cm and one diagonal is 40 cm is

(1) 200 $\sqrt{15}$ cm^2

(2) 100 $\sqrt{15}$ cm^2

(3) 300 $\sqrt{15}$ cm^2

(4) 150 $\sqrt{15}$ cm^2

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

223. On increasing each side of a square by 50%, the ratio of the area of new square formed and the given square will be

(1) 9 : 5 (2) 9 : 3.5
(3) 9 : 7 (4) 9 : 4

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

224. The area of a circle is 324 π square cm. The length of its longest chord (in cm.) is

(1) 36 (2) 28
(3) 38 (4) 32

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

225. The area of a rhombus is 256 square cm, and one of its diagonals is twice the other in length. Then length of its larger diagonal is

(1) 32 cm (2) 16 cm
(3) 48 cm (4) 24 cm

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

226. If the side of a square is $\frac{1}{2}(x+1)$ units and its diagonal is $\frac{3-x}{\sqrt{2}}$ units, then the length of the side of the square would be

(1) $\frac{4}{3}$ units (2) $\frac{1}{2}$ unit
(3) 1 unit (4) 2 units

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

227. The circumference of a triangle is 24 cm and the circumference of its in-circle is 44 cm. Then the area of the triangle is (taking $\pi = \frac{22}{7}$)

(1) 56 square cm.
(2) 84 square cm.
(3) 48 square cm.
(4) 68 square cm.

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

228. If the length of each of two equal sides of an isosceles triangle is 10 cm. and the adjacent angle is 45°, then the area of the triangle is

(1) $20\sqrt{2}$ square cm.

(2) $12\sqrt{2}$ square cm.

(3) $25\sqrt{2}$ square cm.

(4) $15\sqrt{2}$ square cm.

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

229. The length of the diagonal of a rectangle with sides 4 m and 3 m would be

(1) 12 m (2) 7 m
(3) 5 m (4) 14 m

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

230. In a right angled triangle ΔPQR, PR is the hypotenuse of length 20 cm, $\angle PRQ = 30°$, the area of the triangle is

(1) $50\sqrt{3}$ cm^2 (2) $100\sqrt{3}$ cm^2
(3) $25\sqrt{3}$ cm^2 (4) $\frac{100}{\sqrt{3}}$ cm^2

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

231. The perimeter of an equilateral triangle is equal to the circumference of a circle. The ratio of their areas is

$\left(\text{Use } \pi = \frac{22}{7}\right)$

(1) 22 : $21\sqrt{3}$ (2) 21 : $22\sqrt{3}$
(3) 21 : $22\sqrt{2}$ (4) 22 : $21\sqrt{2}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

232. From any point inside an equilat-

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eral triangle, the lengths of perpendiculars on the sides are 'a' cm, 'b' cm and 'c' cms. Its area (in cm^2) is

(1) $\frac{\sqrt{2}}{3}(a+b+c)$

(2) $\frac{\sqrt{3}}{3}(a+b+c)^2$

(3) $\frac{\sqrt{3}}{3}(a+b+c)$

(4) $\frac{\sqrt{2}}{3}(a+b+c)^2$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

233. The areas of a circle and a square are same. The ratio of the side of the square to the radius of the circle is

(1) $2\pi : 1$ (2) $1 : \sqrt{\pi}$

(3) $\sqrt{\pi} : 1$ (4) $1 : \pi$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

234. ABCD is a square inscribed in a circle of radius r. Then the total area (in square units) of the portions of the circle lying outside the square is

(1) $\pi(r^2-4)$ (2) $2\pi(r^2-1)$

(3) $\pi^2 r(r-7)$ (4) $r^2(\pi-2)$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

235. The lengths of the two parallel sides of a trapezium are 28 cm and 40 cm. If the length of each of its other two sides be 12 cm, then the area (in cm^2) of the trapezium is

(1) $312\sqrt{5}$ (2) $408\sqrt{3}$

(3) $204\sqrt{3}$ (4) $504\sqrt{3}$

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

236. The perimeter of a sheet of paper in the shape of a quadrant of a circle is 75 cm. Its area would be $\left(\pi = \frac{22}{7}\right)$

(1) 100 cm^2 (2) 346.5 cm^2

(3) 693 cm^2 (4) 512.25 cm^2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

237. The diagonal of a quadrilateral shaped field is 24m and the perpendiculars dropped on it from the remaining opposite vertices are 8m and 13m. The area of the field is

(1) 252 m^2 (2) 156 m^2

(3) 96 m^2 (4) 1152 m^2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

238. Two isosceles triangles have equal vertical angles and their areas are in the ratio 9:16. Then the ratio of their corresponding heights is-

(1) 4.5 : 8 (2) 4 : 3

(3) 8 : 4.5 (4) 3 : 4

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

239. In ΔABC, a line through A cuts the side BC at D such that BD : DC = 4 : 5. If the area of ΔABD = 60 cm^2, then the area of ΔADC is

(1) 90 cm^2 (2) 50 cm^2

(3) 60 cm^2 (4) 75 cm^2

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

240. If the area of a circle is A, radius of the circle is r and circumference of it is C, then

(1) $\frac{A}{r} = C$ (2) $rC = 2A$

(3) $\frac{C}{A} = \frac{r}{2}$ (4) $AC = \frac{r^2}{4}$

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

241. In a rhombus ABCD, $\angle A = 60°$ and AB = 12 cm. Then the diagonal BD is

(1) 10 cm (2) $2\sqrt{3}$ cm

(3) 6 cm (4) 12 cm

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

242. If two medians BE and CF of a triangle ABC, intersect each other at G and if BG = CG, $\angle BGC = 60°$ and BC = 8 cm then area of the triangle ABC is

(1) $96\sqrt{3}$ cm^2 (2) $64\sqrt{3}$ cm^2

(3) $48\sqrt{3}$ cm^2 (4) 48 cm^2

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

243. Two circles touch each other externally. The sum of their areas is 130 π sq cm and the distance between their centres is 14 cm. The radius of the smaller circle is

(1) 2 cm (2) 4 cm

(3) 5 cm (4) 3 cm

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

244. Let C_1 and C_2 be the inscribed and circumscribed circles of a triangle with sides 3cm, 4cm and 5cm then $\frac{\text{area of } C_1}{\text{area of } C_2}$ is

(1) $\frac{9}{25}$ (2) $\frac{4}{25}$

(3) $\frac{9}{16}$ (4) $\frac{16}{25}$

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

245. If the altitude of an equilateral triangle is $12\sqrt{3}$ cm, then its area would be :

(1) 12 cm^2 (2) 144 $\sqrt{3}$ cm^2

(3) 72 cm^2 (4) 36 $\sqrt{3}$ cm^2

(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

246. Given that : $\Delta ABC \sim \Delta PQR$, If $\frac{\text{area}(\Delta PQR)}{\text{area}(\Delta ABC)} = \frac{256}{441}$ and PR = 12 cm, then AC is equal to

(1) 15.75 cm (2) 16 cm

(3) $12\sqrt{2}$ cm (4) 15.5 cm

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

247. ABCD is a cyclic quadrilateral. Diagonals AC and BD meets at P. If $\angle APB = 110°$ and $\angle CBD = 30°$, then $\angle ADB$ measures

(1) 55° (2) 30°

(3) 70° (4) 80°

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

248. A circular swimming pool is sur-



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rounded by a concrete wall 4m wide. If the area of the concrete wall surrounding the pool is $\frac{11}{25}$ that of the pool, then the radius (in m) of the pool is :
(1) 8 (2) 16
(3) 30 (4) 20
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

249. ΔABC is similar to ΔDEF. The ratio of their perimeters is 4 : 1. The ratio of their areas is
(1) 4 : 1 (2) 16 : 1
(3) 8 : 1 (4) $8\sqrt{2}$: 1
(SSC CGL Tier-I Re-Exam, 30.08.2015)

250. The amount of rice produced in a square field of side 50 m is 750 kg. The amount of rice produced in a similar square field of side 100 m will be
(1) 2000 kg (2) 3000 kg
(3) 3500 kg (4) 1500 kg
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

251. The time required for a boy to travel along the external and internal boundaries of a circular path are in the ratio 20 : 19. If the width of the path be 5 metres, the internal diameter is :
(1) 195 metres (2) 192 metres
(3) 180 metres (4) 190 metres
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

252. In triangle ABC, DE || BC where D is a point on AB and E is a point on AC. DE divides the area of Δ ABC into two equal parts. Then DB : AB is equal to
(1) $\sqrt{2} : (\sqrt{2}+1)$
(2) $\sqrt{2} : (\sqrt{2}-1)$
(3) $(\sqrt{2}-1) : \sqrt{2}$
(4) $(\sqrt{2}+1) : \sqrt{2}$
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

253. The centroid of a ΔABC is G. The area of ΔABC is 60 cm^2. The area of ΔGBC is
(1) 10 cm^2 (2) 30 cm^2
(3) 40 cm^2 (4) 20 cm^2
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

254. In trapezium ABCD, AB || CD and AB = 2CD. Its diagonals intersect at O. If the area of ΔAOB = 84 cm^2, then the area of ΔCOD is equal to
(1) 72 cm^2 (2) 21 cm^2
(3) 42 cm^2 (4) 28 cm^2
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

255. Given that the ratio of altitudes of two triangles is 4 : 5, ratio of their areas is 3 : 2. The ratio of their corresponding bases is
(1) 8 : 15 (2) 15 : 8
(3) 5 : 8 (4) 8 : 5
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

256. The area of an isosceles trapezium is 176 cm^2 and the height is $\frac{2}{11}$ th of the sum of its parallel sides. If the ratio of the length of the parallel sides is 4 : 7, then the length of a diagonal (in cm) is
(1) 28 (2) $\sqrt{137}$
(3) $2\sqrt{137}$ (4) 24
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

257. The area of a circle whose radius is the diagonal of a square whose area is 4 sq. units is :
(1) 16π sq. units (2) 4π sq. units
(3) 6π sq. units (4) 8π sq. units
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

258. A rectangular carpet has an area of 120 m^2 and a perimeter of 46 metre. The length of its diagonal is :
(1) 23 metre (2) 13 metre
(3) 17 metre (4) 21 metre
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

259. A plate on square base made of brass is of length x cm and width 1 mm. The plate weighs 4725 gm. If 1 cubic cm of brass weighs 8.4 gram, then the value of x is :
(1) 75 (2) 76
(3) 72 (4) 74
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

260. The length of two parallel sides of a trapezium are 15 cm and 20 cm. If its area is 175 sq.cm, then its height is :
(1) 15 cm (2) 10 cm
(3) 20 cm (4) 25 cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441136)

261. ABCD is a square. Draw a triangle QBC on side BC considering BC as base and draw a triangle PAC on AC as its base such that $\Delta QBC \sim \Delta PAC$. Then, $\frac{\text{Area of } \Delta QBC}{\text{Area of } \Delta PAC}$ is equal to :
(1) $\frac{1}{2}$ (2) $\frac{2}{1}$
(3) $\frac{1}{3}$ (4) $\frac{2}{3}$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

262. The hypotenuse of a right-angled triangle is 39 cm and the difference of other two sides is 21 cm. Then, the area of the triangle is
(1) 270 sq. cm (2) 450 sq. cm
(3) 540 sq. cm (4) 180 sq. cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9622918)

TYPE–II

1. The perimeter of two squares are 24 cm and 32 cm. The perimeter (in cm) of a third square equal in area to the sum of the areas of these squares is :
(1) 45 (2) 40
(3) 32 (4) 48
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

2. The perimeter of two squares are 40 cm and 32 cm. The perimeter of a third square whose area is the difference of the area of the two squares is
(1) 24 cm (2) 42 cm
(3) 40 cm (4) 20 cm
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

3. If the ratio of areas of two squares is 225 : 256, then the ratio of their perimeter is :
(1) 225 : 256 (2) 256 : 225
(3) 15 : 16 (4) 16 : 15
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

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4. The perimeter of two squares are 40 cm and 24 cm. The perimeter of a third square, whose area is equal to the difference of the area of these squares, is
(1) 34 cm (2) 32 cm
(3) 38 cm (4) 30 cm
(SSC CPO S.I. Exam. 09.11.2008)

5. The length and breadth of a rectangular field are in the ratio of 3 : 2. If the perimeter of the field is 80m, its breadth (in metres) is :
(1) 18 (2) 16
(3) 10 (4) 24
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

6. The sides of a rectangular plot are in the ratio 5:4 and its area is equal to 500 sq.m. The perimeter of the plot is :
(1) 80m. (2) 100m.
(3) 90m. (4) 95m.
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

7. The perimeter of the top of a rectangular table is 28m., whereas its area is 48m^2. What is the length of its diagonal?
(1) 5m. (2) 10m.
(3) 12m. (4) 12.5 m.
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

8. If the length and the perimeter of a rectangle are in the ratio 5 : 16, then its length and breadth will be in the ratio
(1) 5 : 11 (2) 5 : 8
(3) 5 : 4 (4) 5 : 3
(SSC CPO S.I. Exam. 09.11.2008)

9. The length and perimeter of a rectangle are in the ratio 5:18. Then length and breadth will be in the ratio
(1) 4 : 3 (2) 3 : 5
(3) 5 : 4 (4) 4 : 7
(SSC Graduate Level Tier-I Exam. 11.11.2012 (1st Sitting)

10. If the area of a rectangle be $(x^2 + 7x + 10)$ sq. cm, then one of the possible perimeter of it is
(1) $(4x + 14)$ cm (2) $(2x + 14)$ cm
(3) $(x + 14)$ cm (4) $(2x + 7)$ cm
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

11. The perimeter of a rectangular plot is 48 m and area is 108 m^2. The dimensions of the plot are
(1) 36 m and 3 m
(2) 12 m and 9 m
(3) 27 m and 4 m
(4) 18 m and 6 m
(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)

12. The sides of a triangle are in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$. If the perimeter of the triangle is 52 cm, the length of the smallest side is :
(1) 24 cm (2) 10 cm
(3) 12 cm (4) 9 cm
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

13. The area of an equilateral triangle is 400 $\sqrt{3}$ sq.m. Its perimeter is :
(1) 120 m (2) 150 m
(3) 90 m (4) 135 m
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

14. From a point in the interior of an equilateral triangle, the perpendicular distance of the sides are $\sqrt{3}$ cm, $2\sqrt{3}$ cm and $5\sqrt{3}$ cm. The perimeter (in cm) of the triangle is
(1) 64 (2) 32
(3) 48 (4) 24
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

15. The perimeter of a triangle is 30 cm and its area is 30 cm^2. If the largest side measures 13 cm, what is the length of the smallest side of the triangle ?
(1) 3 cm (2) 4 cm
(3) 5 cm (4) 6 cm
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

16. The area of a triangle is 216 cm^2 and its sides are in the ratio 3 : 4 : 5. The perimeter of the triangle is :
(1) 6 cm (2) 12 cm
(3) 36 cm (4) 72 cm
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

17. In a triangular field having sides 30m, 72m and 78m, the length of the altitude to the side measuring 72m is :
(1) 25 m (2) 28 m
(3) 30 m (4) 35 m
(SSC CPO S.I. Exam. 16.12.2007)

18. If the perimeter of a right-angled isosceles triangle is $\left(4\sqrt{2}+4\right)$ cm, the length of the hypotenuse is :
(1) 4 cm (2) 6 cm
(3) 8 cm (4) 10 cm
(SSC CPO S.I. Exam. 16.12.2007)

19. Through each vertex of a triangle, a line parallel to the opposite side is drawn. The ratio of the perimeter of the new triangle, thus formed, with that of the original triangle is
(1) 3 : 2 (2) 4 : 1
(3) 2 : 1 (4) 2 : 3
(SSC CPO S.I. Exam. 09.11.2008)

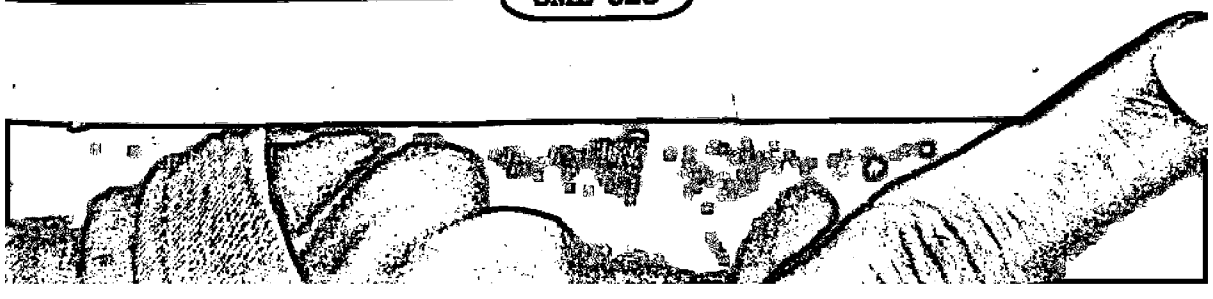
20. The sides of a triangle are in the ratio $\frac{1}{3}:\frac{1}{4}:\frac{1}{5}$ and its perimeter is 94cm. The length of the smallest side of the triangle is:
(1) 18 cm (2) 22.5 cm
(3) 24 cm (4) 27 cm
(SSC CHSL DEO & LDC Exam. 27.11.2010)

21. The length of two sides of an isosceles triangle are 15 and 22 respectively. What are the possible values of perimeter ?
(1) 52 or 59 (2) 52 or 60
(3) 15 or 37 (4) 37 or 29
(SSC CISF Constable (GD) Exam. 05.06.2011)

22. If the perimeter of a right-angled triangle is 56 cm and area of the triangle is 84 sq. cm, then the length of the hypotenuse is (in cm)
(1) 25 (2) 50
(3) 7 (4) 24
(SSC CHSL DEO & LDC Exam. 21.10.2012 (1st Sitting)

23. If the length of each median of an equilateral triangle is $6\sqrt{3}$ cm, the perimeter of the triangle is
(1) 24 cm (2) 32 cm
(3) 36 cm (4) 42 cm
(SSC Graduate Level Tier-I Exam. 11.11.2012 (1st Sitting)

24. The area of an equilateral triangle is $4\sqrt{3}$ sq. cm. Its perimeter is
(1) 12 cm (2) 6 cm
(3) 8 cm (4) $3\sqrt{3}$ cm
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)



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25. The sides of a triangle are in the ratio $\frac{1}{4}:\frac{1}{6}:\frac{1}{8}$ and its perimeter is 91 cm. The difference of the length of longest side and that of shortest side is
(1) 19 cm (2) 20 cm
(3) 28 cm (4) 21 cm
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

26. The diagonals of a rhombus are 32 cm and 24 cm respectively. The perimeter of the rhombus is:
(1) 80 cm (2) 72 cm
(3) 68 cm (4) 64 cm
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

27. The diagonals of a rhombus are 24 cm and 10 cm. The perimeter of the rhombus (in cm) is :
(1) 68 (2) 65
(3) 54 (4) 52
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

28. The perimeter of a rhombus is 40 cm. If one of the diagonals be 12cm long, what is the length of the other diagonal ?
(1) 12 cm (2) $\sqrt{136}$ cm
(3) 16 cm (4) $\sqrt{44}$ cm
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

29. The perimeter of a rhombus is 40 cm. If the length of one of its diagonals be 12 cm, the length of the other diagonal is
(1) 14 cm (2) 15 cm
(3) 16 cm (4) 12 cm
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

30. The sides of a quadrilateral are in the ratio 3 : 4 : 5 : 6 and its perimeter is 72 cm. The length of its greatest side (in cm) is
(1) 24 (2) 27
(3) 30 (4) 36
(SSC (South Zone) Investigator Exam. 12.09.2010)

31. The area of a rhombus is 216 cm^2 and the length of its one diagonal is 24 cm. The perimeter (in cm) of the rhombus is
(1) 52 (2) 60
(3) 120 (4) 100
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

32. The area of a circle is 38.5 sq. cm. Its circumference (in cm) is $\left(\text{use } \pi = \frac{22}{7}\right)$:
(1) 22 (2) 24
(3) 26 (4) 32
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

33. The diameter of a toy wheel is 14 cm. What is the distance travelled by it in 15 revolutions?
(1) 880 cm (2) 660 cm
(3) 600 cm (4) 560 cm
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

34. A can go round a circular path 8 times in 40 minutes. If the diameter of the circle is increased to 10 times the original diameter, the time required by A to go round the new path once travelling at the same speed as before is :
(1) 25 min (2) 20 min
(3) 50 min (4) 100 min
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

35. Diameter of a wheel is 3 cm. The wheel revolves 28 times in a minute. To cover 5.280 km distance, the wheel will take (Take $\pi = \frac{22}{7}$) :
(1) 10 minutes (2) 20 minutes
(3) 30 minutes (4) 40 minutes
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

36. Find the diameter of a wheel that makes 113 revolutions to go 2 km 26 decameters. (Take $P = \frac{22}{7}$)
(1) $4\frac{4}{13}$ m (2) $6\frac{4}{11}$ m
(3) $12\frac{4}{11}$ m (4) $12\frac{8}{11}$ m
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

37. The radius of a circular wheel is 1.75 m. The number of revolutions that it will make in travelling 11 km., is
(1) 1000 (2) 10,000
(3) 100 (4) 10
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003) (Second Sitting)

38. A circular wire of radius 42 cm is bent in the form of a rectangle whose sides are in the ratio of 6 : 5. The smaller side of the rectangle is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 60 cm (2) 30 cm
(3) 25 cm (4) 36 cm
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

39. The number of revolutions, a wheel of diameter 40 cm makes in travelling a distance of 176 m, is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 140 (2) 150
(3) 160 (4) 166
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

40. If the difference between the circumference and diameter of a circle is 30 cm, then the radius of the circle must be
(1) 6 cm (2) 7 cm
(3) 5 cm (4) 8 cm
(SSC CPO S.I. Exam. 03.09.2006)

41. If the perimeter of a semicircular field is 144m, then the diameter of the field is $\left(\text{take } \pi = \frac{22}{7}\right)$
(1) 55m (2) 30m
(3) 28m (4) 56m
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

42. The perimeter (in metres) of a semicircle is numerically equal to its area (in square metres). The length of its diameter is $\left(\text{take } \pi = \frac{22}{7}\right)$
(1) $3\frac{6}{11}$ metres (2) $5\frac{6}{11}$ metres
(3) $6\frac{6}{11}$ metres (4) $6\frac{2}{11}$ metres
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

43. The ratio of the numbers giving the measure of the circumference and the area of a circle of radius 3 cm is
(1) 1 : 3 (2) 2 : 3
(3) 2 : 9 (4) 3 : 2
(SSC CPO S.I. Exam. 09.11.2006)

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44. The ratio of the radii of two wheels is 3 : 4. The ratio of their circumference is
(1) 4 : 3 (2) 3 : 4
(3) 2 : 3 (4) 3 : 2
(SSC CGL Tier-I Exam. 16.06.2010 (Second Sitting)

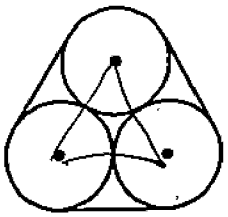
45. The length (in cm) of a chord of a circle of radius 13 cm at a distance of 12 cm from its centre is
(1) 5 (2) 8
(3) 10 (4) 12
(SSC (South Zone) Investigator Exam. 12.09.2010)

46. The diameter of a wheel is 98 cm. The number of revolutions in which it will have to cover a distance of 1540 m is
(1) 500 (2) 600
(3) 700 (4) 800
(SSC CGL Tier-1 Exam.19.06.2011 (First Sitting)

47. The wheel of a motor car makes 1000 revolutions in moving 440 m. The diameter (in metre) of the wheel is
(1) 0.44 (2) 0.14
(3) 0.24 (4) 0.34
(SSC CGL Tier-1 Exam.19.06.2011 (Second Sitting)

48. A bicycle wheel makes 5000 revolutions in moving 11km.Then the radius of the wheel (in cm) is
(Take $\pi = \frac{22}{7}$)
(1) 70 (2) 35
(3) 17.5 (4) 140
(SSC CGL Tier-1 Exam.26.06.2011 (First & Second Sitting)

49. Three circles of diameter 10 cm each, are bound together by a rubber band, as shown in the figure.



The length of the rubber band, (in cm) if it is stretched as shown, is
(1) 30 (2) $30 + 10\pi$
(3) 10π (4) $60 + 20\pi$
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

50. If a chord of length 16 cm is at a distance of 15 cm from the centre of the circle, then the length of the chord of the same circle which is at a distance of 8 cm from the centre is equal to
(1) 10 cm (2) 20 cm
(3) 30 cm (4) 40 cm
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

51. A semicircular shaped window has diameter of 63 cm. Its perimeter equals $\left(\pi = \frac{22}{7}\right)$
(1) 126 cm (2) 162 cm
(3) 198 cm (4) 251 cm
(SSC CISF Constable (GD) Exam. 05.06.2011)

52. A gear 12 cm in diameter is turning a gear 18 cm in diameter. When the smaller gear has 42 revolutions, how many has the larger one made ?
(1) 28 (2) 20
(3) 15 (4) 24
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

53. The perimeter of a semi-circular area is 18cm, then the radius is :
(using $\pi = \frac{22}{7}$)
(1) $5\frac{1}{3}$ cm (2) $3\frac{1}{2}$ cm
(3) 6 cm (4) 4 cm
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

54. A circular road runs around a circular ground. If the difference between the circumference of the outer circle and the inner circle is 66 metres, the width of the road is:
(Take $\pi = \frac{22}{7}$)
(1) 10.5 metres (2) 7 metres
(3) 5.25 metres (4) 21 metres
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

55. A person observed that he required 30 seconds less time to cross a circular ground along its diameter than to cover it once along the boundary. If his speed was 30 m/minute, then the radius of the circular ground is (Take $\pi = \frac{22}{7}$) :
(1) 5.5 m (2) 7.5 m
(3) 10.5 m (4) 3.5 m
(SSC Graduate Level Tier-I Exam. 21.04.2013)

56. The difference of perimeter and diameter of a circle is X unit. The diameter of the circle is
(1) $\frac{X}{\pi - 1}$ unit (2) $\frac{X}{\pi + 1}$ unit
(3) $\frac{X}{\pi}$ unit (4) $\left(\frac{X}{\pi} - 1\right)$ unit
(SSC Graduate Level Tier-I Exam. 19.05.2013)

57. The circumference of a circle is 100 cm. The side of a square inscribed in the circle is
(1) $\frac{100\sqrt{2}}{\pi}$ cm (2) $\frac{50\sqrt{2}}{\pi}$ cm
(3) $\frac{100}{\pi}$ cm (4) $50\sqrt{2}$ cm
(SSC CPO S.I. Exam. 12.01.2003 & 09.11.2008)

58. A path of uniform width surrounds a circular park. The difference of internal and external circumference of this circular path is 132 metres. Its width is :
(Take $\pi = \frac{22}{7}$)
(1) 22m (2) 20 m
(3) 21m (4) 24m
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

59. The ratio of the outer and the inner perimeter of a circular path is 23 : 22. If the path is 5 metres wide, the diameter of the inner circle is :
(1) 110 m (2) 55 m
(3) 220 m (4) 230
(SSC CGL Prelim Exam. 0 .02.2004 (First Sitting)

60. The radius of the incircle of a triangle is 2 cm. If the area of the triangle is 6 cm^2, then its perimeter is
(1) 2 cm (2) 3 cm
(3) 6 cm (4) 9 cm
(SSC CPO (SI, ASI & Intelligence Officer) Exam.28.08.2011 (Paper-I)

61. The area of the circumcircle of an equilateral triangle is 3π s . cm. The perimeter of the triangle is
(1) $3\sqrt{3}$ cm (2) 9 cm
(3) 18 cm (4) 3 cm
(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)



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62. A wire when bent in the form of a square encloses an area of 484 sq. cm. What will be the enclosed area when the same wire is bent into the form of a circle?

(Take $\pi = \frac{22}{7}$)

(1) 462 sq.cm (2) 539 sq.cm
(3) 616 sq.cm (4) 693 sq.cm

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting. Delhi Zone)

63. Four equal sized maximum circular plates are cut off from a square paper sheet of area 784 sq.cm. The circumference of each plate is (Take $\pi = \frac{22}{7}$)

(1) 22 cm (2) 44 cm
(3) 66 cm (4) 88 cm

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

64. If the area of a circle and a square are equal, then the ratio of their perimeter is

(1) 1 : 1 (2) 2 : π
(3) π : 2 (4) $\sqrt{\pi}$: 2

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

65. A copper wire is bent in the form of square with an area of 121 cm^2. If the same wire is bent in the form of a circle, the radius (in cm) of the circle is (Take $\pi = \frac{22}{7}$)

(1) 7 (2) 10
(3) 11 (4) 14

(SSC CGL Tier-1 Exam.19.06.2011 (Second Sitting)

66. If the perimeter of a square and a rectangle are the same, then the area P and Q enclosed by them would satisfy the condition

(1) P < Q (2) P ≤ Q
(3) P > Q (4) P = Q

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

67. A circle and a rectangle have the same perimeter. The sides of the rectangle are 18 cm and 26 cm. The area of the circle is

$\left[\text{Take } \pi = \frac{22}{7}\right]$

(1) 125 cm^2 (2) 230 cm^2
(3) 550 cm^2 (4) 616 cm^2

(SSC Graduate Level Tier-II Exam.16.09.2012)

68. If the sides of an equilateral triangle are increased by 20%, 30% and 50% respectively to form a new triangle, the increase in the perimeter of the equilateral triangle is

(1) 25% (2) $33\frac{1}{3}$%
(3) 75% (4) 100%

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

69. A horse is tied to a post by a rope. If the horse moves along a circular path always keeping the rope stretched and describes 88 metres when it has traced out 72° at the centre, the length of the rope is

$\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 70 m (2) 75 m
(3) 80 m (4) 65 m

(SSC Graduate Level Tier-I Exam. 21.04.2013)

70. Three circles of radii 3.5 cm, 4.5 cm and 5.5 cm touch each other externally. Then the perimeter of the triangle formed by joining the centres of the circles, in cm, is

(1) 27
(2) $\pi[(3.5)^2 + (4.5)^2 + (5.5)^2]$
(3) 27π
(4) 13.5

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

71. ABCD is a parallelogram in which diagonals AC and BD intersect at O. If E, F, G and H are the mid points of AO, DO, CO and BO respectively, then the ratio of the perimeter of the quadrilateral EFGH to the perimeter of parallelogram ABCD is

(1) 1 : 4 (2) 2 : 3
(3) 1 : 2 (4) 1 : 3

(SSC CGL Tier-I Exam. 19.10.2014)

72. A circular wire of diameter 112 cm is cut and bent in the form of a rectangle whose sides are in the ratio of 9 : 7. The smaller side of the rectangle is

(1) 77 cm (2) 97 cm
(3) 67 cm (4) 87 cm

(SSC CGL Tier-I Exam. 26.10.2014)

73. If the perimeter of an equilateral triangle be 18 cm, then the length of each median is

(1) $3\sqrt{2}$ cm (2) $2\sqrt{3}$ cm
(3) $3\sqrt{3}$ cm (4) $2\sqrt{2}$ cm

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

74. Two equal maximum sized circular plates are cut off from a circular paper sheet of circumference 352 cm. Then the circumference of each circular plate is

(1) 176 cm (2) 150 cm
(3) 165 cm (4) 180 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

75. If diagonals of a rhombus are 24 cm and 32 cm, then perimeter of that rhombus is

(1) 80 cm (2) 84 cm
(3) 76 cm (4) 72 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

76. The inradius of an equilateral triangle is $\sqrt{3}$ cm, then the perimeter of that triangle is

(1) 18 cm (2) 15 cm
(3) 12 cm (4) 6 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

77. Length of a side of a square inscribed in a circle is $a\sqrt{2}$ units. The circumference of the circle is

(1) $2\pi a$ units (2) πa units
(3) $4\pi a$ units (4) $\frac{2a}{\pi}$ units

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

78. The perimeter and length of a rectangle are 40 m and 12 m respectively. Its breadth will be

(1) 10 m (2) 8 m
(3) 6 m (4) 3 m

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

79. The difference between the circumference and diameter of a circle is 150 m. The radius of that circle is (Take $\pi = \frac{22}{7}$)

(1) 25 metre (2) 35 metre
(3) 30 metre (4) 40 metre

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

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80. PQRS is a square with side 10 cm. A, B, C and D are mid-points of PQ, QR, RS and SP respectively. Then the perimeter of the square ABCD so formed is

(1) $10\sqrt{2}$ cm (2) $20\sqrt{2}$ cm

(3) $25\sqrt{2}$ cm (4) $15\sqrt{2}$ cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

81. A piece of wire when bent to form a circle will have a radius of 84 cm. If the wire is bent to form a square, the length of a side of the square is

(1) 152 cm (2) 132 cm

(3) 168 cm (4) 225 cm

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

82. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 9 cm. Determine the corresponding side of the second triangle.

(1) 13.5 cm (2) 6 cm

(3) 15 cm (4) 5 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

83. The sides of a triangle having area 7776 sq. cm are in the ratio 3 : 4 : 5. The perimeter of the triangle is

(1) 432 cm (2) 400 cm

(3) 412 cm (4) 424 cm

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

84. The diameter of each wheel of a car is 70 cm. If each wheel rotates 400 times per minute, then the speed of the car (in km/hr) is $\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 0.528 (2) 528

(3) 52.8 (4) 5.28

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

85. Quadrilateral ABCD is circumscribed about a circle. If the lengths of AB, BC and CD are 7 cm, 8.5 cm, and 9.2 cm respectively, then the length (in cm) of DA is

(1) 7.7 (2) 16.2

(3) 10.7 (4) 7.2

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

86. The perimeter of a rhombus is 60 cm and one of its diagonal is 24 cm. The area of the rhombus is

(1) 108 sq. cm. (2) 216 sq. cm.

(3) 432 sq. cm. (4) 206 sq. cm.

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

87. The ratio of circumference and diameter of a circle is 22 : 7. If the circumference be $1\frac{4}{7}$ m, then the radius of the circle is :

(1) $\frac{1}{3}$ m (2) $\frac{1}{2}$ m

(3) $\frac{1}{4}$ m (4) 1 m

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636[illegible])

TYPE–III

1. How many tiles, each 4 decimetre square, will be required to cover the floor of a room 8 m long and 6 m broad ?

(1) 200 (2) 260

(3) 280 (4) 300

(SSC Graduate Level Tier-II Exam. 29.09.2013)

2. The floor of a corridor is 100m long and 3 m wide. Cost of covering the floor with carpet 50 cm wide at the rate of ₹ 15 per m is

(1) ₹ 4500 (2) ₹ 9000

(3) ₹ 7500 (4) ₹ 1900

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

3. Three sides of a triangular field are of length 15 m, 20 m and 25 m long respectively. Find the cost of sowing seeds in the field at the rate of 5 rupees per sq.m.

(1) ₹300 (2) ₹600

(3) ₹750 (4) ₹150

(SSC Graduate Level Tier-I Exam. 21.04.2013)

4. The radius of a circular wheel is 1.75 m. The number of revolutions it will make in travelling 11 km is :

$\left(\text{use } \pi = \frac{22}{7}\right)$

(1) 800 (2) 900

(3) 1000 (4) 1200

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

5. The radius of a wheel is 21 cm. How many revolutions will it make in travelling 924 metres ?

$\left(\text{use } \pi = \frac{22}{7}\right)$

(1) 7 (2) 11

(3) 200 (4) 700

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

6. A playground is in the shape of a rectangle. A sum of ₹1,000 was spent to make the ground usable at the rate of 25 paise per sq. m. The breadth of the ground is 50 m. If the length of the ground is increased by 20 m, what will be the expenditure (in rupees) at the same rate per sq. m. ?

(1) 1,250 (2) 1,000

(3) 1,500 (4) 2,250

(SSC Graduate Level Tier-II Exam.16.09.2012)

7. If each edge of a square be doubled, then the increase percentage in its area is

(1) 200% (2) 250%

(3) 280% (4) 300%

(SSC CHSL DEO & LDC Exam. 16.11.2014)

8. If radius of a circle is increased by 5%, then the increase in its area is

(1) 10.25 % (2) 10 %

(3) 5.75 % (4) 5 %

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

9. The height of a triangle is increased by 10%. To retain the original area of the triangle, its corresponding base must be decreased by

(1) 10% (2) $9\frac{1}{7}\%$

(3) $9\frac{1}{11}\%$ (4) [illegible]

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

10. The percentage increase in the area of a rectangle, if each of its sides is increased by 20% is equal to

(1) 32% (2) 34%

(3) 42% (4) 44%

(SSC CGL Tier-I Re-Exam, 30.08.2015)

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11. If the radius of a circle is decreased by 10%, then the area of the circle is decreased by
(1) 89% (2) 18%
(3) 19% (4) 25%
(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

12. The outer circumference of a circular race-track is 528 metre. The track is everywhere 14 metre wide. Cost of levelling the track at the rate of Rs. 10 per sq. metre is :
(1) Rs. 77660 (2) Rs. 66760
(3) Rs. 76760 (4) Rs. 67760
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–IV

1. The edges of a rectangular box are in the ratio 1 : 2 : 3 and its surface area is 88 cm^2. The volume of the box is
(1) 24 cm^3 (2) 48 cm^3
(3) 64 cm^3 (4) 120 cm^3
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

2. A right triangle with sides 3 cm, 4 cm and 5 cm is rotated about the side 3 cm to form a cone, The volume of the cone so formed is
(1) 16 π cm^3 (2) 12 π cm^3
(3) 15 π cm^3 (4) 20 π cm^3
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

3. If the length of each side of a regular tetrahedron is 12 cm, then the volume of the tetrahedron is
(1) 144$\sqrt{2}$ cu. cm.
(2) 72 $\sqrt{2}$ cu. cm.
(3) 8$\sqrt{2}$ cu. cm.
(4) 12$\sqrt{2}$ cu. cm.
(SS ... 11.12.2011 (Ist Sitting (Delhi Zone)

4. Two right circular cylinders of equal volume have their heights in the ratio 1 : 2. The ratio of their radii is :
(1) $\sqrt{2}$: 1 (2) 2 : 1
(3) 1 : 2 (4) 1 : 4
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

5. The volume of a right circular cylinder whose height is 40cm, and circumference of its base is 66 cm, is :
(1) 55440 cm^3 (2) 3465 cm^3
(3) 7720 cm^3 (4) 13860 cm^3
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

6. The base radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. The ratio of their volumes is :
(1) 27 : 20 (2) 20 : 27
(3) 9 : 4 (4) 4 : 9
(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (Ist Sitting)

7. The curved surface area of a cylindrical pillar is 264 m^2 and its volume is 924 m^3. $\left(\text{Taking } \pi = \frac{22}{7}\right)$. Find the ratio of its diameter to its height.
(1) 7 : 6 (2) 6 : 7
(3) 3 : 7 (4) 7 : 3
(SSC CGL Prelim Exam. 24.02.2002 (IInd Sitting) & (SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting) & CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting, East Zone)

8. A hollow cylindrical tube 20 cm long, is made of iron and its external and internal diameters are 8 cm and 6 cm respectively. The volume of iron used in making the tube is $\left(p = \frac{22}{7}\right)$
(1) 1760 cu.cm. (2) 880 cu.cm.
(3) 440 cu.cm. (4) 220 cu.cm.
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

9. A hollow iron pipe is 21 cm long and its exterior diameter is 8 cm. If the thickness of the pipe is 1 cm and iron weighs 8 g/cm^3, then the weight of the pipe is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 3.696 kg (2) 3.6 kg
(3) 36 kg (4) 36.9 kg
(SSC CGL Prelim Exam. 08.02.2004 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 04.12.2011)

10. The volume of a right circular cylinder, 14 cm in height, is equal to that of a cube whose edge is 11 cm. Taking $\pi = \frac{22}{7}$ the radius of the base of the cylinder is
(1) 5.2 cm. (2) 5.5 cm.
(3) 11.0 cm. (4) 22.0 cm.
(SSC CPO S.I. Exam. 05.09.2004)

11. If the volume of a right circular cylinder is $9\pi h$ m^3, where h is its height (in metres) then the diameter of the base of the cylinder is equal to
(1) 3 m (2) 6 m
(3) 9 m (4) 12 m
(SSC CPO S.I. Exam. 05.09.2004)

12. A right circular cylinder of height 16 cm is covered by a rectangular tin foil of size 16 cm × 22 cm. The volume of the cylinder is
(1) 352 cm^3 (2) 308 cm^3
(3) 616 cm^3 (4) 176 cm^3
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

13. The volume of the metal of a cylindrical pipe is 748 cm^3. The length of the pipe is 14cm and its external radius is 9 cm. Its thickness is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 1 cm (2) 5.2 cm
(3) 2.3 cm (4) 3.7 cm
(SSC CGL Prelim Ex am. 27.07.2008 (First Sitting)

14. Two iron sheets each of diameter 6 cm are immersed in the water contained in a cylindrical vessel of radius 6 cm. The level of the water in the vessel will be raised by
(1) 1 cm (2) 2 cm
(3) 3 cm (4) 6 cm
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

15. The radii of the base of two cylinders A and B are in the ratio 3 : 2 and their height in the ratio n : 1. If the volume of cylinder A is 3 times that of cylinder B, the value of n is
(1) $\frac{4}{3}$ (2) $\frac{2}{3}$
(3) $\frac{3}{4}$ (4) $\frac{3}{2}$
(SSC CPO S.I. Exam. 09.[illegible]08.

16. Water is being pumped out through a circular pipe whose internal diameter is 7cm. If the flow of water is 12 cm per second, how many litres of water is being pumped out in one hour ?
(1) 1663.2 (2) 1500
(3) 1747.6 (4) 2000
(SSC CPO S.I. Exam. 06.09.2009)

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17. The lateral surface area of a cylinder is 1056 cm^2 and its height is 16cm. Find its volume.
(1) 4545 cm^3 (2) 4455 cm^3
(3) 5445 cm^3 (4) 5544 cm^3
(SSC CPO S.I. Exam. 06.09.2009)

18. A cylinder has 'r' as the radius of the base and 'h' as the height. The radius of base of another cylinder, having double the volume but the same height as that of the first cylinder must be equal to
(1) $\frac{r}{\sqrt{2}}$ (2) $2r$
(3) $r\sqrt{2}$ (4) $\sqrt{2r}$
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

19. The diameter of two cylinders, whose volumes are equal, are in the ratio 3 : 2. Their heights will be in the ratio .
(1) 4 : 9 (2) 5 : 6
(3) 5 : 8 (4) 8 : 9
(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

20. From a solid cylinder of height 10 cm and radius of the base 6 cm, a cone of same height and same base is removed. The volume of the remaining solid is :
(1) 240 π cu.cm (2) 5280 cu.cm
(3) 620 π cu.cm (4) 360 π cu.cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

21. From a solid cylinder whose height is 12 cm and diameter 10cm, a conical cavity of same height and same diameter of the base is hollowed out. The volume of the remaining solid is approximately $\left(\pi = \frac{22}{7}\right)$
(1) 942.86 cm^3 (2) 314.29 cm^3
(3) 628.57 cm^3 (4) 450.76 cm^3
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)

22. The radius of a cylinder is 10 cm and height is 4 cm. The number of centimetres that may be added either to the radius or to the height to get the same increase in the volume of the cylinder is
(1) 5 cm (2) 4 cm
(3) 25 cm (4) 16 cm
(SSC Graduate Level Tier-II Exam.16.09.2012)

23. The radii of the base of a cylinder and a cone are in the ratio $\sqrt{3} : \sqrt{2}$ and their heights are in the ratio $\sqrt{2} : \sqrt{3}$. Their volumes are in the ratio of
(1) $\sqrt{3} : \sqrt{2}$ (2) $3\sqrt{3} : \sqrt{2}$
(3) $\sqrt{3} : 2\sqrt{2}$ (4) $\sqrt{2} : \sqrt{6}$
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

24. The curved surface area and the total surface area of a cylinder are in the ratio 1 : 2. If the total surface area of the right cylinder is 616 cm^2, then its volume is :
(1) 1232 cm^3 (2) 1848 cm^3
(3) 1632 cm^3 (4) 1078 cm^3
(SSC Graduate Level Tier-I Exam. 21.04.2013)

25. The perimeter of the base of a right circular cylinder is 'a' unit. If the volume of the cylinder is V cubic unit, then the height of the cylinder is
(1) $\frac{4a^2V}{\pi}$ unit (2) $\frac{4\pi a^2}{V}$ unit
(3) $\frac{\pi a^2 V}{4}$ unit (4) $\frac{4\pi V}{a^2}$ unit
(SSC Graduate Level Tier-I Exam. 19.05.2013)

26. What is the height of a cylinder that has the same volume and radius as a sphere of diameter 12 cm ?
(1) 7 cm (2) 10 cm
(3) 9 cm (4) 8 cm
(SSC CHSL DEO & LDC Exam. 20.10.2013)

27. If diagonal of a cube is $\sqrt{12}$ cm, then its volume in cubic cm is :
(1) 8 (2) 12
(3) 24 (4) $\sqrt[3]{2}$
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

28. If the volume of two cubes are in the ratio 27:1, the ratio of their edge is :
(1) 3 : 1 (2) 27:1
(3) 1:3 (4) 1:27
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC S.O. Commercial Audit Exam. 16.11.2003)

29. The edges of a cuboid are in the ratio 1 : 2 : 3 and its surface area is 88cm^2. The volume of the cuboid is :
(1) 120 cm^3 (2) 64 cm^3
(3) 48 cm^3 (4) 24 cm^3
(SSC CGL Prelim Exam. 04.07.1999 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 28.10.2012)

30. What is the volume of a cube (in cubic cm) whose diagonal measures $4\sqrt{3}$ cm?
(1) 16 (2) 27
(3) 64 (4) 8
(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting) & (SSC CPO S.I. Exam. 03.09.2006)

31. A cuboidal water tank has 216 litres of water. Its depth is $\frac{1}{3}$ of its length and breadth is $\frac{1}{2}$ of $\frac{1}{3}$ of the difference of length and breadth. The length of the tank is
(1) 72 dm (2) 18 dm
(3) 6 dm (4) 2 dm
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

32. A wooden box measures 20 cm by 12 cm by 10 cm. Thickness of wood is 1 cm. Volume of wood to make the box (in cubic cm) is
(1) 960 (2) 519
(3) 2400 (4) 1120
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

33. The area of three adjacent faces of a cuboid are x, y, z square units respectively. If the volume of the cuboid be y cubic units, then the correct relation between v, x, y, z is
(1) $v^2 = xyz$ (2) $v^3 = xyz$
(3) $v^2 = x^3y^3z^3$ (4) $v^3 = x^2y^2z^2$
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

34. Water flows into a tank which is 200m long and 150m wide, through a pipe of cross-section 0.3m x 0.2m at 20 km/hour. Then the time (in hours) for the water level in the tank to reach 8m is
(1) 50 (2) 120
(3) 150 (4) 200
(SSC CGL Tier-I Exam. 19.06.2011 (First Sitting)



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35. A rectangular sheet of metal is 40cm by 15cm. Equal squares of side 4cm are cut off at the corners and the remainder is folded up to form an open rectangular box. The volume of the box is
(1) 896 cm^3 (2) 986 cm^3
(3) 600 cm^3 (4) 916 cm^3
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

36. The areas of three consecutive faces of a cuboid are 12 cm^2, 20 cm^2 and 15 cm^2, then the volume (in cm^3) of the cuboid is
(1) 3600 (2) 100
(3) 80 (4) 60
(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)

37. Surface areas of three adjacent faces of a cuboid are p, q, r. Its volume is
(1) $\sqrt{pq^2+qr^2+rp^2}$
(2) $\left(\sqrt{pq}+\sqrt{qr}+\sqrt{rp}\right)\left(p^2+q^2+r^2\right)$
(3) $\left(\sqrt{\left(p^2+q^2+r^2\right)(p+q+r)}\right)$
(4) $\sqrt{pqr}$
(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

38. A godown is 15 m long and 12 m broad. The sum of the area of the floor and the ceiling is equal to the sum of areas of the four walls. The volume (in m^3) of the godown is:
(1) 900 (2) 1200
(3) 1800 (4) 720
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

39. If the total surface area of a cube is 96 cm^2, its volume is
(1) 56 cm^3 (2) 16 cm^3
(3) 64 cm^3 (4) 36 cm^3
(SSC CHSL DEO & LDC Exam. 20.10.2013)

40. The ratio of the volume of two cones is 2 : 3 and the ratio of radii of their base is 1 : 2. The ratio of their height is
(1) 3 : 8 (2) 8 : 3
(3) 4 : 3 (4) 3 : 4
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CPO S.I. Exam. 03.09.2006) & (SSC CHSL DEO & LDC Exam. 10.11.2013)

41. If the height of a given cone be doubled and radius of the base remains the same, the ratio of the volume of the given cone to that of the second cone will be
(1) 2 : 1 (2) 1 : 8
(3) 1 : 2 (4) 8 : 1
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

42. If the radius of the base of a cone be doubled and height is left unchanged, then ratio of the volume of new cone to that of the original cone will be :
(1) 1 : 4 (2) 2 : 1
(3) 1 : 2 (4) 4 : 1
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

43. Each of the measure of the radius of base of a cone and that of a sphere is 8 cm. Also, the volume of these two solids are equal. The slant height of the cone is
(1) $8\sqrt{17}$ cm (2) $4\sqrt{17}$ cm
(3) $34\sqrt{2}$ cm (4) 34 cm.
(SSC CPO S.I. Exam. 05.09.2004)

44. A cone of height 15 cm and basediameter 30 cm is carved out of a wooden sphere of radius 15 cm. The percentage of wasted wood is :
(1) 75% (2) 50%
(3) 40% (4) 25%
(SSC CPO S.I. Exam. 26.05.2005)

45. In a right circular cone, the radius of its base is 7 cm and its height 24 cm. A cross-section is made through the midpoint of the height parallel to the base. The volume of the upper portion is
(1) 169 cm^3 (2) 154 cm^3
(3) 1078 cm^3 (4) 800 cm^3
(SSC Section Officer (Commercial Audit) Exam.26.11.2006 (Second Sitting)

46. If the area of the base of a cone is 770 cm^2 and the area of the curved surface is 814 cm^2, then its volume (in cm^3) is :
(1) $213\sqrt{5}$ (2) $392\sqrt{5}$
(3) $550\sqrt{5}$ (4) $616\sqrt{5}$
(SSC CPO S.I. Exam. 16.12.2007)

47. Volume of two cones are in the ratio 1 : 4 and their diameters are in the ratio 4 : 5. The ratio of their height is
(1) 1 : 5 (2) 5 : 4
(3) 5 : 16 (4) 25 : 64
(SSC CPO S.I. Exam. 06.09.2009)

48. The height of the cone is 30 cm. A small cone is cut off at the top by a plane parallel to its base. If its volume is $\frac{1}{27}$ of the volume of the cone, at what height, above the base, is the section made?
(1) 6 cm (2) 8 cm
(3) 10 cm (4) 20 cm
(SSC Data Entry Operator Exam. 31.08.2008)

49. The radius of the base and height of a right circular cone are in the ratio 5 : 12. If the volume of the cone is $314\frac{2}{7}$ cm^3, the slant height (in cm) of the cone will be
(1) 12 (2) 13
(3) 15 (4) 17
(SSC Data Entry Operator Exam. 02.08.2009)

50. Two solid right cones of equal height and of radii r_1 and r_2 are melted and made to form a solid sphere of radius R. Then the height of the cone is
(1) $\frac{4R^2}{r_1^2+r_2^2}$ (2) $\frac{4R}{r_1+r_2}$
(3) $\frac{4R^3}{r_1^2+r_2^2}$ (4) $\frac{R^2}{r_1^2+r_2^2}$
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

51. The ratio of radii of two cone is 3 : 4 and the ratio of their height is 4 : 3. Then the ratio of their volume will be
(1) 3 : 4 (2) 4 : 3
(3) 9 : 16 (4) 16 : 9
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

52. If a right circular cone is separated into solids of volumes V_1, V_2, V_3 by two planes parallel to the base, which also trisect the altitude, then $V_1 : V_2 : V_3$ is
(1) 1: 2 : 3 (2) 1: 4 : 6
(3) 1: 6 : 9 (4) 1: 7 : 19
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

53. If the radii of the circular ends of a truncated conical bucket which is 45cm high be 28 cm and 7 cm, then the capacity of the bucket in cubic centimetre is $\left(use\,\pi=\frac{22}{7}\right)$
(1) 48510 (2) 45810
(3) 48150 (4) 48051
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

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54. The ratio of height and the diameter of a right circular cone is 3 : 2 and its volume is 1078 cc, then (taking $\pi = \frac{22}{7}$) its height is :
(1) 7 cm (2) 14 cm
(3) 21 cm (4) 28 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

55. The radius of the base of a right circular cone is doubled keeping its height fixed. The volume of the cone will be :
(1) three times of the previous volume
(2) four times of the previous volume
(3) $\sqrt{2}$ times of the previous volume
(4) double of the previous volume
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

56. The heights of two cones are in the ratio 1 : 3 and the diameters of their base are in the ratio 3 : 5. The ratio of their volume is
(1) 3 : 25 (2) 4 : 25
(3) 6 : 25 (4) 7 : 25
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

57. The base of a right circular cone has the same radius a as that of a sphere. Both the sphere and the cone have the same volume. Height of the cone is
(1) 3a (2) 4a
(3) $\frac{7}{4}a$ (4) $\frac{7}{3}a$
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

58. The circumference of the base of a 16cm height solid cone is 33cm. What is the volume of the cone in cm^3 ?
(1) 1028 (2) 616
(3) 462 (4) 828
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

59. The perimeter of the base of a right circular cone is 8 cm. If the height of the cone is 21 cm, then its volume is:
(1) 108 π cm^3 (2) $\frac{112}{\pi}$ cm^3
(3) 112 π cm^3 (4) $\frac{108}{\pi}$ cm^3
(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

60. If the volume of two right circular cones are in the ratio 4 : 1 and their diameter are in the ratio 5 : 4, then the ratio of their height is :
(1) 25 :16 (2) 25 : 64
(3) 64 : 25 (4) 16 : 25
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

61. The volume of a conical tent is 1232 cu. m and the area of its base is 154 sq. m. Find the length of the canvas required to build the tent, if the canvas is 2m in width.
$\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 270 m (2) 272 m
(3) 276 m (4) 275 m
(SSC Graduate Level Tier-II Exam. 29.09.2013)

62. If the ratio of the diameters of two right circular cones of equal height be 3 : 4, then the ratio of their volume will be
(1) 3 : 4 (2) 9 : 16
(3) 16 : 9 (4) 27 : 64
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

63. A hollow spherical metallic ball has an external diameter 6 cm and is $\frac{1}{2}$ cm thick. The volume of the ball (in cm^3) is $\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) $41\frac{2}{3}$ (2) $37\frac{2}{3}$
(3) $47\frac{2}{3}$ (4) $40\frac{2}{3}$
(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

64. The sum of radii of two spheres is 10 cm and the sum of their volume is 880 cm^3. What will be the product of their radii ?
(1) 21 (2) $26\frac{1}{3}$
(3) $33\frac{1}{3}$ (4) 70
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

65. If the radius of a sphere is doubled, its volume becomes
(1) double (2) four times
(3) six times (4) eight times
(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

66. The radii of two spheres are in the ratio 3 : 2. Their volume will be in the ratio :
(1) 9 : 4 (2) 3 : 2
(3) 8 : 27 (4) 27 : 8
(SSC CPO S.I. Exam. 16.12.2007)

67. The total surface area of a solid hemisphere is 108π cm^2. The volume of the hemisphere is
(1) 72π cm^3 (2) 144π cm^3
(3) $108\sqrt{6}$ cm^3 (4) $54\sqrt{6}$ cm^3
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

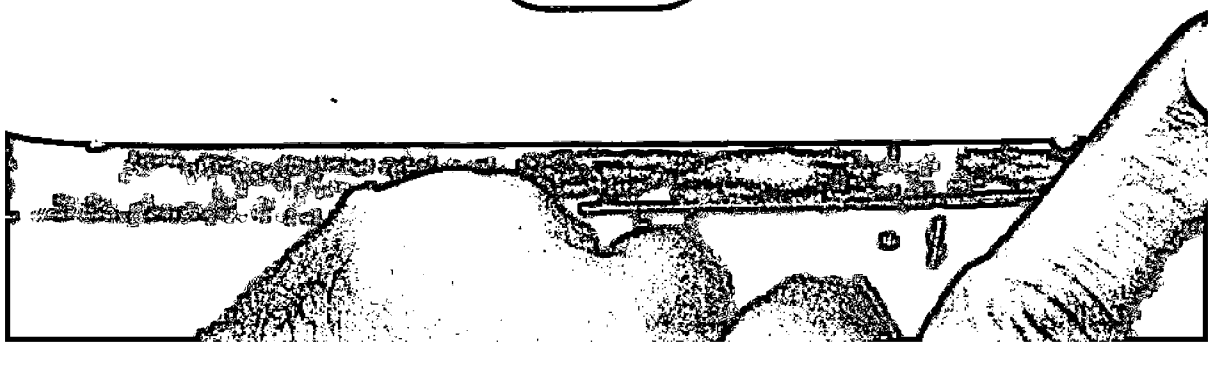
68. The largest sphere is carved out of a cube of side 7 cm. The volume of the sphere (in cm^3) will be
(1) 718.66 (2) 543.72
(3) 481.34 (4) 179.67
(SSC CPO S.I. Exam. 06.09.2009)

69. The surface areas of two spheres are in the ratio 4 : 9. Their volumes will be in the ratio
(1) 2 : 3 (2) 4 :9
(3) 8 : 27 (4) 64 : 729
(SSC Data Entry Operator Exam. 31.08.2008) & (SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting) & (SSC GL Tier-II Exam. 29.09.2013)

70. A sphere and a hemisphere have the same volume. The ratio of their radii is
(1) 1 : 2 (2) 1 : 8
(3) 1 : $\sqrt{2}$ (4) 1 : $\sqrt[3]{2}$
(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

71. A solid sphere of 6 cm diameter is melted and recast into 8 solid spheres of equal volume. The radius (in cm) of each small sphere is
(1) 1.5 (2) 3
(3) 2 (4) 2.5
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

72. The total surface area of a sphere is 8π square unit. The volume of the sphere is
(1) $\frac{8\sqrt{2}}{3}\pi$ cubic unit
(2) $\frac{8}{3}\pi$ cubic unit
(3) $8\sqrt{3}\pi$ cubic unit
(4) $\frac{8\sqrt{3}}{5}\pi$ cubic unit
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)



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73. Area of the base of a pyramid is 57 sq.cm. and height is 10 cm, then its volume (in cm^3), is
(1) 570 (2) 390
(3) 190 (4) 590
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

74. There is a pyramid on a base which is a regular hexagon of side 2a cm. If every slant edge of this pyramid is of length $\frac{5a}{2}$ cm, then the volume of this pyramid is
(1) $3a^3$ cm^3 (2) $3\sqrt{2}\,a^3$ cm^3
(3) $3\sqrt{3}\,a^3$ cm^3 (4) $6a^3$ cm^3
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

75. The base of a right pyramid is a square of side 40 cm long. If the volume of the pyramid is 8000 cm^3, then its height is :
(1) 5 cm (2) 10 cm
(3) 15 cm (4) 20 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

76. The base of a right prism is a trapezium. The length of the parallel sides are 8 cm and 14 cm and the distance between the parallel sides is 8 cm. If the volume of the prism is 1056 cm^3, then the height of the prism is
(1) 44 cm (2) 16.5 cm
(3) 12 cm (4) 10.56 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

77. The height of a right prism with a square base is 15 cm. If the area of the total surface of the prism is 608 sq. cm, its volume is
(1) 910 cm^3 (2) 920 cm^3
(3) 960 cm^3 (4) 980 cm^3
(SSC Graduate Level Tier-II Exam.16.09.2012)

78. The base of a right prism is an equilateral triangle of side 8 cm and height of the prism is 10 cm. Then the volume of the prism is
(1) $320\sqrt{3}$ cubic cm
(2) $160\sqrt{3}$ cubic cm
(3) $150\sqrt{3}$ cubic cm
(4) $300\sqrt{3}$ cubic cm
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

79. The base of right prism is a triangle whose perimeter is 28 cm and the inradius of the triangle is 4 cm. If the volume of the prism is 366 cc, then its height is
(1) 6 cm (2) 8 cm
(3) 4 cm (4) None of these
(SSC CHSL DEO & LDC Exam. 20.10.2013)

80. If the base of a right pyramid is triangle of sides 5 cm, 12 cm, 13 cm and its volume is 330 cm^3, then its height (in cm) will be
(1) 33 (2) 32
(3) 11 (4) 22
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

81. The diameter of the moon is assumed to be one fourth of the diameter of the earth. Then the ratio of the volume of the earth to that of the moon is
(1) 64 : 1 (2) 1 : 64
(3) 60 : 7 (4) 7 : 60
(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

82. A conical vessel whose internal radius is 12 cm and height 50 cm is full of liquid. The contents are emptied into a cylindrical vessel with radius (internal) 10 cm. The height to which the liquid rises in the cylindrical vessel is :
(1) 25cm (2) 20cm
(3) 24cm (4) 22cm
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

83. The volume of a right circular cylinder is equal to the volume of that right circular cone whose height is 108 cm and diameter of base is 30 cm. If the height of the cylinder is 9 cm, the diameter of its base is
(1) 30 cm (2) 60 cm
(3) 50 cm (4) 40 cm
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

84. The total surface area of a cube and a sphere are equal. What will be the ratio between their volume ?
(1) $\pi : 6$ (2) $\sqrt{\pi} : \sqrt{6}$
(3) $\sqrt{6} : \sqrt{\pi}$ (4) $6 : \pi$
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005) & (SSC HSGL Data Entry & LDC Exam. 28.11.2010 (Ist Sitting) & (SSC MTS (Non-Technical Staff Exam. 20.02.2011)

85. A rectangular paper sheet of dimensions 22 cm × 12 cm is folded in the form of a cylinder along its length. What will be the volume of this cylinder ? (Take $\pi = \frac{22}{7}$)
(1) 460 cm^3 (2) 462 cm^3
(3) 624 cm^3 (4) 400 cm^3
(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

86. The ratio of the volume of a cube to that of a sphere, which will fit exactly inside the cube, is
(1) $\pi : 6$ (2) $6 : \pi$
(3) $3 : \pi$ (4) $\pi : 3$
(SSC CGL Prelim Exam. 13.11.2005 (IInd Sitting) & (SSC CGL Prelim Exam. 27.07.2008 (Ist Sitting)

87. The volume of a sphere and a right circular cylinder having the same radius are equal . The ratio of the diameter of the sphere to the height of the cylinder is
(1) 3 : 2 (2) 2 : 3
(3) 1 : 2 (4) 2 : 1
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

88. The size of a rectangular piece of paper is 100 cm × 44 cm. A cylinder is formed by rolling the paper along its length. The volume of the cylinder is (Use $\pi = \frac{22}{7}$)
(1) 4400 cm^3 (2) 15400 cm^3
(3) 35000 cm^3 (4) 144 cm^3
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

89. A cone, a hemisphere and a cylinder stand on equal bases and have the same height. The ratio of their respective volume is
(1) 1 : 2 : 3 (2) 2 : 1 : 3
(3) 1 : 3 : 2 (4) 3 : 1 : 2
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Delhi Zone) & (FCI Asst. Grade-III Exam. 25.02.2012 (Paper-I, North Zone, Ist Sitting)

90. The height of a cylinder and that of a cone are in the ratio 2 : 3 and the radii of their bases in the ratio 3 : 4. The ratio of their volume will be
(1) 1 : 9 (2) 2 : 9
(3) 9 : 8 (4) 3 : 8
(SSC CPO S.I. Exam. 09.11.2008)

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91. Water is flowing at the rate of 5 km/h through a pipe of diameter 14 cm into a rectangular tank which is 50 m long, 44m wide. The time taken (in hours) for the rise in the level of water in the tank to be 7 cm is

(1) 2 (2) $1\frac{1}{2}$

(3) 3 (4) $2\frac{1}{2}$

(SSC CPO S.I. Exam. 06.09.2009 & (SSC CGL Tier-I Exam. 19.06.2011 (IInd Sitting)

92. The total surface area of a solid right circular cylinder is twice that of a solid sphere. If they have the same radii, the ratio of the volume of the cylinder to that of the sphere is given by

(1) 9 : 4 (2) 2 : 1
(3) 3 : 1 (4) 4 : 9

(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

93. In a cylindrical vessel of diameter 24 cm filled up with sufficient quantity of water, a solid spherical ball of radius 6 cm is completely immersed. Then the increase in height of water level is :

(1) 1.5 cm (2) 2 cm
(3) 3 cm (4) 4.2 cm

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

94. A solid wooden toy is in the shape of a right circular cone mounted on a hemisphere. If the radius of the hemisphere is 4.2 cm and the total height of the toy is 10.2 cm, find the volume of the wooden toy (nearly).

(1) 104 cm^3 (2) 162 cm^3
(3) 427 cm^3 (4) 266 cm^3

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)

95. The respective height and volume of a hemisphere and a right circular cylinder are equal, then the ratio of their radii is

(1) $\sqrt{2} : \sqrt{3}$ (2) $\sqrt{3} : 1$

(3) $\sqrt{3} : \sqrt{2}$ (4) $2 : \sqrt{3}$

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

96. The ratio of the volume of a cube and of a solid sphere is 363 : 49. The ratio of an edge of the cube and the radius of the sphere is (taking $\pi = \frac{22}{7}$)

(1) 7 : 11 (2) 22 : 7
(3) 11 : 7 (4) 7: 22

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

97. From a right circular cylinder of radius 10 cm and height 21 cm, a right circular cone of same base-radius is removed. If the volume of the remaining portion is 4400 cm^3, then the height of the removed cone (taking $\pi = \frac{22}{7}$) is :

(1) 15 cm (2) 18 cm
(3) 21 cm (4) 24 cm

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

98. If a solid cone of volume $27\pi\ cm^3$ is kept inside a hollow cylinder whose radius and height are that of the cone, then the volume of water needed to fill the empty space is

(1) $3\pi\ cm^3$ (2) $18\pi\ cm^3$
(3) $54\pi\ cm^3$ (4) $81\pi\ cm^3$

(SSC Graduate Level Tier-II Exam.16.09.2012)

99. A cylindrical can whose base is horizontal and is of internal radius 3.5 cm contains sufficient water so that when a solid sphere is placed inside, water just covers the sphere. The sphere fits in the can exactly. The depth of water in the can before the sphere was put, is

(1) $\frac{35}{3}$ cm (2) $\frac{17}{3}$ cm

(3) $\frac{7}{3}$ cm (4) $\frac{14}{3}$ cm

(SSC Graduate Level Tier-II Exam.16.09.2012)

100. If A denotes the volume of a right circular cylinder of same height as its diameter and B is the volume of a sphere of same radius, then $\frac{A}{B}$ is :

(1) $\frac{4}{3}$ (2) $\frac{3}{2}$

(3) $\frac{2}{3}$ (4) $\frac{3}{4}$

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

101. The base of a right circular cone has the same radius a as that of a sphere. Both the sphere and the cone have the same volume. Height of the cone is

(1) $3a$ (2) $4a$

(3) $\frac{7}{4}a$ (4) $\frac{7}{3}a$

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

102. The radii of the base of a cylinder and a cone are in the ratio $\sqrt{3} : \sqrt{2}$ and their heights are in the ratio $\sqrt{2} : \sqrt{3}$. Their volume are in the ratio of

(1) $\sqrt{3} : \sqrt{2}$ (2) $3\sqrt{3} : \sqrt{2}$

(3) $\sqrt{3} : 2\sqrt{2}$ (4) $\sqrt{2} : \sqrt{6}$

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

103. A semicircular sheet of metal of diameter 28 cm is bent into an open conical cup. The capacity of the cup (taking $\pi = \frac{22}{7}$) is

(1) 624.26 cm^3 (2) 622.38 cm^3
(3) 622.56 cm^3 (4) 623.20 cm^3

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

104. A conical flask is full of water. The flask has base radius r and height h. This water is poured into a cylindrical flask of base radius m. The height of water in the cylindrical flask is

(1) $\frac{m}{2h}$ (2) $\frac{h}{2}m^2$

(3) $\frac{2h}{m}$ (4) $\frac{h}{3m^2}$

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

105. The volume of a cylinder and a cone are in the ratio 3 : 1. Find their diameters and then compare them when their heights are equal.

(1) Diameter of cylinder = 2 times of diameter of cone
(2) Diameter of cylinder = Diameter of cone
(3) Diameter of cylinder > Diameter of cone
(4) Diameter of cylinder < Diameter of cone

(SSC CHSL DEO & LDC Exam. 20.10.2013)

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106. A cone of height 7 cm and base radius 1 cm is carved from a cuboidal block of wood 10 cm × 5cm × 2 cm. [Assuming $\pi = \frac{22}{7}$]

The percentage wood wasted in the process is :

(1) $92\frac{2}{3}\%$ (2) $46\frac{1}{3}\%$

(3) $53\frac{2}{3}\%$ (4) $7\frac{1}{3}\%$

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

107. If the radius of a cylinder is decreased by 50% and the height is increased by 50% to form a new cylinder, the volume will be decreased by

(1) 0% (2) 25%

(3) 62.5% (4) 75%

(SSC CPO S.I. Exam. 07.09.2003)

108. Each of the height and base-radius of a cone is increased by 100%. The percentage increase in the volume of the cone is

(1) 700% (2) 400%

(3) 300% (4) 100%

(SSC CPO S.I. Exam. 07.09.2003)

109. If both the radius and height of a right circular cone are increased by 20%, its volume will be increased by

(1) 20% (2) 40%

(3) 60% (4) 72.8%

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

110. If the height of a right circular cone is increased by 200% and the radius of the base is reduced by 50%, the volume of the cone

(1) increases by 25%

(2) increases by 50%

(3) remains unaltered

(4) decreases by 25%

(SSC CPO S.I. Exam. 03.09.2006)

111. If the height and the radius of the base of a cone are each increased by 100%, then the volume of the cone becomes

(1) double that of the original

(2) three times that of the original

(3) six times that of the original

(4) eight times that of the original

(SSC CPO S.I. Exam. 03.09.2006)

112. If the radius of a right circular cylinder is decreased by 50% and its height is increased by 60%, its volume will be decreased by

(1) 10% (2) 60%

(3) 40% (4) 20%

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

113. The length, breadth and height of a cuboid are in the ratio 1 : 2 : 3. If they are increased by 100%, 200% and 200% respectively, then compared to the original volume the increase in the volume of the cuboid will be

(1) 5 times (2) 18 times

(3) 12 times (4) 17 times

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

114. Each of the radius of the base and the height of a right circular cylinder is increased by 10%. The volume of the cylinder is increased by

(1) 3.31% (2) 14.5%

(3) 33.1% (4) 19.5%

(SSC CPO S.I. Exam. 09.11.2008) & (SSC SAS Exam. 26.06.2010 (Paper-I)

115. If the height of a cone is increased by 100% then its volume is increased by :

(1) 100% (2) 200%

(3) 300% (4) 400%

(SSC CHSL DEO & LDC Exam. 27.11.2010)

116. A hemispherical cup of radius 4 cm is filled to the brim with coffee. The coffee is then poured into a vertical cone of radius 8 cm and height 16 cm. The percentage of the volume of the cone that remains empty is :

(1) 87.5% (2) 80.5%

(3) 81.6% (4) 88.2%

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

117. The volume (in m^3) of rain water that can be collected from 1.5 hectares of ground in a rainfall of 5 cm is

(1) 75 (2) 750

(3) 7500 (4) 75000

(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

118. Each edge of a regular tetrahedron is 3 cm, then its volume is

(1) $\frac{9\sqrt{2}}{4}$ c.c. (2) $27\sqrt{3}$ c.c.

(3) $\frac{4\sqrt{2}}{9}$ c.c. (4) $9\sqrt{3}$ c.c.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

119. The perimeter of the triangular base of a right prism is 15 cm and radius of the incircle of the triangular base is 3 cm. If the volume of the prism be 270 cm^3 then the height of the prism is

(1) 6 cm (2) 7·5 cm

(3) 10 cm (4) 12 cm

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

120. A prism has as the base a right-angled triangle whose sides adjacent to the right angles are 10 cm and 12 cm long. The height of the prism is 20 cm. The density of the material of the prism is 6 gm/cubic cm. The weight of the prism is

(1) 6.4 kg (2) 7.2 kg

(3) 3.4 kg (4) 4.8 kg

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

121. A copper rod of 1 cm diameter and 8 cm length is drawn into a wire of uniform diameter and 18 m length. The radius (in cm) of the wire is

(1) $\frac{1}{15}$ (2) $\frac{1}{30}$

(3) $\frac{2}{15}$ (4) 15

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

122. A well 20 m in diameter is dug 14 m deep and the earth taken out is spread all around it to a width of 5 m to form an embankment. The height of the embankment is :

(1) 10 m (2) 11 m

(3) 11.2 m (4) 11.5 m

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

123. Two solid cylinders of radii 4 cm and 5cm and length 6 cm and 4 cm respectively are recast into cylindrical disc of thickness1 cm. The radius of the disc is

(1) 7 cm (2) 14 cm

(3) 21 cm (4) 28 cm

(SSC CPO S.I. Exam. 06.09.2009)

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124. A metallic hemisphere is melted and recast in the shape of a cone with the same base radius (R) as that of the hemisphere. If H is the height of the cone, then :

(1) $H = 2R$ (2) $H = \frac{2}{3}R$

(3) $H = \sqrt{3R}$ (4) $B = 3R$

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

125. Three solid metallic spheres of diameter 6 cm, 8 cm and 10 cm are melted and recast into a new solid sphere. The diameter of the new sphere is :

(1) 4 cm (2) 6 cm

(3) 8 cm (4) 12 cm

(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

126. Three solid metallic balls of radii 3 cm, 4 cm and 5 cm are melted and moulded into a single solid ball. The radius of the new ball is :

(1) 2 cm (2) 3 cm

(3) 4 cm (4) 6 cm

(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

127. Three solid spheres of a metal whose radii are 1 cm, 6 cm and 8 cm are melted to form an other solid sphere. The radius of this new sphere is

(1) 10.5 cm (2) 9.5 cm

(3) 10 cm (4) 9 cm

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

128. A sphere of radius 2 cm is put into water contained in a cylinder of base-radius 4 cm. If the sphere is completely immersed in the water, the water level in the cylinder rises by

(1) $\frac{1}{3}$ cm (2) $\frac{1}{2}$ cm

(3) $\frac{2}{3}$ cm (4) 2 cm

(SSC CPO S.I. Exam. 07.09.2003)

129. 12 spheres of the same size are made by melting a solid cylinder of 16 cm diameter and 2 cm height. The diameter of each sphere is :

(1) 2 cm (2) 4 cm

(3) 3 cm (4) $\sqrt{3}$ cm

(SSC CGL Prelim Exam. 13.11.2005 (First Sitting)

130. By melting a solid lead sphere of diameter 12 cm, three small spheres are made whose diameters are in the ratio 3 : 4 : 5. The radius (in cm) of the smallest sphere is

(1) 3 (2) 6

(3) 1.5 (4) 4

(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

131. A solid metallic sphere of radius 3 decimetres is melted to form a circular sheet of 1 millimetre thickness. The diameter of the sheet so formed is

(1) 26 metres (2) 24 metres

(3) 12 metres (4) 6 metres

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

132. A copper wire of length 36 m and diameter 2 mm is melted to form a sphere. The radius of the sphere (in cm) is

(1) 2.5 (2) 3

(3) 3.5 (4) 4

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting)

133. A child reshapes a cone made up of clay of height 24cm and radius 6cm into a sphere. The radius (in cm) of the sphere is

(1) 6 (2) 12

(3) 24 (4) 48

(SSC CGL Tier-I Exam. 19.06.2011 (First Sitting)

134. A solid metallic spherical ball of diameter 6 cm is melted and recasted into a cone with diameter of the base as 12 cm. The height of the cone is

(1) 6 cm (2) 2 cm

(3) 4 cm (4) 3 cm

(SSC CPO S.I. Exam. 12.01.2003)

135. The diameter of the iron ball used for the shot-put game is 14 cm. It is melted and then a solid cylinder of height $2\frac{1}{3}$ cm is made. What will be the diameter of the base of the cylinder ?

(1) 14 cm (2) 28 cm

(3) $\frac{14}{3}$ cm (4) $\frac{28}{3}$ cm

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

136. The radius of the base and height of a metallic solid cylinder are r cm and 6 cm respectively. It is melted and recast into a solid cone of the same radius of base. The height of the cone is :

(1) 54 cm (2) 27 cm

(3) 18 cm (4) 9 cm

(SSC CPO S.I. Exam. 16.12.2007)

137. A solid metallic cone is melted and recast into a solid cylinder of the same base as that of the cone. If the height of the cylinder is 7cm, the height of the cone was

(1) 20 cm (2) 21 cm

(3) 28 cm (4) 24 cm

(SSC Data Entry Operator Exam. 02.08.2009)

138. A solid spherical copper ball, whose diameter is 14 cm, is melted and converted into a wire having diameter equal to 14 cm. The length of the wire is

(1) 27 cm (2) $\frac{16}{3}$ cm

(3) 15 cm (4) $\frac{28}{3}$ cm

(SSC Constable (GD) Exam. 12.05.2013 Ist Sitting)

139. A solid sphere is melted and recast into a right circular cone with a base radius equal to the radius of sphere. What is the ratio of the height and radius of the cone so formed?

(1) 4:3 (2) 2:3

(3) 3 : 4 (4) 4 :1

(SSC Constable (GD) Exam. 12.05.2013)

140. A sphere of diameter 6 cm is dropped in a right circular cylindrical vessel partly filled with water. The diameter of the cylindrical vessel is 12 cm. If the sphere is just completely submerged in water, then the rise of water level in the cylindrical vessel is

(1) 2 cm (2) 1 cm

(3) 3 cm (4) 4 cm

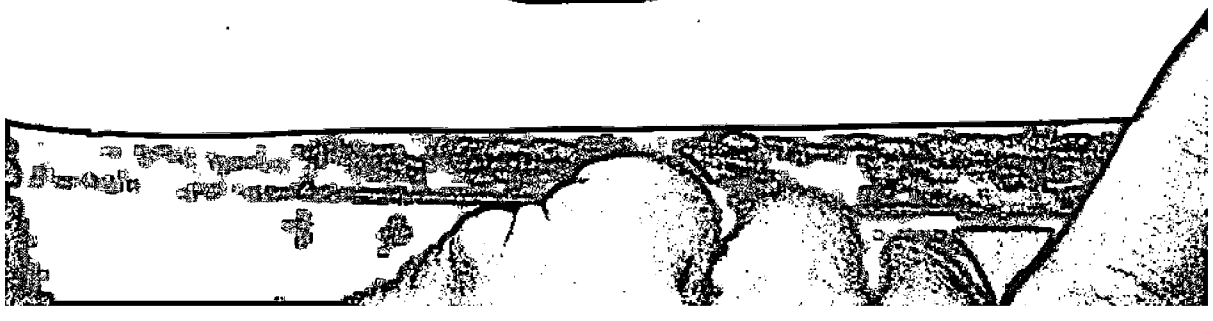
(SSC Graduate Level Tier-I Exam. 19.05.2013)

141. A copper sphere of diameter 18 cm is drawn into a wire of diameter 4 mm. The length of the wire, in metre, is :

(1) 2.43 (2) 243

(3) 2430 (4) 24.3

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)



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142. A rectangular block of metal has dimensions 21 cm, 77 cm and 24 cm. The block has been melted into a sphere. The radius of the sphere is

$\left(\text{Take } \pi = \frac{22}{7}\right)$

(1) 21 cm (2) 7 cm
(3) 14 cm (4) 28 cm

(SSC Graduate Level Tier-II Exam. 29.09.2013

143. The radius of cross-section of a solid cylindrical rod of iron is 50 cm. The cylinder is melted down and formed into 6 solid spherical balls of the same radius as that of the cylinder. The length of the rod (in metres) is

(1) 0.8 (2) 2
(3) 3 (4) 4

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

144. Two right circular cones of equal height of radii of base 3 cm and 4 cm are melted together and made to a solid sphere of radius 5 cm. The height of a cone is

(1) 10 cm (2) 20 cm
(3) 30 cm (4) 40 cm

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

145. A tank 40 m long, 30 m broad and 12 m deep is dug in a field 1000 m long and 30 m wide. By how much will the level of the field rise if the earth dug out of the tank is evenly spread over the field ?

(1) 2 metre (2) 1.2 metre
(3) 0.5 metre (4) 5 metre

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

146. A right pyramid 6 m hight has a square base of which the diagonal is $\sqrt{1152}$ m. Volume of the pyramid is

(1) 144 m^3 (2) 288 m^3
(3) 576 m^3 (4) 1152 m^3

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

147. If the ratio of volumes of two cones is 2 : 3 and the ratio of the radii of their bases is 1 : 2, then the ratio of their heights will be

(1) 8 : 3 (2) 3 : 8
(3) 4 : 3 (4) 3 : 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

148. Two cubes have their volumes in the ratio 27 : 64. The ratio of their surface areas is

(1) 9 : 25 (2) 16 : 25
(3) 9 : 16 (4) 4 : 9

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

149. The radius of the base and the height of a right circular cone are doubled. The volume of the cone will be

(1) 8 times of the previous volume
(2) three times of the previous volume
(3) $3\sqrt{2}$ times of the previous volume
(4) 6 times of the previous volume

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

150. The ratio of weights of two spheres of different materials is 8 : 17 and the ratio of weights per 1 cc of materials of each is 289 : 64. The ratio of radii of the two spheres is

(1) 8 : 17 (2) 4 : 17
(3) 17 : 4 (4) 17 : 8

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

151. Three cubes of sides 6 cm, 8 cm and 1 cm are melted to form a new cube. The surface area of the new cube is

(1) 486 cm^2 (2) 496 cm^2
(3) 586 cm^2 (4) 658 cm^2

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

152. A sphere is cut into two hemispheres. One of them is used as bowl. It takes 8 bowlfuls of this to fill a conical vessel of height 12 cm and radius 6 cm. The radius of the sphere (in centimetre) will be

(1) 3 (2) 2
(3) 4 (4) 6

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

153. The volumes of a right circular cylinder and a sphere are equal. The radius of the cylinder and the diameter of the sphere are equal. The ratio of height and radius of the cylinder is

(1) 3 : 1 (2) 1 : 3
(3) 6 : 1 (4) 1 : 6

(SSC CGL Tier-I Exam. 19.10.2014)

154. Some bricks are arranged in an area measuring 20 cu. m. If the length, breadth and height of each brick is 25 cm, 12.5 cm and 8 cm respectively, then in that pile the number of bricks are (suppose there is no gap in between two bricks)

(1) 6,000 (2) 8,000
(3) 4,000 (4) 10,000

(SSC CGL Tier-I Exam. 26.10.2014)

155. The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume be $\frac{1}{27}$th of the volume of the given cone, at what height above the base is the section made ?

(1) 19 cm (2) 20 cm
(3) 12 cm (4) 15 cm

(SSC CGL Tier-II Exam. 21.09.2014)

156. The height of the right pyramid whose area of the base is 30 m^2 and volume is 500 m^3, is

(1) 50 m (2) 60 m
(3) 40 m (4) 20 m

(SSC CGL Tier-II Exam. 21.09.2014)

157. The base of a right prism is an equilateral triangle. If the lateral surface area and volume is 120 cm^2, $40\sqrt{3}$ cm^3 respectively then the side of base of the prism is

(1) 4 cm (2) 5 cm
(3) 7 cm (4) 40 cm

(SSC CGL Tier-II Exam. 21.09.2014)

158. A ball of lead 4 cm in diameter is covered with gold. If the volume of the gold and lead are equal, then the thickness of gold [given $\sqrt[3]{2} = 1.259$] is approximately

(1) 5.038 cm (2) 5.190 cm
(3) 1.038 cm (4) 0.518 cm

(SSC CGL Tier-II Exam. 21.09.2014)

159. A large solid sphere is melted and moulded to form identical right circular cones with base radius and height same as the radius of the sphere. One of these cones is melted and moulded to form a smaller solid sphere. Then the ratio of the surface area of the smaller to the surface area of the larger sphere is

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(1) $1 : 3^{\frac{4}{3}}$ (2) $1 : 2^{\frac{3}{2}}$

(3) $1 : 3^{\frac{2}{3}}$ (4) $1 : 2^{\frac{4}{3}}$

(SSC CGL Tier-II Exam. 21.09.2014)

160. A conical cup is filled with ice-cream. The ice-cream forms a hemispherical shape on its open top. The height of the hemispherical part is 7 cm. The radius of the hemispherical part equals the height of the cone. Then the volume of the ice-cream is $\left[\pi = \frac{22}{7}\right]$

(1) 1078 cubic cm

(2) 1708 cubic cm

(3) 7108 cubic cm

(4) 7180 cubic cm

(SSC CGL Tier-II Exam. 21.09.2014)

161. A hollow sphere of internal and external diameters 6 cm and 10 cm respectively is melted into a right circular cone of diameter 8 cm. The height of the cone is

(1) 22.5 cm (2) 23.5 cm

(3) 24.5 cm (4) 25.5 cm

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

162. Each edge of a regular tetrahedron is 4 cm. Its volume (in cubic cm) is

(1) $\frac{16\sqrt{3}}{3}$ (2) $16\sqrt{3}$

(3) $\frac{16\sqrt{2}}{3}$ (4) $16\sqrt{2}$

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

163. A flask in the shape of a right circular cone of height 24 cm is filled with water. The water is poured in right circular cylindrical flask whose radius is $\frac{1}{3}$ rd of radius of the base of the circular cone. Then the height of the water in the cylindrical flask is

(1) 32 cm (2) 24 cm

(3) 48 cm (4) 72 cm

(SSC CHSL DEO & LDC Exam. 9.11.2014)

164. The whole surface of a cube is 150 sq.cm. Then the volume of the cube is

(1) 125 cm^3 (2) 216 cm^3

(3) 343 cm^3 (4) 512 cm^3

(SSC CHSL DEO & LDC Exam. 16.11.2014)

165. A solid metallic spherical ball of diameter 6 cm is melted and recast into a cone with diameter of the base as 12 cm. The height of the cone is

(1) 2 cm (2) 3 cm

(3) 4 cm (4) 6 cm

(SSC CHSL DEO & LDC Exam. 16.11.2014)

166. A hemispherical bowl of internal radius 15 cm contains a liquid. The liquid is to be filled into cylindrical shaped bottles of diameter 5 cm and height 6 cm. The number of bottles required to empty the bowl is

(1) 30 (2) 40

(3) 50 (4) 60

(SSC CHSL DEO & LDC Exam. 16.11.2014)

167. If V_1, V_2 and V_3 be the volumes of a right circular cone, a sphere and a right circular cylinder having the same radius and same height, then

(1) $V_1 = \frac{V_2}{2} = \frac{V_3}{3}$

(2) $\frac{V_1}{2} = \frac{V_2}{3} = V_3$

(3) $\frac{V_1}{3} = \frac{V_2}{2} = V_3$

(4) $\frac{V_1}{3} = V_2 = \frac{V_3}{2}$

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

168. If the radius of a shphere be doubled, then the percentage increase in volume is

(1) 500% (2) 700%

(3) 600% (4) 800%

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

169. If 64 buckets of water are removed from a cubical shaped water tank completely filled with water, $\frac{1}{3}$ of the tank remains filled with water. The length of each side of the tank is 1.2 m. Assuming that all buckets are of the same measure, then the volume (in litres) of water contained by each bucket is

(1) 12 (2)16

(3) 15 (4) 18

(SSC CGL Tier-II Exam. 25.10.2015, TF No. 1099685)

170. A wooden box of dimensions 8 metre × 7 metre × 6 metre is to carry rectangular boxes of dimensions 8 cm × 7 cm × 6 cm. The maximum number of boxes that can be carried in 1 wooden box is

(1) 7500000 (2) 9600000

(3) 1200000 (4) 1000000

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

171. Two circular cylinders of equal volume have their heights in the ratio 1 : 2. Ratio of their radii is

(Take $\pi = \frac{22}{7}$)

(1) 1 : 4 (2) 1 : $\sqrt{2}$

(3) $\sqrt{2}$: 1 (4) 1 : 2

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

172. A rectangular piece of paper of dimensions 22 cm by 12 cm is rolled along its length to form a cylinder. The volume (in cu.cm.) of the cylinder so formed is (use $\pi = \frac{22}{7}$)

(1) 562 (2) 412

(3) 462 (4) 362

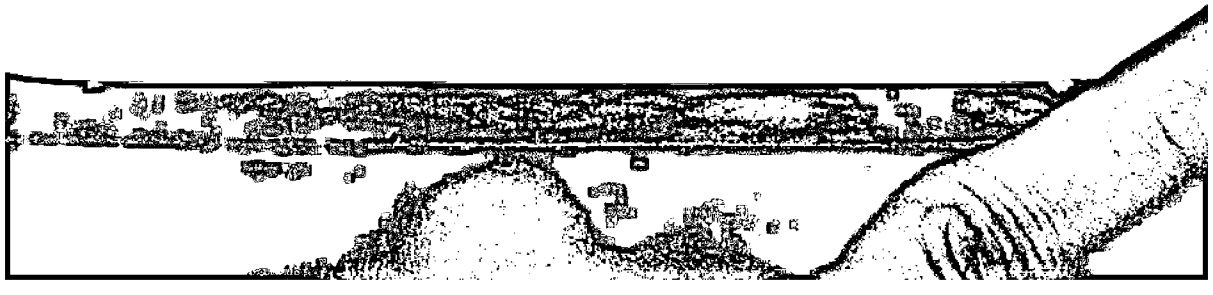
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)

173. A sphere is placed inside a right circular cylinder so as to touch the top, base and the lateral surface of the cylinder. If the radius of the sphere is R, the volume of the cylinder is

(1) $2\pi R^3$ (2) $4\pi R^3$

(3) $8\pi R^3$ (4) $\frac{8}{3}\pi R^3$

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KPO)



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174. The base of a right pyramid is an equilateral triangle of side 4 cm each. Each slant edge is 5 cm long. The volume of the pyramid is

(1) $\frac{4\sqrt{8}}{3}$ cm^3 (2) $\frac{4\sqrt{60}}{3}$ cm^3

(3) $\frac{4\sqrt{59}}{3}$ cm^3 (4) $\frac{4\sqrt{61}}{3}$ cm^3

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

175. If the radius of the base of a cone be 7 cm and its curved surface area be 550 sq. cm, then the volume of the cone is

(1) 1232 cu. cm (2) 1024 cu. cm

(3) 1132 cu. cm (4) 1324 cu. cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

176. A hemisphere of iron is melted and recast in the shape of a right circular cylinder of diameter 18 cm and height 162 cm. The radius of the hemisphere is

(1) 27 cm (2) 9 cm

(3) 6 cm (4) 12 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

177. An iron sphere of radius 27 cm is melted to form a wire of length 729 cm. The radius of wire is

(1) 6 cm (2) 9 cm

(3) 18 cm (3) 36 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

178. A right circular cylinder is circumscribed about a hemisphere so that they share the same base. The ratio of the volumes of cylinder and hemisphere is

(1) 4 : 3 (2) 3 : 1

(3) 3 : 4 (4) 3 : 2

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

179. The ratio of volumes of two cubes is 8 : 125. The ratio of their surface areas is

(1) 4 : 25 (2) 2 : 75

(3) 2 : 15 (4) 4 : 15

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

180. A spherical ball of radius 1 cm is dropped into a conical vessel of radius 3 cm and slant height 6 cm. The volume of water (in cm^3), that can just immerse the ball, is

(1) $\frac{5\pi}{3}$ (2) $\frac{\pi}{3}$

(3) 3π (4) $\frac{4\pi}{3}$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

181. Assume that a drop of water is spherical and its diameter is one-tenth of a cm. A conical glass has a height equal to the diameter of its rim. If 32000 drops of water fill the glass completely, then the height of the glass (in cm.) is

(1) 3 (2) 1

(3) 4 (4) 2

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

182. If the height of a cylinder is 4 times its circumference, the volume of the cylinder in terms of its circumference c, is

(1) $\frac{2c^3}{\pi}$ (2) $4\pi c^3$

(3) $\frac{c^3}{\pi}$ (4) $2\pi c^3$

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

183. Base of a right pyramid is a square whose area is 324 sq metre. If the volume of the pyramid is 1296 cu.metre, then the area (in sq. metre) of the slant surface is

(1) 432 (2) 540

(3) 1080 (4) 360

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

184. If the surface areas of two spheres are in the ratio 9 : 16, the ratio of their volumes is

(1) 16 : 9 (2) 27 : 64

(3) 64 : 27 (4) 9 : 16

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

185. The volume of a right circular cone is equal to the volume of a right circular cylinder. The height and the radius of the cylinder are 9 cm and 20 cm respectively. If the height of the cone is 108 cm, then its radius, (in cm) is

(1) 12 (2) 14

(3) 20 (4) 10

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

186. A right circular cone and a right circular cylinder have the same base and their heights are in the ratio 2 : 3. The ratio of their volumes will be

(1) 1 : 9 (2) 4 : 9

(3) 5 : 9 (4) 2 : 9

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

187. A cone, a cylinder and a hemisphere stand on equal bases and have equal heights. The ratio of their volumes is

(1) 2 : 3 : 1 (2) 2 : 1 : 3

(3) 1 : 3 : 2 (4) 1 : 2 : 3

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

188. The diameters of the internal and external surfaces of a hollow spherical shell are 6 cm and 10 cm respectively. If it is melted and a solid cylinder of length $\frac{8}{3}$ cm is made, then the diameter (in cm) of the cylinder is

(1) 10 (2) 14

(3) 16 (4) 7

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

189. The volume of a metallic cylindrical pipe is 748 cm^3. Its length is 14 cm and external radius is 9 cm. Its thickness is

(Use $\pi = \frac{22}{7}$)

(1) 1 cm (2) 7 cm

(3) 17 cm (4) 11 cm

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

190. A cylindrical vessel of diameter 24 cm contains some water. If two spheres of radii 6 cm each are lowered into the water until they are completely immersed, then the water level (in cm) in the vessel will rise by

(1) 12 (2) 6

(3) 4 (4) 9

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

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191. The perimeter of one face of a cube is 20 cm. Its volume will be
(1) 625 cm^3 (2) 100 cm^3
(3) 125 cm^3 (4) 400 cm^3
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443068)

192. If the volume of a sphere is numerically equal to its surface area then its diameter is
(1) 6 cm (2) 4 cm
(3) 2 cm (4) 3 cm
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

193. A conical iron piece having diameter 28 cm and height 30cm is totally immersed into the water of a cylindrical vessel, resulting in the rise of water level by 6.4 cm. The diameter, in cm, of the vessel is :
(1) 3.5 (2) $\frac{35}{2}$
(3) 32 (4) 35
(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

194. A solid right prism made of iron has cross section of a triangle of sides 5cm, 10cm, 13cm and of height 10 cm. If one cubic cm of iron weights 7g, then the weight of the prism is (approximately)
(1) 1570.8 gram
(2) 1371.32 gram
(3) 1470.8 gram
(4) 1100.68 gram
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

195. A right circular cone of height 20 cm and base radius 15 cm is melted and cast into smaller cones of equal sizes of height 5 cm and base radius 1.5 cm. The number of cones cast are
(1) 300 (2) 150
(3) 400 (4) 100
(SSC Constable (GD) Exam, 04.10.2015, Ist Sitting)

196. A right prism has a triangular base whose sides are 13 cm, 20 cm and 21 cm. If the altitude of the prism is 9 cm, then its volume is
(1) 1314 cm^3 (2) 1134 cm^3
(3) 1413 cm^3 (4) 1143 cm^3
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

197. The portion of a ditch 48m long, 16.5 m wide and 4 m deep that can be filled with stones and earth available during excavation of a tunnel, cylindrical in shape, of diameter 4 m and length 56 m is
$\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) $\frac{1}{4}$ Part (2) $\frac{1}{2}$ Part
(3) $\frac{2}{9}$ Part (4) $\frac{1}{9}$ Part
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

198. If a hemisphere is melted and four spheres of equal volume are made, the radius of each sphere will be equal to
(1) $\frac{1}{4}$ th of the radius of the hemisphere
(2) radius of the hemisphere
(3) $\frac{1}{2}$ of the radius of the hemisphere
(4) $\frac{1}{6}$ th of the radius of the hemisphere
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

199. A cylinder with base radius 8 cm and height 2 cm is melted to form a cone of height 6 cm. The radius of the cone will be
(1) 6 cm (2) 8 cm
(3) 4 cm (4) 5 cm
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

200. A plane divides a right circular cone into two parts of equal volume. If the plane is parallel to the base, then the ratio, in which the height of the cone is divided, is
(1) $1 : \sqrt[3]{2}$ (2) $1 : \sqrt{2}$
(3) $1 : \sqrt[3]{2} + 1$ (4) $1 : \sqrt[3]{2} - 1$
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

201. The radii of two solid iron spheres are 1 cm and 6 cm respectively. A hollow sphere is made by melting the two spheres. If the external radius of the hollow sphere is 9 cm, then its thickness (in cm) is
(1) 2 (2) 1.5
(3) 0.5 (4) 1
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

202. The base of a right prism is a trapezium whose lengths of two parallel sides are 10 cm and 6 cm and distance between them is 5 cm. If the height of the prism is 8 cm, its volume is
(1) 320 cm^3 (2) 300.5 cm^3
(3) 310 cm^3 (4) 300 cm^3
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

203. The radius of a hemispherical bowl is 6 cm. The capacity of the bowl is
(Take $\pi = \frac{22}{7}$)
(1) 345.53 cm^3 (2) 452 cm^3
(3) 495.51 cm^3 (4) 452.57 cm^3

204. Length of each edge of a regular tetrahedron is 1 cm. Its volume is :
(1) $\frac{\sqrt{3}}{12}$ cu. cm.
(2) $\frac{1}{4}\sqrt{3}$ cu. cm.
(3) $\frac{\sqrt{2}}{6}$ cu. cm.
(4) $\frac{1}{12}\sqrt{2}$ cu. cm.
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

205. The volume of a right circular cone which is obtained from a wooden cube of edge 4.2 dm wasting minimum amount of word is :
(1) 19404 cu. dm
(2) 194.04 cu. dm
(3) 19.404 cu. dm
(4) 1940.4 cu. dm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

206. Base of a right prism is a rectangle, the ratio of whose length and breadth is 3 : 2. If the height of the prism is 12 cm and total surface area is 288 sq. cm., the volume of the prism is :
(1) 291 cm^3 (2) 288 cm^3
(3) 290 cm^3 (4) 286 cm^3
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

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207. A right triangle with sides 9 cm, 12 cm and 15 cm is rotated about the side of 9 cm to form a cone. The volume of the cone so formed is :
(1) 327 π cm³ (2) 330 π cm³
(3) 334 π cm³ (4) 324 π cm³
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

208. Volume of a right circular cylinder of height 21 cm and base radius 5 cm is :
(1) 1255 cm³ (2) 1050 cm³
(3) 1175 cm³ (4) 1650 cm³
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

209. The volume of the largest right circular cone that can be cut out of a cube of edge 7 cm ?
$\left(\text{Use } \pi = \frac{22}{7}\right)$
(1) 121 cm³ (2) 89.8 cm³
(3) 13.6 cm³ (4) 147.68 cm³
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

210. By melting two solid metallic spheres of radii 1 cm and 6 cm, a hollow sphere of thickness 1 cm is made. The external radius of the hollow sphere will be
(1) 9 cm (2) 6 cm
(3) 7 cm (4) 8 cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

211. Height of a prism-shaped part of a machine is 8 cm and its base is an isosceles triangle, whose each of the equal sides is 5 cm and remaining side is 6 cm. The volume of the part is
(1) 96 cu. cm (2) 120 cu. cm
(3) 86 cu. cm (4) 90 cu. cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

212. A cuboidal shaped water tank, 2.1 m long and 1.5 m broad is half filled with water. If 630 litres more water is poured into that tank, the water level will rise
(1) 0.15 cm (2) 0.20 metre
(3) 0.18 cm (4) 2 cm
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 20.12.2015 (Ist Sitting) TF No. 9692918)

TYPE–V

1. A cistern 6 m long and 4 m wide, contains water up to a depth of 1 m 25 cm. The total area of the wet surface is
(1) 55 m² (2) 53.5 m²
(3) 50 m² (4) 49 m².
(SSC CGL Prelim Exam. 09.02.2004 (First Sitting)

2. If the height of a cylinder is increased by 15 per cent and the radius of its base is decreased by 10 per cent then by what percent will its curved surface area change?
(1) 3.5 per cent decrease
(2) 3.5 per cent increase
(3) 5 per cent increase
(4) 5 per cent decrease
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

3. The radii of the base of two cylinders are in the ratio 3 : 5 and their heights in the ratio 2 : 3. The ratio of their curved surface will be :
(1) 2 : 5 (2) 2 : 3
(3) 3 : 5 (4) 5 : 3
(SSC CPO S.I. Exam. 16.12.2007)

4. Water flows through a cylindrical pipe, whose radius is 7 cm, at 5 metre per second. The time, it takes to fill an empty water tank, with height 1.54 metres and area of the base (3 × 5) square metres, is $\left(\text{take } \pi = \frac{22}{7}\right)$
(1) 6 minutes (2) 5 minutes
(3) 10 minutes (4) 9 minutes
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

5. A solid cylinder has total surface area of 462 sq.cm. Its curved surface area is $\frac{1}{3}$rd of the total surface area. Then the radius of the cylinder is
(1) 7 cm (2) 3.5 cm
(3) 9 cm (4) 11 cm
(SSC (CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

6. The diameter of a cylinder is 7 cm and its height is 16 cm. Using the value of $\pi = \frac{22}{7}$, the lateral surface area of the cylinder is
(1) 352 cm.² (2) 350 cm.²
(3) 355 cm.² (4) 348 cm.²
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

7. The height of a solid right circular cylinder is 6 metres and three times the sum of the area of its two end faces is twice the area of its curved surface. The radius of its base (in metre) is
(1) 4 (2) 2
(3) 8 (4) 10
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

8. The height of a circular cylinder is increased six times and the base area is decreased to one-ninth of its value. The factor by which the lateral surface of the cylinder increases is
(1) 2 (2) $\frac{1}{2}$
(3) $\frac{2}{3}$ (4) $\frac{3}{2}$
(SSC Graduate Level Tier-II Exam.16.09.2012)

9. The radius and height of a cylinder are in the ratio. 5 : 7 and its volume is 550 cm³. Calculate its curved surface area in sq. cm.
(1) 110 (2) 444
(3) 220 (4) 616
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

10. The area of the curved surface and the area of the base of a right circular cylinder are a square cm and b square cm respectively. The height of the cylinder is
(1) $\frac{2a}{\sqrt{\pi b}}$ cm (2) $\frac{a\sqrt{b}}{2\sqrt{\pi}}$ cm
(3) $\frac{a}{2\sqrt{\pi b}}$ cm (4) $\frac{a\sqrt{\pi}}{2\sqrt{b}}$ cm
(SSC CHSL DEO & LDC Exam 28.10.2012 (Ist Sitting

11. Find the length of the largest ro that can be placed in a room 16m long, 12m broad and $10\frac{2}{3}$ m high.
(1) 23 m. (2) 68 m.
(3) $22\frac{2}{3}$ m. (4) $22\frac{1}{3}$ m.
(SSC CGL Prelim Exam. 04.07.199 (Second Sittin

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12. If the volume of two cubes are in the ratio 27 : 64, then the ratio of their total surface area is :
(1) 27 : 64 (2) 3 : 4
(3) 9 : 16 (4) 3 : 8
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

13. Find the length of the longest rod that can be placed in a hall of 10 m length, 6 m breadth and 4 m height.
(1) $2\sqrt{38}$ m (2) $4\sqrt{38}$ m
(3) $2\sqrt{19}$ m (4) 19 m
(SSC CGL Prelim Exam. 24.02.2002 (Second Sitting)

14. The volume of a cuboid is twice the volume of a cube. If the dimensions of the cuboid are 9 cm, 8 cm and 6 cm, the total surface area of the cube is :
(1) 72 cm^2 (2) 216 cm^2
(3) 432 cm^2 (4) 108 cm^2
(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (IInd Sitting)

15. The length, breadth and height of a room is 5m, 4m and 3m respectively. Find the length of the largest bamboo that can be kept inside the room.
(1) 5 m (2) 60 m
(3) 7 m (4) $5\sqrt{2}$ m
(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone)

16. The length of the longest rod that can be placed in a room which is 12 m long, 9 m broad and 8 m high is
(1) 27 m (2) 19 m
(3) 17 m (4) 13 m
(SSC Section Officer (Commercial Audit) Exam. 16.11.2003) & (SSC CPO S.I. Exam. 06.09.2009) & (SSC CISF Constable (GD) Exam. 05.06.2011)

17. A cube of edge 5 cm is cut into cubes each of edge of 1 cm. The ratio of the total surface of one of the small cubes to that of the large cube is equal to :
(1) 1 : 125 (2) 1 : 5
(3) 1 : 625 (4) 1 : 25
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

18. The perimeter of the floor of a room is 18 m. What is the area of the walls of the room, if the height of the room is 3 m ?
(1) 21 m^2 (2) 42 m^2
(3) 54 m^2 (4) 108 m^2
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

19. The length (in metres) of the longest rod that can be put in a room of dimensions 10 m × 10 m × 5 m is
(1) $15\sqrt{3}$ (2) 15
(3) $10\sqrt{2}$ (4) $5\sqrt{3}$
(SSC CGL Tier-I Exam. 16.05.2010 (First Sitting)

20. The floor of a room is of size 4 m × 3 m and its height is 3 m. The walls and ceiling of the room require painting. The area to be painted is
(1) 66 m^2 (2) 54 m^2
(3) 43 m^2 (4) 33 m^2
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

21. If the sum of three dimensions and the total surface area of a rectangular box are 12 cm and 94 cm^2 respectively, then the maximum length of a stick that can be placed inside the box is
(1) $5\sqrt{2}$ cm (2) 5 cm
(3) 6 cm (4) $2\sqrt{5}$ cm
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.06.2011(Paper-I)

22. If the length of the diagonal of a cube is $8\sqrt{3}$ cm, then its surface area is
(1) 192 cm^2 (2) 512 cm^2
(3) 768 cm^2 (4) 384 cm^2
FCI Assistant Grade-III Exam. 25.02.2012 (Paper-I) North Zone (Ist Sitting)

23. The area of the four walls of a room is 660 m^2 and its length is twice its breadth. If the height of the room is 11 m, then area of its floor (in m^2) is
(1) 120 (2) 150
(3) 200 (4) 330
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

24. The maximum length of a pencil that can be kept in a rectangular box of dimensions 8cm × 6cm × 2cm is
(1) $2\sqrt{13}$ cm (2) $2\sqrt{14}$ cm
(3) $2\sqrt{26}$ cm (4) $10\sqrt{2}$ cm
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

25. The volume of a cubical box is 3.375 cubic metres. The length of edge of the box is
(1) 75 cm (2) 1.5 m
(3) 1.125 m (4) 2.5 m
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

26. Diagonal of a cube is $6\sqrt{3}$ cm. Ratio of its total surface area and volume (numerically) is
(1) 2 : 1 (2) 1 : 6
(3) 1 : 1 (4) 1 : 2
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

27. The length of the largest possible rod that can be placed in a cubical room is $35\sqrt{3}$ m. The surface area of the largest possible sphere that fit within the cubical room (assuming $\pi = \frac{22}{7}$) (in square m) is
(1) 3,500 (2) 3,850
(3) 2,450 (4) 4,250
(SSC Multi-Tasking Staff Exam. 10.03.2013)

28. The volume of air in a room is 204 m^3. The height of the room is 6 m. What is the floor area of the room ?
(1) 32 m^2 (2) 46 m^2
(3) 44 m^2 (4) 34 m^2
(SSC CHSL DEO & LDC Exam. 20.10.2013)

29. The slant height of a conical mountain is 2.5 km and the area of its base is 1.54 km^2. Taking $\pi = \frac{22}{7}$, the height of the mountain is :
(1) 2.2 km (2) 2.4 km
(3) 3 km (4) 3.11 km
(SSC CGL Prelim Exam. 24.02.2002 (First Sitting)

30. The base of a conical tent is 19.2 metres in diameter and the height of its vertex is 2.8 metres. The area of the canvas required to put up such a tent (in square metres) (taking $\pi = \frac{22}{7}$) is nearly.
(1) 3017.1 (2) 3170
(3) 301.7 (4) 30.17
(SSC CGL Prelim Exam. 24.02.2002 & 27.07.2008 (Second Sitting)



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31. If S denotes the area of the curved surface of a right circular cone of height h and semivertical angle α then S equals
(1) $\pi h^2 \tan^2\alpha$
(2) $\frac{1}{3}\pi h^2 \tan^2\alpha$
(3) $\pi h^2 \sec\alpha \tan\alpha$
(4) $\frac{1}{3}\pi h^2 \sec\alpha \tan\alpha$
(SSC CGL Prelim Exam. 27.07.2006 (First Sitting)

32. The height and the radius of the base of a right circular cone are 12 cm and 6cm respectively. The radius of the circular cross-section of the cone cut by a plane parallel to its base at a distance of 3 cm from the base is
(1) 4 cm (2) 5.5 cm
(3) 4.5 cm (4) 3.5 cm
(SSC CGL Prelim Exam. 27.07.2006 (Second Sitting)

33. The radius of base and slant height of a cone are in the ratio 4 : 7. If its curved surface area is 792 cm^2, then the radius (in cm) of its base is [Use $\pi = 22/7$]
(1) 8 (2) 12
(3) 14 (4) 16
(SSC (South Zone) Investigator Exam. 12.09.2010)

34. A semi-circular sheet of metal of diameter 28 cm is bent into an open conical cup. The depth of the cup is approximately
(1) 11 cm (2) 12 cm
(3) 13 cm (4) 14 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

35. The radius and the height of a cone are in the ratio 4 : 3. The ratio of the curved surface area and total surface area of the cone is
(1) 5 : 9 (2) 3 : 7
(3) 5 : 4 (4) 16 : 9
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

36. A right angled sector of radius r cm is rolled up into a cone in such a way that the two binding radii are joined together. Then the curved surface area of the cone is
(1) πr^2 cm^2 (2) $4\pi r^2$ cm^2
(3) $\frac{\pi r^2}{4}$ cm^2 (4) $2\pi r^2$ cm^2
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

37. The radius of the base of a conical tent is 16 metre. If $427\frac{3}{7}$ sq. metre canvas is required to construct the tent, then the slant height of the tent is :
$\left(\text{Take } \pi = \frac{22}{7}\right)$
(1) 17 metre (2) 15 metre
(3) 19 metre (4) 8.5 metre
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

38. The volume of a right circular cone is 1232 cm^3 and its vertical height is 24 cm. Its curved surface area is
(1) 154 cm^2 (2) 550 cm^2
(3) 604 cm^2 (4) 704 cm^2
(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting) & (SSC Graduate Level Tier-II Exam.16.09.2012 & 29.09.2013)

39. If h, c, v are respectively the height, curved surface area and volume of a right circular cone, then the value of $3\pi vh^3 - c^2h^2 + 9v^2$ is
(1) 2 (2) –1
(3) 1 (4) 0
(SSC Graduate Level Tier-II Exam. 29.09.2013)

40. If the radius of a sphere is increased by 2 cm. its surface area increased by 352 cm^2. The radius of sphere before change is :
$\left(\text{use } \pi = \frac{22}{7}\right)$
(1) 3 cm (2) 4 cm
(3) 5 cm (4) 6 cm
(SSC CGL Prelim Exam. 04.07.1999 (Ist Sitting) & (SSC CPO S.I. Exam.12.01.2003)

41. Spheres A and B have their radii 40 cm and 10 cm respectively. Ratio of surface area of A to the surface area of B is :
(1) 1 : 16 (2) 4 : 1
(3) 1 : 4 (4) 16 : 1
(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

42. The volume of a sphere is $\frac{88}{21}\times(14)^3$ cm^3. The curved surface of the sphere is (Take p $= \frac{22}{7}$)
(1) 2424 cm^2 (2) 2446 cm^2
(3) 2484 cm^2 (4) 2464 cm^2
(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

43. The surface area of a sphere is $64\pi cm^2$. Its diameter is equal to
(1) 16 cm (2) 8 cm
(3) 4 cm (4) 2 cm
(SSC CPO S.I. Exam. 07.09.2003)

44. The diameter of two hollow spheres made from the same metal sheet are 21 cm and 17.5 cm respectively. The ratio of the area of metal sheets required for making the two spheres is
(1) 6 : 5 (2) 36 : 25
(3) 3 : 2 (4) 18 : 25
(SSC CPO S.I. Exam. 05.09.2004)

45. When the circumference of a toy ballon is increased from 20 cm to 25 cm, its radius (in cm) is increased by :
(1) 5 (2) $\frac{5}{\pi}$
(3) $\frac{5}{2\pi}$ (4) $\frac{\pi}{5}$
(SSC CPO S.I. Exam. 26.05.2005)

46. If the volume and surface area of a sphere are numerically the same, then its radius is :
(1) 1 unit (2) 2 units
(3) 3 units (4) 4 units
(SSC CPO S.I. Exam. 26.05.2005)

47. The ratio of the surface area of a sphere and the curved surface area of the cylinder circumscribing the sphere is
(1) 1 : 2 (2) 1 : 1
(3) 2 : 1 (4) 2 : 3
(SSC CPO S.I. Exam. 03.09.2006)

48. The total surface area of a metallic hemisphere is 1848 cm^2. The hemisphere is melted to form a solid right circular cone. If the radius of the base of the cone is the same as the radius of the hemisphere, its height is
(1) 42 cm (2) 26 cm
(3) 28 cm (4) 30 cm
(SSC Section Officer (Commercial Audit) Exam. 30.09.2007 (Second Sitting)

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49. If the radii of two spheres are in the ratio 1 : 4, then their surface area are in the ratio :
(1) 1 : 2 (2) 1 : 4
(3) 1 : 8 (4) 1 : 16
(SSC CPO S.I. Exam. 16.12.2007)

50. A solid metallic sphere of radius 8 cm is melted to form 64 equal small solid spheres. The ratio of the surface area of this sphere to that of a small sphere is
(1) 4 : 1 (2) 1 : 16
(3) 16 : 1 (4) 1 : 4
(SSC CGL Prelim Exam. 27.07.2008 (First Sitting)

51. If S_1 and S_2 be the surface area of a sphere and the curved surface area of the circumscribed cylinder respectively, then S_1 is equal to
(1) $\frac{3}{4} S_2$ (2) $\frac{1}{2} S_2$
(3) $\frac{2}{3} S_2$ (4) S_2
(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

52. The volume of two spheres are in the ratio 8 : 27. The ratio of their surface area is :
(1) 4 : 9 (2) 2 : 3
(3) 4 : 5 (4) 5 : 6
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

53. The volume of a solid hemisphere is 19404 cm^3. Its total surface area is
(1) 4158 cm^2 (2) 2858 cm^2
(3) 1738 cm^2 (4) 2038 cm^2
(SSC Graduate Level Tier-II Exam.16.09.2012)

54. A sphere and a hemisphere have the same volume. The ratio of their curved surface area is :
(1) $2^{\frac{3}{2}} : 1$ (2) $2^{\frac{2}{3}} : 1$
(3) $4^{\frac{2}{3}} : 1$ (4) $2^{\frac{1}{3}} : 1$
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

55. If the radius of a sphere be doubled, the area of its surface will become
(1) Double
(2) Three times
(3) Four times
(4) None of the mentioned
(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)

56. A solid hemisphere is of radius 11 cm. The curved surface area in sq. cm is
(1) 1140.85 (2) 1386.00
(3) 760.57 (4) 860.57
(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

57. If the total surface area of a hemisphere is 27π square cm, then the radius of the base of the hemisphere is
(1) $9\sqrt{3}$ cm (2) 3 cm
(3) $3\sqrt{3}$ cm (4) 9 cm
(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)

58. The base of a solid right prism is a triangle whose sides are 9 cm, 12 cm and 15 cm. The height of the prism is 5 cm. Then, the total surface area of the prism is
(1) 180 cm^2 (2) 234 cm^2
(3) 288 cm^2 (4) 270 cm^2
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

59. The base of a right prism is an equilateral triangle of area 173 cm^2 and the volume of the prism is 10380 cm^3. The area of the lateral surface of the prism is (use $\sqrt{3} = 1.73$)
(1) 1200 cm^2 (2) 2400 cm^2
(3) 3600 cm^2 (4) 4380 cm^2
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

60. The base of a right pyramid is a square of side 16 cm long. If its height be 15 cm, then the area of the lateral surface in square centimetre is :
(1) 136 (2) 544
(3) 800 (4) 1280
(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

61. If the slant height of a right pyramid with square base is 4 metre and the total slant surface of the pyramid is 12 square metre, then the ratio of total slant surface and area of the base is :
(1) 16 : 3 (2) 24 : 5
(3) 32 : 9 (4) 12 : 3
(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

62. The base of a right pyramid is an equilateral triangle of side $10\sqrt{3}$ cm. If the total surface area of the pyramid is $270\sqrt{3}$ sq. cm, its height is
(1) $12\sqrt{3}$ cm (2) 10 cm
(3) $10\sqrt{3}$ cm (4) 12 cm
(SSC CHSL DEO & LDC Exam. 20.10.2013)

63. A right prism stands on a base 6 cm equilateral triangle and its volume is $81\sqrt{3}$ cm^3. The height (in cm) of the prism is
(1) 9 (2) 10
(3) 12 (4) 15
(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

64. A right pyramid stands on a square base of diagonal $10\sqrt{2}$ cm. If the height of the pyramid is 12 cm, the area (in cm^2) of its slant surface is
(1) 520 (2) 420
(3) 360 (4) 260
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

65. If the altitude of a right prism is 10 cm and its base is an equilateral triangle of side 12 cm, then its total surface area (in cm^2) is
(1) $(5 + 3\sqrt{3})$ (2) $36\sqrt{3}$
(3) 360 (4) $72(5+\sqrt{3})$
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

66. A right pyramid stands on a base 16 cm square and its height is 15 cm. The area (in cm^2) of its slant surface is
(1) 514 (2) 544
(3) 344 (4) 444
(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

67. The base of a right prism is a right-angled triangle whose sides are 5 cm, 12 cm and 13 cm. If the area of the total surface of the prism is 360 cm^2, then its height (in cm) is
(1) 10 (2) 12
(3) 9 (4) 11
(SSC CHSL DEO & LDC Exam 10.11.2013, IInd Sitting



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68. A hemisphere and a cone have equal base. If their heights are also equal, the ratio of their curved surface will be :

(1) $1 : \sqrt{2}$ (2) $\sqrt{2} : 1$

(3) 1 : 2 (4) 2 : 1

(SSC CGL Prelim Exam. 24.02.2002 & 13.11.2005 (Ist Sitting) & (SSC CGL Tier-I Exam. 26.06.2011 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting) (Delhi Zone)

69. A right circular cylinder just encloses a sphere of radius r. The ratio of the surface area of the sphere and the curved surface area of the cylinder is

(1) 2 : 1 (2) 1 : 2

(3) 1 : 3 (4) 1 : 1

(SSC SAS Exam. 26.06.2010 (Paper-1)

70. A sphere and a cylinder have equal volume and equal radius. The ratio of the curved surface area of the cylinder to that of the sphere is

(1) 4 : 3 (2) 2 : 3

(3) 3 : 2 (4) 3 : 4

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011) & (SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

71. A circus tent is cylindrical up to a height of 3 m and conical above it. If its diameter is 105m and the slant height of the conical part is 63 m, then the total area of the canvas required to make the tent is $\left(\text{take } \pi = \frac{22}{7}\right)$

(1) 11385 m^2 (2) 10395 m^2

(3) 9900 m^2 (4) 990 m^2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

72. A right circular cylinder and a cone have equal base radius and equal height. If their curved surfaces are in the ratio 8 : 5, then the radius of the base to the height are in the ratio :

(1) 2 : 3 (2) 4 : 3

(3) 3 : 4 (4) 3 : 2

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (Delhi Zone)

73. The base of a cone and a cylinder have the same radius 6 cm. They have also the same height 8 cm. The ratio of the curved surface of the cylinder to that of the cone is

(1) 8 : 5 (2) 8 : 3

(3) 4 : 3 (4) 5 : 3

(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

74. A solid right circular cylinder and a solid hemisphere stand on equal bases and have the same height. The ratio of their whole surface area is:

(1) 3 : 2 (2) 3 : 4

(3) 4 : 3 (4) 2 : 3

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

75. A square of side 3 cm is cut off from each corner of a rectangular sheet of length 24 cm and breadth 18 cm and the remaining sheet is folded to form an open rectangular box. The surface area of the box is

(1) 468 cm^2 (2) 396 cm^2

(3) 612 cm^2 (4) 423 cm^2

(SSC CHSL DEO & LDC Exam. 20.10.2013)

76. Three solid iron cubes of edges 4 cm, 5 cm and 6 cm are melted together to make a new cube. 62 cm^3 of the melted material is lost due to improper handling. The area (in cm^2) of the whole surface of the newly formed cube is

(1) 294 (2) 343

(3) 125 (4) 216

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

77. If each edge of a cube is increased by 50%, the percentage increase in its surface area is

(1) 150% (2) 75%

(3) 100% (4) 125%

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013) & (SSC GL Tier-II Exam. 29.09.2013)

78. The length of each edge of a regular tetrahedron is 12 cm. The area (in sq. cm) of the total surface of the tetrahedron is

(1) $288\sqrt{3}$ (2) $144\sqrt{2}$

(3) $108\sqrt{3}$ (4) $144\sqrt{3}$

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

79. A toy is in the form of a cone mounted on a hemisphere. The radius of the hemisphere and that of the cone is 3 cm and height of the cone is 4 cm. The total surface area of the toy (taking $\pi = \frac{22}{7}$) is

(1) 75.43 sq. cm.

(2) 103.71 sq. cm.

(3) 85.35 sq. cm.

(4) 120.71 sq. cm.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

80. Area of the floor of a cubical room is 48 sq.m. The length of the longest rod that can be kept in that room is

(1) 9 metre (2) 12 metre

(3) 18 metre (4) 6 metre

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

81. A sphere and a hemisphere have the same radius. Then the ratio of their respective total surface areas is

(1) 2 : 1 (2) 1 : 2

(3) 4 : 3 (4) 3 : 4

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

82. If the surface area of a sphere is 346.5 cm^2, then its radius $\left[\text{taking } \pi = \frac{22}{7}\right]$ is

(1) 7 cm (2) 3.25 cm

(3) 5.25 cm (4) 9 cm

(SSC CGL Tier-II Exam. 21.09.2014)

83. The base of a prism is a right angled triangle with two sides 5 cm and 12 cm. The height of the prism is 10 cm. The total surface area of the prism is

(1) 360 sq cm (2) 300 sq cm

(3) 330 sq cm (4) 325 sq cm

(SSC CGL Tier-II Exam. 21.09.2014)

84. The ratio of the length and breadth of a rectangular parallelopiped is 5 : 3 and its height is 6 cm. If the total surface area of the parallelopiped be 558 sq. cm, then its length in dm is

(1) 9 (2) 1.5

(3) 10 (4) 15

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

85. Deepali makes a model of a cylindrical kaleidoscope for her science project. She uses a chart paper to make it. If the length of the kaleidoscope is 25 cm and radius 3-5 cm, the area of the paper she used, in square cm, is $\left(\pi = \frac{22}{7}\right)$

(1) 1100 (2) 550

(3) 500 (4) 450

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

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86. If the sum of the dimensions of a rectangular parallelopiped is 24 cm and the length of the diagonal is 15 cm, then the total surface area of it is
(1) 420 cm² (2) 275 cm²
(3) 351 cm² (4) 378 cm²
(SSC CHSL DEO & LDC Exam. 9.11.2014)

87. The length, breadth and height of a cuboid are in the ratio 3 : 4 : 6 and its volume is 576 cm³. The whole surface of the cuboid is
(1) 216 cm² (2) 324 cm²
(3) 432 cm² (4) 460 cm²
(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting))

88. The radius of a right circular cone is 3 cm and its height is 4 cm. The total surface area of the cone is
(1) 48.4 sq.cm (2) 64.4 sq.cm
(3) 96.4 sq.cm (4) 75.4 sq.cm
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

89. There are two cones. The curved surface area of one is twice that of the other. The slant height of the latter is twice that of the former. The ratio of their radii is
(1) 4 : 1 (2) 4 : 3
(3) 3 : 4 (4) 1 : 4
(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

90. From a solid right circular cylinder of length 4 cm and diameter 6 cm, a conical cavity of the same height and base is hollowed out. The whole surface of the remaining solid (in square cm.) is
(1) 48 π (2) 15 π
(3) 63 π (4) 24 π
(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)

91. The length, breadth and height of a wooden box with a lid are 10 cm, 9 cm and 7 cm, respectively. The total inner surface of the closed box is 262 cm². The thickness of the wood (in cm.) is
(1) 2 (2) 3
(3) $\frac{23}{3}$ (4) 1
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

92. The total surface area of a regular triangular pyramid with each edge of length 1 cm is
(1) $4\sqrt{3}$ cm² (2) $\frac{4}{3}\sqrt{3}$ cm²
(3) $\sqrt{3}$ cm² (4) 4 cm²
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

93. The number of paving stones each measuring 2.5m × 2m required to pave a rectangular courtyard 30m long and 17.5 m wide, is
(1) 80 (2) 33
(3) 99 (4) 105
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

94. The length of canvas, 75 cm wide required to build a conical tent of height 14m and the floor area 346.5 m² is
(1) 665 m (2) 860 m
(3) 490 m (4) 770 m
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

95. 5 persons will live in a tent. If each person requires 16m² of floor area and 100m³ space for air then the height of the cone of smallest size to accommodate these persons would be
(1) 16 metre (2) 10.25 metre
(3) 20 metre (4) 18.75 metre
(SSC CGL Tier-I Exam, 16.08.2015 (Ist Sitting) TF No. 3196279)

96. The paint in a certain container is sufficient to paint an area equal to 9.375 m². How many bricks measuring 22.5 cm by 10 cm by 7.5 cm can be painted out of this container?
(1) 200 (2) 1000
(3) 10 (4) 100
(SSC CGL Tier-I Re-Exam, 30.08.2015)

97. The ratio between the length and the breadth of a rectangular park is 3 : 2. If a man cycling along the boundary of the park at the speed of 12 kmph completes one round in 8 minutes, then the area of the park is equal to
(1) 152600 m² (2) 153500 m²
(3) 153600 m² (4) 153800 m²
(SSC CGL Tier-I Re-Exam, 30.08.2015)

98. The base of a right pyramid is a square of side 10 cm. If the height of the pyramid is 12 cm, then its total surface area is
(1) 400 cm² (2) 460 cm²
(3) 260 cm² (4) 360 cm²
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

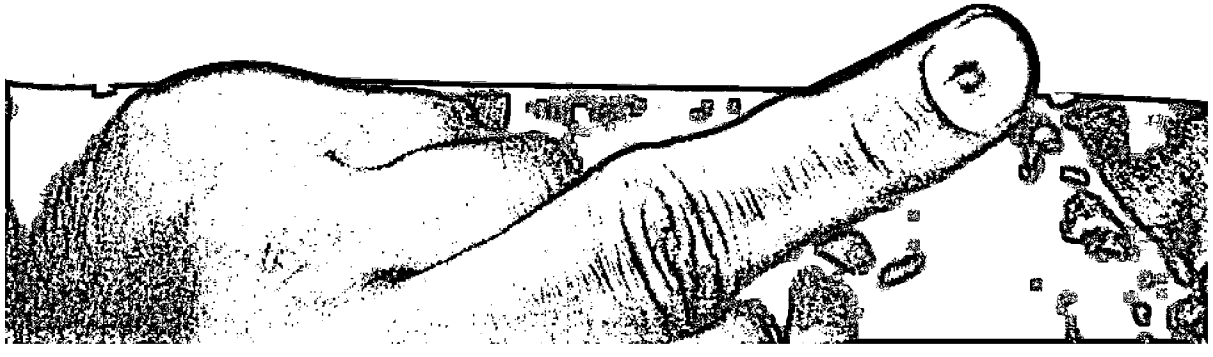
99. There is a wooden sphere of radius $6\sqrt{3}$ cm. The surface area of the largest possible cube cut out from the sphere will be
(1) 864 cm² (2) $464\sqrt{3}$ cm²
(3) 462 cm² (4) $646\sqrt{3}$ cm²
(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

100. A hemisphere and a cone have equal bases. If their heights are also equal, then the ratio of their curved surfaces will be
(1) 1 : 2 (2) 2 : 1
(3) 1 : $\sqrt{2}$ (4) $\sqrt{2}$: 1
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

101. The radius of base and curved surface area of a right cylinder is 'r' units and $4\pi rh$ square units respectively. The height of the cylinder is :
(1) $\frac{h}{2}$ units (2) h units
(3) $2h$ units (4) $4h$ units
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

102. A hemispherical bowl has 3.5 cm radius. It is to be painted inside as well as outside. The cost of painting it at the rate of Rs. 5 per 10 sq. cm will be:
(1) Rs. 77 (2) Rs. 100
(3) Rs. 175 (4) Rs. 50
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)

103. The total surface area of a right circular cylinder with radius of the base 7 cm and height 20 cm, is:
(1) 900 cm² (2) 140 cm²
(3) 1000 cm² (4) 1188 cm²
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (Ist Sitting) TF No. 6636838)



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104. If the radius of a sphere is increased by 2 cm, then its surface area increases by 352 cm^2. The radius of the sphere initially was :

$\left(\text{use } \pi = \frac{22}{7}\right)$

(1) 4 cm (2) 5 cm
(3) 3 cm (4) 6 cm

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

105. The diameter of a 120 cm long roller is 84 cm. It takes 500 complete revolutions of the roller to level a ground. The cost of levelling the ground at Rs. 1.50 per sq. m. is :

(1) Rs. 6000 (2) Rs. 3762
(3) Rs. 2376 (4) Rs. 5750

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

106. A hemispherical bowl has internal radius of 6 cm. The internal surface area would be : (Take π = 3.14)

(1) 225 cm^2 (2) 400 cm^2
(3) 289.75 cm^2 (4) 226.08 cm^2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

107. The surface area of a sphere is 616 cm^2. The volume of the sphere would be :

(1) $1437\frac{1}{3}$ cm^2 (2) 2100 cm^2
(3) 2500 cm^2 (4) $1225\frac{3}{5}$ cm^2

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE–VI

1. The circumference of the base of a circular cylinder is 6π cm. The height of the cylinder is equal to the diameter of the base. How many litres of water can it hold?

(1) 54 π cc (2) 36 π cc
(3) 0.054 π cc (4) 0.54 π cc

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

2. The diameter of the base of a cylindrical drum is 35 dm. and the height is 24 dm. It is full of kerosene. How many tins each of size 25 cm × 22 cm × 35 cm can be filled with kerosene from the drum?

(Use $\pi = \frac{22}{7}$)

(1) 1200 (2) 1020
(3) 600 (4) 120

(SSC CPO S.I. Exam. 07.09.2003)

3. Marbles of diameter 1.4 cm are dropped into a cylindrical beaker containing some water and are fully submerged. The diameter of the beaker is 7 cm. Find how many marbles have been dropped in it if the water rises by 5.6 cm ?

(1) 50 (2) 150
(3) 250 (4) 350

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)

4. A right cylindrical vessel is full with water. How many right cones having the same diameter and height as that of the right cylinder will be needed to store that water ? (Take $\pi = \frac{22}{7}$).

(1) 4 (2) 2
(3) 3 (4) 5

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

5. How many cubes, each of edge 3 cm, can be cut from a cube of edge 15 cm?

(1) 25 (2) 27
(3) 125 (4) 144

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

6. A cuboidal block of 6 cm × 9 cm × 12 cm is cut up into exact number of equal cubes. The least possible number of cubes will be

(1) 6 (2) 9
(3) 24 (4) 30

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

7. A soap cake is of size 8 cm × 5 cm × 4 cm. The number of such soap cakes that can be packed in a box measuring 56 cm × 35 cm × 28 cm is :

(1) 49 (2) 196
(3) 243 (4) 343

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

8. The cost of carpeting a room is ₹ 120. If the width had been 4 metres less, the cost of the Carpet would have been ₹ 20 less. The width of the room is :

(1) 24 m (2) 20 m
(3) 25 m (4) 18.5 m

(SSC CPO S.I. Exam. 26.05.2005)

9. A hall 25 metres long and 15 metres broad is surrounded by a verandah of uniform width of 3.5 metres. The cost of flooring the verandah, at ₹ 27.50 per square metre is

(1) ₹ 9149.50 (2) ₹ 8146.50
(3) ₹ 9047.50 (4) ₹ 4186.50

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)

10. A cube of edge 6 cm is painted on all sides and then cut into unit cubes. The number of unit cubes with no sides painted is

(1) 0 (2) 64
(3) 186 (4) 108

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

11. The height of a conical tank is 60 cm and the diameter of its base is 64cm. The cost of painting it from outside at the rate of ₹ 35 per sq. m. is :

(1) ₹ 52.00 approx.
(2) ₹ 39.20 approx.
(3) ₹ 35.20 approx.
(4) ₹ 23.94 approx.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

12. Some solid metallic right circular cones, each with radius of the base 3 cm and height 4 cm, are melted to form a solid sphere of radius 6 cm. The number of right circular cones is

(1) 12 (2) 24
(3) 48 (4) 6

(SSC CPO S.I. Exam. 03.09.2006)

13. The diameter of a circular wheel is 7 m. How many revolutions will it make in travelling 22 km?

(1) 100 (2) 400
(3) 500 (4) 1000

(SSC Graduate Level Tier-II Exam. 29.09.2013)

14. A spherical lead ball of radius 10cm is melted and small lead balls of radius 5mm are made. The total number of possible small lead balls is (Take $\pi = \frac{22}{7}$)

(1) 8000 (2) 400
(3) 800 (4) 125

(SSC Delhi Police S.I. (SI Exam. 19.08.2012

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14. The total number of spherical bullets, each of diameter 5 decimeter, that can be made by utilizing the maximum of a rectangular block of lead with 11 metre length, 10 metre breadth and 5 metre width is (assume that $\pi > 3$)
(1) equal to 8800
(2) less than 8800
(3) equal to 8400
(4) greater than 9000
(SSC Graduate Level Tier-II Exam. 29.09.2013)

15. A solid metallic cone of height 10 cm, radius of base 20 cm is melted to make spherical balls each of 4 cm diameter. How many such balls can be made ?
(1) 25 (2) 75
(3) 50 (4) 125
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

17. A cylindrical rod of iron whose height is eight times its radius is melted and cast into spherical balls each of half the radius of the cylinder. The number of such spherical balls is
(1) 12 (2) 16
(3) 24 (4) 48
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

18. The number of spherical bullets that can be made out of a solid cube of lead whose edge measures 44 cm, each bullet being of 4 cm diameter, is (take $\pi = \frac{22}{7}$)
(1) 2541 (2) 2451
(3) 2514 (4) 2415
(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)

19. The radius of a metallic cylinder is 3 cm and its height is 5 cm. It is melted and moulded into small cones, each of height 1 cm and base radius 1 mm. The number of such cones formed, is
(1) 450 (2) 1350
(3) 8500 (4) 13500
(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

20. If a metallic cone of radius 30 cm and height 45 cm is melted and recast into metallic spheres of radius 5 cm, find the number of spheres.
(1) 81 (2) 41
(3) 80 (4) 40
(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

21. Water flows at the rate of 10 metres per minute from a cylindrical pipe 5 mm in diameter. How long it take to fill up a conical vessel whose diameter at the base is 30 cm and depth 24 cm ?
(1) 28 minutes 48 seconds
(2) 51 minutes 12 seconds
(3) 51 minutes 24 seconds
(4) 28 minutes 36 seconds
(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

22. A metallic sphere of radius 10.5 cm is melted and then recast into small cones each of radius 3.5 cm and height 3 cm. The number of cones thus formed is
(1) 140 (2) 132
(3) 112 (4) 126
(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

23. The radius of the base of a Conical tent is 12 m. The tent is 9 m high. Find the cost of canvas required to make the tent, if one square metre of canvas costs ₹ 120
(Take $\pi = 3.14$)
(1) ₹ 67, 830 (2) ₹ 67, 800
(3) ₹ 67, 820 (4) ₹ 67, 824
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (Ist Sitting)

24. If the radius of a cylinder is decreased by 50 % and the height is increased by 50 %, then the change in volume is
(1) 52.5 % (2) 67.5 %
(3) 57.5 % (4) 62.5 %
(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

25. The base of a triangle is increased by 10%. To keep the area unchanged the height of the triangle is to be decreased by
(1) $9\frac{1}{11}\%$ (2) $11\frac{1}{9}\%$
(3) 11% (4) 9%
(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

26. If the area of the base of a cone is increased by 100%, then the volume increases by
(1) 200% (2)182%
(3) 141% (4) 100%
(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) TF No. 789 TH 7)

27. The percentage increase in the surface area of a cube when each side is doubled is
(1) 50% (2) 200%
(3) 150% (4) 300%
(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)

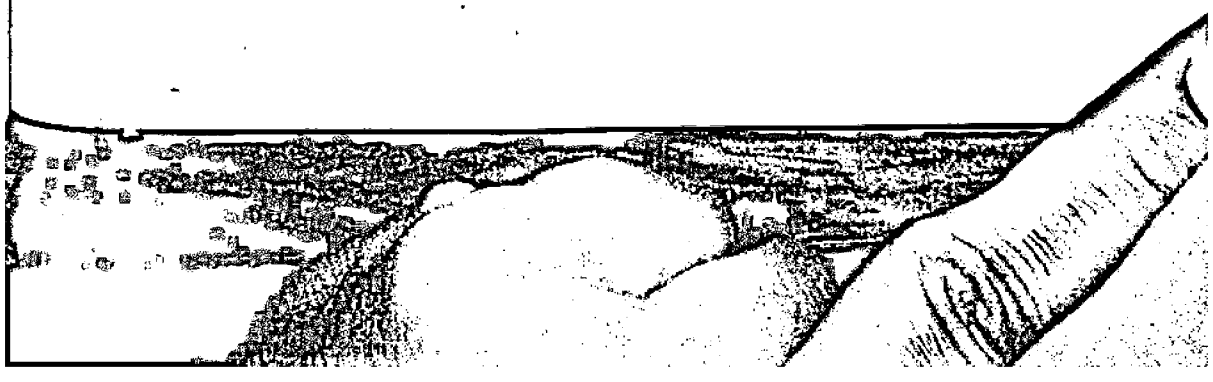
28. Each side of a cube is decreased by 25%. Find the ratio of the volumes of the original cube and the resulting cube.
(1) 8 : 1 (2) 27 : 64
(3) 64 : 1 (4) 64 : 27
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

29. If water is freezed to become ice, its volume is increased by 10%, then if the ice is melted to water again, its volume will be decreased by :
(1) 9% (2) $9\frac{1}{11}\%$
(3) 8% (4) $9\frac{1}{2}\%$
(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)

TYPE - VII

1. If the arcs of square length in two circles subtend angles of 60° and 75° at their centres, the ratio of their radii is
(1) 3 : 4 (2) 4 : 5
(3) 5 : 4 (4) 3 : 5
(SSC Graduate Level Tier-I Exam. 21.04.2013)

2. The length of the perpendiculars drawn from any point in the interior of an equilateral triangle to the respective sides are p_1, p_2 and p_3. The length of each side of the triangle is
(1) $\frac{2}{\sqrt{3}}(p_1 + p_2 + p_3)$
(2) $\frac{1}{3}(p_1 + p_2 + p_3)$
(3) $\frac{1}{\sqrt{3}}(p_1 + p_2 + p_3)$
(4) $\frac{4}{\sqrt{3}}(p_1 + p_2 + p_3)$
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)



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3. The sides of a triangle are in the ratio 3 : 4 : 5. The measure of the largest angle of the triangle is
(1) 60° (2) 90°
(3) 120° (4) 150°
(SSC CPO S.I. Exam. 05.09.2004)

4. From a point within an equilateral triangle, perpendiculars drawn to the three sides, are 6 cm, 7 cm and 8 cm respectively. the length of the side of the triangle is :
(1) 7 cm (2) 10.5 cm
(3) $14\sqrt{3}$ cm (4) $\frac{14\sqrt{3}}{3}$ cm
(SSC CPO S.I. Exam. 26.05.2005)

5. The base and altitude of a right angled triangle are 12 cm and 5 cm respectively. The perpendicular distance of its hypotenuse from the opposite vertex is
(1) $4\frac{4}{13}$ cm (2) $4\frac{8}{13}$ cm
(3) 5 cm (4) 7 cm
(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

6. One acute angle of a right angled triangle is double the other. If the length of its hypotenuse is 10 cm, then its area is
(1) $\frac{25}{2}\sqrt{3}$ cm^2 (2) 25 cm^2
(3) $25\sqrt{3}$ cm^2 (4) $\frac{75}{2}$ cm^2
(SSC CPO S.I. Exam. 09.11.2008)

7. In an equilateral triangle ABC of side 10cm, the side BC is trisected at D. Then the length (in cm) of AD is
(1) $3\sqrt{7}$ (2) $7\sqrt{3}$
(3) $\frac{10\sqrt{7}}{3}$ (4) $\frac{7\sqrt{10}}{3}$
(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting)

8. The perimeter of a triangle is 40cm and its area is 60 cm^2. If the largest side measures 17cm, then the length (in cm) of the smallest side of the triangle is
(1) 4 (2) 6
(3) 8 (4) 15
(SSC CGL Tier-1 Exam. 26.06.2011 (First Sitting)

9. The ratio of the area of two isosceles triangles having the same vertical angle (i.e. angle between equal sides) is 1 : 4. The ratio of their heights is
(1) 1 : 4 (2) 2 : 5
(3) 1 : 2 (4) 3 : 4
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

10. The length of one side of a rhombus is 6.5 cm and its altitude is 10 cm. If the length of its diagonal be 26 cm, the length of the other diagonal will be :
(1) 5 cm (2) 10 cm
(3) 6.5 cm (4) 26 cm
(SSC CPO S.I. Exam. 26.05.2005)

11. The measure of each of two opposite angles of a rhombus is 60° and the measure of one of its sides is 10cm. The length of its smaller diagonal is :
(1) 10 cm (2) $10\sqrt{3}$ cm
(3) $10\sqrt{2}$ cm (4) $\frac{5}{2}\sqrt{2}$ cm
(SSC CPO S.I. Exam. 16.12.2007)

12. Two adjacent sides of a parallelogram are of length 15 cm and 18 cm. If the distance between two smaller sides is 12 cm, then the distance between two bigger sides is
(1) 8 cm (2) 10 cm
(3) 12 cm (4) 15 cm
(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

13. A parallelogram ABCD has sides AB = 24 cm and AD = 16 cm. The distance between the sides AB and DC is 10 cm. Find the distance between the sides AD and BC.
(1) 16 cm. (2) 18 cm.
(3) 15 cm. (4) 26 cm.
(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

14. The adjacent sides of a parallelogram are 36 cm and 27 cm in length. If the distance between the shorter sides is 12 cm, then the distance between the longer sides is
(1) 10 cm (2) 12 cm
(3) 16 cm (4) 9 cm
(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

8 and 6, then the square of its size is
(1) 25 (2) 55
(3) 64 (4) 36
(SSC Graduate Level Tier-II Exam.16.09.2012)

16. One of the four angles of a rhombus is 60°. If the length of each side of the rhombus is 8 cm, then the length of the longer diagonal is
(1) $8\sqrt{3}$ cm (2) 8 cm
(3) $4\sqrt{3}$ cm (4) $\frac{8}{\sqrt{3}}$ cm
(SSC Graduate Level Tier-I Exam. 21.04.2013)

17. The diagonals of a rhombus are 12 cm and 16 cm respectively. The length of one side is
(1) 8 cm (2) 6 cm
(3) 10 cm (4) 12 cm
(SSC Graduate Level Tier-II Exam. 29.09.2013

18. Each interior angle of a regular polygon is 18° more than eight times an exterior angle. The number of sides of the polygon is
(1) 10 (2) 15
(3) 20 (4) 25
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)

19. An exterior angle of a regular polygon is 72°. The sum of all the interior angles is
(1) 360° (2) 480°
(3) 520° (4) 540°
(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

20. A cylindrical tank of diameter 35 cm is full of water. If 11 litres of water is drawn off, the water level in the tank will drop by :
$\left(\text{use } \pi = \frac{22}{7}\right)$
(1) $10\frac{1}{2}$ cm. (2) $12\frac{6}{7}$ cm.
(3) 14 cm. (4) $11\frac{3}{7}$ cm.
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

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21. A right circular cylinder is formed by rolling a rectangular paper 12 cm long and 3 cm wide along its length. The radius of the base of the cylinder will be

(1) $\frac{3}{2\pi}$ cm (2) $\frac{6}{\pi}$ cm

(3) $\frac{9}{2\pi}$ cm (4) 2π cm

(SSC CGL Prelim Exam. 04.02.2007 (Second Sitting)

22. The diameter of the base of a right circular cone is 4 cm and its height $2\sqrt{3}$ cm. The slant height of the cone is

(1) 5 cm (2) 4 cm

(3) $2\sqrt{3}$ cm (4) 3 cm

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)

23. A sector is formed by opening out a cone of base radius 8 cm and height 6 cm. Then the radius of the sector is (in cm)

(1) 4 (2) 8

(3) 10 (4) 6

(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

24. A right circular cone is 3.6 cm high and radius of its base is 1.6 cm. It is melted and recast into a right circular cone with radius of its base as 1.2 cm. Then the height of the cone (in cm) is

(1) 3.6 (2) 4.8

(3) 6.4 (4) 7.2

(SSC Graduate Level Tier-II Exam. 29.09.2013)

25. A copper sphere of radius 3 cm is beaten and drawn into a wire of diameter 0.2 cm. The length of the wire is :

(1) 9 m (2) 12 m

(3) 18 m (4) 36 m

(SSC CPO S.I. Exam. 26.05.2005)

26. If surface area and volume of a sphere are S and V respectively, then value of $\frac{S^3}{V^2}$ is

(1) 36 units (2) 9 units

(3) 18 units (4) 27 units

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

27. Assume that a drop of water is spherical and its diameter is one-tenth of a cm. A conical glass has a height equal to the diameter of its rim. If 32,000 drops of water fill the glass completely, then the height of the glass (in cm) is

(1) 1 (2) 2

(3) 3 (4) 4

(SSC Graduate Level Tier-II Exam. 29.09.2013

28. A cistern of capacity 8000 litres measures externally 3.3 m by 2.6 m by 1.1 m and its walls are 5 cm thick. The thickness of the bottom is :

(1) 1 m (2) 1.1 m

(3) 1 dm (4) 90 cm

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

29. A cone is cut at mid point of its height by a frustum parallel to its base. The ratio between the two parts of cone would be

(1) 1 : 1 (2) 1 : 8

(3) 1 : 4 (4) 1 : 7

(SSC Section Officer (Commercial Audit) Exam. 25.09.2005)

30. The area of a circle of radius 5 is numerically what percent of its circum ference?

(1) 200% (2) 225%

(3) 240% (4) 250%

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

31. If the circumference and area of a circle are numerically equal, then the diameter is equal to :

(1) area of the circle

(2) $\frac{\pi}{2}$

(3) 2π (4) 4

(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

32. A chord of length 30 cm is at a distance of 8 cm from the centre of a circle. The radius of the circle is:

(1) 17 cm (2) 23 cm

(3) 21 cm (4) 19 cm

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

33. The circum-radius of an equilateral triangle is 8 cm. The in-radius of the triangle is

(1) 3.25 cm (2) 3.50 cm

(3) 4 cm (4) 4.25 cm

(SSC CPO S.I. Exam. 07.09.2003)

34. A circle is inscribed in a square. An equilateral triangle of side $4\sqrt{3}$ cm is inscribed in that circle. The length of the diagonal of the square (in centimetres) is

(1) $4\sqrt{2}$ (2) 8

(3) $8\sqrt{2}$ (4) 16

(SSC CPO S.I. Exam. 05.09.2004)

35. The height of an equilateral triangle is $4\sqrt{3}$ cm. The ratio of the area of its circumcircle to that of its in-circle is

(1) 2 : 1 (2) 4 : 1

(3) 4 : 3 (4) 3 : 2

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)

36. A circle is inscribed in a square whose length of the diagonal is $12\sqrt{2}$ cm. An equilateral triangle is inscribed in that circle. The length of the side of the triangle is

(1) $4\sqrt{3}$ cm (2) $8\sqrt{3}$ cm

(3) $6\sqrt{3}$ cm (4) $11\sqrt{3}$ cm

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

37. The radius of the incircle of a triangle whose sides are 9 cm, 12 cm and 15 cm is

(1) 9 cm (2) 13 cm

(3) 3 cm (4) 6 cm

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

38. The ratio of inradius and circumradius of a square is :

(1) 1 : $\sqrt{2}$ (2) $\sqrt{2}$: $\sqrt{3}$

(3) 1 : 3 (4) 1 : 2

(SSC Graduate Level Tier-I Exam. 21.04.2013, Ist Sitting)

39. The perimeter of a rectangle and a square are 160 m each. The area of the rectangle is less than that of the square by 100 sq m. The length of the rectangle is

(1) 30 m (2) 60 m

(3) 40 m (4) 50 m

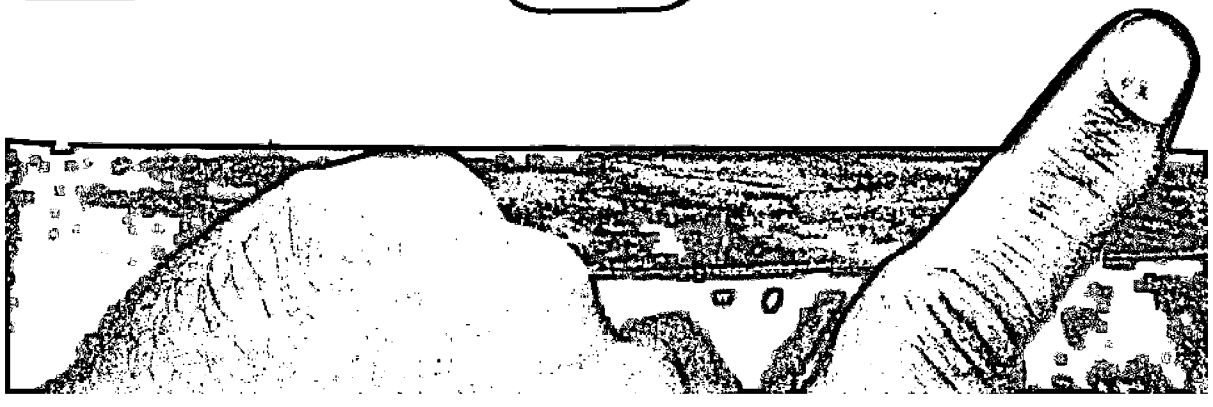
(SSC CGL Prelim Exam. 13.11.2005 (Second Sitting)

40. The volume of a right circular cylinder and that of a sphere are equal and their radii are also equal. If the height of the cylinder be h and the diameter of the sphere d, then which of the following relation is correct ?

(1) $h = d$ (2) $2h = d$

(3) $2h = 3d$ (4) $3h = 2d$

(SSC CPO S.I. Exam. 09.11.2008)



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41. A solid cone of height 9 cm with diameter of its base 18 cm is cut out from a wooden solid sphere of radius 9 cm. The percentage of wood wasted is :

(1) 25% (2) 30%

(3) 50% (4) 75%

(FCI Assistant Grade-III Exam. 06.02.2012 (Paper-I) East Zone (IInd Sitting)

42. Two circles with centres A and B and radius 2 units touch each other externally at 'C'. A third circle with centre 'C' and radius '2' units meets other two at D and E. Then the area of the quadrilateral ABDE is

(1) $2\sqrt{2}$ sq. units

(2) $3\sqrt{3}$ sq. units

(3) $3\sqrt{2}$ sq. units

(4) $2\sqrt{3}$ sq. units

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

43. Two cubes of sides 6 cm each are kept side by side to form a rectangular parallelopiped. The area (in sq. cm) of the whole surface of the rectangular parallelopiped is

(1) 432 (2) 360

(3) 396 (4) 340

(SSC Graduate Level Tier-I Exam. 11.11.2012, Ist Sitting)

44. The diameter of a copper sphere is 1 8 cm. The sphere is melted and is drawn into a long wire of uniform circular cross-section. If the length of the wire is 108 m, the diameter of the wire is

(1) 1 cm (2) 0.9cm

(3) 0.3 cm (4) 0.6 cm

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)

45. A river 3 m deep and 40 m wide is flowing at the rate of 2 km per hour. How much water (in litres) will fall into the sea in a minute?

(1) 4,00,000 (2) 40,00,000

(3) 40,000 (4) 4,000

(SSC CGL Tier-I Exam. 26.06.2011 (First Sitting)

46. Water is flowing at the rate of 3 km/hr through a circular pipe of 20 cm internal diameter into a circular cistern of diameter 10m and depth 2m. In how much time will the cistern be filled ?

(1) 1 hour

(2) 1 hour 40 minutes

(3) 1 hour 20 minutes

(4) 2 hours 40 minutes

(SSC CGL Tier-I Exam. 26.06.2011 (Second Sitting)

47. The rain water from a roof 22 m × 20 m drains into a cylindrical vessel having a diameter of 2 m and height 3.5 m. If the vessel is just full, then the rainfall (in cm) is :

(1) 2 (2) 2.5

(3) 3 (4) 4.5

(SSC CHSL DEO & LDC Exam. 27.11.2010)

48. 2 cm of rain has fallen on a square km of land. Assuming that 50% of the raindrops could have been collected and contained in a pool having a 100 m × 10 m base, by what level would the water level in the pool have increased ?

(1) 1 km (2) 10 m

(3) 10 cm (4) 1 m

(SSC Graduate Level Tier-II Exam.16.09.2012)

49. A parallelopiped whose sides are in ratio 2 : 4 : 8 have the same volume as a cube. The ratio of their surface area is :

(1) 7 : 5 (2) 4 : 3

(3) 8 : 5 (4) 7 : 6

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)

50. If two adjacent sides of a rectangular parallelopiped are 1 cm and 2 cm and the total surface area of the parallelopiped is 22 square cm, then the diagonal of the parallelopiped is

(1) $\sqrt{10}$ cm (2) $2\sqrt{3}$ cm

(3) $\sqrt{14}$ cm (4) 4cm

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)

51. [illegible] long, 16.5 metres broad and 4 metres deep can be filled by the earth got by digging a cylindrical tunnel of diameter 4 metres and length 56 metres? [Use $\pi = \frac{22}{7}$]

(1) $\frac{1}{9}$ (2) $\frac{2}{9}$

(3) $\frac{7}{9}$ (4) $\frac{8}{9}$

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

52. The perimeters of a circle, a square and an equilateral triangle are same and their areas are C, S and T respectively. Which of the following statement is true?

(1) C = S = T (2) C > S > T

(3) C < S < T (4) S < C < T

(SSC CGL Tier-I Exam. 19.10.2014 (Ist Sitting)

53. The base of a right prism is a quadrilateral ABCD. Given that AB = 9 cm, BC = 14 cm, CD = 13 cm, DA = 12 cm and ∠DAB = 90°. If the volume of the prism be 2070 cm^3, then the area of the lateral surface is

(1) 720 cm^2 (2) 810 cm^2

(3) 1260 cm^2 (4) 2070 cm^2

(SSC CGL Tier-I Exam. 19.10.2014)

54. An elephant of length 4 m is at one corner of a rectangular cage of size (16 m × 30 m) and faces towards the diagonally opposite corner. If the elephant starts moving towards the diagonally opposite corner it takes 15 seconds to reach this corner. Find the speed of the elephant.

(1) 1 m/sec (2) 2 m/sec

(3) 1.87 m/sec (4) 1.5 m/sec

(SSC CHSL DEO & LDC Exam. 02.11.2014 (IInd Sitting)

55. A horse takes $2\frac{1}{2}$ seconds to complete a round around a circular field. If the speed of the horse was 66 m/sec, then the radius of the field is,

[Given $\pi = \frac{22}{7}$]

(1) 25.62 m (2) 26.52 m

(3) 25.26 m (4) 26.25 m

(SSC CHSL DEO & LDC Exam. 9.11.2014)

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56. The diameter of the front wheel of an engine is $2x$ cm and that of rear wheel is $2y$ cm. To cover the same distance, find the number of times the rear wheel will revolve when the front wheel revolves 'n' times.

(1) $\frac{n}{xy}$ times (2) $\frac{yn}{x}$ times

(3) $\frac{nx}{y}$ times (4) $\frac{xy}{n}$ times

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

57. A bicycle wheel has a diameter (including the tyre) of 56 cm. The number of times the wheel will rotate to cover a distance of 2.2 km is (Assume $\pi = \frac{22}{7}$)

(1) 625 (2) 1250
(3) 1875 (4) 2500

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)

58. If one diagonal of a rhombus of side 13 cm is 10 cm, then the other diagonal is

(1) 24 cm (2) 20 cm
(3) 16 cm (4) 28 cm

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting TF No. 333 LO 2)

59. A brick 2" thick is placed against a wheel to act for a stop. The horizontal distance of the face of the brick from the point where the wheel touches the ground is 6". The radius of the wheel in inches is

(1) 10 (2) 5
(3) 12 (4) 6

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)

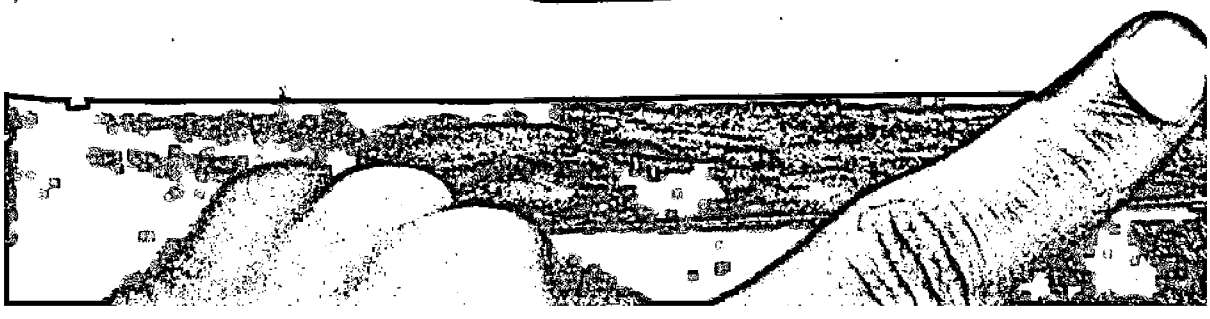
SHORT ANSWERS

TYPE-I

1. (2)	2. (3)	3. (4)	4. (3)
5. (2)	6. (3)	7. (3)	8. (2)
9. (2)	10. (4)	11. (1)	12. (1)
13. (1)	14. (1)	15. (2)	16. (4)
17. (4)	18. (3)	19. (4)	20. (1)
21. (2)	22. (2)	23. (3)	24. (1)
25. (3)	26. (1)	27. (1)	28. (4)
29. (4)	30. (4)	31. (2)	32. (3)
33. (3)	34. (3)	35. (2)	36. (3)
37. (3)	38. (3)	39. (3)	40. (2)
41. (4)	42. (3)	43. (1)	44. (3)
45. (4)	46. (4)	47. (2)	48. (1)
49. (4)	50. (3)	51. (1)	52. (3)
53. (3)	54. (2)	55. (2)	56. (1)
57. (3)	58. (3)	59. (2)	60. (3)
61. (3)	62. (4)	63. (4)	64. (2)
65. (1)	66. (2)	67. (3)	68. (3)
69. (4)	70. (3)	71. (2)	72. (2)
73. (4)	74. (4)	75. (4)	76. (3)
77. (4)	78. (1)	79. (4)	80. (1)
81. (1)	82. (3)	83. (3)	84. (2)
85. (4)	86. (3)	87. (2)	88. (2)
89. (1)	90. (2)	91. (2)	92. (2)
93. (1)	94. (3)	95. (3)	96. (1)
97. (1)	98. (1)	99. (4)	100. (2)
101. (1)	102. (1)	103. (4)	104. (1)
105. (1)	106. (3)	107. (1)	108. (4)
109. (4)	110. (3)	111. (1)	112. (2)
113. (1)	114. (1)	115. (2)	116. (2)
117. (3)	118. (3)	119. (4)	120. (2)
121. (3)	122. (2)	123. (1)	124. (2)
125. (4)	126. (3)	127. (3)	128. (3)
129. (2)	130. (2)	131. (4)	132. (2)
133. (1)	134. (2)	135. (2)	136. (4)
137. (3)	138. (3)	139. (4)	140. (2)
141. (3)	142. (3)	143. (2)	144. (4)
145. (3)	146. (2)	147. (3)	148. (2)
149. (3)	150. (4)	151. (4)	152. (1)
153. (2)	154. (2)	155. (3)	156. (4)
157. (2)	158. (2)	159. (1)	160. (2)
161. (2)	162. (4)	163. (3)	164. (4)
165. (4)	166. (1)	167. (1)	168. (3)
169. (3)	170. (3)	171. (3)	172. (2)
173. (3)	174. (2)	175. (1)	176. (4)
177. (1)	178. (2)	179. (2)	180. (2)
181. (3)	182. (4)	183. (2)	184. (3)
185. (1)	186. (4)	187. (2)	188. (3)
189. (3)	190. (2)	191. (2)	192. (4)
193. (1)	194. (4)	195. (1)	196. (3)
197. (4)	198. (3)	199. (1)	200. (4)
201. (1)	202. (1)	203. (4)	204. (2)
205. (*)	206. (3)	207. (2)	208. (2)
209. (1)	210. (2)	211. (2)	212. (2)
213. (1)	214. (2)	215. (3)	216. (3)
217. (3)	218. (1)	219. (3)	220. (3)
221. (3)	222. (4)	223. (4)	224. (1)
225. (1)	226. (3)	227. (2)	228. (3)
229. (3)	230. (1)	231. (1)	232. (2)
233. (3)	234. (4)	235. (3)	236. (2)
237. (1)	238. (4)	239. (4)	240. (2)
241. (4)	242. (3)	243. (4)	244. (2)
245. (2)	246. (1)	247. (4)	248. (4)
249. (2)	250. (2)	251. (4)	252. (3)
253. (4)	254. (2)	255. (2)	256. (3)
257. (4)	258. (3)	259. (1)	260. (2)
261. (1)	262. (1)		

TYPE-II

1. (2)	2. (1)	3. (3)	4. (2)
5. (2)	6. (3)	7. (2)	8. (4)
9. (3)	10. (1)	11. (4)	12. (3)
13. (1)	14. (3)	15. (3)	16. (4)
17. (3)	18. (1)	19. (3)	20. (3)
21. (1)	22. (1)	23. (3)	24. (1)
25. (4)	26. (1)	27. (4)	28. (3)
29. (3)	30. (1)	31. (2)	32. (1)
33. (2)	34. (3)	35. (2)	36. (2)
37. (1)	38. (1)	39. (1)	40. (2)
41. (4)	42. (3)	43. (2)	44. (2)
45. (3)	46. (1)	47. (2)	48. (2)
49. (2)	50. (3)	51. (2)	52. (1)
53. (2)	54. (1)	55. (4)	56. (1)
57. (2)	58. (3)	59. (3)	60. (3)
61. (2)	62. (3)	63. (2)	64. (4)
65. (1)	66. (3)	67. (4)	68. (2)
69. (1)	70. (1)	71. (3)	72. (1)
73. (3)	74. (1)	75. (1)	76. (1)
77. (1)	78. (2)	79. (2)	80. (2)
81. (2)	82. (2)	83. (1)	84. (3)
85. (1)	86. (2)	87. (3)	



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TYPE-III

1. (4)	2. (2)	3. (3)	4. (3)
5. (4)	6. (1)	7. (4)	8. (1)
9. (4)	10. (4)	11. (3)	12. (4)

TYPE-IV

1. (2)	2. (1)	3. (1)	4. (1)
5. (4)	6. (2)	7. (4)	8. (3)
9. (1)	10. (2)	11. (2)	12. (3)
13. (1)	14. (2)	15. (1)	16. (1)
17. (4)	18. (3)	19. (1)	20. (1)
21. (3)	22. (1)	23. (2)	24. (4)
25. (4)	26. (4)	27. (1)	28. (1)
29. (3)	30. (3)	31. (2)	32. (1)
33. (1)	34. (4)	35. (1)	36. (4)
37. (4)	38. (2)	39. (3)	40. (2)
41. (3)	42. (4)	43. (1)	44. (1)
45. (2)	46. (4)	47. (4)	48. (4)
49. (2)	50. (3)	51. (1)	52. (4)
53. (1)	54. (3)	55. (2)	56. (1)
57. (2)	58. (3)	59. (2)	60. (3)
61. (4)	62. (2)	63. (3)	64. (2)
65. (4)	66. (4)	67. (2)	68. (4)
69. (3)	70. (4)	71. (1)	72. (1)
73. (3)	74. (3)	75. (3)	76. (3)
77. (3)	78. (2)	79. (4)	80. (1)
81. (1)	82. (3)	83. (2)	84. (2)
85. (2)	86. (2)	87. (1)	88. (3)
89. (1)	90. (3)	91. (1)	92. (1)
93. (2)	94. (4)	95. (3)	96. (2)
97. (3)	98. (3)	99. (3)	100. (2)
101. (2)	102. (2)	103. (2)	104. (4)
105. (2)	106. (1)	107. (3)	108. (1)
109. (4)	110. (4)	111. (4)	112. (2)
113. (4)	114. (3)	115. (1)	116. (1)
117. (2)	118. (1)	119. (4)	120. (2)
121. (2)	122. (3)	123. (2)	124. (1)
125. (4)	126. (4)	127. (4)	128. (3)
129. (2)	130. (1)	131. (3)	132. (2)
133. (1)	134. (4)	135. (2)	136. (3)
137. (2)	138. (4)	139. (4)	140. (2)
141. (2)	142. (1)	143. (4)	144. (2)
145. (3)	146. (4)	147. (1)	148. (3)
149. (1)	150. (1)	151. (1)	152. (1)
153. (4)	154. (2)	155. (2)	156. (1)
157. (1)	158. (4)	159. (4)	160. (1)
161. (3)	162. (3)	163. (4)	164. (1)
165. (2)	166. (4)	167. (*)	168. (2)
169. (4)	170. (4)	171. (3)	172. (3)
173. (1)	174. (*)	175. (1)	176. (1)
177. (1)	178. (4)	179. (1)	180. (1)
181. (3)	182. (3)	183. (2)	184. (2)
185. (4)	186. (4)	187. (3)	188. (2)
189. (1)	190. (3)	191. (3)	192. (1)
193. (4)	194. (1)	195. (3)	196. (2)
197. (3)	198. (3)	199. (2)	200. (4)
201. (4)	202. (1)	203. (4)	204. (4)
205. (3)	206. (2)	207. (4)	208. (4)
209. (2)	210. (1)	211. (1)	212. (2)

TYPE-V

1. (4)	2. (2)	3. (1)	4. (2)
5. (1)	6. (1)	7. (1)	8. (1)
9. (3)	10. (3)	11. (3)	12. (3)
13. (1)	14. (2)	15. (4)	16. (3)
17. (4)	18. (3)	19. (2)	20. (2)
21. (1)	22. (4)	23. (3)	24. (3)
25. (2)	26. (3)	27. (2)	28. (4)
29. (2)	30. (3)	31. (3)	32. (3)
33. (2)	34. (2)	35. (1)	36. (3)
37. (4)	38. (2)	39. (4)	40. (4)
41. (4)	42. (4)	43. (2)	44. (2)
45. (3)	46. (3)	47. (2)	48. (3)
49. (4)	50. (3)	51. (2)	52. (1)
53. (1)	54. (4)	55. (3)	56. (3)
57. (2)	58. (3)	59. (3)	60. (2)
61. (1)	62. (4)	63. (1)	64. (4)
65. (4)	66. (2)	67. (1)	68. (2)
69. (4)	70. (2)	71. (1)	72. (3)
73. (1)	74. (3)	75. (2)	76. (1)
77. (4)	78. (4)	79. (2)	80. (2)
81. (3)	82. (3)	83. (3)	84. (2)
85. (2)	86. (3)	87. (3)	88. (4)
89. (1)	90. (1)	91. (4)	92. (3)
93. (4)	94. (4)	95. (4)	96. (4)
97. (3)	98. (4)	99. (1)	100. (4)
101. (3)	102. (1)	103. (4)	104. (4)
105. (3)	106. (4)	107. (1)	

TYPE-VI

1. (1)	2. (1)	3. (2)	4. (3)
5. (3)	6. (3)	7. (4)	8. (1)
9. (3)	10. (2)	11. (4)	12. (2)
13. (4)	14. (1	15. (1)	16. (4)
17. (4)	18. (1)	19. (4)	20. (1)
21. (1)	22. (4)	23. (4)	24. (4)
25. (1)	26. (4)	27. (4)	28. (4)
29. (2)			

TYPE-VII

1. (3)	2. (1)	3. (2)	4. (3)
5. (2)	6. (1)	7. (3)	8. (3)
9. (3)	10. (1)	11. (1)	12. (2)
13. (3)	14. (4)	15. (1)	16. (1)
17. (3)	18. (3)	19. (4)	20. (4)
21. (2)	22. (2)	23. (3)	24. (3)
25. (4)	26. (1)	27. (4)	28. (3)
29. (4)	30. (4)	31. (4)	32. (1)
33. (3)	34. (3)	35. (2)	36. (3)
37. (3)	38. (1)	39. (4)	40. (4)
41. (4)	42. (2)	43. (2)	44. (4)
45. (2)	46. (2)	47. (2)	48. (2)
49. (4)	50. (3)	51. (2)	52. (2)
53. (1)	54. (2)	55. (4)	56. (3)
57. (2)	58. (1)	59. (4)	

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EXPLANATIONS

TYPE-I

1. (2) Side of square $= \frac{\text{Diagonal}}{\sqrt{2}}$

$\therefore$ Area $= \frac{(\text{Diagonal})^2}{2}$

$= \frac{(5.2)^2}{2} = \frac{27.04}{2} = 13.52\ cm^2$

2. (3) Side $= \frac{\text{Diagonal}}{\sqrt{2}} = \frac{a}{\sqrt{2}}$

$\therefore$ Area $= (\text{Side})^2$

$= \left(\frac{a}{\sqrt{2}}\right)^2$ sq.cm. $= \frac{a^2}{2}$ sq.cm.

3. (4) Side of the first square

$= \frac{1}{\sqrt{2}} \times 4\sqrt{2} = 4$ cm.

Its area $= (4)^2 = 16\ cm^2$.

$\therefore$ Area of second square

$= 2 \times 16 = 32\ cm^2$.

Its side $= \sqrt{32} = 4\sqrt{2}$ cm.

$\therefore$ Required diagonal

$= \sqrt{2} \times 4\sqrt{2} = 8$ cm

4. (3) Area of the square A

$= \frac{(\text{diagonal})^2}{2}$

$= \frac{(a+b)^2}{2}$

Area of the new square

$= \frac{(a+b)^2}{2} \times 2 = (a+b)^2$

$\Rightarrow$ Side $= (a + b)$

$\therefore$ Diagonal $= \sqrt{2} \times$ side

$= \sqrt{2}\ (a+b)$

5. (2) Let the length of the smaller line segment $= x$ cm.

The length of larger line segment $= (x + 2)$ cm.

According to the question,

$(x + 2)^2 - x^2 = 32$

$\Rightarrow x^2 + 4x + 4 - x^2 = 32$

$\Rightarrow 4x = 32 - 4 = 28$

$\Rightarrow x = \frac{28}{4} = 7$

The required length

$= x + 2 = 7 + 2 = 9$ cm.

6. (3) Let diagonals be $2x$ and $5x$.

$\therefore \frac{A_1}{A_2} = \frac{\frac{1}{2} \times (2x)^2}{\frac{1}{2} \times (5x)^2} = \frac{4}{25}$

$\Rightarrow 4 : 25$

7. (3) Side of the squares are 6 cm, 8 cm, 10 cm, 19 cm and 20 cm respectively.

Sum of their areas $= (6^2 + 8^2 + 10^2 + 19^2 + 20^2)\ cm^2$

$= (36+64+100+361+400)\ cm^2$

$= 961\ cm^2$

$\therefore$ Area of largest other square $= 961\ cm^2$

$\Rightarrow$ Its side $= \sqrt{961} = 31$ cm

$\therefore$ Required perimeter

$= 4 \times 31 = 124$ cm.

8. (2) Let the side of square be a units.

Area of this square $= a^2$

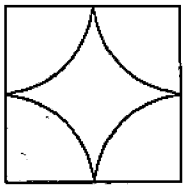
The diagonal of square $= \sqrt{2}\,a$

$\therefore$ Area of square $= 2a^2$

$\therefore$ Required ratio $= a^2 : 2a^2$

$= 1 : 2$

9. (2)



Area of sectors $= \pi r^2 = 4\pi$ sq.cm.

$\Rightarrow$ Area of square $= 4 \times 4 = 16$ sq.cm.

$\therefore$ Area of the remaining portion $= (16 - 4\pi)$ sq.cm.

10. (4) Diagonal of square

$= \sqrt{2} \times$ side

$\therefore \sqrt{2} \times$ side $= 15\sqrt{2}$

$\Rightarrow$ Side $= \frac{15\sqrt{2}}{\sqrt{2}} = 15$

$\therefore$ Area of square $= (\text{side})^2$

$= 15 \times 15 = 225$ sq.cm.

Method 2 :

Quicker Approach

Area of square $= \frac{1}{2} \times (\text{diagonal})^2$

$= \frac{1}{2} \times 15\sqrt{2} \times 15\sqrt{2} = 225$ sq.cm.

11. (1) Area of paper = Area of square + Area of equilateral triangle

$= \frac{1}{2}\ (\text{diagonal})^2 + \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{1}{2} \times 32 \times 32 + \frac{\sqrt{3}}{4} \times 8 \times 8$

$= 512 + 16 \times 1.732$

$= 512 + 27.712 = 539.712\ cm^2$

[**Note :** Diagonal of a square $= \sqrt{2}$ side]

12. (1) Let the length of rectangular hall = x-metre

$\therefore$ Breadth $= \left(\frac{3}{4} \times x\right)$ metre

Area of rectangular

= Length × Breadth

$= x \times \frac{3}{4} x$ sq.m. $= \frac{3}{4} x^2\ m^2$

$\therefore$ According to question,

$\frac{3}{4} x^2 = 768$

$\therefore x^2 = \frac{768 \times 4}{3}$

or, $x = \sqrt{\frac{768 \times 4}{3}} = 32$m

$\therefore$ Length = 32 m and Breadth = 24m

$\therefore$ Required difference

$= 32 - 24 = 8$ m

13. (1) Let breadth of plot $= x\ m$

$\therefore$ length $= 5x\ m$.

According to question,

$\frac{5x^2}{2} = 245$

$\Rightarrow x^2 = \frac{245 \times 2}{5} = 98$

$\Rightarrow x = 7\sqrt{2}\ m$

$\therefore$ Length

$= 5 \times 7\sqrt{2} = 35\sqrt{2}\ m$

14. (1) Area of the rectangular garden $= 12 \times 5 = 60\ m^2$

= Area of the square garden

$\therefore$ Side of the square garden

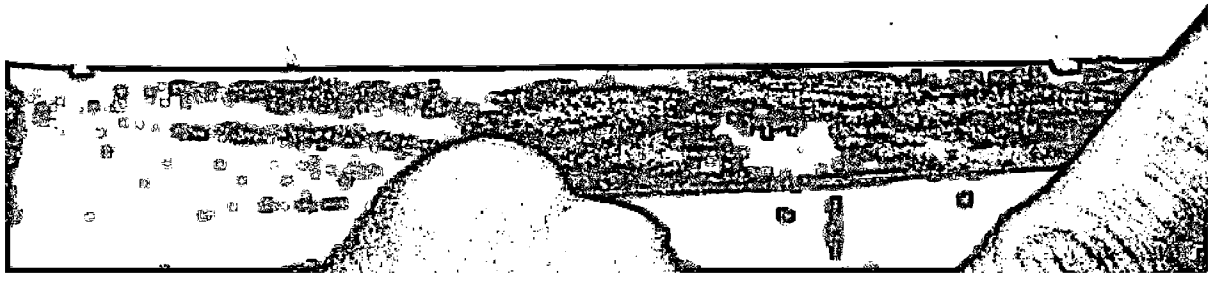
$= \sqrt{60} m^2$

$\therefore$ Diagonal of the square garde

$= \sqrt{2} \times$ side

$= \sqrt{2} \times \sqrt{60} = \sqrt{120} = \sqrt{4 \times 3}$

$= 2\sqrt{30}$m



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15. (2) Radius of circular wire

$= \frac{42}{2} = 21$ cm

Circumference of wire $= 2\pi r$

$= 2 \times \frac{22}{7} \times 21 = 132$ cm

Let the length and breadth of rectangle be $6x$ and $5x$ cm respectively.

$\therefore$ Perimeter of rectangle

$= 2(6x + 5x) = 22x$

According to the question,

$22x = 132$

$\Rightarrow x = \frac{132}{22} = 6$

$\therefore$ Length of rectangle

$= 6x = 6 \times 6 = 36$ cm

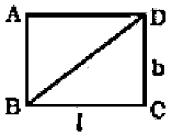
Breadth of rectangle

$= 5x = 5 \times 6 = 30$ cm

$\therefore$ Area $= 36 \times 30$

$= 1080$ cm^2

16. (4)



BD = length of diagonal

= speed $\times$ time

$= \frac{52}{60} \times 15 = 13$ metre

$BD = \sqrt{l^2 + b^2}$

$\Rightarrow l^2 + b^2 = 169$ ...(i)

Again,

$(l + b) = \frac{68}{60} \times 15 = 17$ ...(ii)

$\therefore (l + b)^2 = l^2 + b^2 + 2lb$

$\Rightarrow 17^2 = 169 + 2lb$

$\Rightarrow 2lb = 289 - 169 = 120$

$\Rightarrow lb = \frac{120}{2} = 60$ m^2

17. (4) Let the breadth be x m.

$\therefore$ Length $= (23 + x)$ m

$\Rightarrow 2(x + 23 + x) = 206$

$\Rightarrow 4x = 206 - 46$

$\Rightarrow x = \frac{160}{4} = 40$m

$\therefore$ Length $= 40 + 23 = 63$ m

$\therefore$ Required area $= 63 \times 40$

$= 2520$ m^2

18. (3) Area of the tank

$= 160 \times 120 = 21600$ m^2.

Total area of the circular plot

$= 40000 + 21600 = 61600$ m^2.

$\therefore \pi r^2 = 61600$

$\Rightarrow r^2 = \frac{61600 \times 7}{22}$

$= 2800 \times 7$

$\Rightarrow r = \sqrt{2800 \times 7}$

$\Rightarrow r = 2 \times 7 \times 10 = 140$m

19. (4) Let the breadth of rectangular hall $= x$ m.

$\therefore$ length $= (x + 5)$ m.

Area of hall

= Length $\times$ Breadth

$\Rightarrow 750 = (x + 5)x$

$\Rightarrow x^2 + 5x - 750 = 0$

$\Rightarrow x^2 + 30x - 25x - 750 = 0$

$\Rightarrow x(x + 30) - 25(x + 30) = 0$

$\Rightarrow (x - 25)(x + 30) = 0$

$\Rightarrow x = 25$, as x cannot be negative.

$\therefore$ Length of hall $= x + 5$

$= 25 + 5 = 30$ m.

20. (1) Let the length and breadth of the rectangle be $3x$ and $2x$ cm respectively. Then,

$2(3x + 2x) = 20$

$\Rightarrow 10x = 20 \Rightarrow x = \frac{20}{10} = 2$

$\therefore$ Length $= 3x = 3 \times 2$

$= 6$ cm

Breadth $= 2x = 2 \times 2 = 4$ cm

$\therefore$ Area $= 6 \times 4 = 24$ cm^2.

21. (2)



Let the width of path be x m.

Area of rectangular field

$= 38 \times 32 = 1216$ m^2

Area of rectangular field without path $= (38 - 2x)(32 - 2x)$

$= 1216 - 64x - 76x + 4x^2$

$= 1216 - 140x + 4x^2$

$\therefore$ Area of the path

$= 1216 - 1216 + 140x - 4x^2$

$= 140x - 4x^2$

$\therefore 140x - 4x^2 = 600$

$\Rightarrow 4x^2 - 140x + 600 = 0$

$\Rightarrow x^2 - 35x + 150 = 0$

$\Rightarrow x^2 - 30x - 5x + 150 = 0$

$\Rightarrow x(x - 30) - 5(x - 30) = 0$

$\Rightarrow (x - 5)(x - 30) = 0$

$\Rightarrow x = 5$ as $x \neq 30$

22. (2) Net Effect on area of rectangle

$= \left(20 + 25 + \frac{20 \times 25}{100}\right)\% = 50\%$

$\left[\because \text{Net \% change} = \frac{a + b + ab}{100}\right]\%$

23. (3) Let the breadth of floor be x metre.

$\therefore$ Length $= (x + 20)$ metre

$\therefore$ Area of the floor

$= (x + 20)x$ sq. metre

According to question,

$(x + 10)(x + 5) = x(x + 20)$

$\Rightarrow x^2 + 15x + 50 = x^2 + 20x$

$\Rightarrow 20x = 15x + 50$

$\Rightarrow 5x = 50$

$\Rightarrow x = 10$ metre

$\therefore$ Length $= x + 20 = 10 + 20$

$= 30$ metre

$\therefore$ Area of the floor $= 30 \times 10$

$= 300$ sq.metre

24. (1) Area of garden without street

$= 200 \times 180 = 36000$ sq.metre

Area of garden with street

$= 220 \times 200 = 44000$ sq.metre

$\therefore$ Area of the path

$= 44000 - 36000$

$= 8000$ sq.metre

25. (3) Required percentage

$= \left(x + y + \frac{xy}{100}\right)\%$

Negative sign for decrease

$= \left(5 - 2 - \frac{5 \times 2}{100}\right)\% = 2.9\%$

26. (1) $\frac{1}{12}$ hectare $= \frac{1}{12} \times 10000$ sq.metre

$= \frac{2500}{3}$ sq. metre

$\therefore 3x \times 4x = \frac{2500}{3}$

$\Rightarrow x^2 = \frac{2500}{3 \times 3 \times 4} \Rightarrow x = \frac{50}{6}$

$\Rightarrow$ Width $= 3x = 3 \times \frac{50}{6}$

$= 25$ metre

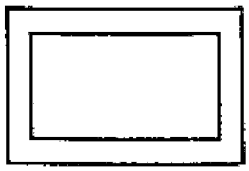
27. (1) Side of a square $= x$ cm

$\therefore$ Area of rectangle $= 3 \times$ area of square

$\Rightarrow 20 \times \frac{3}{2}x = 3 \times x^2$

$\Rightarrow x = \frac{20 \times 3}{2 \times 3} = 10$ cm

28. (4)

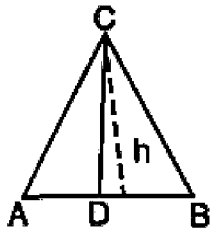


Let length of rectangular field =

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$7x$ metre & breadth = $4x$ metre
Length of field with path
= $(7x + 8)$ metre
Breadth = $(4x + 8)$ metre
∴ Area of path
= $(7x + 8) \times (4x + 8) - 7x \times 4x$
= $28x^2 + 32x + 56x + 64 - 28x^2$
= $88x + 64$
∴ $88x + 64 = 416$
⇒ $88x = 416 - 64 = 352$
⇒ $x = 4$
∴ Breadth of field = 16 metre

29. (4)



Given : AB = 5
DB = 3
∴ AD = 5 − 3 = 2
In the figure we can see that both ΔADC and ΔABC have the same height, h.
Area of a triangle

$= \frac{1}{2} \times \text{base} \times \text{height}$

When height is constant,
We know, Area of triangle α base,

$\therefore \frac{\text{Area of } \Delta ADC}{\text{Area of } \Delta ABC} = \frac{AD}{AB} = \frac{2}{5}$

30. (4) Let the base and altitude be $3x$ and $4x$ respectively.
∴ According to question,

$\frac{1}{2}$ base × altitude = 1176 cm²

or, $\frac{1}{2} \times 3x \times 4x = 1176$

$12x^2 = 1176 \times 2$

$x^2 = \frac{1176 \times 2}{12}$

$x^2 = 196$

$\Rightarrow x = \sqrt{196} = 14$ cm.

∴ Altitude of a triangle = $4x$
= 4 × 14 cm = 56 cm

31. (2) Area of the first triangle

$= \frac{1}{2} \times \text{base} \times \text{height}$

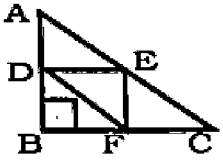
$= \frac{1}{2} \times 15 \times 12 = 90$ cm²

According to the question
Area of the another (second) triangle = 2 × 90 = 180 cm²
∴ Area of the new triangle =

180 cm² $= \frac{1}{2} \times 20 \times$ height

∴ Height $= \frac{180 \times 2}{20} = 18$ cm

32. (3)



$3^2 + 4^2 = 5^2$
Δ ABC is a right angled triangle.

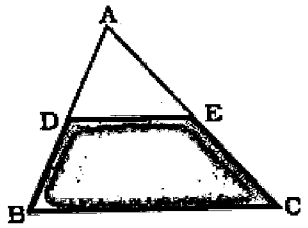
∴ area ABC $= \frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times 3 \times 4 = 6 \text{cm}^2$

∴ Required Area of Δ DEF

$= \frac{1}{4} \times 6 = \frac{3}{2}$ sq.cm.

33. (3)



D is the mid-point of AB and E is the mid-point of AC.
∴ DE is parallel to BC.

and DE $= \frac{1}{2}$ BC

ΔADE and ΔABC are similar, because

$\angle D = \angle B$ and $\angle E = \angle C$

$\therefore \frac{\Delta ADE}{\Delta ABC} = \frac{DE^2}{BC^2} = \frac{1}{4}$

⇒ 4ΔADE = ΔABC
∴ Area of trapezium DBCE
= ΔABC − ΔADE
4ΔADE − ΔADE = 3.ΔADE
∴ Required percentage

$= \frac{3}{4} \times 100 = 75\%$

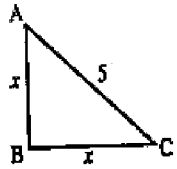
34. (3) Let the respective altitudes be p_1 and p_2.

$\therefore \frac{a}{b} = \frac{\frac{1}{2} \times x \times p_1}{\frac{1}{2} \times y \times p_2}$

$\Rightarrow \frac{p_1}{p_2} = \frac{ay}{bx}$

$\Rightarrow ay : bx$

35. (2)



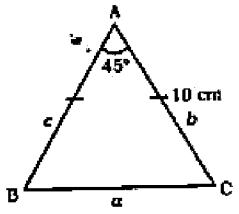
$x^2 + x^2 = (5)^2 \Rightarrow 2x^2 = 25$

$\Rightarrow x^2 = \frac{25}{2} \Rightarrow x = \frac{5}{\sqrt{2}}$

Area $= \frac{1}{2} \times \frac{5}{\sqrt{2}} \times \frac{5}{\sqrt{2}}$

$= \frac{25}{4} = 6.25$ sq.cm

36. (3)



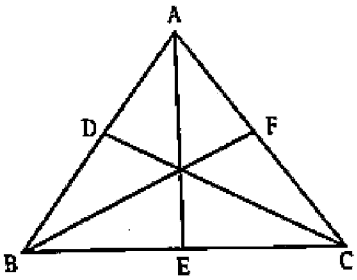
AB = AC = 10 cm

∴ Area $= \frac{1}{2}$ bc sin A

$= \frac{1}{2} \times 10 \times 10 \sin 45°$

$= \frac{50}{\sqrt{2}} = \frac{50 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = 25\sqrt{2}$ cm²

37. (3) Let the side of the equilateral triangle ABC be x cm.



According to the question,

$\frac{1}{2} \times x \times 6 + \frac{1}{2} \times x \times 8 + \frac{1}{2} \times$

$x \times 10 = \frac{\sqrt{3}}{4} \times x^2$

$\Rightarrow 3x + 4x + 5x = \frac{\sqrt{3}}{4} x^2$

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$\Rightarrow \frac{\sqrt{3}}{4}x = 12$

$\Rightarrow x = \frac{12\times4}{\sqrt{3}} = 16\sqrt{3}$ cm

∴ Area of Δ ABC

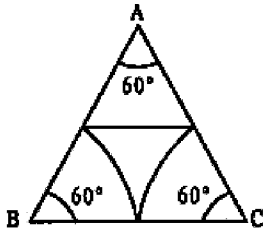
$= \frac{\sqrt{3}}{4}\times(16\sqrt{3})^2 = 192\sqrt{3}$ cm²

38. (3) The ratio of the area of two similar triangles is equal to the ratio of square of the corresponding altitudes.

Ratio of altitudes = $\frac{\sqrt{25}}{\sqrt{36}} = \frac{5}{6}$

or 5 : 6

39. (3)



Each angle of the triangle = 60°
Required area of the three sectors = $3\times\frac{60}{360}\times\pi(1)^2$

$= \frac{\pi}{2}$ cm²

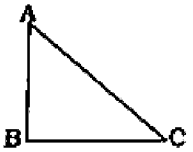
Area of triangle

$= \frac{\sqrt{3}}{4}\times4 = \sqrt{3}$ cm²

∴ Required area

$= \left(\sqrt{3}-\frac{\pi}{2}\right)$ cm²

40. (2)



Let AB = BC = x;

$AC = 16\sqrt{2}$

∴ $x^2 + x^2 = (16\sqrt{2})^2$

$\Rightarrow 2x^2 = 16\times16\times2$

$\Rightarrow x^2 = 16\times16$

$\Rightarrow x = 16$

∴ Area of triangle

$= \frac{1}{2}\times$ base × height

$= \frac{1}{2}\times16\times16 = 128$ cm²

41. (4) Ratio = 2 : 3 : 4
= 4 : 6 : 8
Perimeter = 18 cm

∴ Semi-perimeters = $\frac{4+6+8}{2}$

= 9

∴ Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{9(9-4)(9-6)(9-8)}$

$= \sqrt{9\times5\times3\times1} = 3\sqrt{15}$ sq.cm.

42. (3) If the side of the equilateral triangle be x units,
then,

$3x = \sqrt{3}\left(\frac{\sqrt{3}}{4}x^2\right)$

$\Rightarrow 3x = \frac{3x^2}{4}$

$\Rightarrow x = 4$ units

43. (1) Area of the equilateral triangle = $\frac{\sqrt{3}}{4}\times(\text{side})^2$

$= \frac{\sqrt{3}}{4}\times6\times6 = 9\sqrt{3}$ sq.cm.

44. (3) Let the corresponding altitude of the triangle = x cm.
According to the question,
Area of the triangle = Area of the circle

$\Rightarrow \frac{1}{2}x\times8 = \pi\times8\times8$

$\Rightarrow x = 2\times8\pi = 16\pi$ cm.

45. (4) $3^2 + 4^2 = 5^2$
∴ Base = 3 cm and perpendicular = 4 cm
∴ Area of the right angled triangle

$= \frac{1}{2}\times$ base × height

$= \frac{1}{2}\times3\times4 = 6$ sq.cm.

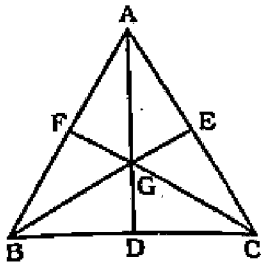
46. (4) Area of the equilateral triangle = $\frac{\sqrt{3}}{4}\times\text{Side}^2$

∴ $4\sqrt{3} = \frac{\sqrt{3}}{4}(\text{Side})^2$

$\Rightarrow (\text{Side})^2 = \frac{4\sqrt{3}\times4}{\sqrt{3}} = 16$

∴ Side = $\sqrt{16} = 4$ cm

47. (2) AG = 6 cm.



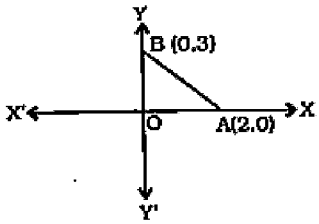
$BG = \frac{2}{3}\times12 = 8$ cm.

$GC = \frac{2}{3}\times15 = 10$ cm.

Area of $\Delta ABG = \frac{1}{2}\times6\times8$

= 24 sq. cm.
∴ Area of ΔABC
= 3 × 24 = 72 sq. cm.

48. (1) Putting $y = 0$ in the equation $3x + 2y = 6$,
$3x + 0 = 6 \Rightarrow x = 2$



∴ Point of intersection on x-axis = (2, 0)
Putting $x = 0$, in the equation $3x + 2y = 6$,
gives $0 + 2y = 6$
$\Rightarrow y = 3$
∴ Point of intersection on y-axis = (0, 3)
So, OA = 2, OB = 3

∴ $\Delta OAB = \frac{1}{2}\times OA\times OB$

$= \frac{1}{2}\times2\times3 = 3$ sq. units

49. (4) Let Sides = $3x$, $3x$ and $4x$
Semi perimeter

$= \frac{3x+3x+4x}{2} = 5x$

∴ $\Delta = \sqrt{5x(5x-3x)(5x-3x)(5x-4x)}$

$= \sqrt{5x\times2x\times2x\times x}$

$= 2\sqrt{5}x^2$

∴ $2\sqrt{5}x^2 = 18\sqrt{5}$
$\Rightarrow x^2 = 9 \Rightarrow x = 3$
∴ Third side = $4x = 4\times3$
= 12 units

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50. (3) Here, $(3x)^2 + (4x)^2 = (5x)^2$
$\therefore$ It is a right angled triangle.
So, Area of the triangle

$= \frac{1}{2} \times 3x \times 4x = 6x^2$

$\therefore 6x^2 = 72 \Rightarrow x^2 = 12$

$\Rightarrow x = 2\sqrt{3}$

Hence, Smallest side

$= 3x = 6\sqrt{3}$ units

51. (1) Side of equilateral triangle $= x$ units.

$\therefore \frac{\sqrt{3}}{4}\left((x+2)^2 - x^2\right) = 3 + \sqrt{3}$

$\Rightarrow \frac{\sqrt{3}}{4}(4x+4) = 3 + \sqrt{3}$

$\Rightarrow \sqrt{3}x + \sqrt{3} = 3 + \sqrt{3} \Rightarrow \sqrt{3}x = 3$

$\Rightarrow x = \sqrt{3}$ units

52. (3) Semi-perimeter,

$S = \frac{9+10+11}{2} = 15$ cm

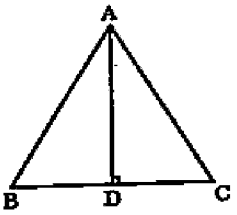
Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{15(15-9)(15-10)(15-11)}$

$= \sqrt{15 \times 6 \times 5 \times 4} = 30\sqrt{2}$ cm^2

53. (3)



Let, $AB = AC = x$ units

$BD = DC = 1$ unit [$\because BC = 2$ units]

Now, $AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{x^2 - 1}$

$\therefore \frac{1}{2} \times BC \times AD = 4$

$\Rightarrow \frac{1}{2} \times 2 \times \sqrt{x^2 - 1} = 4$

$\Rightarrow \sqrt{x^2 - 1} = 4$

$\Rightarrow x^2 - 1 = 16$

$\Rightarrow x^2 = 17$

$\Rightarrow x = \sqrt{17}$ units

54. (2) Sides of triangle
Let $3x$, $4x$ and $5x$ units
Here, $(3x)^2 + (4x)^2 = (5x)^2$
$\therefore$ It is a right angled triangle.
Now, Area of triangle

$= \frac{1}{2} \times 3x \times 4x = 6x^2$

$\therefore 6x^2 = 72$

$\Rightarrow x^2 = \frac{72}{6}$

$\Rightarrow x = \sqrt{12} = 2\sqrt{3}$

Perimeter of right angled triangle
$= 3x + 4x + 5x$
$= 12x = 12 \times 2\sqrt{3}$
$= 24\sqrt{3}$ units

$\therefore$ Perimeter of equilateral triangle $= 24\sqrt{3}$ units

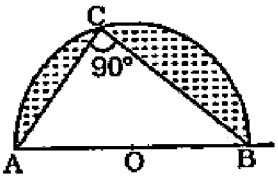
Its side $= \frac{24\sqrt{3}}{3} = 8\sqrt{3}$ units

Area $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 8\sqrt{3} \times 8\sqrt{3}$

$= 48\sqrt{3}$ sq units.

55. (2)



$\angle ACB = 90°$

$AC = CB = x$ cm

$AB = 14$ cm

From ΔABC

$AC^2 + BC^2 = AB^2$

$\Rightarrow x^2 + x^2 = 14^2$

$\Rightarrow 2x^2 = 14 \times 14$

$\Rightarrow x^2 = 14 \times 7$

$\Rightarrow x = \sqrt{14 \times 7} = 7\sqrt{2}$ cm

$\therefore$ Area of ΔABC

$= \frac{1}{2} \times AC \times BC$

$= \frac{1}{2} \times 7\sqrt{2} \times 7\sqrt{2} = 49$ sq. cm

Area of semi-circle

$= \frac{\pi r^2}{2} = \frac{22}{7 \times 2} \times 7 \times 7$

$= 77$ sq. cm

$\therefore$ Area of the shaded region
$= 77 - 49 = 28$ sq. cm $= 28$ cm^2

56. (1) Let the sides of triangle be a, b and c respectively.

$\therefore 2s = a + b + c = 32$

$\Rightarrow 11 + b + c = 32$

$\Rightarrow b + c = 32 - 11 = 21$ .....(i)

and $b - c = 5$ .....(ii)

By adding equations (i) and (ii)

$2b = 26 \Rightarrow b = 13$

$\Rightarrow c = 13 - 5 = 8$

Now, $2s = 32 \Rightarrow s = 16$

$a = 11$, $b = 13$, $c = 8$

$\therefore$ Area of triangle

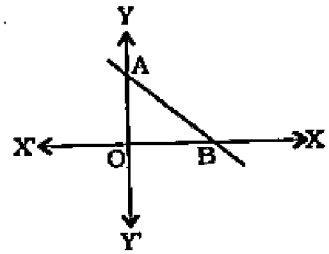
$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{16(16-11)(16-13)(16-8)}$

$= \sqrt{16 \times 5 \times 3 \times 8}$

$= 8\sqrt{30}$ sq. cm.

57. (3)



Putting $y = 0$ in the equation $3x + 4y = 12$,

$3x + 0 = 12 \Rightarrow x = 4$

Co-ordinates of point B $= (4, 0)$

Putting $x = 0$ in the equation $3x + 4y = 12$

$0 + 4y = 12 \Rightarrow y = 3$

$\therefore$ Co-ordinates of point A $= (0, 3)$

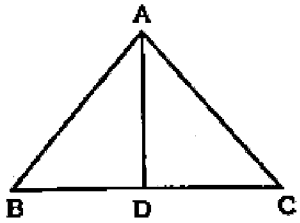
$\Rightarrow OB = 4$ and $OA = 3$

$\therefore$ Area of ΔOAB

$= \frac{1}{2} \times OB \times OA$

$= \frac{1}{2} \times 4 \times 3 = 6$ sq. units

58. (3)



Let $AB = BC = CA = 2a$ cm,

$AD \perp BC$

$AD = \sqrt{AB^2 - BD^2}$

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$= \sqrt{4a^2 - a^2} = \sqrt{3}\,a$

$\therefore \sqrt{3}\,a = 15$

$\Rightarrow a = 5\sqrt{3}$

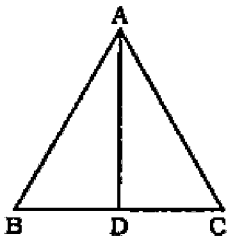
$\therefore 2a = \text{Side} = 10\sqrt{3}$ cm

$\therefore$ Area of triangle

$= \frac{\sqrt{3}}{4} \times \left(10\sqrt{3}\right)^2$

$= 75\sqrt{3}$ sq. cm.

59. (2)



$\frac{\sqrt{3}}{4} \times \text{side}^2 = 9\sqrt{3}$

$\Rightarrow \text{Side}^2 = 9 \times 4 = 36$

$\Rightarrow \text{Side} = \sqrt{36} = 6$ metre

$\therefore BD = 3$ metre

$AD = \sqrt{AB^2 - BD^2} = \sqrt{6^2 - 3^2}$

$= \sqrt{36 - 9} = \sqrt{27} = 3\sqrt{3}$ metre

60. (3) Semi-perimeter

$S = \frac{16 + 12 + 20}{2}$

$= \frac{48}{2} = 24$ cm

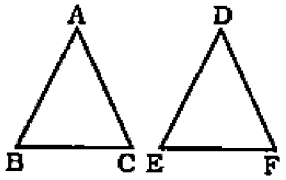
Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{24(24-16)(24-12)(24-20)}$

$= \sqrt{24 \times 8 \times 12 \times 4} = 96$ sq.cm.

61. (3)



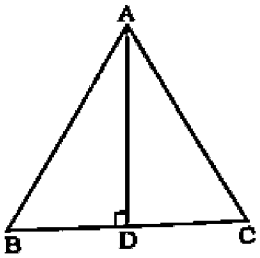
$\frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{AB^2}{DE^2}$

$\Rightarrow \frac{360}{250} = \frac{8 \times 8}{DE^2}$

$\Rightarrow DE^2 = \frac{8 \times 8 \times 250}{360} = \frac{8^2 \times 5^2}{6^2}$

$\Rightarrow DE = \frac{8 \times 5}{6} = \frac{20}{3} = 6\frac{2}{3}$ cm

62. (4)



Let AD be the altitude.

Base $= x$ cm

Each equal side $= \frac{5x}{6}$ cm

$\therefore x + 2 \times \frac{5x}{6} = 544$

$\Rightarrow \frac{3x + 5x}{3} = 544$

$\Rightarrow 8x = 544 \times 3$

$\Rightarrow x = \frac{544 \times 3}{8} = 204$

$\therefore BD = 102$ cm

$\Rightarrow AB = \frac{5x}{6} = \frac{5 \times 204}{6} = 170$ cm

and $AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{170^2 - 102^2}$

$= \sqrt{(170 + 102)(170 - 102)}$

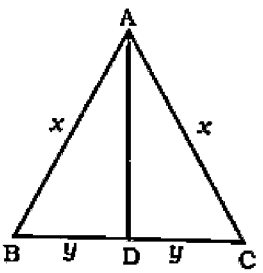
$= \sqrt{272 \times 68} = 136$ cm

$\therefore \Delta ABC = \frac{1}{2} BC \times AD$

$= \frac{1}{2} \times 204 \times 136$

$= 13872$ sq.cm.

63. (4)



Let $AB = AC = x$ cm

and $BD = DC = y$ cm

then, $AD^2 = x^2 - y^2$

$\Rightarrow x^2 - y^2 = 64$

$x + x + 2y = 64$

$\Rightarrow 2x + 2y = 64$

$\Rightarrow x + y = 32$

$\therefore \frac{x^2 - y^2}{x + y} = \frac{64}{32}$

$\Rightarrow x - y = 2$

$\therefore x + y = 32$

$x - y = 2$

$2x = 34$

$\Rightarrow x = 17$ cm

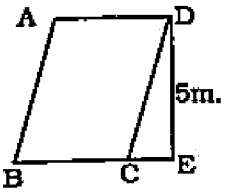
Also, $x + y = 32$

$\Rightarrow y = 32 - 17 = 15$ cm

$\therefore$ area of $\Delta ABC = \frac{1}{2} \times BC \times AD$

$= \frac{1}{2} \times 30 \times 8 = 120$ sq.cm.

64. (2)



Perimeter of rhombus

$= 4 \times$ side

$\therefore 4 \times \text{side} = 40$

$\Rightarrow \text{Side} = \frac{40}{4} = 10$ m.

As, rhombus is a parallelogram of equal sides, its area = base x height $= 10 \times 5 = 50 m^2$.

65. (1) Let the parallel sides be $5x$ and $3x$ metres.

Area of trapezium $= \frac{1}{2}$ (sum of parallel sides) $\times$ distance between them

$\Rightarrow 1440 = \frac{1}{2}(5x + 3x) \times 24$

$\Rightarrow 12 \times 8x = 1440$

$\Rightarrow x = \frac{1440}{12 \times 8} = 15$

$\therefore$ The longer parallel side

$= 5x = 5 \times 15 = 75$ metres

66. (2) Let d_1, d_2 be the diagonals of a rhombus, Area $= \frac{1}{2} d_1 . d_2$

$\Rightarrow 150 = \frac{1}{2} \times 10 \times d_2$

$\Rightarrow d_2 = \frac{150}{5} = 30$cm.

67. (3) Perimeter of rhombus

$= 2\sqrt{d_1^2 + d_2^2}$

Where d_1 and d_2 are diagonals.

$\therefore 2\sqrt{d_1^2 + d_2^2} = 100$

$\Rightarrow \sqrt{d_1^2 + d_2^2} = 50$

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$\Rightarrow d_1^2 + d_2^2 = 2500$

$\Rightarrow (14)^2 + d_2^2 = 2500$

$\Rightarrow d_2^2 = 2500 - 196 = 2304$

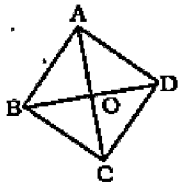
$\therefore d_2 = \sqrt{2304} = 48$

$\therefore$ Area of the rhombus

$= \frac{1}{2} d_1 \times d_2$

$= \frac{1}{2} \times 14 \times 48 = 336$ sq.cm.

68. (3)



AB = 10cm, AC = 16 cm;

$\Rightarrow$ AO = 8 cm

$\therefore$ BO = $\sqrt{10^2 - 8^2}$

$= \sqrt{100 - 64}$

$= \sqrt{36} = 6$ cm

$\therefore$ BD = 12cm

Hence, Area of rhombus

$= \frac{1}{2} d_1 d_2$

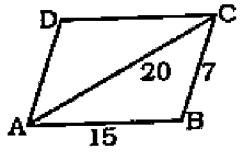
$= \frac{1}{2} \times 16 \times 12 = 96$ cm^2

69. (4) Area of the trapezium $= \frac{1}{2}$ (sum of parallel sides) × altitude

$\Rightarrow 450 = \frac{1}{2} (3x + 2x) \times 15$

$\Rightarrow 5x = \frac{450 \times 2}{15} = 60$ cm

70. (3)



Area of parallelogram ABCD

= Area of 2 ΔABC

Semi-perimeter of ΔABC

$S = \frac{20 + 7 + 15}{2} = \frac{42}{2} = 21$ cm

$\therefore$ area of Δ ABC

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{21(21-7)(21-20)(21-15)}$

$= \sqrt{21 \times 14 \times 6} = 42$ sq.cm.

$\therefore$ Area of parallelogram = 2 × 42 = 84 sq. cm.

71. (2) Let the sides of parallelogram be 5x and 4x.

Base × Height

= Area of parallelogram

$\therefore 5x \times 20 = 1000$

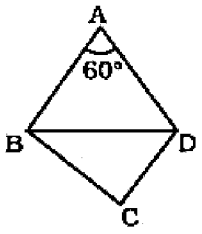
$\Rightarrow x = \frac{1000}{5 \times 20} = 10$

$\Rightarrow$ Sides = 50 and 40 units

$\therefore 40 \times h = 1000$

$\Rightarrow h = \frac{1000}{40} = 25$ units

72. (2)



Side = $\frac{40}{4} = 10$ cm

AB = AD = 10 cm

$\angle$ ABD = $\angle$ADB = 60°

$\therefore$ Area of the rhombus

$= 2 \times \frac{\sqrt{3}}{4} \times (AB)^2$

$= 2 \times \frac{\sqrt{3}}{4} \times 10 \times 10$

$= 50\sqrt{3}$ cm^2

73. (4) Let Sides of the trapezium be 2x and 3x cm

$\therefore \frac{1}{2}(2x + 3x) \times 12 = 480$

$\Rightarrow 5x = \frac{480}{6} = 80$

$\Rightarrow x = \frac{80}{5} = 16$

$\therefore$ Larger side = $3x = 16 \times 3$

= 48 cm

74. (4) $l + b + h = 24$ [given]

$l^2 + b^2 + h^2 = 225$ [given]

$\therefore (l + b + h)^2$

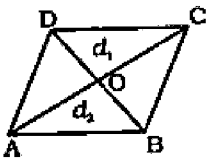
$= l^2 + b^2 + h^2 + 2(lb + bh + hl)$

$\Rightarrow (24)^2 = 225 + 2(lb + bh + hl)$

$\Rightarrow 2(lb + bh + hl)$

$= 576 - 225 = 351$ sq. cm.

75. (4)



Side of rhombus = $\frac{20}{4} = 5$ cm

OB = 4 cm

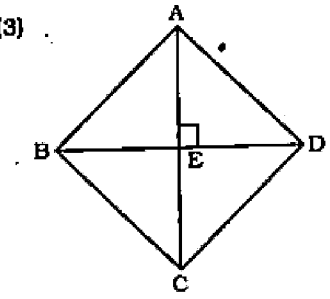
OA = $\sqrt{5^2 - 4^2} = \sqrt{9} = 3$ cm

AC = 6 cm

Area of rhombus

$= \frac{1}{2} d_1 d_2 = \frac{1}{2} \times 8 \times 6 = 24$ sq. cm

76. (3)



BD = 40 cm

BE = 20 cm

AE = x cm

AB = $\frac{100}{4} = 25$ cm

$\therefore$ From ΔABE,

AE = $\sqrt{25^2 - 20^2}$

$= \sqrt{45 \times 5} = 15$ cm

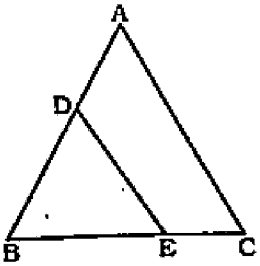
$\therefore$ AC = 30 cm

Area of rhombus ABCD

$= \frac{1}{2} d_1 d_2 = \frac{1}{2} \times 40 \times 30$

= 600 sq.cm

77. (4)



DE $\parallel$ AC $\therefore \Delta DBE \equiv \Delta ABC$

$\frac{AD}{DB} = \frac{EC}{EB} = \frac{3}{2}$

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$$\frac{AD}{DB}+1=\frac{3}{2}+1$$

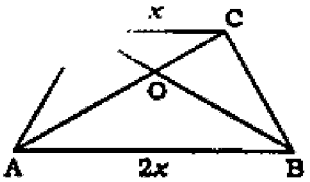
$$\Rightarrow \frac{AB}{DB}=\frac{5}{2}$$

$$\therefore \frac{\Delta ABC}{\Delta DBE}=\frac{AB^2}{BD^2}=\frac{25}{4}$$

$$\Rightarrow \frac{\Delta ABC}{\Delta DBE}-1=\frac{25}{4}-1$$

$$\Rightarrow \frac{\Delta ABC-\Delta DBE}{\Delta DBE}=\frac{25-4}{4}$$

$$\therefore \frac{\square ACED}{\Delta DBE}=\frac{21}{4} \text{ or } 21:4$$



Let CD = x
$\Rightarrow$ AB = $2x$. Δ COD ~ Δ AOB because CD || AB and take BD and AC as transversals.

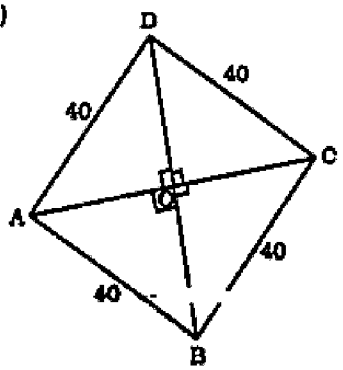
$$\therefore \frac{ar(COD)}{ar(AOB)}=\frac{CD^2}{AB^2}=\frac{x^2}{4x^2}=\frac{1}{4}.$$

$\Rightarrow \Delta ABD - \Delta AOD = \Delta ACB - \Delta BOC$

$\Rightarrow \Delta AOB = \Delta AOB$

$$\Rightarrow \frac{\Delta AOB}{\Delta COD}=\frac{1}{1} \text{ or } 1:1$$

79. (4)



Side of rhombus = side of square.

$= \sqrt{2a} = 40\sqrt{2} \Rightarrow a = 40$

AC $\perp$ BD; $\angle AOD = 90°$

Let AC = $3x$ and BD = $4x$ cm

$$\therefore AO=\frac{3x}{2};\ OD=2x \text{ cm}$$

From ΔAOD,

$OA^2 + OD^2 = AD^2$

$$\Rightarrow \left(\frac{3x}{2}\right)^2+4x^2=40^2$$

$\Rightarrow 9x^2 + 16x^2 = 1600 \times 4$

$\Rightarrow 25x^2 = 6400$

$\Rightarrow x^2 = 6400 \div 25 = 256$

$\Rightarrow x = \sqrt{256} = 16$

$\therefore$ AC = $3 \times 16 = 48$ cm

and BD = $4 \times 16 = 64$ cm

$\therefore$ Area of rhombus

$$=\frac{1}{2}\times AC\times BD$$

$$=\frac{1}{2}\times 48\times 64$$

$= 1536$ sq. cm.

80. (1) Area of regular hexagon

$$=\frac{3\sqrt{3}}{2}\times(\text{side})^2$$

$$=\frac{3\sqrt{3}}{2}\times 2\sqrt{3}\times 2\sqrt{3}$$

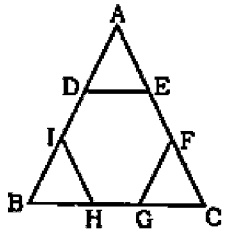
$= 18\sqrt{3}$ cm^2.

81. (1) Area of a regular hexagon

$$=\frac{3\sqrt{3}}{2}\times(\text{Side})^2$$

$$=\frac{3\sqrt{3}}{2}\times 1=\frac{3\sqrt{3}}{2}\text{ cm}^2$$

82. (3) Tricky approach



Side of the regular hexagon

$$=\frac{1}{3}\times 6=2 \text{ cm}$$

$\therefore$ Area of the hexagon

$$=\frac{3\sqrt{3}}{2}a^2$$

$$=\frac{3\sqrt{3}}{2}\times 2\times 2$$

$= 6\sqrt{3}$ sq. cm.

83. (3) Perimeter of regular hexagon = Perimeter of equilateral triangle.

i.e. If a side of the regular hexagon be x units, then side of triangle = $2x$ units.

$\therefore$ Required ratio

$$=6\frac{\sqrt{3}}{4}x^2 : \frac{\sqrt{3}}{4}(2x)^2$$

$= 6 : 4 = 3 : 2$

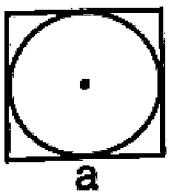
84. (2) Here, l = arc length = 3.5 cm

r = radius = 5 cm

$$\therefore \text{Area of sector} = \frac{1}{2}lr$$

$$=\frac{1}{2}\times 3.5\times 5=8.75 \text{ cm}^2$$

85. (4)



The diameter of the largest circle inscribed inside a square is equal to its side.

$\therefore$ d = a = 28cm.

$$\text{Area of the circle} = \frac{\pi d^2}{4}$$

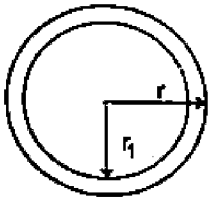
$$=\frac{1}{4}\times\frac{22}{7}\times(28)^2\text{cm}^2$$

$= 22 \times 28$ cm^2 = 616 cm^2

86. (3) When the circumference is doubled, it means radius of circle is doubled, as circumference = $2\pi r$

Since, area = πr^2, it will quadrupled.

87. (2)



According to question,

Circumference of outer circle = $2\pi r = 132$ cm

$$\Rightarrow r=\frac{132}{2\times 22}\times 7=21 \text{ cm}$$

Circumference of inner circle = $2\pi r_1 = 88$cm

$$\Rightarrow r_1=\frac{88}{2\times 22}\times 7=14cm$$

$\therefore$ Area of outer circle = πr^2

$$=\frac{22}{7}\times 21\times 21=1386 \text{ cm}^2$$

and Area of inner circle = πr_1^2

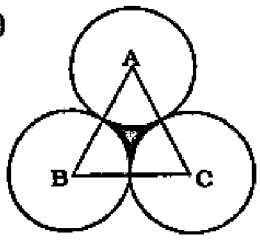
$$=\frac{22}{7}\times 14\times 14=616 \text{ cm}^2$$

$\therefore$ Area of ring

= (1386 – 616) cm^2 = 770cm^2

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88. (2)



Radius of each circle = 3.5 cm
From the figure.
ΔABC will be an equilateral triangle of side 7 cm each.
Now, the required area
= Area of DABC – 3× (Area of a sector of angle 60° in a circle of radius 3.5 cm)

$$= \frac{\sqrt{3}}{4}\times(7)^2 - 3\left[\frac{60}{360}\times\frac{22}{7}\times(3.5)^2\right]\text{cm}^2$$

$$= \left[\frac{49\sqrt{3}}{4} - 19.25\right]\text{cm}^2$$

$$= \{21.217 - 19.25\}\text{ cm}^2$$

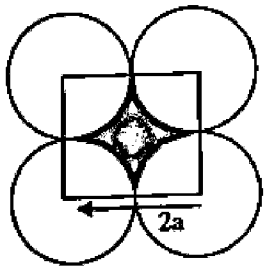
$$= 1.967\text{ cm}^2$$

89. (1) $\because \pi r^2 = 2464$ sq.m.

$$\Rightarrow r^2 = \frac{2464\times7}{22} = 784$$

$\Rightarrow r = 28$ m.
$\therefore$ Required distance = 2r
= 2 × 28 = 56 metres

90. (2) Area of shaded part

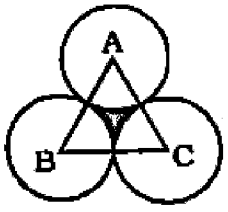


= Area of square – Area of circle

$$= (2a)^2 - \pi r^2 = 4a^2 - \frac{22}{7}a^2$$

$$\Rightarrow \frac{28a^2 - 22a^2}{7} = \frac{6a^2}{7}$$

91. (2)



Obviously, the triangle ABC will be equilateral.
AB = BC = CA = 2 cm.
Area of ΔABC

$$= \frac{\sqrt{3}}{4}\times2\times2$$

$$= \sqrt{3}\text{ cm}^2.$$

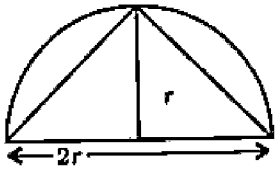
Then, area 'A' of the three sectors each of angle 60° in a circle of radius 1 cm.

$$A = 3\times\frac{60}{360}\times\pi\times1 = \frac{\pi}{2}$$

$\therefore$ Area of the shaded portion

$$= \left(\sqrt{3} - \frac{\pi}{2}\right)\text{ cm}^2.$$

92. (2) The largest triangle inscribed in a semi-circle will have base equal to 2r cm and height equal to r cm as shown in figure.



$$\therefore \text{Area} = \frac{1}{2}\times\text{base}\times\text{height}$$

$$= \frac{1}{2}\times2r\times r = r^2\text{ cm}^2$$

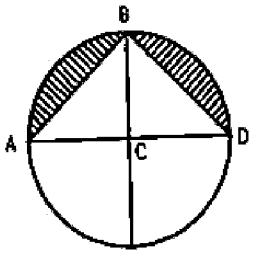
93. (1) Area of original circle
$= \pi\times(6)^2 = 36\pi\text{ cm}^2$
After trisection, the area of the smallest circle

$$= \frac{1}{3}\times36\pi = 12\pi$$

$$= \pi\times\left(2\sqrt{3}\right)^2$$

$\therefore$ Required radius = $2\sqrt{3}$ cm

94. (3)



Let Radius of circle = a units
$\therefore$ Area of semi circle

$$= \frac{\pi a^2}{2}\text{ sq.units}$$

Both triangles Δ ABC and Δ BCD are isosceles and equal.

$$\therefore \text{Area of each triangle} = \frac{1}{2}a^2$$

$\Rightarrow$ Area of both triangles

$$= 2\times\frac{1}{2}a^2 = a^2\text{ sq.units}$$

$\therefore$ Area of shaded region

$$= \frac{\pi a^2}{2} - a^2 = a^2\left(\frac{\pi}{2} - 1\right)\text{ sq.units}$$

95. (3) Let the original radius be r cm.
According to the question,
$\pi(r+1)^2 - \pi r^2 = 22$

$$\Rightarrow \pi(r^2+2r+1-r^2) = 22$$

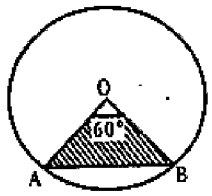
$$\Rightarrow (2r+1)\times\frac{22}{7} = 22$$

$$\Rightarrow 2r+1 = \frac{22\times7}{22} = 7$$

$$\Rightarrow 2r = 7-1 = 6 \Rightarrow r = \frac{6}{2} = 3\text{ cm.}$$

96. (1) Required ratio
$= \pi(4r)^2 : \pi(2r)^2 : \pi(r)^2$
= 16 : 4 : 1

97. (1) Let the radius of the circle be r cm.



According to the question,

$$2\pi r = 11 \Rightarrow 2\times\frac{22}{7}r = 11$$

$$\Rightarrow r = \frac{11\times7}{2\times22} = \frac{7}{4}\text{ cm}$$

$\therefore$ Area of the sector AOB

$$= \frac{\theta}{360°}\times\pi r^2$$

$$= \frac{60°}{360°}\times\frac{22}{7}\times\frac{7}{4}\times\frac{7}{4}\text{ sq.cm}$$

$$= \frac{77}{48} = 1\frac{29}{48}\text{ sq.cm.}$$

98. (1) If the radius of the circular park be r metre, then $2\pi r = 176$

$$\Rightarrow 2\times\frac{22}{7}\times r = 176$$

$$\Rightarrow r = \frac{176\times7}{2\times22} = 28\text{ metre}$$

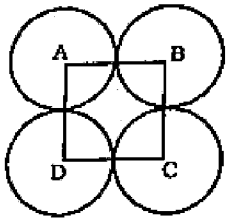
Radius of the park with road
= 28 + 7 = 35 metre
$\therefore$ Area of the road

$$= \frac{22}{7}(35^2 - 28^2)$$

$$= \frac{22}{7}\times63\times7 = 1386\text{ m}^2$$

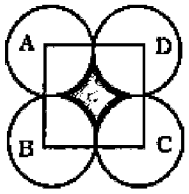
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99. (4)



Side of the square = 8 cm
∴ Area of the square
= 8 × 8 = 64 sq.cm.
Area of the four sectors
= π × 4² = 16π sq.cm.
∴ Required area = 64 – 16π
= 16 (4 – π) sq.cm.

100. (2)



Area of the shaded region
= Area of square of side
6cm – 4 × a right angled sector

$$= 36 - 4 \times \frac{\pi \times 3^2}{4}$$

$$= 36 - 9\pi = 9(4 - \pi) \text{ sq. cm.}$$

101. (1) $\pi(r+1)^2 - \pi r^2 = 22$

$$\Rightarrow \pi(r^2 + 2r + 1 - r^2) = 22$$

$$\Rightarrow 2\pi r + \pi = 22$$

$$\Rightarrow \frac{22}{7}(2r+1) = 22$$

$$\Rightarrow 2r + 1 = 7$$

$$\Rightarrow 2r = 6 \Rightarrow r = 3 \text{ cm.}$$

102. (1) $\pi r^2 = \pi \times 5^2 + \pi \times 12^2$

$$\Rightarrow r^2 = 25 + 144 = 169$$

$$\Rightarrow r = \sqrt{169} = 13 \text{ cm}$$

103. (4) $\pi r + 2r = 36$

$$\Rightarrow r\left(\frac{22}{7} + 2\right) = 36$$

$$\Rightarrow r\left(\frac{22+14}{7}\right) = 36$$

$$\Rightarrow r = \frac{36 \times 7}{36} = 7 \text{ metre}$$

$$\text{Area} = \frac{\pi r^2}{2}$$

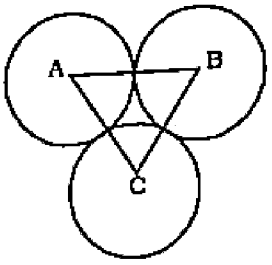
$$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$$

= 77 sq. metre

104. (1) $\pi r_1^2 : \pi r_2^2 = 4 : 7$

$$\Rightarrow r_1 : r_2 = \sqrt{4} : \sqrt{7} = 2 : \sqrt{7}$$

105. (1)



$x = AB = a + b$
$y = BC = b + c$
$z = CA = a + c$

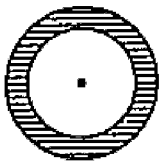
$$\therefore s = \frac{AB + BC + CA}{2} = a + b + c$$

∴ Area of Δ ABC

$$= \sqrt{s(s-x)(s-y)(s-z)}$$

$$= \sqrt{(a+b+c)abc}$$

106. (3)



Area of circle = kr^2
Area of shaded region
= $k(5^2 - 3^2) = 16\pi$ sq. units
Area of larger circle = $k \times 5^2$
= 25π sq. units
∴ Required ratio = 16 : 25

107. (1) Let Side of square = x units
Diagonal of square = $\sqrt{2}x$ units

then Radius of smaller circle = $\frac{x}{2}$ units

Radius of larger circle

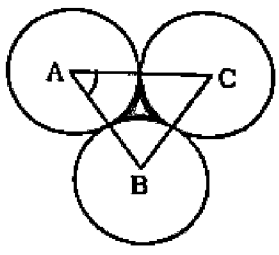
$$= \frac{\sqrt{2}x}{2} = \frac{x}{\sqrt{2}} \text{ units}$$

∴ Required ratio of areas

$$= \pi\frac{x^2}{4} : \frac{\pi x^2}{2}$$

= 2 : 4 = 1 : 2

108. (4)



Let AB = BC = CA = 2a cm.
∠BAC = ∠ACB = ∠ABC = 60°

$$\text{Area of } \Delta ABC = \frac{\sqrt{3}}{4} \times (\text{side})^2$$

$$= \frac{\sqrt{3}}{4} \times 4a^2$$

$$= \sqrt{3}a^2 \text{ sq.cm.}$$

Area of three sectors

$$= 3 \times \frac{60}{360} \times \pi \times a^2$$

$$= \frac{\pi a^2}{2} \text{ sq.cm.}$$

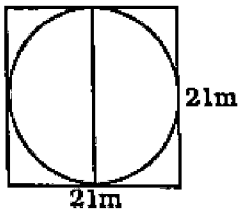
Area of the shaded region

$$= \sqrt{3}a^2 - \frac{\pi}{2}a^2$$

$$= \left(\frac{2\sqrt{3} - \pi}{2}\right)a^2 \text{ sq.cm.}$$

109. (4) Let the required radius = r cm, then
$\pi r^2 = \pi r_1^2 + \pi r_2^2$
$\Rightarrow r^2 = r_1^2 + r_2^2 = 10^2 + 24^2$
= 100 + 576 = 676
$\therefore r = \sqrt{676} = 26$ cm

110. (3)



The diameter of the greatest circle inscribed inside a square will be equal to the side of square i.e., 21 cm.

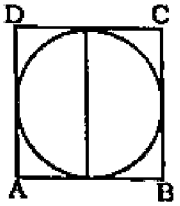
$$\therefore \text{ Radius of the circle} = \frac{21}{2}$$

∴ Area of the circle
= π × (radius)²

$$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} = \frac{693}{2} \text{ cm}^2.$$

= 346.5 cm².

111. (1)



Side of the square

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$= \frac{120}{4} = 30$ cm.

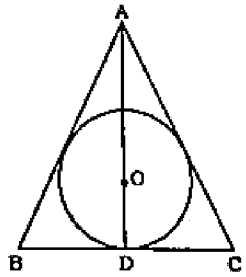
Clearly, diameter of the greatest circle = Side of the square = 30 cm

$\therefore$ Radius $= \frac{30}{2} = 15$ cm

Required area = $\pi \times (\text{radius})^2$

$= \frac{22}{7} \times (15)^2$ cm^2.

112. (2)



Let ABC be the equilateral triangle of side 42 cm and let AD be perpendicular from A on BC. Since the triangle is equilateral, so D bisects BC.

$\therefore$ BD = CD = 21 cm.

The centre of the inscribed circle will coincide with the centroid of Δ ABC.

Therefore, $OD = \frac{1}{3}AD$

In Δ ABC

$AB^2 = AD^2 + BD^2$

$\Rightarrow 42^2 = AD^2 + 21^2$

$\Rightarrow AD = \sqrt{42^2 - 21^2}$

$= \sqrt{(42+21)(42-21)}$

$= \sqrt{63 \times 21} = 3 \times 7\sqrt{3}$ cm,

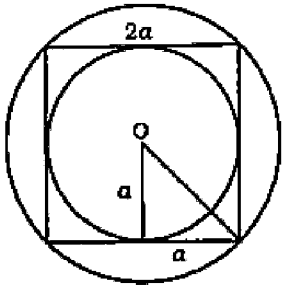
$\therefore OD = \frac{1}{3}AD = 7\sqrt{3}$ cm.

$\therefore$ Area of the incircle $= \pi (OD)^2$

$= \frac{22}{7} \times 7\sqrt{3} \times 7\sqrt{3}$

$= 22 \times 7 \times 3 = 462$ cm^2

113. (1)



Let the side of the square be $2x$.

Then radius of incircle = a

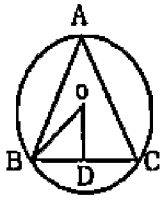
Radius of circum-circle

$\sqrt{a^2 + a^2} = \sqrt{2}a$

$\therefore$ Ratio of area

$= \pi a^2 : \pi(\sqrt{2}a)^2 = a^2 : 2a^2 = 1 : 2$

114. (1)



Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times (\text{side})^2$

$\Rightarrow \frac{\sqrt{3}}{4} \times (\text{side})^2 = 4\sqrt{3}$

$\Rightarrow$ side $= \sqrt{16} = 4$ cm

$\therefore \angle BOD = 60°$

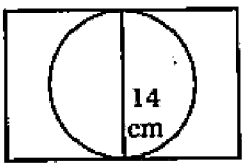
$\therefore \sin 60° = \frac{BD}{OB}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{2}{OB} \Rightarrow OB = \frac{4}{\sqrt{3}}$

$\therefore$ Area of circle $= \pi r^2$

$= \pi \times \frac{16}{3} = \frac{16}{3}\pi$ cm^2

115. (2)

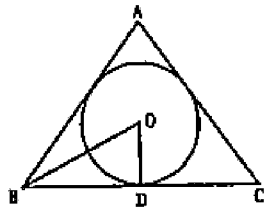


The largest circle will have radius equal to 7 cm.

$\therefore$ Area $= \pi \times r^2$

$= \frac{22}{7} \times 7 \times 7 = 154$ cm^2

116. (2)



Radius of in-circle = BD cot 60°

$= \frac{4}{\sqrt{3}}$ cm

Area of the circle

$= \pi \times \frac{4}{\sqrt{3}} \times \frac{4}{\sqrt{3}}$

$= \frac{16}{3}\pi$ cm^2 = 16.76 cm^2

Area of the triangle

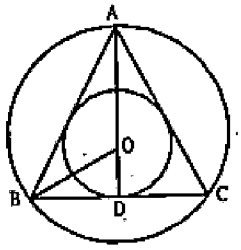
$= \frac{\sqrt{3}}{4} \times 8 \times 8$

$= 16\sqrt{3}$ cm^2

$\therefore$ Required area = $16\sqrt{3} - 16.76$

= (27.71 − 16.76) = 10.95 cm^2

117. (3) Let the each side of the equilateral triangle be $2x$ cm.



Then BD = x

Radius of incircle = OD = $\frac{1}{3}$ AD

$= \frac{1}{3}\sqrt{(2x)^2 - x^2}$

$= \frac{\sqrt{3}x}{3} = \frac{x}{\sqrt{3}}$ cm

Radius of circum circle

$= BO = \sqrt{BD^2 + OD^2}$

$= \sqrt{x^2 + \frac{x^2}{3}} = \frac{2x}{\sqrt{3}}$ cm

According to the question,

$\pi\left(\frac{2x}{\sqrt{3}}\right)^2 - \pi\left(\frac{x}{\sqrt{3}}\right)^2 = 44$

$\Rightarrow \frac{4\pi x^2}{3} - \frac{\pi x^2}{3} = 44$

$\Rightarrow \pi x^2 = 44$

$\Rightarrow x^2 = \frac{44 \times 7}{22} = 14$

$\therefore$ Area of the equilateral triangle

$= \frac{\sqrt{3}}{4} \times \text{side}^2 = \frac{\sqrt{3}}{4} \times (2x)^2$

$= \sqrt{3}x^2 = 14\sqrt{3}$ Sq. cm.

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118. (3)



$\therefore$ Area of the circle $= \pi r^2 = 9\pi$

$\Rightarrow r^2 = 9$

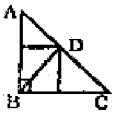
$\Rightarrow r = \sqrt{9} = 3$ cm

$\therefore$ Side of the square $= 2r = 6$ cm

$\therefore$ Area of the Square $=$ side^2

$= 6 \times 6 = 36$ cm^2

119. (4)



Here, $6^2+8^2 = 10^2$

Hence, ΔABC is right angled

BD is perpendicular to AC

$\therefore \frac{1}{2} \times AB \times BC = \frac{1}{2} \times AC \times BD$

$\Rightarrow \frac{1}{2} \times 6 \times 8 = \frac{1}{2} \times 10 \times BD$

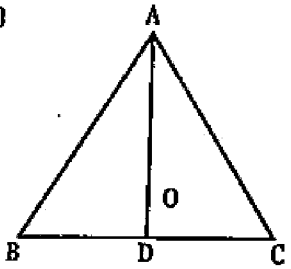
$\Rightarrow BD = \frac{48}{10} = \frac{24}{5}$

$\therefore$ BD = diagonal of square

$\therefore$ Area of square $= \frac{24 \times 24}{2 \times 5 \times 5}$

$= \frac{576}{50}$ cm^2

120. (2)



Let AD $\perp$ BC

$\therefore$ BD = 4 cm and

AB = 8 cm

$\therefore$ AD $= \sqrt{AB^2 - BD^2} = \sqrt{8^2 - 4^2}$

$= \sqrt{64-16} = \sqrt{48} = 4\sqrt{3}$ cm

$\therefore$ OD = radius of the in circle

$= \frac{1}{3} \times 4\sqrt{3}$ cm $= \frac{4}{\sqrt{3}}$ cm

$\therefore$ Area of the in circle

$= \pi\left(\frac{4}{\sqrt{3}}\right)^2$ cm$^2 = \frac{16}{3}\pi$ cm^2

AO = radius of circum-circle

$= \frac{2}{3} \times 4\sqrt{3} = \frac{8}{\sqrt{3}}$ cm

$\therefore$ Area of the cirum-circle

$= \pi \times \left(\frac{83}{\sqrt{3}}\right)^2 = \frac{64}{3}\pi$ cm^2

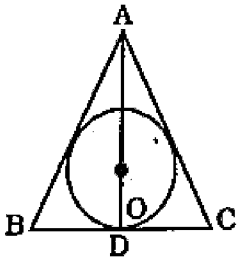
$\therefore$ Area of the required region

$= \left(\frac{64}{3}\pi - \frac{16}{3}\pi\right)$ cm^2

$= \frac{48\pi}{3} = 16\pi$ cm^2

$= \frac{16 \times 22}{7} = \frac{352}{7} = 50\frac{2}{7}$ cm^2

121. (3)



BD = DC = $7\sqrt{3}$ cm

AD $= \sqrt{AB^2 - BD^2}$

$= \sqrt{(14\sqrt{3})^2 - (7\sqrt{3})^2}$

$= \sqrt{(14\sqrt{3}+7\sqrt{3})(14\sqrt{3}-7\sqrt{3})}$

$= \sqrt{21\sqrt{3} \times 7\sqrt{3}} = 21$cm

$\therefore$ OD = Radius of circle

$= \frac{1}{3} \times 21 = 7$cm

$\therefore$ Area of circle $= \pi r^2$

$= \frac{22}{7} \times 7 \times 7 = 154$ sq.cm.

122. (2) Side of square $= \sqrt{2}$ metre

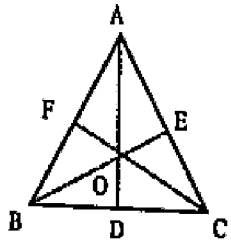
Radius of in-circle

$= \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$ metre

Area of the circle $= \pi r^2$

$= \pi \times \frac{1}{2} = \frac{\pi}{2}$ sq. metre.

123. (1)



Let the side of the equilateral triangle be x cm.

$\therefore \Delta AOB + \Delta BOC + \Delta COA = \Delta ABC$

$\Rightarrow \frac{1}{2}x \times 3 + \frac{1}{2} \times x \times 4 + \frac{1}{2} \times x \times 5$

$= \frac{\sqrt{3}}{4}x^2$

$\Rightarrow 6 = \frac{\sqrt{3}}{4}x \Rightarrow x = \frac{24}{\sqrt{3}} = 8\sqrt{3}$

$\therefore$ Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times$ side^2

$= \frac{\sqrt{3}}{4} \times 8\sqrt{3} \times 8\sqrt{3} = 48\sqrt{3}$ sq.cm.

124. (2) For the equilateral triangle of side a,

In radius $= \frac{a}{2\sqrt{3}}$

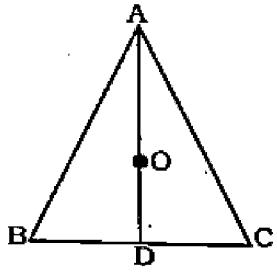
Circum-radius $= \frac{a}{\sqrt{3}}$

$\therefore$ Required ratio

$= \pi\left(\frac{a}{\sqrt{3}}\right)^2 : \pi\left(\frac{a}{2\sqrt{3}}\right)^2$

$= \frac{1}{3} : \frac{1}{12} = 4:1$

125. (4)



DB= DC = 3cm.

AD $= \sqrt{AB^2 - BD^2} = \sqrt{6^2 - 3^2}$

$= \sqrt{36-9} = \sqrt{27} = 3\sqrt{3}$ cm.

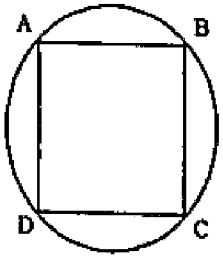
$\therefore$ OD = In-radius

$= \frac{1}{3} \times 3\sqrt{3} = \sqrt{3}$ cm.

$\therefore$ Area of the in-circle $= \pi r^2$

$= \pi \times \sqrt{3} \times \sqrt{3} = 3\pi$ sq.cm.

126. (3)



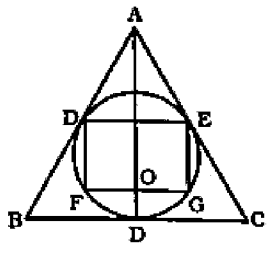
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BD = Diagonal = 16 cm
[∵ Radius = 8 cm]

Area of square = $\frac{1}{2} \times BD^2$

$= \frac{1}{2} \times 16 \times 16 = 128$ sq. cm.

127. (3)



Let AB = BC = CA = x units, then

$AD = \sqrt{x^2 - \frac{x^2}{4}} = \frac{\sqrt{3}x}{2}$

$OD = \frac{1}{3} AD = \frac{x}{2\sqrt{3}}$ = radius of circle

⇒ Diagonal of square

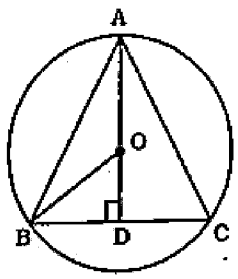
$= 2 \times \frac{x}{2\sqrt{3}} = \frac{x}{\sqrt{3}}$

∴ Triangle : Square

$= \frac{\sqrt{3}}{4}x^2 : \frac{x^2}{2 \times 3}$

$= \frac{\sqrt{3}}{2} : \frac{1}{3} = 3\sqrt{3} : 2$

128. (3)



Let AB = BC = AC = $2x$ units

$AD = \sqrt{4x^2 - x^2} = \sqrt{3}x$

$OD = \frac{1}{3} \times \sqrt{3}x = \frac{x}{\sqrt{3}}$

$\therefore OB = \sqrt{x^2 + \frac{x^2}{3}}$

$= \frac{2x}{\sqrt{3}}$ = Circum radius

∴ ΔABC : Area of circum-circle

$= \frac{\sqrt{3}}{4} \times 4x^2 : \pi \times \frac{4x^2}{3}$

$= 3\sqrt{3} : 4\pi$

129. (2) Area of a square = (side)²

$= \left(\frac{\text{Perimeter}}{4}\right)^2 = \left(\frac{44}{4}\right)^2$

$= (11)^2 = 121$ cm²

Area of a cricle = π (radius)²

$= \pi \left(\frac{\text{Circumference}}{2\pi}\right)^2$

$= \frac{(\text{Circumference})^2}{4\pi}$

$= \frac{44 \times 44}{4 \times \frac{22}{7}} = 22 \times 7 = 154$ cm²

Area of circle – Area of square
= 154 – 121 = 33cm²
∴ Area of the circle is larger than the area of the square by 33 cm².

130. (2) Area of circular field = πr^2
= 3850 sq.m.
⇒ $\pi r^2 = 3850$

$\Rightarrow r^2 = \frac{3850}{22} \times 7$

$\Rightarrow r^2 = 1225$

$\therefore r = \sqrt{1225} = 35$ m

Now, circumference of circle = $2\pi r$

$= 2 \times \frac{22}{7} \times 35 = 44 \times 5 = 220$ m

∴ According to question,
Perimeter of Square = Circumference of circle
Let side of square be x m.
then, 4x = 220m
⇒ x = 55m
∴ Area of square = x²
= 55 x 55m² = 3025 m²

131. (4) Let the length of the side of the square be x cm.
∴ $x^2 = (x + 5)(x - 3)$
⇒ $x^2 = x^2 + 5x - 3x - 15$

$\Rightarrow 2x = 15 \Rightarrow x = \frac{15}{2}$ cm.

Now, length of the rectangle

$= x + 5 = \frac{15}{2} + 5 = \frac{25}{2}$ cm

and breadth

$= \frac{15}{2} - 3 = \frac{15 - 6}{2} = \frac{9}{2}$ cm

∴ Required perimeter

$= 2\left(\frac{25}{2} + \frac{9}{2}\right) = 2 \times \frac{34}{2} = 34$ cm

132. (2) The length of wire
= perimeter of the square
$= 4 \times \sqrt{\text{Area of square}}$
$= 4 \times \sqrt{81} = 4 \times 9 = 36$ cm
Now, perimeter of semicircular shape = 36 cm
⇒ $(\pi \times r + 2r) = 36$ cm.

$\Rightarrow r\left(\frac{22}{7} + 2\right) = 36$ cm

$\Rightarrow r \times \frac{36}{7} = 36$ cm

$\Rightarrow r = \frac{36 \times 7}{36} = 7$ cm

∴ Required area

$= \frac{\pi r^2}{2} = \frac{22 \times 7 \times 7}{7 \times 2}$

$= 77$ cm².

133. (1) Let the length and breadth of rectangle are a and b respectively.
According to the question,
$2(a + b) = 160$
⇒ $a + b = 80$ ...(i)
$a - b = 48$ ...(ii)

$2a = 128$ (On adding)

$\Rightarrow a = \frac{128}{2} = 64m$

From equation (i),
$b = 80 - 64 = 16$ m
∴ Area of rectangle
= 64 x 16 m²
∴ Area of square
= 64 x 16 m²
⇒ (side)² = 64 x 16
⇒ side = 8 x 4 = 32 m

134. (2) Area of square = (12)²
= 144 cm²
Area of triangle

$= \frac{1}{2} \times$ base xheight

$= \frac{1}{2} \times 12 \times$ height

$\Rightarrow \frac{1}{2} \times 12 \times \text{height} = 144$

$\Rightarrow \text{Height} = \frac{144 \times 2}{12} = 24$cm

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135. (2) Let the length of rectangle = 48 m. and breadth = 16m.
Perimeter of square = Perimeter of rectangle
$= 2(48 + 16)$
$\Rightarrow 4 \times \text{Side} = 2 \times 64$

$\Rightarrow \text{Side} = \frac{2+64}{4} = 32$ metres

$\therefore$ Area of the square $= (32)^2$
$= 1024$ metre^2

136. (4) As a square and an equilateral triangle are drawn on the same base, side of triangle and square will be the same. Let the side be x units.

$$\therefore \frac{\text{Area of square}}{\text{Area of triangle}} = \frac{x^2}{\frac{\sqrt{3}}{4}x^2}$$

$$= \frac{4}{\sqrt{3}} \Rightarrow 4 : \sqrt{3}$$

137. (3) Side of the square

$= \sqrt{121} = 11$ cm
$\therefore$ Length of the wire $= 4 \times$ side
$= 4 \times 11 = 44$ cm
Now the wire is bent into the form of a circle.
If the radius of the circle be r cm, then,
$\therefore 2\pi r = 44$

$$\Rightarrow r = \frac{44}{2\pi} = \frac{44 \times 7}{2 \times 22} = 7 \text{ cm}$$

$\therefore$ Area of the circle $= \pi r^2$

$$= \frac{22}{7} \times 7 \times 7 = 154 \text{ cm}^2$$

138. (3) Area of the equilateral triangle

$$= \frac{\sqrt{3}}{4} \text{ side}^2$$

$$\Rightarrow 121\sqrt{3} = \frac{\sqrt{3}}{4} \times \text{side}^2$$

$$\therefore \text{Side}^2 = \frac{121\sqrt{3} \times 4}{\sqrt{3}} = 121 \times 4$$

$\therefore$ Side $= \sqrt{121 \times 4}$
$= 11 \times 2 = 22$ cm
$\therefore$ Total length of wire $= 3 \times 22$
$= 66$ cm
Let the radius of the circle be r cm, then
$2\pi r = 66$

$$\Rightarrow \frac{2 \times 22}{7} \times r = 66$$

$$\Rightarrow r = \frac{66 \times 7}{2 \times 22} = \frac{21}{2} \text{ cm}$$

$\therefore$ Area of the circle $= \pi r^2$

$$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$$

$= 346.5$ cm^2

139. (4) Side of a square

$= \sqrt{81} = 9$ cm
$\therefore$ Length of the wire
$= 4 \times 9 = 36$ cm.
$\therefore$ Perimeter of semi-circle
$= (\pi + 2)r$ where r = radius

$$\Rightarrow \left(\frac{22}{7} + 2\right)r = 36$$

$$\Rightarrow \frac{36}{7}r = 36$$

$$\Rightarrow r = \frac{36 \times 7}{36} = 7 \text{ cm.}$$

140. (2) Area grazed by all cows

$$= \frac{180°}{360°}\pi r^2 = \frac{\pi r^2}{2}$$

$$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 77 \text{ sq.metre}$$

Semi-perimeter of triangular field

$$S = \frac{26 + 28 + 30}{2} = 42 \text{ metres}$$

$\therefore$ Area of the field

$$= \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{42(42-26)(42-28)(42-30)}$$

$$= \sqrt{42 \times 16 \times 14 \times 12}$$

$= 336$ sq.metre
$\therefore$ Area ungrazed by the cows
$= 336 - 77$
$= 259$ sq.metre

141. (3) Let the side of the square be x units, then

diagonal $= \sqrt{2}x$ units

$\therefore$ Area of the square $= x^2$
and area of triangle

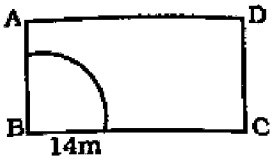
$$= \frac{\sqrt{3}}{4}(\sqrt{2}x)^2$$

$$= \frac{\sqrt{3}x^2}{2} \text{ sq. units}$$

$\therefore$ Required ratio

$$= x^2 : \frac{\sqrt{3}x^2}{2} = 2 : \sqrt{3}$$

142. (3)



Required area $= \frac{\pi}{4}r^2$

$$= \frac{22 \times 14 \times 14}{7 \times 4} = 154 \text{m}^2$$

143. (2) Let the radius of circle be r units and the side of square be x units, then
$x^2 = \pi r^2$

$$\Rightarrow \frac{x^2}{r^2} = \frac{\pi}{1} \Rightarrow \frac{x}{r} = \frac{\sqrt{\pi}}{1} \text{ or } \sqrt{\pi}:1$$

144. (4) Let Side of rectangle are $2x$ and x units.
and Side of square $= y$ units
$\therefore 4y = 6x$

$$\Rightarrow \frac{x}{y} = \frac{4}{6} = \frac{2}{3}$$

$$\therefore \frac{2x \times x}{y^2} = \frac{2x^2}{y^2} = \frac{2 \times 4}{9}$$

$= 8 : 9$

145. (3) Let Length of rectangle $= x$ units and breadth $= y$ units
$\therefore$ Side of triangle $= y$ units
$\Rightarrow 2x + 2y = 3y$
$\Rightarrow 2x = y$ ...(i)

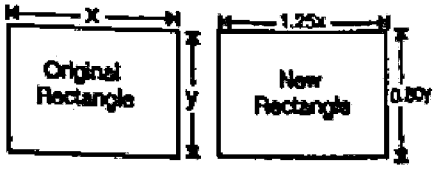
$$\therefore \frac{\text{Area of rectangle}}{\text{Area of triangle}}$$

$$= \frac{xy}{\frac{\sqrt{3}}{4}y^2} = \frac{4x}{\sqrt{3}y}$$

$$= \frac{4x}{\sqrt{3}.2x} = \frac{2}{\sqrt{3}} \text{ or } 2 : \sqrt{3}$$

146. (2) Radius of circle = Side of square = r units
$\therefore$ Area of circle : Area of square
$= \pi r^2 : r^2$
$= \pi : 1$

147. (3)



According to question,
Area of original rectangle
$= xy$

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Area of new rectangle
$= 1.25x \times 0.80y$
$= xy$
$\therefore$ Effective change

$= \left(25 - 20 - \frac{25 \times 20}{100}\right)\% = 0\%$

i.e. Hence, the area of the rectangle remains unchanged.

148. (2) Let the length and breadth of a rectangle are changed by x and y per cent respectively, then the net change

$= \left(x + y + \frac{xy}{100}\right)\%$, where positive and negative signs show increase and decrease respectively.
$\therefore$ Net change

$= -10 + 10 - \frac{10 \times 10}{100} = -1\%$

149. (3) Net effect

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$

$= 40 + 4 = 44\%$

150. (4) Let radius $= r$
$\therefore$ Circumference $= 2\pi r$
Reduced circumference

$= \pi r = 2\pi \times \frac{r}{2}$

$\therefore$ New radius $= \frac{r}{2}$

$\therefore$ Reduced area

$= \pi \times \left(\frac{r}{2}\right)^2 = \frac{\pi r^2}{4}$

It is 25% of πr^2 (the original area)
$\therefore$ Area is reduced by 75%.

151. (4) Let the side of a square is increased by x %, its area is increased by $\left(2x + \frac{x^2}{100}\right)\%$.

Here, $x = 25\%$
$\therefore$ Effective increase in area

$= \left(2 \times 25 + \frac{25 \times 25}{100}\right)\% = 56.25\%$

152. (1) If the radius of circle is increased by x%, the area changes by $\left(2x + \frac{x^2}{100}\right)\%$

$= \left(2 \times 50 + \frac{50 \times 50}{100}\right)\% = 125\%$

153. (2) Effective change in area

$= \left(x + y + \frac{xy}{100}\right)\%$

where x and y denote percentage change

$= \left(20 - 20 - \frac{20 \times 20}{100}\right)\%$

$= -4\%$

Hence, the area will decrease by 4%

154. (2) Effective increase

$= \left(50 + 50 + \frac{50 \times 50}{100}\right)\% = 125\%$

155. (3) Let the base of triangle be decreased by x%.
According to the question,

$10 - x - \frac{10x}{100} = 0$

[$\because$ Area remains same]

$\Rightarrow x + \frac{x}{10} = 10$

$\Rightarrow \frac{10x + x}{10} = 10 \Rightarrow \frac{11x}{10} = 10$

$\Rightarrow x = \frac{100}{11} = 9\frac{1}{11}\%$

156. (4) For an increase of 50% in the circumference of circle, the radius of circle should be increased by 50%.
Then, required percentage increase in the area of the circle

$= 50 + 50 + \frac{50 \times 50}{100}$

$= 100 + 25 = 125\%$

157. (2) Percentage increase in the area of rectangle

$= \left(12 + 15 + \frac{12 \times 15}{100}\right)\%$

$= \left(27 + \frac{9}{5}\right)\% = 28\frac{4}{5}\%$

158. (2) Let the length and breadth of a rectangle are changed by x% and y% respectively, the effective change in area

$= \left(x + y + \frac{xy}{100}\right)\%$

Here, $x = -40$
$y = -40$
$\therefore$ Percentage decrease

$= \left(-40 - 40 + \frac{40 \times 40}{100}\right)\%$

$= (-80 + 16)\% = -64\%$

Negative sign shows decrease.

159. (1) For changes of x% and y% in length and breadth respectively, effective change in area

$= \left(x + y + \frac{xy}{100}\right)\%$

(decrease with negative sign)

$\therefore 60 - y - \frac{60y}{100} = 0$

$\Rightarrow y + \frac{3y}{5} = 60 \Rightarrow \frac{8y}{5} = 60$

$y = \frac{60 \times 5}{8} = \frac{75}{2} = 37\frac{1}{2}\%$

160. (2) Increase percent in area

$= \left(10 + 10 + \frac{10 \times 10}{100}\right)\% = 21\%$

161. (2) Net % effect $= \left(x - y - \frac{xy}{100}\right)\%$

$= \left(5 - 10 - \frac{5 \times 10}{100}\right)\%$

$= (-5 - 0.5)\% = -5.5\%$

The negative sign shows decrease.

162. (4) %Effect on area

$= \left(1 + 1 + \frac{1 \times 1}{100}\right)\% = 2.01\%$

163. (3) Required net effect

$= \left(x + y + \frac{xy}{100}\right)\%$

Negative sign shows decrease

$= \left(5 - 2 - \frac{5 \times 2}{100}\right)\% = 2.9\%$

164. (4) Percentage increase in area

$= \left(30 + 20 + \frac{30 \times 20}{100}\right)\% = 56\%$

165. (4) Required percentage increase

$= \left(40 + 40 + \frac{40 \times 40}{100}\right)\% = 96\%$

Or Let edge = 10, S. Area = 600,
New edge = 14 $\Rightarrow$ New surface area $= 6 \times 14^2 = 6 \times 196 = 1176$.

% increase $= \left(\frac{1176 - 600}{600}\right) 100$

$= \frac{576}{6} = 96\%$.

166. (1) Required percentage increase

$= \left(8 + 8 + \frac{8 \times 8}{100}\right)\% = 16.64\%$

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167. (1) If the required percentage be x, then

$$30 - x - \frac{30x}{100} = 0$$

$$\Rightarrow 300 - 10x - 3x = 0$$

$$\left(\text{Percentage Effect} = \left(x + y + \frac{xy}{100}\right)\%\right)$$

$$\Rightarrow 13x = 300$$

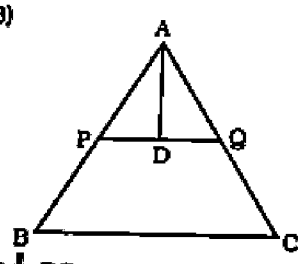
$$\Rightarrow x = \frac{300}{13} = 23\frac{1}{13}\%$$

168. (3) Percentage increase in area

$$= \left(100 + 100 + \frac{100 \times 100}{100}\right)\%$$

$= 300\%$

169. (3)



$PQ \parallel BC$

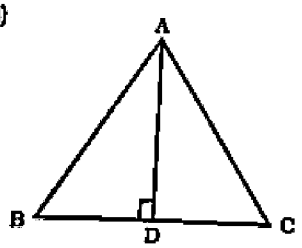
$\angle APQ = \angle ABC = 60°$

$\angle AQP = \angle ACB = 60°$

$$\therefore \text{Area of } \Delta APQ = \frac{\sqrt{3}}{4} \times (PQ)^2$$

$$= \frac{\sqrt{3}}{4} \times (5)^2 = \frac{25\sqrt{3}}{4} \text{ sq.cm.}$$

170. (3)



$AD = b$

Let $BD = DC = x$

Each angle $= 60°$

[$\because \Delta$ is equilateral]

$$\therefore \tan 60° = \frac{AD}{BD}$$

$$\Rightarrow \sqrt{3} = \frac{b}{x} \Rightarrow x = \frac{b}{\sqrt{3}}$$

$$\Rightarrow BC = 2x = \frac{2b}{\sqrt{3}}$$

$\therefore$ Area of the triangle

$$= \frac{1}{2} \times BC \times AD$$

$$a = \frac{1}{2} \times \frac{2b}{\sqrt{3}} \times b$$

$$\Rightarrow \frac{b^2}{a} = \sqrt{3}$$

Let $AB = BC = AC = S$ Area of equilateral Δ i.e. $a = \frac{\sqrt{3}}{4}S^2$

Also AD (height)

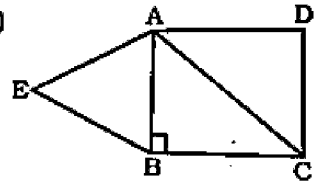
$$= \sqrt{S^2 - \left(\frac{S}{2}\right)^2} = \sqrt{S^2 - \frac{S^2}{4}} = \sqrt{\frac{3S^2}{4}}$$

$$\Rightarrow b = \frac{\sqrt{3}S}{2} \therefore \frac{b^2}{a}$$

$$= \frac{\left(\frac{\sqrt{3}S}{2}\right)^2}{\frac{\sqrt{3}}{4}S^2} = \frac{3S^2}{4} \times \frac{4}{\sqrt{3}S^2}$$

$$= \frac{3}{\sqrt{3}} = \sqrt{3}$$

171. (3)



$AB = x$ units

$BC = x$ units

$AC = \sqrt{2}x$ units

[Using Pythagorus]

$$\therefore \frac{\Delta ABE}{\Delta ACD} = \frac{\frac{\sqrt{3}}{4}x^2}{\frac{\sqrt{3}}{4}(\sqrt{2}x)^2}$$

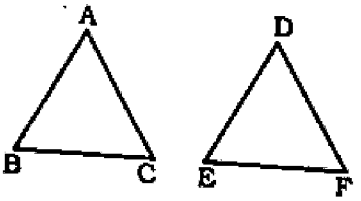
$$= \frac{1}{2} = 1 : 2$$

172. (2) $\frac{\Delta ABC}{\Delta DEF} = \frac{AB^2}{DE^2} = \frac{100}{64} = \frac{25}{16}$

$= 25 : 16$

[$\because \Delta ABC \sim \Delta DEF$]

173. (3)



$\Delta ABC \sim \Delta DEF$

$$\therefore \frac{\Delta ABC}{\Delta DEF} = \frac{3^2}{4^2} \Rightarrow \frac{54}{\Delta DEF} = \frac{9}{16}$$

$$\Rightarrow \Delta DEF = \frac{16 \times 54}{9}$$

$= 96$ sq.cm.

174. (2) $\frac{\Delta ABC}{\Delta DEF} = \frac{AB^2}{DE^2}$

$$\Rightarrow \frac{20}{45} = \frac{25}{DE^2}$$

$$\Rightarrow DE^2 = \frac{45 \times 25}{20} = \frac{225}{4}$$

$$\therefore DE = \frac{15}{2} = 7.5 \text{ cm}$$

175. (1) Join AC & DQ

$\because \Delta APC$ and ΔBCP lie on the same base PC and between the same parallels AB and PC

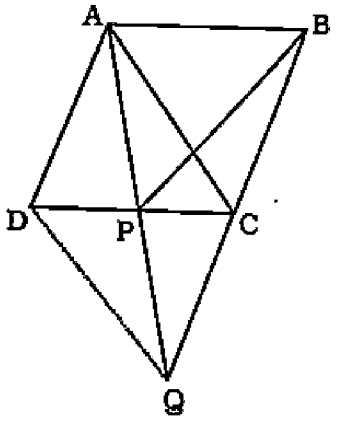
$\therefore$ ar (ΔAPC) = ar (ΔBCP)

Now,

$AD \parallel CQ$ and $AD = CQ$ ...(i)

$\therefore ADQC$ is a parallelogram.

Again ΔADC and ΔDAQ are on the same base AD and between same parallels AD and CQ.



$\therefore$ ar (ΔADC) = ar (ΔADQ)

Subtracting ar (DAP) from both sides, we get

ar (ΔAPC) = ar (ΔDPQ) ...(ii)

From (i) and (ii), we get ar (ΔBPC) = ar (ΔDPQ)

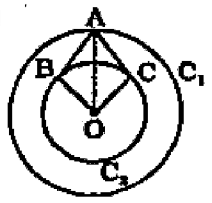
176. (4) Area of the trapezium $= \frac{1}{2}$ (sum of parallel sides) $\times$ altitude

$$\Rightarrow 450 = \frac{1}{2}(3x + 2x) \times 15$$

$$\Rightarrow 5x = \frac{450 \times 2}{15} = 60 \text{ cm}$$

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177. (1)



AB = AC = tangents from the same point
OB = OC = 3 cm
OA = 12 cm
$\angle ABO = 90°$

$\therefore AB = \sqrt{12^2 - 3^2}$

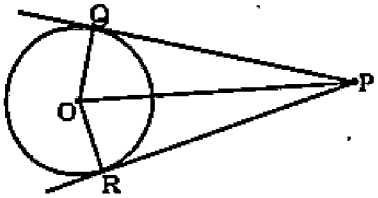
$= \sqrt{15 \times 9} = 3\sqrt{15}$

$\Delta OAB = = \frac{1}{2} OB \times AB$

$= \frac{1}{2} \times 3 \times 3\sqrt{15} = \frac{9\sqrt{15}}{2}$

$\therefore$ Area of OABC = $\frac{9\sqrt{15}}{2}$ sq.cm.

178. (2)



$\angle OQP = \angle ORP = 90°$

$PQ = \sqrt{OP^2 - OQ^2}$

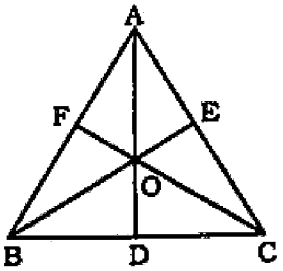
$= \sqrt{13^2 - 5^2} = 12$

$\therefore$ Area of PQOR = 2 × Δ OPQ

$= 2 \times \frac{1}{2} \times 5 \times 12$

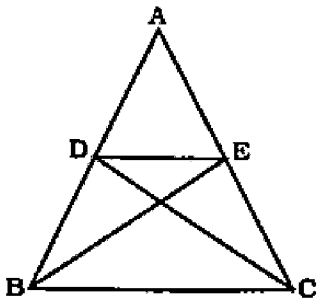
= 60 sq. cm

179. (2)



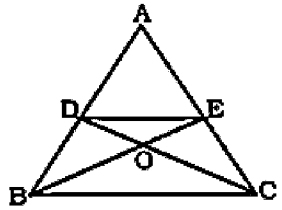
ar(ΔAOE) = ar(ΔBOD)
= ar(ΔBOF)
Area of quadrilateral BDOF
= 2 × 15 = 30 sq.cm.

180. (2)



ΔDBC and ΔEBC lie on the same base and between same parallel lines.
$\therefore$ $\Delta DBC = \Delta BEC$
$\Rightarrow$ $\Delta ABC \sim \Delta DBC$
$\Rightarrow$ $\Delta ABC \sim \Delta BEC$
$\Rightarrow$ $\Delta ADE = \Delta ABE = 36$ sq.cm

181. (3)



In Δs ODE and BOC,
$\angle BOC = \angle DOE$
$\angle DEO = \angle OBC$; $\angle ODE = \angle OCB$
$\therefore$ Both triangles are similar,

$\therefore \frac{\Delta ODE}{\Delta BOC} = \frac{DE^2}{BC^2}$

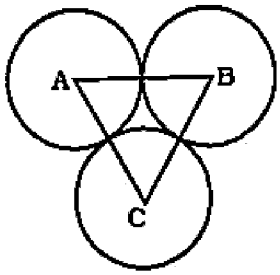
DE || BC and DE = $\frac{1}{2}$BC

and area of Δ ABC
= 3 × Area of Δ OBC

$\therefore \frac{\Delta ODE}{\Delta ABC} = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$

or, 1 : 12

182. (4)



AB = 4 + 6 = 10 cm
BC = 6 + 8 = 14 cm
CA = 8 + 4 = 12 cm
$\therefore$ Semi-perimeter

= $\frac{10+14+12}{2}$ = 18 cm

Area = $\sqrt{s(s-a)(s-b)(s-c)}$

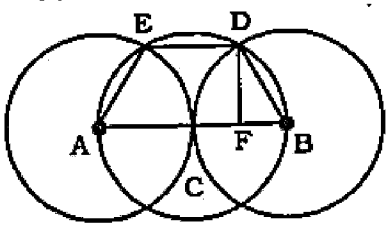
= $\sqrt{18(18-10)(18-14)(18-12)}$

= $\sqrt{18 \times 8 \times 4 \times 6}$

= $3 \times 2 \times 2 \times 2\sqrt{6}$

= $24\sqrt{6}$ sq.cm.

183. (2)



ABDE will be a trapezium
AB = 4 units

DE = $\frac{1}{2}$ AB = 2 units

FB = 1 unit, BD = 2 units.

$\therefore$ DF = $\sqrt{2^2 - 1^2} = \sqrt{3}$ units

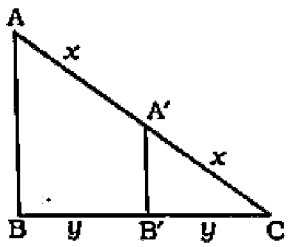
$\therefore$ Area of ABDE

= $\frac{1}{2}$ (AB + DE) × DF

= $\frac{1}{2}$ (4 + 2) × $\sqrt{3}$

= $3\sqrt{3}$ sq. units

184. (3)



$\Delta A'B'C \sim \Delta ABC$
$\angle C = \angle C$,

$\frac{CA'}{CA} = \frac{1}{2}$ and $\frac{CB'}{CB} = \frac{1}{2}$

and

$\therefore \frac{\Delta ABC}{\Delta A'B'C} = \frac{(2x)^2}{x^2} = \frac{4}{1}$

[$\because$ BC = 2B'C and AC = 2A'C]

$\Rightarrow \frac{\Delta A'B'C}{\Delta ABC} = \frac{1}{4}$

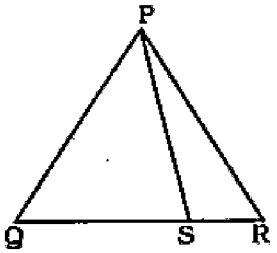
$\Rightarrow 1 - \frac{\Delta A'B'C}{\Delta ABC} = 1 - \frac{1}{4}$

$\Rightarrow \frac{\square AA'B'C}{\Delta ABC} = \frac{3}{4} = 3 : 4$

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185. (1) Both the triangles are congruent.
$\therefore \Delta ABC = 60$ sq.cm.
$\Delta PQR = 60$ sq.cm.

186. (4)



$QR = 4.5$ cm
$SR = 1.5$ cm
$\therefore QS = 4.5 - 1.5 = 3$ cm

$$\frac{\Delta PQS}{\Delta PSR} = \frac{\frac{1}{2} \times h \times QS}{\frac{1}{2} \times h \times SR}$$

$$= \frac{3}{1.5} = 2:1$$

187. (2) Radius of the larger circle $= R$ cm
Radius of the smaller circle $= r$ cm
$\therefore R - r = 14$ cm
and $\pi (R^2 - r^2) = 1056$

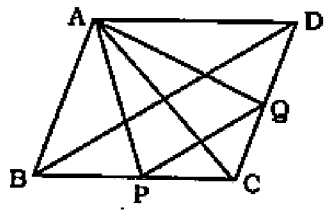
$$\Rightarrow R^2 - r^2 = \frac{1056}{\pi} = \frac{1056 \times 7}{22}$$

$\Rightarrow R^2 - r^2 = 336$
$\Rightarrow (R + r)(R - r) = 336$

$$\Rightarrow R + r = \frac{336}{14} = 24 \text{ cm}$$

$\therefore (R + r) - (R - r) = 24 - 14$
$\Rightarrow 2r = 10 \Rightarrow r = 5$ cm

188. (3)

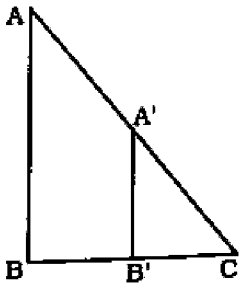


$$\Delta APQ = \frac{3}{8} (\square ABCD)$$

$$= \frac{3}{4} \Delta ABC$$

$$= \frac{3}{4} \times 12 = 9 \text{ sq.cm.}$$

189. (3)



In ΔABC and $\Delta A'B'C$
$A'B' \parallel AB$
$\angle B' = \angle B, \angle A' = \angle A$
$\therefore \Delta ABC \sim \Delta A'B'C$

$$\therefore A'B' = \frac{1}{2} AB.$$

$\therefore$ Area of $\Delta A'B'C$

$$= \frac{1}{2} \times B'C \times A'B'$$

$$= \frac{1}{2} \times \frac{1}{2} BC \times \frac{1}{2} AB$$

$$= \frac{1}{4} \left(\frac{1}{2} \times BC \times AB\right)$$

$$= \frac{1}{4} \times \text{Area of } \Delta ABC$$

190. (2) Circumference of circle $= 2\pi r = 44$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 44$$

$$\Rightarrow r = \frac{44 \times 7}{2 \times 22} = 7 \text{ cm.}$$

Area of circle $= \pi r^2$

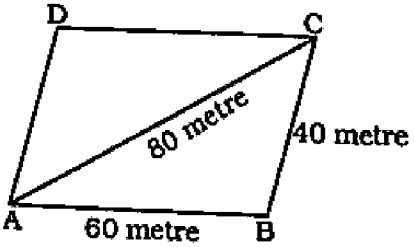
$$= \frac{22}{7} \times 7 \times 7 = 154 \text{ sq. cm.}$$

Perimeter of square $= 44$ cm.

$$\text{Side of square} = \frac{44}{4} = 11 \text{cm.}$$

Area of square $= 11 \times 11$
$= 121$ sq. cm.
Difference $= 154 - 121$
$= 33$ sq. cm.

191. (2)



Semiperimeter of $\Delta ABC(s)$

$$= \frac{a + b + c}{2}$$

$$= \frac{60 + 40 + 80}{2} = 90 \text{ metre}$$

$\therefore$ Area of ΔABC

$$= \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{90(90-60)(90-40)(90-80)}$$

$$= \sqrt{90 \times 30 \times 50 \times 10}$$

$$= \sqrt{3 \times 30 \times 30 \times 5 \times 10 \times 10}$$

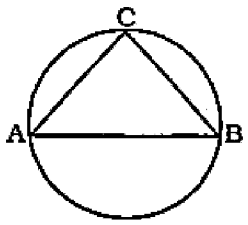
$$= 30 \times 10\sqrt{15}$$

$$= 300\sqrt{15} \text{ sq. metre}$$

$\therefore$ Area of $\square ABCD$
$= 2 \times$ Area of ΔABC
$= 2 \times 300\sqrt{15}$

$$= 600\sqrt{15} \text{ sq. metre}$$

192. (4)

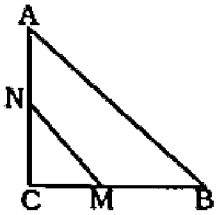


Angle at the semi-circle is a right angle.
$\therefore \angle ACB = 90°$
$AB = 5$ cm.
$AC = 3x$ cm. $BC = 4x$ cm.
$\therefore (3x)^2 + (4x)^2 = (5)^2$
$\Rightarrow 9x^2 + 16x^2 = 25 \Rightarrow 25x^2 = 25$
$\Rightarrow x^2 = 1$
$\Rightarrow x = 1$

$$\therefore \text{Area of } \Delta ABC = \frac{1}{2} \times BC \times AC$$

$$= \frac{1}{2} \times 4 \times 3 = 6 \text{ sq.cm.}$$

193. (1)



$\because 8^2 + 6^2 = 10^2$
$\therefore \Delta ABC$ is a right angled triangle.

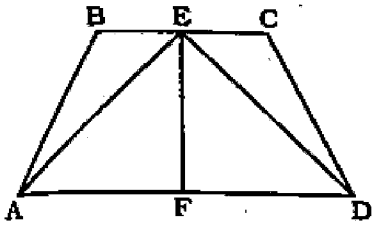
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CM = MB = 4 cm.
N is the mid point of AC.
∴ CN = 3 cm.
∴ Area of trapezium ABMN
= Area of Δ ABC – Area of Δ CMN

$= \frac{1}{2} \times 6 \times 8 - \frac{1}{2} \times 3 \times 4$

= 24 – 6 = 18 sq. cm.

194. (4)



EF is perpendicular on side AD.
∴ Area of trapezium

$= \frac{1}{2}(AD + BC) \times EF$

Area of $\Delta AED = \frac{1}{2} \times AD \times EF$

∴ Required ratio

$= \frac{\frac{1}{2}(AD + BC) \times EF}{\frac{1}{2} \times AD \times EF}$

$= \frac{AD + BC}{AD}$

195. (1) In-radius $= \frac{a}{2\sqrt{3}}$

$= \frac{24}{2\sqrt{3}} = 4\sqrt{3}$ cm

Area of triangle $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 24 \times 24$

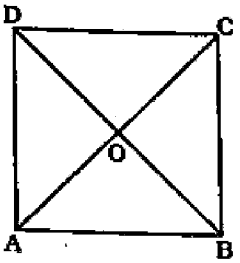
$= 144\sqrt{3}$ sq.cm. $= 144 \times 1.732$
= 249.408 sq.cm.
Area of circle $= \pi r^2$

$= \frac{22}{7} \times 4\sqrt{3} \times 4\sqrt{3}$

$= \frac{1056}{7} = 150.86$ sq.cm.

Area of remaining part
= (249.408 – 150.86) sq.cm.
= 98.548 sq.cm.
= 98.55 sq.cm.

196. (3)



Side of a rhombus

$= \frac{2p}{4} = \frac{p}{2}$ units

OA = OC = y (let)
∴ AC = $2y$ units
OB = OD = x (let)
∴ BD = $2x$ units
From Δ OAB,
∠AOB = 90°
$AB^2 = OA^2 + OB^2$

$\Rightarrow \frac{p^2}{4} = x^2 + y^2$

$\Rightarrow p^2 = 4x^2 + 4y^2$ ...(i)

and $2x + 2y = m$
On squaring both sides,
$4x^2 + 4y^2 + 8xy = m^2$
$\Rightarrow p^2 + 8xy = m^2$
$\Rightarrow 8xy = m^2 - p^2$

$\Rightarrow 4xy = \frac{1}{2}(m^2 - p^2)$

∴ Area of the rhombus

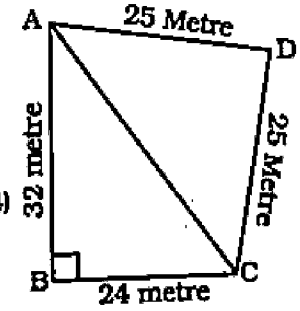
$= \frac{1}{2} \times AC \times BD$

$= \frac{1}{2} \times 2x \times 2y = \frac{1}{2} \times 4xy$

$= \frac{1}{2} \times \frac{1}{2}(m^2 - p^2)$

$= \frac{1}{4}(m^2 - p^2)$ sq. units

197. (4)



$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{32^2 + 24^2}$

$= \sqrt{1024 + 576}$

$= \sqrt{1600} = 40$ metre

∴ Area of Δ ABC

$= \frac{1}{2} \times BC \times AB$

$= \frac{1}{2} \times 24 \times 32$

= 384 sq. metre
Semi-perimeter of Δ ADC (s)

$= \frac{25 + 25 + 40}{2}$

$= \frac{90}{2} = 45$ metre

∴ Area of ΔADC

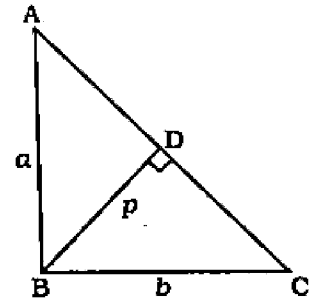
$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{45(45-25)(45-25)(45-40)}$

$= \sqrt{45 \times 20 \times 20 \times 5} = 20 \times 15$

= 300 sq. metre
∴ Area of the plot = 384 + 300
= 684 sq.metre

198. (3)



BD ⊥ AC
AB ⊥ BC
Hypotenuse of ΔABC

$= \sqrt{AB^2 + BC^2}$

$= \sqrt{a^2 + b^2}$

Area of $\Delta ABC = \frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times AC \times BD$

$\Rightarrow AB \times BC = AC \times BD$

$\Rightarrow ab = \sqrt{a^2 + b^2} \times p$

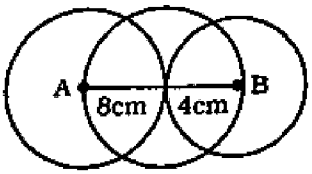
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On squaring both sides,

$a^2b^2 = (a^2 + b^2)\, p^2$

$\therefore p^2 = \dfrac{a^2b^2}{a^2+b^2}$

199. (1)



Diameter = AB = 8 + 4 = 12 units

Radius = $\dfrac{12}{2}$ = 6 units

$\therefore$ Area of circle = $\pi r^2 = \pi \times 6^2$

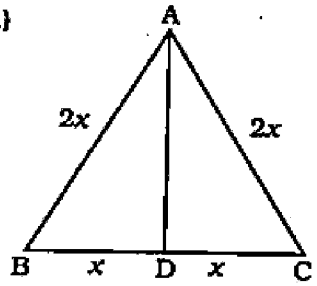
= 36π sq. units

200. (4) Change in area = $\dfrac{-10\times10}{100}$ =

−1 %

Negative sign shows decrease.

201. (1)



AB = 2x units

BD = DC = x units

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{4x^2 - x^2}$

$= \sqrt{3x^2}$

$= \sqrt{3}x$ units

Area of $\Delta ABC = \dfrac{\sqrt{3}}{4} \times (2x)^2$

According to question,

$\because \dfrac{\sqrt{3}}{4} \times (2x)^2 = \sqrt{3}x$

$\Rightarrow \dfrac{\sqrt{3}}{4} \times 4x^2 = \sqrt{3}x$

$\Rightarrow x^2 = x \Rightarrow x(x-1) = 0$

$\Rightarrow x = 1$ Hence length of side

$2 \times 1 = 2$ units

$\therefore$ Length of side = 9 units

202. (1) Length of side of square

= 2x units

Diameter of circle = 2x units

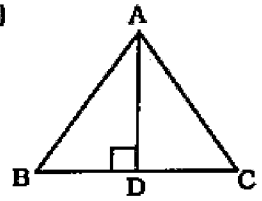
Radius = x units

$\therefore$ Required ratio = $4x^2 : \pi x^2$

= $4 : \dfrac{22}{7}$

= 14 : 11

203. (4)



AB = BC = AC = a cm

AD = Median = $6\sqrt{3}$ cm.

$\therefore \dfrac{\sqrt{3}}{2} a = 6\sqrt{3}$

$\Rightarrow a = \dfrac{6\sqrt{3}\times2}{\sqrt{3}}$ = 12 cm.

$\therefore$ Area of $\Delta ABC = \dfrac{\sqrt{3}}{4} \times$ side ^{2} =

$\dfrac{\sqrt{3}}{4} \times 12 \times 12$

= $36\sqrt{3}$ sq. cm.

204. (2) Radius of circle = r units

According to question,

Area of circle = circumference of circle

$\Rightarrow \pi r^2 = 2\pi r$

$\Rightarrow r = 2$ units

$\therefore$ Area of circle = πr^2

= 4π sq. units

205. (*) Area of equilateral triangle =

$\dfrac{\sqrt{3}}{4} \times (\text{side})^2$

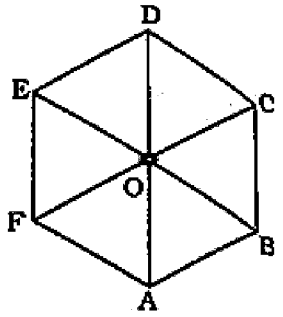
$\Rightarrow \dfrac{\sqrt{3}}{4} \times (\text{side})^2 = 48$

$(\text{Side})^2 = \dfrac{48\times4}{\sqrt{3}}$

$= \dfrac{16\times\sqrt{3}\times\sqrt{3}\times4}{\sqrt{3}} = 64\sqrt{3}$

$\therefore$ Side = $\sqrt{64\sqrt{3}} = 8\sqrt[4]{3}$ cm

206. (3) Area of regular hexagon



6 equilateral triangles

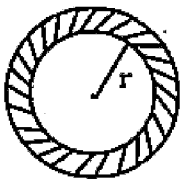
$= 6 \times \dfrac{\sqrt{3}}{4} (\text{side})^2$

$= \dfrac{3\sqrt{3}}{2} a^2$

$= \dfrac{3\sqrt{3}\times\sqrt{3}}{2\sqrt{3}} a^2$

$= \dfrac{9}{2\sqrt{3}} a^2$ sq. units

207. (2)



In-radius of circular plot

= r metre (let)

Width of path = x metre

$\therefore$ Ex radius = (r + x) metre

According to the question

$2\pi(r + x) - 2\pi r = 33$

$\Rightarrow 2\pi r + 2\pi x - 2\pi r = 33$

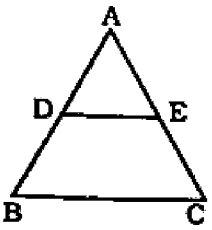
$\Rightarrow 2\pi x = 33$

$\Rightarrow 2 \times \dfrac{22}{7} \times x = 33$

$\Rightarrow x = \dfrac{33\times7}{2\times22} = \dfrac{21}{4}$ metre

= 5.25 metre

208. (2)



DE || BC

$\therefore \angle ADE = \angle ABC$

$\angle AED = \angle ACB$

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$\therefore \Delta ADE \sim \Delta ABC$

$\therefore \frac{AD}{BD} = \frac{2}{3}$

$\Rightarrow \frac{BD}{AD} = \frac{3}{2}$

$\Rightarrow \frac{BD}{AD} + 1 = \frac{3}{2} + 1$

$\Rightarrow \frac{BD + AD}{AD}$

$= \frac{3+2}{2} \Rightarrow \frac{AB}{AD} = \frac{5}{2}$

$\therefore \frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC} = \frac{AD^2}{AB^2}$

$= \left(\frac{2}{5}\right)^2 = \frac{4}{25}$

$\Rightarrow 1 - \frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC}$

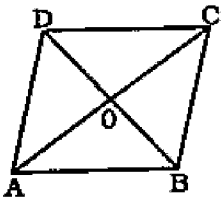
$= 1 - \frac{4}{25}$

$\Rightarrow \frac{\text{Area of } \Delta ABC - \text{Area of } \Delta ADE}{\text{Area of } \Delta ABC}$

$= \frac{25-4}{25}$

$\therefore \frac{\text{Area of trapezium DECB}}{\text{Area of } \Delta ABC} = \frac{21}{25}$

209. (1)



AB = BC = CD = DA = 10 cm

AC = 16 cm

In ΔOAB

OA = 8 cm

AB = 10 cm

$\angle AOB = 90°$

$\therefore OB = \sqrt{AB^2 - OA^2}$

$= \sqrt{10^2 - 8^2}$

$= \sqrt{(10+8)(10-8)}$

$= \sqrt{18 \times 2} = \sqrt{36} = 6$ cm

$\therefore BD = 2 \times OB = 2 \times 6 = 12$ cm

$\therefore$ Area of rhombus ABCD

$= \frac{1}{2} d_1 \times d_2$

$= \frac{1}{2} \times 16 \times 12 = 96$ sq.cm.

210. (2) Ratio of the lengths of sides = 5 : 6 : 7

Sum of ratios = 5 + 6 + 7 = 18

$\therefore$ Sides $\Rightarrow \frac{5}{18} \times 54 = 15$ metre;

$\frac{6}{18} \times 54 = 18$ metre;

$\frac{7}{18} \times 54 = 21$ metre;

Semi-perimeter (s)

$= \frac{15+18+21}{2}$

$= \frac{54}{2} = 27$

$\therefore$ Area of triangle

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{27\,(27-15)\,(27-18)\,(27-21)}$

$= \sqrt{27 \times 12 \times 9 \times 6}$

$= \sqrt{3 \times 3 \times 3 \times 2 \times 2 \times 3 \times 3 \times 3 \times 2 \times 3}$

$= 3 \times 3 \times 3 \times 2\sqrt{6}$

$= 54\sqrt{6}$ sq.metre

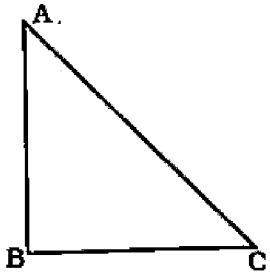
211. (2) Area of trapezium

$= \frac{1}{2}$ (sum of parallel sides) × perpendicular distance

$= \frac{1}{2}(6+8) \times 4 = \frac{1}{2} \times 14 \times 4$

$= 28$ sq. cm.

212. (2)



BC = a units, AB = b units

$AC = \sqrt{a^2 + b^2} = 10$

$\Rightarrow a^2 + b^2 = 100$ .....(i)

Area of ΔABC

$= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} ab$

$\therefore \frac{1}{2} ab = 20$

$\Rightarrow ab = 40$ square units .....(ii)

$\therefore (a+b)^2 = a^2 + b^2 + 2ab$

$= 100 + 2 \times 40 = 180$ square units

213. (1) If the radius of circle be r cm. then

$\pi r^2 = 154$

$\Rightarrow \frac{22}{7} r^2 = 154$

$\Rightarrow r^2 = \frac{154 \times 7}{22} = 7 \times 7$

$\therefore r = 7$ cm

$\therefore$ Length of wire $= 2\pi r$

$= 2 \times \frac{22}{7} \times 7 = 44$ cm

= Perimeter of equilateral triangle

$\therefore$ Side of equilateral triangle

$= \frac{44}{3}$ cm

$\therefore$ Area of equilateral triangle

$= \frac{\sqrt{3}}{4} \times \text{side}^2$

$= \frac{\sqrt{3}}{4} \times \frac{44}{3} \times \frac{44}{3}$

$= \frac{1.732 \times 44 \times 11}{9} = \frac{838.288}{9}$

$= 93.14$ sq.cm.

214. (2) Area of triangle $= \frac{1}{2} \times$ base $\times$ height $= \frac{1}{2} bh$

$\therefore \frac{\frac{1}{2} b_1 h_1}{\frac{1}{2} b_2 h_2} = \frac{4}{3}$

$\Rightarrow \frac{b_1 \times 3}{b_2 \times 4} = \frac{4}{3}$

$\Rightarrow \frac{b_1}{b_2} = \frac{4 \times 4}{3 \times 3} = \frac{16}{9}$

215. (3) $A = 10^2 = 100$ sq. cm.

$B = \frac{1}{2} \times 14^2 = 98$ sq. cm.

$\therefore A - B = 100 - 98$

$= 2$ sq. cm.

216. (3) Area of parallelogram = base × height

$= 25 \times 10 = 250$ sq. cm.

If the required altitude be x cm. then

$x \times 20 = 250$

$\Rightarrow x = \frac{250}{20} = 12.5$ cm.

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217. (3) Side of equilateral triangle = x metre

$\therefore$ Difference of area = $\sqrt{3}$

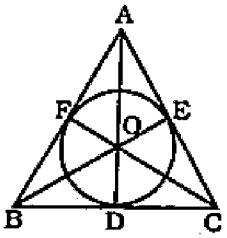
$\Rightarrow \frac{\sqrt{3}}{4}[(x+1)^2 - x^2] = \sqrt{3}$

$\Rightarrow x^2 + 2x + 1 - x^2 = 4$

$\Rightarrow 2x + 1 = 4$

$\Rightarrow 2x = 3 \Rightarrow x = \frac{3}{2}$ metre

218. (1)



OD = OE = OF = 6 cm.

Area of triangle ABC

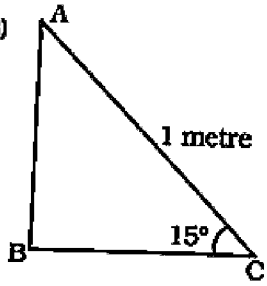
= Area of (Δ AOB + Δ BOC + Δ AOC)

$= \frac{1}{2}$ AB × OF + $\frac{1}{2}$ BC × OD + $\frac{1}{2}$ AC × DE

$= \frac{1}{2} \times 6$ (AB + BC + CA)

$= \frac{1}{2} \times 6 \times 50 = 150$ square cm.

219. (3)



$\sin 15° = \sin(45° - 30°)$

$= \sin 45° \times \cos 30° - \cos 45° \times \sin 30°$

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \frac{\sqrt{3}}{2\sqrt{2}} - \frac{1}{2\sqrt{2}} = \frac{\sqrt{3}-1}{2\sqrt{2}}$

and $\cos 15° = \cos(45° - 30°)$

$= \cos 45° \cdot \cos 30° + \sin 45° \cdot \sin 30°$

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \frac{\sqrt{3}}{2\sqrt{2}} + \frac{1}{2\sqrt{2}} = \frac{\sqrt{3}+1}{2\sqrt{2}}$

$\therefore$ AB = AC sin 15°

$= \frac{\sqrt{3}-1}{2\sqrt{2}}$ metre.

BC = AC cos 15° = $\frac{\sqrt{3}+1}{2\sqrt{2}}$ metre

$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times$ AB × BC

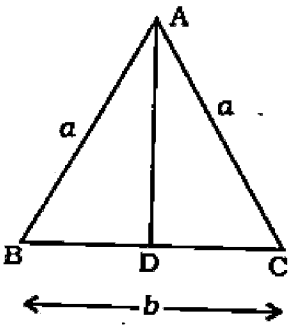
$= \left(\frac{1}{2} \times \frac{\sqrt{3}-1}{2\sqrt{2}} \times \frac{\sqrt{3}+1}{2\sqrt{2}}\right)$ square metre

$= \left(\frac{3-1}{16}\right)$ square metre

$= \frac{1}{8}$ square metre.

$= \frac{10000}{8} = 1250$ square cm.

220. (3)



AD, is perpendicular on BC.

$BD = DC = \frac{b}{2}$

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{a^2 - \left(\frac{b}{2}\right)^2} = \sqrt{a^2 - \frac{b^2}{4}}$

$= \frac{\sqrt{4a^2 - b^2}}{2}$ units

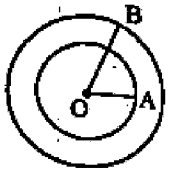
$\therefore$ Area of Δ ABC

$= \frac{1}{2} \times$ BC × AD

$= \frac{1}{2} b \times \frac{\sqrt{4a^2 - b^2}}{2}$

$= \frac{b}{4}\sqrt{4a^2 - b^2}$ square units.

221. (3)



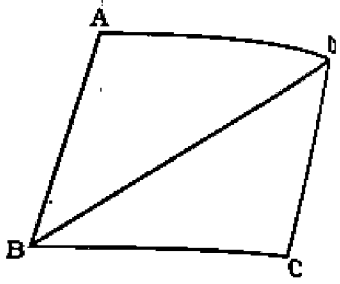
$OA = \frac{700}{2} = 350$ metre

$OB = \frac{728}{2} = 364$ metre

Width of path = OB − OA

= 364 − 350 = 14 metre

222. (4)



In Δ ABD, AB = 20 cm. AD = 30 cm.

BD = 40 cm.

$\therefore$ Semi-Perimeter (s)

$= \frac{a+b+c}{2} = \frac{20+30+40}{2}$

= 45 cm

$\therefore$ Area of Δ ABD

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{45(45-20)(45-30)(45-40)}$

$= \sqrt{45 \times 25 \times 15 \times 5}$

$= \sqrt{5 \times 3 \times 3 \times 5 \times 5 \times 5 \times 3 \times 5}$

$= \sqrt{5^2 \times 5^2 \times 5 \times 3^2 \times 3}$

$= 5 \times 5 \times 3\sqrt{15}$

$= 75\sqrt{15}$ square cm.

$\therefore$ Area of parallelogram ABCD

$= 2 \times 75\sqrt{15}$

$= 150\sqrt{15}$ square cm.

223. (4) Side of the given square = x cm (let)

Side of new square

$= \frac{3x}{2}$ cm. (let)

$\therefore$ Required ratio of areas

$= \left(\frac{3x}{2}\right)^2 : x^2 = \frac{9x^2}{4} : x^2$

= 9 : 4

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224. (1) Area of circle = πr^2

$\Rightarrow \pi r^2 = 324\pi$

$\Rightarrow r^2 = 324$

$\therefore r = \sqrt{324} = 18$ cm.

$\therefore$ Length of longest chord of circle = Diameter

$= 2 \times 18 = 36$ cm.

225. (1) One diagonal of rhombus $= d_1 = x$ cm.

Second diagonal $= d_2 = 2x$ cm.

Area of rhombus $= \frac{1}{2} d_1 . d_2$

$\therefore \frac{1}{2} d_1 . d_2 = 256$

$\Rightarrow \frac{1}{2} x . 2x = 256$

$\Rightarrow x^2 = 256$

$\Rightarrow x = \sqrt{256} = 16$ cm.

$\therefore$ Larger diagonal $= 2x$

$= 2 \times 16 = 32$ cm.

226. (3) Diagonal of square

$= \sqrt{2} \times$ side

$\Rightarrow \frac{3-x}{\sqrt{2}} = \sqrt{2} \times \frac{1}{2}(x+1)$

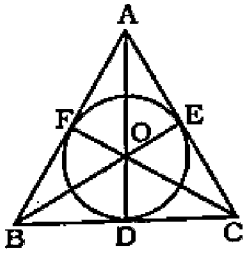
$\Rightarrow 3 - x = \sqrt{2} \times \sqrt{2} \times \frac{1}{2}(x+1)$

$\Rightarrow 3 - x = x + 1$

$\Rightarrow x + x = 3 - 1$

$\Rightarrow 2x = 2 \Rightarrow x = 1$ unit

227. (2)



The centre of incircle is point 'O'.

$OD = OE = OF = r$

$\therefore 2\pi r = 44$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44$

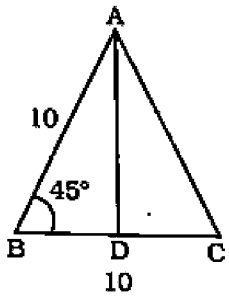
$\Rightarrow r = \frac{44 \times 7}{2 \times 22} = 7$ cm.

$\therefore$ Area of ΔABC

$= \frac{1}{2}(AB + BC + CA) \times r$

$= \frac{1}{2} \times 24 \times 7 = 84$ square cm.

228. (3)



$AD = AB \sin 45° = 10 \times \frac{1}{\sqrt{2}}$

$= 5\sqrt{2}$ cm.

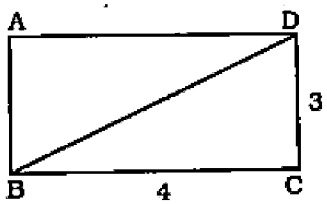
$\therefore$ Area of ΔABC

$= \frac{1}{2} \times BC \times AD$

$= \frac{1}{2} \times 10 \times 5\sqrt{2}$

$= 25\sqrt{2}$ square cm.

229. (3)

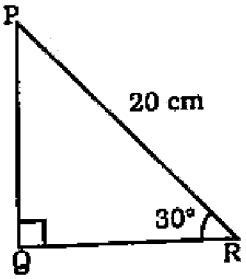


$BD = \sqrt{BC^2 + CD^2}$

$= \sqrt{4^2 + 3^2} = \sqrt{16 + 9} = \sqrt{25}$

$= 5$ metre

230. (1)



$\sin 30° = \frac{PQ}{PR}$

$\Rightarrow \frac{1}{2} = \frac{PQ}{20}$

$\Rightarrow PQ = 20 \times \frac{1}{2} = 10$ cm.

$\cos 30° = \frac{QR}{PR}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{QR}{20}$

$\Rightarrow QR = \frac{\sqrt{3}}{2} \times 20 = 10\sqrt{3}$ cm.

$\therefore$ Area of triangle PQR

$= \frac{1}{2} \times 10 \times 10\sqrt{3}$

$= 50\sqrt{3}$ square cm.

231. (1) Side of the equilateral triangle $= x$ units (let)

According to the question,

$3x = 2\pi r$

$\Rightarrow x = \frac{2}{3}\pi r$

$\therefore$ Area of equilateral triangle

$= \frac{\sqrt{3}}{4} \times$ side^2

$= \frac{\sqrt{3}}{4} \times \left(\frac{2}{3}\pi r\right)^2$

$= \frac{\sqrt{3}}{4} \times \frac{4}{9} \pi^2 r^2$

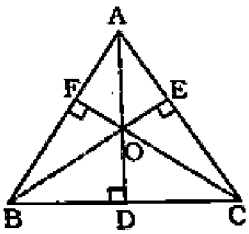
$= \frac{\pi^2 r^2}{3\sqrt{3}}$ sq. units.

$\therefore$ Required ratio $= \frac{\pi^2 r^2}{3\sqrt{3}} : \pi r^2$

$= \pi : 3\sqrt{3}$

$= \frac{22}{7} : 3\sqrt{3} = 22 : 21\sqrt{3}$

232. (2)



$OD = a$ cm., $OE = b$ cm.

$OF = c$ cm.

$BC = AC = AB$

Area of ΔABC

= Area of ($\Delta BOC + \Delta COE + \Delta BOA$)

$= \frac{1}{2} \times BC \times a + \frac{1}{2} AC \times b + \frac{1}{2} \times AB \times c$

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$= \frac{1}{2} BC(a+b+c)$ ...(i)

$(\because AB = BC = CA)$

Again, Area of ΔABC

$= \frac{\sqrt{3}}{4} \times BC^2$

$\therefore \frac{\sqrt{3}}{4} \times BC^2 = \frac{1}{2} BC(a+b+c)$

$\Rightarrow BC = \frac{2}{\sqrt{3}}(a+b+c)$

$\therefore$ Required area

$= \frac{1}{2} \times \frac{2}{\sqrt{3}}(a+b+c)^2$

[From equation (i)]

$= \frac{\sqrt{3}}{\sqrt{3} \times \sqrt{3}}(a+b+c)^2$

$= \frac{\sqrt{3}}{3}(a+b+c)^2$ sq. units

233. (3) Area of circle $= \pi r^2$

Area of square $= x^2$

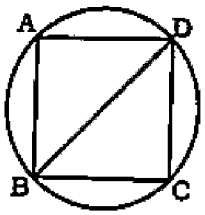
According to the question,

$x^2 = \pi r^2 \Rightarrow x = \sqrt{\pi}\, r$

$\therefore$ Required ratio $= \frac{x}{r} = \frac{\sqrt{\pi} r}{r}$

$= \sqrt{\pi} : 1$

234. (4)



Radius of circle = r units

Area of circle $= \pi r^2$ sq. units

In square ABCD

Diagonal $= BD = 2r$ units

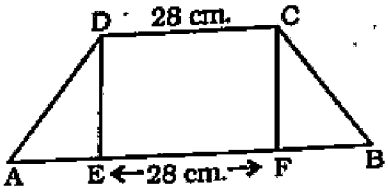
$\therefore$ Area of square

$= \frac{1}{2} \times (2r)^2 = 2r^2$

$\therefore$ Required difference $= \pi r^2 - 2r^2$

$= r^2(\pi - 2)$ sq. units

235. (3)



$AE = FB = 6$ cm.

In ΔADE,

$DE = \sqrt{AD^2 - AE^2}$

$= \sqrt{12^2 - 6^2}$

$= \sqrt{(12+6)(12-6)}$

$= \sqrt{18 \times 6}$

$= 6\sqrt{3}$ cm

$\therefore$ Area of CDEF $= 28 \times 6\sqrt{3}$

$= 168\sqrt{3}$ sq. cm.

Area of ΔADE

$= \frac{1}{2} \times AE \times DE$

$= \frac{1}{2} \times 6 \times 6\sqrt{3}$

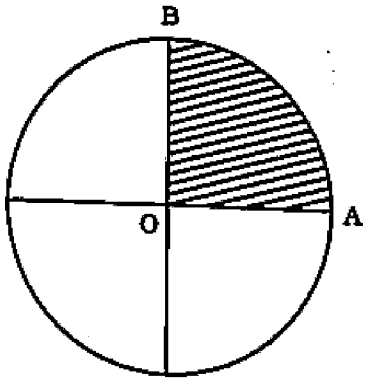
$= 18\sqrt{3}$ sq. cm.

$\therefore$ Area of trapezium

$= \left(168\sqrt{3} + 2 \times 18\sqrt{3}\right)$ sq. cm.

$= 204\sqrt{3}$ sq. cm.

236. (2)



If the radius of circle be r cm, then

Perimeter of quadrant OAB

$= OA + \overset{\frown}{AB} + OB$

$= r + \frac{2\pi r}{4} + r = \frac{\pi r}{2} + 2r$

$\therefore \frac{\pi r}{2} + 2r = 75$

$\Rightarrow r\left(\frac{\pi}{2} + 2\right) = 75$

$\Rightarrow r\left(\frac{22}{7 \times 2} + 2\right) = 75$

$\Rightarrow r \times \frac{50}{14} = 75$

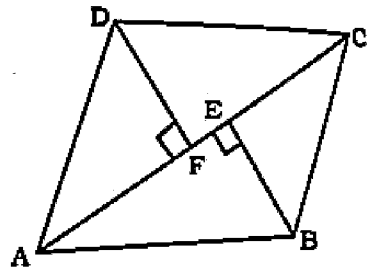
$\Rightarrow r = \frac{75 \times 14}{50} = 21$ cm

$\therefore$ Required area $= \frac{\pi r^2}{4}$

$= \left(\frac{22}{7 \times 4} \times 21 \times 21\right)$ sq.cm.

$= 346.5$ sq.cm.

237. (1)



AC = 24 metre

BE = 8 metre

DF = 13 metre

$\therefore$ Area of quadrilateral ABCD

= Area of ΔABC + Area of ΔACD

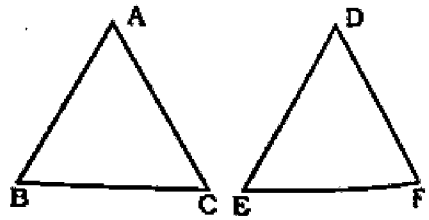
$= \frac{1}{2} \times AC \times BE + \frac{1}{2} \times AC \times DF$

$= \frac{1}{2}(24 \times 8 + 24 \times 13)$

$= \frac{1}{2} \times 24(8 + 13)$

$= \frac{1}{2} \times 24 \times 21 = 252$ sq.metre

238. (4)



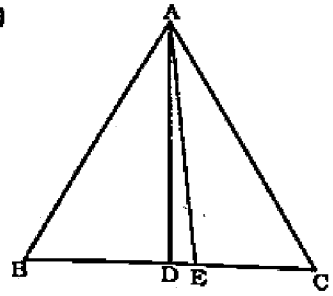
$\angle A = \angle D$

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$\therefore$ $\angle B = \angle E$; $\angle C = \angle F$
$\therefore$ Ratio of altitudes

$= \sqrt{\frac{9}{16}} = 3 : 4$

239. (4)



Let, $AE \perp BC$

$\therefore \frac{\text{Area of } \Delta ABD}{\text{Area of } \Delta ADC}$

$= \frac{\frac{1}{2} \times BD \times AE}{\frac{1}{2} \times CD \times AE}$

$\Rightarrow \frac{60}{\Delta ADC} = \frac{BD}{CD}$

$\Rightarrow \frac{60}{\Delta ADC} = \frac{4}{5}$

$\Rightarrow \Delta ADC = \frac{60 \times 5}{4}$

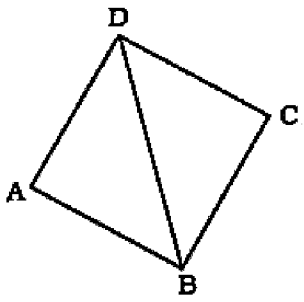
$= 75$ sq. cm.

240. (2) $A = \pi r^2$
$C = 2\pi r$

$\therefore \frac{A}{C} = \frac{\pi r^2}{2\pi r} = \frac{r}{2}$

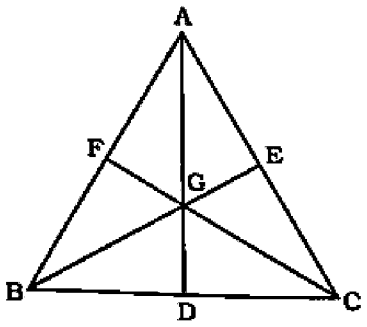
$\Rightarrow rC = 2A$

241. (4)



In the rhombus ABCD,
$AB = AD = 12$ cm.
$\angle BAD = 60°$
$\therefore \angle ABD = \angle ADB = 60°$
$\therefore$ BD = 12 cm. because ΔABD is an equilateral triangle.

242. (3)



$\angle BGC = 60°$
$BG = GC$
$\therefore \angle GBC = \angle GCB = 60°$
$\therefore \Delta GBC$ is an equilateral triangle.
$\therefore$ Area of ΔGBC

$= \frac{\sqrt{3}}{4} \times 8^2$

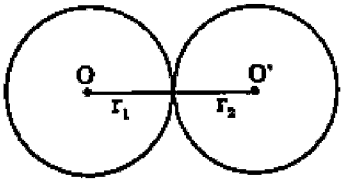
$= 16\sqrt{3}$ sq. cm.

$\therefore$ Area of ΔABC

$= 3 \times 16\sqrt{3}$

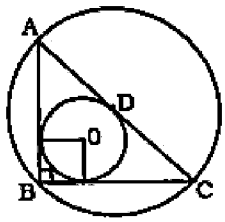
$= 48\sqrt{3}$ sq. cm.

243. (4)



$OO' = r_1 + r_2 = 14$ cm. --(i)
Again, $\pi r_1^2 + \pi r_2^2 = 130\pi$
$\Rightarrow r_1^2 + r_2^2 = 130$
$\Rightarrow r_1^2 + (14 - r_1)^2 = 130$
[From equation (i)]
$\Rightarrow r_1^2 + 196 - 28r_1 + r_1^2 = 130$
$\Rightarrow 2r_1^2 - 28r_1 + 196 - 130 = 0$
$\Rightarrow 2r_1^2 - 28r_1 + 66 = 0$
$\Rightarrow r_1^2 - 14r_1 + 33 = 0$
$\Rightarrow r_1^2 - 11r_1 - 3r_1 + 33 = 0$
$\Rightarrow r_1(r_1 - 11) - 3(r_1 - 11) = 0$
$\Rightarrow (r_1 - 11)(r_1 - 3) = 0$
$\Rightarrow r_1 = 11$ or, 3 cm.
$\therefore r_2 = 3$ or, 11 cm.

244. (2) It is a right angled triangle.



Riadius of circum circle C_2

$= \frac{5}{2}$ cm. because
AC = Diameter of circle
Semi-perimeter of $\Delta ABC(s)$

$= \frac{3+4+5}{2} = 6$ cm.

Area of $\Delta ABC = \frac{1}{2} \times 3 \times 4$

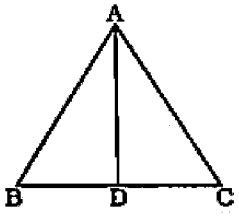
$= 6$ sq. cm.

$\therefore$ In-radius $= \frac{\Delta}{s} = \frac{6}{6} = 1$ cm.

$\therefore \frac{\text{Area of } C_1}{\text{Area of } C_2} = \frac{\pi \times 1^2}{\pi \times \left(\frac{5}{2}\right)^2}$

$= \frac{1}{\frac{25}{4}} = \frac{4}{25}$

245. (2)



$AD = 12\sqrt{3}$ cm.
$AB = 2x$ cm. (let)
$BD = x$ cm.
From ΔABD,

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{(2x)^2 - x^2}$

$= \sqrt{4x^2 - x^2} = \sqrt{3x^2} = \sqrt{3}x$

$\therefore \sqrt{3}x = 12\sqrt{3}$
$\Rightarrow x = 12$ cm.
$\therefore AB = 2x = 2 \times 12 = 24$ cm.

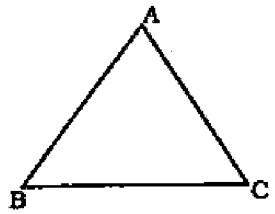
$\therefore$ Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times \text{side}^2$

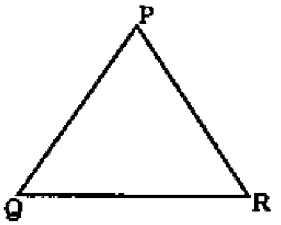
$= \frac{\sqrt{3}}{4} \times 24 \times 24$

$= 144\sqrt{3}$ sq. cm.

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246. (1)





The ratio of the areas of two similar triangles is equal to the ratio of squares of any two corresponding sides.

$$\therefore \frac{\text{Area of } \Delta PQR}{\text{Area of } \Delta ABC} = \frac{PR^2}{AC^2}$$

$$\Rightarrow \frac{PR^2}{AC^2} = \frac{256}{441}$$

$$\Rightarrow \frac{12^2}{AC^2} = \frac{256}{441}$$

Taking square roots of both sides,

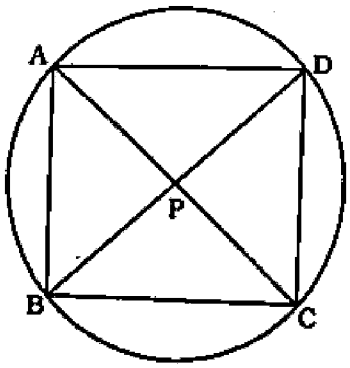
$$\frac{12}{AC} = \frac{16}{21}$$

$$\Rightarrow 16 \times AC = 12 \times 21$$

$$\Rightarrow AC = \frac{12 \times 21}{16} = \frac{63}{4}$$

$= 15.75$ cm.

247. (4)



$\angle APB = 110^\circ = \angle CPD$

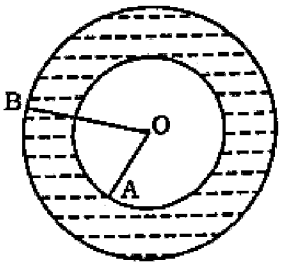
$\therefore \angle APD = 180^\circ - 110^\circ = 70^\circ = \angle BPC$

$\therefore \angle PCB = 180^\circ - 70^\circ - 30^\circ = 80^\circ$

Angles subtended by same arcs at the circumference are equal.

$\therefore \angle ACB$ or $\angle PCB = \angle ADB = 80^\circ$

248. (4)



Let the radius of swimming pool be r metre.

Breadth of shaded part = 4 metre

$\therefore OB = (r + 4)$ metre

According to the question,

$\pi \times OB^2 - \pi \times OA^2$

$$= \frac{11}{25} \pi \times OA^2$$

$$\Rightarrow (r+4)^2 - r^2 = \frac{11}{25} r^2$$

$$\Rightarrow r^2 + 8r + 16 - r^2 = \frac{11}{25} r^2$$

$$\Rightarrow 8r + 16 = \frac{11}{25} r^2$$

$$\Rightarrow 200r + 400 = 11r^2$$

$$\Rightarrow 11r^2 - 200r - 400 = 0$$

$$\Rightarrow 11r^2 - 220r + 20r - 400 = 0$$

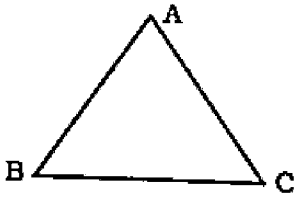
$$\Rightarrow 11r(r-20) + 20(r-20) = 0$$

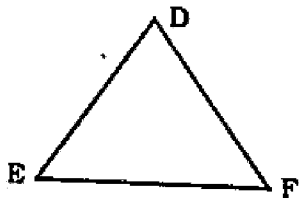
$$\Rightarrow (r-20)(11r+20) = 0$$

$\Rightarrow r = 20$ metre because

$$r \neq -\frac{20}{11} \text{ metre}$$

249. (2)





$\Delta ABC \sim \Delta DEF$

$$\therefore \frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

$$= \frac{AB + BC + AC}{DE + EF + DF} = \frac{4}{1}$$

$$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta DEF}$$

$$= \frac{AB^2}{DE^2} = \frac{16}{1} = 16 : 1$$

250. (2) Area of the field with side 50 m $= 50 \times 50 = 2500$ sq. metre

Area of the field of side 100 m

$= 100 \times 100$

$= 10000$ sq. metre

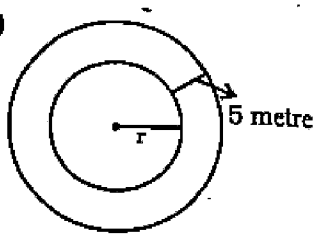
$\because$ 2500 sq. metre $\equiv$ 750 kg.

$\therefore$ 10000 sq. metre

$$\equiv \frac{750}{2500} \times 10000 \text{ kg.}$$

$= 3000$ kg.

251. (4)



More distance, more time (speed is constant)

$$\therefore \frac{2\pi(r+5)}{2\pi r} = \frac{20}{19}$$

$$\Rightarrow \frac{r+5}{r} = \frac{20}{19}$$

$\Rightarrow 20r = 19r + 95$

$\Rightarrow 20r - 19r = 95$

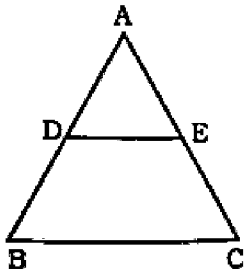
$\Rightarrow r = 95$ metre

$\therefore$ Internal diameter

$= (2 \times 95)$ metre

$= 190$ metre

252. (3)



$DE \parallel BC$

Area of ΔADE = Area of quadrilateral BDEC

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$\Rightarrow$ Area of $\Delta ABC = 2 \times$ Area of ΔADE

In ΔADE and ΔABC,

$\angle D = \angle B$; $\angle E = \angle C$

$\therefore \Delta ADE \sim \Delta ABC$

$$\therefore \frac{\text{Area of } \Delta ABC}{\text{Area of } \Delta ADE} = \frac{AB^2}{AD^2}$$

$$\Rightarrow \frac{AB^2}{AD^2} = 2 \Rightarrow AB = \sqrt{2}\,AD$$

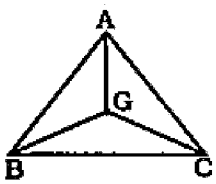
$\Rightarrow AB = \sqrt{2}\,(AB - DB)$

$\Rightarrow \sqrt{2}\,AB - AB = \sqrt{2}\,DB$

$\Rightarrow AB(\sqrt{2}-1) = \sqrt{2}\,DB$

$$\Rightarrow \frac{DB}{AB} = \frac{\sqrt{2}-1}{\sqrt{2}}$$

253. (4)



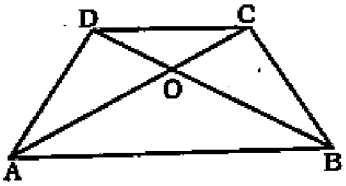
$\Delta GBC = \Delta ACG = \Delta AGB$

$\therefore$ Area of ΔGBC

$$= \frac{1}{3} \times \text{Area of } \Delta ABC$$

$$= \frac{1}{3} \times 60 = 20 \text{ sq.cm.}$$

254. (2)



$DC \parallel AB$

$\angle DCA = \angle CAB$

$\angle CDB = \angle DBA$

$\therefore \Delta COD \sim \Delta AOB$

$$\therefore \frac{\text{Area of } \Delta COD}{\text{Area of } \Delta AOB}$$

$$= \frac{CD^2}{AB^2} = \frac{CD^2}{4\,CD^2} = \frac{1}{4}$$

$\therefore$ Area of ΔCOD

$$= \frac{1}{4} \times 84$$

$= 21$ sq. cm.

255. (2) Area of triangle $= \frac{1}{2} \times$ base $\times$ height

$$= \frac{1}{2} \times b \times h$$

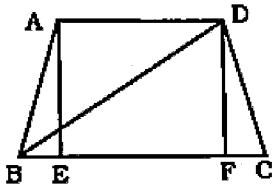
$\therefore$ According to the question,

$$\frac{\frac{1}{2} \times b_1 h_1}{\frac{1}{2} b_2 h_2} = \frac{3}{2}$$

$$\Rightarrow \frac{b_1}{b_2} \times \frac{4}{5} = \frac{3}{2}$$

$$\Rightarrow \frac{b_1}{b_2} = \frac{3}{2} \times \frac{5}{4} = \frac{15}{8} = 15:8$$

256. (3)



$BC = 7x$ cm.

$AD = 4x$ cm.

$AB = DC$; $AE \perp BC$; $DF \perp BC$

Area of trapezium ABCD

$$= \frac{1}{2} \times (AD + BC) \times AE$$

$$\Rightarrow 176 = \frac{1}{2} \times 11x \times \frac{2}{11} \times 11x$$

$$\Rightarrow 176 = 11x^2$$

$$\Rightarrow x^2 = \frac{176}{11} = 16$$

$$\Rightarrow x = \sqrt{16} = 4$$

$\therefore BC = 7 \times 4 = 28$ cm.

$AD = 4 \times 4 = 16$ cm.

$$\therefore BE = FC = \frac{1}{2}(28 - 16) \text{ cm.}$$

$= 6$ cm.

$\therefore BF = 16 + 6 = 22$ cm.

$$\therefore DF = \frac{2}{11} \times 11x = 2x$$

$= 8$ cm.

$\therefore$ Diagonal $BD = \sqrt{BF^2 + FD^2}$

$$= \sqrt{22^2 + 8^2}$$

$$= \sqrt{484 + 64}$$

$$= \sqrt{548} = \sqrt{4 \times 137}$$

$$= 2\sqrt{137} \text{ cm.}$$

257. (4) Side of square $= \sqrt{4}$

$= 2$ units

Diagonal of square

$= 2\sqrt{2}$ units

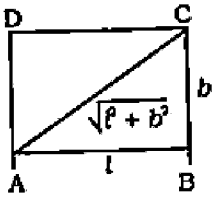
= radius of the circle

$\therefore$ Area of circle $= \pi r^2$

$$= \pi \times \left(2\sqrt{2}\right)^2$$

$= 8\pi$ sq. units.

258. (3)



Let the length of carpet be l metre and breadth be b metre.

$\therefore$ Diagonal $= \sqrt{l^2 + b^2}$ ...(i)

According to the question,

$lb = 120$

and, $2(l + b) = 46$

$\Rightarrow l + b = 23$

On squaring both sides,

$(l + b)^2 = 23^2$

$\Rightarrow l^2 + b^2 + 2lb = 529$

$\Rightarrow l^2 + b^2 + 2 \times 120 = 529$

$\Rightarrow l^2 + b^2 = 529 - 240 = 289$

$$\therefore \sqrt{l^2 + b^2} = \sqrt{289}$$

$= 17$ metre

= Diagonal of the carpet

259. (1) Volume of the plate of square base = Area of base $\times$ height

$$= x^2 \times \frac{1}{10} = \frac{x^2}{10} \text{ cu. cm.}$$

According to the question,

$$\frac{x^2}{10} \times 8.4 = 4725$$

$$\Rightarrow x^2 = \frac{4725 \times 10}{8.4} = 5625$$

$$\Rightarrow x = \sqrt{5625} = 75 \text{ cm.}$$

260. (2) Area of the trapezium

$$= \frac{1}{2} \times (\text{Sum of parallel sides}) \times \text{height}$$

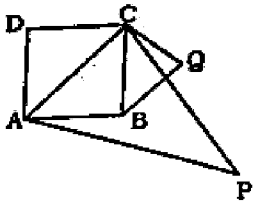
$$\Rightarrow 175 = \frac{1}{2}(15 + 20) \times h$$

$$\Rightarrow \frac{175 \times 2}{35} = h$$

$\Rightarrow h = 10$ cm

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261. (1) D



From ΔABC

$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{BC^2 + BC^2}$

$= \sqrt{2}\ BC$

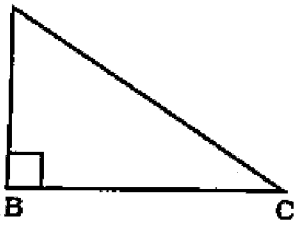
$\Delta QBC \sim \Delta PAC$

$\therefore \dfrac{\text{Area of } \Delta QBC}{\text{Area of } \Delta PAC} = \dfrac{BC^2}{AC^2}$

$= \dfrac{BC^2}{(\sqrt{2}BC)^2}$

$= \dfrac{BC^2}{2BC^2} = \dfrac{1}{2}$

262. (1) A



AC = 39 cm.

BC – AB = 21 cm.

On squaring both sides,

$(BC - AB)^2 = 21^2$

$\Rightarrow BC^2 + AB^2 - 2BC.AB = 441$

$\Rightarrow AC^2 - 2BC.AB = 441$

$\Rightarrow 39^2 - 2BC.AB = 21^2$

$\Rightarrow 2.BC.AB = 39^2 - 21^2$

$\Rightarrow 2.BC.AB = (39 + 21)(39 - 21)$

$\Rightarrow 2\ BC\ .\ AB = 60 \times 18$

$\Rightarrow BC\ .\ AB = \dfrac{60 \times 18}{2}$

$= 60 \times 9$

$\therefore$ Area of triangle

$= \dfrac{1}{2}\ BC.AB$

$= \dfrac{1}{2} \times 60 \times 9 = 270$ sq. cm.

TYPE-II

1. (2) Side of square, whose perimeter is 24 cm $= \dfrac{24}{4} = 6$ cm

So, Area of the square $= 6^2$
$= 36\ cm^2$

Again, side of square, whose perimeter is 32cm $= \dfrac{32}{4} = 8$ cm

So, Area of this square $= 8^2$
$= 64\ cm^2$

According to the question

Area of new square
$= 64 + 36 = 100 cm^2$

$\therefore$ Side of the new square
$= \sqrt{100} = 10$ cm

Hence, Perimeter of new square
$= 10 \times 4 = 40$ cm

2. (1) Side of one square $= \dfrac{40}{4} = 10$ cm.

[$\because$ Perimeter = 4 × side]

Side of other square $= \dfrac{32}{4}$

$= 8$ cm.

According to the question,

Area of third square
$= (10)^2 - (8)^2 = 100 - 64$
$= 36$ sq.cm.

Side of third square $= \sqrt{36} = 6$ cm.

Its perimeter $= 4 \times 6 = 24$ cm.

3. (3) Ratio of area $= \dfrac{225}{256}$

$\Rightarrow$ Ratio of side

$= \sqrt{\dfrac{225}{256}} = \dfrac{15}{16}$

$\therefore$ Ratio of perimeter

$= \dfrac{4 \times 15}{4 \times 16} = \dfrac{15}{16} \Rightarrow 15 : 16$

4. (2) Side of the first square

$= \dfrac{40}{4} = 10$ cm

Side of the second square

$= \dfrac{24}{4} = 6$ cm

Difference of the area of these squares
$= (10 \times 10 - 6 \times 6)\ cm^2$
$= (100 - 36)\ cm^2$
$= 64\ cm^2$

$\therefore$ Area of the third square
$= 64\ cm^2$

$\Rightarrow$ Side of third square
$= \sqrt{64} = 8$ cm

$\therefore$ Perimeter of this square
$= (4 \times 8)$ cm $= 32$ cm

5. (2) Let length be 3x and breadth be 2x

$\therefore$ Perimeter = 2 (length + breadth)
$= 2(3x + 2x) = 10x$

According to question,

$10x = 80m$

$\Rightarrow x = 8m$

$\therefore$ Breadth $= 2x = 2 \times 8 = 16$ m

6. (3) Area of rectangle $= l \times b$

$\therefore 5x \times 4x = 500$ sq.m.

or, $20x^2 = 500$ sq.m.

$\Rightarrow x^2 = \dfrac{500}{20} = 25$

$\Rightarrow x = 5$

$\therefore l = 5 \times 5 = 25$ m

$b = 5 \times 4 = 20$ m

$\therefore$ Perimeter $= 2(l + b)$m
$= 2(25 + 20) = 2 \times 45 = 90$ m

7. (2) Let the length = l m and breadth = b m.

$\therefore\ 2(l + b) = 28$

$\Rightarrow l + b = 14$ ... (i)

$lb = 48$ ....(ii)

Now, $(l - b)^2 = (l + b)^2 - 4lb$

$= (14)^2 - 4 \times 48$ [From (i) & (ii)]

$= 196 - 192 = 4$

$\Rightarrow l - b = 2$ ....(iii)

$\therefore\ l = 8,\ b = 6$

$\therefore$ Diagonal $= \sqrt{8^2 + 6^2} = 10$ m.

8. (4) Let the length of the rectangle be x units and breadth be y units.

$\therefore$Perimeter of rectangle
$= 2(x + y)$ cm

According to the question,

$\dfrac{x}{2x + 2y} = \dfrac{5}{16}$

$\Rightarrow \dfrac{x}{x + y} = \dfrac{5}{8}$

$\Rightarrow \dfrac{x + y}{x} = \dfrac{8}{5}$

$\Rightarrow \dfrac{x}{x} + \dfrac{y}{x} = \dfrac{8}{5} \Rightarrow \dfrac{y}{x} = \dfrac{8}{5} - 1$

$\Rightarrow \dfrac{y}{x} = \dfrac{3}{5} \Rightarrow x : y = 5 : 3$

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9. (3) $\frac{l}{2(l+b)} = \frac{5}{18} \Rightarrow \frac{l}{l+b} = \frac{5}{9}$

$\Rightarrow \frac{l+b}{l} = \frac{9}{5} \Rightarrow \frac{l+b}{l} - 1 = \frac{9}{5} - 1$

$\Rightarrow \frac{b}{l} = \frac{4}{5}$

$\Rightarrow l : b = 5 : 4$

10. (1) $x^2 + 7x + 10$
$= x^2 + 5x + 2x + 10$
$= x(x + 5) + 2(x + 5)$
$= (x + 2)(x + 5)$
$\therefore$ Possible perimeter
$= 2(x + 2 + x + 5)$
$= 2(2x + 7) = (4x + 14)$ cm

11. (4) If the length and breadth of the plot be x and y respectively, then
$2(x + y) = 48$
$\Rightarrow x + y = 24$ .....(i)
$xy = 108$ .....(ii)
$\therefore (x - y)^2 = (x + y)^2 - 4xy$
$= (24)^2 - 4 \times 108$
$= 576 - 432 = 144$
$\therefore x - y = 12$ .....(iii)
From equations (i) and (iii),
$x = 18$ metre and $y = 6$ metre

12. (3) According to question,
Ratio of sides of triangle
$= \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$
Now, $6x + 4x + 3x = 52$ cm.
$13x = 52$
$\therefore x = 4$cm
$\therefore$ Length of smallest side $= 3x =$
$4 \times 3 = 12$cm

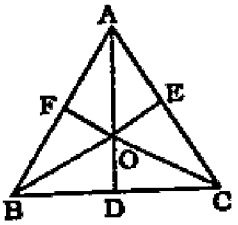
13. (1) Area of equilateral triangle
$= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$\Rightarrow \frac{\sqrt{3}}{4} \times (\text{side})^2 = 400\sqrt{3}$

$\Rightarrow (\text{Side})^2 = \frac{400\sqrt{3} \times 4}{\sqrt{3}}$

$\Rightarrow$ Side $= \sqrt{4 \times 400} = 40$ metres
$\therefore$ Perimeter $= 3 \times$ side
$= 3 \times 40 = 120$ metres

14. (3)



Let ABC be an equilateral triangle of side x cm.
Also, Let OD $= \sqrt{3}$ cm.
OE $= 2\sqrt{3}$ cm and OF $= 5\sqrt{3}$ cm.
From the figure,
ar. ΔBOC + ar. ΔAOC + ar. ΔAOB = ar. ΔABC

or, $\frac{1}{2} \times x \times \sqrt{3} + \frac{1}{2} \times x \times 2\sqrt{3} + \frac{1}{2} \times x \times 5\sqrt{3}$

$= \frac{\sqrt{3}}{4} x^2$

or, $2\sqrt{3} + 4\sqrt{3} + 10\sqrt{3} = \sqrt{3}x$
or, $x = 2 + 4 + 10 = 16$
$\therefore$ Perimeter of the triangle $= 3x$
$= 3 \times 16 = 48$ cm

15. (3) The perimeter of a triangle $= 30$ cm.
Area $= 30$ cm^2
We know that, $5^2 + 12^2 = 13^2$
$\therefore$ The triangle is right angled.

Now, Area $= \frac{1}{2} \times 5 \times 12 = 30$cm^2

And, Perimeter $= 5 + 12 + 13 = 30$
Hence, the smallest side $= 5$ cm

16. (4) Let the sides be $3x$, $4x$ and $5x$ respectively.
Here, $(3x)^2 + (4x)^2 = (5x)^2$
Hence, the triangle is right angled.

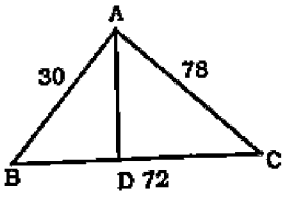
$\therefore \frac{1}{2} \times 3x \times 4x = 216$

$\Rightarrow 6x^2 = 216 \Rightarrow x^2$

$= \frac{216}{6} = 36$

$\therefore x = \sqrt{36} = 6$
Perimeter of triangle
$= (3x + 4x + 5x)$ cm
$= 12x$ cm
$= 12 \times 6 = 72$ cm

17. (3)



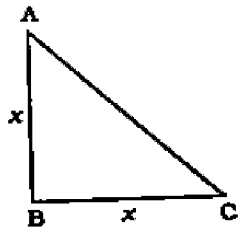
Semi-perimeter,
$S = \frac{30 + 72 + 78}{2} = 90$
Area of triangle ABC
$= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{90(90-30)(90-72)(90-78)}$
$= \sqrt{90 \times 60 \times 18 \times 12}$
$= 1080$ m^2
If the altitude AD be h metre, then,

$\frac{1}{2} \times$ base $\times$ height $= 1080$

$\Rightarrow \frac{1}{2} \times 72 \times h = 1080$

$\Rightarrow h = \frac{1080}{36} = 30$ metre

18. (1)



Let ABC be a right-angled isosceles triangle where
AB = BC = x and $\angle B = 90°$.

$\therefore$ AC $= \sqrt{x^2 + x^2} = \sqrt{2}x$

$\therefore$ Perimeter of the triangle ABC
$= 4\sqrt{2} + 4$

$\Rightarrow x + x + \sqrt{2}x = 4\sqrt{2} + 4$

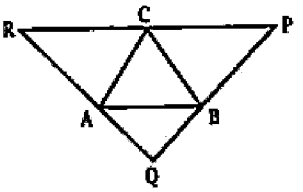
$\Rightarrow 2x + \sqrt{2}x = 4\sqrt{2} + 4$

$\Rightarrow 2x + \sqrt{2}x = 2.2\sqrt{2} + \sqrt{2}.2\sqrt{2}$

$\Rightarrow x = 2\sqrt{2}$

$\therefore$ Length of the hypotenuse
$= \sqrt{2}.x = \sqrt{2}.2\sqrt{2} = 4$ cm.

19. (3)



AQ || CB, and AC || QB
$\therefore$ AQBC is a parallelogram
$\Rightarrow$ BC = AQ
Again, AR || BC and AB || RC
$\therefore$ ARCB, is a parallelogram.
$\Rightarrow$ BC = AR
$\Rightarrow$ AQ = AR

$\Rightarrow$ AQ = AR $= \frac{1}{2}$QR

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$\Rightarrow BC = \frac{1}{2}QR$

Similarly, $AB = \frac{1}{2}PR$ and

$AC = \frac{1}{2}PQ$

$\therefore$ Required ratio
$= (PQ + QR + RP) : (AB + BC + CA)$
$= 2 : 1$

20. (3) $\frac{1}{3} : \frac{1}{4} : \frac{1}{5}$

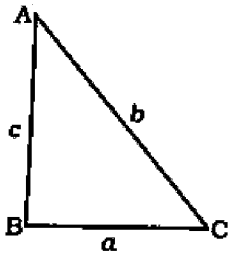
or $\frac{1}{3}\times 60 : \frac{1}{4}\times 60 : \frac{1}{5}\times 60$
or $20 : 15 : 12$
$\therefore\ 20x + 15x + 12x = 94$
[As per question]

$\Rightarrow\ 47x = 94 \Rightarrow x = \frac{94}{47} = 2$

$\therefore$ The smallest side $= 12x$
$= 12 \times 2 = 24$ cm

21. (1) Perimeter of isosceles triangle
$= 15 + 15 + 22$ or $15 + 22 + 22$
$= 52$ or 59 units

22. (1)



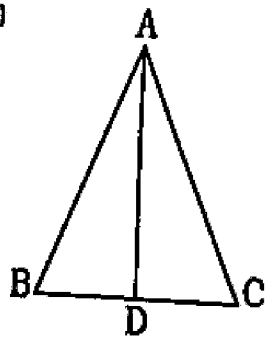
$a + b + c = 56$ ...(i)

$\frac{1}{2}ac = 84$

$\Rightarrow ac = 168$ sq.cm.
$\therefore\ b^2 = a^2 + c^2$
$\Rightarrow b^2 = (a + c)^2 - 2ac$
$\Rightarrow b^2 = (56 - b)^2 - 2 \times 168$ [By (i)]
$\Rightarrow b^2 = 3136 - 112b + b^2 - 336$
$\Rightarrow 112b = 2800$

$\Rightarrow b = \frac{2800}{112} = 25$ cm

23. (3)



If $AB = x$ cm, then

$BD = \frac{x}{2}$ cm

$\therefore$ From ΔABD
$AB^2 = BD^2 + AD^2$

$\Rightarrow x^2 = \frac{x^2}{4} + \left(6\sqrt{3}\right)^2$

$\Rightarrow x^2 - \frac{x^2}{4} = 36 \times 3$

$\Rightarrow \frac{3x^2}{4} = 36 \times 3$

$\Rightarrow x^2 = 36 \times 4$
$\Rightarrow x = 6 \times 2 = 12$ cm
$\therefore$ Perimeter of equilateral triangle
$= 3 \times 12 = 36$ cm

24. (1) $\frac{\sqrt{3}}{4}x^2 = 4\sqrt{3}$

$\Rightarrow x^2 = 4 \times 4 \Rightarrow x = 4$ cm
$\therefore$ Perimeter of equilateral triangle
$= 3 \times 4 = 12$ cm

25. (4) Ratio of the sides of triangle

$= \frac{1}{4} : \frac{1}{6} : \frac{1}{8}$

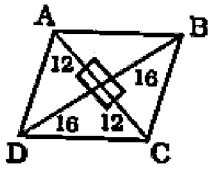
$= \frac{1}{4}\times 24 : \frac{1}{6}\times 24 : \frac{1}{8}\times 24$

[LCM of 4, 6, 8 = 24]
$= 6 : 4 : 3$
$\therefore\ 6x + 4x + 3x = 91$
$\Rightarrow 13x = 91$

$\Rightarrow x = \frac{91}{13} = 7$

$\therefore$ Required difference
$= 6x - 3x = 3x$
$= 3 \times 7 = 21$ cm

26. (1) We know that rhombus is parallelogram whose all four sides are equal and its diagonals bisect each other at 90°.



$\therefore AB = \sqrt{(16)^2 + (12)^2}$

$= \sqrt{256 + 144} = \sqrt{400}$
$= 20$ cm = side of the rhombus
$\therefore$ Perimeter of the rhombus
$= 20 \times 4 = 80$ cm

27. (4) If d_1 and d_2 are the lengths of diagonals of a rhombus. Then

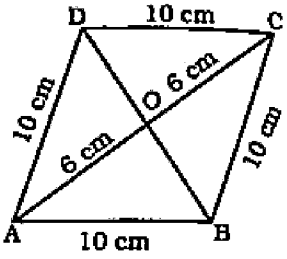
Perimeter $= 2\sqrt{d_1^2 + d_2^2}$

$= 2\sqrt{24^2 + 10^2}$

$= 2\sqrt{576 + 100} = 2\sqrt{676}$
$= 2 \times 26 = 52$ cm

28. (3) $4 \times$ side $= 40$ cm [given]

$\Rightarrow$ Side $= \frac{40}{4} = 10$ cm.



In ΔAOB,

$OB = \sqrt{(10)^2 - (6)^2}$

$= \sqrt{100 - 36} = \sqrt{64} = 8$ cm
$\therefore$ Diagonal $BD = 8 \times 2$
$= 16$ cm

29. (3) If d_1 and d_2 be the diagonals of a rhombus, we have
Perimeter $= 4 \times$ side

$= 2\sqrt{d_1^2 + d_2^2}$

$\left[\because \text{Side} = \frac{1}{2}\sqrt{d_1^2 + d_2^2}\right]$

$\Rightarrow 40 = 2\sqrt{12^2 + d_2^2}$

$\Rightarrow 20 = \sqrt{144 + d_2^2}$

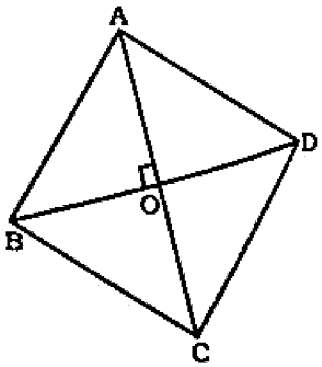
$\Rightarrow 144 + d_2^2 = 20^2 = 400$

$\Rightarrow d_2^2 = 400 - 144 = 256$

$\Rightarrow d_2 = \sqrt{256} = 16$ cm.

30. (1) $3x + 4x + 5x + 6x = 72$
$\Rightarrow 18x = 72$
$\Rightarrow x = 4$
$\therefore$ Largest side $= 6x = 6 \times 4$
$= 24$ cm.

31. (2)



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Area of rhombus $= \frac{1}{2} d_1 d_2$

$\Rightarrow 216 = \frac{1}{2} \times 24 \times d_2$

$\Rightarrow d_2 = \frac{216}{12} = 18$ cm

$\therefore$ AO = 12 cm, BO = 9 cm

$\Rightarrow AB = \sqrt{12^2 + 9^2} = \sqrt{144 + 81}$

$= \sqrt{225} = 15$ cm

$\therefore$ Perimeter of rhombus

$= 4 \times 15 = 60$ cm

32. (1) We know that

Area of circle $= \pi r^2$

According to question,

$\pi r^2 = 38.5$

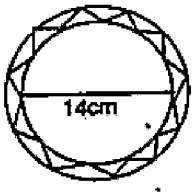
$\Rightarrow r^2 = \frac{38.5}{22} \times 7 = (3.5)^2$

$\Rightarrow r = 3.5$ cm

$\therefore$ Circumference of circle

$= 2\pi r = 2 \times \frac{22}{7} \times 3.5 = 22$cm

33. (2)



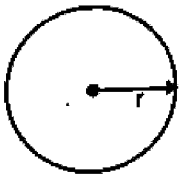
Circumference of wheel $= \pi D$

$= \frac{22}{7} \times 14 = 44$ cm.

$\therefore$ Total distance travelled by wheel in 15 revolutions

$= 15 \times 44$ cm $= 660$ cm

34. (3)



Circumference $= 2\pi r$

$= \frac{44}{7} \times r$ metre

Distance covered in 8 times

$= 16\pi r$ metres

$\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{16\pi r}{40}$ m / minute

$= \frac{2\pi r}{5}$ m/minute

New circumference

$= 2\pi r \times 10 = 20\pi r$

$\therefore$ Required time

$= \frac{20\pi r}{2\pi r} \times 5$ minute $= 50$ minutes

35. (2) Diameter of the wheel = 3 metres

$\therefore$ Circumference $= \pi \times$ diameter

$= \frac{22}{7} \times 3 = \frac{66}{7}$ metres

Since a wheel covers a distance equal to its circumference in one revolution, therefore, distance covered in 28 revolutions

$= 28 \times \frac{66}{7}$

$= 264$ metres

Now, 264 metres distance is covered in 1 minute

$\therefore$ 5280 metres distance will be covered in $= \frac{5280}{264}$

$= 20$ minutes.

36. (2) The distance covered

= 2 km 26 decameters

$= (2 \times 1000 + 26 \times 10)$ m.

$= 2260$ m.

The distance covered in one revolution

$= \frac{\text{Total distance}}{\text{Number of revolutions}}$

$= \frac{2260}{113} = 20$ m.

Clearly,

Circumference of wheel

= distance covered in 1 revolution

$= 20$ m

$\pi \times$ diameter $= 20$ m.

Diameter $= \frac{20}{\pi} = \frac{20 \times 7}{22}$

$= \frac{70}{11} = 6\frac{4}{11}$ m.

37. (1) Distance covered in 1 revolution = Circumference of wheel

$= 2 \times \frac{22}{7} \times 1.75$ m

$\therefore$ Number of revolutions

$= \frac{11 \times 1000}{2 \times \frac{22}{7} \times 1.75}$

$= \frac{11 \times 7 \times 1000}{2 \times 22 \times 1.75} = 1000$

38. (1) Circumference of the circular wire $= 2\pi r$

$= 2 \times \frac{22}{7} \times 42 = 264$ cm

$\Rightarrow$ Perimeter of rectangle $= 264$ cm

Let the sides of rectangle be $6x$ and $5x$ cm.

$\therefore 2(6x + 5x) = 264$

$\Rightarrow 2 \times 11x = 264$

$\Rightarrow x = \frac{264}{22} = 12$

$\therefore$ The smaller side

$= 5x = 5 \times 12 = 60$ cm.

39. (1) Distance covered in 1 revolution

= Circumference of wheel

$= 2\pi r = 2 \times \frac{22}{7} \times 20$ cm.

Total distance = 176 m

= 17600 cm

$\therefore$ Number of revolutions

$= \frac{17600}{2 \times \frac{22}{7} \times 20}$

$= \frac{17600 \times 7}{2 \times 22 \times 20} = 140$

40. (2) Let the radius of the circle be r cm.

Then, $2\pi r - 2r = 30$

$2r(\pi - 1) = 30$

$\Rightarrow 2r \times \frac{22 - 7}{7} = 30$

$\Rightarrow 2r \times 15 = 30 \times 7 \Rightarrow r = \frac{30 \times 7}{30}$

$\Rightarrow r = 7$ cm

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41. (4) If the radius be r metre, then

$\pi r + 2r = 144$

$\Rightarrow r(\pi + 2) = 144$

$\Rightarrow r = \frac{144}{\pi+2} = \frac{144}{\frac{22}{7}+2}$

$= \frac{144 \times 7}{36} = 28$

$\therefore$ Diameter $= 2r = 2 \times 28$

$= 56$ metre

42. (3) Let the radius of the semi – circle be r metre.

According to the question,

$\pi r + 2r = \pi r^2$

$= \pi + 2 = \frac{\pi r^2}{2}$

$\Rightarrow 2\pi + 4 = \pi r$

$r = \frac{2\pi+4}{\pi} = 2 + \frac{4}{\pi} = 2 + \frac{28}{22}$

$= 2 + \frac{14}{11} = \frac{36}{11}$

$\therefore$ Diameter

$= \frac{2 \times 36}{11} = \frac{72}{11} = 6\frac{6}{11}$ metres

43. (2) Circumference of circle $= 2\pi r$

$= 2\pi \times 3 = 6\pi$ cm

Area of circle $= \pi r^2 = \pi \times 3 \times 3$

$= 9\pi$ cm^2

$\therefore$ Required ratio $= 6\pi : 9\pi$

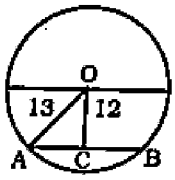
$= 2 : 3$

44. (2) Tricky Approach

Ratio of the circumference

= Ratio of radii = 3 : 4

45. (3)



$AC = \sqrt{13^2 - 12^2} = \sqrt{169 - 144}$

$= \sqrt{25} = 5$ cm

$\therefore$ AB = 10 cm

46. (1) Distance covered by wheel in one revolution = circumference of the wheel

$= \pi \times$ diameter $= \frac{22}{7} \times 98$

$= 308$ cm

$\therefore$ Number of revolutions

$= \frac{1540 \times 100}{308} = 500$

47. (2) Distance covered by wheel in one revolution

= Circumference of wheel

$\therefore \pi \times$ diameter $= \frac{440}{1000}$

$\Rightarrow \frac{22}{7} \times$ diameter $= \frac{440}{1000}$

$\Rightarrow$ Diameter $= \frac{440}{1000} \times \frac{7}{22}$

$= 0.14$ m

48. (2) Distance covered by wheel in one revolution

= Circumference of wheel

$= \frac{11000}{5000} = \frac{11}{5}$ metre

$= \frac{11}{5} \times 100$ cm $= 220$ cm

$\therefore 2\pi r = 220$

$\Rightarrow 2 \times \frac{22}{7} \times r = 220$

$\Rightarrow r = \frac{220 \times 7}{2 \times 22} = 35$ m

49. (2) Length of the rubber band

$= 3d + 2\pi r$

$= (30 + 10\pi)$ cm

50. (3) The chord nearer to the centre is larger.

$\therefore \frac{15}{8} = \frac{x}{16}$

$\Rightarrow x = \frac{15 \times 16}{8} = 30$ cm

51. (2) Perimeter of semi-circular shaped window

$= (\pi r + 2r)$ cm $= r(\pi + 2)$ cm

$= \frac{63}{2}\left(\frac{22}{7} + 2\right)$ cm

$= \frac{63}{2} \times \frac{36}{7} = 162$ cm

52. (1) Number of revolutions

$= \frac{12 \times 42}{18} = 28$

53. (2) Perimeter of semi-circular region = 18 cm

$\therefore \pi r + 2r = 18$

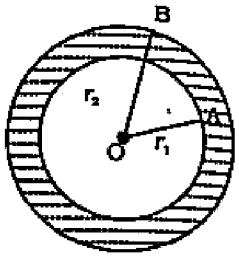
$\Rightarrow r(\pi + 2) = 18$

$\Rightarrow r\left(\frac{22}{7} + 2\right) = 18$

$\Rightarrow r\left(\frac{36}{7}\right) = 18$

$\Rightarrow r = \frac{18 \times 7}{36} = \frac{7}{2} = 3\frac{1}{2}$ cm

54. (1)



Breadth of road $= r_2 - r_1$

$\therefore 2\pi r_2 - 2\pi r_1 = 66$

$\Rightarrow 2\pi(r_2 - r_1) = 66$

$\Rightarrow r_2 - r_1 = \frac{66}{2\pi} = \frac{66 \times 7}{2 \times 22}$

$= 10.5$ metres

55. (4) Let the radius of circular field be r metre, then

$\frac{2\pi r}{30} - \frac{2r}{30} = \frac{30}{60}$

$\Rightarrow \frac{\pi r}{15} - \frac{r}{15} = \frac{1}{2}$

$\Rightarrow \pi r - r = \frac{15}{2}$

$\Rightarrow r(\pi - 1) = \frac{15}{2}$

$\Rightarrow r\left(\frac{22}{7} - 1\right) = \frac{15}{2}$

$\Rightarrow r \times \frac{15}{7} = \frac{15}{2}$

$\Rightarrow r = \frac{7}{2} = 3.5$ metre

56. (1) If the diameter of the circle be d units, then

$\pi d - d = X$

$\Rightarrow d(\pi - 1) = X$

$\Rightarrow d = \frac{X}{\pi - 1}$ units

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57. (2) Radius of the circle

$= \frac{100}{2\pi}$ cm

When a square is inscribed in the circle, diagonal of the square is equal to diameter of the circle.

∴ Diagonal of square

$= 2 \times \frac{100}{2\pi} = \frac{100}{\pi}$ cm

∴ Side of square $= \frac{\text{Diagonal}}{\sqrt{2}}$

$= \frac{100}{\sqrt{2}\pi} = \frac{50\sqrt{2}}{\pi}$ cm.

58. (3) Let the internal radius of the park be r and the external radius (with the path) be R.

The difference between the internal and external circumferences is 132 m.

i.e. $2\pi R - 2\pi r = 132$

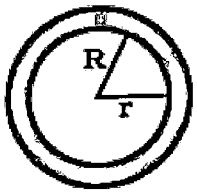
$\Rightarrow 2\pi (R - r) = 132$

$\Rightarrow R - r = \frac{132}{2\pi} = \frac{132 \times 7}{2 \times 22} = 21$

Hence, the width of path

= 21 metres

59. (3)



Let the shaded portion be the circular path.

Let the inner radius be r metres.

∴ Outer radius R = (r + 5) metres.

According to the question,

$\frac{2\pi R}{2\pi r} = \frac{23}{22}$

$\Rightarrow \frac{R}{r} = \frac{23}{22}$

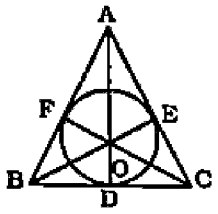
$\Rightarrow \frac{r+5}{r} = \frac{23}{22}$

$\Rightarrow 23r = 22r + 110$

$\Rightarrow r = 110$ metres

∴ Diameter = 2 × 110 = 220 metres

60. (3)



OD = OE = OF = 2cm.

∴ Area of Δ ABC

= Area of Δ AOB

+ Area of Δ BOC

+ Area of Δ AOC

$\Rightarrow 6 = \frac{1}{2} \times AB \times 2 + \frac{1}{2} \times BC \times 2$

$+ \frac{1}{2} \times CA \times 2$

$\Rightarrow$ AB + BC + CA = 6 cm

61. (2) Circum-radius $= \frac{\text{Side}}{\sqrt{3}}$

∴ Area of circum-circle

$= \pi \times \frac{\text{side}^2}{3} = 3\pi$

$\Rightarrow \text{Side}^2 = 9 \Rightarrow$ Side = 3 cm

∴ Perimeter of triangle

= 3 + 3 + 3 = 9 cm

62. (3) Area of the square = $(\text{side})^2$

484 sq.cm. = $(\text{side})^2$

Side $= \sqrt{484} = 22$ cm

∴ Perimeter of the square

= 4 × side = 4 × 22 = 88 cm

According to the question, the circle is made by same wire.

Therefore,

Perimeter of the square

= circumference of the circle

88 cm = $2\pi r$

$88 \text{ cm} = 2 \times \frac{22}{7} \times r$

$\Rightarrow r = \frac{88 \times 7}{2 \times 22} = 14$ cm

∴ Area of circle = πr^2

$= \frac{22}{7} \times (14)^2 = \frac{22}{7} \times 14 \times 14$

= 616 sq.cm.

63. (2) Side of the square paper sheet

$= \sqrt{784} = 28$ cm.

Obviously, radius of each circle

$= \frac{28}{4} = 7$ cm.

Circumference of each circular plate = $2\pi r$

$= 2 \times \frac{22}{7} \times 7 = 44$ cm

64. (4) Let the radius of circle = r and side of square = x units.

Then,

$\frac{\text{Area of circle}}{\text{Area of square}} = \frac{\pi r^2}{x^2} = 1$

$\Rightarrow x^2 = \pi r^2 \Rightarrow x = \sqrt{\pi}\, r$

Now,

$\frac{\text{Circumference of circle}}{\text{Perimeter of square}}$

$= \frac{2\pi r}{4\sqrt{\pi}\, r} = \frac{\sqrt{\pi}}{2}$ or $\sqrt{\pi} : 2$

65. (1) Side of square

$= \sqrt{121} = 11$ cm

∴ Length of wire = 4 × 11

= 44 cm

∴ $2\pi r = 44$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44$

$\Rightarrow r = \frac{44 \times 7}{2 \times 22} = 7$ cm

66. (3) Let the side of square be 1 cm, then 2 (l + b)

= 4 × side = 4 × 1

$\Rightarrow$ l + b = 2, If l = 1.5, b = 0.5

∴ Area of square = 1 sq.cm.

and Area of rectangle = 1.5 × 0.5

= 0.75 sq.cm.

For a given perimeter, square has the largest area. i.e, P > Q

67. (4) $2\pi r = 2 (18 + 26)$

$\Rightarrow 2 \times \frac{22}{7} \times r = 44 \times 2$

$\Rightarrow r = 14$ cm

∴ Area of circle = πr^2

$= \frac{22}{7} \times 14 \times 14 = 616$ sq. cm.

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68. (2) Let the side of equilateral triangle be x units.

$\therefore$ Perimeter $= 3x$ units.

After increase,

Perimeter $= 1.2x + 1.3x + 1.5x$

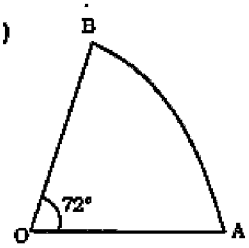
$= 4x$ units

Increase $= 4x - 3x = x$ units

$\therefore$ % Increase

$$= \frac{x}{3x} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$$

69. (1)



$\theta = 72° \rightarrow 88$m

$\because 360° \rightarrow \frac{88}{72} \times 360 = 440$ m

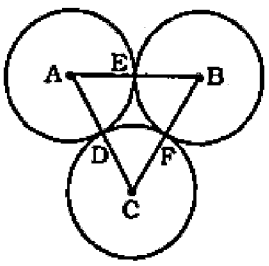
$\Rightarrow 2\pi r = 440$

$\therefore r = \frac{440}{2} \cdot \frac{7}{22}$

$\therefore r = 70$m

$=$ OA which is the length of the rope.

70. (1)



AE $=$ AD $= 3.5$ cm

BE $=$ BF $= 4.5$ cm

CD $=$ CF $= 5.5$ cm

$\therefore$ Perimeter of triangle

$=$ AB + BC + CA

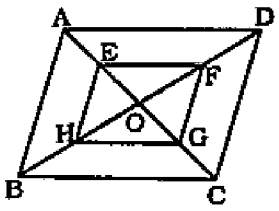
$=$ AE + EB + BF + FC + CD + DA

$= 2$(AE + BE + CD)

$= 2(3.5 + 4.5 + 5.5)$

$= 2 \times 13.5 = 27$ cm

71. (3)



In Δ OAB,

Mid-point of OA $=$ E

Mid-point of OB $=$ H

$\therefore$ EH $\|$ AB and HE $= \frac{1}{2}$AB

Similarly, HG $= \frac{1}{2}$BC,

FG $= \frac{1}{2}$ CD and EF $= \frac{1}{2}$AD

$\therefore$ EH + HG + FG + EF

$= \frac{1}{2}$(AB + BC + CD + AD)

$\Rightarrow$ Perimeter of EFGH

$= \frac{1}{2} \times$ Perimeter of ABCD

$\therefore$ Required ratio $= 1 : 2$

72. (1) Circumference of circular shape $= \pi \times$ diameter

$= \frac{22}{7} \times 112 = 352$ cm

$=$ length of wire

$\therefore$ Perimeter of rectangle

$= 2$ (length + breadth)

$\Rightarrow 2(l + b) = 352$

$\Rightarrow l + b = \frac{352}{2} = 176$ $\therefore$

Smaller side of rectangle

$= \frac{7}{16} \times 176 = 77$ cm

73. (3) Perimeter of equilateral triangle $= 3 \times$ side

$\therefore 3 \times$ side $= 18$

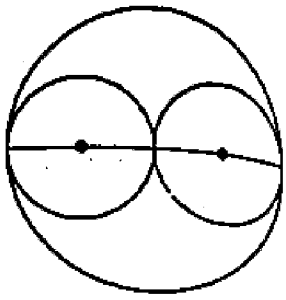
$\Rightarrow$ Side $= \frac{18}{3} = 6$ cm.

$\therefore$ Length of median

$= \frac{\sqrt{3}}{2} \times$ side

$= \frac{\sqrt{3}}{2} \times 6 = 3\sqrt{3}$ cm.

74. (1)



Radius of circular paper sheet

$$\frac{\text{Circumference}}{2\pi} = \frac{352}{2\pi}$$

$$= \frac{352}{2 \times \frac{22}{7}}$$

$$= \frac{352 \times 7}{2 \times 22} = 56 \text{ cm}$$

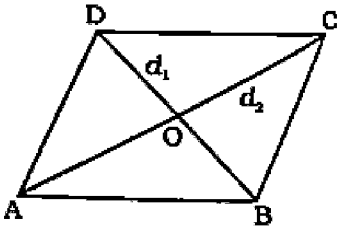
$\therefore$ Radius of each plate $= \frac{56}{2}$

$= 28$ cm

$\therefore$ Circumference of each circular plate $= 2\pi r$

$= 2 \times \frac{22}{7} \times 28 = 176$ cm

75. (1)



AC $= 24$ cm $= d_2$

BD $= 32$ cm $= d_1$

$\therefore$ OD $= 16$ cm

OC $= 12$ cm

$\angle$COD $= 90°$

$\therefore$ CD $= \sqrt{OC^2 + OD^2}$

$= \sqrt{12^2 + 16^2}$

$= \sqrt{144 + 256} = \sqrt{400} = 20$ cm

$\therefore$ Perimeter of rhombus

$= 4 \times$ CD $= 4 \times 20 = 80$ cm

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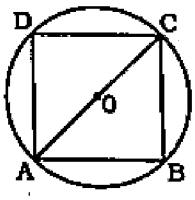
76. (1) In-radius $= \frac{\text{Side}}{2\sqrt{3}}$

$\therefore \sqrt{3} = \frac{\text{Side}}{2\sqrt{3}}$

$\Rightarrow$ Side $= 2\sqrt{3} \times \sqrt{3} = 6$ cm

$\therefore$ Perimeter of equilateral $= 3 \times 6 = 18$ cm

77. (1)



Side of a square $= AB = \sqrt{2}\ a$ units

$\therefore$ AC = Diagonal $= \sqrt{2} \times \sqrt{2}\ a$

$= 2a$ units

= Diameter (d) of circle

$\therefore$ Circumference of circle

$= \pi \times d$

$= \pi \times 2a = 2\pi a$ units

78. (2) Perimeter of rectangle $= 40$ metre

Length $= 12$ metre

$\therefore 2(l + b) = 40$

$\Rightarrow 2(12 + b) = 40$

$\Rightarrow 12 + b = \frac{40}{2} = 20$

$\Rightarrow b = 20 - 12 = 8$ metre

79. (2) Circumference of circle

$= \pi \times$ diameter $= \pi d$

$\therefore \pi d - d = 150$

$\Rightarrow d(\pi - 1) = 150$

$\Rightarrow d\left(\frac{22}{7} - 1\right) = 150$

$\Rightarrow d\left(\frac{22-7}{7}\right) = 150$

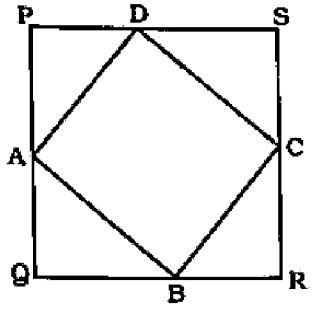
$\Rightarrow d \times \frac{15}{7} = 150$

$\Rightarrow d = \frac{150 \times 7}{15} = 70$

$\therefore$ Radius $= \frac{d}{2} = \frac{70}{2}$

$= 35$ metre

80. (2)



$PA = AQ = QB = 5$ cm.

$\therefore \angle AQB = 90°$

$\therefore AB = \sqrt{AQ^2 + QB^2}$

$= \sqrt{5^2 + 5^2} = \sqrt{25 + 25} = \sqrt{50}$

$= 5\sqrt{2}$ cm.

$\therefore$ Perimeter of ABCD

$= 4 \times 5\sqrt{2} = 20\sqrt{2}$ cm.

81. (2) Length of wire = Circumference of circle $= 2\pi r$

$= 2 \times \frac{22}{7} \times 84 = 528$ cm.

$\therefore$ Perimeter of square $= 528$ cm.

$\Rightarrow 4 \times$ side $= 528$

$\Rightarrow$ Side $= \frac{528}{4} = 132$ cm.

82. (2) If the required side be x cm, then

$\frac{30}{20} = \frac{9}{x}$

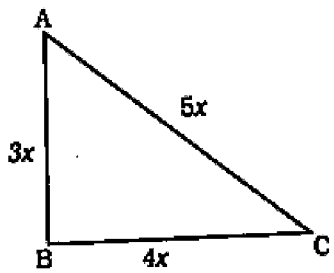
$\Rightarrow 3x = 9 \times 2$

$\Rightarrow x = \frac{9 \times 2}{3} = 6$ cm

83. (1) Let the sides of triangle be $3x$, $4x$ and $5x$ units.

Here, $(3x)^2 + (4x)^2 = (5x)^2$

Hence, it is a right angled triangle.



Area of ΔABC

$= \frac{1}{2} \times AB \times BC$

$\Rightarrow \frac{1}{2} \times 3x \times 4x = 7776$

$\Rightarrow 6x^2 = 7776$

$\Rightarrow x^2 = \frac{7776}{6} = 1296$

$\Rightarrow x = \sqrt{1296} = 36$ cm.

$\therefore$ Perimeter of triangle

$= 3x + 4x + 5x$

$= 12x = 12 \times 36 = 432$ cm.

84. (3) Circumference of the wheel of car $= \pi \times d$

$= \frac{22}{7} \times 70 = 220$ cm.

= Distance covered in one rotation

$\therefore$ Distance covered by car in 1 minute $= (400 \times 220)$ cm.

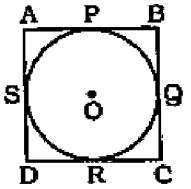
$\therefore$ Distance covered by car in 1 hour $= (400 \times 220 \times 60)$ cm.

$= \left(\frac{400 \times 220 \times 60}{1000 \times 100}\right)$ km.

$= 52.8$ km.

$\therefore$ Speed of car $= 52.8$ kmph

85. (1)



Since tangents drawn from an exterior point to a circle are equal in length.

$\therefore$ AP = AS

BP = BQ

CR = CQ

DR = DS

On adding all these,

AP + BP + CR + DR = AS + BQ + CQ + DS

$\Rightarrow$ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)

$\Rightarrow$ AB + CD = BC + DA

$\Rightarrow 7 + 9.2 = 8.5 + DA$

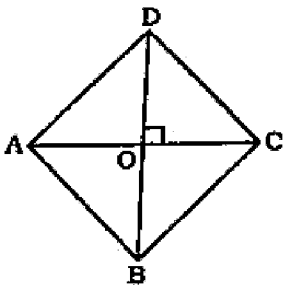
$\Rightarrow 16.2 = 8.5 + DA$

$\Rightarrow DA = 16.2 - 8.5 = 7.7$ cm.

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66. (2) Side of rhombus

$= \frac{\text{Perimeter}}{4} = \frac{60}{4} = 15$ cm.



$d_1 = AC = 24$ cm.
$OC = 12$ cm.
$CD = 15$ cm.
$\angle COD = 90°$
$\therefore$ In ΔOCD,

$OD = \sqrt{CD^2 - OC^2}$

$= \sqrt{15^2 - 12^2} = \sqrt{225 - 144}$

$= \sqrt{81} = 9$ cm.

$\therefore d_2 = BD = 2 \times 9 = 18$ cm.
$\therefore$ Area of rhombus

$= \frac{1}{2} d_1 d_2 = \frac{1}{2} \times 24 \times 18$

$= 216$ sq. cm.

67. (3) $\frac{\text{Circumference}}{\text{Diameter}} = \frac{22}{7}$

$\Rightarrow \frac{\frac{11}{7}}{2r} = \frac{22}{7}$

$\Rightarrow \frac{11}{14r} = \frac{22}{7}$

$\Rightarrow 14r \times 22 = 11 \times 7$

$\Rightarrow r = \frac{11 \times 7}{14 \times 22} = \frac{1}{4}$ metre

TYPE-III

1. (4) Area of the floor $= 8 \times 6$
$= 48$ sq. m. $= 4800$ sq. dm.
Area of a square tile $= 4 \times 4$
$= 16$ sq. dm

$\therefore$ Number of tiles $= \frac{4800}{16} = 300$

2. (2) We will need 600 m of 50cm wide carpet to cover the floor of corridor.
$\therefore$ Total Cost $= 600 \times 15 =$ ₹ 9000.

3. (3) $15^2 + 20^2 = 25^2$
$\therefore$ The triangular field is right angled.
$\therefore$ Area of the field

$= \frac{1}{2} \times 15 \times 20$

$= 150$ sq. metre
Hence, Cost of sowing seeds
$= 150 \times 5 =$ ₹ 750

4. (3) The distance travelled by wheel in one revolution

$= 2\pi r = 2 \times \frac{22}{7} \times 1.75\text{m} = 11\text{m}$

Therefore, the number of revolution to cover 11 km i.e. 11000 m by wheel

$= \frac{11000}{11} = 1000$

5. (4) Circumference of wheel $= 2\pi r$

$= 2 \times \frac{22}{7} \times 21$ cm $= 132$ cm

$\therefore$ Number of revolutions

$= \frac{92400}{132} = 700$

6. (1) Area of rectangular field

$= \frac{1000}{\frac{1}{4}} = 4000$ sq. metre

$\therefore$ Length $= \frac{4000}{50} = 80$ metre

New length of field $= 100$ metre
New area $= 100 \times 50 = 5000$ sq. metre
$\therefore$ Required expenditure

$= ₹ (5000 \times \frac{1}{4}) = ₹ 1250$

7. (4) Percentage increase in area

$= \left(x + y + \frac{xy}{100}\right)\%$

Here, $x = 100\%$
$y = 100\%$

$= \left(100 + 100 + \frac{100 \times 100}{100}\right)\%$

$= 300\%$

8. (1) Required per cent increase

$\left(2x + \frac{x^2}{100}\right)\%$

$= \left(2 \times 5 + \frac{5 \times 5}{100}\right)\% = 10.25\%$

9. (4) Required per cent

$= \frac{10}{100 + 10} \times 100 = \frac{100}{11} = 9\frac{1}{11}\%$

10. (4) Required percentage increase in area

$= \left(x + y + \frac{xy}{100}\right)\%$

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$

$= 44\%$

11. (3) Percentage decrease

$= \left(2x + \frac{x^2}{100}\right)\%$

$= \left(2 \times (-10) + \frac{(-10)^2}{100}\right)\%$

$= (-20 + 1)\% = -19\%$

12. (4) External radius of circular path $= R$ metre
$\therefore 2\pi R = 528$

$\Rightarrow 2 \times \frac{22}{7} \times R = 528$

$\Rightarrow R = \frac{528 \times 7}{2 \times 22} = 84$ metre

$\therefore$ In-radius (r)
$= 84 - 14 = 70$ metre
$\therefore$ Area of path $= \pi(R^2 - r^2)$

$= \frac{22}{7} (84^2 - 70^2)$

$= \frac{22}{7} (84 + 70)(84 - 70)$

$= \frac{22}{7} \times 154 \times 14$

$= 6776$ sq. metre
$\therefore$ Required cost $= 6776 \times 10$
$=$ Rs. 67760

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TYPE-IV

1. (2) Sides of the box = x, $2x$ and $3x$ cm

$\therefore$ $2(x \times 2x + 2x \times 3x + 3x \times x)$ = 88

$\Rightarrow$ $11x^2 = 44$

$\Rightarrow$ $x^2 = 4$

$\Rightarrow$ $x = 2$

$\therefore$ Volume of the box

$= x \times 2x \times 3x$

$= 6x^3 = 6 \times 8 = 48$ cu.cm.

2. (1) Clearly, $r = 4$ cm, $h = 3$cm.

$\therefore$ Volume of cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times 16 \times 3 = 16\pi$ cm^3

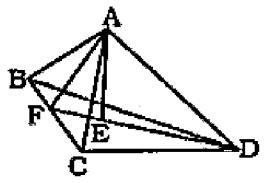
3. (1) Volume of the tetrahedron

$= \frac{1}{3} \times$ Area of base $\times$ height

$\therefore$ Area of the base

$= \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3}$ sq.cm

A regular tetrahedron is made up of 4 equilateral triangles. One is the base triangles and other are the 3 faces.



In ΔDBC, draw $DF \perp BC$. ΔDBC is are equilateral triangle.

DF (perpendicular) [DF ⊥ AF]

$= \sqrt{DC^2 - FC^2}$

$= \sqrt{12^2 - 6^2} = \sqrt{18 \times 6}$

$= 6\sqrt{3}$ = AF [altitude of ΔABC]

[ΔABC is also an equilateral Δ with side 12cm].

$FE = \frac{1}{3} \times 6\sqrt{3} = 2\sqrt{3}$ cm.

[E is the centroid].

$\therefore$ $AE = \sqrt{AF^2 - FE^2}$

$= \sqrt{(6\sqrt{3})^2 - (2\sqrt{3})^2}$

$= \sqrt{108 - 12} = \sqrt{96} = 4\sqrt{6}$ cm

$\therefore$ Required volume

$= \frac{1}{3} \times 36\sqrt{3} \times 4\sqrt{6}$

$= 144\sqrt{2}$ cu.cm.

4. (1) Let radius are r_1 and r_2 respectively, then $\pi r_1^2 h_1 = \pi r_2^2 h_2$ where h_1 and h_2 are heights

According to question,

$h_1 : h_2 = 1 : 2$

$\therefore$ $r_1 : r_2 = \sqrt{h_2 : h_1} = \sqrt{2:1} = \sqrt{2} : 1$

5. (4) Circumference of the base, $C = 2\pi r$

where, r = radius of the base

$\Rightarrow r = \frac{C}{2\pi}$

Given: C = 66cm, h = 40cm

Volume $= \pi r^2 h$

$= \pi\left(\frac{C}{2\pi}\right)^2 h = \frac{C^2 h}{4\pi}$

$= \frac{66 \times 66 \times 40}{4 \times \frac{22}{7}}$ cm^3

$= 7 \times 3 \times 66 \times 10$ cm^3

$= 13860$ cm^3

6. (2) Let the radii of two cylinders are r_1, r_2 and length of the cylinders are h_1, h_2 respectively.

According to the question

$\frac{r_1}{r_2} = \frac{2}{3}$ and $\frac{h_1}{h_2} = \frac{5}{3}$

$\therefore$ Ratio of their volume

$= \pi r_1^2 h_1 : \pi r_2^2 h_2$

$= r_1^2 h_1 : r_2^2 h_2$

$= (2)^2 \times 5 : (3)^2 \times 3$

$= 4 \times 5 : 9 \times 3 = 20 : 27$

7. (4) If r be radius of base and h the height, then

Curved surface of cylindrical pillar $= 2\pi rh$.

and volume $= \pi r^2 h$.

$\therefore$ $2\pi rh = 264$ m^2 ...(i)

$\pi r^2 h = 924$ m^3 ...(ii)

On dividing (ii) by (i), we get

$\frac{\pi r^2 h}{2\pi rh} = \frac{924}{264}$ m.

$\Rightarrow \frac{r}{2} = \frac{924}{264}$ m

$\Rightarrow r = \frac{924 \times 2}{264}$ m $= 7$ m

$\therefore$ Diameter $= 2 \times 7 = 14$m

From (i),

$h = \frac{264}{\pi \times d} = \frac{264 \times 7}{22 \times 14} = 6$m

$\therefore$ Required ratio

$= \frac{14}{6}$ i.e, 7 : 3

8. (3) The volume of iron used

$= \pi r_1^2 h - \pi r_2^2 h = \pi h\left(r_1^2 - r_2^2\right)$

$= \frac{22}{7} \times 20\left(4^2 - 3^2\right)$

$= \frac{22}{7} \times 20 \times 7 = 440$ cu.cm.

9. (1) The pipe can be assumed as hollow cylinder.

External radius $= \frac{8}{2} = 4$ cm.

Thickness = 1 cm

$\therefore$ Internal radius

$= 4 - 1 = 3$ cm.

Volume of the material

$= \pi h (R^2 - r^2)$

$= \frac{22}{7} \times 21 \times \left(4^2 - 3^2\right)$

$= \frac{22}{7} \times 21 \times 7$

$= 462$ cm^3.

Now, 1cm^3 iron weighs = 8 gm

$\therefore$ 462 cm^3 iron weighs

$= 462 \times 8$ gm

$= \frac{462 \times 8}{1000}$ kg

$= 3.696$ kg

10. (2) Volume of the cube = (edge)^3

$= (11 \times 11 \times 11)$cm^3

$\therefore$ Volume of cylinder

$= 11 \times 11 \times 11$

$\Rightarrow \pi r^2 \times 14 = 11 \times 11 \times 11$

$\Rightarrow r^2 = \frac{11 \times 11 \times 11 \times 7}{22 \times 14} = \frac{11 \times 11}{4}$

$\Rightarrow r = \sqrt{\frac{(11)^2}{4}} = \frac{11}{2} = 5.5$ cm

11. (2) Let the radius of base be r metres.

$\therefore$ $\pi r^2 h = 9\pi h$

$\Rightarrow r^2 = 9 \Rightarrow r = 3$ m

$\therefore$ Diameter $= 2 \times 3$

$= 6$ metres.

12. (3) Curved surface area of cylinder = Area of rectangular tin foil

$\Rightarrow 2\pi rh = 16 \times 22$

$\Rightarrow 2 \times \frac{22}{7} \times r \times 16 = 16 \times 22$

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$\Rightarrow r = \frac{7}{2}$ cm

$\therefore$ Volume of the cylinder $= \pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 16 = 616$ cm^3

13. (1) Let the thickness of the pipe be x cm
$\therefore$ If the external radius = 9 cm
then, in radius = $(9 - x)$ cm
According to the question,
$\pi \times 9^2 \times 14 - \pi \times 14 \times (9 - x)^2 = 748$
$\Rightarrow \pi \times 14 (81 - (81 + x^2 - 18x)) = 748$
$\Rightarrow \pi \times 14 (-x^2 + 18x) = 748$
$\Rightarrow -x^2 + 18x = \frac{748}{\pi \times 14} = \frac{748 \times 7}{22 \times 14}$
$\Rightarrow -x^2 + 18x = 17$
$\Rightarrow x^2 - 18x + 17 = 0$
$\Rightarrow x^2 - 17x - x + 17 = 0$
$\Rightarrow x(x - 17) - 1(x - 17) = 0$
$\Rightarrow (x - 1)(x - 17) = 0$
$\Rightarrow x = 1$ or 17 but
$x = 17$ is inadmissible
$\therefore x = 1$ cm

14. (2) When the two iron sheets are immersed in water, it will displace water equal to its volume.
Let the water be raised in the vessel by x cm.

$\therefore 2 \times \frac{4}{3} \times \pi \times (3)^3 = \pi \times (6)^2 \times x$

$\Rightarrow 72\pi = 36\pi x$

$\Rightarrow x = \frac{72}{36} = 2$ cm

15. (1) Let the radius of the base of cylinder A be $3x$ units and that of cylinder B be $2x$ units.
Similarly, height of cylinder A $= ny$ units and that of cylinder B be y units.
Since, Volume of cylinder $= \pi r^2 h$
According to the question
$\pi (3x)^2 \times ny = 3\pi (2x)^2 \times y$
$\Rightarrow 9x^2 y.n = 12x^2 y$

$\Rightarrow n = \frac{12}{9} = \frac{4}{3}$

16. (1) Volume of water flowing per second $= \pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12 = 462$ cm^3

$\therefore$ Volume of water pumped out in 1 hour
$= 462 \times 60 \times 60$ cm^3
$= 1663200$ cm$^3 = 1663.2$ litres

17. (4) Let the radius of base be r cm and height be 16 cm.
then $2\pi rh = 1056$

$\Rightarrow 2 \times \frac{22}{7} \times r \times 16 = 1056$

$\Rightarrow r = \frac{1056 \times 7}{2 \times 22 \times 16} = \frac{21}{2}$ cm

$\therefore$ Volume of the cylinder $= \pi r^2 h$

$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 16 = 5544$ cm^3

18. (3) Let the radius of the new cylinder be R then,
$2\pi r^2 h = \pi R^2 h$
$\Rightarrow R^2 = 2r^2 \Rightarrow R = \sqrt{2}r = r\sqrt{2}$

19. (1) $\frac{d_1}{d_2} = \frac{r_1}{r_2} = \frac{3}{2}$

$\therefore \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = 1 \Rightarrow \frac{9}{4} \times \frac{h_1}{h_2} = 1$

$\Rightarrow \frac{h_1}{h_2} = \frac{4}{9} \Rightarrow 4 : 9$

20. (1) Volume of the remaining solid

$\pi r^2 h - \frac{1}{3}\pi r^2 h$

$= \frac{2}{3}\pi r^2 h = \frac{2}{3}\pi \times 6 \times 6 \times 10$
$= 240\pi$ cu.cm.

21. (3) Volume of solid cylinder $= \pi r^2 h$

Volume of cone $= \frac{1}{3}\pi r^2 h$

Difference $= \pi r^2 h - \frac{1}{3}\pi r^2 h$

$= \frac{2}{3}\pi r^2 h = \frac{2}{3} \times \frac{22}{7} \times 5 \times 5 \times 12$
$= 628.57$ cu.cm.

22. (1) Let radius be increased by x cm.
then Volume of cylinder
$= \pi(10 + x)^2 \times 4$
Again, let height be increased by x cm.
then Volume of cylinder
$= \pi \times 10^2 (4 + x)$
$\therefore \pi (10 + x)^2 \times 4$
$= \pi (10)^2 (4 + x)$
$\Rightarrow (10 + x)^2 = 25 (4 + x)$
$\Rightarrow 100 + 20x + x^2 = 100 + 25x$
$\Rightarrow x^2 - 5x = 0 \Rightarrow x(x - 5) = 0$
$\Rightarrow x = 5$ cm

23. (2)

$\frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$

$= 3\left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$

$= 3 \times \left(\frac{\sqrt{3}}{\sqrt{2}}\right)^2 \times \frac{\sqrt{2}}{\sqrt{3}}$

$= 3 \times \frac{\sqrt{3}}{\sqrt{2}} = 3\sqrt{3} : \sqrt{2}$

24. (4) $2\pi rh : 2\pi rh + 2\pi r^2 = 1 : 2$
$\Rightarrow 2\pi rh : 616 = 1 : 2$

$\Rightarrow 2\pi rh = \frac{616}{2} = 308$

$\therefore 2\pi rh + 2\pi r^2 = 616$
$\Rightarrow 308 + 2\pi r^2 = 616$
$\Rightarrow 2\pi r^2 = 308$

$\Rightarrow r^2 = \frac{308 \times 7}{22 \times 2} = 49$

$\Rightarrow r = 7$

$\therefore 2 \times \frac{22}{7} \times 7 \times h = 308$

$\Rightarrow h = \frac{308}{44} = 7$

$\therefore$ Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 7 = 1078$ cu.cm.

25. (4) If the radius of base of cylinder be r units and its height be h units, then

$2\pi r = a$

$\Rightarrow r = \frac{a}{2\pi}$ units

$\therefore$ Volume of cylinder $= \pi r^2 h$

$\Rightarrow V = \pi \times \frac{a^2}{4\pi^2} \times h$

$\Rightarrow h = \frac{4\pi V}{a^2}$ units

26. (4) Volume of sphere

$= \frac{4}{3}\pi \times (6)^3$ cu. cm.

$\therefore$ Volume of cylinder $= \pi r^2 h$
$= \pi \times (6)^2 \times h$

Now, $\pi \times (6)^2 \times h = \frac{4}{3}\pi \times (6)^3$

$\Rightarrow \pi = \frac{4}{3} \times 6 = 8$ cm.

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27. (1) Diagonal of cube $= \sqrt{3a^2}$

$\therefore$ According to question,

$\sqrt{3}\,a = 2\sqrt{3}$

$\Rightarrow a = 2$

$\therefore$ Its volume $= a^3 = 2^3$

$= 8$ cu cm

28. (1) Volume of cube = (Side)^3

$\therefore$ Ratio of volume = 27 : 1

$\therefore$ Ratio of the edges $= \sqrt[3]{\frac{27}{1}}$

or 3 : 1

29. (3) Surface area of cuboid

$= 2 \times (l \times b + b \times h + h \times l)$

$= 2\,(3x \times 2x + 2x \times x + x \times 3x)$

$= 2\,(6x^2 + 2x^2 + 3x^2) = 22x^2$

$\therefore 22x^2 = 88$

$\Rightarrow x^2 = 4$

$\Rightarrow x = \sqrt{4} = 2$

$\therefore l = 6$ cm, $b = 4$ cm, $h = 2$ cm

$\therefore$ Volume of cuboid $= l \times b \times h$

$= 6 \times 4 \times 2$ cm$^3 = 48$ cm^3

30. (3) Diagonal of a cube

$= \sqrt{3} \times$ side

$\Rightarrow 4\sqrt{3} = \sqrt{3} \times$ side

$\therefore$ Side $= 4$ cm

$\therefore$ Volume of the cube

$=$ (side)$^3 = (4)^3 = 64$ cm^3

31. (2) Let the length of tank $= x$ dm

$\text{Depth} = \frac{x}{3}$ dm

$\Rightarrow \text{Breadth} = \left(x - \frac{x}{3}\right) \times \frac{1}{3} \times \frac{1}{2}$

$= \frac{2x}{3} \times \frac{1}{3} \times \frac{1}{2} = \frac{x}{9}$ dm

$\therefore$ Volume of tank

$= x \times \frac{x}{9} \times \frac{x}{3} = \frac{x^3}{27}$

According to the question,

$\frac{x^3}{27} = 216$

$\Rightarrow x^3 = 27 \times 216$

$\Rightarrow x = (27 \times 216)^{1/3}$

$\therefore x = 3 \times 6 = 18$ dm

32. (1) The external dimensions of the box are :

Length = 20 cm, Breadth = 12cm, Height = 10 cm

External volume of the box

$= 20 \times 12 \times 10 = 2400$ cm^3.

Thickness of the wood = 1 cm

Internal length $= 20 - 2 = 18$ cm

$\therefore$ Internal breadth

$= 12 - 2 = 10$ cm

Internal height $= 10 - 2 = 8$ cm

Internal volume

$= 18 \times 10 \times 8 = 1440$ cm^3.

Volume of the wood

$= (2400 - 1440)$ cm$^3 = 960$ cm^3.

33. (1) If l, b, h be the dimensions of the cuboid, then volume of the cuboid $= l \times b \times h$

Now, $x = l \times b$, $y = l \times h$,

$z = b \times h$

$\therefore xyz = l^2 b^2 h^2 = v^2$

34. (4) Water supplied by pipe in 1 hour $= (0.3 \times 0.2 \times 20 \times 1000)$ cubic metre $= 1200$ cubic metre

$\therefore$ Total time

$= \frac{\text{Volume of water to be filled in the tank}}{1200}$

$= \frac{200 \times 150 \times 8}{1200} = 200$ hours

35. (1) Length of the box

$= 40 - 2 \times 4 = 32$ cm

Breadth of the box $= 15 - 2 \times 4$

$= 7$ cm

Height of the box = 4 cm

$\therefore$ Volume of the box $= 32 \times 7 \times 4$

$= 896$ cu. cm.

36. (4) Let the length, breadth and height of the cuboid be x, y and z cm respectively, then

$xy = 12$; $yz = 20$; $zx = 15$

$\therefore x^2y^2z^2 = 12 \times 20 \times 15$

$= 3600$ cm^6

$\therefore v = xyz = \sqrt{3600} = 60$ cm^3

37. (4) Let the length, breadth and height of a cuboid be l, b and h units respectively, then

$p = lb$; $q = bh$, $r = hl$

$\Rightarrow pqr = l^2b^2h^2$

$\therefore$ Volume of the cuboid $= lbh$

$= \sqrt{pqr}$

38. (2) If the height of the godown be h metre, then

$2(15 \times 12) = 2 \times h(15 + 12)$

$\Rightarrow 27h = 15 \times 12$

$\Rightarrow h = \frac{15 \times 12}{27} = \frac{20}{3}$ metre

$\therefore$ Volume of the godown

$= \frac{15 \times 12 \times 20}{3}$

$= 1200$ cu.metre

39. (3) Let Edge of cube $= x$ cm

$\therefore 6x^2 = 96 \Rightarrow x^2 = \frac{96}{6} = 16$

$\Rightarrow x = \sqrt{16} = 4$ cm

Volume of cube $=$ (edge)$^3 = (4)^3$

$= 64$ cu. cm

40. (2) Let the height be h_1 and h_2 and radii be r and 2r respectively.

$\therefore \frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r^2 h_1}{\frac{1}{3}\pi (2r)^2 \times h_2}$

$\Rightarrow \frac{r^2 \times h_1}{4r^2 \times h_2} = \frac{2}{3}$

$\Rightarrow \frac{h_1}{h_2} = \frac{2}{3} \times \frac{4}{1} = \frac{8}{3} = 8 : 3$

41. (3) Case I : When height $= h_1$, radius $= r_1$,

Volume of the cone $V_1 = \frac{1}{3}\pi r_1^2 h_1$

Case II.

When height $h_2 = 2h_1$,

radius $r_2 = r_1$ [radius is same]

Volume of the cone V_2

$= \frac{1}{3}\pi r_1^2 . 2h_1$

$\therefore$ The required ratio = 1 : 2

42. (4) Volume of original cone, V_1

$= \frac{1}{3}\pi r^2 h$

Now, radius of new cone, $r_1 = 2r$

height, $h_1 = h$

$\therefore$ Volume $V_2 = \frac{1}{3}\pi r_1^2 h_1$

$= \frac{1}{3}\pi (2r)^2 \times h = \frac{4}{3}\pi r^2 h$

$\therefore \frac{V_2}{V_1} = \frac{\frac{4}{3}\pi r^2 h}{\frac{1}{3}\pi r^2 h} = 4 : 1$

43. (1) Volume of sphere

$= \frac{4}{3}\pi \times 8^3 =$ Volume of cone

Volume of cone $= \frac{1}{3}\pi r^2 h$

$\therefore \frac{1}{3} \times \pi \times 8 \times 8 \times h$

$= \frac{4}{3}\pi \times 8^3$

$\Rightarrow h = 32$ cm.

$\therefore$ Slant height $= \sqrt{h^2 + r^2}$

$= \sqrt{32^2 + 8^2} = \sqrt{1024 + 64}$

$= \sqrt{64\,(16 + 1)} = 8\sqrt{17}$ cm.

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44. (1) Volume of the cone

$= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times (15)^2 \times 15$

$= \frac{1}{3}\pi \times (15)^3 \text{ cm}^3$

Volume of the wooden sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times (15)^3 \text{ cm}^3$

Wasted wood

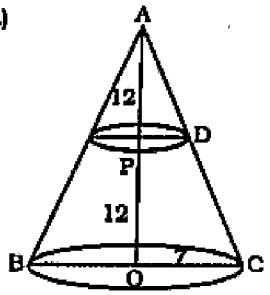
$= \frac{4}{3}\pi \times (15)^3 - \frac{1}{3}\pi(15)^3$

$= \pi \times (15)^3 \text{ cm}^3$

$\therefore$ Required percentage

$= \frac{\pi \times (15)^3}{\frac{4}{3}\pi(15)^3} \times 100 = 75\%$

45. (2)



In ΔAPD and ΔAOC

$\frac{AP}{AO} = \frac{PD}{OC}$ [$\because \Delta APD \sim \Delta AOC$]

$PD = \frac{AP \times OC}{AO} = \frac{12 \times 7}{24} = 3.5 \text{ cm}$

$\therefore$ Volume $= \frac{1}{3}\pi r^2 \times h$

$= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 12$

$= 154 \text{ cm}^3$

46. (4) Area of the base of cone

$= 770 \text{ cm}^2$

$\Rightarrow r^2 = 770$

$\Rightarrow \frac{22}{7} r^2 = 770$

$\Rightarrow r^2 = \frac{770 \times 7}{22} = 245$

$\therefore r = \sqrt{245} = 7\sqrt{5} \text{ cm}$

Curved surface area of the cone

$= \pi r l = 814$

$\Rightarrow \frac{22}{7} \times 7\sqrt{5} \times l = 814$

$\Rightarrow l = \frac{814}{22 \times \sqrt{5}} = \frac{37}{\sqrt{5}} \text{ cm}$

Let the height of the cone be h cm, then $h^2 + r^2 = l^2$

$\Rightarrow h^2 + \left(7\sqrt{5}\right)^2 = \left(\frac{37}{\sqrt{5}}\right)^2$

$\Rightarrow h^2 + 245 = \frac{1369}{5}$

$\Rightarrow h^2 = \frac{1369}{5} - 245$

$\Rightarrow h^2 = \frac{1369 - 1225}{5} = \frac{144}{5}$

$\Rightarrow h = \frac{12}{\sqrt{5}} \text{ cm}$

$\therefore$ Volume of the cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 7\sqrt{5} \times 7\sqrt{5} \times \frac{12}{\sqrt{5}}$

$= 616\sqrt{5} \text{ cm}^3$

47. (4) Let the height of the cones be h_1 and h_2 respectively.

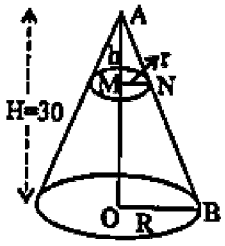
$\therefore \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \frac{1}{4}$

(r_1 and r_2 are radii)

$\Rightarrow \frac{h_1}{h_2} = \frac{1}{4} \times \frac{r_2^2}{r_1^2} = \frac{1}{4} \times \frac{25}{16} = \frac{25}{64}$

$\Rightarrow 25 : 64$

48. (4) Let H and R be the height and radius of bigger cone respectively and h and r that of smaller cone.



From triangles AOB and AMN.

$\angle A$ is common and $MN \parallel OB$.

$\therefore$ Triangles AOB and AMN are similar,

$\therefore \frac{AO}{AM} = \frac{BO}{MN}$

$\Rightarrow \frac{30}{h} = \frac{R}{r}$ ...(i)

Volume of smaller cone $= \frac{1}{3}\pi r^2 h$

Volume of bigger cone $= \frac{1}{3}\pi R^2 H$

According to the question,

$\frac{1}{3}\pi r^2 h = \left(\frac{1}{3}\pi R^2 H\right) \times \frac{1}{27}$

$\Rightarrow r^2 h = \frac{R^2 H}{27} \Rightarrow 27 r^2 h = R^2 H$

$\Rightarrow \frac{27h}{H} = \frac{R^2}{r^2}$

$\Rightarrow \frac{27h}{H} = \left(\frac{30}{h}\right)^2$ [From (i)]

$\Rightarrow \frac{27h}{H} = \frac{900}{h^2}$

$\Rightarrow 27h^3 = 900H = 900 \times 30$

$\Rightarrow h^3 = \frac{900 \times 30}{27} = 1000$

$\Rightarrow h = \sqrt[3]{1000} = 10 \text{ cm}$

$\therefore$ Required height $= 30 - 10$

$= 20 \text{ cm}$

49. (2) Let the radius of the base of the cone be $5x$ cm and its height be $12x$ cm.

$\therefore V = \frac{1}{3}\pi r^2 h$

$\Rightarrow 314\frac{2}{7} = \frac{1}{3} \times \frac{22}{7} \times 5x \times 5x \times 12x$

$\Rightarrow x^3 = \frac{2200 \times 3 \times 7}{7 \times 22 \times 25 \times 12} = 1$

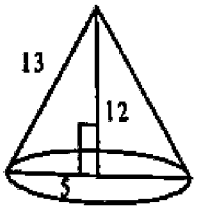
$\Rightarrow x = 1$

$\therefore$ Slant height of the cone

$= \sqrt{5^2 + 12^2} = \sqrt{25 + 144}$

$= \sqrt{169} = 13 \text{ cm}.$

[Note : For a right circular cone, $5^2 + 12^2 = 13^2$]



50. (3) Let the height be h units.

$\therefore \frac{1}{3}\pi h(r_1^2 + r_2^2) = \frac{4}{3}\pi R^3$

$\Rightarrow h(r_1^2 + r_2^2) = 4R^3$

$\Rightarrow h = \frac{4R^3}{r_1^2 + r_2^2}$

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51. (1) $\frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$

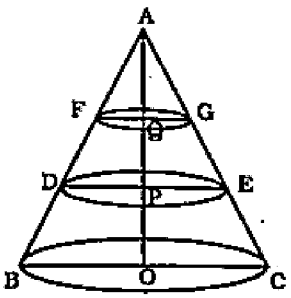
$= \left(\frac{3}{4}\right)^2 \times \frac{4}{3}$

$= \frac{3}{4} \times \frac{3}{4} \times \frac{4}{3} = \frac{3}{4} \Rightarrow 3 : 4$

52. (4) Let FQ = r_1, DP = r_2 and BO = r_3

Also, AQ = QP = PO = $\frac{h}{3}$

From Δ AFQ and Δ ADP,



$\frac{FQ}{DP} = \frac{AQ}{AP}$

$\Rightarrow \frac{r_1}{r_2} = \frac{1}{2} \Rightarrow r_2 = 2r_1$

From Δ AFQ and Δ ABO,

$\frac{FQ}{BO} = \frac{AQ}{AO}$

$\Rightarrow \frac{r_1}{r_3} = \frac{1}{3} \Rightarrow r_3 = 3r_1$

$\therefore V_1 : V_2 : V_3 = \frac{1}{3}\pi r_1^2 \times \frac{h}{3} :$

$\frac{1}{3}\pi\frac{h}{3}\left(r_1^2 + r_2^2 + r_1 r_2\right)$

$: \frac{1}{3}\pi\frac{h}{3}\left(r_2^2 + r_3^2 + r_2 r_3\right)$

$= r_1^2 : \left(r_1^2 + 4r_1^2 + 2r_1^2\right)$

$: \left(4r_1^2 + 9r_1^2 + 6r_1^2\right)$

$= r_1^2 : 7r_1^2 : 19r_1^2$

$= 1 : 7 : 19$

53. (1) Volume of bucket

$= \frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$

$= \frac{1}{3} \times \frac{22}{7} \times 45(28^2 + 7^2 + 28 \times 7)$

$= \frac{1}{3} \times \frac{22}{7} \times 45(784 + 49 + 196)$

$= \frac{1}{3} \times \frac{22}{7} \times 45 \times 1029$

$= 48510$ cu. cm.

54. (3) Let, Height of the cone = $3x$ cm and diameter = $2x$ cm.

$\therefore$ Radius = x cm.

Volume = $\frac{1}{3}\pi r^2 h$

$\Rightarrow 1078 = \frac{1}{3} \times \frac{22}{7} \times x^2 \times 3x$

$\Rightarrow 1078 = \frac{22}{7}x^3$

$\Rightarrow x^3 = \frac{1078 \times 7}{22} = 343$

$\Rightarrow x = \sqrt[3]{343} = 7$

$\therefore$ Height = $3 \times 7 = 21$ cm

55. (2) Original volume of cone

$= \frac{1}{3}\pi r^2 h$

New volume of cone

$= \frac{1}{3}\pi(2r)^2 h = \frac{4}{3}\pi r^2 h$

$= 4 \times \frac{1}{3}\pi r^2 h$

i.e. Four times of the previous volume.

56. (1) Required ratio

$= \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$

$= \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2} = \left(\frac{3}{5}\right)^2 \times \frac{1}{3}$

$= \frac{3}{25} \Rightarrow 3 : 25$

57. (2) $\frac{1}{3}\pi a^2 h = \frac{4}{3}\pi a^3$

$\Rightarrow h = 4a$

58. (3) Circumference of the base of cone = 33 cm

$\Rightarrow 2\pi r = 33$

$\Rightarrow 2 \times \frac{22}{7} \times r = 33$

$\Rightarrow r = \frac{33 \times 7}{2 \times 22} = \frac{21}{4}$ cm

$\therefore$ Volume of the cone

$= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times \frac{21}{4} \times \frac{21}{4} \times 16$

$= 462$ cu.cm.

59. (2) $2\pi r = 8 \Rightarrow \pi r = 4$

$\Rightarrow r = \frac{4}{\pi}$

$\therefore V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times \frac{4 \times 4}{\pi \times \pi} \times 21$

$= \frac{112}{\pi}$ cu.cm.

60. (3) $\frac{V_1}{V_2} = \frac{r_1^2 h_1}{r_2^2 h_2}$

$\Rightarrow \frac{4}{1} = \frac{25}{16} \times \frac{h_1}{h_2}$

$\Rightarrow \frac{h_1}{h_2} = \frac{16 \times 4}{25} = \frac{64}{25}$ or 64 : 25

61. (4) $\pi r^2 = 154$

$\Rightarrow \frac{22}{7} \times r^2 = 154$

$\Rightarrow r^2 = \frac{154 \times 7}{22} \Rightarrow r = 7$ metre

$\therefore \frac{1}{3}\pi r^2 h = 1232$

$\Rightarrow \frac{h}{3} = \frac{1232}{154} = 8$

$\Rightarrow h = 24$ metre

Area of canvas curved surface area of cone = $\pi r l$

$= \pi r\sqrt{h^2 + r^2}$

$= \frac{22}{7} \times 7 \times \sqrt{24^2 + 7^2}$ sq. metre

$= 22 \times 25 = 550$ sq. metre

$\therefore$ Its length = $\frac{550}{2} = 275$ metre

62. (2) Ratio of the volumes of cone

$= \frac{\frac{1}{3}\pi r_1^2 h}{\frac{1}{3}\pi r_2^2 h} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{3}{4}\right)^2$

$= \frac{9}{16}$ or 9 : 16

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63. (3) External radius,

$R = \frac{6}{2} = 3$ cm

Internal radius, r

$= 3 - \frac{1}{2} = \frac{5}{2}$ cm.

∴ Volume of hollow sphere (material)

$= \frac{4}{3}\pi(R^3 - r^3)$

$= \frac{4}{3}\pi\left[3^3 - \left(\frac{5}{2}\right)^3\right]$ cm^3

$= \frac{4}{3}\times\frac{22}{7}\left(27 - \frac{125}{8}\right)$ cm.^{3}

$= \frac{4}{3}\times\frac{22}{7}\left(\frac{216-125}{8}\right)$ cm^3

$= \frac{4}{3}\times\frac{22}{7}\times\frac{91}{8}$

$= \frac{143}{3} = 47\frac{2}{3}$ cm^3

64. (2) According to question

$r_1 + r_2 = 10$ ... (i)

$\frac{4}{3}\pi(r_1^3 + r_2^3) = 880$

$\Rightarrow r_1^3 + r_2^3 = \frac{880\times3\times7}{22\times4} = 210$ ...(ii)

∴ $(r_1 + r_2)^3 = 1000$

$\Rightarrow r_1^3 + r_2^3 + 3r_1r_2(r_1 + r_2) = 1000$

$\Rightarrow 210 + 3r_1r_2(10) = 1000$

$\Rightarrow 30r_1r_2 = 1000 - 210 = 790$

$\Rightarrow r_1r_2 = \frac{790}{30} = \frac{79}{3} = 26\frac{1}{3}$

65. (4) Volume of sphere

$= \frac{4}{3}\pi r^3$

Volume of second sphere

$= \frac{4}{3}\pi(2r)^3 = 8\times\left(\frac{4}{3}\pi r^3\right)$

66. (4) Ratio of the volume of both spheres $= \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}$

$= \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{3}{2}\right)^3 = \frac{27}{8}$

or 27 : 8

67. (2) If the radius of the solid hemisphere be r cm,

then total surface area $= 3\pi r^2$

$\Rightarrow 3\pi r^2 = 108\pi$

$\Rightarrow r^2 = \frac{108}{3} = 36$

$\Rightarrow r = \sqrt{36} = 6$ cm

∴ Volume of the hemisphere

$= \frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi\times6\times6\times6$

$= 144\pi$ cubic cm

68. (4) Radius of the largest sphere

$= \frac{7}{2}$ cm

∴ Volume of sphere $= \frac{4}{3}\pi r^3$

$= \left(\frac{4}{3}\times\frac{22}{7}\times\frac{7}{2}\times\frac{7}{2}\times\frac{7}{2}\right)$ cm^3

$= 179.67$ cm^3

69. (3) Let the radii of the first and second sphere be r_1 and r_2 units respectively.

According to the question,

$\frac{4\pi r_1^2}{4\pi r_2^2} = \frac{4}{9}$

$\Rightarrow \frac{r_1^2}{r_2^2} = \frac{4}{9} \Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$

$\therefore \frac{V_1}{V_2} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{r_1^3}{r_2^3}$

$= \left(\frac{2}{3}\right)^3 = \frac{8}{27}$ or 8 : 27

70. (4) Let the radius of sphere be r_1 units and that of hemisphere be r_2 units, then,

$\frac{4}{3}\pi r_1^3 = \frac{2}{3}\pi r_2^3$

$\Rightarrow \left(\frac{r_1}{r_2}\right)^3 = \frac{1}{2}$

$\Rightarrow \frac{r_1}{r_2} = \frac{1}{\sqrt[3]{2}}$ or $1 : \sqrt[3]{2}$

71. (1) Volume of original sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi\times3\times3\times3$

$= 36\pi$ cu. cm.

$\therefore 8\times\frac{4}{3}\pi r_1^3 = 36\pi$

$\Rightarrow r_1^3 = \frac{36\times3}{8\times4} = \frac{27}{8}$

$\therefore r_1 = \sqrt[3]{\frac{27}{8}} = \frac{3}{2} = 1.5$ cm

72. (1) Surface area of sphere $= 4\pi r^2$

$\Rightarrow 4\pi r^2 = 8\pi$

$\Rightarrow r^2 = 2 \Rightarrow r \Rightarrow \sqrt{2}$ units

∴ Volume of sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi\times\left(\sqrt{2}\right)^3$

$= \frac{8\sqrt{2}}{3}\pi$ cubic units

73. (3) Volume of the pyramid $= \frac{1}{3}\times$ height × area of the base

$= \frac{1}{3}\times10\times57 = 190$ cu.cm.

74. (3) Area of the base

$= 6\times\frac{\sqrt{3}}{4}\times(2a)^2$

$= 6\times\frac{\sqrt{3}}{4}\times4a^2 = 6\sqrt{3}a^2$ sq.cm.

Height $= \sqrt{\left(\frac{5a}{2}\right)^2 - (2a)^2}$

$= \sqrt{\frac{25}{4}a^2 - 4a^2} = \sqrt{\frac{9a^2}{4}}$

$= \frac{3}{2}a$ cm.

∴ Volume of pyramid

$= \frac{1}{3}\times$ area of base × height

$= \frac{1}{3}\times6\sqrt{3}a^2\times\frac{3}{2}a$

$= 3\sqrt{3}a^3$ cm^3

75. (3) Area of the base $= 40\times40$

$= 1600$ sq.cm

We know, Volume of pyramid

$= \frac{1}{3}\times$ area of base × height

$\Rightarrow 8000 = \frac{1}{3}\times1600\times h$

$\Rightarrow h = \frac{8000\times3}{1600} = 15$ cm

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76. (3) Area of the base

$= \frac{1}{2}$(sum of parallel sides) ×(perpendicular distance)

$= \frac{1}{2}(14 + 8) \times 8 = 88$ sq. cm.

∴ Volume = Area of the base × height

$\Rightarrow 1056 = 88 \times h$

$\Rightarrow h = \frac{1056}{88} = 12$ cm

77. (3) Total surface area of prism = Curved surface area + 2 × Area of base

$\Rightarrow$ 608 = Perimeter of base × height + 2 × Area of base

$\Rightarrow 608 = 4x \times 15 + 2x^2$

(Where x = side of square)

$\Rightarrow x^2 + 30x - 304 = 0$

$\Rightarrow x^2 + 38x - 8x - 304 = 0$

$\Rightarrow x(x + 38) - 8(x + 38) = 0$

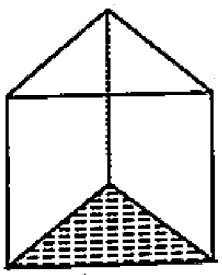
$\Rightarrow (x - 8)(x + 38) = 0$

$\Rightarrow x = 8$

$\Rightarrow$ Volume of prism = Area of base × height

$= 8 \times 8 \times 15 = 960$ cu. cm.

78. (2) Area of the base $= \frac{\sqrt{3}}{4} \times (\text{side})^2$



$= \frac{\sqrt{3}}{4} \times 8 \times 8 = 16\sqrt{3}$ sq. cm

∴ Volume of prism = Area of base × height

$= 16\sqrt{3} \times 10 = 160\sqrt{3}$ cu. cm

79. (4) Volume of prism = Area of base × height

$\Rightarrow 366 = \frac{1}{2} \times 4 \times 28 \times h$

$\Rightarrow h = \frac{366}{56} = 6.53$ cm

80. (1) Area of base = Area of right angled triangle

$= \frac{1}{2} \times 5 \times 12 = 30$ sq.cm.

$[\because 5^2 + 12^2 = 13^2]$

∴ Volume $= \frac{1}{3} \times$ Area of base × height

$\Rightarrow 330 = \frac{1}{3} \times 30 \times h$

$\Rightarrow h = \frac{330}{10} = 33$ cm

81. (1) Volume of earth : Volume of moon

$= \frac{4}{3}\pi r^3 : \frac{4}{3}\pi\left(\frac{r}{4}\right)^3 = 64 : 1$

82. (3) In both the vessels, the volume of liquid will be same.

∴ Volume of liquid in cylinder = Volume of liquid in cone.

Let the height of liquid column in cylinder be h cm, then

$\pi r^2 h = \frac{1}{3}\pi \times (12)^2 \times 50$

$\therefore h = \frac{1}{3} \times \frac{12 \times 12 \times 50}{10 \times 10} = 24$cm

83. (2) Volume of the cone

$= \frac{1}{3}\pi \times (15)^2 \times 108$ cm

Volume of cylinder

$= \pi \times r^2 \times 9$ cm^3

According to the question,

$\pi \times r^2 \times 9$

$= \frac{1}{3}\pi \times 15 \times 15 \times 108$

$\Rightarrow r^2 = \frac{5 \times 15 \times 108}{9}$

$\Rightarrow r^2 = 900 \Rightarrow r = 30$

Diameter of base

$= 2r = 2 \times 30 = 60$ cm.

84. (2) Total surface area of cube $= 6x^2$

Surface area of sphere $= 4\pi r^2$

According to question

$6x^2 = 4\pi r^2$

$\Rightarrow r = \sqrt{\frac{6x^2}{4\pi}} = \frac{x\sqrt{6}}{2\sqrt{\pi}}$

So, Volume of sphere

$= \frac{4}{3}\pi \times \frac{x\sqrt{6}}{2\sqrt{\pi}} \times \frac{x\sqrt{6}}{2\sqrt{\pi}} \times \frac{x\sqrt{6}}{2 \times \sqrt{\pi}}$

$= \frac{4}{3}\pi \times \frac{6x^2 \times x\sqrt{6}}{8\pi \times \sqrt{\pi}}$

∴ Required ratio

$= \frac{x^3 \times 3 \times 8\pi \times \sqrt{\pi}}{4\pi \times 6x^3 \times \sqrt{6}} = \frac{\sqrt{\pi}}{\sqrt{6}} = \sqrt{\pi} : \sqrt{6}$

85. (2) $2\pi r = 22$

$\Rightarrow 2 \times \frac{22}{7} \times r = 22 \quad \therefore r = \frac{7}{2}$

Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12 = 462$ cm^3

86. (2) As the sphere fits exactly inside the cube, the diameter of sphere will be equal to the edge of cube.

Let the edge of cube be x units.

∴ Radius of sphere $= \frac{x}{2}$

Then,

$$\frac{\text{Volume of cube}}{\text{Volume of sphere}}$$

$= \frac{x^3}{\frac{4}{3}\pi\left(\frac{x}{2}\right)^3} = \frac{6}{\pi}$ or 6 : π

87. (1) Volume of sphere $= \frac{4}{3}\pi r^3$

Volume of cylinder $= \pi r^2 h$

As given,

$\pi r^2 h = \frac{4}{3}\pi r^3 \Rightarrow h = \frac{4}{3}r$

$\Rightarrow \frac{h}{r} = \frac{4}{3} \Rightarrow \frac{h}{2r} = \frac{4}{3 \times 2} = \frac{2}{3}$

$\Rightarrow \frac{d}{h} = \frac{3}{2}$, where $d = 2r$

or 3 : 2

88. (3) When the rectangular sheet is rolled along its length, the length of the sheet forms the circumference of the base of cylinder and breadth of sheet forms the height of cylinder.

Circumference = 100

$\Rightarrow 2\pi r = 100$

$\Rightarrow 2 \times \frac{22}{7} \times r = 100$

$\Rightarrow r = \frac{700}{44} = \frac{175}{11}$ cm

∴ Volume of the cylinder

$= \pi r^2 h$

$= \frac{22}{7} \times \frac{175}{11} \times \frac{175}{11} \times 44$

$= \frac{245000}{7} = 35000$ cm^3

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89. (1) Required ratio

$$= \frac{1}{3}\pi r^2 h : \frac{2}{3}\pi r^2 h : \pi r^2 h$$

$$= \frac{1}{3} : \frac{2}{3} : 1 = 1 : 2 : 3$$

90. (3) Let radius of cylinder = $3x$
radius of cone = $4x$
Also, let height of cylinder = $2y$
and height of cylinder = $3y$

$$\frac{\text{Volume of the cylinder}}{\text{Volume of the cone}}$$

$$= \frac{\pi(3x)^2 \times 2y}{\frac{1}{3}\pi(4x)^2 \times 3y}$$

$$= \frac{18\pi x^2 y}{16\pi x^2 y} = 9 : 8$$

91. (1) Water flowed by the pipe in 1 hour = $\pi r^2 h$

$$= \frac{22}{7} \times \frac{7 \times 7}{100 \times 100} \times 5000 = 77 \text{ m}$$

Volume of expected water in the tank

$$= \frac{50 \times 44 \times 7}{100} = 154 \text{ m}^3$$

∴ Required time

$$= \frac{154}{77} = 2 \text{ hours}$$

92. (1) According to question,
$2\pi rh + 2\pi r^2 = 8\pi r^2$
$\Rightarrow 2\pi rh = 6\pi r^2$

$$\Rightarrow \frac{h}{r} = 3$$

∴ Required ratio

$$= \pi r^2 h : \frac{4}{3}\pi r^3$$

$$= 3h : 4r = 9 : 4$$

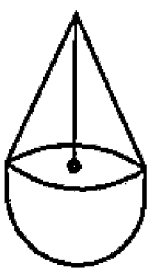
93. (2) If the height of increased water level be h cm, then

$$\pi r^2 h = \frac{4}{3}\pi R^3$$

$$\Rightarrow 12 \times 12 \times h = \frac{4}{3} \times 6 \times 6 \times 6$$

$$\Rightarrow h = \frac{4 \times 2 \times 6 \times 6}{12 \times 12} = 2\text{cm}$$

94. (4)



Radius of cone = 4.2cm
Height of cone = 10.2 − 4.2
= 6cm
Volume of the toy
= Volume of cone + Volume of hemisphere

$$= \frac{1}{3}\pi(4.2)^2 \times 6 + \frac{2}{3}\pi(4.2)^3$$

$$= \frac{1}{3}\pi(4.2)^2(6 + 2 \times 4.2)$$

$$= \frac{1}{3} \times \frac{22}{7} \times 4.2 \times 4.2 \times 14.4$$

= 266 cu.cm.

95. (3) Let Radius of hemisphere = Height of cylinder = r units

$$\therefore \frac{\text{Volume of hemisphere}}{\text{Volume of cylinder}} = 1$$

$$\Rightarrow \frac{\frac{2}{3}\pi r^3}{\pi r_1^2 r} = 1 \Rightarrow \frac{r^2}{r_1^2} = \frac{3}{2}$$

$$\Rightarrow \frac{r}{r_1} = \frac{\sqrt{3}}{\sqrt{2}} \text{ or } \sqrt{3} : \sqrt{2}$$

96. (2) $\frac{\text{Volume of the cube}}{\text{Volume of the sphere}}$

$$= \frac{363}{49}$$

$$\Rightarrow \frac{x^3}{\frac{4}{3}\pi r^3} = \frac{363}{49}$$

$$\Rightarrow \frac{x^3}{r^3} = \frac{363}{49} \times \frac{4}{3} \times \frac{22}{7}$$

$$= \frac{121 \times 4 \times 22}{49 \times 7}$$

$$\Rightarrow \frac{x^3}{r^3} = \frac{11 \times 11 \times 11 \times 2 \times 2 \times 2}{7 \times 7 \times 7}$$

$$\therefore \frac{x}{r} = \frac{11 \times 2}{7} = \frac{22}{7} \text{ or } 22 : 7$$

97. (3) Volume of the cylinder
$= \pi r^2 h$

$$= \frac{22}{7} \times 10 \times 10 \times 21$$

= 6600 cu. cm
Volume of the cone
= 6600 − 4400 = 2200 cu.cm

$$\therefore 2200 = \frac{1}{3}\pi \times 10^2 \times h$$

$$\Rightarrow 2200 = \frac{2200}{21} \times h$$

$$\Rightarrow h = 21 \text{ cm.}$$

98. (3) Volume of required water
= 2 × volume of cone
$= 2 \times 27\pi = 54\pi$ cu.cm

99. (3) Increase in water level

$$= \frac{\text{Volume of sphere}}{\text{Area of base of cylinder}}$$

$$= \frac{\frac{4}{3}\pi r^3}{\pi r^2}$$

$$= \frac{4}{3}r = \frac{4}{3} \times 3.5 = \frac{14}{3} \text{ cm.}$$

∴ Required water level

$$= 7 - \frac{14}{3} = \frac{7}{3} \text{ cm.}$$

100. (2) Volume of cylinder = $\pi r^2 h$
$\Rightarrow A = \pi r^2 (2r) = 2\pi r^3$ [$\because h = 2r$]
Volume of sphere = $\frac{4}{3}\pi r^3$

$$\Rightarrow B = \frac{4}{3}\pi r^3$$

$$\Rightarrow \frac{A}{B} = \frac{2\pi r^3}{\frac{4}{3}\pi r^3} = \frac{6}{4} = \frac{3}{2}$$

101. (2) $\frac{1}{3}\pi a^2 h = \frac{4}{3}\pi a^3$

$$\Rightarrow h = 4a$$

102. (2) $\frac{\text{Volume of cylinder}}{\text{Volume of cone}}$

$$= \frac{\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = 3\left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$$

$$= 3 \times \left(\frac{\sqrt{3}}{\sqrt{2}}\right)^2 \times \frac{\sqrt{2}}{\sqrt{3}}$$

$$= 3 \times \frac{\sqrt{3}}{\sqrt{2}} = 3\sqrt{3} : \sqrt{2}$$

103. (2) Let the radius of the base of cup be r cm,
$2\pi r = \pi \times 14$
$\Rightarrow r = 7$ cm
Slant height = 14 cm.
Height = $\sqrt{14^2 - 7^2}$

$$= \sqrt{21 \times 7} = 7\sqrt{3} \text{ cm}$$

∴ Capacity of cup = $\frac{1}{3}\pi r^2 h$

$$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 7\sqrt{3}$$

= 622.36 cubic cm.

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104. (4) Volume of water in conical flask

$= \frac{1}{3}\pi r^2 h$

If the height of water level in cylindrical flask be H units, then

$\pi m^2 r^2 H = \frac{1}{3}\pi r^2 h$

$\Rightarrow H = \frac{1}{3} \cdot \frac{\pi r^2 h}{\pi m^2 r^2} = \frac{h}{3m^2}$

105. (2) $\frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{3}{1}$

$\Rightarrow \frac{\pi r_1^2 h}{\frac{1}{3}\pi r_2^2 h} = \frac{3}{1} \Rightarrow r_1 = r_2$

$\therefore$ Diameter of cylinder = Diameter of cone

106. (1) Volume of cone

$= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 1 \times 7$

$= \frac{22}{3}$ cu.cm.

Volume of cubical block
$= 10 \times 5 \times 2$ cm^3. $= 100$ cm^3.
Wastage of wood

$= \left(100 - \frac{22}{3}\right) \text{cm}^3$

$= \frac{300 - 22}{3} = \frac{278}{3}$ cm^3

$\therefore$ % Wastage $= \frac{\frac{278}{3}}{100} \times 100$

$= \frac{278}{3} = 92\frac{2}{3}\%$

107. (3) Required percentage decrease

$= 100 - \frac{50 \times 50 \times 150}{100 \times 100}$

$= 100 - 37{\cdot}5 = 62{\cdot}5\%$

108. (1) Required per cent

$\therefore \frac{200 \times 200 \times 200}{100 \times 100} - 100$

$= 800 - 100 = 700\%$

109. (4) Let height and radius both of a cylinder change by x%, then volume changes by

$\left[3x + \frac{3x^2}{100} + \frac{x^3}{100^2}\right]\%$

$= \left[3 \times 20 + \frac{3 \times 20 \times 20}{100} + \frac{20 \times 20 \times 20}{10000}\right]\%$

$= (60 + 12 + 0.8)\% = 72.8\%$

110. (4) Volume of original cone

$= \frac{1}{3}\pi r^2 h$

Now, r_1 = radius of new cone

$= \frac{r}{2}$

h_1 = height of new cone = $3h$

$\therefore V_1 = \frac{1}{3}\pi r_1^2 h_1 = \frac{1}{3}\pi \frac{r^2}{4} \times 3h$

$= \frac{1}{3}\pi r^2 h \times \frac{3}{4} = \frac{3}{4}V$

$\therefore$ Decrease % $= \left(\frac{V - \frac{3}{4}V}{V}\right) \times 100$

$= 25\%$

111. (4) For original cone,

$V = \frac{1}{3}\pi r^2 h$

For the second cone,
$r_1 = 2r$
$h_1 = 2h$

$\therefore V_1 = \frac{1}{3}\pi r_1^2 h_1$

$= \frac{1}{3}\pi (2r)^2 \times 2h$

$= 8 \times \frac{1}{3}\pi r^2 h = 8V$

112. (2) Let the radius of a right circular cylinder is changed by x% and height is changed y%, then Volume change by

$\left(2x + y + \frac{x^2 + 2xy}{100} + \frac{x^2 y}{100^2}\right)\%$

$\therefore$ Effective change

$= \left(-2 \times 50 + 60 + \frac{2500 - 6000}{100} + \frac{150000}{10000}\right)$

$= (-100 + 60 - 35 + 15)$
$= (75 - 135) = -60\%$
Negative sign shows decrease.

113. (4) Let length, breadth and height of a cuboid are increased by x%, y% and z% respectively, then its volume is increased by

$\left(x + y + z + \frac{xy + yz + zx}{100} + \frac{xyz}{10000}\right)\%$

$\therefore$ Effective increase

$= \left(\begin{matrix}100 + 200 + 200 + 20000 + 40000 \\ + \frac{20000}{100} + \frac{4000000}{10000}\end{matrix}\right)\%$

$= 500 + 800 + 400 = 1700\%$

$= 1700 \times \frac{1}{100} = 17$ times

Method : 2
Original volume $= x \times 2x \times 3x$
$= 6x^3$ cubic units
New volume $= 2x \times 6x \times 9x$
$= 108x^3$ cubic units
Change in volume
$= 108x^3 - 6x^3$
$= 102x^3$ cubic units

Increase $= \frac{102x^3}{6x^3} = 17$ times.

114. (3) Intial area of the cylinder
$= \pi r^2 h$
Volume of the new cylinder
$= \pi (1.1r)^2 \times 1.1h$
$= 1.331\ \pi r^2 h$
$\therefore$ Increase in area
$= (1.331 - 1)\ \pi r^2 h$
$= 0.331\ \pi r^2 h$
$\therefore$ Percentage increase

$= \frac{0.331 \pi r^2 h}{\pi r^2 h} \times 100 = 33.1\%$

115. (1) Volume of the cone

$= \frac{1}{3}\pi r^2 h$, new height = 100%h

$\therefore$ Percentage increase in volume
$= 100\%$

116. (1) Volume of the hemispherical cup $= \frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi \times 4 \times 4 \times 4$

$= \frac{128\pi}{3}$ cu.cm.

Volume of cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \times 8 \times 8 \times 16$

$= \frac{128 \times 8\pi}{3}$ cu.cm.

Part filled $= \frac{1}{8}$

$\therefore$ Part remaining empty

$= \frac{7}{8} = 87.5\%$

117. (2) 1 hectare = 10000 sq.metre
then Area of the ground = 15000 sq.metre
$\therefore$ Required volume

$= 15000 \times \frac{5}{100}$

$= 750$ cubic metre

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118. (1) Area of the tetrahedron

$= \frac{1}{3} \times$ area of base $\times$ height

Area of the base

$= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 3 \times 3 = \frac{9\sqrt{3}}{4}$ cm^2

Now, length of the perpendicular in the equilateral triangle

$= \sqrt{3^2 - \left(\frac{3}{2}\right)^2}$

$= \sqrt{9 - \frac{9}{4}} = \frac{3\sqrt{3}}{2}$ cm

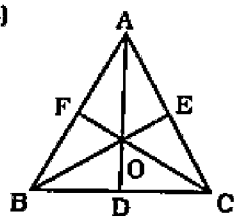
$\therefore$ Height $= \sqrt{\left(\frac{3\sqrt{3}}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2}$

$= \sqrt{\frac{27}{4} - \frac{3}{4}} = \sqrt{6}$ cm

$\therefore$ Required area $= \frac{1}{3} \times \frac{9\sqrt{3}}{4} \times \sqrt{6}$

$= \frac{9\sqrt{2}}{4}$ cu.cm.

119. (4)



Radius of the in-circle = OE = OD = OF = 3 cm

Area of triangular base

$= \left(\frac{1}{2} AB \times OF + \frac{1}{2} \times BC \times OD + \frac{1}{2} \times AC \times OE\right)$

$= \frac{1}{2} \times 3 \times (AB + BC + AC)$

$= \frac{1}{2} \times 3 \times 15 = \frac{45}{2}$ sq. cm.

Volume of the prism

= Area of the base $\times$ height

$\Rightarrow 270 = \frac{45}{2} \times$ height

$\therefore$ Height $= \frac{270 \times 2}{45} = 12$ cm.

120. (2) Area of the base of prism

$= \frac{1}{2} \times 10 \times 12 = 60$ sq. cm.

$\therefore$ Volume of prism = Area of the base $\times$ height $= 60 \times 20$

$= 1200$ cu.cm

$\therefore$ Mass of prism

= Volume $\times$ density

$= (1200 \times 6)$ gm

$= \left(\frac{1200 \times 6}{1000}\right)$ kg. $= 7.2$ kg.

121. (2) Let the radius of wire $= r$ cm.

Volume of copper rod

$= \pi \times \left(\frac{1}{2}\right)^2 \times 8 = 2\pi$ cm^3

Volume of wire $= \pi r^2 \times 1800$

$= 1800\,\pi r^2$ cm^3

Clearly,

$1800\pi r^2 = 2\pi$

$\Rightarrow r^2 = \frac{1}{900} \Rightarrow r = \frac{1}{30}$

122. (3) Radius of the base of well

$= \frac{20}{2} = 10$m

Volume of the earth taken out

$= \pi r^2 h = \frac{22}{7} \times 10^2 \times 14$m^3

Let the height of embankment be x metres.

Then,

Volume $= \pi (R^2 - r^2) \times x$, where R $= 15$ m, $r = 10$m

$= \frac{22}{7}(15^2 - 10^2) \times x$

$= \frac{22}{7} \times 25 \times 5 \times x$

Clearly,

$\frac{22}{7} \times 25 \times 5 \times x$

$= \frac{22}{7} \times 10^2 \times 14$

$\Rightarrow x = \frac{100 \times 14}{25 \times 5} = 11.2$ m

123. (2) Sum of the volume of two cylinders

$= \pi r_1^2 h_1 + \pi r_2^2 h_2$

$= \frac{22}{7} (4 \times 4 \times 6 + 5 \times 5 \times 4)$

$= \frac{22}{7} (96 + 100)$

$= \frac{22}{7} \times 196 = 616$ cm^3

Let the radius of the disc be r cm.

$\therefore \pi r^2 \times 1 = 616$

$\Rightarrow \frac{22}{7} \times r^2 = 616$

$\Rightarrow r^2 = \frac{616 \times 7}{22} = 196$

$\Rightarrow r = \sqrt{196} = 14$ cm

124. (1) When we change shape of a solid figure, volume remains constant

$\therefore$ Volume of hemisphere

= Volume of cone

$\Rightarrow \frac{2}{3}\pi R^3 = \frac{1}{3}\pi R^2 H \quad \therefore 2R = H$

125. (4) According to the question, three solid metallic spheres are melted and recast into a new solid sphere. It means that the volume of new solid sphere will be equal to the sum of volume of three solid spheres.

$\therefore$ Volume of new solid sphere

$= \frac{4}{3}\pi\left(\frac{6}{2}\right)^3 + \frac{4}{3}\pi\left(\frac{8}{2}\right)^3 + \frac{4}{3}\pi\left(\frac{10}{2}\right)^3$

$\frac{4}{3}\pi r^3 = \frac{4}{3}\pi\left[(3)^3 + (4)^3 + (5)^3\right]$

$\Rightarrow r^3 = 27 + 64 + 125$

$\Rightarrow r^3 = 216$

$\Rightarrow r^3 = (6)^3$

$\Rightarrow r = 6$ cm

$\therefore$ Diameter of the new sphere $= 2 \times 6 = 12$ cm

126. (4) Let the radius of new ball $= R$ cm

then $\frac{4}{3}\pi R^3 = \frac{4}{3}\pi\left(3^3 + 4^3 + 5^3\right)$

$R^3 = 27 + 64 + 125 = 216$

$\Rightarrow R = \sqrt[3]{6 \times 6 \times 6} = 6$ cm

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127. (4) $\frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(1)^3 + \frac{4}{3}\pi(6)^3 + \frac{4}{3}\pi(8)^3$

$\Rightarrow \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(1 + 216 + 512)$

$\Rightarrow r^3 = 729 \Rightarrow r = \sqrt[3]{729}$

$\Rightarrow r = 9$ cm

128. (3) According to question
Volume of sphere = Volume of displaced water

$\Rightarrow \frac{4}{3}\pi\times2\times2\times2 = \pi\times4\times4\times h$

$\therefore h = \frac{2}{3}$ cm

129. (2) Volume of cylinder
$= \pi r^2 h = \pi \times (8)^2 \times 2 = 128\pi$ cm^3
Let the radius of each sphere be r cm.

$\therefore 12 \times \frac{4}{3}\pi r^3 = 128\pi$

$\Rightarrow 16\pi r^3 = 128\pi$

$\Rightarrow r^3 = \frac{128\pi}{16\pi}$

$\Rightarrow r = \sqrt[3]{8} = 2$ cm

$\therefore$ Diameter $= 2 \times 2 = 4$cm

130. (1) Volume of original sphere

$= \frac{4}{3}\pi(6)^3 = 288\pi$ cm^3

Let the radii of small spheres be $3x$, $4x$ and $5x$ cm respectively

$\therefore \frac{4}{3}\pi\left[(3x)^3 + (4x)^3 + (5x)^3\right]$

$= 288\pi$

$\Rightarrow \frac{4}{3}\pi(27x^3 + 64x^3 + 125x^3)$

$= 288\pi$

$\Rightarrow \frac{4}{3}\pi \times 216x^3 = 288\pi$

$\Rightarrow x^3 = \frac{288\pi\times3}{4\pi\times216} = 1$

$\Rightarrow x = 1$

$\therefore$ Required radius
$= 3 \times 1 = 3$cm.

131. (3) Volume of solid sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(0.3)^3$ cubic metre

If the radius of the circular sheet be R, then
Volume of the sheet
$= \pi R^2 \times 0.001$

$= \frac{4}{3}\pi(0.3)^3$

$R^2 \times 0.001 = \frac{4}{3} \times 0.3 \times 0.3 \times 0.3$

$R^2 = 36 \Rightarrow R = 6$ metres

$\therefore$ Diameter $= 12$ metres

132. (2) Volume of the wire $= \pi r^2 h$
$= \pi \times 0.1 \times 0.1 \times 3600$ cm^3
$= 36\pi$ cm^3

Volume of the sphere $= \frac{4}{3}\pi R^3$

$= 36\pi$

$\Rightarrow R^3 = \frac{36\times3}{4} = 27$

$\therefore R = \sqrt[3]{27} = 3$ cm

133. (1) Volume of the cone $= \frac{1}{3}\pi r^2 h$

$= \frac{\pi}{3}\times6\times6\times24$ cm^3

= Volume of the sphere
If the radius of the sphere be r cm, then

$\frac{4}{3}\pi r^3 = \frac{\pi}{3}\times6\times6\times24$

$\Rightarrow r^3 = 6\times6\times6$

$\therefore r = \sqrt{6\times6\times6} = 6$ cm.

134. (4) Radius of ball = 3 cm
Volume of the metallic spherical ball

$= \frac{4}{3}\times\pi\times(3)^3 = 36\pi$ cm^3.

Let h be the height of the cone.
Volume of cone = Volume of ball

$\Rightarrow \frac{1}{3}\pi\times6\times6\times h = 36\pi$

$\Rightarrow h = \frac{36\pi\times3}{\pi\times6\times6} = 3$ cm

135. (2) Radius of the iron ball $= \frac{14}{2}$

$= 7$ cm
Volume of the ball

$= \frac{4}{3}\pi\times(7)^3$ cm^3.

Let the radius of cylinder be r cm.
$\therefore$ Volume of cylinder

$= \pi r^2 \times \frac{7}{3}$ cm^3

Clearly,

$\pi r^2 \times \frac{7}{3} = \frac{4}{3}\pi\times(7)^3$

$\Rightarrow r^2 = \frac{4\times7\times7\times3}{7\times3}$

$\Rightarrow r = \sqrt{4\times7\times7} = 14$ cm
$\therefore$ Diameter $= 2 \times 14$
$= 28$ cm

136. (3) Volume of the cylinder
$= \pi r^2 \times h$
$= \pi r^2 \times 6$
$= 6\pi r^2$ cm^3
Let the height of the cone be h cm.

$\therefore$ Volume of the cone $= \frac{1}{3}\pi r^2 h$

According to the question,
Volume of the cone = Volume of the cylinder

$\Rightarrow \frac{1}{3}\pi r^2 h = 6\pi r^2$

$\Rightarrow h = 18$ cm.

137. (2) Volume of the cone = Volume of the cylinder

$\Rightarrow \frac{1}{3}\pi r^2 h_1 = \pi r^2 h_2$

$\Rightarrow h_1 = 3h_2 = 3 \times 7 = 21$ cm.

138. (4) Volume of the solid sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi\times7\times7\times7$ cu. cm.

If the length of wire (cylindrical) be h cm, then

$\pi R^2 h = \frac{4}{3}\times\pi\times7\times7\times7$

$\Rightarrow 7\times7\times h = \frac{4}{3}\times7\times7\times7$

$\Rightarrow h = \frac{28}{3}$ cm

139. (4) In this case volume remains same.

$\therefore \frac{4}{3}\pi R^3 = \frac{1}{3}\pi R^2 H$

$\Rightarrow 4R = H$

$\Rightarrow H : R = 4 : 1$

140. (2) Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi\times3\times3\times3$

$= 36\pi$ cu. cm.

If the water level rises by h cm, then

$\pi R^2 h = 36\pi$

$\Rightarrow 6\times6\times h = 36$

$\Rightarrow h = 1$ cm

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141. (2) Volume of sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 9 \times 9 \times 9$

$= 972\,\pi$ cubic.cm.

If the length of wire be h cm., then

$\pi \times (0.2)^2 \times h = 972\,\pi$

$\Rightarrow h = \frac{972}{0.2 \times 0.2} = 24300$ cm

or 243 metres

142. (1) Volume of block

$= 21 \times 77 \times 24$ cu. cm.

Let the radius of sphere be r cm, then

$\frac{4}{3}\pi r^3 = 21 \times 77 \times 24$

$\Rightarrow r^3 = \frac{21 \times 77 \times 24 \times 3 \times 7}{4 \times 22}$

$= 21 \times 7 \times 3 \times 3 \times 7$

$= 3^3 \times 7^3$

$\Rightarrow r = 3 \times 7 = 21$ cm

143. (4) Let Length of rod $= x$ cm

$\therefore$ Volume of cylinder = Volume of 6 spheres

$\Rightarrow \pi r^2 h = 6 \times \frac{4}{3}\pi r^3$

$\Rightarrow h = 6 \times \frac{4}{3} \times r = 8 \times 50$

$= 400$ cm $= 4$ metres

144. (2) Volume of cone = Volume of sphere

$\Rightarrow \frac{1}{3}\pi r_1^2 h + \frac{1}{3}\pi r_2^2 h = \frac{4}{3}\pi r^3$

$\Rightarrow (r_1^2 + r_2^2)h = 4r^3$

$\Rightarrow (9 + 16)h = 4 \times 5^3$

$\Rightarrow 25h = 4 \times 125$

$\Rightarrow h = 4 \times 5 = 20$ cm

145. (3) Volume of earth taken out

$= 40 \times 30 \times 12$

$= 14400$ cu.metre

Area of the rectangular field

$= 1000 \times 30 = 30000$ sq. metre

Area of the region of tank

$= 40 \times 30 = 1200$ sq. metre

Remaining area

$= 30000 - 1200$

$= 28800$ sq. metre

Increase in level

$= \frac{14400}{28800} = 0.5$ metre

146. (4) Area of the base of pyramid

$= \frac{1}{2} \times (\text{diagonal})^2$

$= \frac{1}{2} \times 1152 = 576$ sq.metre

Volume of pyramid $= \frac{1}{3} \times$ Area of base $\times$ Height

$= \frac{1}{3} \times 576 \times 6 = 1152$ cu.metre

147. (1) $\frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$

$\Rightarrow \frac{2}{3} = \left(\frac{1}{2}\right)^2 \times \frac{h_1}{h_2}$

$\Rightarrow \frac{h_1}{h_2} = \frac{2}{3} \times 4 = \frac{8}{3} = 8 : 3$

148. (3) Edges of cubes $= x$ and y units (let)

$\therefore$ Ratio of volumes $= \frac{x^3}{y^3}$

$\therefore \frac{x^3}{y^3} = \frac{27}{64} \Rightarrow \frac{x}{y} = \frac{3}{4}$

$\therefore$ Ratio of surface areas $= \frac{6x^2}{6y^2}$

$= \frac{x^2}{y^2} = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$

149. (1) Volume of a cone $= \frac{1}{3}\pi r^2 h$

Again, $r_1 = 2r$, $h_1 = 2h$

$\therefore$ Volume of the second cone

$= \frac{1}{3}\pi r_1^2 h_1$

$= \frac{1}{3}\pi (2r)^2 \times 2h$

$= \frac{1}{3}\pi r^2 h \times 8$

= Eight times of the previous volume

150. (1) Ratio of the volumes of spheres

$= \frac{8 \times 64}{289 \times 17}$

$\Rightarrow \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{8 \times 8 \times 8}{17 \times 17 \times 17}$

$\Rightarrow \frac{r_1^3}{r_2^3} = \left(\frac{8}{17}\right)^3$

$\Rightarrow \frac{r_1}{r_2} = \frac{8}{17}$

151. (1) Volume of the new cube

$= [(6)^3 + (8)^3 + (1)^3]$ cu.cm.

$= (216 + 512 + 1)$ cu.cm.

$= 729$ cu.cm.

Edge of new cube $= \sqrt[3]{729}$

$= 9$ cm

Its surface area $= 6 \times (\text{edge})^2$

$= 6 \times 9 \times 9 = 486$ sq. cm.

152. (1) Volume of conical vessel

$= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 6 \times 6 \times 12$

$= 144\,\pi$ cu. cm.

If the radius of sphere be R cm, then

$8 \times \frac{2}{3}\pi R^3 = 144\pi$

$\Rightarrow R^3 = \frac{144 \times 3}{8 \times 2}$

$= 9 \times 3 = 3 \times 3 \times 3$

$\therefore R = \sqrt[3]{3 \times 3 \times 3} = 3$ cm.

153. (4) Radius of cylinder $= r$ units

Radius of sphere $= \frac{r}{2}$ units

Let the height of cylinder be h units,

$\therefore$ Volume of cylinder = Volume of sphere

$\Rightarrow \pi r^2 h = \frac{4}{3}\pi \left(\frac{r}{2}\right)^3$

$\Rightarrow \pi r^2 h = \frac{1}{6}\pi r^3$

$\Rightarrow h = \frac{1}{6} r$

$\Rightarrow \frac{h}{r} = \frac{1}{6}$

154. (2) Volume of pile $= 20$ cu. metre

$= 20 \times (100)^3$ cu.cm.

Volume of one brick

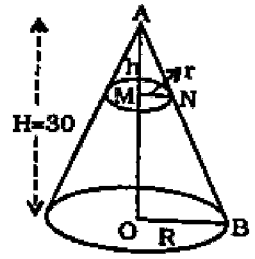
$= (25 \times 12.5 \times 8)$ cu.cm.

$\therefore$ Required number of bricks

$= \frac{20 \times 100 \times 100 \times 100}{25 \times 12.5 \times 8} = 800$

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155. (2) Let H and R be the height and radius of bigger cone respectively and h and r that of smaller cone.



From triangles AOB and AMN.
$\angle A$ is common and MN || OB.
$\therefore$ Triangles AOB and AMN are similar.

$$\therefore \frac{AO}{AM} = \frac{BO}{MN}$$

$$\Rightarrow \frac{30}{h} = \frac{R}{r} \quad \text{...(i)}$$

Volume of smaller cone

$$= \frac{1}{3}\pi r^2 h$$

Volume of bigger cone

$$= \frac{1}{3}\pi R^2 H$$

$\therefore$ According to the question,

$$\frac{1}{3}\pi r^2 h = \left(\frac{1}{3}\pi R^2 H\right) \times \frac{1}{27}$$

$$\Rightarrow r^2 h = \frac{R^2 H}{27}$$

$$\Rightarrow 27 r^2 h = R^2 H$$

$$\Rightarrow \frac{27h}{H} = \frac{R^2}{r^2}$$

$$\Rightarrow \frac{27h}{H} = \left(\frac{30}{h}\right)^2 \quad \text{...[From (i)]}$$

$$\Rightarrow \frac{27h}{H} = \frac{900}{h^2}$$

$$\Rightarrow 27h^3 = 900H = 900 \times 30$$

$$\Rightarrow h^3 = \frac{900 \times 30}{27} = 1000$$

$$\Rightarrow h = \sqrt[3]{1000} = 10 \text{ cm}$$

$\therefore$ Required height = 30 – 10 = 20 cm

156. (1) Volume of pyramid

$$= \frac{1}{3} \times \text{area of base} \times \text{height}$$

$$\Rightarrow 500 = \frac{1}{3} \times 30 \times h$$

$$\Rightarrow 10h = 500$$

$$\Rightarrow h = \frac{500}{10} = 50 \text{ metre}$$

157. (1) Lateral surface area of prism = 3 × side × height

$\therefore$ 3 × side × height = 120

$$\Rightarrow \text{Side} \times \text{height} = \frac{120}{3}$$

= 40 sq.cm. ...(i)

Volume of prism = Area of base × height

$$\Rightarrow 40\sqrt{3} = \frac{\sqrt{3}}{4} \times \text{side}^2 \times \text{height}$$

$$\Rightarrow \frac{40\sqrt{3} \times 4}{\sqrt{3}} = \text{side}^2 \times \text{height}$$

$\Rightarrow$ side^2 × height = 160 cu.cm ...(ii)

Dividing equation (ii) by (i),

$$\text{Side} = \frac{160}{40} = 4 \text{ cm.}$$

158. (4) Volume of lead

$$= \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times 2^3$$

If the thickness of gold be x cm, then

Volume of gold

$$= \frac{4}{3}\pi\left((2+x)^3 - 2^3\right) \text{cu.cm}$$

$$\therefore \frac{4}{3}\pi\left((2+x)^3 - 2^3\right)$$

$$= \frac{4}{3}\pi \times 2^3$$

$$\Rightarrow (2+x)^3 - 2^3 = 2^3$$

$$\Rightarrow (2+x)^3 = 8 + 8 = 16$$

$$\Rightarrow (2+x)^3 = 2^3.2$$

$$\Rightarrow 2 + x = 2 \times \sqrt[3]{2}$$

$$\Rightarrow 2 + x = 2 \times 1.259 = 2.518$$

$\therefore x = 2.518 - 2 = 0.518$ cm

159. (4) Radius of larger sphere = R units

$\therefore$ Its volume $= \frac{4}{3}\pi R^3$ cu. units

Volume of smaller cone

$$= \frac{1}{3}\pi R^3 \text{ cubic units}$$

Volume of smaller sphere

$$= \frac{1}{3}\pi R^3$$

$$\therefore \frac{4}{3}\pi r^3 = \frac{1}{3}\pi R^3$$

$$\Rightarrow r^3 = \frac{R^3}{4}$$

$$\Rightarrow r = \frac{R}{\sqrt[3]{4}}$$

$\therefore$ Surface area of smaller sphere : Surface area of larger sphere

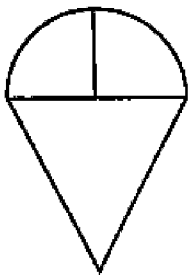
$$= 4\pi r^2 : 4\pi R^2$$

$$= r^2 : R^2$$

$$= \left(\frac{R}{\sqrt[3]{4}}\right)^2 : R^2 = 1 : \left(\sqrt[3]{4}\right)^2$$

$$= 1 : \left((2^2)^{\frac{1}{3}}\right)^2 = 1 : 2^{\frac{4}{3}}$$

160. (1)



Volume of hemisphere $= \frac{2}{3}\pi r^3$,

Where r = radius = 7 cm.

$$= \left(\frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7\right) \text{ cu.cm.}$$

Volume of conical part

$$= \frac{1}{3}\pi r^2 h$$

$[\because r = h]$

$$= \left(\frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 7\right) \text{ cu.cm.}$$

$\therefore$ Volume of ice-cream

$$= \frac{2}{3} \times \frac{22}{7} \times 7^3 + \frac{1}{3} \times \frac{22}{7} \times 7^3$$

$$= \frac{22}{7} \times 7^3 = 22 \times 7^2$$

= 1078 cu.cm.

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161. (3) Volume of material of hollow sphere $= \frac{4}{3}\pi\left(r_1^3 - r_2^3\right)$

$= \frac{4}{3} \times \pi\left(5^3 - 3^3\right)$

$= \frac{4}{3} \times \pi \times (125 - 27)$

$= \frac{4}{3} \times \pi \times 98$ cu.cm.

Volume of cone $= \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 4^2 \times h$

$\therefore \frac{1}{3}\pi \times 16 \times h = \frac{4}{3} \times \pi \times 98$

$\Rightarrow 4h = 98$

$\Rightarrow h = \frac{98}{4} = 24.5$ cm

162. (3) Volume of the tetrahedron

$= \frac{a^3}{6\sqrt{2}}$, where a = edge = 4 cm

$= \frac{4 \times 4 \times 4}{6\sqrt{2}} = \frac{16\sqrt{2}}{3}$ cu.cm.

163. (4) Radius of the base of conical shape = r cm (let)

Radius of base of cylinder

$= \frac{r}{3}$ cm

Volume of water = Volume of cone

$= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2 \times 24$

$= 8\pi r^2$ cu. cm.

$\therefore$ Volume of cylinder $= \pi R^2 H$

$= \pi \times \left(\frac{r}{3}\right)^2 H = \frac{\pi r^2 H}{9}$ cu. cm.

$\therefore \frac{\pi r^2 H}{9} = 8\pi r^2$

$\Rightarrow H = 9 \times 8 = 72$ cm

164. (1) Edge of cube = a cm (let)

$\therefore$ Its total surface area $= 6a^2$

$\therefore 6a^2 = 150$

$\Rightarrow a^2 = \frac{150}{6} = 25$

$\Rightarrow a = \sqrt{25} = 5$ cm

$\therefore$ Volume of cube $= a^3$

$= (5 \times 5 \times 5)$ cu.cm

$= 125$ cu.cm

165. (2) Volume of metallic sphere

$= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times 3 \times 3 \times 3$

$= 36\pi$ cu.cm.

$\therefore$ Volume of cone

$= 36\pi$ cu.cm.

$\Rightarrow \frac{1}{3}\pi R^2 h = 36\pi$

$\Rightarrow R^2 h = 108$

$\Rightarrow 6 \times 6 \times h = 108$

$\Rightarrow h = \frac{108}{6 \times 6} = 3$ cm.

166. (4) Volume of hemi-spherical bowl

$= \frac{2}{3}\pi r^3$

$= \left(\frac{2}{3} \times \pi \times 15 \times 15 \times 15\right)$ cu.cm

Volume of a bottle $= \pi R^2 h$

$= \pi \times \frac{5}{2} \times \frac{5}{2} \times 6$ cu.cm

$\therefore$ Number of bottles

$= \frac{2 \times \pi \times 15 \times 15 \times 15}{3 \times \pi \times \frac{5}{2} \times \frac{5}{2} \times 6} = 60$

167. (*) Volume of cone

$= V_1 = \frac{1}{3}\pi r^2 h$

$= \frac{\pi}{3} r^3$ $(\because h = r)$

Volume of sphere $= V_2 = \frac{4}{3}\pi r^3$

Volume of cylinder $= V_3 = \pi r^2 h$

$= \pi r^3$

$\therefore V_1 : V_2 : V_3 = \frac{1}{3} : \frac{4}{3} : 1$

$= 1 : 4 : 3$

$\therefore V_1 = \frac{V_2}{4} = \frac{V_3}{3}$

168. (2) Volume of sphere

$= \frac{4}{3}\pi r^3$ cu. units

Case II,

$R = 2r$ units

$\therefore$ Volume of sphere $= \frac{4}{3}\pi R^3$

$= \frac{4}{3}\pi (2r)^3$

$= \frac{32}{3}\pi r^3$ cu. units

Difference $= \frac{32}{3}\pi r^3 - \frac{4}{3}\pi r^3$

$= \frac{28}{3}\pi r^3$

$\therefore$ Percentage increase

$= \frac{\frac{28}{3}\pi r^3}{\frac{4}{3}\pi r^3} \times 100$

$= 700\%$

OR

Single equivalent per cent increase for increases of 100% and 100%

$= \left(100 + 100 + \frac{100 \times 100}{100}\right)\%$

$= 300\%$

Single equivalent per cent increase for increases of 300% and 100%

$= \left(300 + 100 + \frac{300 \times 100}{100}\right)\%$

$= 700\%$

169. (4) Volume of tank $= (1.2)^3$ cubic metre

$= 1.728$ cubic metre

$\therefore$ 64 × Volume of 1 bucket

$= \frac{2 \times 1.728}{3}$ cubic metre

$\therefore$ Volume of 1 bucket

$= \left(\frac{1.728 \times 2}{3 \times 64}\right)$ cubic metre

$= 0.018$ cubic metre

$= (0.018 \times 1000)$ litres

$= 18$ litres

170. (4) Volume of wooden box

$= (8 \times 7 \times 6)$ cu.m.

$= (8 \times 7 \times 6 \times 100^3)$ cu.cm.

Volume of a box

$= (8 \times 7 \times 6)$ cu.cm.

$\therefore$ Maximum number of boxes

$= \frac{8 \times 7 \times 6 \times 100^3}{8 \times 7 \times 6}$

$= 1000000$

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171. (3) $\pi r_1^2 h_1 = \pi r_2^2 h_2$

$$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 = \frac{h_2}{h_1} = \frac{2}{1}$$

$$\therefore \frac{r_1}{r_2} = \frac{\sqrt{2}}{1} = \sqrt{2} : 1$$

172. (3) Paper is folded along the length.

$\therefore$ Circumference of the base = 22 cm.

Height of cylinder = 12 cm

$\therefore 2\pi r = 22$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 22$$

$$\Rightarrow r = \frac{7}{2} \text{ cm}$$

$\therefore$ Volume of cylinder $= \pi r^2 h$

$$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12$$

= 462 cu.cm.

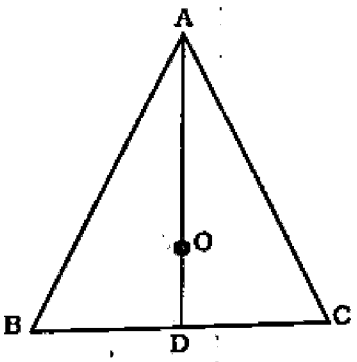
173. (1) Height of cylinder = 2 R units

Radius of base = R units

$\therefore$ Volume of cylinder $= \pi R^2 h$

$\Rightarrow \pi (R)^2 (2R) = 2\pi R^3$

174. (*)



Area of the base of pyramid

$$= \frac{\sqrt{3}}{4} \times \text{side}^2$$

$$= \frac{\sqrt{3}}{4} \times 4 \times 4 = 4\sqrt{3} \text{ sq. cm.}$$

Length of median on the base (AD)

$$= \sqrt{4^2 - 2^2} = \sqrt{12} = 2\sqrt{3} \text{ cm}$$

$$\therefore OD = \frac{1}{3} \times 2\sqrt{3} = \frac{2}{\sqrt{3}} \text{ cm}$$

Height of pyramid

$$= \sqrt{5^2 - \left(\frac{2}{\sqrt{3}}\right)^2}$$

$$= \sqrt{25 - \frac{4}{3}} = \frac{\sqrt{71}}{\sqrt{3}} \text{ cm}$$

$\therefore$ Volume of pyramid

$$= \frac{1}{3} \times \text{area of base} \times \text{height}$$

$$= \frac{1}{3} \times 4\sqrt{3} \times \frac{\sqrt{71}}{\sqrt{3}}$$

$$= \frac{4\sqrt{71}}{3} \text{ cu.cm.}$$

175. (1) Curved surface area of cone = 550 sq. cm.

$\Rightarrow \pi r l = 550$

$$\Rightarrow \frac{22}{7} \times 7 \times \sqrt{r^2 + h^2} = 550$$

$$\Rightarrow \frac{22}{7} \times 7 \times \sqrt{49 + h^2} = 550$$

$$\Rightarrow \sqrt{49 + h^2} = \frac{550}{22} = 25$$

$\Rightarrow 49 + h^2 = (25)^2 = 625$

$\Rightarrow h^2 = 625 - 49 = 576$

$\Rightarrow h = \sqrt{576} = 24$ cm.

$\therefore$ Volume of cone $= \frac{1}{3} \pi r^2 h$

$$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24$$

= 1232 cu. cm.

176. (1) Volume of cylinder $= \pi r^2 h = (\pi \times 9^2 \times 162)$ cu.cm.

$\therefore$ Volume of hemisphere = $(\pi \times 9^2 \times 162)$ cu. cm.

$$\therefore \frac{2}{3} \pi \times R^3 = \pi \times 9^2 \times 162$$

$$\Rightarrow R^3 = \frac{9^2 \times 162 \times 3}{2}$$

$$= 9^2 \times 81 \times 3$$

$$\therefore R = \sqrt[3]{9^2 \times 9^2 \times 3}$$

$= 9 \times 3 = 27$ cm.

177. (1) Volume of iron sphere

$$= \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \pi \times 27 \times 27 \times 27$$

$= (36 \times 27 \times 27)\pi$ cu. cm.

$\therefore$ If the radius of wire be R cm., then

$\pi \times R^2 \times 729 = 36 \times 27 \times 27 \pi$

$[\because V = \pi R^2 H]$

$$\Rightarrow R^2 = \frac{36 \times 27 \times 27}{729} = 36$$

$$\therefore R = \sqrt{36} = 6 \text{ cm.}$$

178. (4)



Radius of cylinder = radius of hemisphere

= r units

$\therefore$ Required ratio

$$= \pi r^2 . r : \frac{2}{3} \pi r^3$$

= 3 : 2

179. (1) Ratio of the volumes of cubes

$$= \frac{8}{125}$$

$$\Rightarrow \frac{l_1^3}{l_2^3} = \frac{8}{125} \Rightarrow \frac{l_1}{l_2} = \frac{2}{5}$$

$\therefore$ Ratio of their total surface areas $= \frac{6l_1^2}{6l_2^2} = \frac{l_1^2}{l_2^2} = \frac{4}{25}$

180. (1) Volume of water

$$= \frac{4}{3} \pi r^3 + \frac{1}{4} \times \frac{4}{3} \pi r^3$$

$$= \frac{5}{3} \pi r^3 = \frac{5}{3} \pi \text{ cube cm.}$$

181. (3) Volume of one drop of water

$$= \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \times \pi \times \left(\frac{1}{20}\right)^3 \text{ cube cm.}$$

$\therefore$ Volume of 32000 drops of water

$$= \frac{4\pi}{3} \times \frac{32000}{20 \times 20 \times 20} \text{ cubic cm.}$$

$$= \frac{16\pi}{3} \text{ cubic cm.}$$

$\therefore$ Volume of glass $= \frac{1}{3} \pi R^2 H$

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Here, $R = \frac{H}{2}$

$\therefore \frac{1}{3}\pi\left(\frac{H}{2}\right)^2 . H = \frac{16\pi}{3}$

$\Rightarrow \frac{H^3}{4} = 16$

$\Rightarrow H^3 = 64$

$\therefore H = \sqrt[3]{64} = 4$ cm.

182. (3) If the radius of base of cylinder be r units, then,
Height $= 4 \times 2\pi r$
$= 8\pi r$ units
$\therefore 2\pi r = c$

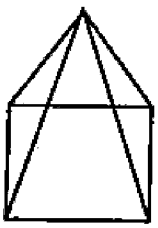
$\therefore r = \frac{c}{2\pi}$ and $h = 4c$

$\therefore$ Volume of cylinder $= \pi r^2 h$

$= \frac{\pi c^2}{4\pi^2} \times 4c$

$= \frac{c^3}{\pi}$ cubic units

183. (2)



Volume of pyramid

$= \frac{1}{3} \times$ area of base $\times$ height

$\Rightarrow 1296 = \frac{1}{3} \times 324 \times h$

$\Rightarrow h = \frac{1296 \times 3}{324} = 12$ metre

$\therefore$ Side of square base $= \sqrt{324}$
$= 18$ metre

$\therefore$ Slant height $= \sqrt{12^2 + \left(\frac{18}{2}\right)^2}$

$= \sqrt{12^2 + 9^2}$

$= \sqrt{144 + 81}$

$= \sqrt{225} = 15$ metre

$\therefore$ Area of the lateral surfaces

$= \frac{1}{2} \times$ perimeter of base $\times$ slant height

$= \frac{1}{2} \times 4 \times 18 \times 15$

$= 540$ sq.metre.

184. (2) Radii of spheres $= r_1$ and r_2 units
According to the question

$\frac{4\pi r_1^2}{4\pi r_2^2} = \frac{9}{16}$

$\Rightarrow \frac{r_1^2}{r_2^2} = \frac{9}{16}$

$\Rightarrow \frac{r_1}{r_2} = \sqrt{\frac{9}{16}} = \frac{3}{4}$

$\therefore$ Ratio of their volumes

$= \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}$

$= \left(\frac{r_1}{r_2}\right)^3 = \left(\frac{3}{4}\right)^3 = \frac{27}{64}$

185. (4) Volume of cylinder $= \pi r^2 h$
$= (\pi \times 20 \times 20 \times 9)$ cu.cm.
$= 3600\,\pi$ cu.cm.
$\therefore$ Volume of cone
$= 3600\,\pi$ cu.cm.

$\Rightarrow \frac{1}{3}\pi R^2 H = 3600\,\pi$

$\Rightarrow \frac{1}{3} \times R^2 \times 108 = 3600$

$\Rightarrow R^2 = \frac{3600 \times 3}{108} = 100$

$\Rightarrow R = \sqrt{100} = 10$ cm.

186. (4) Radius of the base of the cylinder = radius of the base of cone $= x$ units

$\frac{\text{Volume of cone}}{\text{Volume of cylinder}}$

$= \frac{\frac{1}{3}\pi r^2 H}{\pi r^2 h}$

$= \frac{1}{3} \cdot \frac{H}{h} = \frac{1}{3} \times \frac{2}{3} = 2 : 9$

187. (3) Ratio of volumes
= cone : cylinder : hemi-sphere

$= \frac{1}{3}\pi r^2 h : \pi r^2 h : \frac{2}{3}\pi r^3$

$= \frac{1}{3}\pi r^3 : \pi r^3 : \frac{2}{3}\pi r^3$

[$\because r = h$]

$= \frac{1}{3} : 1 : \frac{2}{3} = 1 : 3 : 2$

188. (2) Volume of the material of the hollow cylinder

$= \frac{4}{3}\pi\left(R^3 - r^3\right)$

$= \frac{4}{3}\pi\left(5^3 - 3^3\right)$

$= \frac{4}{3}\pi(125 - 27)$

$= \frac{4 \times 98}{3}\pi$ cu.cm.

If the radius of the cylinder be R cm, then

$\pi R^2 \times \frac{8}{3} = \frac{4 \times 98\pi}{3}$

$\Rightarrow R^2 = \frac{4 \times 98}{8} = 49$

$\Rightarrow R = \sqrt{49} = 7$ cm.

$\therefore$ Diameter $= 2R = 2 \times 7$
$= 14$ cm.

189. (1) According to the question,
$\pi(R^2 - r^2)\,h = 748$

$\Rightarrow \frac{22}{7}(R^2 - r^2) \times 14 = 748$

$\Rightarrow R^2 - r^2 = \frac{748 \times 7}{22 \times 14} = 17$

$\Rightarrow 9^2 - r^2 = 17 \Rightarrow 81 - r^2 = 17$

$\Rightarrow r^2 = 81 - 17 = 64$

$\Rightarrow r = \sqrt{64} = 8$ cm.

$\therefore$ Thickness of pipe
$= R - r = 9 - 8 = 1$ cm.

190. (3) Volume of the two spheres of radius 6 cm. each

$= 2 \times \frac{4}{3}\pi r^3$

$= 2 \times \frac{4}{3} \times \pi \times (6)^3$

$= 576\,\pi$ cu. cm.

According to the question,

$\pi \times 12 \times 12 \times h = 576\,\pi$

$\Rightarrow h = \frac{576}{12 \times 12} = 4$ cm.

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191. (3) Perimeter of a face of cube = 20 cm.
∴ An edge of cube
$= \frac{20}{4} = 5$ cm.
∴ Volume of cube = (edge)³
= (5)³ = 125 cu. cm.

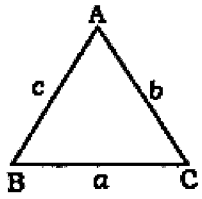
192. (1) Radius of sphere = r units
According to the question,
$\frac{4}{3}\pi r^3 = 4\pi r^2 \Rightarrow r = 3$ units
∴ Diameter = 2 × 3 = 6 units

193. (4) Radius of cylindrical vessel = r cm. (let).
Volume of conical piece of iron =
$\frac{1}{3}\pi R^2 h$
$= \left(\frac{1}{3}\pi \times 14 \times 14 \times 30\right)$ cu. cm.
Volume of raised water
= $\pi r^2 \times 6.4$ cu. cm.
∴ $\pi r^2 \times 6.4$
$= \frac{1}{3}\pi \times 14 \times 14 \times 30$
$\Rightarrow r^2 = \frac{14 \times 14 \times 10}{6.4}$
$\Rightarrow r^2 = \frac{14^2 \times 10^2}{8^2}$
$\Rightarrow r = \frac{14 \times 10}{8}$
$\Rightarrow 2r = \frac{2 \times 14 \times 10}{8}$
= 35 cm = diameter

194. (1) The base of a prism is a triangular.
Semi-perimeter of triangle(s)
$= \frac{5+10+13}{2} = \frac{28}{2} = 14$ cm.
∴ Area of triangle
$= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{14(14-5)(14-10)(14-13)}$
$= \sqrt{14 \times 9 \times 4 \times 1}$
$= 6\sqrt{14}$ sq. cm.
∴ Volume of prism
= Area of base × height
$= 6\sqrt{14} \times 10 = 60\sqrt{14}$ cu.cm.
= 60 × 3.742 = 224.52 cu.cm.
∴ Weight of the prism
= (224.52 × 7) gram
= 1571.64 gram

195. (3) Volume of cone $= \frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \pi \times 15 \times 15 \times 20$
$= 1500\pi$ cu.cm.
∴ Volume of a smaller cone
$= \frac{1}{3}\pi \times 1.5 \times 1.5 \times 5$
$= 3.75\pi$ cu.cm.
∴ Number of smaller cones
$= \frac{1500\pi}{3.75\pi} = 400$

196. (2) In ΔABC,
a = 13 cm., b = 20 cm., c = 21 cm.,



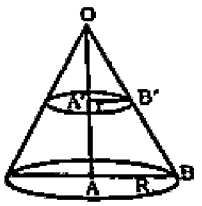
Semi-perimeter = $s = \frac{a+b+c}{2}$
$= \left(\frac{13+20+21}{2}\right)$ cm.
$= \frac{54}{2} = 27$ cm.
∴ Area of ΔABC = Area of the base of prism
$= \sqrt{s(s-a)(s-b)(s-c)}$
$= \sqrt{27(27-13)(27-20)(27-21)}$
$= \sqrt{27 \times 14 \times 7 \times 6}$
$= \sqrt{3 \times 3 \times 3 \times 2 \times 7 \times 7 \times 2 \times 3}$
= 3 × 3 × 2 × 7 = 126 sq. cm.
∴ Volume of prism = Area of base × height
= 126 × 9 = 1134 cu. cm.

197. (3) Volume of earth and stones taken out from the tunnel
$= \pi r^2 h$
$= \left(\frac{22}{7} \times 2 \times 2 \times 56\right)$ cu. metre
= 704 cu. metre
Volume of ditch
= (48 × 16.5 × 4) cu. metre
= 3168 cu. metre
∴ Part of ditch filled
$= \frac{704}{3168} = \frac{2}{9}$ parts

198. (3) Volume of hemisphere
$= \frac{2}{3}\pi R^3$ cu. units
Volume of newphere
$= \frac{4}{3}\pi r^3$ cu. units
According to the question,
$\frac{2}{3}\pi R^3 = 4 \times \frac{4}{3}\pi r^3$
$\Rightarrow R^3 = 8r^3$
$\Rightarrow R = 2r$ units
$\therefore r = \frac{1}{2}$ R Units

199. (2) Volume of cylinder = $\pi r^2 h$
= (π × 8 × 8 × 2) cu. cm.
= 128 π cu. cm.
If the radius of the base of cone be R cm. then
$\frac{1}{3}\pi R^2 H = 128\pi$
$\Rightarrow R^2 \times 6 = 128 \times 3$
$\Rightarrow R^2 = \frac{128 \times 3}{6} = 64$
$\Rightarrow R = \sqrt{64} = 8$ cm.

200. (4)



OA' = h units
AA' = H units
AB = R units
A'B' = r units.
A'B' ∥ AB
∠OA'B' = ∠OAB
∠OB'A' = ∠OBA
∴ Δ OAB ~ Δ OA'B'
$\therefore \frac{OA'}{OA} = \frac{A'B'}{AB}$
$\Rightarrow \frac{h}{H+h} = \frac{r}{R}$

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According to the question,

$$\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi R^2 (H+h) - \frac{1}{3}\pi r^2 h$$

$$\Rightarrow \frac{2}{3}\pi r^2 h = \frac{1}{3}\pi R^2 (H+h)$$

$$\Rightarrow 2\frac{r^2}{R^2} = \frac{H+h}{h}$$

$$\Rightarrow 2.\frac{h^2}{(H+h)^2} = \frac{H+h}{h}$$

$$\Rightarrow \frac{(H+h)^3}{h^3} = 2$$

$$\Rightarrow \frac{H+h}{h} = \sqrt[3]{2}$$

$$\Rightarrow \frac{H}{h} + 1 = \sqrt[3]{2}$$

$$\Rightarrow \frac{H}{h} = \frac{\sqrt[3]{2}-1}{1}$$

$$\therefore \frac{h}{H} = 1 : \sqrt[3]{2} - 1$$

201. (4) Volume of sphere $= \frac{4}{3}\pi r^3$

$\therefore$ Total volume of both spheres

$$= \frac{4}{3}\pi (r_1^3 + r_2^3)$$

$$= \frac{4}{3}\pi (1^3 + 6^3)$$

$$= \frac{4}{3}\pi (1 + 216)$$

$$= \left(\frac{4\pi}{3} \times 217\right) \text{cu. cm.}$$

If the internal radius of hollow sphere = r cm, then

$\therefore$ Volume of the iron of this sphere $= \frac{4}{3}\pi (9^3 - r^3)$ cu.cm.

According to the question,

$$\frac{4}{3}\pi (9^3 - r^3) = \frac{4\pi}{3} \times 217$$

$\Rightarrow 729 - r^3 = 217$

$\Rightarrow r^3 = 729 - 217 = 512$

$\Rightarrow r^3 = (8)^3$

$\Rightarrow r = 8$ cm

$\therefore$ Required thickness $= 9 - r = 9 - 8 = 1$ cm.

202. (1) Area of the base of prism

$$= \frac{1}{2}(10+6) \times 5$$

$$= \frac{1}{2} \times 16 \times 5 = 40 \text{ sq. cm.}$$

$\therefore$ Volume of prism
= Area of base × height
= 40 × 8 = 320 cu. cm.

203. (4) Capacity of bowl $= \frac{2}{3}\pi r^3$

$$= \left(\frac{2}{3} \times \frac{22}{7} \times 6 \times 6 \times 6\right) \text{ cu. cm.}$$

$$= \frac{3168}{7} = 452.57 \text{ cu. cm.}$$

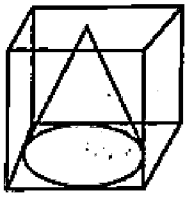
204. (4) Volume of regular tetrahedron

$$= \frac{a^3}{6\sqrt{2}} \text{ cu. cm.}$$

$$= \frac{1}{6\sqrt{2}} = \frac{\sqrt{2}}{6\sqrt{2} \times \sqrt{2}} \text{ cu. cm.}$$

$$= \frac{\sqrt{2}}{12} \text{ cu. cm.}$$

205. (3)



The volume of cone should be maximum.

$\therefore$ Radius of the base of cone

$$= \frac{\text{Edge of cube}}{2}$$

$$= \frac{4.2}{2} = 2.1 \text{ dm.}$$

Height = Edge of cube = 4.2 dm.

$\therefore$ Volume of cone $= \frac{1}{3}\pi r^2 h$

$$= \left(\frac{1}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 4.2\right) \text{ cu.dm.}$$

= 19.404 cu. dm.

206. (2) Length of base = $3x$ cm and breadth = $2x$ cm (let)

Total surface area of prism
= perimeter of base × height + 2 × area of base
= $\{2(3x + 2x) \times 12 + 2 \times 3x \times 2x\}$ sq. cm.
= $(120x + 12x^2)$ sq. cm.

According to the question,

$120x + 12x^2 = 288$

$\Rightarrow x^2 + 10x = 24$

$\Rightarrow x^2 + 10x - 24 = 0$

$\Rightarrow x^2 + 12x - 2x - 24 = 0$

$\Rightarrow x(x+12) - 2(x+12) = 0$

$\Rightarrow (x-2)(x+12) = 0$

$\Rightarrow x = 2$ because $x \neq -12$

$\therefore$ Volume of prism
= Area of base × height
= $(3x \times 2x \times 12)$ cu. cm.
= $72x^2 = (72 \times 2 \times 2)$ cu. cm.
= 288 cu. cm.

207. (4) Radius of cone so formed = 9 cm

Its height = 12 cm

$\therefore$ Volume of cone $= \frac{1}{3}\pi r^2 h$

$$= \frac{1}{3} \times \pi \times 9 \times 9 \times 12$$

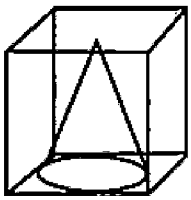
$= 324\,\pi$ cu. cm.

208. (4) Volume of right circular cylinder $= \pi r^2 h$

$$= \frac{22}{7} \times 5 \times 5 \times 21$$

= 1650 cu. cm.

209. (2)



Radius of the base of cone

$$= \frac{7}{2} \text{ cm}$$

Its height = 7 cm

$\therefore$ Volume of cone $= \frac{1}{3}\pi r^2 h$

$$= \left(\frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 7\right) \text{cu.cm.}$$

$$= \frac{539}{6} = 89.83 \text{ cu.cm.}$$

210. (1) Volume of two solid metallic spheres $= \frac{4}{3}\pi(r_1^3 + r_2^3)$

$$= \frac{4\pi}{3}(1^3 + 6^3)$$

$$= \frac{4\pi}{3}(1 + 216)$$

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$= \left(\frac{4\pi}{3} \times 217\right)$ cu cm.

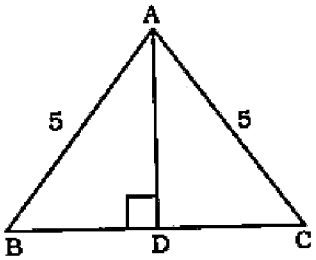
Internal radius of hollow sphere $= r$ cm (let)

$\therefore \frac{4}{3}\pi\,((r+1)^3 - r^3)$

$= \frac{4\pi}{3} \times 217$

$\Rightarrow r^3 + 3r^2 + 3r + 1 - r^3 = 217$
$\Rightarrow 3r^2 + 3r + 1 = 217$
$\Rightarrow 3r^2 + 3r - 216 = 0$
$\Rightarrow r^2 + r - 72 = 0$
$\Rightarrow r^2 + 9r - 8r - 72 = 0$
$\Rightarrow r(r+9) - 8(r+9) = 0$
$\Rightarrow (r-8)(r+9) = 0$
$\Rightarrow r = 8$ cm. because $r \neq -9$
$\therefore$ External radius of hollow sphere = 9 cm.

211. (1)



AB = AC = 5 cm.
BD = DC = 3 cm.
From Δ ABD,

$AD = \sqrt{AB^2 - BD^2}$

$= \sqrt{5^2 - 3^2} = \sqrt{25-9}$

$= \sqrt{16} = 4$ cm.

$\therefore$ Area of the base of prism

$= \frac{1}{2} \times BC \times AD$

$= \frac{1}{2} \times 6 \times 4 = 12$ sq. cm.

$\therefore$ Volume of prism
= Area of base × height
= 12 × 8 = 96 cu. cm.

212. (2) Increase in water level = x cm (let)
According to the question,
$2.1 \times 1.5 \times 10000 \times x$
$= 630 \times 1000$ cu. cm.

$\Rightarrow 21 \times 15 \times 100 \times x = 630000$

$\Rightarrow x = \frac{630000}{21 \times 15 \times 100} = 20$ cm.
= 0.2 metre

TYPE-V

1. (4) Required total area
= Area of four walls + Area of the base
$= 2 \times 1.25\,(6+4) + 6 \times 4$
$= 2.5 \times 10 + 24 = 49$ m².

2. (2) Per cent change in surface area

$= \left[x + y + \frac{xy}{100}\right]$

$= \left[15 + (-10) + \frac{15 \times (-10)}{100}\right]$

$= \left[15 - 10 - \frac{150}{100}\right] = [15 - 11.5]$

= 3.5 per cent.
(+ve) sign shows 3.5 per cent increases.

3. (1) Let for the first cylinder,
$r_1 = 3x$
$h_1 = 2y$
For the second cylinder,
$r_2 = 5x$
$h_2 = 3y$

$\therefore \frac{2\pi r_1 h_1}{2\pi r_2 h_2} = \frac{2\pi \times 3x \times 2y}{2\pi \times 5x \times 3y} = \frac{2}{5}$

$\Rightarrow 2 : 5$

4. (2) Volume of the tank = (3 × 5 × 1.54) cu.metre
Volume of water flowing through pipe per second

$= \pi \times \left(\frac{7}{100}\right)^2 \times 5$ m³

$\therefore$ Required time

$= \frac{3 \times 5 \times 1.54 \times 100 \times 100 \times 7}{22 \times 7 \times 7 \times 5}$

= 300 seconds = 5 minutes

5. (1) Area of the curved surface

$= \frac{1}{3} \times 462 = 154$ sq.cm

$\therefore 2\pi rh + 2\pi r^2 = 462$
$\Rightarrow 154 + 2\pi r^2 = 462$
$\Rightarrow 2\pi r^2 = 462 - 154 = 308$

$\Rightarrow r^2 = \frac{308}{2\pi} = \frac{308 \times 7}{2 \times 22} = 49$

$\Rightarrow r = \sqrt{49} = 7$ cm

6. (1) Lateral surface area of the cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times \frac{7}{2} \times 16$

= 352 sq.cm.

7. (1) Let the radius of the base be r metre.
then $3 \times 2\pi r^2 = 2 \times 2\pi rh$
$\Rightarrow 3r = 2h$
$\Rightarrow 3r = 2 \times 6 \Rightarrow r = 4$ metre

8. (1) Curved surface of cylinder
$= 2\pi rh$

Now, Radius $= \frac{1}{3}r$; height = 6h

Curved surface

$= 2\pi \times \frac{1}{3}r \times 6h = (2\pi rh) \times 2$

$\therefore$ Increase will be twice.

9. (3) $V = \pi r^2 h$
$\Rightarrow 550 = \pi \times 5x \times 5x \times 7x$

$\Rightarrow 550 = \frac{22}{7} \times 25 \times 7x^3$

$\Rightarrow x^3 = \frac{550}{22 \times 25} = 1 \Rightarrow x = 1$

$\therefore$ Area of curved surface

$= 2 \times \frac{22}{7} \times 5 \times 7$

= 220 sq.cm.

10. (3) Curved surface of cylinder
$= 2\pi rh = a$
Area of base $= \pi r^2 = b$
$\therefore 2\pi rh = a$
$\Rightarrow 4\pi^2 r^2 h^2 = a^2 \Rightarrow 4\pi b h^2 = a^2$

$\Rightarrow h^2 = \frac{a^2}{4\pi b}$

$\Rightarrow h = \frac{a}{2\sqrt{\pi b}}$ cm.

11. (3) Length of the largest rod

$= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{16^2 + 12^2 + \left(\frac{32}{3}\right)^2}$

$= \sqrt{400 + \frac{1024}{9}} = \sqrt{\frac{4624}{9}} = \frac{68}{3}$

$= 22\frac{2}{3}$ m

12. (3) Let the side of the two cubes are x and y.
According to the question

$\frac{x^3}{y^3} = \frac{27}{64} = \frac{(3)^3}{(4)^3}, \therefore \frac{x}{y} = \frac{3}{4}$

We know that surface area of the cube = 6 × (side)²
$\therefore$ Ratio of their surface areas

$= \frac{6x^2}{6y^2} = \frac{6 \times 3^2}{6 \times 4^2} = \frac{9}{16} = 9 : 16$

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13. (1) The length of the longest rod = The diagonal of the hall

$= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{10^2 + 6^2 + 4^2}$

$= \sqrt{100 + 36 + 16} = \sqrt{152}$

$= \sqrt{2 \times 2 \times 38} = 2\sqrt{38}$ m

14. (2) We have

2 × volume of cube = Volume of cuboid

$\Rightarrow 2 \times (\text{edge})^3 = 9 \times 8 \times 6$ cu.cm.

$\Rightarrow (\text{edge})^3 = 9 \times 8 \times 3$

$\Rightarrow$ Edge $= \sqrt[3]{3 \times 3 \times 3 \times 2 \times 2 \times 2}$

$= 3 \times 2 = 6$ cm.

∴ Total surface area of the cube

$= 6 \times (\text{edge})^2$

$= 6 \times 6 \times 6 = 216$ cm^2.

15. (4) Length of largest bamboo (Diagonal) $= \sqrt{(5)^2 + (4)^2 + (3)^2}$

$= \sqrt{25 + 16 + 9} = \sqrt{50}$

$= \sqrt{25 \times 2} = 5\sqrt{2}$ m

16. (3) The required length = Diagonal of the room

$= \sqrt{12^2 + 9^2 + 8^2}$

$= \sqrt{144 + 81 + 64}$

$= \sqrt{289} = 17$m

17. (4) Surface area of a small cube $= 6 \times (\text{edge})^2 = 6 \times 1 = 6$ cm^2

Surface area of the large cube $= 6\,(5)^2 = 6 \times 25$ cm^2.

∴ Required ratio

$= \frac{6}{6 \times 25} = \frac{1}{25}$

or 1 : 25

18. (3) Area of four walls of a room

= 2 (length + breadth) × height

= Perimeter of floor × height

$= 18 \times 3 = 54$ m^2

19. (2) Length of the longest rod

Diagonal $= \sqrt{10^2 + 10^2 + 5^2}$

$= \sqrt{225} = 15$ metre

20. (2) Area of the four walls of the room

= 2 × height (length × breadth)

$= 2 \times 3\,(4 + 3) = 42$ sq. metre

Area of ceiling $= 4 \times 3$

= 12 sq. metre

∴ Total area = 42 + 12

= 54 sq. metre

21. (1) Let the length, breadth and height of the box be x, y and z cm respectively.

$\therefore x + y + z = 12$ ...(i)

and $2(xy + yz + zx) = 94$ ...(ii)

$\therefore (x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

$\Rightarrow 144 = x^2 + y^2 + z^2 + 94$

$\Rightarrow x^2 + y^2 + z^2 = 144 - 94 = 50$

∴ Maximum length of stick

$= \sqrt{x^2 + y^2 + z^2}$

$= \sqrt{50} = 5\sqrt{2}$ cm

22. (4) If the length of the edge of cube be x cm, then

diagonal $= \sqrt{3}x$ cm

$\therefore \sqrt{3}x = 8\sqrt{3} \Rightarrow x = 8$ cm

∴ Surface area of the cube

$= 6x^2 = 6 \times 8 \times 8 = 384$ sq. cm

23. (3) Let Breadth of room = x metre

Length = $2x$ metre

∴ Area of four walls

$= 2 \times h\,(l + b)$

$\Rightarrow 660 = 2 \times 11\,(2x + x)$

$= 22 \times 3x = 66x$

$\Rightarrow x = \frac{660}{66} = 10$

∴ Area of floor $= 2x^2$

$= 2 \times 10^2 = 200$ sq.metre

24. (3) Maximum length of the pencil

$= \sqrt{8^2 + 6^2 + 2^2}$

$= \sqrt{64 + 36 + 4} = \sqrt{104}$

$= 2\sqrt{26}$ cm

25. (2) Length of the edge of the box

$= \sqrt[3]{3.375}$ metre

$= \sqrt[3]{1.5 \times 1.5 \times 1.5}$ metre

= 1.5 metre

26. (3) Diagonal of the cube

$= 6\sqrt{3}$ cm

$\therefore \sqrt{3} \times$ edge $= 6\sqrt{3}$ cm

$\Rightarrow$ Edge = 6 cm

∴ Total surface area : Volume

$= 6 \times 6^2 : 6^3 = 1 : 1$

27. (2) Diagonal of cubical room

$= 35\sqrt{3}$ metre

$\therefore \sqrt{3} \times$ edge $= 35\sqrt{3}$

$\Rightarrow$ Edge = 35 metre

$\Rightarrow$ Diameter of sphere

= 35 metre

$\Rightarrow$ Surface area of the sphere

$= 4\pi r^2$

$= 4 \times \frac{22}{7} \times \frac{35 \times 35}{4}$

= 3850 sq. metre

28. (4) Area of the floor

$= \frac{\text{Volume of room}}{\text{Height of room}}$

$= \frac{204}{6} = 34$ sq. m.

29. (2) Area of the base of mountain $= \pi r^2$

$1.54 \text{ km}^2 = \frac{22}{7} r^2$

$\Rightarrow \frac{1.54 \times 7}{22} = r^2$

$\Rightarrow 0.49 = r^2$

∴ r = 0.7 km

Slant height = 2.5 km

∴ Height of the mountain

$= \sqrt{(2.5)^2 - (0.7)^2}$

$= \sqrt{6.25 - 0.49}$

$= \sqrt{5.76} = 2.4$ km

30. (3) Radius of base (r)

= 19.2 + 2 = 9.6 m

Height (h) = 2.8 m

Slant height

$l = \sqrt{r^2 + h^2}$

$= \sqrt{(9.6)^2 + (2.8)^2}$

$= \sqrt{92.16 + 7.84} = \sqrt{100}$

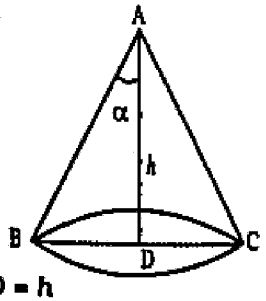
= 10 m

∴ Required area = curved surface area $= \pi rl$

$= \frac{22}{7} \times 9.6 \times 10$ sq.m.

= 301.7 sq.m.

31. (3)



AD = h

$\tan \alpha = \frac{BD}{AD}$

$\Rightarrow BD = h \tan \alpha$

∴ Radius (r) = h tan α

$\therefore l = \sqrt{h^2 + r^2}$

$= \sqrt{h^2 + h^2 \tan^2 \alpha}$

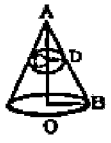
$= \sqrt{h^2 (1 + \tan^2 \alpha)}$

$= \sqrt{h^2 \sec^2 \alpha} = h \sec \alpha$

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∴ Curved Surface area of the circular cone = πrl
= $\pi \times h \tan\alpha \cdot h \sec\alpha$
= $\pi h^2 \sec\alpha \tan\alpha$

32. (3)



AC = 12 − 3 = 9 cm
OB = 6cm
Δ ACD ~ AOB

$\Rightarrow \frac{AC}{OA} = \frac{CD}{OB}$

$\Rightarrow \frac{9}{12} = \frac{CD}{6}$

$\Rightarrow CD = \frac{9}{12} \times 6 = 4.5cm$

33. (2) Let radius = 4x cm and slant height (l) = 7x cm

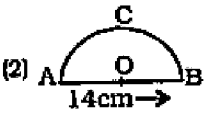
$\therefore \pi rl = \frac{22}{7} \times 4x \times 7x = 792$

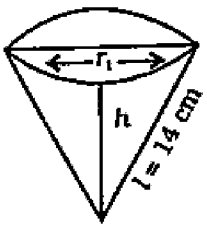
$\Rightarrow x^2 = \frac{792 \times 7}{22 \times 4 \times 7} = 9$

$\therefore x = 3$

$\therefore$ Radius = 4 × 3 = 12 cm

34. (2)





Length (ACB) of semi-circular sheet = πr

$= \frac{22}{7} \times 14 = 44$ cm.

Slant height of the cone = 14 cm.
Circumference of the base of the cone = $2\pi r_1 = \frac{44}{7} r_1$

$\Rightarrow 44 = \frac{44}{7} r_1 \Rightarrow r_1 = 7$ cm.

$\therefore h = \sqrt{l^2 - r_1^2} = \sqrt{14^2 - 7^2}$

$= 7\sqrt{3}$ cm.
= 7 × 1.732 = 12cm.

35. (1) $\frac{r}{h} = \frac{4}{3} \Rightarrow \frac{r}{4} = \frac{h}{3} = k$

$\Rightarrow r = 4k; h = 3k$

$\therefore l = \sqrt{r^2 + h^2} = \sqrt{16k^2 + 9k^2}$

$= \sqrt{25k^2} = 5k$

$\therefore \frac{\text{Curved surface area}}{\text{Total surface area}}$

$= \frac{\pi rl}{\pi r(r+l)}$

$= \frac{l}{r+l} = \frac{5k}{4k+5k} = \frac{5}{9}$

or 5 : 9

36. (3) Radius of the base (r_1) = $\frac{r}{4}$.

Slant height = r
∴ Curved surface area = $\pi r_1 l$

$= \frac{\pi r^2}{4}$ cm²

37. (4) Curved surface area of cone = πrl

$\therefore \frac{22}{7} \times 16 \times l = \frac{2992}{7}$

$\Rightarrow 22 \times 16 \times l = 2992$

$\Rightarrow l = \frac{2992}{22 \times 16} = 8.5$ metre

38. (2) $\frac{1}{3}\pi r^2 h = 1232$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 1232$

$\Rightarrow r^2 = \frac{1232 \times 3 \times 7}{22 \times 24} = 49$

$\Rightarrow r = \sqrt{49} = 7$ cm.

$\therefore$ Slant height (l) = $\sqrt{h^2 + r^2}$

$= \sqrt{24^2 + 7^2} = \sqrt{625} = 25$ cm.

$\therefore$ Curved surface of cone = πrl

$= \frac{22}{7} \times 7 \times 25 = 550$ cm²

39. (4) Radius of the base of cone = r units

$\therefore$ Volume (v) = $\frac{1}{3}\pi r^2 h$

Curved surface area
= $\pi r\sqrt{h^2 + r^2}$

$\therefore 3\pi v h^3 - c^2 h^2 + 9v^2$

$= 3\pi \times \frac{1}{3}\pi r^2 h \times h^3$

$- \pi^2 r^2 (h^2 + r^2) h^2 + 9 \times \frac{1}{9}\pi^2 r^4 h^2$

$= \pi^2 r^2 h^4 - \pi^2 r^2 h^4 - \pi^2 r^4 h^2 + \pi^2 r^4 h^2$
= 0

40. (4) Let the radius of first sphere be r cm
and the radius of second sphere = (r + 2) cm
Now, Difference between surface area = 352

$\Rightarrow 4\pi\{(r+2)^2 - r^2\} = 352$

or, $4 \times \frac{22}{7}\{(r+2-r) + (r+2+r)\}$

= 352

$\Rightarrow 2 \times 2(r+1) = \frac{352 \times 7}{4 \times 22}$

$\Rightarrow r + 1 = \frac{352 \times 7}{4 \times 4 \times 22}$

$\Rightarrow r + 1 = 7$
$\therefore r = 7 - 1 = 6$ cm

41. (4) $\frac{\text{Surface area of } A}{\text{Surface area of } B}$

$= \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{r_1^2}{r_2^2}$

Where r_1 and r_2 are radii of spheres A and B respectively.

$= \frac{40 \times 40}{10 \times 10} = \frac{16}{1}$

$\Rightarrow 16 : 1$

42. (4) Volume of the sphere = $\frac{4}{3}\pi r^3$

or $\frac{4}{3}\pi r^3 = \frac{88}{21} \times (14)^3$

or $\frac{4}{3} \times \frac{22}{7} \times r^3 = \frac{4}{3} \times \frac{22}{7} \times (14)^3$

or r = 14
The curved surface of the sphere = $4\pi r^2$

$= 4 \times \frac{22}{7} \times 14 \times 14 = 2464$ cm².

43. (2) $4\pi r^2 = 64\pi$ sq.cm.

$\Rightarrow r^2 = 16$
$\Rightarrow r = 4$ cm
$\therefore$ Diameter = 8 cm

44. (2) Let $r_1 = \frac{21}{2}$ cm and

$r_2 = \frac{17.5}{2}$ cm

$\therefore$ Required ratio

$= \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{r_1^2}{r_2^2}$

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$$= \frac{\left(\frac{21}{2}\right)^2}{\left(\frac{17.5}{2}\right)^2} = \frac{21\times21}{17.5\times17.5} = 36:25$$

45. (3) Here, we can treat the balloon as sphere.
Its circumference $= 2\pi r$
$\therefore 2\pi r_1 = 20$ ...(i)
$2\pi r_2 = 25$ ....(ii)
On dividing equation (ii) by (i),

$$\Rightarrow \frac{2\pi r_2}{2\pi r_1} = \frac{25}{20} \Rightarrow \frac{r_2}{r_1} = \frac{5}{4}$$

$\therefore$ Increase $= r_2 - r_1$

$$= \frac{5}{4}r_1 - r_1 = \frac{1}{4}r_1$$

$$= \frac{1}{4}\times\frac{20}{2\pi} = \frac{5}{2\pi}$$ [From (i)]

46. (3) Let the radius of the sphere be r units.
According to the question,

$$\frac{4}{3}\pi r^3 = 4\pi r^2 \Rightarrow r = 3 \text{ units}$$

47. (2) Let Height of the cylinder $= 2r$, where r = radius of sphere.
Radius of cylinder $= r$

$$\therefore \frac{\text{Surface area of sphere}}{\text{Curved surface area of cylinder}}$$

$$= \frac{4\pi r^2}{2\pi r\times 2r} = 1:1$$

48. (3) Total curved surface area of hemisphere $= 3\pi r^2$, where r = radius of hemisphere.
$\therefore 3\pi r^2 = 1848$

$$\Rightarrow 3\times\frac{22}{7}\times r^2 = 1848$$

$$\Rightarrow r^2 = \frac{1848\times7}{3\times22} = 196$$

$$\Rightarrow r = \sqrt{196} = 14 \text{ cm.}$$

Volume of hemisphere $= \frac{2}{3}\pi r^3$

$$= \frac{2}{3}\times\pi\times14\times14\times14 \text{ cm}^3$$

$$= \frac{5488}{3}\pi \text{ cm}^3$$

According to the question,
Volume of cone = Volume of hemisphere

$$\Rightarrow \frac{1}{3}\pi r^2 h = \frac{5488}{3}\pi \text{ cm}^3$$

$$\Rightarrow r^2h = 5488$$

$$\Rightarrow 14\times14\times h = 5488$$

$$\Rightarrow h = \frac{5488}{14\times14} = 28 \text{ cm}$$

49. (4) Required ratio

$$= \frac{4\pi r_1^2}{4\pi r_2^2} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{1}{4}\right)^2 = \frac{1}{16}$$

or 1 : 16

50. (3) Volume of the solid metallic sphere $= \frac{4}{3}\pi r^3$

$$= \frac{4}{3}\times\pi\times(8)^3$$

$$= \frac{2048}{3}\pi \text{ cm}^3$$

Let the radius of the each small sphere be x cm

$$\therefore 64\times\frac{4}{3}\pi x^3 = \frac{2048}{3}\pi$$

$$\Rightarrow x^3 = \frac{2048}{64\times4} = 8$$

$$\Rightarrow x = \sqrt[3]{8} = 2 \text{ cm}$$

$\therefore$Required ratio $= 4\pi.(8)^2 : 4\pi(2)^2$
$= 64 : 4 = 16 : 1$

51. (2) S_1 = surface area of sphere $= 4\pi r^2$
S_2 = curved surface of the circumscribed cylinder
$= 2\pi RH = 2\pi(2r)(2r) = 8\pi r^2$

$$\therefore \frac{S_1}{S_2} = \frac{4\pi r^2}{8\pi r^2} = \frac{1}{2}$$

$$\Rightarrow S_1 = \frac{1}{2}S_2$$

52. (1) Let the volume be $8x^3$ and $27x^3$
$\Rightarrow$ Their radius are $2x$ and $3x$
$\therefore$ The ratio of their surface area $= 4x^2 : 9x^2 = 4 : 9$

53. (1) $\frac{2}{3}\pi r^3 = 19404$

$$\Rightarrow \frac{2}{3}\times\frac{22}{7}\times r^3 = 19404$$

$$\Rightarrow r^3 = \frac{19404\times3\times7}{2\times22} = 9261$$

$$\Rightarrow r = \sqrt[3]{21\times21\times21} = 21 \text{ cm.}$$

$\therefore$ Total surface area $= 3\pi r^2$

$$= 3\times\frac{22}{7}\times21\times21$$

$= 4158$ sq. cm.

54. (4) $\frac{4}{3}\pi r^3 = \frac{2}{3}\pi r_1^3$
[r_1 being the radius of hemisphere]

$$\Rightarrow 2r^3 = r_1^3 \Rightarrow \frac{r}{r_1} = \frac{1}{2^{\frac{1}{3}}}$$

$$\therefore \text{Required ratio} = \frac{4\pi r^2}{2\pi r_1^2}$$

$$= 2\left(\frac{r}{r_1}\right)^2 = 2\left(\frac{1}{2^{\frac{1}{3}}}\right)^2$$

$$= 2\times2^{\frac{2}{3}} : 1 = 2^{\frac{1}{3}} : 1$$

55. (3) Original surface area of sphere $= 4\pi r^2$
$\Rightarrow$ Surface area of sphere
$= 4\pi(2r)^2 = 16\pi r^2$
$= 4\times4\pi r^2 = 4$ (original surface area)

56. (3) Curved surface area of hemisphere
$= 2\pi r^2$

$$= 2\times\frac{22}{7}\times11\times11$$

$= 760.57$ sq.cm.

57. (2) If the radius of hemisphere be r cm, then
$2\pi r^2 + \pi r^2 = 27\pi$
$\Rightarrow 3\pi r^2 = 27\pi$
$\Rightarrow 3r^2 = 27$
$\Rightarrow r^2 = 9$
$\therefore r = \sqrt{9} = 3$ cm

58. (3) Perimeter of triangle

$$S = \frac{9+12+15}{2} = 18 \text{ cm}$$

$\therefore$ Area of triangle

$$= \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{18(18-9)(18-12)(18-15)}$$

$$= \sqrt{18\times9\times6\times3}$$

$= 54$ sq.cm.
$\therefore$ Total surface area of the prism = Perimeter of base $\times$ height + 2 $\times$ Area of base
$= 36\times5 + 2\times54 = 288$ sq.cm.

59. (3) Volume of right prism = Area of the base $\times$ height
$\Rightarrow 10380 = 173\times h$

$$\Rightarrow h = \frac{10380}{173} = 60 \text{ cm}$$

Now, Area of triangle

$$= \frac{\sqrt{3}}{4}\times(\text{Side})^2$$

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$\Rightarrow 173 = \frac{\sqrt{3}}{4} \times (\text{Side})^2$

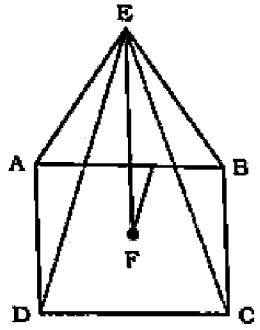
$\therefore$ Side $= \sqrt{\frac{173 \times 4}{\sqrt{3}}} = \sqrt{\frac{173 \times 4}{1.73}}$

$= 20$ cm

$\Rightarrow$ Perimeter $= 3 \times 20 = 60$ cm

$\therefore$ Area of the lateral surface = Perimeter of base $\times$ height $= 60 \times 60 = 3600$ sq.cm.

60. (2)



Height of the triangle

$= \sqrt{15^2 + 8^2}$

$= \sqrt{225 + 64} = \sqrt{289}$

$= 17$ cm

$\therefore$ Area of the lateral surface of pyramid $= 4 \times$ Area of triangle

$= 4 \times \frac{1}{2} \times$ base $\times$ height

$= 4 \times \frac{1}{2} \times 16 \times 17 = 544$ sq.cm.

61. (1) Let the length of each side of base be x metres, then

$\frac{1}{2} \times$ perimeter of base $\times$ slant height $= 12$

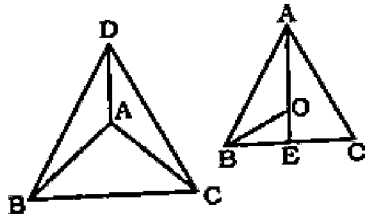
$\Rightarrow \frac{1}{2} \times 4x \times 4 = 12$

$\Rightarrow x = \frac{12}{8} = \frac{3}{2}$ metre

$\therefore$ Area of the base $= \frac{9}{4}$ sq. metre

$\therefore$ Required ratio $= 12 : \frac{9}{4} = 16 : 3$

62. (4)



AB $= 10\sqrt{3}$ cm

BE $= 5\sqrt{3}$ cm

AE $= \sqrt{(10\sqrt{3})^2 - (5\sqrt{3})^2}$

$= \sqrt{225} = 15$ cm

OE $= \frac{1}{3} \times 15 = 5$ cm

Let the height of pyramid be h cm, then

Slant height

$= \sqrt{h^2 + 5^2} = \sqrt{h^2 + 25}$

Now, Total surface area = Area of the 3 faces + Area of base

$= 3\left[\frac{1}{2} \text{base} \times \text{slant height}\right] + \text{Area}$ of the base

Total surface area

$= \frac{1}{2} \times$ (perimeter of base) $\times$ (slant height) + Area of base [base of all the 3 triangular faces is the edge of the equilateral triangle].

$\Rightarrow 270\sqrt{3} = \frac{1}{2} \times 30\sqrt{3} \times \sqrt{h^2 + 25} + \frac{\sqrt{3}}{4} \times (10\sqrt{3})^2$

$\Rightarrow 270\sqrt{3} = 15\sqrt{3}\sqrt{h^2 + 25} + 75\sqrt{3}$

$\Rightarrow 15\sqrt{3}\sqrt{h^2 + 25} = 195\sqrt{3}$

$\Rightarrow \sqrt{h^2 + 25} = 13$

$\Rightarrow h^2 + 25 = 169$

$\Rightarrow h^2 = 169 - 25 = 144$

$\Rightarrow h = \sqrt{144} = 12$ cm

63. (1) Area of the base of prism

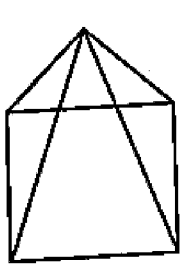
$= \frac{\sqrt{3}}{4} \times 6 \times 6 = 9\sqrt{3}$ sq.cm.

$\therefore$ Volume = Area of base $\times$ height

$\Rightarrow 81\sqrt{3} = 9\sqrt{3} \times$ height

$\Rightarrow$ height $= \frac{81\sqrt{3}}{9\sqrt{3}} = 9$ cm

64. (4)



Side of square base

$= \frac{1}{\sqrt{2}} \times 10\sqrt{2} = 10$ cm

Slant height $= \sqrt{5^2 + 12^2}$

$= 13$ cm

$\therefore$ Area of the lateral surface

$= \frac{1}{2} \times$ perimeter of base $\times$ slant height

$= \frac{1}{2} \times 40 \times 13 = 260$ sq. cm.

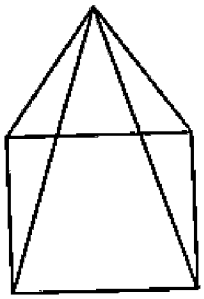
65. (4) Total surface area = Perimeter of base $\times$height + 2 $\times$ area of base

$= 36 \times 10 + 2 \times \frac{\sqrt{3}}{4} \times 12 \times 12$

$= 360 + 72\sqrt{3}$

$= 72(5 + \sqrt{3})$ sq. cm

66. (2)



Lateral surface area

$= \frac{1}{2} \times$ perimeter of base $\times$ slant height

[$\because$ Slant height $= \sqrt{8^2 + 15^2}$

$= \sqrt{64 + 225} = \sqrt{289} = 17$ cm]

$\therefore$ Required area $= \frac{1}{2} \times 64 \times 17$

$= 544$ sq.cm.

67. (1) Total surface area = Lateral surface area + 2 Area of base

= Area of base $\times$ height + area of base

$\Rightarrow 360 = 30 \times h + \frac{1}{2} \times 5 \times 12$

$\Rightarrow 360 - 30 = 30 \times h$

$\Rightarrow 30h = 330$

$\Rightarrow h = \frac{300}{30} = 10$ cm

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68. (2) According to the question
Base of hemisphere
= Base of cone
i.e. radius of hemisphere
= radius of cone ...(i)
and height of hemisphere
= height of cone ...(ii)
We know that height of hemisphere = radius of hemisphere
⇒ height of cone = radius of hemisphere [From (i)]
⇒ height of cone = radius of cone [From (ii)]
Now, Curved surface area of hemisphere $= 2\pi r^2$
Curved surface area of cone
$= \pi r\sqrt{r^2+h^2}$
$= \pi r\sqrt{r^2+r^2} (r = h)$
$= \pi r\sqrt{2r^2} = \pi r \times \sqrt{2}\, r = \sqrt{2}\,\pi r^2$
∴ Ratio of curved surface area of hemisphere and cone
$= 2\pi r^2 : \sqrt{2}\pi r^2 = 2 : \sqrt{2} = \sqrt{2} : 1$

69. (4) Let Height of the cylinder = $2r$
Curved surface area of the cylinder
$= 2\pi RH$
∴ Required ratio
$= 4\pi r^2 : 2\pi \times r \times 2r = 1 : 1$

70. (2) $\frac{\text{Volume of sphere}}{\text{Volume of cylinder}}$

$\frac{\frac{4}{3}\pi r^3}{\pi r^2 h} \Rightarrow \frac{r}{h} = \frac{3}{4}$

$\therefore \frac{\text{Curved surface area of cylinder}}{\text{Surface area of sphere}}$

$= \frac{2\pi rh}{4\pi r^2} = \frac{h}{2r} = \frac{1}{2} \times \frac{4}{3} = \frac{2}{3}$
or 2 : 3

71. (1) Total area of the canvas
$= 2\pi rh + \pi rl = \pi r(2h + l)$
$= \frac{22}{7} \times \frac{105}{2}(2 \times 3 + 63)$
$= \frac{22}{7} \times \frac{105}{2} \times 69$
= 11385 sq.metre

72. (3) Let Radius of the base = r units and height = h units
$\Rightarrow \frac{\text{Curved surface of cylinder}}{\text{Curved surface of cone}}$
$= \frac{2\pi rh}{\pi rl}$
$\Rightarrow \frac{8}{5} = \frac{2h}{l}$
$\Rightarrow \frac{4}{5} = \frac{h}{\sqrt{h^2+r^2}}$
$\Rightarrow \frac{16}{25} = \frac{h^2}{h^2+r^2}$
$\Rightarrow \frac{h^2+r^2}{h^2} = \frac{25}{16}$
$\Rightarrow 1 + \frac{r^2}{h^2} = \frac{25}{16}$
$\Rightarrow \frac{r^2}{h^2} = \frac{25}{16} - 1 = \frac{9}{16}$
$\Rightarrow \frac{r}{h} = \frac{3}{4}$ or 3 : 4

73. (1) Slant height of cone
$l = \sqrt{6^2+8^2}$
$= \sqrt{36+64} = \sqrt{100}$
= 10 cm
∴ Curved surface of cylinder : Curved surface of cone
$= 2\pi rh : \pi rl$
$= 2h : l = 16 : 10 = 8 : 5$

74. (3) Radius of cylinder = r units and height = r units
[∵ height of hemisphere = radius]
∴ Required ratio
$= 2\pi r^2 + 2\pi r^2 : 2\pi r^2 + \pi r^2$
= 4 : 3

75. (2)



Length of box = 24 – (2 × 3)
= 18 cm
Width of box = 18 – 2 × 3 = 12 cm
Height of box = 3 cm
∴ Surface area of box
= 18 × 12 + 2 (12 × 3 + 3 × 18)
= 216 + 180 = 396 sq. cm

76. (1) Volume of all three cubes
$= (4^3 + 5^3 + 6^3)$ cu.cm.
= (64 + 125 + 216) cu.cm.
= 405 cu.cm.
∴ Volume of new cube
= 405 – 62
= 343 cu.cm.
∴ Edge of cube = $\sqrt[3]{343}$ = 7 cm.
∴ Surface area = 6×7^2
= 294 sq. cm.

77. (4) Percentage increase
$= \left(50 + 50 + \frac{50 \times 50}{100}\right)\% = 125\%$

78. (4) Total surface of the tetrahedron
$= 4 \times \frac{\sqrt{3}}{4} \times 12^2$
$= 144\sqrt{3}$ sq.cm.

79. (2)



Total surface area of the toy
$= 2\pi r^2 + \pi rl$
$= \pi r\left(2r + \sqrt{r^2+h^2}\right)$
$= \frac{22}{7} \times 3\left(2 \times 3 + \sqrt{3^2+4^2}\right)$
$= \frac{22}{7} \times 3(6 + 5)$
$= \frac{22 \times 3 \times 11}{7} = 103.71$ sq.cm.

80. (2) Length of room = $\sqrt{48}$
= $4\sqrt{3}$ metre
∴ Diagonal = $\sqrt{3 \times \left(4\sqrt{3}\right)^2}$
= $\sqrt{3 \times 16 \times 3}$ = 12 metre

81. (3) Radius of sphere = r units
$\therefore \frac{\text{Surface area of sphere}}{\text{Surface area of hemisphere}}$
$= \frac{4\pi r^2}{3\pi r^2} = \frac{4}{3} = 4 : 3$

82. (3) Surface area of sphere
$= 4\pi r^2$
$\therefore 4 \times \frac{22}{7} \times r^2 = 346.5$
$\Rightarrow 4 \times 22 \times r^2 = 346.5 \times 7$
$\Rightarrow r^2 = \frac{346.5 \times 7}{4 \times 22} = 27.5625$
$\therefore r = \sqrt{27.5625} = 5.25$ cm

83. (3) Hypotenuse of base
$= \sqrt{5^2+12^2}$
$= \sqrt{25+144} = \sqrt{169}$
= 13 cm
∴ Surface area
$= h(a + b + c)$

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$= 10(5 + 12 + 13) = 300$ sq.cm.

Area of base $= \frac{1}{2} \times 5 \times 12$

$= 30$ sq.cm.

$\therefore$ Total surface area of lateral surfaces

$= 300 + 30$

$= 330$ sq.cm.

84. (2) Length $= 5x$ cm

Breadth $= 3x$ cm

Total surface area of parallelopiped

$= 2(l \times b + b \times h + h \times l)$

$= 2(5x \times 3x + 3x \times 6 + 6 \times 5x)$

$= 2(15x^2 + 18x + 30x)$

$= 2(15x^2 + 48x)$

$\therefore 2(15x^2 + 48x) = 558$

$\Rightarrow 15x^2 + 48x = \frac{558}{2} = 279$

$\Rightarrow 5x^2 + 16x = 93$

$\Rightarrow 5x^2 + 16x - 93 = 0$

$\Rightarrow 5x^2 + 31x - 15x - 93 = 0$

$\Rightarrow x(5x + 31) - 3(5x + 31) = 0$

$\Rightarrow (x - 3)(5x + 31) = 0$

$\Rightarrow x = 3$

$\therefore$ Length $= 5x = 5 \times 3 = 15$ cm $= 1.5$ dm

85. (2) Required area $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 3.5 \times 25$

$= 550$ sq. cm.

86. (3) Let, length $= a$ cm.

breadth $= b$ cm.

height $= c$ cm.

$\therefore a + b + c = 24$ — (i)

and $\sqrt{a^2 + b^2 + c^2} = 15$

$\Rightarrow a^2 + b^2 + c^2 = 15 \times 15 = 225$ — (ii)

$\therefore (a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 24^2 = 225 + 2(ab + bc + ca)$

$\Rightarrow 576 = 225 + 2(ab + bc + ca)$

$\Rightarrow 2(ab + bc + ca) = 576 - 225$

$= 351$ sq.cm. = Total surface area

87. (3) Length of parallelopiped $= 3x$ cm

breadth $= 4x$ cm and height $= 6x$ cm.

$\therefore$ Its volume $= 576$ cu.cm.

$\Rightarrow 3x \times 4x \times 6x = 576$

$\Rightarrow 72x^3 = 576$

$\Rightarrow x^3 = \frac{576}{72} = 8$

$\Rightarrow x = \sqrt[3]{8} = 2$

$\therefore$ Total surface area

$= 2(l \times b + b \times h + h \times l)$

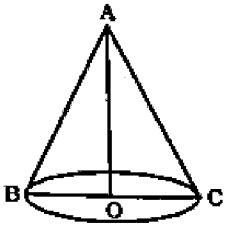
$= 2(3x \times 4x + 4x \times 6x + 6x \times 3x)$

$= 2(12x^2 + 24x^2 + 18x^2)$

$= 108\,x^2$

$= 108 \times 2^2 = 108 \times 4 = 432$ sq. cm.

88. (4)



OB $= 3$ cm

OA $= 4$ cm

$\therefore$ AB $= l$

$= \sqrt{3^2 + 4^2} = \sqrt{9 + 16}$

$= \sqrt{25} = 5$ cm

$\therefore$ Total surface area $= \pi rl + \pi r^2$

$= \pi r(l + r)$

$= \frac{22}{7} \times 3(5 + 3)$

$= \frac{22}{7} \times 3 \times 8$

$= 75.4$ sq.cm.

89. (1) Curved surface area of first cone $= \pi r_1 l_1$

Curved surface area of second cone $= \pi r_2 l_2$

$\pi r_1 l_1 = 2\pi r_2 l_2$

$\Rightarrow r_1 l_1 = 2 r_2 l_2$

$\Rightarrow \frac{r_1}{r_2} = \frac{2l_2}{l_1} = \frac{2 \times 2l_1}{l_1} = \frac{4}{1} = 4:1$

90. (1) Whole surface of the remaining solid

$= 2\pi rh + \pi r^2 + \pi rl$

where l = slant height of cone.

$l = \sqrt{r^2 + h^2} = \sqrt{3^2 + 4^2}$

$= \sqrt{9 + 16} = \sqrt{25} = 5$ cm

$\therefore$ Required area

$= (2 \times \pi \times 4 \times 3 + \pi \times 3 \times 3 + \pi \times 3 \times 5)$ square cm.

$= (24\pi + 9\pi + 15\pi)$ square cm.

$= 48\pi$ square cm.

91. (4) Let the thickness of wood $= x$ cm.

$\therefore$ Area of the inner surface

$= 2(9 - 2x)(10 - 2x) + 2(9 - 2x)(7 - 2x) + 2(7 - 2x)(10 - 2x) = 262$

Putting $x = 1$, the equation is satisfied.

92. (3) Total surface area

$= 4 \times \frac{\sqrt{3}}{4} \times (1)^2 = \sqrt{3}$ sq.cm.

93. (4) Number of paving stones

$= \frac{\text{Area of courtyard}}{\text{Area of a stone}}$

$= \frac{30 \times 17.5}{2.5 \times 2} = 105$

94. (4) Area of the base of conical tent

$= 346.5$ sq. metre

$\therefore \pi r^2 = 346.5$

$\Rightarrow \frac{22}{7} \times r^2 = 346.5$

$\Rightarrow r^2 = \frac{346.5 \times 7}{22} = 110.25$

$\Rightarrow r = \sqrt{110.25} = 10.5$ metre

$\therefore$ Slant height $= \sqrt{h^2 + r^2}$

$= \sqrt{(14)^2 + (10.5)^2}$

$= \sqrt{196 + 110.25}$

$= \sqrt{306.25} = 17.5$ metre

$\therefore$ Area of curved surface of the tent $= \pi rl$

$= \frac{22}{7} \times 10.5 \times 17.5$

$= 577.5$ sq. metre

$\therefore$ Length of canvas

$= \frac{577.5}{\frac{75}{100}} = \frac{577.5 \times 100}{75}$

$= \frac{57750}{75} = 770$ metre

95. (4) Let the radius of the base of conical tent be r metre and its height be h metre.

$\therefore$ Area of base $= \pi r^2$

$= 16 \times 5 = 80$ .....(i)

Volume $= \frac{1}{3} \pi r^2 h$

$= 5 \times 100$ cu. metre .....(ii)

On dividing equation (ii) by (i),

$\frac{1}{3} \frac{\pi r^2 h}{\pi r^2} = \frac{5 \times 100}{80}$

$\Rightarrow \frac{h}{3} = \frac{25}{4}$

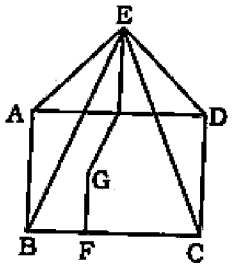
$\Rightarrow h = \frac{75}{4} = 18.75$ metre.

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96. (4) Whole surface area of a brick
$= 2(l \times b + b \times h + h \times l)$
$= 2(22.5 \times 10 + 10 \times 7.5 + 7.5 \times 22.5)$
$= 2(225 + 75 + 0.75 \times 225)$
$= 2 \times 75 (3 + 1 + 0.75 \times 3)$
$= 150 \times 6.25$
$= 937.5$ sq. cm.
∴ Number of bricks
$= \frac{9.375 \times 100 \times 100}{937.5} = 100$

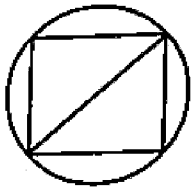
97. (3) Length of park = $3x$ metre (let)
Breadth = $2x$ metre
Perimeter of park = Distance covered by cyclist
$= \frac{12 \times 8}{60} = \frac{8}{5}$ km.
$= \left(\frac{8}{5} \times 1000\right)$ metre
$= 1600$ metre
According to the question,
$2(3x + 2x) = 1600$
$\Rightarrow 10x = 1600 \Rightarrow x = \frac{1600}{10} = 160$
∴ Area of the park $= 3x \times 2x$
$= 6x^2 = 6 \times (160)^2$
$= 153600$ sq. metre

98. (4)



Slant height = BE = $\sqrt{12^2 + 5^2}$
$= \sqrt{144 + 25} = \sqrt{169} = 13$ cm.
∴ Lateral surface of pyramid
$= \frac{1}{2} \times$ perimeter of base $\times$ slant height
$= \frac{1}{2} \times 40 \times 13 = 260$ sq. cm.
Area of base $= 10 \times 10$
$= 100$ sq. cm.
∴ Total surface area
$= (260 + 100)$ sq. cm.
$= 360$ sq. cm.

99. (1)



Diagonal of cube = Diameter of sphere
$= 6\sqrt{3} \times 2 = 12\sqrt{3}$ cm.
∴ Edge of cube $= \frac{12\sqrt{3}}{\sqrt{3}}$
$= 12$ cm.
∴ Surface area of cube
$= 6 \times (\text{edge})^2$
$= (6 \times 12 \times 12)$ sq. cm.
$= 864$ sq. cm.

100. (4) Curved surface area of hemisphere $= 2\pi r^2$
Curved surface area of cone
$= \pi r l$
$= \pi r \sqrt{r^2 + r^2}$
$[\because h = r]$
$= \sqrt{2}\pi r^2$
∴ Required ratio
$= 2\pi r^2 : \sqrt{2}\pi r^2 = \sqrt{2} : 1$

101. (3) Curved surface area of cylinder $= 2\pi RH$
∴ According to the question,
$2\pi rH = 4\pi rh$
$\Rightarrow H = 2h$ units

102. (1) Inner and outer surface areas of the bowl $= 4\pi r^2$
$= 4 \times \frac{22}{7} \times 3.5 \times 3.5$
$= 154$ sq. cm.
∴ Cost of painting
$= 154 \times \frac{5}{10}$
$= $ Rs. 77

103. (4) Total surface area of right circular cylinder $= 2\pi rh + 2\pi r^2$
$= 2\pi r(h + r)$
$= 2 \times \frac{22}{7} \times 7(20 + 7)$
$= 2 \times 22 \times 27 = 1188$ sq. cm.

104. (4) Initial radius of sphere = r cm (let).
According to the question,
$4\pi(r + 2)^2 - 4\pi r^2 = 352$
$\Rightarrow 4\pi((r + 2)^2 - r^2) = 352$
$\Rightarrow r^2 + 4r + 4 - r^2 = \frac{352}{4\pi}$
$= \frac{352}{4 \times \frac{22}{7}}$
$\Rightarrow 4r + 4 = \frac{352 \times 7}{4 \times 22} = 28$
$\Rightarrow 4r = 28 - 4 = 24$
$\Rightarrow r = \frac{24}{4} = 6$ cm.

105. (3) Levelled area in one revolution of roller $= 2\pi rh$
$= 2 \times \frac{22}{7} \times 42 \times 120$
$= 31680$ sq. cm.
Area levelled in 500 revolutions
$= (31680 \times 500)$ sq. cm.
$= 15840000$ sq. cm.
$= 1584$ sq. metre
∴ Required cost
$= $ Rs. (1584×1.5)
$= $ Rs. 2376

106. (4) Internal surface area of hemispherical bowl $= 2\pi r^2$
$= (2 \times 3.14 \times 6 \times 6)$ sq.cm.
$= 226.08$ sq.cm.

107. (1) Surface area of sphere
$= 4\pi r^2$
$\Rightarrow 4\pi r^2 = 616$
$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 616$
$\Rightarrow r^2 = \frac{616 \times 7}{4 \times 22} = 49$
$\Rightarrow r = \sqrt{49} = 7$ cm
∴ Volume of sphere $= \frac{4}{3}\pi r^3$
$= \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$
$= \frac{4312}{3} = 1437\frac{1}{3}$ cu.cm.

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TYPE-VI

1. (1) Let Circumference of base $= \pi d$

$\Rightarrow \pi d = 6\pi \Rightarrow d = 6$ cm

$\therefore$ Height, $h = 6$ cm

Volume of the cylinder,

$$V = \frac{\pi d^2 h}{4}$$

$$= \frac{\pi d^3}{4} = \frac{\pi(6)^3}{4} \text{ cc} = 54\pi \text{ cc}$$

2. (1) Required number of tins

$$= \frac{\text{Volume of cylindrical drum}}{\text{volume of a tin}}$$

$$= \frac{22 \times 350 \times 350 \times 240}{7 \times 2 \times 2 \times 25 \times 22 \times 35} = 1200$$

3. (2) Volume of raised water in cylindrical beaker

$$= \pi r^2 h = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 5.6$$

$= 215.6$ cu.cm.

Volume of a marble $= \frac{4}{3}\pi r^3$

$$= \frac{4}{3} \times \frac{22}{7} \times (0.7)^3 = \frac{4.312}{3} \text{ cu.cm.}$$

$\therefore$ Number of marbles

$$= \frac{215.6}{\frac{4.312}{3}} = \frac{215.6 \times 3}{4.312} = 150$$

4. (3) Volume of cylindrical vessel $= \pi r^2 h$

Volume of cone $= \frac{1}{3}\pi r^2 h$

$$\therefore \text{Number of cones} = \frac{\pi r^2 h}{\frac{1}{3}\pi r^2 h} = 3$$

5. (3) No. of Cubes

$$= \frac{\text{Volume of larger cube}}{\text{Volume of smaller cube}}$$

$$= \frac{(15)^3}{(3)^3} = \frac{15 \times 15 \times 15}{3 \times 3 \times 3}$$

$= 5 \times 5 \times 5 = 125$

6. (3) The number of cubes will be least if each cube will be of maximum edge.

$\therefore$ Maximum possible length = HCF of 6, 9, 12 = 3

$\therefore$ Volume of cube $= 3 \times 3 \times 3$ cm^3

$\therefore$ Number of cubes

$$= \frac{6 \times 9 \times 12 \text{ cm}^3}{3 \times 3 \times 3 \text{ cm}^3} = 24$$

7. (4) Volume of the box $= (56 \times 35 \times 28)$ cm^3

Volume of a soap cake $= (6 \times 5 \times 4)$ cm^3

$\therefore$ Number of soap cakes

$$= \frac{56 \times 35 \times 28}{8 \times 5 \times 4} = 343$$

8. (1) Let the cost of carpeting per sq. metre be ₹ 1.

$\therefore$ Area of the room $= 120$ sq. metre

Let the breadth of the room be x metres.

Then, Length of room

$$= \frac{120}{x} \text{ metres}$$

New cost $= 120 - 20 =$ ₹ 100

Breadth $= (x - 4)$ metres

Then, $\frac{120}{x} \times (x - 4) = 100$

$$\Rightarrow \frac{6}{x}(x - 4) = 5$$

$\Rightarrow 6x - 24 = 5x$

$\Rightarrow x = 24$

$\therefore$ Breadth of the room $= 24$ metres

9. (3) Area of the verandah

$= (25 + 2 \times 3.5)(15 + 2 \times 3.5) - 25 \times 15$

$= 32 \times 22 - 25 \times 15 = 704 - 375$

$= 329$ sq.metre

$\therefore$ Cost of flooring $= 329 \times 27.5$

$=$ ₹ 9047.5

10. (2) Volume of bigger cube $= 6 \times 6 \times 6$

$= 216$ cu. cm.

Volume of unit cube

$= 1 \times 1 \times 1 = 1$ cu. cm

Number of uncoloured cubes

$= 4 \times 4 \times 4 = 64$ [because edge of uncoloured cube = 4 cm]

11. (4) Area of the curved surface $= \pi rl$

where, $l = \sqrt{r^2 + h^2} = \sqrt{(32)^2 + (60)^2}$

$= \sqrt{4624} = 68$ cm

Area of the curved surface

$$= \pi rl = \frac{22}{7} \times 32 \times 68$$

$\therefore$ Total cost of painting

$$= 35 \times \frac{22}{7} \times 32 \times 68 \times \frac{1}{10000}$$

$=$ ₹ 23.94 approx.

12. (2) Volume of a right circular cone

$$= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times (3)^2 \times 4$$

$= 12\pi$ cm^3

Volume of a solid sphere

$$= \frac{4}{3}\pi \times (6)^3 = 288\pi \text{ cm}^3$$

Let the number of cones be n.

$\therefore n \times 12\pi = 288\pi$

$$\Rightarrow n = \frac{288\pi}{12\pi} = 24$$

13. (4) Distance covered by the wheel in one revolution $= \pi d$

$$= \frac{22}{7} \times 7 = 22 \text{ metre}$$

$\therefore$ Number of revolutions

$$= \frac{22 \times 1000}{22} = 1000$$

14. (1) Volume of bigger ball $= \frac{4}{3}\pi r^3$

$$= \frac{4}{3} \times \pi \times 10 \times 10 \times 10 \text{ cu. cm.}$$

Volume of smaller ball

$$= \frac{4}{3}\pi(0.5)^3$$

$\therefore$ Possible number of smaller balls

$$= \frac{\frac{4}{3}\pi \times 10 \times 10 \times 10}{\frac{4}{3}\pi \times 0.5 \times 0.5 \times 0.5} = 8000$$

15. (1) Volume of rectangular block $= 11 \times 10 \times 5 = 550$ cubic metre $= 550000$ cubic dm

Volume of a sphere

$$= \frac{4}{3}\pi \times \frac{5}{2} \times \frac{5}{2} \times \frac{5}{2} \text{ cubic dm.}$$

$$= \frac{500}{8} \text{ cubic dm}$$

$\therefore$ Required answer

$$= \frac{550000 \times 8}{500} = 8800$$

16. (4) Let number of balls $= n$

$\therefore$ Volume of n balls = Volume of cone

$$\Rightarrow n \times \frac{4}{3}\pi r^3 = \frac{1}{3}\pi R^2 h$$

$$\Rightarrow n \times \frac{4}{3}(2)^3 = \frac{1}{3} \times (20)^2 \times 10$$

$\Rightarrow n = 125$

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17. (4) Let the radius of the base of cylinder be r units.
Height = $8r$ units
Its volume = $\pi r^2 \times 8r$
= $8\pi r^3$ cu.units

Radius of sphere = $\frac{r}{2}$ units

Volume = $\frac{4}{3}\pi\left(\frac{r}{2}\right)^3$

= $\frac{\pi r^3}{6}$ cu.units

∴ Number of spherical balls

= $\frac{8\pi r^3}{\pi r^3} \times 6 = 48$

18. (1) Volume of the solid cube
= (44 × 44 × 44) cu.cm.

Volume of a bullet = $\frac{4}{3}\pi r^3$

= $\left(\frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2\right)$ cu.cm.

∴ Number of bullets

= $\frac{44 \times 44 \times 44 \times 3 \times 7}{4 \times 22 \times 2 \times 2 \times 2}$ = 2541

19. (4) Volume of cylinder
= $\pi r^2 h = \pi \times 9 \times 5$
= 45π cu.cm.

Volume of a cone = $\frac{1}{3}\pi r^2 h$

= $\frac{1}{3} \times \pi \times \frac{1}{100} \times 1$

= $\frac{\pi}{300}$ cu.cm.

∴ Number of cones = $\frac{45\pi}{\frac{\pi}{300}}$

= 13500

20. (1) Volume of metallic cone

= $\frac{1}{3}\pi r^2 h$

= $\frac{1}{3}\pi \times 30 \times 30 \times 45$ cu.cm.

Volume of a sphere = $\frac{4}{3}\pi R^3$

= $\frac{4}{3}\pi \times 5 \times 5 \times 5$ cu. cm.

∴ Required number of spheres

= $\frac{\frac{1}{3}\pi \times 30 \times 30 \times 45}{\frac{4}{3}\pi \times 5 \times 5 \times 5}$ = 81

21. (1) Volume of water flowing from the pipe in 1 minute
= $\pi \times 0.25 \times 0.25 \times 1000$ cu.cm.
Volume of conical vessel

= $\frac{1}{3}\pi \times 15 \times 15 \times 24$ cu.cm.

∴ Required time

= $\frac{\pi \times 15 \times 15 \times 24}{3\pi \times 0.25 \times 0.25 \times 1000}$

= 28 minutes 48 seconds

22. (4) Volume of sphere

= $\frac{4}{3}\pi\,(10.5)^3$ cu.cm.

Volume of a cone

= $\frac{1}{3}\pi\,(3.5)^2 \times 3$ cu.cm.

∴ Number of cones

= $\frac{\frac{4}{3}\pi(10.5)^3}{\frac{1}{3}\pi(3.5)^2 \times 3}$ = 126

23. (4) Slant height of the tent (l)

= $\sqrt{12^2 + 9^2}$

= $\sqrt{144 + 81} = \sqrt{225}$

= 15 metre

∴ Curved surface area of the tent
= $\pi r l$
= (3.14 × 12 × 15) sq. metre
∴ Total cost
= ₹ (3.14 × 12 × 15 ×120)
= ₹ 67824

24. (4) Single equivalent decrease for 50% and 50%

= $\left(-50 - 50 + \frac{50 \times 50}{100}\right)\%$

= (– 100 + 25)% = – 75%
Single equivalent percent for – 75% and 50%

= $\left(-75 + 50 - \frac{75 \times 50}{100}\right)\%$

= (– 25 – 37.5)% = – 62.5%
Negative sign shows decrease.

25. (1) Percentage increase

= $\left(x + y + \frac{xy}{100}\right)\%$

$\Rightarrow 0 = \left(10 + y + \frac{10y}{100}\right)$

$\Rightarrow -10 = y + \frac{y}{10}$

$\Rightarrow -10 = \frac{10y + y}{10}$

$\Rightarrow 11y = -100$

$\Rightarrow y = \frac{-100}{11} = -9\frac{1}{11}\%$

Negative sign shows decrease.

OR

Percentage decrease

= $\frac{10}{100 + 10} \times 100$

= $\frac{100}{11} = 9\frac{1}{11}\%$

26. (4) Increase in height = 0%

Volume = $\frac{1}{3}$ area of base × height

∴ Percentage increase

= $\left(x + y + \frac{xy}{100}\right)\%$

= $\left(100 + 0 + \frac{100 \times 0}{100}\right)\%$

= 100%

27. (4) Required percentage increase

= $\left(x + y + \frac{xy}{100}\right)\%$

= $\left(100 + 100 + \frac{100 \times 100}{100}\right)\%$

= 300%

28. (4) Edge of the original cube = x units

Edge of the new cube = $\frac{3x}{4}$ units

∴ Required ratio = $\frac{x^3}{\left(\frac{3x}{4}\right)^3}$

= $\frac{4^3}{3^3} = \frac{64}{27}$

29. (2) Percentage decrease

= $\frac{10}{100 + 10} \times 100$

= $\frac{100}{11} = 9\frac{1}{11}\%$

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TYPE-VII

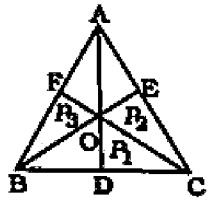
1. (3) $\theta = \frac{s}{r}$

$\Rightarrow s = r\theta$

$\Rightarrow s = r_1\theta_1 = r_2\theta_2$

$\Rightarrow \frac{r_1}{r_2} = \frac{\theta_2}{\theta_1} = \frac{75}{60} = \frac{5}{4}$ or 5 : 4

2. (1)



Let the side of ΔABC be x.
O is the point in the interior of ΔABC.
OD, OE, OF are perpendiculars.
$\therefore$ Clearly
$\Delta OAB + \Delta OBC + \Delta OAC = \Delta ABC$

$\Rightarrow \frac{1}{2}x \times p_3 + \frac{1}{2}x \times p_1 + \frac{1}{2}x \times p_2 = \frac{\sqrt{3}}{4}x^2$

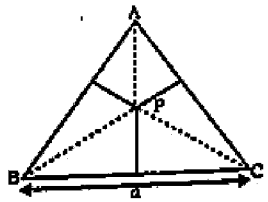
$\Rightarrow \frac{1}{2}x(p_3 + p_1 + p_2) = \frac{\sqrt{3}}{4}x^2$

$\Rightarrow p_1 + p_2 + p_3 = \frac{\sqrt{3}}{2}x$

$\Rightarrow x = \frac{2}{\sqrt{3}}(p_1 + p_2 + p_3)$

3. (2) Let the sides of triangle be $3x$, $4x$ and $5x$. Here,
$(3x)^2 + (4x)^2 = (5x)^2$
$\therefore$ The triangle is right angled.
Hence, the largest angle = 90°

4. (3) Let ABC be equilateral triangle of side a cm and P be a point inside it.



From the figure.
Area of ΔAPB + Area of ΔPBC + Area of ΔAPC = Area of ΔABC

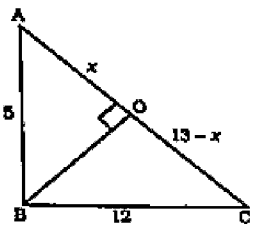
$\Rightarrow \frac{1}{2} \times a \times 6 + \frac{1}{2} \times a \times 7 + \frac{1}{2} \times a \times 8 = \frac{\sqrt{3}}{4}a^2$

$\Rightarrow \frac{1}{2}a(6 + 7 + 8) = \frac{\sqrt{3}}{4}a^2$

$\Rightarrow \frac{21a}{2} = \frac{\sqrt{3}}{4}a^2$

$\Rightarrow a = \frac{21}{2} \times \frac{4}{\sqrt{3}} = 14\sqrt{3}$ cm.

5. (2)



In ΔABC,

$AC = \sqrt{12^2 + 5^2} = \sqrt{144 + 25}$

$= \sqrt{169} = 13$

Let $AO = x$. Then
$OC = 13 - x$
$OB^2 = 5^2 - x^2 = 25 - x^2$ ....(i)
$OB^2 = 12^2 - (13 - x)^2$
$= 144 - 169 - x^2 + 26x$ ....(ii)
From (i) and (ii),
$25 - x^2 = -25 - x^2 + 26x$
$\Rightarrow 26x = 50$

$\Rightarrow x = \frac{50}{26} = \frac{25}{13}$

$\therefore OB^2 = 25 - x^2$

$= 25 - \left(\frac{25}{13}\right)^2$

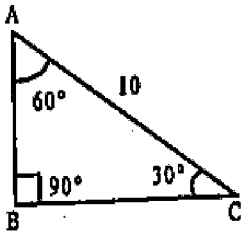
$\therefore OB^2 = 25 - x^2 = 25 - \left(\frac{25}{13}\right)^2$

$OB^2 = 25\left(1 - \frac{25}{169}\right) = 25 \times \frac{144}{169}$

$OB = \sqrt{\frac{25 \times 144}{169}} = \frac{5 \times 12}{13} = \frac{60}{13}$

$= 4\frac{8}{13}$ cm

6. (1)



From ΔABC

$\sin 30° = \frac{AB}{AC}$

$\Rightarrow \frac{1}{2} = \frac{AB}{AC}$

$\Rightarrow AB = \frac{1}{2}AC = \frac{1}{2} \times 10 = 5$ cm

$\therefore BC = \sqrt{AC^2 - AB^2} = \sqrt{10^2 - 5^2}$

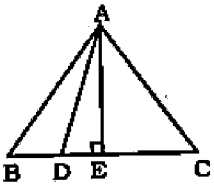
$= \sqrt{100 - 25} = \sqrt{75} = 5\sqrt{3}$ cm

$\therefore$ Area of ΔABC

$= \frac{1}{2} \times AB \times BC$

$= \frac{1}{2} \times 5 \times 5\sqrt{3} = \frac{25\sqrt{3}}{2}$ cm^2

7. (3)



$AE \perp BC$
$\therefore$ BE = EC = 5 cm
AC = 10 cm

$AE = \sqrt{10^2 - 5^2}$

$= \sqrt{100 - 25} = \sqrt{75} = 5\sqrt{3}$ cm
DE = DC − EC

$= \frac{2}{3} \times 10 - 5 = \frac{5}{3}$ cm

$\therefore AD = \sqrt{\left(\frac{5}{3}\right)^2 + \left(5\sqrt{3}\right)^2}$

$= \sqrt{\frac{25}{9} + 75} = \sqrt{\frac{25 + 675}{9}}$

$= \sqrt{\frac{700}{9}} = \frac{10\sqrt{7}}{3}$ cm

8. (3) Smallest side of the triangle = x cm (let)
$\therefore$ Second side of triangle
$= 40 - 17 - x = 23 - x$

Semi-perimeter $= s = \frac{40}{2} = 20$

$\therefore \sqrt{s(s-a)(s-b)(s-c)} = 60$

$\Rightarrow \sqrt{20(20 - 17)(20 - x)(20 - 23 + x)} = 60$
$\Rightarrow (20 - x)(x - 3) = 60$
$\Rightarrow 20x - 60 - x^2 + 3x = 60$
$\Rightarrow x^2 - 23x + 120 = 0$
$\Rightarrow x^2 - 15x - 8x + 120 = 0$
$\Rightarrow x(x - 15) - 8(x - 15) = 0$
$\Rightarrow (x - 8)(x - 15) = 0$
$\Rightarrow x = 8$ or 15
$\Rightarrow$ Smallest side = 8 cm

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9. (3) Both the triangles are equiangular.
⇒ These are similar triangles.
∴ Ratio of their height
= Square root of ratio of their area
= 1 : 2

10. (1) We know that if all the sides of a parallelogram are equal, it is called a rhombus.
Area = Base × Height
= 6.5 × 10 = 65 cm^2
Let the diagonals of the rhombus be d_1 and d_2.

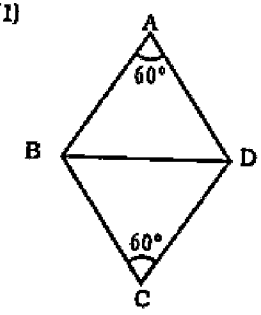
$\therefore$ Area = $\frac{1}{2} d_1 d_2$

$\Rightarrow 65 = \frac{1}{2} \times 26 \times d_2$

$\Rightarrow d_2 = \frac{2 \times 65}{26} \Rightarrow d_2 = 5$

Hence, other diagonal of rhombus = 5 cm.

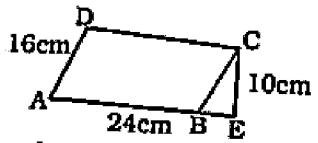
11. (1)



Let AB = BC = CD = DA = 10 cm
$\angle BAD = \angle BCD = 60°$
$\therefore \angle ABC = \angle ADC = 120°$
and $\angle CBD = \angle CDB = 60°$
$\therefore$ BD = 10cm

12. (2) Area of the parallelogram
= Base × Height
= 15 × 12 = 180 sq.cm.
$\therefore$ 180 = 18 × height
$\Rightarrow$ Height = 10 cm

13. (3)



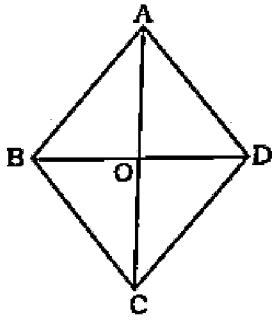
Area of the parallelogram
= Base × Height
= 24 × 10 = 240 sq.cm.
If the required distance be x cm, then
240 = 16 × x

$\Rightarrow x = \frac{240}{16} = 15$ cm

14. (4) Area of parallelogram
= base × height
= 27 × 12 = 324 sq. cm.
Again,
324 = 36 × h

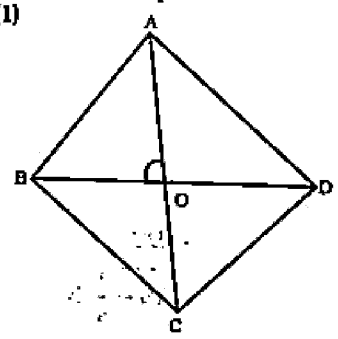
$\Rightarrow h = \frac{324}{36} = 9$ cm

15. (1) BO = 4 units; OC = 3 units
$\angle BOC = 90°$



$\therefore$ BC = $\sqrt{4^2 + 3^2}$ = 5 units
$\therefore$ BC^2 = 25 sq. units

16. (1)



$\angle BAD = 60°$
$\therefore \angle BAO = 30°$
$\angle ABO = 60°$

$\therefore \sin 60° = \frac{OA}{AB}$

$\Rightarrow \frac{\sqrt{3}}{2} \times 8 = OA$

$\Rightarrow OA = 4\sqrt{3}$

$\therefore AC = 8\sqrt{3}$ cm

17. (3) Side of rhombus

$= \sqrt{\left(\frac{d_1}{2}\right)^2 + \left(\sqrt{\frac{d_2}{2}}\right)^2}$

$= \sqrt{6^2 + 8^2} = 10$ cm

18. (3) Let the number of sides of the regular polygon be n, then

$\therefore \left(\frac{2n-4}{n}\right) \times 90$

$= 8 \times \frac{4 \times 90°}{n} + 18$

$\Rightarrow \left(\frac{2n-4}{n}\right) \times 5 = \frac{160}{n} + 1$
$\Rightarrow 10n - 20 = 160 + n$
$\Rightarrow 10n - n = 180$
$\Rightarrow 9n = 180$
$\Rightarrow n = 20$

19. (4) Number of sides of polygon

$= \frac{360}{72} = 5$

$\therefore$ Sum of interior angles
$= (2n - 4) \times 90°$
$= (2 \times 5 - 4) \times 90° = 540°$

20. (4) Volume of water drawn from cylinder

$= \pi r^2 h = \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \times h$

$\therefore \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2} \times h = 11000 cm^3$

$\therefore h = \frac{11000 \times 7 \times 2 \times 2}{22 \times 35 \times 35}$

$= \frac{80}{7} = 11\frac{3}{7}$ cm.

21. (2) When a right circular cylinder is formed by rolling a rectangular paper along its length, the circumference of base is equal to length of paper.

$\therefore 2\pi r = 12 \Rightarrow r = \frac{12}{2\pi} = \frac{6}{\pi}$ cm

22. (2) Slant height of cone (l)

$= \sqrt{r^2 + h^2}$

$= \sqrt{2^2 + \left(2\sqrt{3}\right)^2}$

$= \sqrt{4 + 12} = \sqrt{16} = 4$ cm

23. (3) Radius of sector = Slant height of cone

$= \sqrt{h^2 + r^2}$

$= \sqrt{6^2 + 8^2} = \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm

24. (3) Volume of cone

$= \frac{1}{3} \pi r^2 h$

$= \frac{\pi}{3} \times 1.6 \times 1.6 \times 3.6$

$= \pi \times 1.6 \times 1.6 \times 1.2$ cu.cm.

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$\therefore \frac{1}{3} \times \pi \times 1.2 \times 1.2 \times H$

(H is height of new cone)

$= \pi \times 1.6 \times 1.6 \times 1.2$

$\Rightarrow H = \frac{1.6 \times 1.6 \times 3}{1.2} = 6.4$ cm

25. (4) Volume of copper sphere

$= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 3 \times 3 \times 3$

$= \frac{36 \times 22}{7}$ cm^3

Radius of the wire = 0.1 cm

The wire can be treated as a solid cylinder.

Let its length be h cm.

$\therefore \pi \times (0.1)^2 \times h = \frac{36 \times 22}{7}$

$\Rightarrow h = 36 \times \frac{22}{7} \times \frac{7}{22} \times \frac{1}{0.01}$

= 3600 cm = 36 m.

∴ Length of the wire

= 36 metres.

26. (1) $S = 4\pi r^2$, $V = \frac{4}{3}\pi r^3$

$\therefore \frac{S^3}{V^2} = \frac{64\pi^3 r^6}{\frac{16}{9}\pi^2 r^6}$

$= \frac{64\pi \times 9}{16} = 36\pi$

27. (4) Let Height of glass = h cm

then Radius = $\frac{h}{2}$ cm

Volume of glass = volume of 32000 drops

$\therefore \frac{1}{3}\pi\left(\frac{h}{2}\right)^2 \times h$

$= \frac{4}{3}\pi\left(\frac{1}{20}\right)^3 \times 32000$

$\Rightarrow \frac{h^3}{4} = 4 \times \frac{1}{8000} \times 32000$

$\Rightarrow h^3 = 4^3 \Rightarrow h = 4$ cm

28. (3) Walls are 5 cm thick.

∴ Internal length

= (330 – 2 × 5) cm = 320 cm.

Let the thickness of bottom be x

Breadth = (260 – 10)cm = 250 cm

Height = (110 – x) cm

Here, the cistern is assumed to be open and x is the thickness of bottom.

$\therefore$ 320 × 250 × (110 – x)

= 8000 litres

$\Rightarrow$ 320 × 250 × (110 – x)

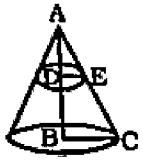
= 8000 × 1000 cm^3

$\Rightarrow (110 - x) = \frac{8000000}{320 \times 250}$

$\Rightarrow$ 110 – x = 100

$\Rightarrow x$ = 10 cm or 1 dm.

29. (4)



$\Delta ADE \sim \Delta ABC$

$\therefore \frac{AD}{AB} = \frac{DE}{BC} = \frac{1}{2}$

$AD = AB$; $DE = \frac{1}{2}BC$

∴Required ratio

$= \frac{\frac{1}{3}\pi (DE)^2 \times AD}{\frac{1}{3}\pi BC^2 \times AB - \frac{1}{3}\pi (DE)^2 \times AD}$

$= \frac{DE^2 \times AD}{BC^2 \times AB - DE^2 \times AD}$

$= \frac{\frac{1}{4}BC^2 \times \frac{1}{2}AB}{BC^2 \times AB - \frac{1}{4}BC^2 \times \frac{AB}{2}}$

$= \frac{\frac{1}{8}}{1 - \frac{1}{8}} = 1 : 7$

30. (4) We know that

Circumference = $2\pi r$

$= 2 \times \frac{22}{7} \times 5 = \frac{220}{7}$

Area = $\pi r^2 = \frac{22}{7} \times 25 = \frac{550}{7}$

$\Rightarrow$ Required %

$= \frac{550}{7} \times \frac{7}{220} \times 100 = 250\%$

31. (4) We know that

The area of circle = πr^2

$= \frac{\pi D^2}{4}$

[where D : diameter of circle] and Circumference of circle

$= 2\pi r = \pi D$

Now, according to question,

$\frac{\pi D^2}{4} = \pi D$

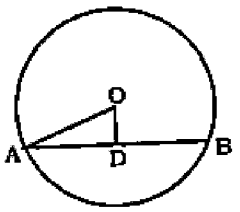
$D^2 = 4D$

$D^2 - 4D = 0$

$\Rightarrow D(D - 4) = 0$

$\Rightarrow D = 4$

32. (1)



AD = DB = 15 cm[∵ AB = 30 cm]

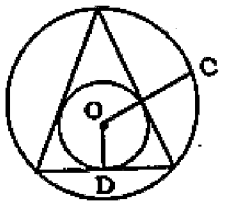
OD = 8 cm

$OA = \sqrt{15^2 + 8^2}$

$= \sqrt{225 + 64} = \sqrt{289}$

= 17cm

33. (3)

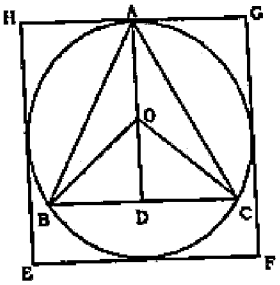


$\because \frac{OC}{OD} = \frac{2}{1}$

$\Rightarrow \frac{8}{OD} = \frac{2}{1} \Rightarrow OD = 4$ cm

In-radius = 4 cm

34. (3)



Area of equilateral triangle ABC

$= \frac{\sqrt{3}}{4} \times \left(4\sqrt{3}\right)^2 = \frac{48\sqrt{3}}{4}$

$= 12\sqrt{3}$ cm^2

Again, AD is the height and O is the centre of the circle

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$\therefore$ Area of ΔABC

$= \frac{1}{2} \times BC \times AD$

$\Rightarrow 12\sqrt{3} = \frac{1}{2} \times 4\sqrt{3} \times AD$

$\Rightarrow AD = \frac{12\sqrt{3}}{2\sqrt{3}} = 6$

$\therefore OD = \frac{1}{3}AD = 2$ cm

$\therefore OB = \sqrt{BD^2 + OD^2}$

$= \sqrt{(2\sqrt{3})^2 + 2^2} = \sqrt{16} = 4$ cm.

$\therefore$ Side of square $= 2 \times OB$
$= 2 \times 4 = 8$ cm.
$\therefore$ Diagonal of square
$= \sqrt{2} \times$ Side $= 8\sqrt{2}$ cm

35. (2) Radius of the circumcircle

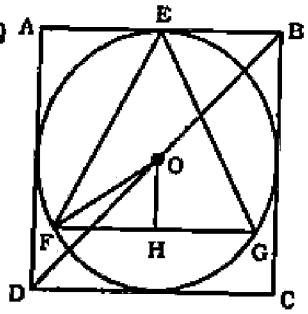
$= \frac{2}{3} \times 4\sqrt{3}$ cm $= 2r$ cm

Radius of the in circle

$= \frac{1}{3} \times 4\sqrt{3}$ cm $= r$ cm

$\therefore$ Required ratio $= \pi(2r)^2 : \pi r^2$
$= 4 : 1$

36. (3)



Side of square

$= \frac{1}{\sqrt{2}} \times 12\sqrt{2} = 12$ cm

$\therefore$ Radius of circle

$= \frac{12}{2} = 6$ cm

$AB = 2x$ cm
$\therefore FH = x$ cm
$\therefore$ From ΔOFH,

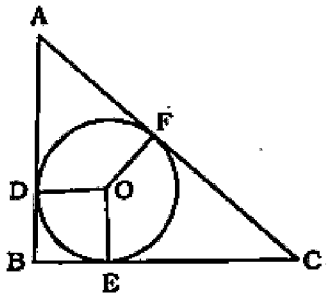
$\cos 30° = \frac{FH}{OF}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{x}{6}$

$\Rightarrow x = \frac{6 \times \sqrt{3}}{2} = 3\sqrt{3}$

$\therefore$ Length of side $= 6\sqrt{3}$ cm

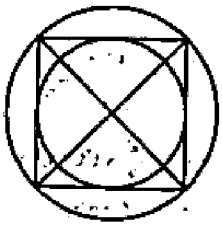
37. (3) $9^2 + 12^2 = 15^2$
$\therefore$ The triangle is right angled



$AB = 9$, $BC = 12$ cm
$OD = OE = OF = x$ cm
$AD = AF = 9 - x$
$EC = CF = 12 - x$
$\therefore AC = AF + FC$
$= 9 - x + 12 - x = 15$
$\Rightarrow 21 - 2x = 15$
$\Rightarrow 2x = 21 - 15 = 6$

$\Rightarrow x = \frac{6}{2} = 3$ cm

38. (1)



Radius of circum-circle

$= \frac{\text{Diagonal}}{2} = \frac{\sqrt{2} \times \text{Side}}{2} = \frac{\text{Side}}{\sqrt{2}}$

Radius of in-circle $= \frac{\text{Side}}{2}$

$\therefore$ Ratio $= \frac{\text{Side}}{2} : \frac{\text{Side}}{\sqrt{2}} = 1 : \sqrt{2}$

39. (4) Let the length and breadth of rectangle be x and y m. respectively.
According to the question,
$2(x + y) = 160$

$\Rightarrow x + y = \frac{160}{2} = 80$ m ...(i)

Perimeter of square $= 160$ m

$\therefore$ Side of square $= \frac{160}{4} = 40$ m

Now,
Area of rectangle $= xy$
Area of square $= 40 \times 40$
$= 1600$ m^2
Then,
$1600 - xy = 100$
$\Rightarrow xy = 1600 - 100 = 1500$ ...(ii)
Now,
$(x - y)^2 = (x + y)^2 - 4xy$
$= (80)^2 - 4 \times 1500$
$= 6400 - 6000 = 400$

$\Rightarrow x - y = \sqrt{400} = 20$ ...(iii)
From equations (i) and (iii),
$2x = 100$

$\Rightarrow x = \frac{100}{2} = 50$ m.

40. (4) Volume of the cylinder $= \pi r^2 h$

$= \frac{\pi d^2 h}{4}$ cubic units $\left[\because r = \frac{d}{2}\right]$

Volume of sphere $= \frac{4}{3}\pi\left(\frac{d}{2}\right)^3$

$= \frac{\pi}{6}d^3$ cubic units

According to the question,

$\frac{\pi}{6}d^3 = \frac{\pi d^2 h}{4}$

$\Rightarrow \frac{d}{6} = \frac{h}{4} \Rightarrow 4d = 6h$

$\Rightarrow 2d = 3h$

41. (4) Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi \times 9 \times 9 \times 9$

$= 972\pi$ cu.cm.

Volume of cone $= \frac{1}{3}\pi R^2 H$

$= \frac{1}{3}\pi \times 9 \times 9 \times 9$

$= 243\pi$ cu.cm.
$\therefore$ Percentage of wood wasted

$= \frac{(972\pi - 243\pi)}{972\pi} \times 100$

$= 75\%$

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Method 2 :

Quicker Approach

In both cases

$\because r = 9,\ h = 9\text{cm}$

$\therefore$ Volume of sphere $= \frac{4}{3}\pi r^3$

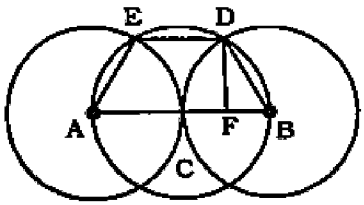
and Volume of cone $= \frac{1}{3}\pi r^3$

Wasted wood $= \pi r^3$

$\therefore$ Required percentage

$= \frac{\pi r^3}{\frac{4}{3}\pi r^3} \times 100 = \frac{3}{4} \times 100 =$ 75%

42. (2)



ABDE will be a trapezium

AB = 4 units

$DE = \frac{1}{2}AB = 2$ units

FB = 1 unit, BD = 2 units.

$\Rightarrow DF = \sqrt{2^2 - 1^2} = \sqrt{3}$ units

$\therefore$ Area of ABDE

$= \frac{1}{2}(AB + DE) \times DF$

$= \frac{1}{2}(4 + 2) \times \sqrt{3}$

$= 3\sqrt{3}$ sq. units

43. (2) Length of parallelopiped = 12 cm.

breadth = 6 cm.

height = 6 cm.

$\therefore$ Total surface area

$= 2(12 \times 6 + 6 \times 6 + 12 \times 6)$ sq.cm.

$= 2(72 + 36 + 72)$ sq.cm.

$= 360$ sq.cm.

44. (4) Volume of sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \pi \times 9 \times 9 \times 9$

$= 972\pi$ cu. cm

Let the radius of wire be R cm, then

$\pi R^2 \times 10800 = 972\pi$

$\Rightarrow R^2 = \frac{972}{10800} = 0.09$

$\Rightarrow R = \sqrt{0.09} = 0.3$ cm

$\therefore$ Diameter $= 2 \times 0.3 = 0.6$ cm

45. (2) Volume of water flowed in an hour

$= 2000 \times 40 \times 3$ cubic metre

$= 240000$ cubic metre

$\therefore$ Volume of water flowed in 1 minute

$= \frac{240000}{60} = 4000$ cubic metre

$= 4000000$ litre

46. (2) Water flowed in 1 hour through the pipe

$= \frac{22}{7} \times \frac{10 \times 10 \times 3000}{10000}\ m^3$

$= \frac{660}{7}\ m^3$

Volume of circular/cylindrical cistern

$= \frac{22}{7} \times 5 \times 5 \times 2 = \frac{1100}{7}\ m^3$

$\therefore$ Required time $= \frac{\frac{1100}{7}}{\frac{660}{7}} = \frac{5}{3}$ hours

or 1 hour $\frac{2}{3} \times 60$ minutes

or 1 hour 40 minutes

47. (2) Let amount of rainfall be 'x'

$20 \times 20 \times x = \frac{22}{7} \times 1^2 \times 3.5$

$\Rightarrow x = \frac{22 \times 3.5}{7 \times 22 \times 20}$

$= 0.025$ metre $= 2.5$ cm

48. (2) Volume of rain water = Area of base × height

$= 1000000 \times \frac{2}{100}$

$= 20000$ cu. metre

Water stored in pool

$= 10000$ cu. metre

$\therefore$ Required water level

$= \frac{10000}{1000} = 10$ metre

49. (4) Let the sides of the parallelopiped be $2x$, $4x$ and $8x$ units respectively and the edge of cube be y units.

$\therefore 2x \times 4x \times 8x = y^3$

$\Rightarrow 8 \times 8x^3 = y^3$

Taking cube roots,

$\Rightarrow 4x = y$ ....(i)

Surface area of parallelopiped

$= 2(2x \times 4x + 4x \times 8x + 8x \times 2x)$

$= 2(8x^2 + 32x^2 + 16x^2)$

$= 112x^2$ sq. units.

Surface area of cube

$= 6y^2$ sq. units.

$\therefore$ Required ratio

$= \frac{112x^2}{6y^2} = \frac{112x^2}{6 \times 16x^2}$

$= \frac{7}{6}$ or 7 : 6

50. (3) Let the third side of the rectangular parallelopiped be x cm, then

$2(x \times 1 + 1 \times 2 + 2 \times x) = 22$

$\Rightarrow 3x + 2 = 11$

$\Rightarrow 3x = 11 - 2 = 9$

$\Rightarrow x = \frac{9}{3} = 3$ cm

Diagonal $= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{3^2 + 2^2 + 1^2}$

$= \sqrt{9 + 4 + 1}$

$= \sqrt{14}$ cm

51. (2) Volume of earth taken out

$= \pi r^2 h$

$= \frac{22}{7} \times 2 \times 2 \times 56 = 704\ m^3$

Volume of the ditch

$= 48 \times 16.5 \times 4\ m^3 = 3168\ m^3$

Part of the ditch filled

$= \frac{704}{3168} = \frac{2}{9}$

52. (2) Radius of circle = x cm.

Side of square = y cm.

Side of equilateral triangle

= z cm.

Circumference of circle = Perimeter of square = Perimeter of equilateral triangle

$\Rightarrow 2\pi x = 4y = 3z$

$\Rightarrow x = \frac{4y}{2\pi} = \frac{2y}{\pi}$

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$x = \frac{4y}{3}$

Area of circle 'C' $= \pi x^2$

$= \pi \times \frac{4}{\pi^2} y^2 = \frac{4}{\pi} y^2 > y^2$

Area of square 'S' $= y^2$

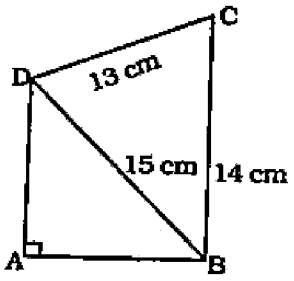
Area of triangle 'T' $= \frac{\sqrt{3}}{4} x^2$

$= \frac{\sqrt{3}}{4} \times \frac{4 \times 4}{3 \times 3} y^2$

$= \frac{4}{3\sqrt{3}} y^2 < y^2$

$\therefore T < S < C$

53. (1) Area of base = Area of Δ ABD + Area of Δ BCD



In, Δ ABD

$BD = \sqrt{AB^2 + AD^2} = \sqrt{9^2 + 12^2}$

$= \sqrt{81 + 144} = \sqrt{225} = 15$ cm

Area of Δ ABD

$= \frac{1}{2} \times AB \times AD$

$= \frac{1}{2} \times 9 \times 12$

= 54 sq. cm

For Δ BCD,

Semi-perimeter (s) $= \frac{13 + 14 + 15}{2}$

$= \frac{42}{2} = 21$

$\therefore$ Area of Δ BCD

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{21(21-13)(21-14)(21-15)}$

$= \sqrt{21 \times 8 \times 7 \times 6}$

= 21 × 4 = 84 sq. cm

Area of quadrilateral ABCD

= 54 + 84 = 138 sq. cm

$\therefore$ Height of prism

$= \frac{\text{Volume}}{\text{Area of base}} = \frac{2070}{138}$

= 15 cm

Perimeter of base

= (9 + 14 + 13 +12) cm

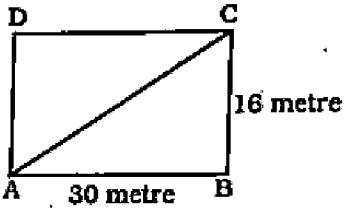
= 48 cm

$\therefore$ Area of lateral surfaces

= perimeter × height

= 48 × 15 = 720 sq. cm.

54. (2)



$AC = \sqrt{AB^2 + BC^2}$

$= \sqrt{30^2 + 16^2}$

$= \sqrt{900 + 256} = \sqrt{1156}$

= 34 metre

Distance travelled by elephant = 34 − 4 = 30 metre

$\therefore$ Speed of elephant $= \frac{30}{15}$

= 2 m/sec.

55. (4) Distance covered in one revolution = Circumference of circular field = $2\pi r$

Again, speed of horse

= 66 metre/second

Time $= \frac{5}{2}$ seconds

$\therefore$ Distance covered $= 66 \times \frac{5}{2}$

= 165 metre

$\therefore 2\pi r = 165$

$\Rightarrow 2 \times \frac{22}{7} \times r = 165$

$\Rightarrow r = \frac{165 \times 7}{2 \times 22} = 26.25$ metre

56. (3) Number of revolutions of rear wheel

= m (let)

Distance covered by front wheel in 1 revolution

= π × diameter

= 2πx cm.

Distance covered by rear wheel in 1 revolution = 2πy cm

$\therefore 2\pi x \times n = 2\pi y \times m$

$\Rightarrow m = \frac{nx}{y}$

57. (2) Distance covered by wheel in 1 revolution = π × diameter

$= \frac{22}{7} \times 56 = 176$ cm

Total distance = 2.2 km

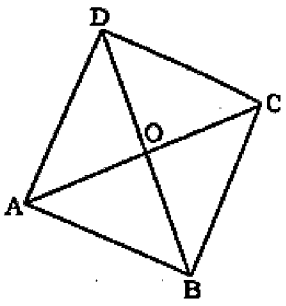
= (2.2 × 1000 ×100) cm

= 220000 cm

$\therefore$ Number of revolutions

$= \frac{220000}{176} = 1250$

58. (1)



AC = 10 cm.

AO = OC = 5 cm.

$\angle AOB = 90°$

AB = 13 cm.

From Δ AOB,

$\therefore$ OB

$= \sqrt{AB^2 - OA^2} = \sqrt{13^2 - 5^2}$

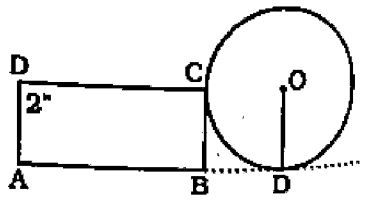
$= \sqrt{169 - 25} = \sqrt{144}$

= 12 cm.

$\therefore$ BD = 2OB = 2 × 12

= 24 cm.

59. (4)



BC = 2" ; $\angle ODB = 90°$

BD = 6" = Radius of wheel

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TEST YOURSELF

1. A sphere of radius r is inscribed in a right circular cone whose slant height equals twice the radius of the base a. What is the relation between r and a?

   (1) $r = \frac{a}{\sqrt{2}}$ (2) $r = \frac{a}{3}$

   (3) $r = \frac{a}{\sqrt{3}}$ (4) $3r = 2a$

2. When the length of rectangle is decreased by 10ft. and the breadth is increased by 5 feet, the rectangle becomes a square and its area is reduced by 210 square feet. Find the area of the rectangle.

   (1) 2440 square feet

   (2) 2340 square feet

   (3) 2444 square feet

   (4) 2540 square feet

3. ABCD is a parallelogram. P and Q are the mid-points of BC and CD respectively. What is the ratio between the area of ΔAPQ to that of the parallelogram ABCD?

   (1) 3 : 7 (2) 3 : 8

   (3) 3 : 5 (4) 4 : 9

4. A solid sphere of diameter 6 cms is melted and shaped as a hollow cylinder of outer radius 5 cms and height 4 cms. What is the thickness of the cylinder?

   (1) 2 cm (2) 2.5 cm

   (3) 9 cm (4) 1 cm

5. The sum of length, breadth and height of a rectangular parallelopiped is 20 cm. and its whole surface area is 264 sq. cm. Find the area of the square whose side is equal to the length of the diagonal of the parallelopiped.

   (1) 136 square cm.

   (2) 120 square cm.

   (3) 125 square cm.

   (4) 100 square cm.

6. Find the ratio of the areas of squares circumscribed about and inscribed in the same circle.

   (1) 1 : 3 (2) 2 : 1

   (3) $\sqrt{2}$: 1 (4) 1 : $\sqrt{2}$

7. A cube and a sphere have equal surface areas. Find the ratio of their volumes.

   (1) $\pi : \sqrt{6}$ (2) $\sqrt{\pi} : \sqrt{6}$

   (3) $\sqrt{\pi} : 6$ (4) None of these

8. The outer and inner radii of a hollow metallic cylinder of height 24 cms. are respectively 6.75 cms. and 5.25 cms. It is melted to form a solid sphere. Find the surface area of the sphere.

   (1) $\pi \times (12)^{\frac{2}{3}}$ sq. cm

   (2) $\pi \times 36 \times (12)^{\frac{2}{3}}$ sq. cm

   (3) 1220 sq. cm

   (4) $\pi \times 36 \times (12)^{\frac{1}{3}}$ sq. cm

9. A right pyramid stands on a square base of diagonal $10\sqrt{2}$ cm. If the height of the pyramid is 12 cm, the area (in cm^2) of its slant surface is

   (1) 520 (2) 420

   (3) 360 (4) 260

10. If the altitude of a right prism is 10 cm and its base is an equilateral triangle of side 12 cm, then its total surface area (in cm^2) is

    (1) $(5 + 3\sqrt{3})$ (2) $36\sqrt{3}$

    (3) 360 (4) $72(5+\sqrt{3})$

11. In ΔABC, D, E and F are the mid-points of sides BC, CA and AB respectively. What is the area of quadrilateral BDEF?

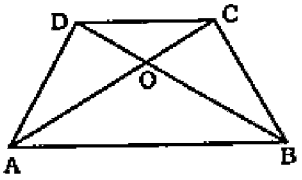
    (1) $\frac{1}{3}$ rd of area of Δ ABC

    (2) Half of the area of Δ ABC

    (3) $\frac{1}{4}$ th of the area of Δ ABC

    (4) None of these

12. ABCD is a trapezium in which AB || DC and AB = 2DC. Then what is the ratio between the areas of ΔAOB and ΔCOD respectively?

    (1) 4 : 1 (2) 1 : 3

    (3) 2 : 1 (4) 3 : 1

13. The area of a triangle formed by $y = x$, $x = 6$ and $y = 0$ is :

    (1) 36 sq. units (2) 18 sq. units

    (3) 9 sq. units (4) 72 sq. units

14. The radius of a circle is so increased that its circumference increases by 5%. The area of the circle then increases by:

    (1) 12.5% (2) 10.25%

    (3) 10.5% (4) None of these

15. A lawn is in the form of a rectangle having its breadth and length respectively in the ratio 2 : 3. The area of the lawn is 600 sq. metres. Find the length of the lawn

    (1) 20m (2) 30m

    (3) 25m (4) None of these

16. The breadth of a rectangular plot is decreased by 20 per cent. By what percent should the length be increased to keep the area same?

    (1) 25 (2) 20

    (3) 30 (4) None of these

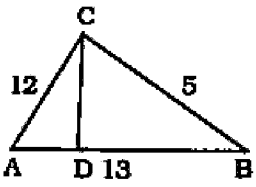
17. A cow is grazing in a pasture bordered by two fences more than ten feet long that meet at an angle of 60°. If the cow is tethered by a ten foot rope to the post where the fences meet, it can graze an area of:

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(1) 20π sq. feet (2) $\frac{50\pi}{3}$ sq. feet

(3) $\frac{5\pi}{3}$ sq. feet (4) None of these

18. CD is a ⊥ dropped from C. If the area of Δ ADC is 'a', then the area of Δ BDC is :

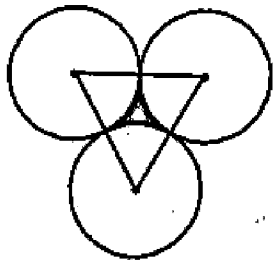


(1) (30 – a) sq. units
(2) (60 – a) sq. units

(3) $\left(a+\frac{12}{5}a\right)$ sq. units

(4) None of these

19. The radius of each circle is 'a'. Then the area of the shaded portion is :



(1) $a^2\left(\sqrt{3}-\frac{\pi}{2}\right)$ sq. units

(2) $a\left(\pi a^2-\sqrt{3}\right)$ sq. units

(3) $\left(a^2-\frac{\pi}{2}\right)\sqrt{3}$ sq. units

(4) None of these

20. If the radius of a circle is increased by 20% then how much will its area be increased by ?
(1) 40% (2) 44%
(3) 50% (4) None of these

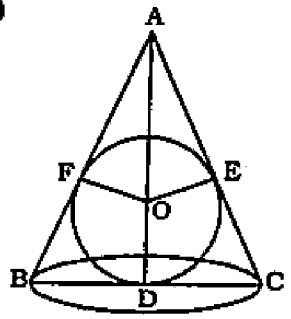
21. 66 cubic centimetres of silver is drawn into a wire 1 mm in diameter. The length of the wire in metres will be :
(1) 84 (2) 128
(3) 116 (4) None of these

SHORT ANSWERS

1. (3)	2. (3)	3. (2)	4. (4)
5. (1)	6. (2)	7. (2)	8. (2)
9. (4)	10. (4)	11. (2)	12. (1)
13. (2)	14. (2)	15. (2)	16. (1)
17. (2)	18. (1)	19. (1)	20. (2)
21. (1)			

EXPLANATIONS

1. (3)



$AB = 2a$
$BD = a$
$AD = \sqrt{4a^2 - a^2}$
$= \sqrt{3a^2} = \sqrt{3}a$
$\angle AFO = 90°$
$OD = r$
$AO = \sqrt{3}a - r$

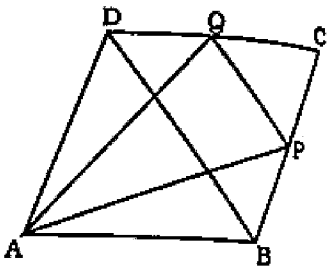
$\sin BAD = \frac{a}{2a} = \frac{1}{2}$
$\angle BAD = 30°$
$\sin 30°$
$= \frac{OF}{AO} \Rightarrow \frac{1}{2} = \frac{r}{AO} = \frac{r}{\sqrt{3}a - r}$
$\Rightarrow 2r = \sqrt{3}a - r$
$\Rightarrow 3r = \sqrt{3}a$

$\Rightarrow r = \frac{a}{\sqrt{3}}$

2. (3) Let the length and breadth of rectangle be x and y feet respectively.
Area of rectangle $= xy$

Again, $x - 10 = y + 5 =$ side of square
$\Rightarrow x = y + 15$ ....(i)
Again, $xy - (y + 5)^2 = 210$
$\Rightarrow y(y + 15) - (y^2 + 10y + 25) = 210$
$\Rightarrow y^2 + 15y - y^2 - 10y - 25 = 210$
$\Rightarrow 5y = 235$
$\Rightarrow y = 47$ feet
$\therefore x = y + 5 = 52$ feet
Area of rectangle $= 52 \times 47$
$= 2444$ sq. feet

3. (2)



In Δ BCD,

PQ ∥ BD and $PQ = \frac{1}{2}$ BD

$\Rightarrow ar(\Delta CPQ) = \frac{1}{4} ar(BDC)$

$\Rightarrow ar(\Delta CPQ)$

$= \frac{1}{8} ar(\|^{gm} ABCD)$

$\left[\because \frac{1}{2} ar(\|^{gm} ABCD = ar(\Delta BCD)\right]$

$BP = \frac{1}{2} BC$

$\therefore ar(\Delta ABP) = \frac{1}{4} (\|^{gm} ABCD)$

Similarly, $ar(\Delta AQD)$

$= \frac{1}{4} (\|^{gm} ABCD)$

$\therefore ar(\Delta APQ) = ar(\|^{gm} ABCD - [ar \Delta ABP + ar(\Delta AQD) + ar(\Delta CPQ)]$

$= ar(\|^{gm} ABCD) - \left(\frac{1}{4} + \frac{1}{4} + \frac{1}{8}\right) ar(\|^{gm} ABCD)$

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$= \left(1-\frac{5}{8}\right)$ ar (||gm ABCD)

$= \frac{3}{8}$ ar (||gm ABCD)

4. (4) Volume of sphere $= \frac{4}{3}\pi r^3 =$

$\frac{4}{3}\pi \times (3)^3$ cu.cm.

Let the thickness of cylinder be x cm.

$\therefore$ Its internal radius

$= (5 - x)$ cm

Now, volume of cylinder

$= \frac{4}{3}\pi \times 27$

$\Rightarrow \pi\{(5)^2 - (5-x)^2\} \times 4$

$= \frac{4}{3}\pi \times 27$

$\Rightarrow 25 - (25 + x^2 - 10x) = 9$

$\Rightarrow x^2 - 10x + 9 = 0$

$\Rightarrow x^2 - 9x - x + 9 = 0$

$\Rightarrow x(x-9) - 1(x-9) = 0$

$\Rightarrow (x-1)(x-9) = 0$

$\Rightarrow x = 1$ because $x \neq 9$

5. (1) Let the length, breadth and height of the parallelopiped be a, b and c cm respectively.

$\therefore a + b + c = 20$

$2(ab + bc + ca) = 264$

$\therefore (a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$\Rightarrow 400 = a^2 + b^2 + c^2 + 264$

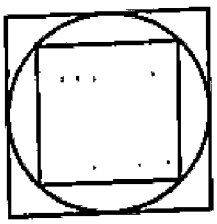
$\Rightarrow a^2 + b^2 + c^2 = 400 - 264$

$= 136$ sq. cm.

Area of square

$= \left(\sqrt{a^2+b^2+c^2}\right)^2 = 136$ sq. cm.

6. (2)



Let the diameter of circle be d units.

$\therefore$ Diagonal of the inscribed square $= d$

Its area $= \frac{1}{2}d^2$ sq. units.

Side of the circumscribed square $= d$ units

$\therefore$ Its area $= d^2$ sq. units

Required ratio

$= d^2 : \frac{1}{2}d^2 = 2 : 1$

7. (2) Let the edge of cube be x units and radius of sphere be y units.

$\therefore$ Surface area of cube = surface area of sphere

$\Rightarrow 6x^2 = 4\pi y^2$

$\Rightarrow \frac{x^2}{y^2} = \frac{4\pi}{6} = \frac{2\pi}{3}$

$\Rightarrow \frac{x}{y} = \sqrt{\frac{2\pi}{3}} \Rightarrow x : y = \sqrt{2\pi} : \sqrt{3}$

$\Rightarrow$ Volume of cube : Volume of sphere

$= x^3 : \frac{4}{3}\pi y^3 = 3x^3 : 4\pi y^3$

$= 3 \times 2\pi\sqrt{2\pi} : 4\pi \times 3 \times \sqrt{3}$

$= \sqrt{2\pi} : 2\sqrt{3}$

$= \sqrt{\pi} : \sqrt{6}$

8. (2) Volume of metallic cylinder

$= \pi\left(r_2^2 - r_1^2\right) \times h$

$= \pi(6.75^2 - 5.25^2) \times 24$

$= \pi \times 12 \times 1.5 \times 24$ cu.cm.

$\therefore$ Volume of sphere

$= \pi \times 12 \times 1.5 \times 24$

$\Rightarrow \frac{4}{3}\pi r^3 = \pi \times 12 \times 1.5 \times 24$

$\Rightarrow r^3 = \frac{12 \times 1.5 \times 24 \times 3}{4}$

$= 12 \times 3 \times 3 \times 3$

$\therefore r = \sqrt[3]{12 \times 3 \times 3 \times 3}$

$= 3\sqrt[3]{12}$

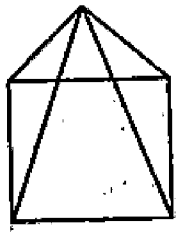
$\therefore$ Surface area $= 4\pi r^2$

$= 4 \times \pi \times \left(3\sqrt[3]{12}\right)^2$

$= 4 \times \pi \times 9\,(12)^{\frac{2}{3}}$

$= \pi \times 36\,(12)^{\frac{2}{3}}$ sq.cm.

9. (4)



Side of square base

$= \frac{1}{\sqrt{2}} \times 10\sqrt{2} = 10$ cm

Slant height $= \sqrt{5^2 + 12^2}$

$= 13$ cm

$\therefore$ Area of the lateral surface

$= \frac{1}{2} \times$ perimeter of base $\times$ slant height

$= \frac{1}{2} \times 40 \times 13 = 260$ sq. cm.

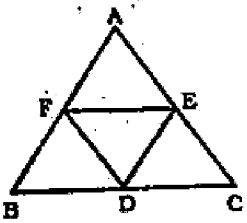
10. (4) Total surface area = Perimeter of base $\times$ height + 2 $\times$ area of base

$= 36 \times 10 + 2 \times \frac{\sqrt{3}}{4} \times 12 \times 12$

$= 360 + 72\sqrt{3}$

$= 72(5 + \sqrt{3})$ sq. cm

11. (2)



D, E are the mid-points on BC and AC respectively.

$\therefore$ DE || BA $\Rightarrow$ DE || BF

Similarly, FE || BD

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$\therefore$ BDEF is a parallelogram.
Similarly, DCEF and AFDE are parallelograms.
$\therefore$ Δ BDF = Δ DEF
Δ DCE = Δ DEF
and Δ AFE = Δ DEF
$\therefore$ $\Delta BDF = \Delta DCE = \Delta AFE = \Delta DEF$

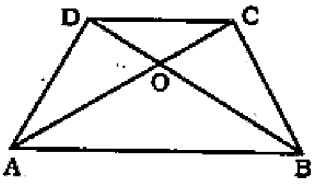
$\Rightarrow \Delta DEF = \frac{1}{4}\Delta ABC$

$\therefore$ Quadrilateral BDEF $= 2 \times \Delta DEF$
$\Rightarrow$ Quadrilateral BDEF

$= 2 \times \frac{1}{4}\Delta ABC$

$= \frac{1}{2}\Delta ABC$

12. (1)

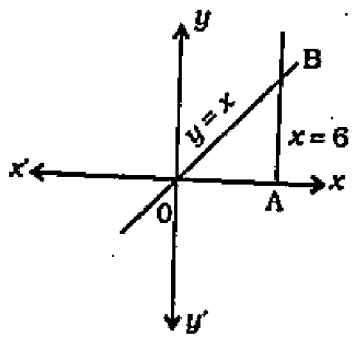


In Δ AOB and Δ COD,
$\angle AOB = \angle COD$ and $\angle OAB = \angle OCD$
By AA-similarly theorem,
$\Delta AOB \sim \Delta COD$

$\therefore \frac{\Delta AOB}{\Delta COD} = \frac{AB^2}{DC^2}$

$= \frac{(2DC)^2}{DC^2} = \frac{4}{1}$

13. (2)



Co-ordinates of point B = (6, 6)
as $y = x$ and $x = 6$
$\therefore$ OA = 6 and AB = 6
$\therefore$ Area of ΔOAB

$= \frac{1}{2} \times OA \times AB$

$= \frac{1}{2} \times 6 \times 6 = 18$ sq. units

14. (2) Increase in radius of circle = Increase in circumference of circle = 5%
$\therefore$ Increase in area

$= \left(5 + 5 + \frac{5 \times 5}{100}\right)\% = 10.25\%$

15. (2) $2x \times 3x = 600$
$\Rightarrow 6x^2 = 600 \Rightarrow x^2 = 100$
$\Rightarrow x = 10$
$\therefore$ Length $= 3 \times 10 = 30$ metre

16. (1) $0 = x - 20 - \frac{20x}{100}$

$\left[\text{Net effect} = \left(x + y + \frac{xy}{100}\right)\%\right]$

$\Rightarrow x - 20 - \frac{x}{5} = 0$

$\Rightarrow 5x - 100 - x = 0$
$\Rightarrow 4x = 100 \Rightarrow x = 25\%$

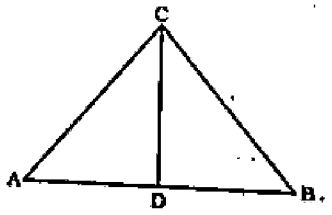
17. (2) Required region

$= \frac{60^\circ}{360^\circ} \times \pi r^2$

$= \frac{1}{6} \times \pi \times 10 \times 10$

$= \frac{50\pi}{3}$ sq.feet

18. (1)

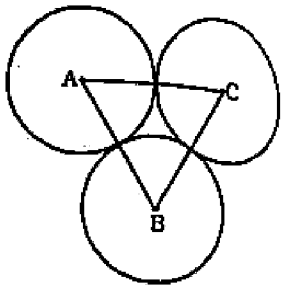


$5^2 + 12^2 = 13^2$
ΔABC is a right angled triangle.
$\Delta ADC + \Delta BDC = \Delta ABC$

$\Rightarrow a + \Delta BDC = \frac{1}{2} \times 5 \times 12 = 30$

$\Rightarrow \Delta BDC = (30 - a)$ sq. units.

19. (1)



$AB = BC = CA = 2a$

Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times (2a)^2$

$= \sqrt{3}a^2$

Area of three sectors

$= 3 \times \frac{60}{360} \times \pi a^2 = \frac{\pi a^2}{2}$

$\therefore$ Area of shaded region

$= \sqrt{3}a^2 - \frac{\pi a^2}{2}$

$= a^2\left(\sqrt{3} - \frac{\pi}{2}\right)$ sq.units

20. (2) Required increase

$= \left(20 + 20 + \frac{20 \times 20}{100}\right)\%$

$= 44\%$

21. (1) If the length of wire be h cm. then
$\pi r^2 h = 66$

$\Rightarrow \frac{22}{7}\left(\frac{1}{20}\right)^2 \times h = 66$

$\Rightarrow h = \frac{66 \times 400 \times 7}{22}$

$= 8400$ cm
$= 84$ metre

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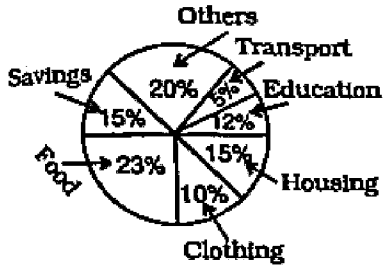
21 STATISTICS AND DATA INTERPRETATION

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

Directions (1-5) : Read the following pie-chart to answer the questions given below it.

(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)



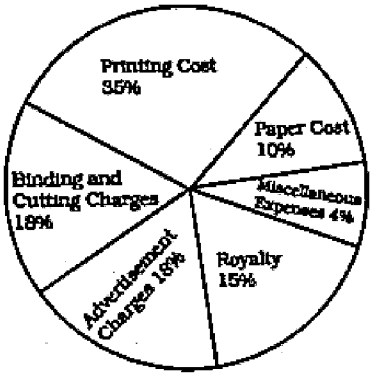
Per cent of money spent by a family on various items during 1998

1. If the total amount spent during the year 1998 was ₹ 46000/-, the amount spent on food, was :
   (1) ₹ 2000/- (2) ₹ 10580/-
   (3) ₹ 23000/- (4) ₹ 2300/-
2. If the total amount spent was ₹ 46000/-, how much was spent on clothing and housing together?
   (1) ₹ 11500/- (2) ₹1150/-
   (3) ₹ 10000/- (4) ₹15000/-
3. The ratio of the total amount of money spent on housing to that spent on education was :
   (1) 5 : 2 (2) 2 : 5
   (3) 4 : 5 (4) 5 : 4
4. Graph shows that the maximum amount was spent on:
   (1) Food (2) Housing
   (3) Clothing (4) Others
5. If the total expenditure of the family for the year 1998 was ₹ 46000/-, the family saved during the year,
   (1) ₹ 1500/-
   (2) ₹ 15000/-
   (3) ₹ 6900/-
   (4) ₹ 3067/- approx.

Directions (6-10) : The following questions are based on the pie-chart given below. Study the pie-chart and answer the questions.

(SSC CGL Prelim Exam. 11.05.2003 (First Sitting)

The percentage expenses on various items during book production and sale.

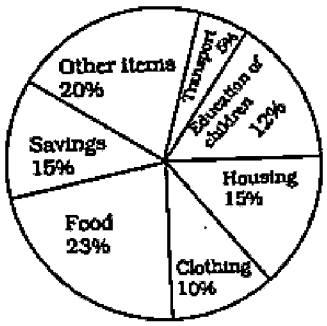


6. The central angle for the sector on "Paper-Cost" is
   (1) $22\frac{1}{2}°$ (2) 16°
   (3) 54.8° (4) 36°
7. If the 'Printing-Cost' is ₹ 17500, the royalty paid is
   (1) ₹ 8750 (2) ₹ 7500
   (3) ₹ 3150 (4) ₹ 6300
8. If the "miscellaneous expenses" are ₹ 6000. How much more are "binding and cutting charges" than "Royalty" ?
   (1) ₹ 6000 (2) ₹ 5500
   (3) ₹ 4500 (4) ₹10500
9. The central angle corresponding to the sector on "Printing Cost" is more than that of "Advertisement Charges " by :
   (1) 72° (2) 61.2°
   (3) 60° (4) 54.8°
10. The "Paper Cost" is approximately what per cent of "Printing Cost" ?
    (1) 20.3% (2) 28.6%
    (3) 30% (4) 32.5%

Directions (11-15) : The pie chart drawn below shows the expenses of a family on various items and its savings during the year 2001. Study the graph and answer the questions.

(SSC CGL Prelim Exam. 11.05.2003 (Second Sitting)

Percent of money spent on various items and savings by a family during 2001



11. Maximum expenditure of the family was on
    (1) Food (2) Housing
    (3) Education of children
    (4) Other items
12. The total savings of the family for the year were equal to the expenditure on
    (1) Food
    (2) Clothing
    (3) Housing
    (4) Other items including transport
13. What per cent of the income was spent on transport and other items together ?
    (1) 25% (2) 20%
    (3) 30% (4) 32%
14. If the total income of the family was ₹ 1,00,000, how much money was spent on the education of the children?

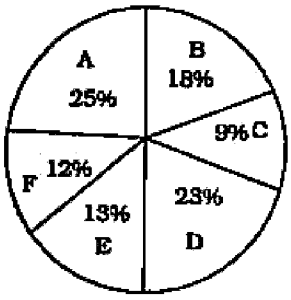
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(1) ₹10000 (2) ₹12000
(3) ₹ 15000 (4) ₹ 23000

15. If the total income for the year was ₹ 1,00,000, the difference of the expenses (in rupees) between housing and transport was
(1) ₹ 15000 (2) ₹ 12000
(3) ₹ 7000 (4) ₹ 10000

Directions (16-20) : The Pie chart given here represents the domestic expenditure of a family in per cent. Study the chart and answer the following questions if the total monthly income of the family is ₹ 33,650.

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)



A : Expenditure on food
B : Expenditure on house-rent
C: Expenditure on entertainment
D : Expenditure on education and maintenance of children
E: Medical and miscellaneous expenditure
F : Deductions towards provident fund

16. The house rent per month is :
(1) ₹ 6000 (2) ₹ 6152
(3) ₹ 6057 (4) ₹ 6048

17. The annual savings in the form of provident fund would be
(1) ₹ 48,456 (2) ₹ 48,540
(3) ₹ 44,856 (4) ₹ 45,480

18. After provident fund deductions and payment of house rent, the total monthly income of the family remains
(1) ₹ 23,545 (2) ₹ 24,435
(3) ₹ 23,555 (4) ₹25, 355

19. The total amount per month, the family spends on food and entertainment combined together, is :
(1) ₹ 11,432 (2) ₹ 11,441
(3) ₹ 12,315 (4) ₹ 12,443

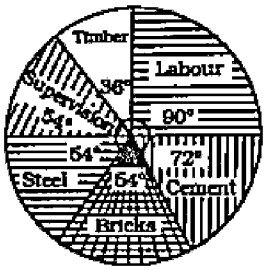
20. Had there been no children in the family what would have been the total savings of the family including that provident fund ?
(1) ₹ 12,667.50
(2) ₹ 12,625.50
(3) ₹ 11,727.50
(4) ₹ 11,777.50

Directions (21-24) : The pie graph given here shows the break-up of the cost of construction of a house.

Assuming that the total cost of construction is ₹ 6,00,000, answer the questions.

(SSC Section Officer (Commercial Audit) Exam. 26.11.2006 (Second Sitting)

Break-up of the cost of construction of a house



21. The amount spent on cement is
(1) ₹ 2,00,000 (2) ₹ 1,60,000
(3) ₹ 1,20,000 (4) ₹ 1,00,000

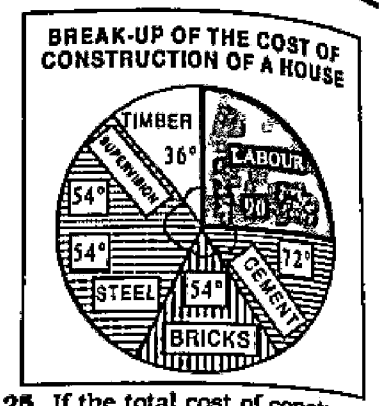
22. The amount spent on labour exceeds the amount spent on steel by
(1) 5 per cent of the total cost.
(2) 10 per cent of the total cost.
(3) 12 per cent of the total cost.
(4) 15 per cent of the total cost.

23. The amount spent on cement, steel and supervision is what percent of the total cost of construction?
(1) 40% (2) 45%
(3) 50% (4) 55%

24. The amount spent on labour exceeds the amount spent on supervision by
(1) ₹ 2,00,000 (2) ₹ 1,60,000
(3) ₹ 1,20,000 (4) ₹ 60,000

Directions (25-28) : The pie chart given here shows the breakup of the cost of construction of a house on various heads. Study the chart and answer the questions.

(SSC CPO S.I. Exam. 09.11.2008)



25. If the total cost of construction of the house is ₹ 15,00,000, how much amount of money was spent on labour ?
(1) ₹ 90,000 (2) ₹ 2,50,000
(3) ₹ 3,60,000 (4) ₹ 3,75,000

26. The total expenditure incurred on bricks, steel and cement is what per cent of the total cost of construction ?
(1) 50% (2) 54%
(3) 72% (4) 75%

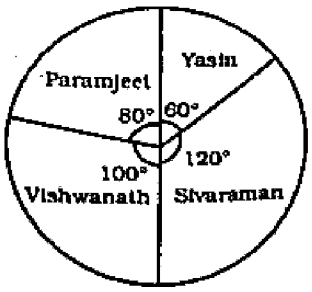
27. Expenditure incurred on timber is what per cent of the expenditure on cement ?
(1) 36% (2) 50%
(3) 72% (4) 18%

28. Out of the total cost (₹ 15,00,000) of construction how much amount of money was spent on labour and supervision combined together ?
(1) ₹ 1,44,000 (2) ₹ 3,00,000
(3) ₹ 6,00,000 (4) ₹ 7,50,000

Directions (29–31) : The pie chart, given here, represents the number of valid votes obtained by four students who contested election for school leadership. The total number of valid votes polled was 720.

Observe the chart and answer the questions based on it.

(SSC CGL Tier-I Exam, 16.05.2010 (First Sitting)



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29. What was the minimum number of votes obtained by any candidate?
(1) 100 (2) 110
(3) 120 (4) 130

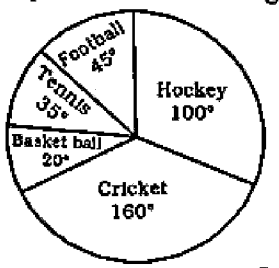
30. Who was the winner?
(1) Sivaraman (2) Paramjeet
(3) Yasin (4) Vishwanath

31. By how many votes did the winner defeat his nearest rival?
(1) 40 (2) 45
(3) 48 (4) 50

Directions (32–34) : The pie chart, given here, shows the amount of money spent on various sports by a school administration in a particular year.

(SSC CGL Tier-I Exam. 16.05.2010 (Second Sitting))

Observe the pie chart and answer the questions based on this graph.



32. If the money spent on football was ₹ 9,000 how much more money was spent on hockey than on football?
(1) ₹ 11,000 (2) ₹ 11,500
(3) ₹ 12,000 (4) ₹ 12,500

33. If the money spent on football was ₹ 9,000, what amount was spent on Cricket?
(1) ₹ 31,000 (2) ₹ 31,500
(3) ₹ 32,000 (4) ₹ 32,500

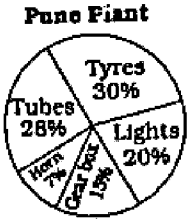
34. If the money spent on football is ₹ 9,000, then what was the total amount spent on all sports?
(1) ₹ 73,000 (2) ₹ 72,800
(3) ₹ 72,500 (4) ₹ 72,000

Directions (35-37) : The pie charts, given here show some automobile parts manufactured by an automobile company at its Pune and Nagpur plants in the year 2009.

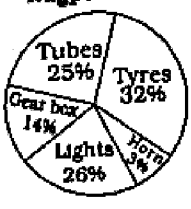
Study the pie charts and answer the questions

(SSC CISF ASI Exam. 29.08.2010 (Paper-I))

Pune Plant



Nagpur Plant



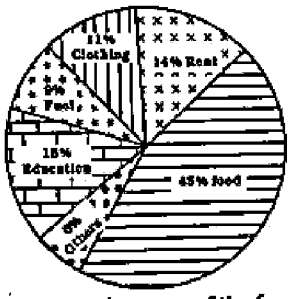
35. If the Nagpur plant produced 8,00,000 tyres, then the number of horns produced by it was
(1) 12,000 (2) 18,500
(3) 75,000 (4) 60,000

36. How many percent more tubes were produced at the Pune plant than those produced at the Nagpur plant?
(1) 14% (2) 12%
(3) 8% (4) 3%

37. The ratio of number of horns produced at Nagpur plant to that produced at Pune plant is
(1) 3 : 7 (2) 10 : 3
(3) 7 : 3 (4) 7 : 10

Directions (38–41) : The pie chart given below shows the spendings of a family on various heads during a month. Study the graph and answer the following questions.

(SSC CGL Tier-1 Exam. 19.06.2011 (First Sitting))



38. If the total income of the family is ₹25,000, then the amount spent on Rent and Food together is
(1) ₹ 17,250 (2) ₹ 14, 750
(3) ₹ 11, 250 (4) ₹ 8, 500

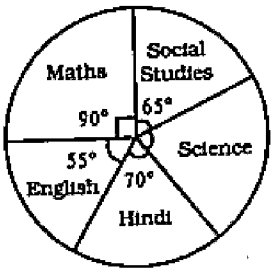
39. What is the ratio of the expenses on Education to the expenses on Food?
(1) 1 : 3 (2) 3 : 1
(3) 3 : 5 (4) 5 : 3

40. Expenditure on Rent is what percent of expenditure on Fuel?
(1) 135% (2) 156%
(3) 167% (4) 172%

41. Which three expenditures together have a central angle of 108°?
(1) Fuel, Clothing and Others
(2) Fuel, Education and Others
(3) Clothing, Rent and Others
(4) Education, Rent and Others

Directions (42-45) : The pie-chart given below shows the marks obtained by a student in an examination. If the total marks obtained by him in the examination were 540, answer the questions given below based on this pie chart.

(SSC Data Entry Operator Exam. 31.09.2008)



42. In which subject, did the student obtain 105 marks?
(1) Maths (2) Social studies
(3) Science (4) Hindi

43. What is the central angle corresponding of Science?
(1) 40° (2) 80°
(3) 75° (4) 60°

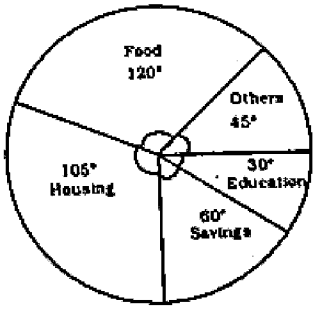
44. How many more marks were obtained by the student in Maths than those in Hindi?
(1) 30 (2) 20
(3) 10 (4) 40

45. How many marks were obtained by the student in Science?
(1) 130 (2) 120
(3) 125 (4) 140

Directions (46–49) : The pie-chart given here shows expenditures incurred by a family on various items and their savings, which amounts to ₹ 8,000 in a month.

Study the chart and answer the questions based on the pie-chart

(SSC Data Entry Operator Exam. 02.08.2009)



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46. How much expenditure is incurred on education ?
(1) ₹ 3,000 (2) ₹ 5,000
(3) ₹ 4,000 (4) ₹ 7,000

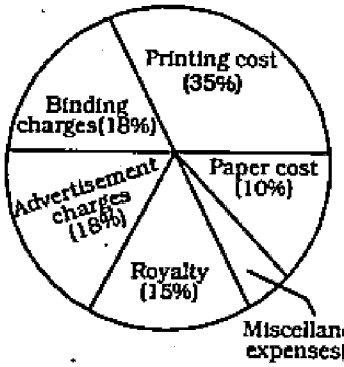
47. The ratio of the expenditure on food to the savings is
(1) 3 : 2 (2) 2 : 1
(3) 4 : 3 (4) 3 : 4

48. What is the total expenditure of the family for the month ?
(1) ₹ 40,000 (2) ₹ 48,000
(3) ₹ 45,000 (4) ₹ 50,000

49. How much more amount is spent on food than on housing ?
(1) ₹ 1,000 (2) ₹ 3,000
(3) ₹ 2,000 (4) ₹ 2,500

Directions (50–53) : The pie-chart, given here, shows various expenses of a publisher in the production and sale of a book. Study the chart and answer questions based on it.

(SSC CHSL DEO & LDC Exam. 27.11.2010)



50. If the printing cost is ₹ 17,500, the 'Royalty' paid is :
(1) ₹8,750 (2) ₹7,500
(3) ₹6,300 (4) ₹3,130

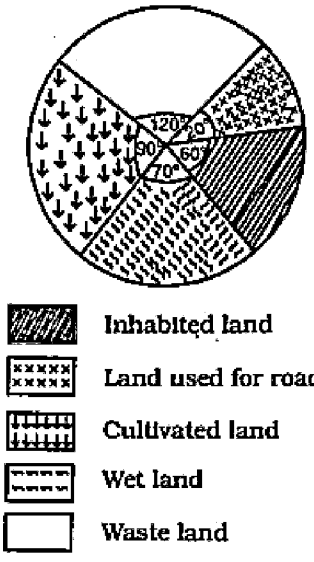
51. The measure of central angle for the section 'printing cost' is :
(1) 126° (2) 70°
(3) 63° (4) 35°

52. Miscellaneous expenses are what percent of paper cost ?
(1) 4% (2) 10%
(3) 40% (4) 44%

53. The difference between the measure of central angles of sector for binding charges and advertisement charges is :
(1) 180° (2) 90°
(3) 18° (4) 0°

Directions (54–57) : The pie-chart, given here, shows the land distribution of a village.
Study the pie-chart and answer the questions based on it.

(SSC CHSL DEO & LDC Exam. 28.11.2010 (IInd Sitting)



54. The ratio of the waste land to the cultivated land is
(1) 4 : 3 (2) 3 : 2
(3) 2 : 1 (4) 3 : 1

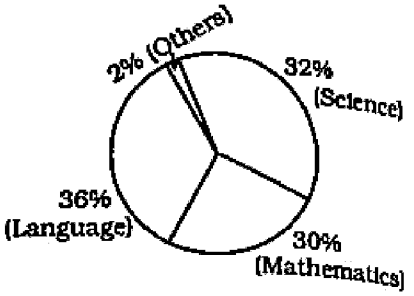
55. What percent of total land is used for cultivation ?
(1) 24% (2) 25%
(3) 50% (4) 90%

56. If the total area of the village is 7200 acres, the total area of the wet land is
(1) 1028 acres (2) 5040 acres
(3) 3600 acres (4) 1400 acres

57. The land used for roads is what percent of the inhabited land ?
(1) $66\frac{2}{3}\%$ (2) 48%
(3) $33\frac{1}{3}\%$ (4) 30%

Directions (58–62) : The following pie-chart shows the number of students who failed in different subjects in an examination. Examine the chart and answer the following questions. The total number of students who have failed is 500.

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)



58. The number of students failed in science is less than the number of students failed in all other subjects by :
(1) 170 (2) 140
(3) 180 (4) 160

59. The central angle of the sector for the students who have failed in mathematics is :
(1) 30° (2) 100°
(3) 105.2° (4) 108°

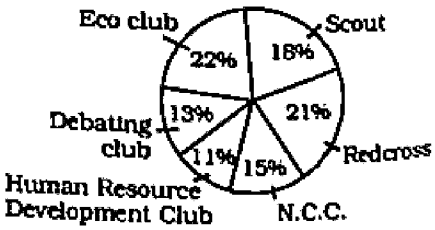
60. Total number of students who did not qualify in Mathematics and Language and Science, is :
(1) 460 (2) 490
(3) 480 (4) 470

61. Number of students who failed in mathematics is less than the students who did not qualify in languages by :
(1) 20 (2) 40
(3) 30 (4) 50

62. The percentage of students who have failed in mathematics and language is :
(1) 65.5% (2) 60%
(3) 66% (4) 62%

Directions (63–67) : The pie-chart given below shows the number of students enrolled in a school in different activities. Total number of students in the school is 1200. Study the chart and answer the questions.

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)



63. How many students are enrolled in N.C.C. activities ?
(1) 180 (2) 120
(3) 72 (4) 240

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64. What is the total number of students enrolled in Debating Club and HRD Club ?
(1) 144 (2) 216
(3) 288 (4) 72

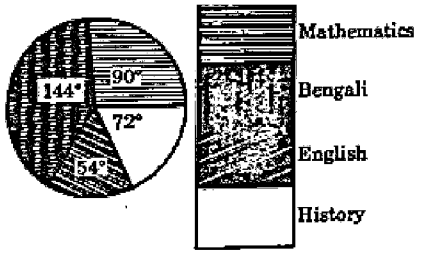
65. The number of students enrolled in Eco-club is what per cent of those enrolled in Redcross activities ?
(1) 94.24% (2) 95.45%
(3) 82.45% (4) 104.76%

66. What is the ratio of number of students enrolled in Scout and Redcross activities together to those enrolled in Debating Club activities ?
(1) 3 : 1 (2) 4 : 1
(3) 1 : 4 (4) 1 : 3

67. Which two clubs have the enrolment in the ratio of 2 : 1 ?
(1) Eco club, HRD club
(2) Eco club, N.C.C.
(3) HRD club, Eco club
(4) Debating club, Eco club

Directions (68-72) : The following pie-chart represents the result of 600 successful students in various subjects at an examination. Study the chart and answer question

(SSC CHSL DEO & LDC Exam. 28.10.2012 (1st Sitting)



68. The ratio of students who passed in Bengali, to the students who passed in History is
(1) 1 : 2 (2) 2 : 1
(3) 3 : 4 (4) 3 : 5

69. The number of students passed in Bengali is greater than the number of students passed in History by
(1) 150 (2) 60
(3) 120 (4) 100

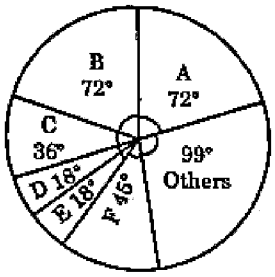
70. The percentage of students who passed in English is
(1) 15% (2) 20%
(3) 5% (4) 12%

71. The number of students passed in English is less than the number of students passed in Mathematics by
(1) 50 (2) 60
(3) 90 (4) 75

72. The highest number of students passed in a subject in percentage
(1) 20% (2) 25%
(3) 40% (4) 35%

Directions (73-77) : The following Pie Chart shows the export of different foodgrains from India in 2010. Study the chart and answer the questions :

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)



73. Of the total export of foodgrains, the percentage of crop B exported is
(1) 15% (2) 20%
(3) 16% (4) 10%

74. If a total of 1.5 million quintals of crop F was exported, the amount of total foodgrains exported (in million) quintals was
(1) 8.7 (2) 12
(3) 10.8 (4) 9.6

75. The three crops which combine to contribute to exactly 50% of the total export of foodgrains are
(1) A, F and others
(2) B, C and F
(3) A, B and C
(4) C, F and others

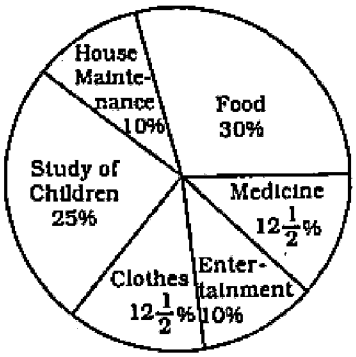
76. If a total of 1.5 million quintals of crop F was exported, then the total quantity of D and E that was exported (in million quintals) was
(1) 1.2 (2) 1.5
(3) 4.5 (4) 6.5

77. If the revenue from 1 quintal of crop A is thrice that from 1 quintal of crop C, then the ratio of the total revenues of A and C is
(1) 1 : 6 (2) 2 : 3
(3) 3 : 2 (4) 6 : 1

Directions (78–82) : Following is the pie-chart showing the spendings of a family on various items in a particular year

Study the pie chart and answer questions.

(SSC Graduate Level Tier-I Exam. 11.11.2012 (1st Sitting)



78. The ratio of the total amount spent for food and medicine is
(1) 1 : 2 (2) 3 : 1
(3) 12 : 5 (4) 11 : 5

79. If the total amount spent on the family during the year was ₹50,000, how much they spent for buying clothes ?
(1) ₹6,250 (2) ₹6,500
(3) ₹7,250 (4) ₹7,500

80. If the total amount spent on the family during the year was ₹35,000, the amount spent for study of children and food together was
(1) ₹19,250 (2) ₹19,500
(3) ₹19,750 (4) ₹19,850

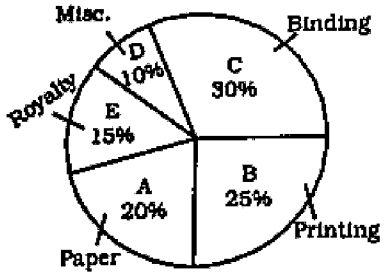
81. Angle of the pie chart representing the expenditure on entertainment is
(1) 15° (2) 10°
(3) 36° (4) $12\frac{1}{2}°$

82. If the difference in the amount spent for buying clothes and house maintenance was ₹1,500, how much they spent for house maintenance ?
(1) ₹ 5,000 (2) ₹ 6,000
(3) ₹ 7,000 (4) ₹ 8,000

Directions (83–87) : The following pie-diagram shows the expenditure incurred on the preparation of a book by a publisher, under different heads. Study the pie-diagram and answer the following questions.

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

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83. Angle of the pie-chart representing expenditure incurred on paying royalty is
(1) 27° (2) 36°
(3) 15° (4) 54°

84. If the expenditure on printing and binding of one book is ₹110, then the cost of production of the book is (in ₹)
(1) 250 (2) 200
(3) 110 (4) 550

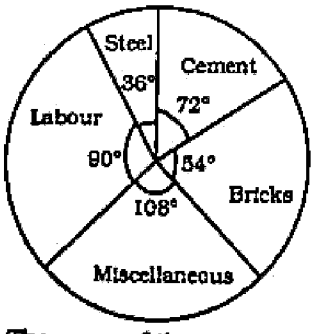
85. If cost of publishing a book is ₹ 200, then printing cost is (in ₹)
(1) 40 (2) 60
(3) 20 (4) 50

86. Which two expenditures together will form an angle of 108° at the centre of the pie-diagram ?
(1) A and D (2) A and C
(3) A and B (4) A and E

87. The number of heads on which the expenditure on a book is more than the average is
(1) 3 (2) 2
(3) 4 (4) None of these

Directions (88-92) : The following pie-chart shows the expenditure incurred on the construction of a house in a city. Study the chart and answer the following questions.

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)



88. The mean of the expenditure is on
(1) Brick (2) Cement
(3) Steel (4) Labour

89. The ratio of expenditure on Steel, Cement and Bricks is
(1) 2 : 4 : 3 (2) 4 : 2 : 3
(3) 3 : 2 : 4 (4) 4 : 3 : 2

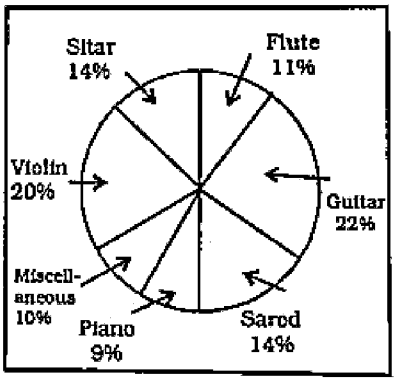
90. The highest expenditure in percentage is
(1) 40% (2) 30%
(3) 45% (4) 60%

91. What part of expenditure on labour is in respect of total expenditure ?
(1) $\frac{3}{10}$ part (2) $\frac{5}{8}$ part
(3) $\frac{1}{4}$ part (4) $\frac{7}{18}$ part

92. Of the total expenditure the percentage of expenditure on steel and bricks together is
(1) 90% (2) 20%
(3) 25% (4) 30%

Directions (93-97) : The following pie-chart shows the preference of musical instruments of 60,000 people surveyed over whole India. Examine the chart and answer the questions.

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)



93. If 2100 people be less from the number of people who prefer Flute, the percentage of people who prefer Flute would have been :
(1) 9.5% (2) 6.5%
(3) 7.5% (4) 8.5%

94. The total number of people who prefer either Sarod or Guitar, is greater than the total number of people who prefer either Violin or Sitar by :
(1) 1200 (2) 1600
(3) 1100 (4) 1400

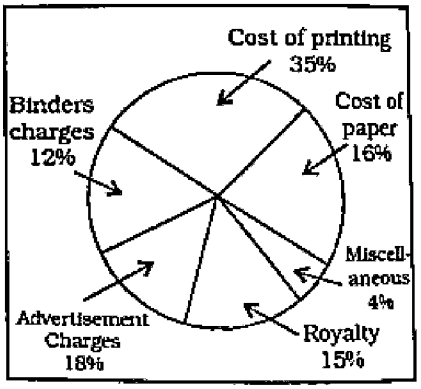
95. The number of people who prefer the musical instrument Sarod is :
(1) 7400 (2) 8400
(3) 6400 (4) 8600

96. If $16\frac{2}{3}$% of the people who prefer Piano, would go with the people who prefer Flute, the percentage of people who prefer Flute would have been
(1) 13.5% (2) 14.5%
(3) 15.5% (4) 12.5%

97. The number of people who prefer Guitar is greater than the total number of people who prefer either Flute or Piano by :
(1) 1200 (2) 1100
(3) 1300 (4) 1400

Directions (98-102) : Circle graph given below shows the expenditure incurred in bringing out a book by a publisher. Study the graph and answer the question.

(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)



98. The central angle of the sector for the cost of the paper is :
(1) 22.5° (2) 16°
(3) 54.8° (4) 57.6°

99. Royalty on the book is less than the Advertisement charges by :
(1) 3% (2) 25%
(3) 20% (4) $16\frac{2}{3}$%

100. If 5500 copies are published, Miscellaneous expenditures amounts to ₹1848 and publisher's profit is 25%, then marked price of each copy is
(1) ₹ 12.50 (2) ₹ 10.50
(3) ₹ 10 (4) ₹ 8.40

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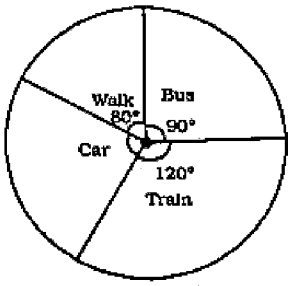
101. If the cost of printing is ₹ 17,500, the Royalty is :
(1) ₹ 8750 (2) ₹ 6300
(3) ₹ 7500 (4) ₹ 3150

102. If the Miscellaneous charges is ₹ 6,000, the Advertisement charges are :
(1) ₹ 27,000 (2) ₹ 90,000
(3) ₹ 12,000 (4) ₹ 1,333.33

Directions (103–107) : The pie-chart given below represents the number of students using different transport to a school in which total number of students is 2160.

Answer the questions based on the following diagram.

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)



103. The number of students who come to school by car is
(1) 70 (2) 290
(3) 420 (4) 480

104. The ratio of the number of students who come to school by car to the number of students who come to school by bus is
(1) 21 : 24 (2) 21 : 27
(3) 36 : 27 (4) 36 : 21

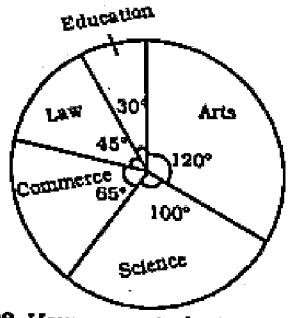
105. The total number of students coming to school either by walking or by bus is
(1) 480 (2) 540
(3) 1020 (4) 170

106. The number of students who don't come to school by train is
(1) 720 (2) 1020
(3) 2040 (4) 1440

107. The number of students coming to school by bus exceeds the number of students coming to school walking, by
(1) 10% (2) 12.5%
(3) 11% (4) 11.5%

Directions (108-110) : In the following questions, the pie-chart shows the number of students admitted in different faculties of a college. Study the chart and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013, 1st Sitting)



108. How many students are more in commerce than in law if 1000 students are in science?
(1) 200 (2) 2000
(3) 500 (4) 20

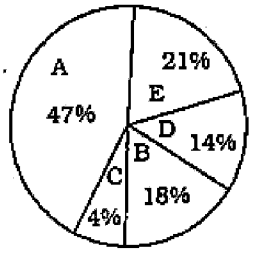
109. If 1000 students are admitted in science, what is the ratio of students in science and arts?
(1) 6 : 5 (2) 7 : 5
(3) 7 : 6 (4) 5 : 6

110. If 1000 students are admitted in science, what is the total number of students?
(1) 180 (2) 1800
(3) 3600 (4) 360

Directions (111-114) : In the following questions, study the two pie-charts and answer the questions.

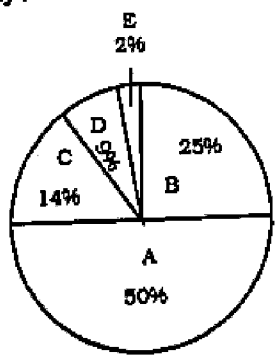
(SSC Graduate Level Tier-I Exam. 21.04.2013, 1st Sitting)

April month's salary : ₹ 24000



A – Education
B – Savings
C – Grocery
D – Electricity and Phone Bills
E – Miscellaneous

May month's salary : ₹ 25000



111. What is the percent increase in Education in May month than April month ?
(1) 9.56% (2) 12.35%
(3) 20% (4) 10.82%

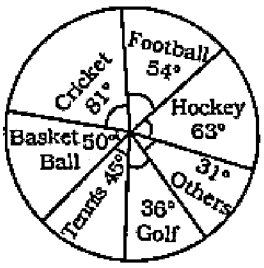
112. The ratio of amount spent for savings in April month's salary and miscellaneous in May month's salary is :
(1) 216 : 25 (2) 217 : 26
(3) 205 : 13 (4) 235 : 50

113. From the salary of May, the amount spent on Grocery and Electricity are:
(1) ₹ 6250, ₹ 3360
(2) ₹ 960, ₹ 5040
(3) ₹ 3500, ₹ 2250
(4) ₹ 2160, ₹ 480

114. The average amount spent on Education, Grocery and Savings from April month's salary is:
(1) ₹ 5800 (2) ₹ 6000
(3) ₹ 6325 (4) ₹ 5520

Directions (115–118) : The Pie Chart shows the expenditure of a country on various sports during a particular year. Study the graph and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)



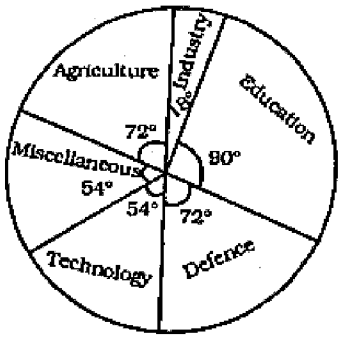
115. If the total amount spent on cricket and hockey together is ₹ 80,000, the total amount spent on sports is
(1) ₹ 1,00,000
(2) ₹ 2,00,000
(3) ₹ 2,50,000
(4) ₹ 3,00,000

116. How much per cent more is spent on Hockey than that on Golf ?
(1) 27% (2) 35%
(3) 37.5% (4) 75%

117. How much per cent less is spent on football than that on cricket ?
(1) $22\frac{2}{9}\%$ (2) 27%
(3) $39\frac{1}{3}\%$ (4) $37\frac{1}{2}\%$

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118. Study the graph & answer the question



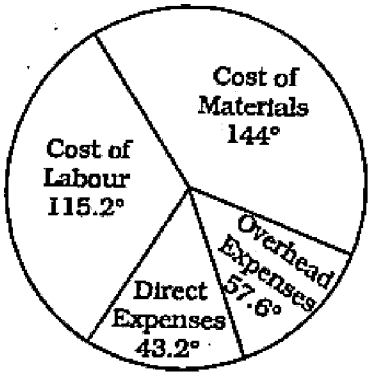
In a certain country, allocations to various sectors of the yearly budget per ₹ 1000 crores are represented by this pie-diagram. The expenditure (in ₹) on Agriculture is

(1) 250 crores (2) 150 crores
(3) 300 crores (4) 200 crores

(SSC Graduate Level Tier-I Exam. 21.04.2013)

Directions (119–120) : Following figure is Pie-chart representing item-wise cost of manufacturing certain product. Study the chart and answer the questions.

(SSC Graduate Level Tier-I Exam. 19.05.2013)



119. Total manufacturing cost is ₹ 96,000. Then, cost of labour is

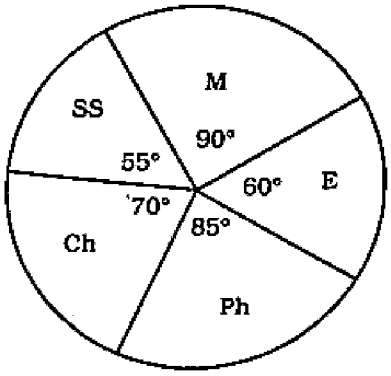
(1) ₹ 30,720 (2) ₹ 38,400
(3) ₹ 11,520 (4) ₹ 15,000

120. The difference of cost of material and direct expenses is

(1) ₹ 26,000 (2) ₹ 10,000
(3) ₹ 26,500 (4) ₹ 26,880

Directions (121–124) : The following pie-chart shows the marks scored by a student in different subjects - viz. Physics (Ph), Chemistry (Ch), Mathematics (M), Social Science (SS) and English (E) in an examination. Assuming that total marks obtained for the examination is 810. Answer the questions given below.

(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)



121. The difference of marks between Physics and Chemistry is same as that between

(1) Chemistry and Social Science
(2) Physics and English
(3) Mathematics and English
(4) English and Social Science

122. The marks obtained in Mathematics and Chemistry exceed the marks obtained in Physics and Social Science by

(1) 50 (2) 30
(3) 40 (4) 45

123. The subject in which the student obtained 135 marks is

(1) English
(2) Physics
(3) Chemistry
(4) Mathematics

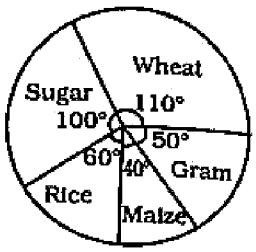
124. The marks obtained in English, Physics and Social Science exceed the marks obtained in Mathematics and Chemistry by

(1) $11\frac{1}{9}\%$ (2) 10%

(3) $10\frac{1}{9}\%$ (4) 11%

Direction (125) : The annual agricultural production (in tonnes) of an Indian State is given in the pie chart. The total production is 9000 tonnes. Read the pie chart and answer the question.

(SSC Graduate Level Tier-II Exam. 29.09.2013)



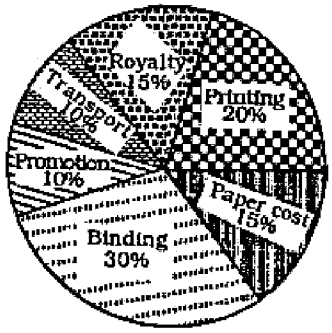
(In tonnes)

125. What is the annual production of wheat?

(1) 2750 tonnes
(2) 3000 tonnes
(3) 3540 tonnes
(4) 3500 tonnes

Directions (126-127) : Various expenditures incurred by a publishing company for publishing a book in 2011 are given below. Study the chart and answer the questions.

(SSC CHSL DEO& LDC Exam. 20.10.2013)



126. Price of a book is 20% above cost price. If the marked price is ₹ 180, then the cost of paper for a single copy (in ₹) is

(1) 44.25 (2) 36
(3) 22.50 (4) 42

127. Royalty of a book is less than the printing cost by

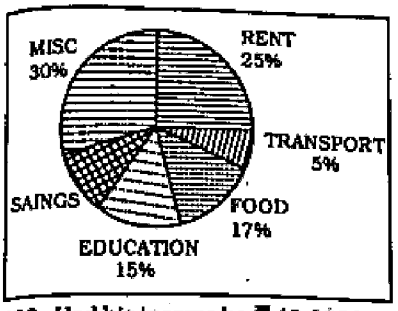
(1) 25% (2) 5%

(3) $33\frac{1}{3}\%$ (4) 20%

Directions (128-131) : The adjoining pie-chart shows the proportional expenditure on various items of Amar's family. If monthly income of Amar is ₹ 48,000, answer the questions.

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)

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128. Had his income be ₹ 40,000 how much would be spent on food ?
(1) ₹ 14,960 (2) ₹ 1,360
(3) ₹ 8,160 (4) ₹ 6,800

129. If 10% of miscellaneous expenditure is earmarked for clothing, how much amount is spent on clothes ?
(1) ₹ 14,400 (2) ₹ 1,440
(3) ₹ 2,880 (4) ₹ 15,840

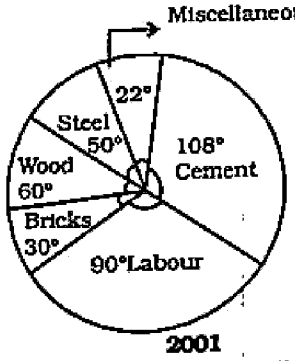
130. How much does he save per month ?
(1) ₹ 7,200 (2) ₹ 14,400
(3) ₹ 3,840 (4) ₹ 2,400

131. How much does he spend more on rent than on transport and education taken together ?
(1) ₹ 2,400 (2) ₹ 9,600
(3) ₹ 4,800 (4) ₹ 12,000

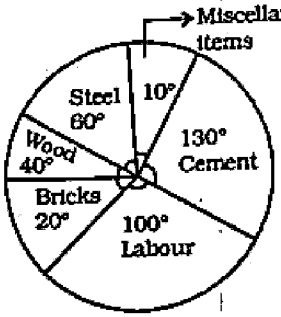
Directions (132-134) : Pie-charts show the expenses on various heads in construction of a house. Study the pie-chart.

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014) (Ist Sitting)

1991



2001



132. What percentage of the total amount is being spent on cement in 1991 ?
(1) 18% (2) 30%
(3) 48% (4) 60%

133. The percentage increase in the amount spent on labour from 1991 to 2001, given that the total amount spent on the construction of the house is ₹3,60, 000 in 1991 and ₹8,64,000, in 2001 is

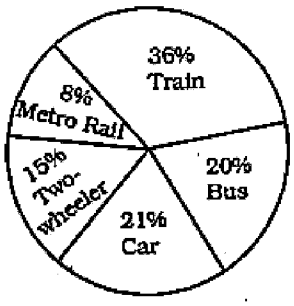
(1) $3\frac{1}{9}\%$ (2) $43\frac{1}{3}\%$

(3) $41\frac{2}{3}\%$ (4) $2\frac{2}{9}\%$

134. If the total cost of constructing the house is ₹3,60,000 in 1991 and ₹8,64,000, in 2001, what is the amount spent on Steel in 1991 and 2001 ?
(1) ₹ 2,16,000, ₹ 4,32,000
(2) ₹ 60,000, ₹ 84,000
(3) ₹ 80,000, ₹ 2,10,000
(4) ₹ 50,000, ₹ 1,44,000

Directions (135-138) : The pie chart given below represents the modes of transport for 1400 officers of the Staff Selection Commission, Kolkata. Study the chart and answer the following questions.

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014) (IInd Sitting)



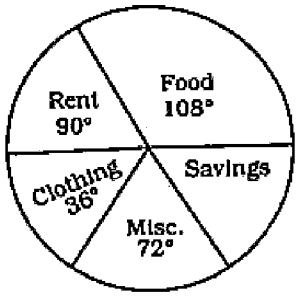
135. The ratio of two-wheelers and cars being used as modes of transport is
(1) 4 : 7 (2) 7 : 5
(3) 5 : 7 (4) 3 : 5

136. Write down the difference :
(officers availing train – officers availaing car)
(1) 210 (2) 462
(3) 562 (4) 452

137. The number of officers who go to office by Metro Rail is
(1) 142 (2) 132
(3) 112 (4) 122

138. The number of officers who go to office by car is
(1) 394 (2) 304
(3) 214 (4) 294

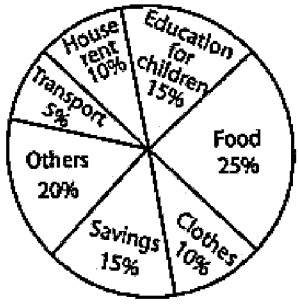
139. The following pie - chart shows the monthly expenditure of a family on food, clothing, rent, miscellaneous expenses and savings. What is the central angle for savings ?



(1) 54° (2) 56°
(3) 50° (4) 52°

(SSC CGL Tier-I Exam. 26.10.2014)

140. The pie - chart gives the expenditure (in percentage) on various items and savings of a family during a month. Monthly savings of the family is ₹ 3, 000. On which item is the expenditure maximum and how much is it ?



(1) Others, ₹ 2,000
(2) Food, ₹ 3,000
(3) Others, ₹ 5,000
(4) Food, ₹ 5,000

(SSC CGL Tier-I Exam. 26.10.2014)

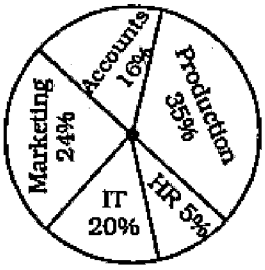
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Directions (141-144): Study the pie-chart and table given below and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

Details of percentage of employees working in various departments in an organization and number of males among them.

Total number of employees = 800.



Department	No. of Males
Production	245
HR	12
IT	74
Marketing	165
Accounts	93

141. The respective ratio between the number of females working in HR department to the total number of employees working in the HR department is
(1) 7 : 10 (2) 8 : 17
(3) 8 : 19 (4) 5 : 7

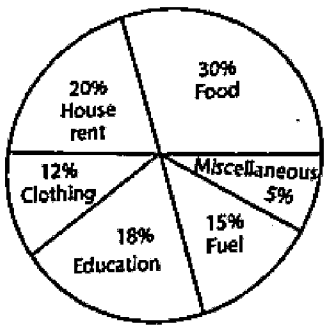
142. The percentage of the number of male employees working in Marketing department to the total number of employees in Marketing department is
(1) 84% (2) 86%
(3) 88% (4) 91%

143. The percentage of females working in IT department to the total number of employees working in the organization is
(1) 10.25% (2) 10.75%
(3) 15.25% (4) 15.75%

144. The ratio of number of males in Marketing department to the number of females working in that department is
(1) 52 : 7 (2) 52 : 9
(3) 55 : 7 (4) 55 : 9

Directions (145-149): The following pie-chart shows the monthly expenditure of a family on food, house rent, clothing, education, fuel and miscellaneous. Study the pie-chart and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)



145. If the expenditure for food is ₹ 9000, then the expenditure for education is
(1) ₹ 5000 (2) ₹ 5200
(3) ₹ 5400 (4) ₹ 6000

146. The central angle of the sector for the expenditure on fuel (in degrees) is
(1) 50.4 (2) 54
(3) 57.6 (4) 72

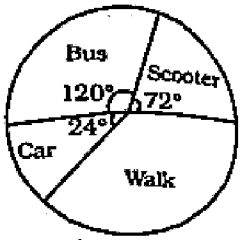
147. If the expenditure on fuel is ₹ 3000, the total expenditure excluding expenditure on house rent and education is
(1) ₹ 11600 (2) ₹ 12000
(3) ₹ 12400 (4) ₹ 12500

148. If the percentage of expenditure on food is x% of the total percentage of expenditure on clothing, education and fuel, then x equals
(1) 66 (2) $66\frac{1}{3}$
(3) $66\frac{2}{3}$ (4) 67

149. Total percentage of expenditure on house rent, clothing and fuel is greater than the percentage of expenditure on food by
(1) 16 (2) 17
(3) 18 (4) 20

Directions (150 – 153): The following graph represents the transport used by children. Study the graph and answer the given questions.

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting TF No. 545 QP 6)



150. What is the measure of the angle at the centre representing people walking?
(1) 144° (2) 48°
(3) 36° (4) 72°

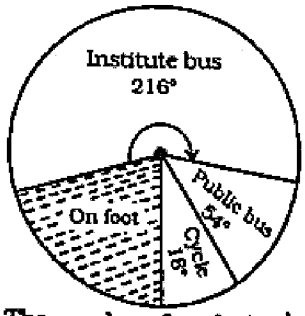
151. What is the percentage of children using scooter?
(1) 20% (2) $33\frac{1}{3}$%
(3) 15% (4) 40%

152. If 10 students come by car, how many come by bus?
(1) 60 (2) 50
(3) 30 (4) 100

153. If 180 students come walking to school what is the strength of the school?
(1) 540 (2) 450
(3) 360 (4) 600

Directions (154 – 156): In an Institution there are 800 students. Students use different modes of transport for going to the institution and return. The given pie diagram represents the requisite data. Study the diagram carefully and answer the questions.

(SSC CGL Tier-II Exam. 12.04.2015 TF No. 567 TL 9)



154. The number of students who travel in public bus is
(1) 150 (2) 120
(3) 130 (4) 125

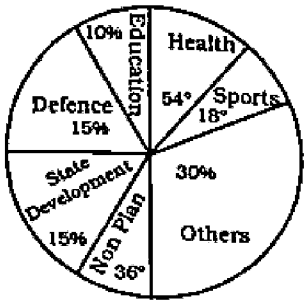
155. The number of students who do not use institute bus is
(1) 330 (2) 350
(3) 480 (4) 320

156. The number of students who go to institute on foot is
(1) 160 (2) 170
(3) 120 (4) 106

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Directions (157–161) : The expenses of a country for a particular year is given in Pie–Chart. Read the Pie–chart and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) (TF No. 8037731)



157. If the total amount spent by the Government during the year was ₹ 1,00,000 crores, then the amount spent on Health and Education together was
(1) ₹ 25,000 crore
(2) ₹ 20,000 crore
(3) ₹ 30,000 crore
(4) ₹ 15,000 crore

158. If the total amount spent by the Government during the year was ₹ 3,00,000 crores, the amount spent on state development exceeds that on sports by
(1) ₹ 30,000 crore
(2) ₹ 45,000 crore
(3) ₹ 35,000 crore
(4) ₹ 25,000 crore

159. The percent of less money spent on non plan than that on defence is
(1) 15% (2) 5%
(3) 12% (4) 10%

160. The percent of excess money spent on Others than that on Sports is
(1) 26% (2) 25%
(3) 27% (4) 28%

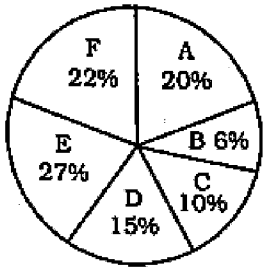
161. The percent of the total spending that is spent on health is
(1) 15% (2) 20%
(3) 25% (4) 30%

Directions (162 – 166) : Study the following graph carefully and answer the given questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

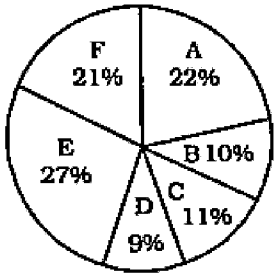
Percentage of different types of employees in a company in two consecutive years.

Total Number of employees = 42960



1997

Total Number of employees = 48640



1998

162. In 1997 the total number of which of the following types of pairs of employees was approximately equal to A type of employees in 1998 ?
(1) C and D (2) D and E
(3) B and C (4) A and C

163. From 1997 to 1998 in the case of which of the following types of employees the change was maximum ?
(1) B (2) A
(3) C (4) D

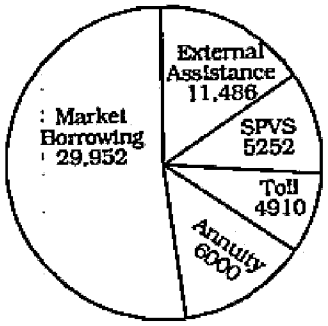
164. What was the approximate difference in the number of B type of employees during 1997 and 1998 ?
(1) 2285 (2) 2325
(3) 2620 (4) 2085

165. If the number of D type employees in 1998 was 5000, what would have been its approximate percentage in the company ?
(1) 10 (2) 14
(3) 12 (4) 16

166. The number of A type employees in 1998 was approximately what percent of the number of A type employees in 1997 ?
(1) 140 (2) 115
(3) 95 (4) 125

Directions (167 – 169) : The following pie-chart shows the sources of funds (in Rs. crores) to be collected by the National Highways Authority of India (NHAI) for its Phase II projects. Study the pie-chart and answer the following **Three** questions :

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)



167. If the toll is to be collected through an outsourced agency by allowing a maximum 10% commission, how much amount should be permitted to be collected by the outsourced agency, so that the project is supported with Rs. 4,910 crores ?
(1) Rs. 6,213 crores
(2) Rs. 5,827 crores
(3) Rs. 5,401 crores
(4) Rs. 5,316 crores

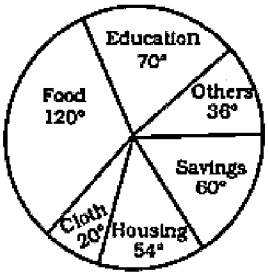
168. If NHAI could receive a total of Rs. 9,695 crores as External Assistance, by what percent (approximately) should it increase the Market Borrowing to arrange for the shortage of funds ?
(1) 4.5% (2) 7.5%
(3) 6% (4) 8%

169. The central angle corresponding to Market Borrowing is
(1) 52° (2) 137.8°
(3) 187.2° (4) 192.4°

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Directions (170 – 172) : The pie-chart given below shows expenditure incurred by a family on various items and their savings. Study the chart and answer the questions based on the pie-chart

(SSC CGL Tier-I Exam, 16.08.2015 (1st Sitting) TF No. 3196279)



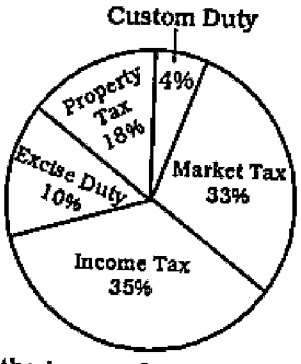
170. The ratio of expenditure on food to savings is :
(1) 3 : 2 (2) 10 : 9
(3) 3 : 1 (4) 2 : 1

171. If the expenditure on education is ₹1600 more than that on housing, then the expenditure on food is :
(1) ₹ 12000 (2) ₹ 6000
(3) ₹ 3333 (4) ₹ 7000

172. If the monthly income is ₹ 36000, then the yearly savings is :
(1) ₹ 70000 (2) ₹ 72000
(3) ₹ 60000 (4) ₹ 74000

Directions (173–175) : The income of a state under different heads is given in the following pie-chart. Study the chart and answer the questions.

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)



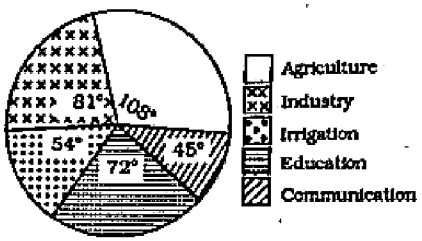
173. If the income from the market tax in a year be ₹ 165 crores then the total income from other sources is (in ₹ crore)
(1) 325 (2) 335
(3) 365 (4) 345

174. If the total income in a year be ₹ 733 crores then the income (in ₹ crores) from 'Income tax' and 'Excise duty' is :
(1) 329.85 (2) 331.50
(3) 331.45 (4) 329.80

175. The central angle of the sector representing income tax is :
(1) 126° (2) 135°
(3) 150° (4) 119°

Directions (176–178) : The pie-chart shows the proposed outlay for different sectors during a Five-Year plan of Government of India. Total outlay is Rs. 40,000 crores. By reading the pie-chart answer the following three questions.

(SSC CGL Tier-I Re-Exam, 30.08.2015)



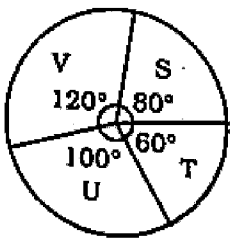
176. What is the proposed outlay for Education?
(1) Rs. 6000 crores
(2) Rs. 8000 crores
(3) Rs. 9000 crores
(4) Rs. 7000 crores

177. If the proposed outlay of Irrigation is x% of the proposed outlay of Agriculture, then x is equal to
(1) 50% (2) 15%
(3) 25% (4) 75%

178. What is the ratio between the proposed outlay of Irrigation and Communication?
(1) 9 : 8 (2) 3 : 2
(3) 9 : 5 (4) 6 : 5

Directions (179–180) : The following pie-chart shows the market share of four companies S, T, U and V. Total market is worth Rs. 72 crores. Study the pie-chart and answer the questions.

(SSC Constable (GD) Exam, 04.10.2015, IInd Sitting)

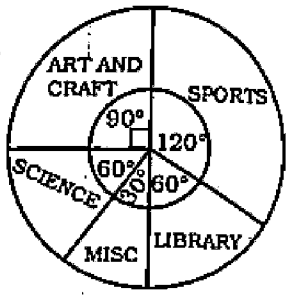


179. The company having maximum market share is
(1) T (2) U
(3) S (4) V

180. The difference of market shares of companies V and U is
(1) Rs. 8 crores (2) Rs. 9 crores
(3) Rs. 6 crores (4) Rs. 4 crores

Directions (181–185) : The pie chart shows how the school funds is spent under different heads in a certain school. Using the pie chart answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)



Misc. Miscellaneous

181. What percentage of the total expense is spent on library?
(1) 24.3 (2) 24
(3) 20 (4) 16.6

182. Which head uses 25% of the funds?
(1) Sports
(2) Misc
(3) Library
(3) Art and Craft

183. Which heads have the same amount of expenditure?
(1) Library and Science
(2) Sports and Science
(3) Science and Misc (4) Misc and Library

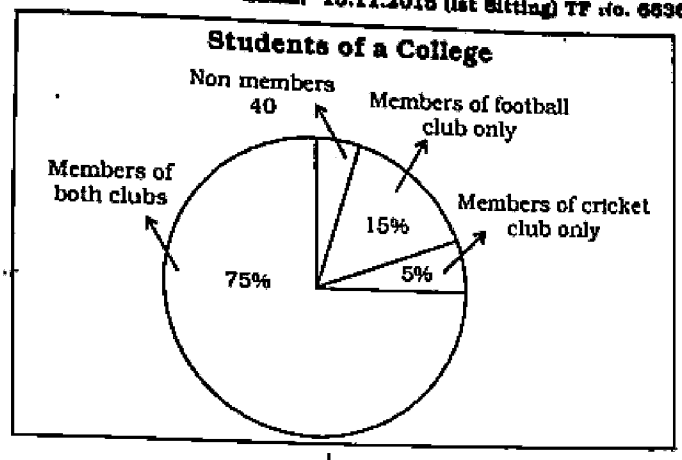
184. Which head has the maximum expenditure?
(1) Art and Craft
(2) Sports
(3) Library
(4) Science

185. What is the ratio of expenditure on sports to that on art and craft?
(1) 1 : 1 (2) 4 : 3
(3) 1 : 4 (4) 2 : 1

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Directions (186 – 189) : Study the Pie chart carefully and answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam. 15.11.2015 (Ist Sitting) TF No. 6636838)



186. Percentage of students who are not members of any club is :
(1) 5% (2) 8%
(3) 10% (4) 6%

187. Number of students who are members of cricket club only :
(1) 35 (2) 40
(3) 42 (4) 41

188. Ratio of members of cricket club only and football club only respectively is :
(1) 1 : 3 (2) 2 : 1
(3) 1 : 2 (4) 4 : 1

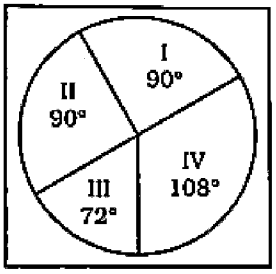
189. The number of students who are members of both the clubs is :
(1) 500 (2) 650
(3) 550 (4) 600

Directions (190–193) : Study the pie chart and answer the given questions.

The total expenditure of a company for a particular month is Rs. 60000. The various heads of expenditure I to IV are indicated in a pie chart given below. These heads are :

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)

I. Raw materials
II. Conveyance
III. Electricity
IV. Overhead expenses



190. Total expenditure on conveyance is :
(1) Rs. 12,000 (2) Rs. 15,000
(3) Rs. 20,000 (4) Rs. 10,000

191. What percentage of total expenditure is on electricity?
(1) 23% (2) 25%
(3) 30% (4) 20%

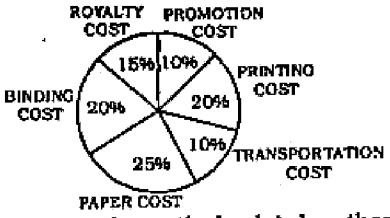
192. What is the amount spent on overhead expenses?
(1) Rs. 12,000 (2) Rs. 15,000
(3) Rs. 18,000 (4) Rs. 10,000

193. What percentage of total expenditure is on raw materials?
(1) 25% (2) 30%
(3) 60% (4) 23%

Directions (194-197) : The following pie-chart shows the percentage distribution of the expenditure incurred in publishing a book. Read the pie-chart and answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)

Various Expenditure (in percentage) incurred in publishing a book



194. Royalty on the book is less than the printing cost by :
(1) 20% (2) 5%
(3) 25% (4) $33\frac{1}{3}$

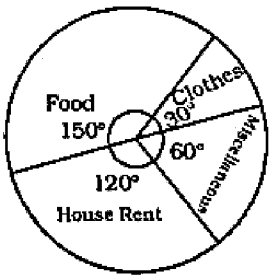
195. The central angle of the sector corresponding to the expenditure incurred on Royalty is :
(1) 15° (2) 48°
(3) 54° (4) 24°

196. If 5500 copies are published and the transportation cost on them amount to Rs. 82500 then the selling price of the book so that the publisher can earn a profit of 25% is :
(1) Rs. 191.50 (2) Rs. 187.50
(3) Rs. 180 (4) Rs. 175

197. If for a certain quantity of books, the publisher has to pay Rs. 30600 as printing cost, then the amount of royalty cost to be paid for these books is :
(1) Rs. 21200 (2) Rs. 19450
(3) Rs. 22950 (4) Rs. 26150

Directions (198–201) : The Expenditure of a family in a month is represented by a Pie-chart. Read it carefully to answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)



198. The total money spent on clothes and miscellaneous is :
(1) None of the options
(2) Rs. 900 (3) Rs. 3600
(4) Rs. 2000

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199. The percentage of money spent on food compared to house rent is
(1) 25% (2) 12.5%
(3) 50% (4) None of these

200. The ratio of the amount spent on food and clothes is
(1) 4 : 1 (2) 4 : 5
(3) 5 : 1 (4) 2 : 5

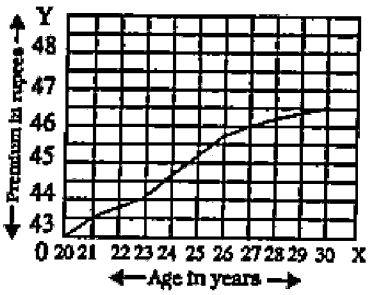
201. If the total amount spent is Rs. 7,200, find the amount spent on food :
(1) Rs. 1500 (2) Rs. 6000
(3) Rs. 4500 (4) Rs. 3000

TYPE–II

Directions (1–5) : The graph given here shows the annual premiums of an insurance company, charged for an insurance of ₹ 1000 for individuals of different age-groups. Study the graph and answer each of the following questions :

(SSC CPO S.I.Exam. 07.09.2003)

Scale { along O X → 1 small div = 1 year
along O Y → 1 small div = 50 paise



1. The annual premium for a man aged 26 years for an insurance of ₹ 1000 is
(1) ₹ 46 (2) ₹ 44
(3) ₹ 45.7 (4) ₹ 45.25

2. What is the age of a person whose premium is ₹ 44.60 for an insurance of ₹ 1000 ?
(1) 23 years (2) $23\frac{1}{2}$ years
(3) 24 years (4) 45 years

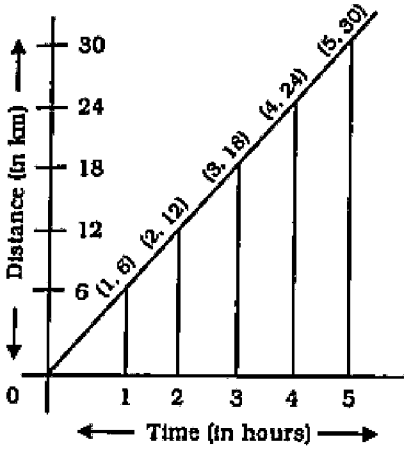
3. The premium for a man aged 22 years for an insurance of ₹ 10,000 is
(1) ₹ 435 (2) ₹ 440
(3) ₹ 43.75 (4) ₹ 437.50

4. What percent of the premium is increased if a man aged 30 years is insured for ₹ 1000 instead of a man aged 23 years ?
(1) 4.75% (2) 5.68%
(3) 6.24% (4) 6%

5. Each of two persons aged 21 years and 23 years is insured for ₹ 1,00,000. The difference between their annual premiums will be
(1) ₹ 100 (2) ₹ 50
(3) ₹ 25 (4) ₹ 20

Directons (6-9) : The graph given here shows a car following the linear path with uniform speed. Study the graph and answer the questions.

(SSC CPO S.I. Exam. 03.09.2006)



6. The speed of the car is
(1) 12 km/hr (2) 6 km/hr
(3) 18 km/hr (4) 24 km/hr

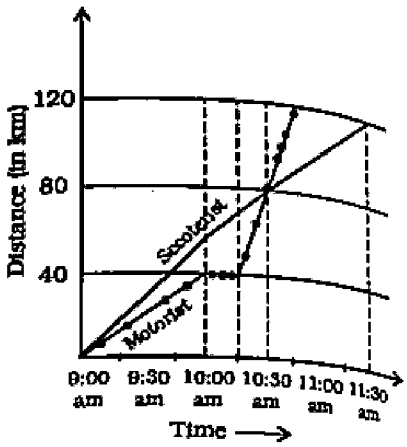
7. The speed of the car (in metres per minute) is
(1) 60 (2) 100
(3) 600 (4) 1000

8. The distance travelled by the car in 4.5 hours is
(1) 27 km (2) 30 km
(3) 36 km (4) 40 km

9. The car covers a distance of 15 kilometres in
(1) 3 hours (2) 2 hours
(3) 1.5 hours (4) 2.5 hours

Directions (10-13) : A motorist and a scooterist made a journey of 120 km at the same time and from the same place. The graph shows the progress of the journey made by each person. Study the graph and answer the questions.

FCI Assistant Grade-III Exam.05.02.2012 (Paper-I) East Zone (IInd Sitting)



10. At what time did the motorist meet the scooterist ?
(1) 10.30 am (2) 10.45 am
(3) 10.15 am (4) 10.20 am

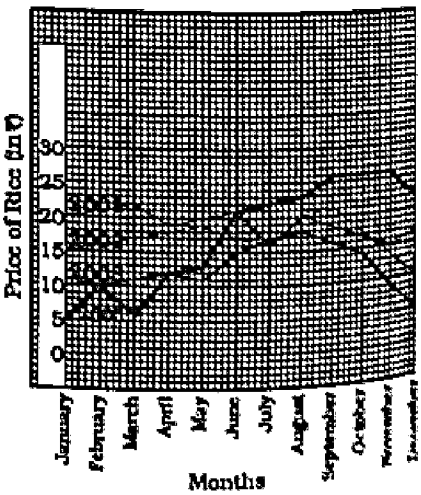
11. What was the speed of the scooterist during the journey ? (in kmph)
(1) 45 (2) 48
(3) 42 (4) 46

12. The scooterist completes the journey in (hours) :
(1) 3 (2) 2
(3) $2\frac{1}{2}$ (4) $3\frac{1}{2}$

13. How far, from the start, did the motorist meet the scooterist ? (in km)
(1) 75 (2) 70
(3) 90 (4) 80

Directions (14–17) : A graph showing the price of rice in India during the year 2000 to 2003 is given below. Study the graph carefully and answer the questions.

(SSC Delhi Police S.I.(SI) Exam. 19.08.2012)



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14. For the month of May, the graph shows that the price of rice was the lowest in the year

(1) 2000 (2) 2001
(3) 2002 (4) 2003

15. The range of price for a year is the difference between the maximum and the minimum prices for that year. The graph shows that this range of price was the greatest for the year

(1) 2000 (2) 2001
(3) 2002 (4) 2003

16. The month in which the price of rice were equal for the year 2000 and 2001 was

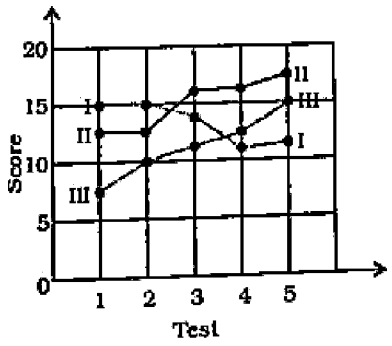
(1) September (2) August
(3) June (4) November

17. The maximum difference in price between any two years was in the month of

(1) January (2) November
(3) March (4) December

18. A class is divided into 3 equal groups and the class is given 5 tests in Maths. Average score of the groups and the tests is given below. The average score of the entire class in Test II is

Average scores of the groups in the first five Mental Maths tests

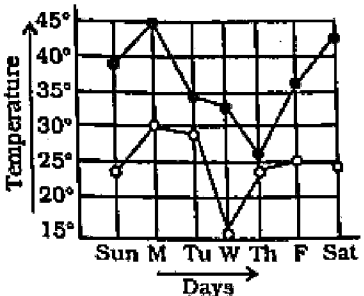


(1) 13 (2) 13.5
(3) 10 (4) 12.5

(SSC Multi-Tasking Staff Exam. 17.03.2013, Ist Sitting)

19. The following graph represents the maximum and minimum temperature recorded every day in a certain week. The day on which the difference between the maximum and minimum temperature was maximum is

● Maximum temperature
○ Minimum temperature

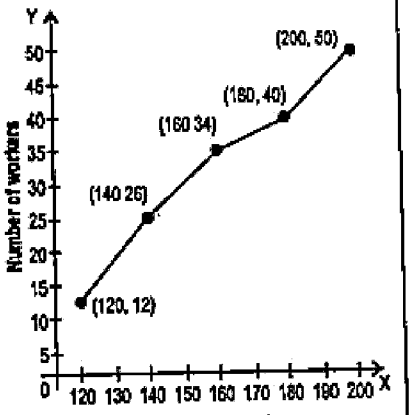


(1) Wednesday (2) Saturday
(3) Sunday (4) Monday

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

Directions (20-21) : The graph given below shows the daily income of 50 workers in a factory. Study the graph and answer the questions.

(SSC Multi-Tasking Staff Exam. 17.03.2013, Kolkata Region)



20. What percentage of the factory workers earn between ₹ 150 and ₹ 180 ?

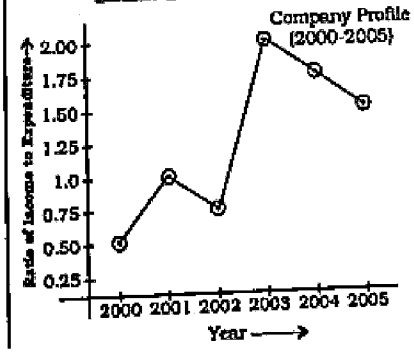
(1) 6% (2) 16%
(3) 12% (4) 20%

21. The median wages in the factory is

(1) ₹ 140 (2) ₹ 138
(3) ₹ 150 (4) ₹ 160

Directions (22-23) : Study the following graph and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)



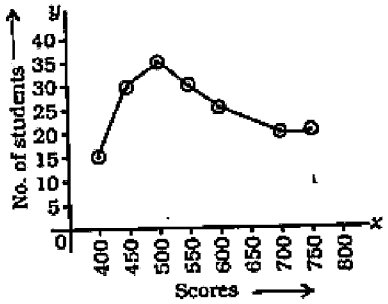
22. Find the percentage decrease in income from 2001 to 2002.

(1) 50% (2) 33%
(3) $37\frac{1}{2}$ %
(4) Data inadequate

23. If the income shows positive growth every year throughout the period (2000 - 2005), then in how many years the expenditure shows a positive growth ?

(1) 5 (2) 3
(3) 4 (4) 2

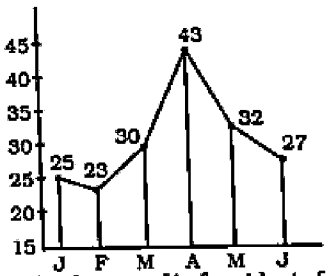
24. The adjoining diagram is frequency polygon for the scores of students in a test. What is the total number of students appeared in the test ?



(1) 180 (2) 200
(3) 250 (4) 150

(SSC Graduate Level Tier-I Exam. 21.04.2013)

25. Given is a line graph showing the number of accidents in a city during the first 6 months of 1999.



The decrease % of accidents from May to June is

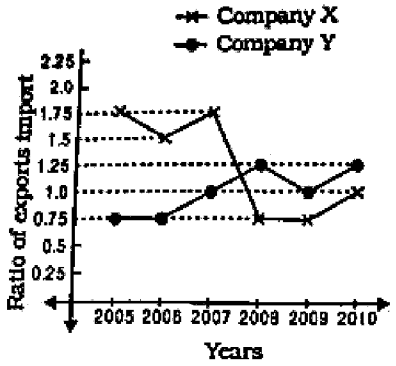
(1) $15\frac{3}{8}$% (2) $15\frac{1}{8}$%
(3) $15\frac{5}{8}$% (4) $15\frac{7}{8}$%

(SSC Graduate Level Tier-II Exam. 29.09.2013

Directions (26-27) : Study the following graph and answer the questions.

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

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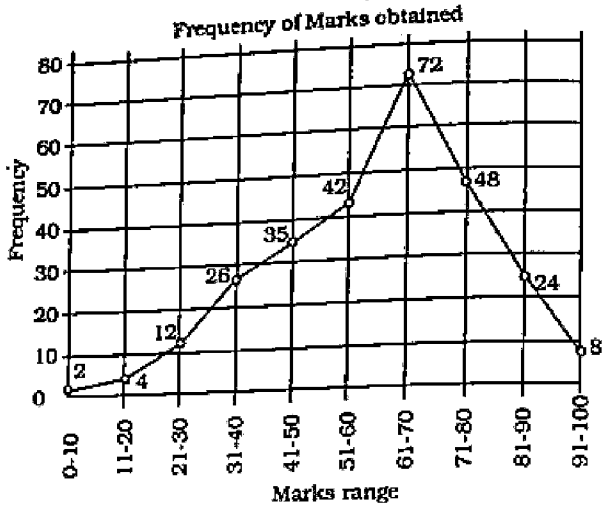


26. If the imports of company X in 2007 were increased by 40%, what would be the ratio of exports to the increased imports ?
(1) 1.25 (2) 1.75
(3) 0.25 (4) 0.75

27. In 2005, the exports of company X were double that of company Y in that year. If the imports of company X during the year were ₹ 180 crores, what was the amount (in crore ₹) of imports of company Y during the year ?
(1) 212 (2) 210
(3) 315 (4) 282

Directions (28 -31) : The marks obtained by 273 examinees are shown by the frequency polygon. Given that mean marks is 59.5. Study the frequency polygon and answer the given questions.

(SSC CHSL DEO & LDC Exam. 16.11.2014)



28. The number of examinees getting more than average marks is
(1) 72 (2) 105
(3) 152 (4) 164

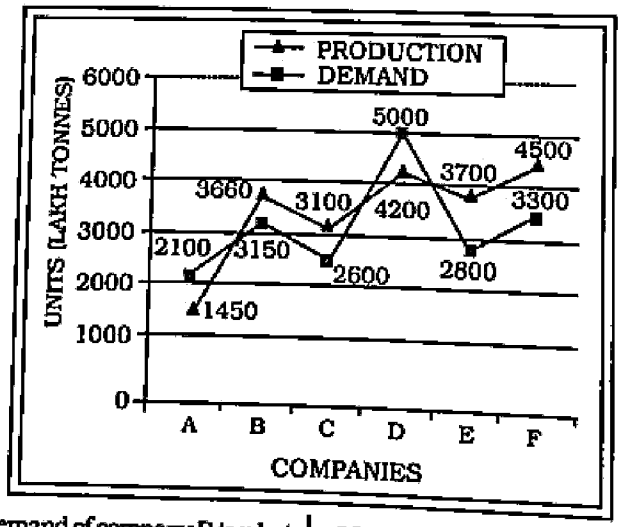
29. Percentage of the students who get above 80% marks is
(1) 9.81 (2) 10.53
(3) 11.28 (4) 11.72

30. Percentage of the students who got marks above 60% and below 80% is
(1) 43.95 (2) 48.39
(3) 51.06 (4) 56.84

31. If 40 is the pass marks, percentage of students failed is
(1) 14.56 (2) 15.84
(3) 16.11 (4) 17.25

Directions (32 - 35) : In the following questions, the Graph shows the demand and production of different companies. Study the graph and answer the questions.

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)



32. The demand of company B is what percentage of the production of company F ?
(1) 60% (2) 70%
(3) 80% (4) 50%

33. What is the difference between the average demand and the average production of the companies (in lakh tonnes)? [Approximately]
(1) 200
(2) 325
(3) 275
(4) 250

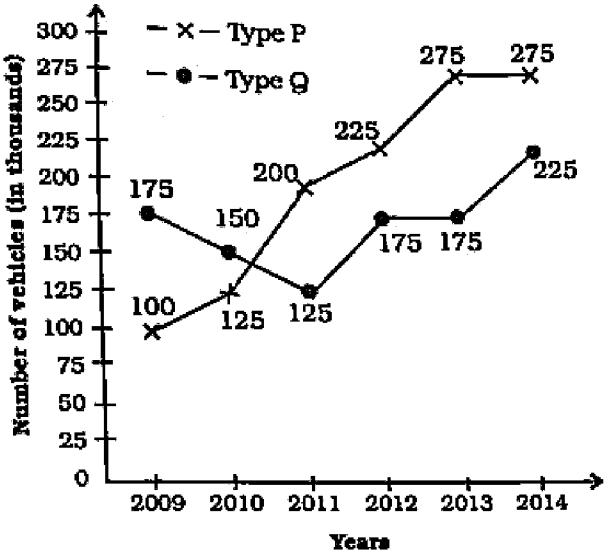
34. The production of company A is approximately what percent of the demand of company C ?
(1) 50%
(2) 65%
(3) 60%
(4) 55%

35. What is the ratio of the companies having more demand than production to those having more production than demand ?
(1) 2 : 3
(2) 1 : 2
(3) 3 : 2
(4) 2 : 1

Directions (36–40) : The following graph shows production (in thousands) of two types (P and Q) of vehicles by a factory over the years 2009 to 2014. Study the graph and answer the given questions.

(SSC CGL Tier-II Exam, 25.10.2015, TF No. 1099685)

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36. In how many of the given years, was the production of Type P vehicles of the company more than the average production of this type vehicles in the given years?
(1) 3 (2) 4
(3) 2 (4) 5

37. Approximate percentage decrease in production of Type Q vehicles from 2010 to 2011 is
(1) 10.1 (2) 16.7
(3) 14.3 (4) 12.5

38. The total production of Type P vehicles in the years 2009 and 2011 is what percent of total production of Type Q vehicles in 2010 and 2014?
(1) 75
(2) 69.25
(3) 80
(4) 81.25

39. The ratio of total production of Type P vehicles to total production of type Q vehicles over the years is
(1) 48 : 41 (2) 5 : 8
(3) 8 : 5 (4) 41 : 48

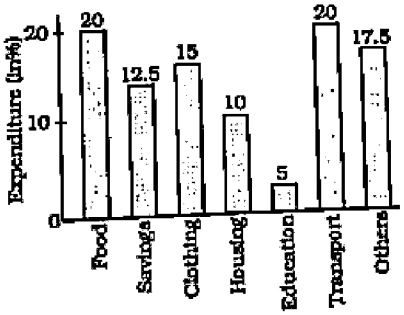
40. The production of Type Q vehicles in 2010 was approximately what percent of Type P vehicles in 2014?
(1) 60 (2) 45.5
(3) 54.5 (4) 75

TYPE-III

Directions (1-5) : The bar graph given below shows the spending of family income on various items and savings during 1993. Observe the graph and answer the following questions :

(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

Family Income spent during 1993 (In percentage)



1. The per cent of income spent on food is :
(1) 5% (2) 10%
(3) 12.5% (4) 20%

2. The per cent of income spent on clothing exceeds that on savings by :
(1) 12.5% (2) 2.5%
(3) 10% (4) 22.5%

3. If the total income of the family during 1993 was ₹ 100000, the savings of the family in 1993 was :
(1) ₹ 1,750 (2) ₹ 20,000
(3) ₹12,500 (4) ₹ 50,000

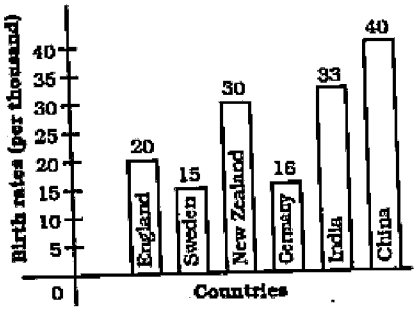
4. The total expenses of the family on transport is equal to those spent on :
(1) savings (2) clothing
(3) food (4) others

5. The savings of the family is more than that of expenditure incurred on :
(1) housing (2) clothing
(3) transport (4) others

Directions (6–10) : Study the bar diagram given below carefully and answer the following questions based on it.

(SSC CPO S.I. Exam. 05.09.2004)

Birth rates in different countries



6. The birth-rate of which country is 25% more than that of Germany?
(1) India (2) China
(3) England 4) New Zealand

7. The birth rate of India is what per cent of the birth-rate of England?
(1) 165% (2) 155%
(3) 140% (4) 100%

8. The birth-rate of China is how many times the birth-rate of Germany?
(1) 0.4 (2) 5.2
(3) 4.0 (4) 2.5

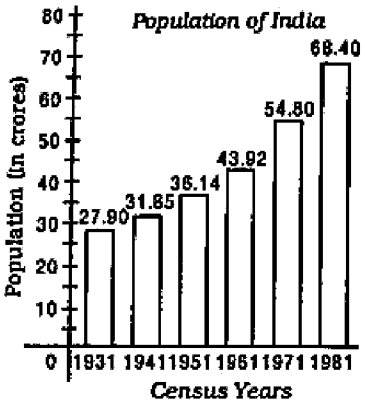
9. What is the ratio of birth-rate of India to that of Sweden ?
(1) 5 : 11 (2) 11 : 5
(3) 2 : 1 (4) 1 : 2

10. By how much per cent is the birth-rate of England less than the birth-rate of New Zealand?
(1) 30% (2) $33\frac{1}{3}\%$
(3) 45% (4) 50%

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Directions (11–14) : The Bar Graph given here shows the population (in crores) of India in various census years. Observe the graph and answer the question based on it.

(SSC CGL Prelim Exam. 27.07.2008 (Second Sitting)



11. The per cent increase in population from 1971 to 1981 is
(1) 24.8% (2) 20%
(3) 16.7% (4) 22.9%

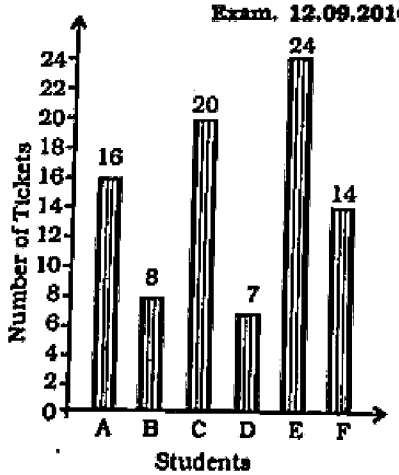
12. In which census year, the per cent increase in population is highest as compared to that in the previous census year ?
(1) 1951 (2) 1961
(3) 1971 (4) 1981

13. In which census year, the per cent increase in population is least as compared to that in the previous census year ?
(1) 1961 (2) 1951
(3) 1971 (4) 1941

14. Per year increase in population from the year 1931 to 1981 is
(1) 8100000 (2) 7600000
(3) 8900000 (4) 6700000

Directions (15-17) : The bar graph, given here, shows the number of tickets sold by 6 students A, B. C, D, E and F during a fair.
Observe the graph and answer questions based on it

(SSC (South Zone) Investigator Exam. 12.09.2010)



15. Total number of tickets sold by A, B and C is
(1) 45 (2) 44
(3) 42 (4) 40

16. The least number of tickets were sold by
(1) B (2) F
(3) A (4) D

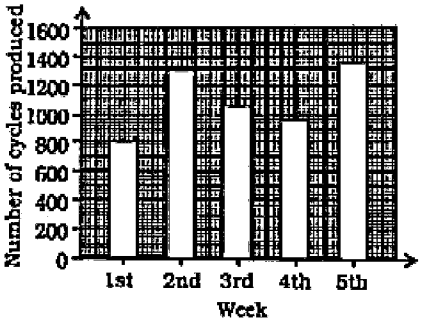
17. Total number of tickets sold by D, E and F is
(1) 47 (2) 46
(3) 45 (4) 44

Directions (18 – 20) : Given here is a bar graph showing the number of cycles produced in a factory during five consecutive weeks.

Observe the graph and answer the questions based on this graph.

(SSC CPO S.I. Exam 12.12.2010 (Paper-I)

Graph showing the number of cycles produced in a factory in 5 consecutive weeks



18. The number of cycles produced during third and fourth weeks together is
(1) 1060 (2) 1980
(3) 920 (4) 1900

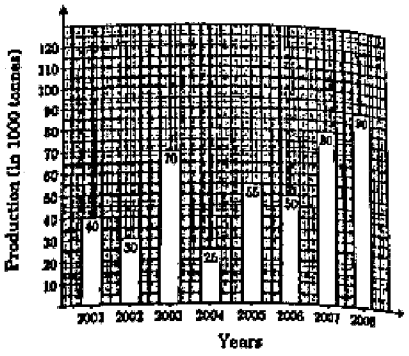
19. The number of cycles produced in the 5th week is
(1) 1400 (2) 1300
(3) 1440 (4) 1600

20. Total number of cycles produced in five consecutive weeks is
(1) 5520 (2) 1600
(3) 7200 (4) 7000

Directions (21-24) : Study the following graph and answer the questions given below it.

(SSC Multi-Tasking (Non-Technical) Staff Exam. 20.02.2011)

Production of salt by a company (in 1000 tonnes) over the years



21. What was the percentage decline in the production of salt from 2003 to 2004 ?
(1) 64.2% (2) 180%
(3) 62.4% (4) 107%

22. The average production of 2004 and 2005 was exactly equal to the average production of which of the following pair of years?
(1) 2006, 2007 (2) 2005, 2006
(3) 2002, 2006 (4) 2001, 2005

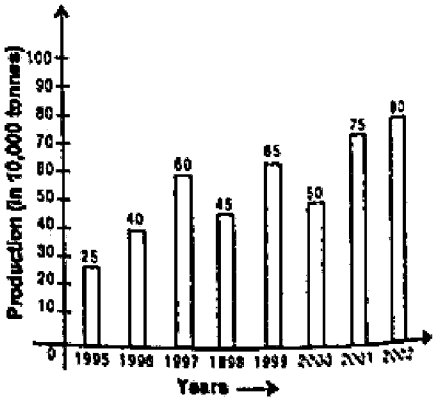
23. What was the percentage increase in production of salt in 2008 compared to that of 2001?
(1) 55.5% (2) 125%
(3) 150% (4) 220%

24. In how many of the given years was the production of salt more than the average production of the given years?
(1) 1 (2) 2
(3) 3 (4) 4

Directions (25–28) : Study the following graph and answer the questions based on it.

(SSC Multi-Tasking (Non-Technical) Staff Exam. 27.02.2011)

Production of fertilizers by a company (in 10000 tonnes over the years 1995-2002)



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25. What was the percentage decline in the production of fertilizers from 1997 to 1998 ?

(1) $33\frac{1}{3}\%$ (2) 30%

(3) 25% (4) 20%

26. In how many years was the production of fertilizers more than the average production of the given years ?

(1) 1 (2) 2

(3) 3 (4) 4

27. In which year was the percentage increase in production as compared to the previous year, the maximum ?

(1) 2002 (2) 2001

(3) 1996 (4) 1997

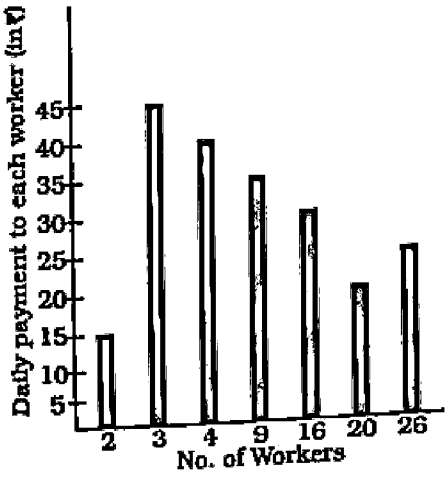
28. The ratio of total production of fertilizers in the year 1996 and 1997 to that of total production in the year 1995, 1998 and 2000 is

(1) 5 : 6 (2) 6 : 5

(3) 20 : 29 (4) 13 : 24

Directions (29-30) : Given here is a graph showing the number of workers with their daily payment by a workshop. Study the graph and answer questions based on this graph.

(SSC CISF Constable (GD) Exam. 05.06.2011)



29. The number of workers whose daily payment is ₹ 20 is

(1) 9 (2) 16

(3) 20 (4) 4

30. The total daily payment made to the group which contains 9 workers is (in ₹)

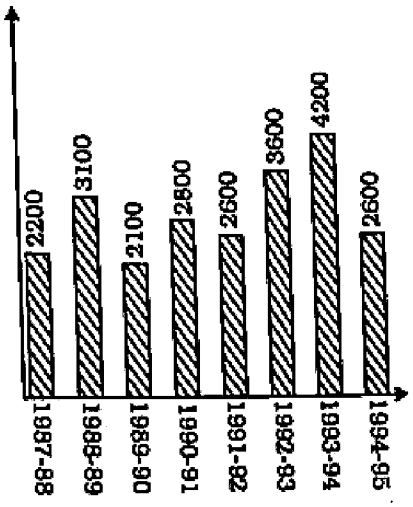
(1) 400 (2) 315

(3) 460 (4) 135

Directions (31-35) : Read the following graph and answer questions

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (North Zone)

Trade Deficit of a Country (in Crores of Rupees)



31. The deficit in 1993-94 was roughly how many times the deficit in 1990-91 ?

(1) 1.4 (2) 1.5

(3) 2.5 (4) 0.5

32. Percentage increase in deficit in 1993-94 as compared to deficit in 1989-90 was

(1) 200% (2) 150%

(3) 100% (4) 2100%

33. In which of the following years, the percent increase of deficit was highest over its preceding year?

(1) 1992-93 (2) 1990-91

(3) 1993-94 (4) 1988-89

34. The ratio of the number of years, in which the trade deficit is above the average deficit, to those years in which the trade deficit is below the average deficit, is

(1) 3 : 5 (2) 5 : 3

(3) 4 : 4 (4) 3 : 4

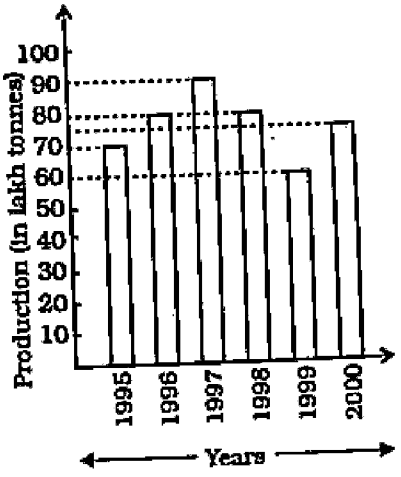
35. The deficit in 1992-93 was approximately how many percent of the average deficit?

(1) 150% (2) 140%

(3) 125% (4) 90%

Directions (36-40) : The following bar graph shows the production of fertilizers (in lakh tonnes) by a company, in six consecutive years. Study the graph and answer the questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)



36. The difference of the average production of fertilizers in the first three years and the average production in the last three years (in lakh tonnes) is

(1) $2\frac{1}{3}$ (2) $8\frac{1}{3}$

(3) $4\frac{1}{6}$ (4) $3\frac{1}{3}$

37. The ratio of the total production of fertilizers in the year 1995, 1997 and 1999 to the total production in the remaining three years is

(1) 44 : 45 (2) 48 : 43

(3) 44 : 47 (4) 46 : 45

38. The total production of fertilizers in the year 1998 and 2000 is x% of the total production in the years 1997 and 1999. Then x is equal to

(1) $103\frac{1}{3}$ (2) $79\frac{7}{17}$

(3) $96\frac{24}{31}$ (4) $125\frac{25}{27}$

39. The year in which the production of fertilizers is nearest to the average production of all the six years, is

(1) 1999 (2) 1998

(3) 1995 (4) 2000

40. Percentage increase in production of fertilizers for a year with respect to its previous year was maximum in the year

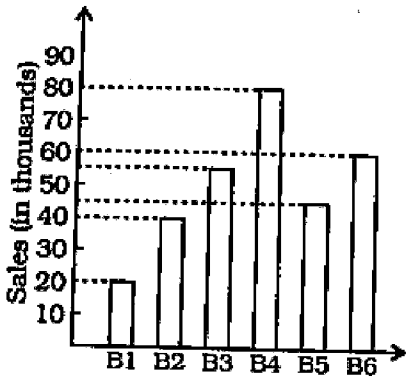
(1) 1996 (2) 1997

(3) 1999 (4) 2000

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Directions (41–45) : Sales of books (in thousands) from six branches (B1, B2, B3, B4, B5, B6) of a publishing company are given below. Study the graph and answer the following questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)



41. The average sales of the branches B1 and B4 is equal to the average sales of the branches
(1) B3 and B5 (2) B3 and B6
(3) B5 and B6 (4) B2 and B5

42. The number of branches in which sales of books are below the average level is
(1) 2 (2) 3
(3) 1 (4) 4

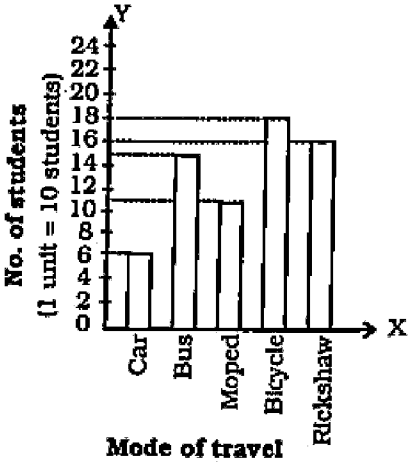
43. If the sale of books from the branch B2 increases by 30% and that from the branch B4 decreases by 10%, the approximate sale from all the six branches will
(1) increase by 1·33%
(2) decrease by 1·67%
(3) remain same
(4) decrease by 1·33%

44. If each branch can increase the sale of books by 2%, then the total number of books (in thousands) sold by the company will be
(1) 305 (2) 306
(3) 310 (4) 315

45. If all the six branches are divided into three groups such that each group has equal performance on selling books, then the minimum difference of the number of books (in thousands) sold by the two members of any group is
(1) 20 (2) 10
(3) 15 (4) 5

Directions (46–49) : The following bar diagram, represents the use of different modes of travel to school by students in a certain locality of the town. Study the graph and answer the questions.

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (Ist Sitting)



46. How many students are coming from that locality ?
(1) 500 (2) 600
(3) 560 (4) 660

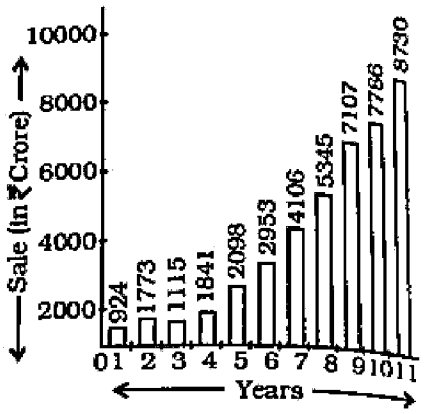
47. How many students use Bicycle and Rickshaw combined ?
(1) 240 (2) 340
(3) 140 (4) 440

48. What is the percentage of students using Bus from that locality ?
(1) $22\frac{14}{33}\%$ (2) $18\frac{2}{3}\%$
(3) $22\frac{8}{11}\%$ (4) 22%

49. What is the ratio of the students using their means of transport as Car with those using Rickshaw ?
(1) 7 : 2 (2) 8 : 3
(3) 2 : 7 (4) 3 : 8

Directions (50–54) : The following Bar chart shows the sales of a company XYZ (in ₹ Crore). Study the chart and answer the following questions.

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)



50. Total sales in 2nd and 3rd years together is :
(1) ₹ 2688 crores
(2) ₹ 2888 crores
(3) ₹ 2788 crores
(4) ₹ 2488 crores

51. The 2nd highest sale is in the year :
(1) 10 (2) 9
(3) 8 (4) 7

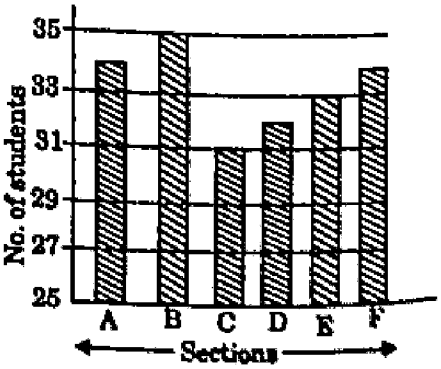
52. The 2nd least sale is in year :
(1) 2 (2) 3
(3) 6 (4) 4

53. The mean of the highest and the lowest sale (in ₹ Crore) is :
(1) ₹ 4922.5 (2) ₹ 4827
(3) ₹ 4365 (4) ₹ 4922

54. The sale in the year 4 is less than the sale in the year 8, by
(1) ₹ 3608 crores
(2) ₹ 3504 crores
(3) ₹ 3127 crores
(4) ₹ 3427 crores

Directions (55-59) : The bar graph given below shows the total number of students in six sections of a class VI of a certain school. Using this graph, answer the question.

(SSC CHSL DEO & LDC Exam. 28.10.2012 (Ist Sitting)



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55. Which two sections have the same number of students ?
(1) Sec A and Sec E
(2) Sec A and Sec F
(3) Sec C and Sec D
(4) Sec B and Sec F

56. What is the ratio of the number of students in section A to that in section C ?
(1) 34 : 35 (2) 32 : 35
(3) 31 : 35 (4) 34 : 31

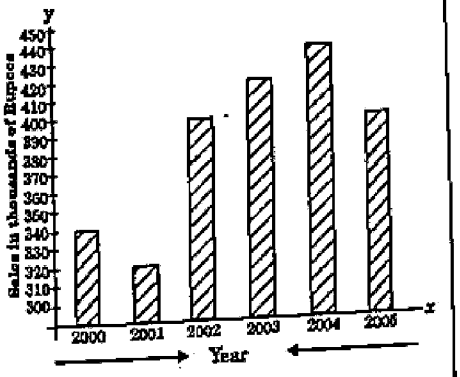
57. What is the total number of students in class VI ?
(1) 200 (2) 209
(3) 199 (4) 179

58. The ratio of the students in section B and section C is
(1) 31 : 34 (2) 34 : 35
(3) 35 : 31 (4) 31 : 35

59. The percentage of students in section C out of the total students in class VI is approximately
(1) 17.58% (2) 16.08%
(3) 16.58% (4) 15.57%

Directions (60–64) : The following bar diagram analys the sale of a company from 2000 to 2005, Examine the diagram and answer the questions.

(SSC CHSL DEO & LDC Exam. 04.11.2012 (IInd Sitting)



60. The sales in 2004 are what percentage of those in 2002?
(1) 40% (2) 4%
(3) 110% (4) 1.1%

61. In which year did the sales show the least decrease to that of the preceding year ?
(1) 2004 (2) 2001
(3) 2003 (4) 2005

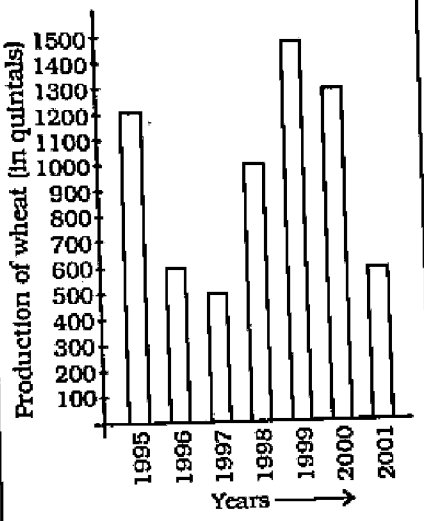
62. By what amount are the sales in 2003 more than those in 2001 ?
(1) ₹ one hundred
(2) ₹ ten thousand
(3) ₹ one lakh
(4) ₹ ten lakhs

63. The sales in 2001 are how many times those of 2002 ?
(1) 8 times (2) 0.8 times
(3) 2.5 times (4) 3 times

64. In which year did the sales show the least percent increase to that of the preceding year ?
(1) 2000 (2) 2002
(3) 2003 (4) 2004

Directions (65–68) : The graph shows the production of wheat in different years of a particular State. Study the graph and answer questions.

(SSC Graduate Level Tier-I Exam. 11.11.2012 (Ist Sitting)



65. The year in which the production reached maximum is
(1) 1995 (2) 1997
(3) 1999 (4) 2000

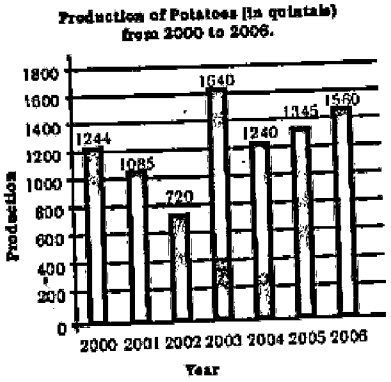
66. The percentage increase in production of wheat from 1997-1998 is
(1) 100% (2) 150%
(3) 90% (4) 120%

67. The year which had the percentage of decrease vis-a-vis its previous year in production as $13\frac{1}{3}\%$ is
(1) 1996-97 (2) 1995-96
(3) 1999-2000 (4) 2000-01

68. The total production from the year 1995 to 1998 (in quintals) is
(1) 3000 (2) 3100
(3) 3200 (4) 3300

Directions (69–70) : The bar diagram below shows the production of potatoes (in quintals) from the year 2000 to 2006. Study the diagram and answer the following questions.

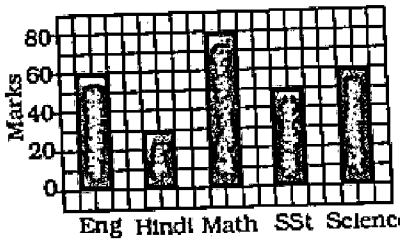
(SSC Multi-Tasking Staff Exam. 10.03.2013)



69. Considering the average production during this period, the number of years in which the production is above average is :
(1) 1 (2) 2
(3) 3 (4) 4

70. During this period, the highest rate of decline in production is:
(1) 24.4% (2) 28.22%
(3) 33.64% (4) 35.32%

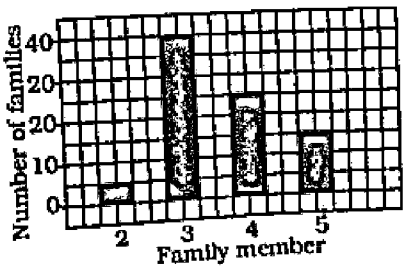
71.



The above bar graph show the marks obtained by a student in an examination. What is the average marks obtained by the student ?
(1) 55 (2) 56
(3) 57 (4) 58

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

72.



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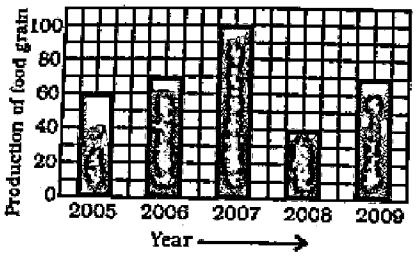
Study the bar graph carefully and answer the following question.

Which type of family is the most common ?

(1) 2 members (2) 3 members
(3) 4 members (4) 5 members

(SSC Graduate Level Tier-I Exam. 21.04.2013 IInd Sitting)

73.



Study the above bar graph showing the production of food grains (in million tons).

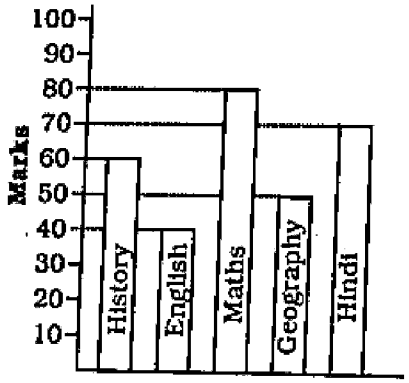
What is the ratio between the maximum production and the minimum production during the given period ?

(1) 1 : 2 (2) 2 : 3
(3) 3 : 4 (4) 5 : 2

(SSC Graduate Level Tier-I Exam. 21.04.2013)

Directions (74-75) : The bar graph shows the marks obtained by a student in an examination out of 100 marks in each subject. Study the graph and answer the questions.

(SSC (CHSL DEO & LDC Exam. 20.10.2013)



74. The ratio of the marks of Maths and History is

(1) 6 : 5 (2) 8 : 5
(3) 3 : 4 (4) 4 : 3

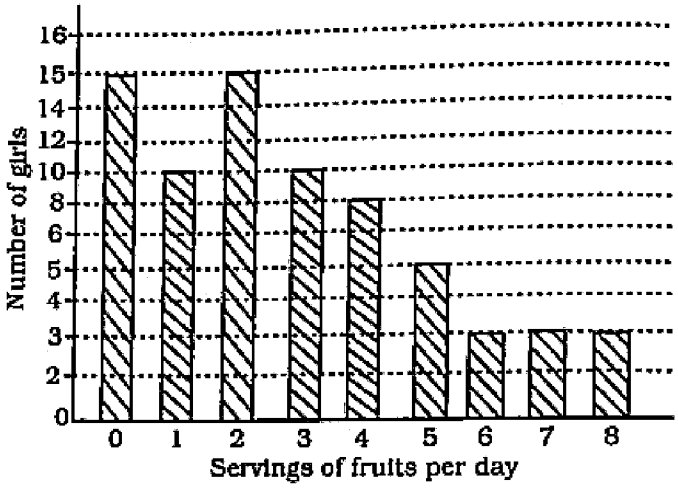
75. The average marks of Hindi and English is

(1) 65 (2) 50
(3) 55 (4) 60

Directions (76-78) : The distribution of fruit consumption in a sample of 72 seventeen - year - old girls is given in the graph below. Study the graph and answer the questions.

(SSC CGL Tier-I Exam. 26.10.2014)

Distribution of fruit consumption



76. How many of these girls ate fewer than two servings per day ?

(1) 15 (2) 40
(3) 25
(4) None of these

77. What percent of these girls ate six or more servings per day ?

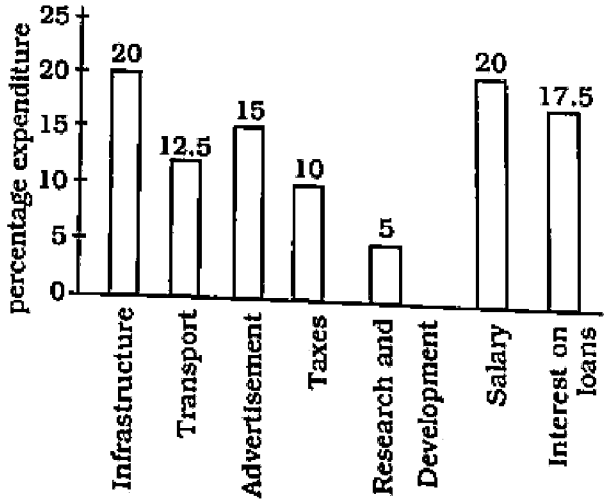
(1) 12.5% (2) 13%
(3) 10% (4) 11%

78. How many of these girls ate more than two servings but less than six servings per day ?

(1) 26 (2) 18
(3) 23 (4) 38

Directions (79 – 83) : The bar-graph given below shows the percentage distribution of total expenditures of a company under various expense heads during 2013. Study the graph and answer the given questions.

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)



79. The expenditure on the interest on loans is what percent more than the expenditure on transport ?

(1) 5% (2) 10%
(3) 20% (4) 40%

80. The ratio of the total expenditure on infrastructure and transport to the total expenditure on taxes and interest on loans is

(1) 5 : 4 (2) 8 : 7
(3) 9 : 7 (4) 13 : 11

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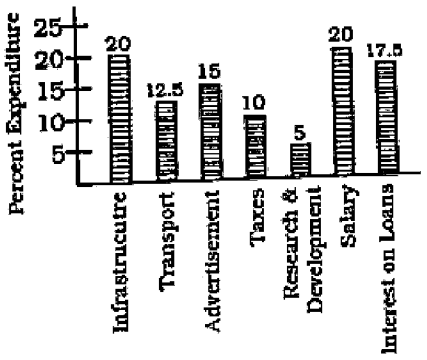
81. If the expenditure on advertisement is ₹ 2.10 crores, then the difference between the expenditures on transport and taxes is
(1) ₹ 25 lakhs (2) ₹ 35 lakhs
(3) ₹ 65 lakhs (4) ₹ 95 lakhs

82. If the total amount of expenditure of the company is N times the expenditure on research and development, then the value of N is
(1) 5 (2) 18
(3) 20 (4) 27

83. If the interest on loans amounts ot ₹ 2.45 crores, then the total amount of expenditure on advertisement, taxes and research and developments is
(1) ₹ 2.4 crores (2) ₹ 4.2 crores
(3) ₹ 5.4 crores (4) ₹ 7 crores

Directions (84–87) : The bar graph shows the percentage distribution of the total expenditures of a company under various expense heads during 2005. Study the bar graph and answer the following **four** questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.08.2015 IInd Sitting)



84. If the expenditure on advertisement is Rs. 2.10 crores, then the difference between the expenditure on transport and taxes is equal to
(1) Rs. 65 lakhs (2) Rs. 1.25 lakhs
(3) Rs. 35 lakhs (4) Rs. 95 lakhs

85. The ratio of the total expenditure on infrastructure and transport to the total expenditure on taxes and interest on loans is
(1) 5 : 4 (2) 13 : 11
(3) 9 : 7 (4) 8 : 7

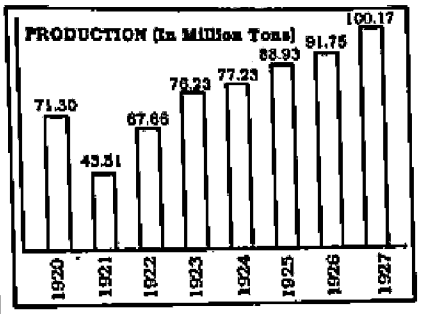
86. If the interest on loans amounted to Rs. 2.45 crores, then the total amount of expenditure on advertisement, taxes and research and development is equal to
(1) Rs. 3 crores
(2) Rs. 5.4 crores
(3) Rs. 4.2 crores
(4) Rs. 7 crores

87. The expenditure on the interest on loans is by what percent more than the expenditure on transport ?
(1) 20% (2) 40%
(3) 5% (4) 10%

Directions (88–91) : The following table shows the worldwide production of steel in 1920–1927. Study the table and answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 01.11.2015, IInd Sitting)

Year	1920	1921	1922	1923	1924	1925	1926	1927
Production (In million tons)	71.30	43.51	67.66	76.23	77.23	88.93	91.75	100.17



88. The difference of the production of steel in the year 1923 and 1924 is x% of 1927. Then the value of x is approximately
(1) 0.01 (2) 0.1
(3) 0.001 (4) 1

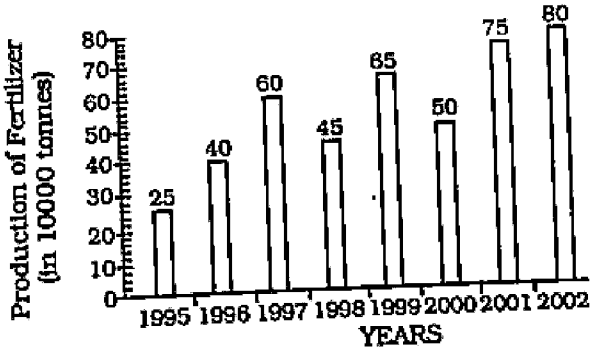
89. The ratio of production of steel in the year 1924 and 1925 to that of 1923 and 1927 is
(1) 2005 : 2077
(2) 2077 : 2205
(3) 2205 : 2007
(4) 2205 : 2077

90. The number of years during which the company has its production less than the average production during 1920–1927 is approximately
(1) 6 (2) 4
(3) 3 (4) 2

91. The average production of steel is (in million tonnes)
(1) 76.09 (2) 74.07
(3) 77.10 (4) 75.13

Directions (92–96) : Sutdy the following bar graph and answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (IInd Sitting) TF No. 3441135)



92. The number of years, the production of fertilizers was more than average production of the given years is :
(1) 4 (2) 2
(3) 1 (4) 3

93. The average production of 1996 and 1997 is exactly equal to the average production of the years
(1) 1995 and 2001
(2) 1995 and 1999
(3) 1999 and 2000
(4) 2000 and 2001

94. The percentage increase in production of fertilizers in 2002 compared to that in 1995 is :
(1) 220% (2) 180%
(3) 240% (4) 200%

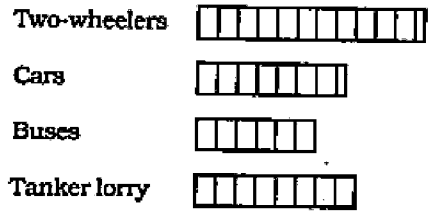
95. The percentage increase in production as compared to previous year is maximum in year :
(1) 1999 (2) 1996
(3) 1997 (4) 2002

96. The percentage decline in the production of fertilizers from 1997 to 1998 is :
(1) 26 % (2) 25%
(3) 27.5% (4) 23%

TYPE-IV

Directions (1–5) : The following is a horizontal bar diagram showing the accidents in which two-wheelers are involved with other objects. Study the diagram and answer the questions.

OBJECTS HIT



(SSC CHSL DEO & LDC Exam. 21.10.2012 (Ist Sitting)

1. The difference in percentage between the accidents involving two-wheelers and two-wheelers and two-wheelers and other objects is respectively.
(1) 77% more (2) 77% less
(3) 54% more (4) 54% less

2. 60% of the accidents are involved due to
(1) cars, buses, tanker lorry and pedestrians
(2) cars, tanker lorry, bicycles and stationary vehicles
(3) two-wheelers, cars, buses and stationary vehicles
(4) two-wheelers, cars, buses and tanker lorry

3. If the data of the bar diagram is represented by a pie-chart, and the angle of a sector of the pie-chart is 36°, then this sector represents the accidents involving
(1) pedestrians (2) bicycles
(3) buses
(4) stationary vehicles

4. The percentage of accidents in which pedestrians and cyclists are involved is
(1) 24% (2) 6%
(3) 60% (4) 20.4%

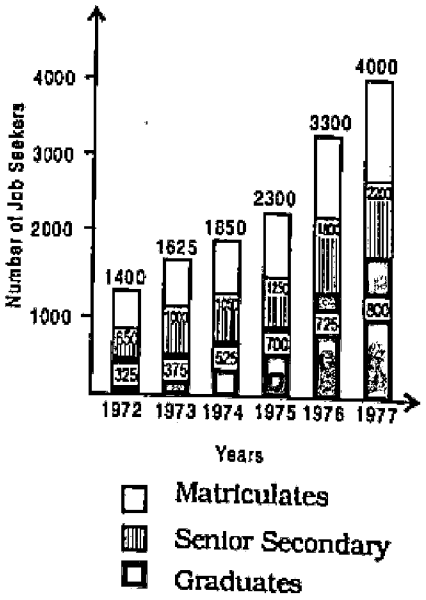
5. The percentage by which the accidents involving buses is less than the accidents involving tanker lorry is
(1) 6% (2) 4%
(3) 40% (4) 28%

Directions (6–9) : The bar graph given here shows the number of job-seekers of a state in various years at different stages of education.

Study the graph carefully and answer the questions based on it.

(SSC CPO Sub-Inspector Exam. 16.12.2007)

Job-Seekers in Various Years



6. In which year was the number of Graduate job-seekers the same as that of Senior Secondary job-seekers ?
(1) 1973 (2) 1974
(3) 1975 (4) 1976

7. In comparison to the year 1973, how many more job-seekers in all, were there in the year 1977?
(1) 700 (2) 1700
(3) 2375 (4) 2150

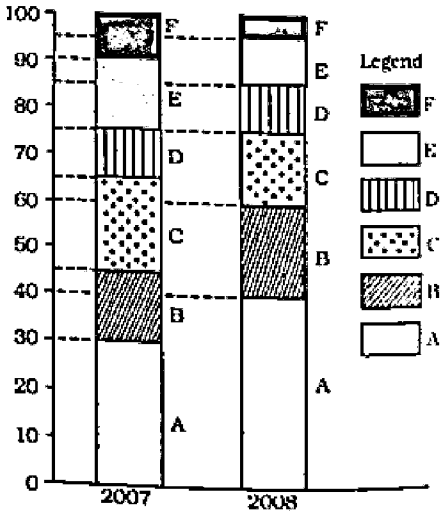
8. In which year, was the number of Matriculate job-seekers maximum ?
(1) 1973 (2) 1975
(3) 1972 (4) 1977

9. The number of job-seekers, having their qualification as Senior Secondary, in the year 1974 was :
(1) 525 (2) 800
(3) 1050 (4) 1875

Directions (10–14) : The bar chart given below shows the percentage distribution of the production of various models of a mobile manufacturing company in 2007 and 2008. The total production in 2007 was 35 lakh mobile phones and in 2008 the production was 44 lakh. Study the chart and answer the following questions.

(SSC Graduate Level Tier-II Exam.16.09.2012)

Percentage of six different types of mobiles manufactured by a company over two years



10. Total number of mobiles of models A, B and E manufactured in 2007 was
(1) 24,50,000 (2) 22,75,000
(3) 21,00,000 (4) 19,25,000

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11. For which models was the percentage variation in production from 2007 to 2008 the maximum?
(1) B and C (2) C and D
(3) D and E (4) A and B

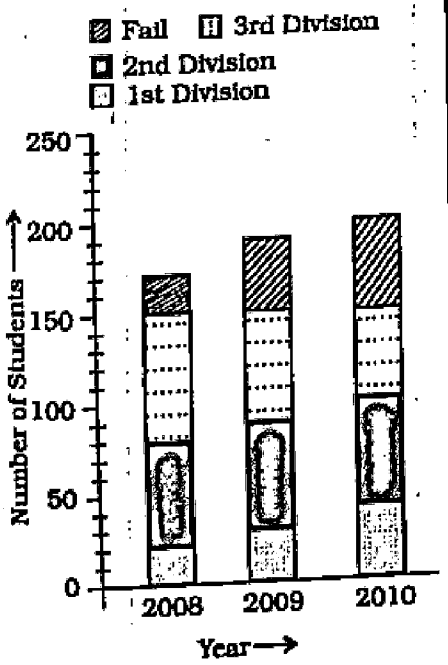
12. What was the difference in the number of B type mobiles produced in 2007 and 2008?
(1) 3,55,000 (2) 2,70,000
(3) 2,25,000 (4) 1,75,000

13. If the percentage production of A type mobiles in 2008 was same as that in 2007, then the number of A type mobiles produced in 2008 would have been
(1) 14,00,000 (2) 13,20,000
(3) 11,70,000 (4) 10,50,000

14. If 85% of the D type mobiles produced in each year were sold by the company, how many D type mobiles remained unsold?
(1) 76,500 (2) 93,500
(3) 1,18,500 (4) 1,22,500

Directions (15 –19) : The sub divided bar diagram given below depicts H.S. Students of a school for three years. Study the diagram and answer the questions.

(SSC Graduate Level Tier-I Exam. 19.05.2013)



15. The percentage passed in 1st division in 2008 was
(1) 27% (2) 32%
(3) $15\frac{3}{8}\%$ (4) $11\frac{13}{17}\%$

16. The pass percentage in 2008 was
(1) 67% (2) 73%
(3) $79\frac{2}{3}\%$ (4) $82\frac{6}{17}\%$

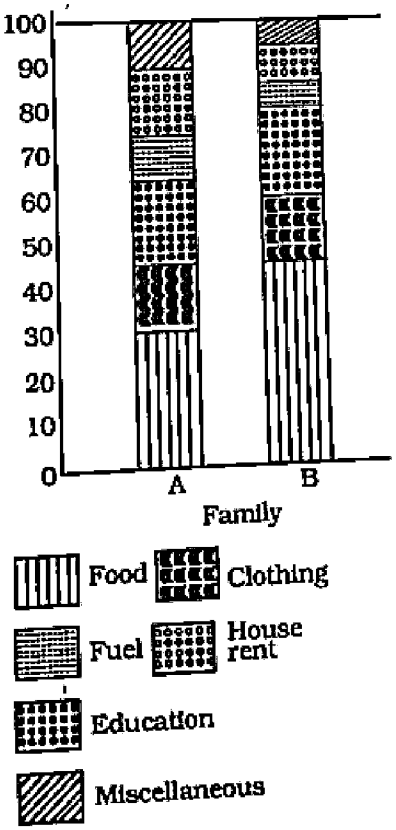
17. In which year the school had the best result for H.S. in respect of percentage of pass candidates?
(1) 2008 (2) 2009
(3) 2010
(4) The percentage of pass candidates are same for the three years.

18. The number of students passed with 3rd division in the year 2008 was
(1) 50 (2) 60
(3) 70 (4) 80

19. The percentage of the students passed with 2nd division in the year 2010 was
(1) 30% (2) 40%
(3) 50% (4) 60%

Directions (20-22) : Study the diagram and answer the questions.

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)



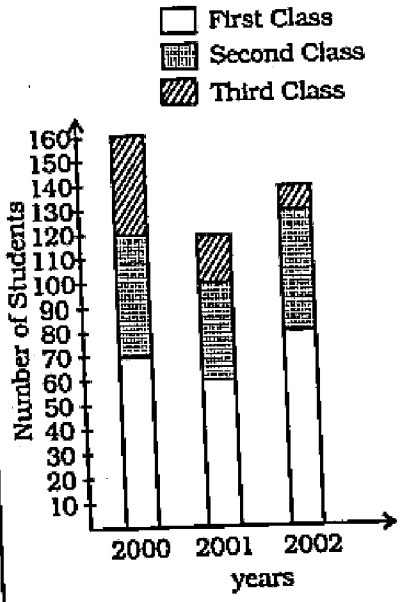
20. If the total annual expenditure of family B is ₹ 10,000 then money spent on clothes during the year is
(1) ₹ 600 (2) ₹ 6000
(3) ₹ 1500 (4) ₹ 200

21. What fraction of the total expenditure is spent on Education in family A?
(1) $\frac{2}{3}$ (2) $\frac{9}{13}$
(3) $\frac{1}{5}$ (4) $\frac{13}{20}$

22. If the total annual expenditure of family A is ₹ 30,000 then money spent on food, clothes and house-rents is.
(1) ₹ 18,000 (2) ₹ 21,000
(3) ₹ 15,000 (4) ₹ 18,500

Directions (23-26) : The sub divided bar diagram given below depicts the result of Class XII students of a school for three years. Study the diagram and answer the questions given below :

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014) (1st Sitting)



23. The percentage of students passed with Second class in the year 2000 is
(1) $33\frac{1}{4}\%$ (2) $32\frac{1}{4}\%$
(3) $30\frac{1}{4}\%$ (4) $31\frac{1}{4}\%$

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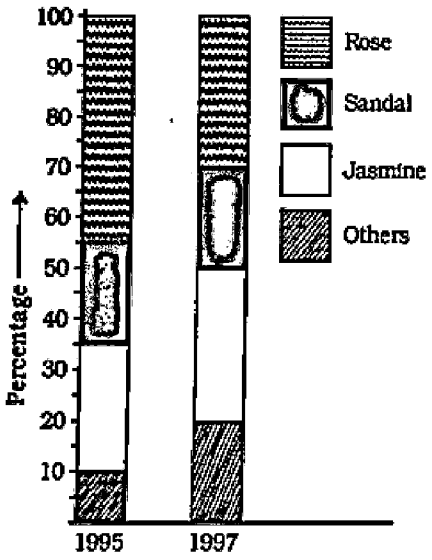
24. The percentage of students passed with First class in the year 2001 is
(1) 50% (2) 45%
(3) 60% (4) 65%

25. The number of students passed with Third class in the year 2002 is
(1) 130 (2) 10
(3) 140 (4) 20

26. The number of students passed with Second class in the year 2002 is
(1) 80 (2) 130
(3) 50 (4) 100

Directions (27-29) : The production figures of a perfume manufacturer are given in the form of percentage in sub-divided bar diagram. Study the diagram and answer the questions.

(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014) (IInd Sitting)



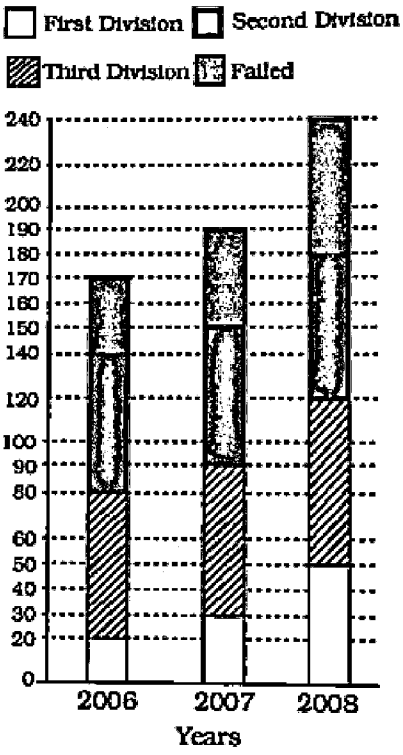
27. What is the ratio of percentage production of rose perfume during 1995 to that during the year 1997 ?
(1) 4 : 3 (2) 3 : 2
(3) 2 : 3 (4) 5 : 4

28. What is the percentage of production of sandal perfume during the year 1995 over that during 1997 ?
(1) 100% (2) 1%
(3) 0% (4) 50%

29. What is the production of Jasmine perfume in the year 1997? Given that during the year 1997 total perfumed production was 5000 units.
(1) 1200 (2) 2500
(3) 2000 (4) 1500

Directions (30 – 33) : The sub-divided bar diagram given below depicts the result of B.Com. students of a college for 3 years. Study the graph and answer the given questions.

(SSC CHSL DEO Exam. 16.11.2014 (Ist Sitting)



30. How many percent of students passed in first division in 2007?
(1) $15\frac{15}{19}\%$ (2) $11\frac{13}{17}\%$
(3) $16\frac{2}{3}\%$ (4) $12\frac{1}{2}\%$

31. What was the pass percentage in 2008 ?
(1) $33\frac{1}{3}\%$ (2) $82\frac{6}{17}\%$
(3) 75% (4) 78%

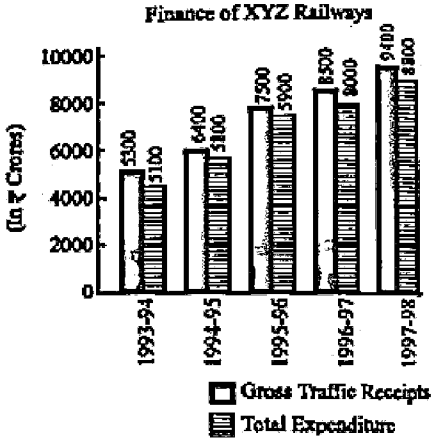
32. What was the number of third divisions in 2006 ?
(1) 60 (2) 140
(3) 59 (4) 120

33. In which year, did the college have the best result for B. Com ?
(1) 2007 and 2008
(2) 2008
(3) 2007
(4) 2006

TYPE-V

Directions (1-5) : The following questions are based on the bar graph. Read the graph and answer the questions.

(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)



1. What is the percentage increase in the gross traffic receipts in 1995-96 as compared to 1993-94?
(1) 33.9% (2) 41.5%
(3) 20.7% (4) 17%

2. If profit = gross traffic receipts— total expenditure, then in 1996-97, what percentage of gross traffic receipts is the profit made?
(1) 5.9% (2) 6.4%
(3) 7.2% (4) 8%

3. In which year was the profit as a percentage of gross traffic receipts the highest?
(1) 1997-98 (2) 1996-97
(3) 1995-96 (4) 1994-95

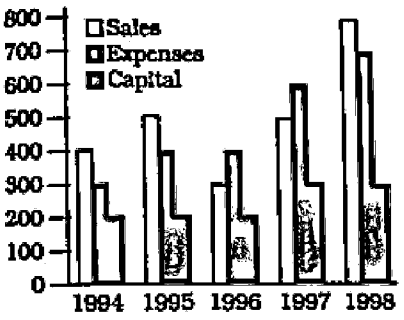
4. In order to make a profit of 10%. What should have been the gross traffic receipts (in ₹ crores) in 1994-95, total expenditure remaining the same?
(1) 5,667 (2) 5,876
(3) 6,444 (4) 7,667

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5. By what amount (in ₹ crores) has the expenditure increased over the period 1993-94 to 1997-98?
(1) 4,100 (2) 3,900
(3) 3,850 (4) 3,700

Directions (6-10) : The following graph gives Sales, Expense and Capital of a company for a period of five years 1994 to 1998. Read the graph and answer the following questions.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)



Profit = Sales – Expense

6. What has been the simple average growth rate per annum of expense between 1994 and 1998 ?
(1) 25% (2) $33\frac{1}{3}\%$
(3) 40% (4) 130%

7. In which year was the Sales to Expense ratio the lowest?
(1) 1994 (2) 1996
(3) 1997 (4) 1998

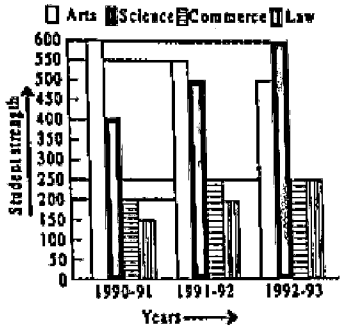
8. What was the average per annum increase in sales (in ₹ cr.) from 1994 to 1998 ?
(1) 50 (2) 60
(3) 80 (4) 100

9. In which year was the ratio of profit to capital the highest?
(1) 1998
(2) 1995
(3) 1996
(4) 1997

10. In which year was the ratio of sales to capital the lowest ?
(1) 1998
(2) 1997
(3) 1996
(4) 1995

Directions (11-14) : Given here is a multiple bar diagram depicting the changes in the students strength of a college in four faculties from 1990 – 91 to 1992 – 93. Study the diagram and answer the questions.

(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)



11. In which faculty was there a regular decrease in students' strength?
(1) Arts (2) Science
(3) Commerce (4) Law

12. The percentage of students in Science faculty in 1990 – 91 was
(1) 26.9% (2) 27.8%
(3) 29.6% (4) 30.2%

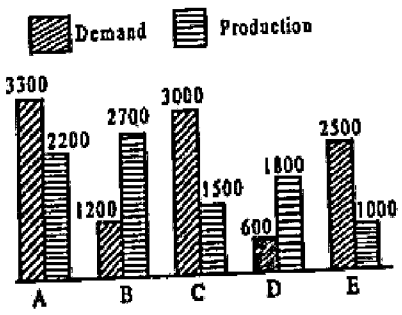
13. The total students strength in 1991 – 92 was how many times that of Commerce students in the same year ?
(1) 3 (2) 4
(3) 5 (4) 6

14. What was the percent increase in Science students from the year 1990 – 91 to 1992 – 93 ?
(1) 50% (2) $66\frac{2}{3}\%$
(3) 75% (4) 150%

Directions (15–16) : Study the following graph and answer the questions. Number on the top of a bar is the number of TVs.

(SSC CPO S.I. Exam. 06.09.2009)

Demand and Production of Colour T.Vs of five Companies for January 2006



15. What is the ratio of the companies having more demand than production to the companies having more production than demand ?
(1) 2 : 3 (2) 4 : 1
(3) 2 : 2 (4) 3 : 2

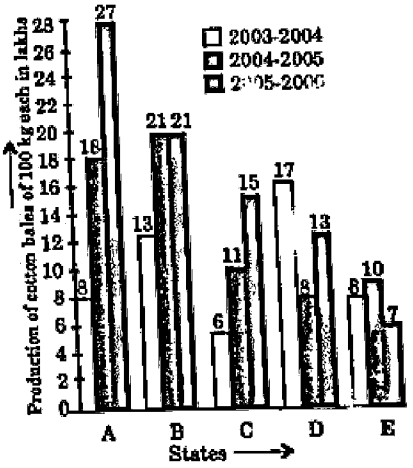
16. What is the difference between average demand and average production of the five companies taken together ?
(1) 1400 (2) 400
(3) 280 (4) 138

17. Demand of company D is approximately what per cent of demand of company E ?
(1) 12% (2) 20%
(3) 24% (4) 30%

18. What is the ratio of average demand to average production of companies B and D ?
(1) 1 : 5 (2) 2 : 5
(3) 3 : 5 (4) 4 : 5

Directions (19–22) : The following graph shows the production of cotton bales of 100 kg each (in lakhs) by different states A, B, C, D and E over the years. Study the graph and answer the following Questions.

(SSC CGL Tier-1 Exam. 19.06.2011 (Second Sitting)



19. The production of State C in 2003-2004 is how many times its production in 2005-2006 ?
(1) 2.5 (2) 1.85
(3) 1.5 (4) 0.4

20. In which State(s) is there a steady increase in the production of cotton during the given period ?
(1) A and B (2) B and D
(3) A and C (4) D and E

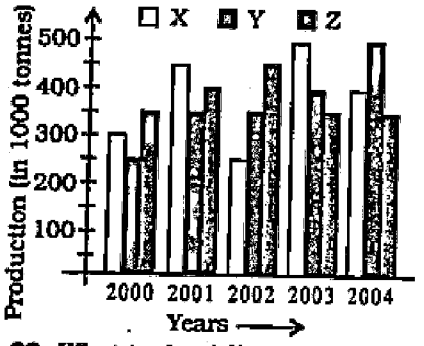
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21. How many kg of cotton was produced by State C during the given period ?
(1) 32,00,00,000 kg
(2) 42,50,00,000 kg
(3) 33,00,00,000 kg
(4) 35,00,00,000 kg

22. The number of States for which the production of cotton in 2005-2006 is less than or equal to the preceding year is
(1) 3 (2) 2
(3) 1
(4) There is no such State

Directions (23-26) : The following graph shows the production of wheat flour (in 1000 tonnes) by three companies *X*, *Y* and *Z* over the years. Study the graph and answer the questions.

(SSC CGL Tier-1 Exam. 26.06.2011 (Second Sitting)



23. What is the difference between the production of company *Z* in 2004 and company *Y* in 2000 (in thousand tonnes) ?
(1) 100 (2) 200
(3) 20 (4) 2

24. What is the ratio of the average production of company *X* in the period 2002-2004 to the average production of company *Y* in the same period ?
(1) 1 : 1 (2) 15 : 17
(3) 23 : 25 (4) 27 : 29

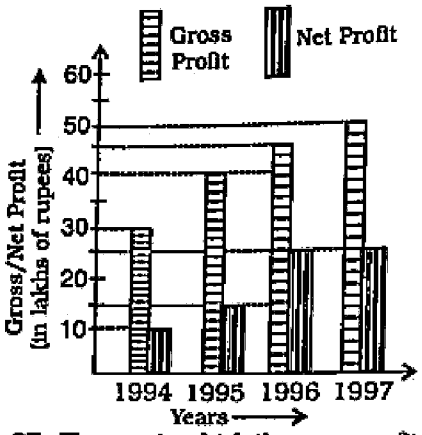
25. What is the percentage increase in the production of company *Y* from 2002 to 2003?
(1) $14\frac{2}{7}\%$ (2) $16\frac{6}{7}\%$
(3) 25% (4) 40%

26. The average production for five years was maximum for which company (s) ?
(1) X and Z both
(2) Y (3) Z
(4) X and Y both

Directions (27-31) : Study the following bar graph and answer the questions.

FCI Assistant Grade-III Exam. 26.02.2012 (Paper-I) North Zone (Ist Sitting)

Gross Profit and Net Profit of a company (in lakhs of rupees) for the years 1994-1997:



27. The year in which the gross profit is double the net profit
(1) 1997 (2) 1995
(3) 1996 (4) 1994

28. The percentage of net profit of 1995 as compared to the gross profit in that year is
(1) 25.5% (2) 35.5%
(3) 37.5% (4) 42.5%

29. The difference of average gross profit and average net profit calculated for four years is
(1) ₹ 18.75 lakhs
(2) ₹ 19.75 lakhs
(3) ₹ 20.5 lakhs
(4) ₹ 22.5 lakhs

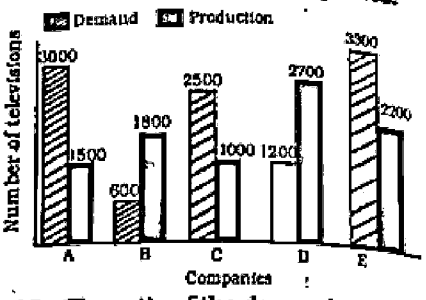
30. The ratio of gross profit to net profit in a year was greatest in the year
(1) 1994 (2) 1995
(3) 1996 (4) 1997

31. For the entire four years as shown, the ratio of total gross profit to total net profit is
(1) 13 : 4 (2) 11 : 6
(3) 11 : 5 (4) 9 : 4

Directions (32-35) : The bar graph, given here, shows the demand and production of colour televisions of five companies for Diwali season in the year 2009. Study the graph carefully and answer the questions based on the graph.

(SSC CHSL DEO & LDC Exam. 28.11.2010 (Ist Sitting)

Demand and Production of Colour Televisions of Five Companies.



32. The ratio of the demand and production of colour televisions of company E is :
(1) 3 : 2 (2) 2 : 3
(3) 2 : 1 (4) 1 : 2

33. The demand of colour televisions of company B is appoximately what per cent of that of company C ?
(1) 60% (2) 25%
(3) 24% (4) 6%

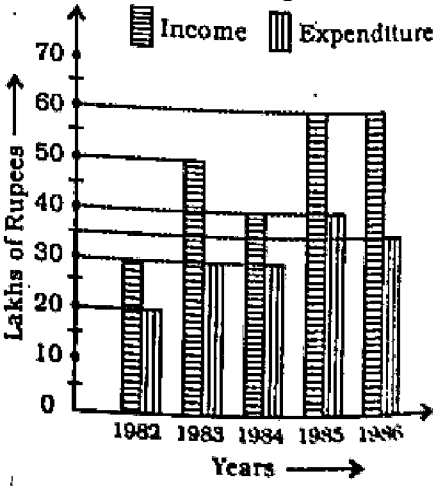
34. The production of colour televisions of company D is how many times that of company A ?
(1) 1.9 (2) 1.8
(3) 1.5 (4) 2.3

35. The ratio of companies having more demand than production of colour televisions to those having more production than demand is :
(1) 2 : 3 (2) 4 : 1
(3) 1 :4 (4) 3 : 2

Directions (36-40) : Read the graph and answer the following questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (Ist Sitting (East Zone)

Income and Expenditure of a company over the years (in lakhs of rupees)



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36. What is the difference in profit between 1983 and 1984 (in lakhs of rupees) ?
(1) No profit (2) 5
(3) 10 (4) 15

37. The number of years in which the income is more than the average income of the given years is
(1) One (2) Two
(3) Three (4) Four

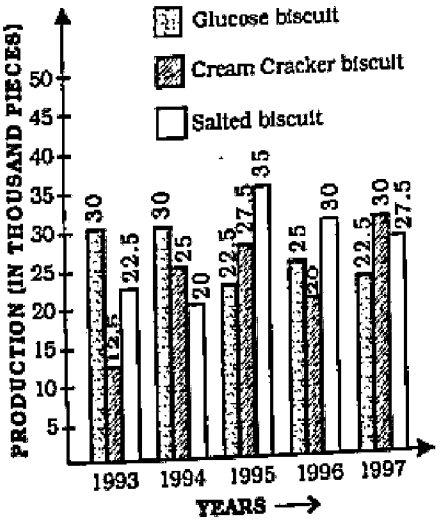
38. The ratio of the average income of all the years to the average profit is
(1) 24 : 13 (2) 48 : 17
(3) 12 : 7 (4) 6 : 5

39. Percentage increase in profit in 1986 over 1982 is
(1) 150% (2) 120%
(3) 100% (4) 80%

40. The total income exceeds the total expenditure over the years 1982 to 1986 by
(1) 85 lakhs (2) 105 lakhs
(3) 115 lakhs (4) 120 lakhs

Directions (41-45) : The bar diagram given below shows the productions (in the unit of thousand pieces) of three types of biscuits by a company in the five consecutive years. Study the diagram and answer the following questions.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)



41. The percentage drop in the number of glucose biscuits manufactured from 1994 to 1995 is
(1) 10% (2) 15%
(3) 25% (4) 20%

42. The difference (in the unit of thousand pieces) between the total number of cream cracker biscuits manufactured in the years 1993, 1995 and 1997 and the total number of the biscuits of same type in the years 1994 and 1996 is
(1) 15 (2) 25
(3) 30 (4) 20

43. Total production of all the three types of biscuits was the least in the year
(1) 1993 (2) 1997
(3) 1996 (4) 1995

44. The production of all the three types of biscuits was maximum in the year
(1) 1995 (2) 1994
(3) 1996 (4) 1993

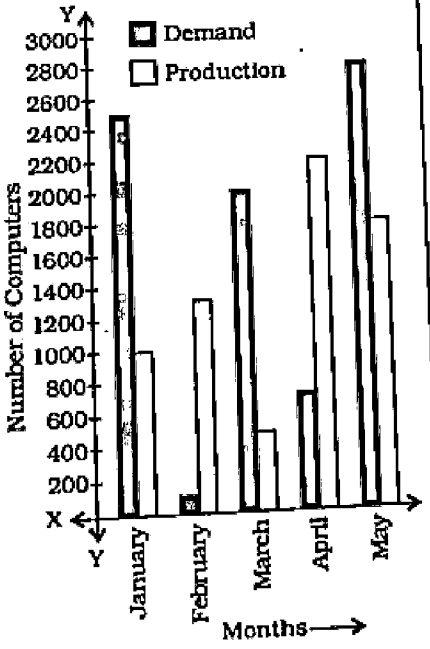
45. The ratio of production of glucose biscuits and total production of biscuits in that year was maximum in
(1) 1994 (2) 1993
(3) 1996 (4) 1997

Directions (46-50) : Read the graph and answer the following questions.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

Demand and production of computers of a company for five months of 2007.

(Scale : 1 unit = 1 cm)



46. Which month has least demand of computers relative to production ?
(1) January (2) April
(3) May (4) February

47. What per cent of the demand of computers for the month of March is the demand of computers for the month of February ?
(1) 5% (2) 10%
(3) 7.5% (4) 15%

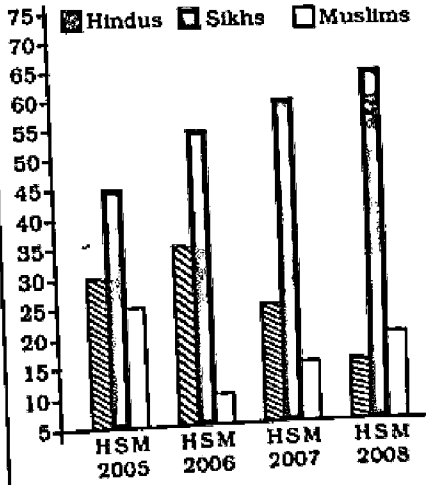
48. The production of computers in April is approximately how many times that of production in January ?
(1) 2.2 (2) 1.8
(3) 1.4 (4) 2.6

49. What is the difference between average demand and average production of computers of the five months taken together ?
(1) 400 (2) 700
(3) 540 (4) 260

50. What is the ratio of the month having more demand than production to those having more production than demand ?
(1) 4 : 1 (2) 2 : 3
(3) 3 : 2 (4) 1 : 4

Directions (51-54) : The following diagram shows the percentage of population of Hindus, Sikhs and Muslims with respect to total population in a town during 2005 to 2008. Study the diagram and answer the questions :

(SSC Constable (GD) & Rifleman (GD) Exam. 22.04.2012 (IInd Sitting)



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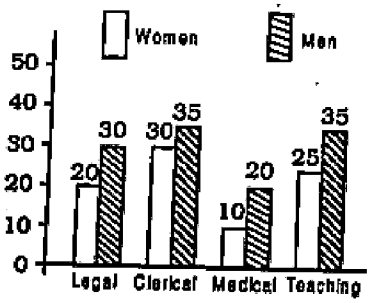
51. If the total population in 2007 was 80 lakh, then the number of Hindus in 2007 was (in lakh)
(1) 25 (2) 16
(3) 18 (4) 20

52. Percentage decrease in Hindu population from 2005 to 2008 is
(1) 50% (2) 40%
(3) 25% (4) 15%

53. Difference of percentage of population of Hindus in 2005 and 2008 is
(1) 20% (2) 15%
(3) 25% (4) 30%

54. If the total number of Hindus in 2008 was 12 lakh, the number of Muslims in 2008 was (in lakh)
(1) 18 (2) 12
(3) 24 (4) 16

55. Given below is a graph which shows the different occupations of men and women. The occupation that has larger proportion of women compared to the other three jobs is



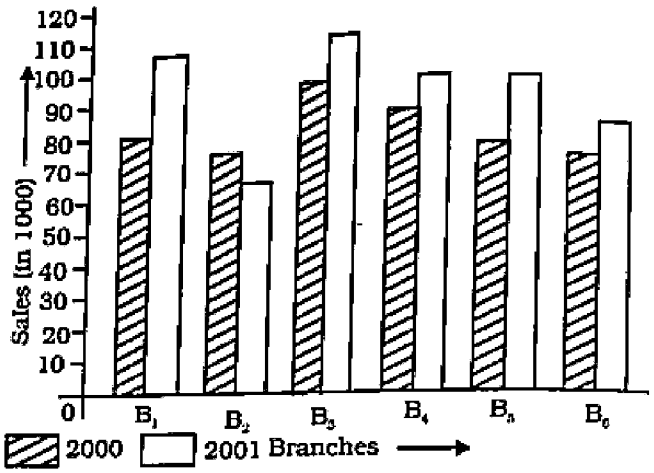
(1) Clerical (2) Teaching
(3) Medical (4) Legal

(SSC Multi-Tasking Staff Exam. 17.03.2013, 1st Sitting)

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Directions (56-59) : Bar-chart showing the Sales of Books (in 1000) from six-branches B_1, B_2, B_3, B_4, B_5 and B_6 of a Publishing Company in 2000 and 2001 is given below. Study the chart and answer the questions.

(SSC FCI Assistant Grade-III Main Exam. 07.04.2013)



56. Total sales of branch B_6 for both the years is what percent of the total sales of branch B_3 for both the years?
(1) 71.11% (2) 73.17%
(3) 68.54% (4) 77.26%

57. What is the ratio of the total sales of branch B_2 for both the years to the total sales of branch B_4 for both years ?
(1) 2 : 3 (2) 3 : 5
(3) 5 : 7 (4) 7 : 9

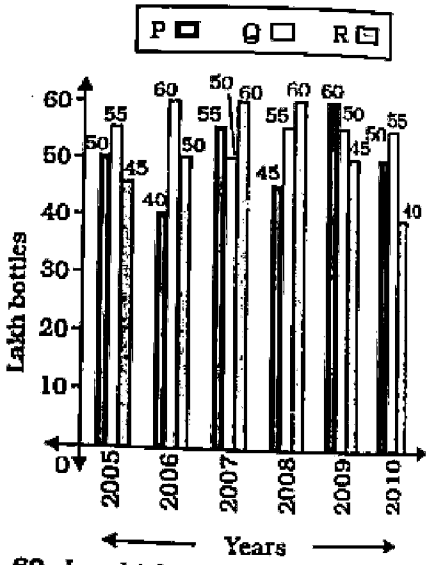
58. What percent of the average sales of branches B_1, B_2 and B_3 in 2001 is the average sales of branches B_1, B_5 and B_6 in 2000 ?
(1) 87.5% (2) 75%
(3) 77.5% (4) 85%

59. What is the average sale of books from all the branches for the year 2000?
(1) 70 (2) 80
(3) 70.5 (4) 80.5

Directions (60-64) : A health drink company prepares the drink of three different flavours P, Q, R. The production of three flavours over a period of six years has been expressed on bar graph provided below. Study the graph and answer the questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013) & (SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

(Production of 3 different flavours of health drinks of a company in 6 years (in Lakh) bottles)



60. In which of the following years the percentage of rise or fall in production from the previous year is maximum for the flavour of Q?
(1) 2007 (2) 2009
(3) 2010 (4) 2006

61. The percentage of the total production of flavour R in 2007 and 2008 with respect to the production of flavour P in 2005 and 2006 is :
(1) 102.25% (2) 115.35%
(3) 133.33% (4) 97.67%

62. The average annual production of which flavour was maximum in the given period ?
(1) P and Q both
(2) Q only
(3) P and R both
(4) P only

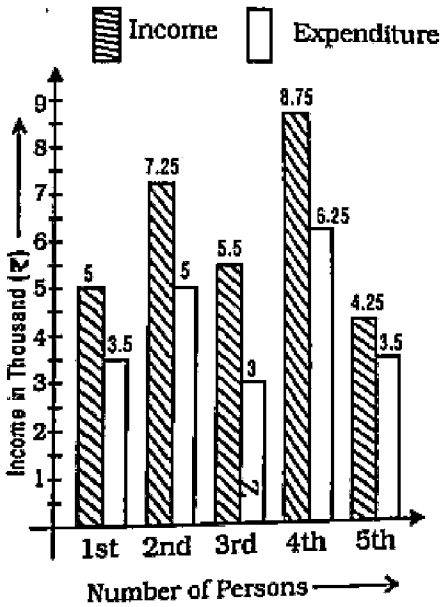
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63. What was the approximate decline in the production of flavour R in 2010 as compared to the production of 2008 in percentage ?
(1) 43.33% (2) 33.33%
(3) 30.33% (4) 53.33%

64. What is the difference between the average production of flavour Q in 2008, 2009 and 2010 from that of flavour P in 2005, 2006 and 2007 (in lakh bottles) ?
(1) 50 (2) 0.5
(3) 5.5 (4) 5

Directions (65–66) : In the following questions, a graphical representation of income and expenditure of 5 persons during the month of January has been given. Read the graph and answer the questions.

(SSC Constable (GD) Exam. 12.05.2013)

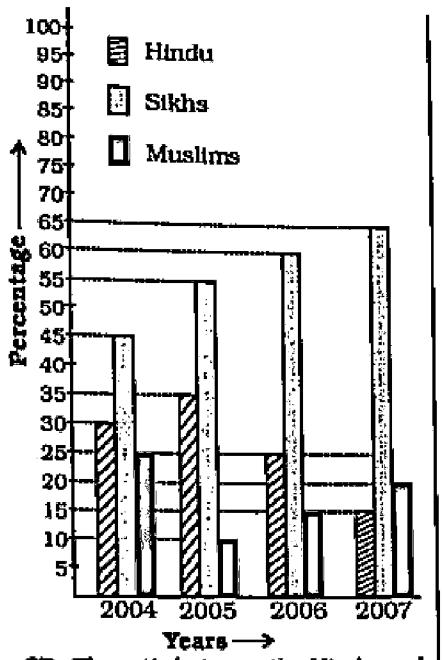


65. What is the average income of five persons per month ?
(1) ₹ 5775 (2) ₹ 6000
(3) ₹ 6150 (4) ₹ 6250

66. What is the income range of the persons ?
(1) ₹ 3000 (2) ₹ 3250
(3) ₹ 3750 (4) ₹ 4500

Directions (67–69) : The following bar diagram shows the percentage of Hindus, Sikhs and Muslims in a state during the years from 2004 to 2007. Examine the bar diagram and answer the following questions.

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)



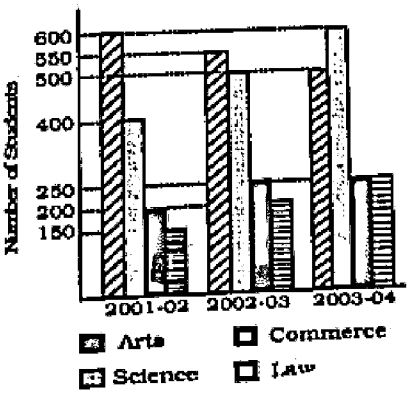
67. The ratio between the Hindu and Sikh population in 2004 was
(1) 3 : 5 (2) 1 : 2
(3) 2 : 3 (4) 3 : 4

68. If the total population of the state in 2004 was 5 lakhs, then the Hindu and Muslim population in that year was
(1) 200000 (2) 275000
(3) 250000 (4) 225000

69. If the total population of the state in 2005 was 5 million, then the Hindu population was [1 million = 10,00,000]
(1) 2000000 (2) 1250000
(3) 1500000 (4) 1750000

Directions (70–72) : Shown below is the multiple bar diagram depicting the changes in the roll strength of a college in four faculties from 2001-02 to 2003-04.

(SSC Graduate Level Tier-I Exam. 19.05.2013 Ist Sitting)



Study the above bar diagram and answer the questions.

70. The percentage of students in Science faculty in 2001-2002 is
(1) 30.2% (2) 26.9%
(3) 27.8% (4) 29.6%

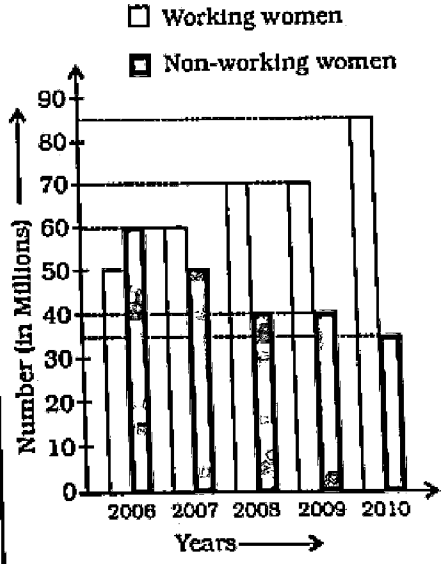
71. The percentage of students in Law faculty in 2003-04 is
(1) 14.8% (2) 18.5%
(3) 15.6% (4) 16.7%

72. Percentage of increase in Science students in 2003-04 over 2001-2002 is
(1) 75% (2) 50%
(3) 150% (4) $66\frac{2}{3}\%$

Directions (73-77) : Study the following multiple bar graph carefully and answer the questions

(SSC CHSL DEO & LDC Exam. 28.10.2012, Ist Sitting)

Survey of the number of working and non-working women over the years.



73. The number of non-working women in the year 2010 was approximately (correct up to an integer) what per cent of total number of working as well as non-working women in that year ?
(1) 23% (2) 25%
(3) 29% (4) 31%

74. What is the ratio of numbers of working women to the non-working women in the year 2009 ?
(1) 7 : 4 (2) 4 : 7
(3) 2 : 3 (4) 3 : 2

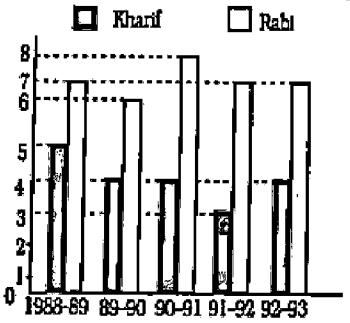
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75. What is the ratio of the number of women working in the year 2006 to the number of women working in the year 2010 ?
(1) 5 : 17 (2) 17 : 5
(3) 17 : 10 (4) 10 : 17

76. In which year was the difference between the number of working and non-working women the highest?
(1) 2007 (2) 2008
(3) 2009 (4) 2010

77. In which year or years, the difference between the number of working and non-working women the lowest ?
(1) 2006 and 2007
(2) 2007 and 2008
(3) Only 2006
(4) Only 2007

78. The average Kharif production of the given years is
Production of pulses in Rabi and Kharif season (in million tonnes)

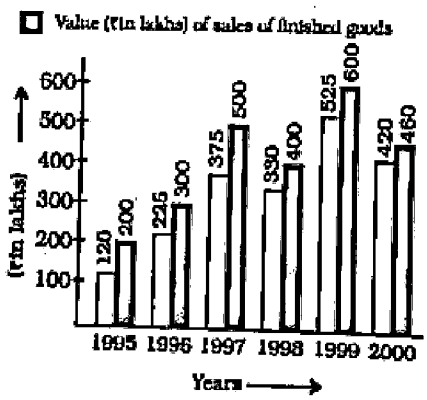


(1) 4 million tonnes
(2) 5 million tonnes
(3) 4.5 million tonnes
(4) 5.5 million tonnes

(SSC Graduate Level Tier-II Exam. 29.09.2013

Directions (79-80) : Study the following graph and answer the given questions

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

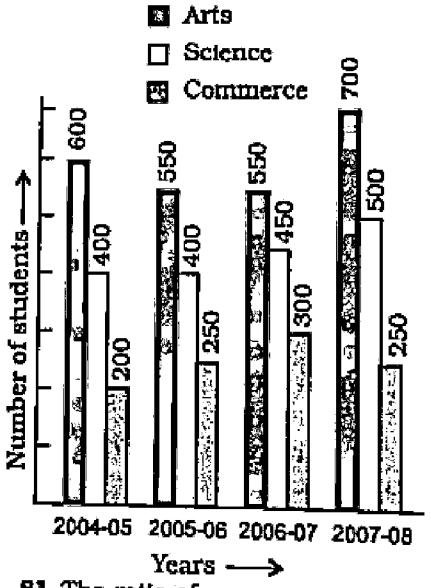


79. In which year, there has been a maximum percentage increase in the amount invested in raw materials as compared to the previous year ?
(1) 1996 (2) 1997
(3) 1998 (4) 1999

80. What was the difference between the average amount invested in raw materials during the given period and the average value of sales of finished goods during this period ?
(1) ₹ 62.5 lakhs (2) ₹ 68.5 lakhs
(3) ₹ 71.5 lakhs (4) ₹ 77.5 lakhs

Directions (81-82) : Student's strength of a college in Arts, Science and Commerce from 2004-05 to 2007-08 sessions are shown in the following bar graph. Study the graph and answer the questions.

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

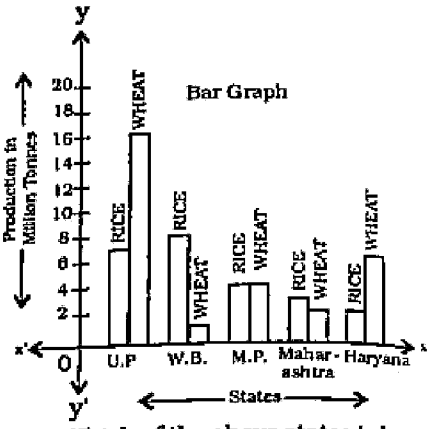


81. The ratio of average number of students in Arts to the average number of students in Commerce is
(1) 12 : 5 (2) 10 : 7
(3) 7 : 4 (4) 48 : 35

82. The % increase in Science students in 2007-08 over 2006-07 was
(1) 10.1% (2) 11.1%
(3) 16.7% (4) 18.2%

Directions (83-87) : Read the bar graph given below and answer the questions.

FCI Assistant Grade-III Exam. 05.02.2012 (Paper-I) East Zone (IInd Sitting)



83. Which of the above states is least producer of wheat ?
(1) Maharashtra (2) W.B.
(3) M.P. (4) Haryana

84. Which of the above states is the largest producer of rice ?
(1) U.P. (2) W.B.
(3) M.P. (4) Haryana

85. What fraction of rice is produced by Haryana of the total production of rice by all the above States?
(1) $\frac{1}{8}$ (2) $\frac{1}{12}$
(3) $\frac{1}{4}$ (4) $\frac{1}{6}$

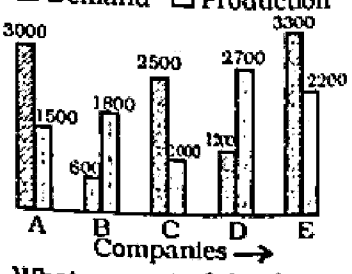
86. In which of the above states the total production of rice and wheat is the least ?
(1) W.B. (2) M.P.
(3) Maharashtra (4) Haryana

87. Which of the above States is the largest producer of wheat ?
(1) M.P. (2) Haryana
(3) Maharashtra (4) U.P.

Directions (88-92) : Study the graph and answer the following questions.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

Demand and Production of Colour T.V. sets of five companies A, B, C, D and E for October 2006



88. What percent of the demand of company C is that of the company B ?
(1) 14% (2) 20%
(3) 24% (4) 26%

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89. What is the difference between average demand and average production of the companies taken together ?
(1) 1400 (2) 400
(3) 280 (4) 138

90. The average production of the companies A, B, C and that of the companies D, E are in the ratio :
(1) 85 : 147 (2) 86 : 147
(3) 86 : 149 (4) 87 : 149

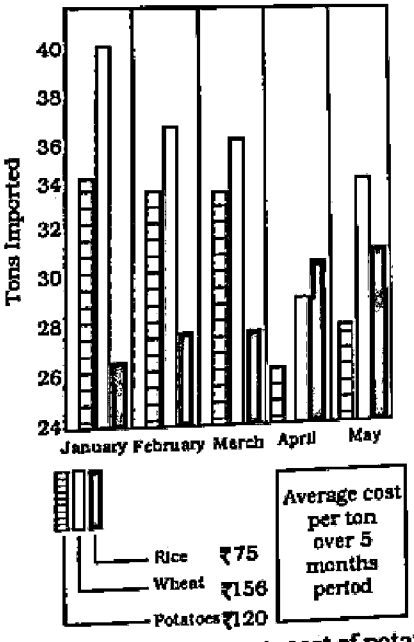
91. What is the ratio of companies having more demand than production to those having more production than demand ?
(1) 2 : 3 (2) 4 : 1
(3) 1:4 (4) 3 : 2

92. How many times of the production of company A is that of the company D ?
(1) 1.4 (2) 1.5
(3) 1.8 (4) 2.5

Directions (93–94) : The following Bar Diagram depicts figures for some agricultural imports from January-May, 2008. Answer (as closely as possible) the questions using the date provided here

(SSC Multi-Tasking Staff Exam. 24.03.2013, Ist Sitting)

Agricultural Imports - January to May

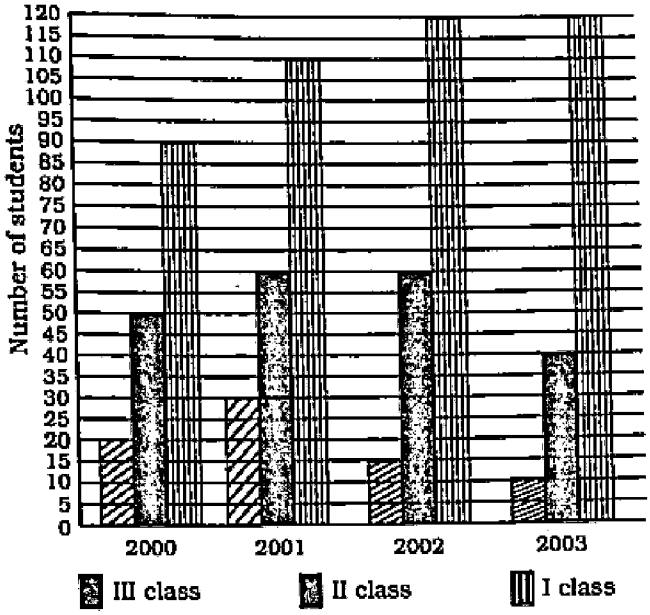


93. What is the average cost of potato import in February and March?
(1) ₹ 3,960 (2) ₹ 5,960
(3) ₹ 1,280 (4) ₹ 4,440

94. What was the total cost (in ₹) of wheat import in March?
(1) ₹ 3,212 (2) ₹ 5,616
(3) ₹ 7,042 (4) ₹ 2,224

Directions (95-98) : The graph shows the result of 10th class students of a school for 4 years. Study the graph and answer the questions :

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)



95. The number of students appeared for the 10th class exam in the year 2002 is
(1) 180 (2) 195
(3) 200 (4) 120

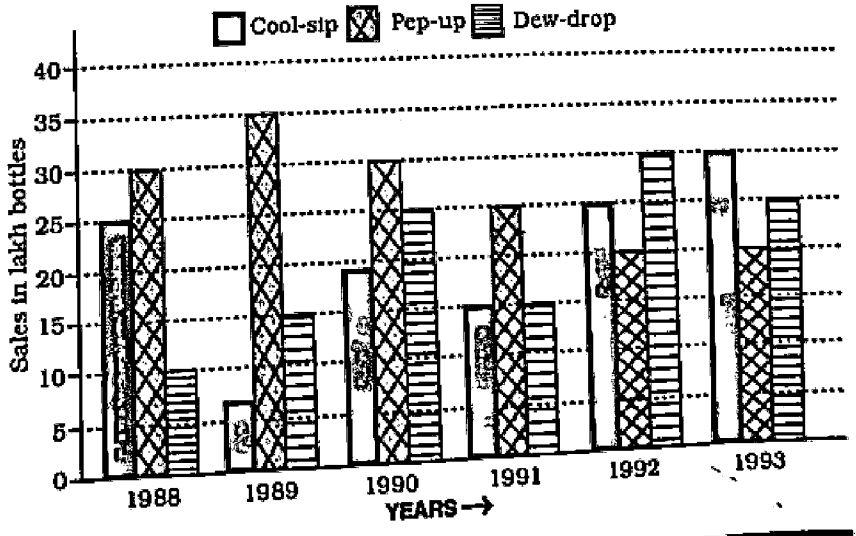
96. The percentage increase of first class in the year 2003 over the year 2002 is approximately
(1) 12% (2) 0%
(3) 10% (4) 9%

97. The year in which the maximum number of students appeared for the 10th class exam is
(1) 2001 (2) 2002
(3) 2003 (4) 2000

98. The ratio of students who scored second class to the total students appeared in the year 2000 is
(1) 3 : 16 (2) 4 : 17
(3) 5 : 16 (4) 11 : 16

Directions (99-104) : Study the graph and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014) (Ist Sitting)



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99. In which year the sale of cool-sip is minimum ?
(1) 1990 (2) 1992
(3) 1993 (4) None of the above

100. In case of which soft drink was the average annual sale maximum during the period 1988-1993 ?
(1) Pep-up only
(2) Pep-up and Dew-drop
(3) Cool-sip only
(4) Cool-sip and Pep-up

101. What was the approximate percent drop in the sale of Pep-up in 1990 over its sale in 1989 ?
(1) 5 (2) 14
(3) 12 (4) 20

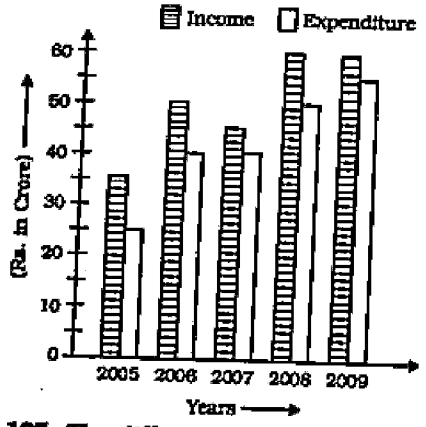
102. What was the approximate percent increase in sales of Cool-sip in 1990 over its sales in 1989 ?
(1) 100 (2) 50
(3) 171 (4) 150

103. In which year sale of Dew-drop is maximum ?
(1) 1988 (2) 1992
(3) 1989 (4) 1993

104. In case of which soft drink was the average annual sale minimum during the period 1988-1993 ?
(1) Pep-up only
(2) Cool-sip only
(3) Dew-drop only
(4) Dew-drop and Cool-sip

Directions (105-108) : Study the following graph which shows income and expenditure of a company over the years and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014)



105. The difference in profit (in Rs. crores) of the company during 2007 and 2008 is
(1) 5 (2) 10
(3) 15 (4) 20

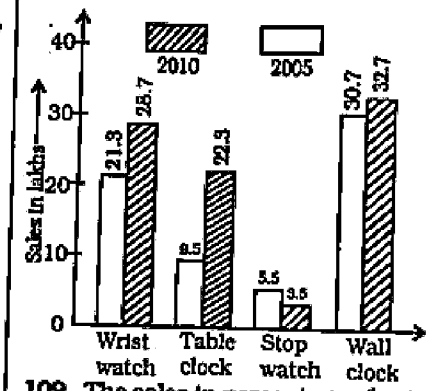
106. In how many years was the expenditure of the company more than the average expenditure of the given years ?
(1) 4 (2) 3
(3) 2 (4) 1

107. The percentage increase in income of the company from 2007 to 2008 is
(1) 30 (2) 25
(3) $33\frac{1}{3}$ (4) $42\frac{6}{7}$

108. Ratio of total income to total expenditure of the company over the years is
(1) 21 : 25 (2) 25 : 21
(3) 26 : 21 (4) 25 : 22

Directions (109-113) : A watch company produces four different products. The sale of these products in lakhs during 2005 and 2010 are shown in the following bar diagram. Study the graph and answer the questions.

(SSC CGL Tier-II Exam. 21.09.2014)



109. The sales in percentage of wrist watch in 2010 more than the sales of table clock in 2010 was nearly by
(1) 26.7% (2) 27.7%
(3) 28.7% (4) 21.7%

110. The ratio of sales of stop watch in 2010 to the sale of table clock in 2005 is
(1) 6 : 19 (2) 7 : 6
(3) 19 : 6 (4) 7 : 19

111. The sales of table clock in 2005 was less than the sales of wall clock in 2005 is nearly by
(1) 70.05% (2) 69.05%
(3) 68.05% (4) 62.05%

112. During the period 2005-2010 the minimum rate of increase in sales is in the product of
(1) Wrist watch (2) Table clock
(3) Stop watch (4) Wall clock

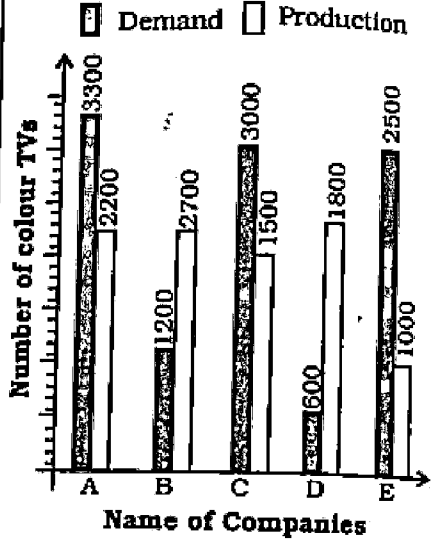
113. The sales have increased by nearly 135% from 2005 to 2010 in the product of
(1) Table clock (2) Wrist watch
(3) Stop watch (4) Wall clock

Directions (114-118) : Study the bar diagram and answer the following questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014)

Demand and Production of colour TVs of five companies A, B, C, D and E.

(Number on the top of a bar is the number of colour TVs)



114. The ratio of the number of companies having more demand than production to the companies having more production than demand, is
(1) 2 : 3 (2) 4 : 1
(3) 1 : 1 (4) 3 : 2

115. The difference between average demand and average production of the five companies taken together is
(1) 1400 (2) 400
(3) 280 (4) 138

116. The percentage of the demand of company D as compared to the demand of company E is
(1) 12 (2) 24
(3) 20 (4) 30

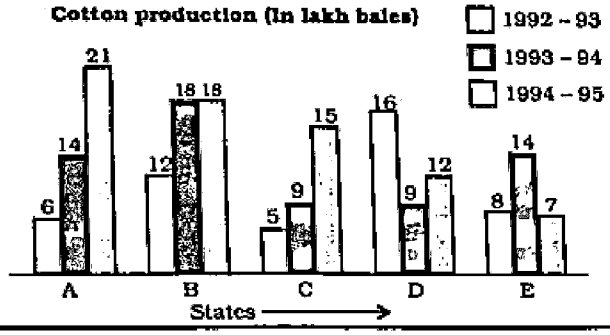
117. The ratio of average demand to average production of companies B and D is
(1) 1 : 5 (2) 2 : 5
(3) 3 : 5 (4) 4 : 5

118. The ratio of demand and production is maximum in factory
(1) E (2) C
(3) A (4) D

Directions (119-122) : Study the graph carefully and answer the following questions.

(SSC CHSL DEO & LDC Exam. 02.11.2014) (IInd Sitting)

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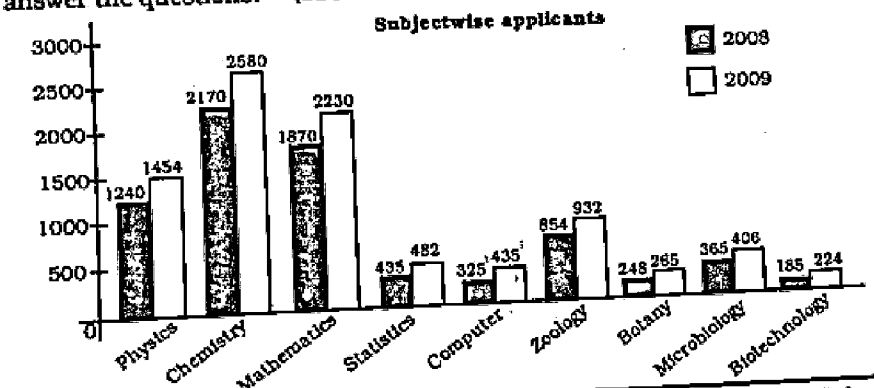
119. The production of State D in 1993–94 is how many times its production in 1994–95 ?
(1) 1.33 (2) 0.75
(3) 0.56 (4) 1.77

120. Which of the following statement is false ?
(1) State A and E showed the same production in 1993–94.
(2) There was no improvement in the production of cotton in state B during 1994–95.
(3) State A has produced maximum cotton during the given period.
(4) Production of state C and D together is equal to that of state B during 1993–94.

121. How many states showing below average production in 1992–93 showed above average production in 1993–94 ?
(1) 4 (2) 2
(3) 3 (4) 1

122. What is the average production of the four states in the year 1994–95 taken together ?
(1) 12.3 (2) 14.6
(3) 15.6 (4) 16.3

Directions (123-127) : The subjectwise number of applicants for the year 2008 and 2009 in a college is given in the following chart. Study the graph and answer the questions. **(SSC CHSL DEO & LDC Exam. 02.11.2014) (IInd Sitting)**



123. The subject for which growing of demand is maximum is
(1) Chemistry
(2) Mathematics
(3) Computer
(4) Biotechnology

124. The subject for which growing of demand is minimum is
(1) Statistics
(2) Zoology
(3) Botany
(4) Microbiology

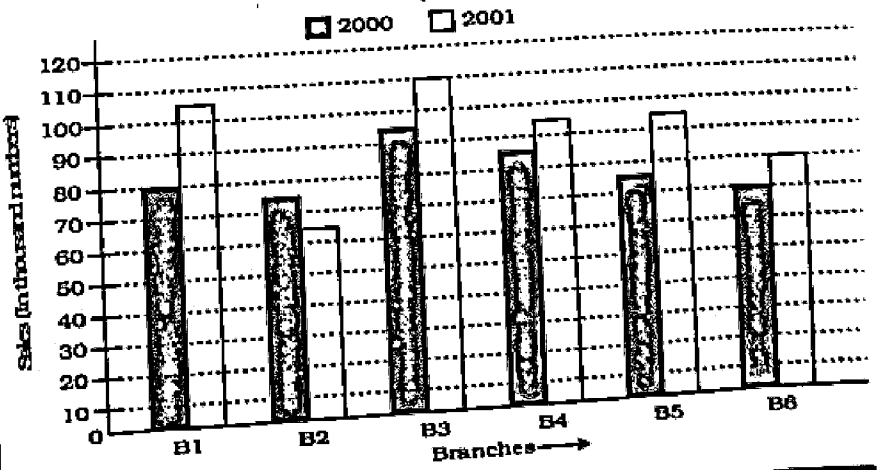
125. The number of Chemistry seeking applicants increased by
(1) 17.26 %
(2) 18.89 %
(3) 19.25 %
(4) 21.08 %

126. The number of Physics seeking applicants increased by
(1) 17.26 %
(2) 18.89 %
(3) 19.25 %
(4) 21.08 %

127. The number of Mathematics seeking applicants increased by
(1) 17.26 %
(2) 18.89 %
(3) 19.25 %
(4) 21.08 %

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Directions (128 – 131) : Sales of Books (in thousand numbers) from Six Branches – B1, B2, B3, B4, B5 and B6 of a publishing Company in 2000 and 2001. Study the graph and answer the questions.
(SSC CHSL DEO & LDC Exam. 9.11.2014)



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128. Total sale of branches B1, B3 and B5 together for both the years (in thousand) is
(1) 250 (2) 310
(3) 435 (4) 560

129. Find the ratio of the total sales of branch B2 for both years to the total sales of branch B4 for both years.
(1) 2 : 3 (2) 3 : 5
(3) 4 : 5 (4) 7 : 9

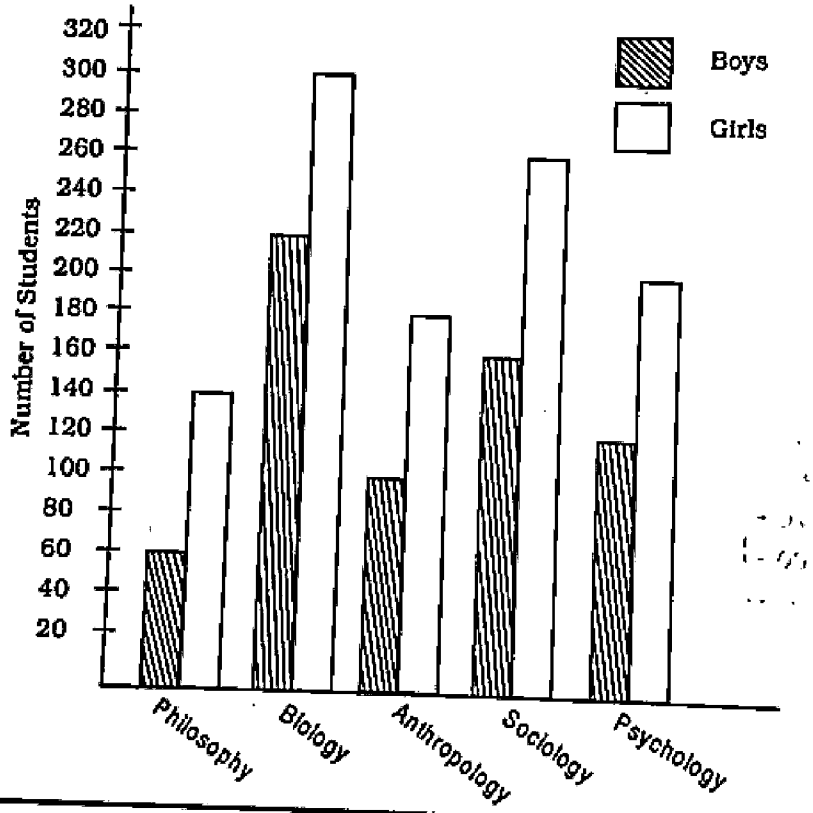
130. The average sale of branches B1, B3 and B6 in 2000 is what percent of the average sale of branches B1, B2 and B3 in 2000 ?
(1) 87.5 (2) 75
(3) 77.5 (4) 82.5

131. Find the percentage increase in the sales of books of branch B3 in the year 2001 than the branch B2.
(1) 69.2 (2) 50.8
(3) 40.9 (4) 65.7

Directions (132 - 136) : Study the bar diagram and answer the questions.

(SSC CHSL DEO & LDC Exam. 16.11.2014)

Total number of boys and girls in five different departments of a college



132. The percentage of the girls from Biology Department compared to the total number of girls from all the other Departments together is
(1) $37\frac{1}{2}$ (2) 37
(3) $36\frac{1}{2}$ (4) $35\frac{1}{2}$

133. The difference between the total number of boys and the total number of girls from all the Departments together is
(1) 540 (2) 520
(3) 460 (4) 440

134. The average number of boys from all the departments together is
(1) 123 (2) 132
(3) 134 (4) 142

135. The percentage of the boys from Biology Department compared to the total number of boys from all the Departments together is
(1) $33\frac{1}{2}$ (2) 50
(3) $33\frac{1}{3}$ (4) 30

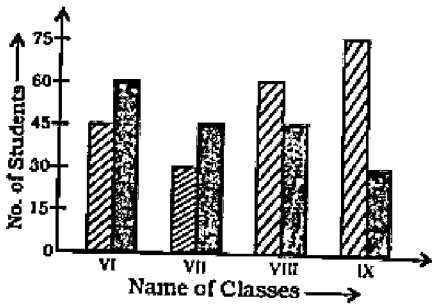
136. The respective ratio of number of girls from Philosophy Department to the number of girls from Psychology Department is
(1) 7 : 11 (2) 11 : 7
(3) 7 : 10 (4) 6 : 11

Directions (137 - 141) : Study the double bar graph given below and answer the questions.

(SSC CHSL DEO Exam. 02.11.2014 (Ist Sitting)

▨ : No. of students participating in the school exhibition in the year 2013

▩ : No. of students participating in the cultural events of school in the year 2013 of a particular school



137. The class having maximum number of participants in exhibition is
(1) Class IX (2) Class VIII
(3) Class VII (4) Class VI

138. The average of the number of students participating in cultural events is
(1) 48.75 (2) 52.5
(3) 45 (4) 50

139. The average of the number of students participating in exhibition is
(1) 48.75 (2) 52.5
(3) 45 (4) 50

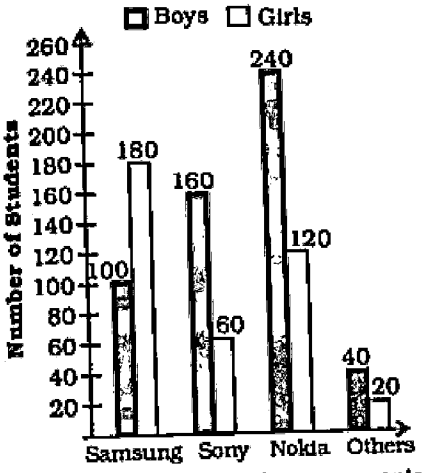
140. The ratio of the participants in exhibition of class IX with the total participants of class IX is
(1) 5 : 7 (2) 5 : 14
(3) 1 : 4 (4) 3 : 5

141. The percentage of students of class VIII participating in cultural event out of total participants of cultural event is
(1) 30% (2) 25%
(3) 35% (4) 40%

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Directions (142-145) : The following bar chart represents the number of first year B. Com. students of St Xavier's College using different companies' smart phones. Study bar chart and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)



The bar chart representing the number of students using different smart phones.

142. The ratio of the number of boys to the number of girls using the smart phones of Samsung and Sony together is
(1) 12 : 13 (2) 13 : 12
(3) 14 : 11 (4) 11 : 14

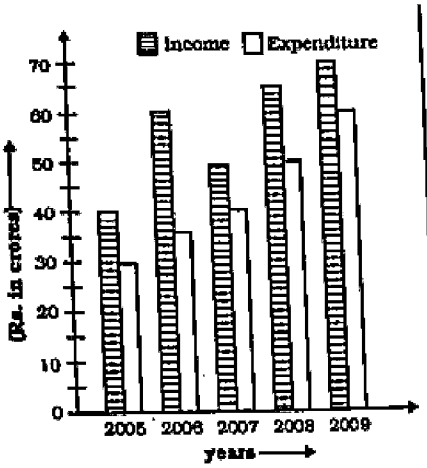
143. What percentage of boys are using the smart phones of Samsung?
(1) 16.52% (2) 17.52%
(3) 18.52% (4) 15.52%

144. What percentage of girls are using the smart phones of Nokia?
(1) 33.58% (2) 32.58%
(3) 30.58% (4) 31.58%

145. The difference between the total number of students using smart phones of Samsung combined together and the total number of students using smart phones of Sony taken together is
(1) 20 (2) 60
(3) 80 (4) 40

Directions (146-149) : Study the following graph which shows income and expenditure of a company over the years 2005 – 2009 and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)



146. The difference in profit (Rs. in crores) of the company during 2006 and 2007 is
(1) 10 (2) 15
(3) 20 (4) 25

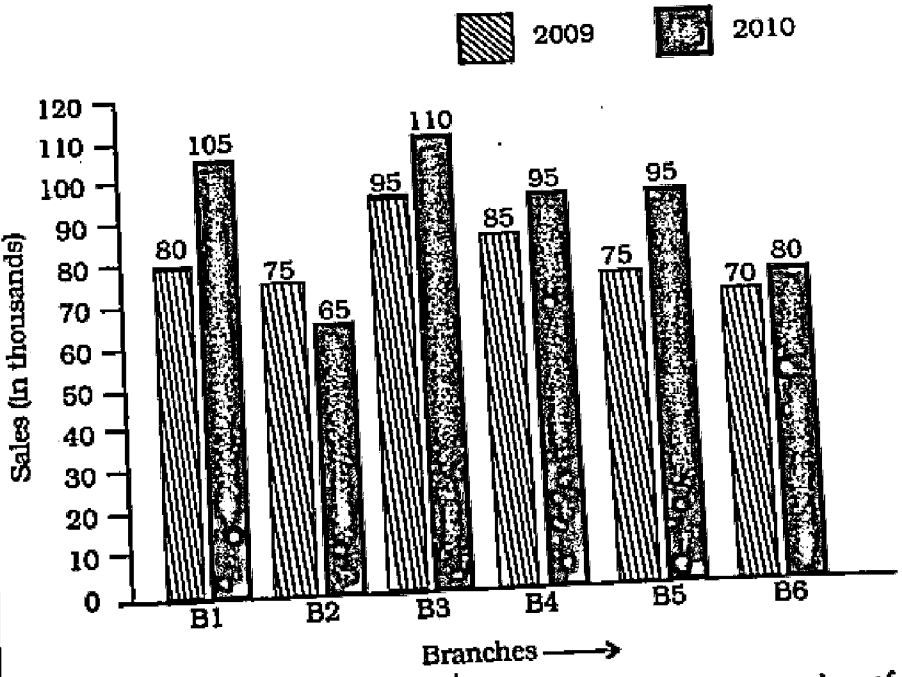
147. In how many years was the income of the company less than the average income of the given years ?
(1) 4 (2) 3
(3) 2 (4) 1

148. The percentage increase in expenditure of the company from 2007 to 2008 is
(1) 20 (2) 25
(3) 30 (4) 35

149. Profit of the company was maximum in the year
(1) 2009 (2) 2008
(3) 2006 (4) 2005

Directions (150 - 154) : In the following bar diagram sales of books (in thousand numbers) from six branches – B1, B2, B3, B4, B5 and B6 of a publishing company in 2009 and 2010 have been shown. Study the graph and answer the questions.

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, IInd Sitting (TF No. 545 QP 6)



150. The ratio of the total sales of branch B2 for both the years to the total sales of branch B4 for both the years is
(1) 7 : 9 (2) 2 : 3
(3) 4 : 5 (4) 3 : 5

151. Total sales of branch B6 for both the years is x per cent of the total sales of branch B3 for both the years. The value of x is
(1) 68.54% (2) 73.17%
(3) 71.11% (4) 75.55%

152. x% of the average sales of branches B1, B2 and B3 in 2010 is the average sales of branches B1, B3 and B6 in 2009. The value of x is
(1) 77.5% (2) 87.5%
(3) 82.5% (4) 75%

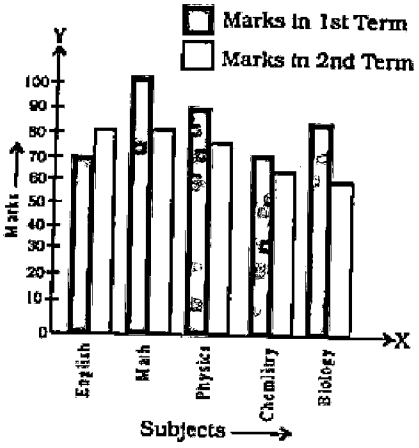
153. The average sales of all the branches for the year 2009 is
(1) 73 (2) 83
(3) 80 (4) 88

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154. Total sales of branches B1, B3 and B5 together for both the years is
(1) 250 (2) 310
(3) 435 (4) 560

Directions (155 – 156) : Study the bar diagram and answer the given questions.

(SSC CGL Tier-II Exam. 12.04.2015 (TF No. 567 TL 9)

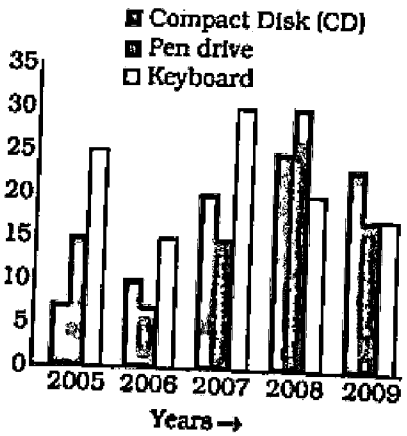


155. Ratio of highest and lowest marks obtained in first term among all the subjects is
(1) 7 : 9 (2) 9 : 7
(3) 10 : 7 (4) 7 : 10

156. Average marks obtained by the students for all subjects in second term is
(1) 65 (2) 73
(3) 62 (4) 72

Directions (157–161): Study the following graph which shows the production (in thousand) of different items, and answer the questions.

(SSC CGL Tier-II Exam, 2014 12.04.2015 (Kolkata Region) (TF No. 789 TH 7)



157. The total number of all products produced by the company in the year 2006 and 2008 together is
(1) 107500 (2) 105700
(3) 10750 (4) 1075

158. The average number of pendrives produced by the company over all the years together is
(1) 1700 (2) 170000
(3) 17000 (4) 85000

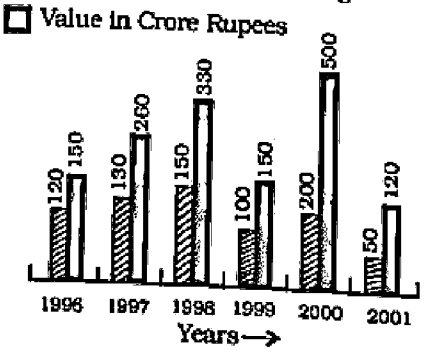
159. The difference between the total number of CD and pen-drives produced by the company together in the year 2008 and the number of keyboards produced by the company in the year 2006 is
(1) 3500 (2) 35000
(3) 4000 (4) 40000

160. The ratio between the number of keyboards produced by the company in the year 2006, 2007 and 2008 respectively is
(1) 1 : 2 : 3 (2) 3 : 4 : 5
(3) 3 : 6 : 4 (4) 3 : 4 : 6

161. The respective ratio between the number of CDs produced by the company in the year 2009 and the number of keyboards produced by the company in the year 2005 is
(1) 9 : 10 (2) 11 : 10
(3) 10 : 9 (4) 10 : 11.

Directions (162–165) : Study the bar diagram and answer the questions.

(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) (TF No. 8037731)



162. Percentage fall in value from 2000 to 2001 is
(1) 25% (2) 50%
(3) 75% (4) 40%

163. The difference between the bags exported in 1999 and 2000 was
(1) 1,00,000.00
(2) 1,50,000.00
(3) 50,000.00
(4) 2,00,000.00

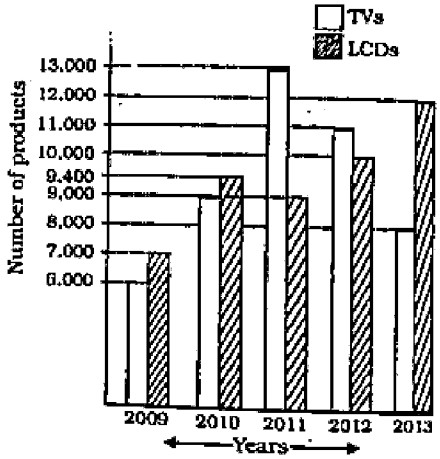
164. Value per bag was minimum in the year
(1) 2001 (2) 1999
(3) 1996 (4) 1997

165. The approximate percentage increase in quantity from 1997 to 1998 was
(1) 26.9% (2) 27.8%
(3) 26.5% (4) 27.3%

Directions (166–169) : Study the following bar diagram carefully and answer the following questions.

(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

The number of the production of electronic items (TVs and LCDs) in a factory during the period from 2009 to 2013.



166. The total number of products of electronic items is maximum in the year
(1) 2009 (2) 2010
(3) 2011 (4) 2013

167. The ratio of production of LCDs in the year 2011 and 2013 is
(1) 3 : 4 (2) 4 : 3
(3) 2 : 3 (4) 1 : 4

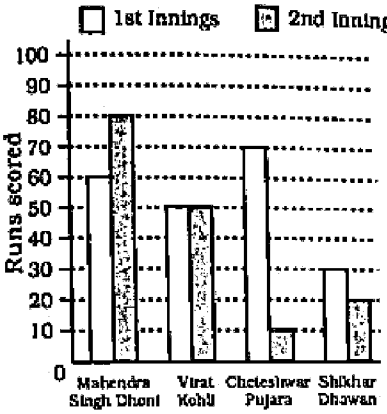
168. The difference between averages of production of TVs and LCDs from 2009 to 2012 is
(1) 600 (2) 700
(3) 800 (4) 900

169. The ratio of production of TVs in the years 2009 and 2010 is
(1) 7 : 6 (2) 6 : 7
(3) 2 : 3 (4) 3 : 2

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Directions (170 – 173) : Given here is a multiple bar diagram of the scores of four players in two innings. Study the diagram and answer the questions.

(SSC CGL Tier-I Exam, 16.08.2015 (1st Sitting) TF No. 3196279)



170. The average runs of two innings of the player who scored highest in average are :
(1) 70 (2) 80
(3) 85 (4) 75

171. The average runs in two innings of the player who has scored minimum in the second innings are:
(1) 30 (2) 60
(3) 50 (4) 40

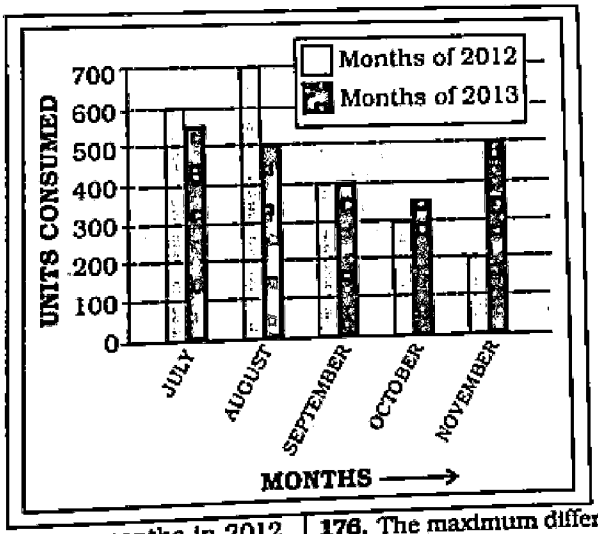
172. The total scores in the first innings contributed by the four players is :
(1) 190 (2) 210
(3) 220 (4) 200

173. The average score in second innings contributed by the four players is :
(1) 40 (2) 50
(3) 30 (4) 60

Directions (174–177) : Study the following bar-diagram and answer the questions.

(SSC CGL Tier-I Exam, 16.08.2015 (IInd Sitting) TF No. 2176783)

Electricity units consumed by a family in two consecutive years during July to November.



174. In how many months in 2012, the consumption of electric units was more than the average units consumption in that year ?
(1) 4 (2) 5
(3) 2 (4) 3

175. The average electric consumption by the family during these 5 months in 2013 is
(1) 470 units (2) 400 units
(3) 440 units (4) 450 units

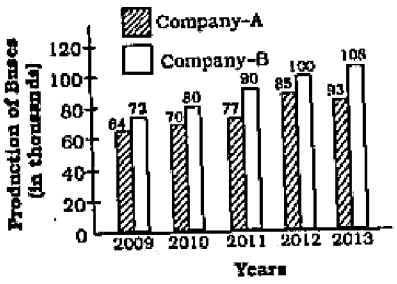
176. The maximum difference in the units consumption between these two years has been found in the month of
(1) August (2) July
(3) October (4) November

177. The total units consumption in the year 2013 during these 5 months, in respect of the same in the previous year has been
(1) increased by 2.27%
(2) decreased by 2.27%
(3) found unaltered
(4) increased by 2.22%

Directions (178–181): Study the following bar diagram carefully and answer the four questions.

(SSC CGL Tier-I Re-Exam, 30.08.2015)

Production of buses of company A and company B over the given years.



178. In which year for the company A the percentage increase of production of buses with respect to the previous year is maximum?
(1) 2010 (2) 2012
(3) 2011 (4) 2013

179. The average production (in thousand) of the company B over the years 2009, 2011, 2012 is
(1) 87.33 (2) 80.67
(3) 90.33 (4) 84

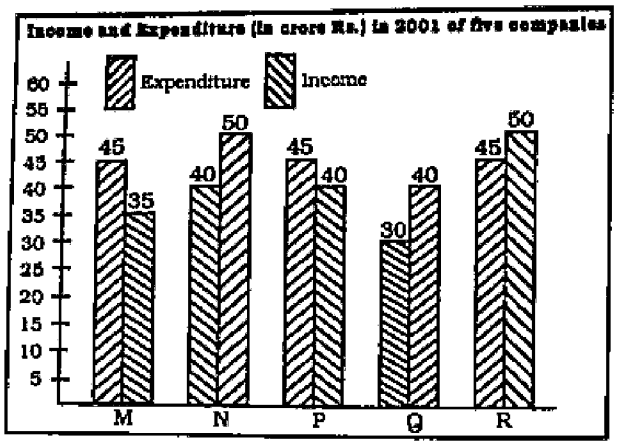
180. The average production (in thousand) of company A over the years 2010, 2011, 2012, 2013 is
(1) 74 (2) 81.25
(3) 85.5 (4) 81

181. The ratio of the average production of company A in 2009 and 2010 to the average production of company B in the same years is
(1) 147 : 170 (2) 81 : 95
(3) 67 : 76 (4) 85 : 99

Directions (182 – 186) : Study the bar chart given below and answer the following questions :

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 16.11.2015 (1st Sitting) TF No. 6636838)

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182. In 2001, the approximate percentage of profit/loss of all the five companies taken together is equal to
(1) 6.88% loss (2) 4.65% profit
(3) 6.48% profit (4) 4% loss

183. If the income of compnay Q in 2001 was 10% more than that in 2000 and the company had earned a profit of 20% in 2000, then its expenditure in 2000 (in crores Rs.) was :
(1) 34.34 (2) 28.28
(3) 29.09 (4) 32.32

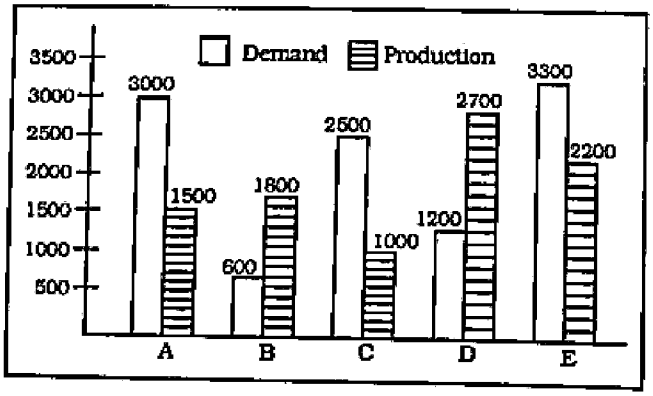
184. The company earning the maximum percentage of profit in the year 2001 is :
(1) Q (2) M
(3) N (4) P

185. The companies M and N together had a percentage of profit/loss of :
(1) No loss and no profit
(2) 12% loss (3) 10% loss
(4) 10% profit

186. For company R, if the expenditure had increased by 20% in the year 2001 from the year 2000 and the company had earned profit of 10% in 2000, the company's income in 2000 was (in crore Rs.) :
(1) 41.67 (2) 35.75
(3) 37.25 (4) 38.5

Directions (187–191) : The following chart represents Demand and Production for 5 companies ABCDE. On the basis of the graph answer the questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 15.11.2015 (IInd Sitting) TF No. 7203752)



187. If company A desires to meet the demand by purchasing surplus production of company, then the most suitable company is :
(1) C (2) D
(3) E (4) B

188. If x% of demand for company C equals demand for company B, then x equals
(1) 24 (2) 20
(3) 60 (4) 4

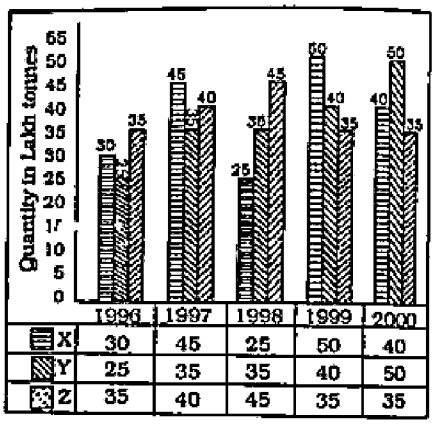
189. If the production of company D is h times of the production of company A. Then h equals :
(1) 1.5 (2) 2.5
(3) 1.2 (4) 1.8

190. The difference between average demand and average production of the five companies taken together is :
(1) 400 (2) 280
(3) 130 (4) 620

191. The ratio of the number of companies having more demand than production to those having more production than demand is :
(1) 4 : 1 (2) 2 : 2
(3) 3 : 2 (4) 2 : 3

Directions (192-196) : The bar graph provided below gives the data of the production of paper (in lakh tonnes) by three different companies X, Y and Z over the years. Study the bar chart and answer the following questions.

(SSC CHSL (10+2) LDC, DEO & PA/SA Exam, 06.12.2015 (Ist Sitting) TF No. 1375232)



	1996	1997	1998	1999	2000
X	30	45	25	50	40
Y	25	35	35	40	50
Z	35	40	45	35	35

192. The percentage of production of company Z to the production of company Y is maximum in :
(1) 2000 (2) 1996
(3) 1999 (4) 1998

193. The ration of the average production of company X in the period 1998-2000 to the average production of company Y in the same period is :
(1) 27 : 29 (2) 23 : 25
(3) 25 : 26 (4) 24 : 27

194. The average production for five years is maximum for which company?
(1) X and Z (2) X
(3) Z (4) Y

195. The percentage increase in the production of company Y from 1996 to 1999 is :
(1) 60% (2) 50%
(3) 55% (4) 40%

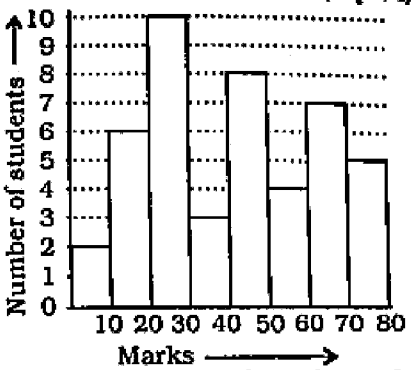
196. The difference between the production of company Z in 1998 and company Y in 1996 is :
(1) 25,00,000 tonnes
(2) 10,00,000 tonnes
(3) 15,00,000 tonnes
(4) 20,00,000 tonnes

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TYPE-VI

Directions (1–5) : The histogram shows the marks obtained by 45 students of a class. Look at the histogram and answer the questions.

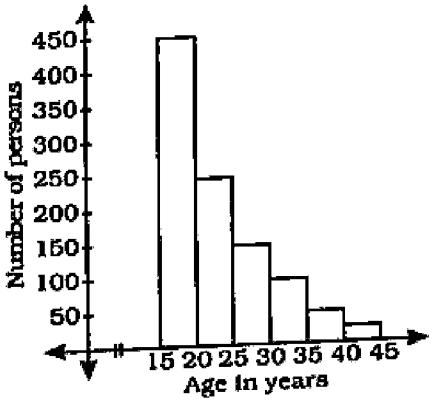
(SSC CPO (SI, ASI & Intelligence Officer) Exam. 28.08.2011 (Paper-I)



1. How many students have obtained marks 50 and above ?
   (1) 9 (2) 10
   (3) 11 (4) 16
2. If the pass mark be 30, what is the number of failures ?
   (1) 2 (2) 6
   (3) 18 (4) 20
3. If the pass mark be 30, what is the percentage of successful students ?
   (1) 75% (2) 60%
   (3) 50% (4) 40%
4. How many students have obtained marks less than 10 ?
   (1) 2 (2) 10
   (3) 1 (4) 4
5. How many students have obtained 30 or more marks but less than 40 ?
   (1) 3 (2) 4
   (3) 5 (4) 6

Directions (6–10) : Study the following histogram and answer the questions.

(SSC CHSL DEO & LDC Exam. 21.10.2012 (IInd Sitting)



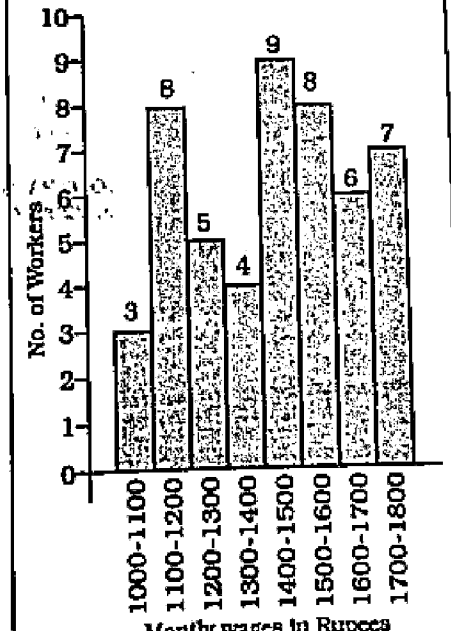
6. The total number of persons in the age group of 15 years to 45 years is :
   (1) 450 (2) 800
   (3) 1000 (4) 500
7. The number of persons in the age group 20 – 30 years is :
   (1) 475 (2) 400
   (3) 300 (4) 700
8. The ratio of the number of persons between the age group of 20 – 25 and 30 – 35 is :
   (1) 1 : 3 (2) 2 : 1
   (3) 10 : 3 (4) 6 : 1
9. The ratio of maximum population in an age group to the total number of persons under study is :
   (1) 4 : 5 (2) 9 : 10
   (3) 9 : 20 (4) 2 : 5
10. The percentage of population under study which is in the age group of 40 – 45 is :
    (1) 2.5% (2) 3.5%
    (3) 1.5% (4) 5%

Directions (11–14) : Study the bar-graph and answer the following questions.

(SSC Assistant Grade-III Exam. 11.11.2012 (IInd Sitting)

Bar-graph showing the wages of workers in a factory

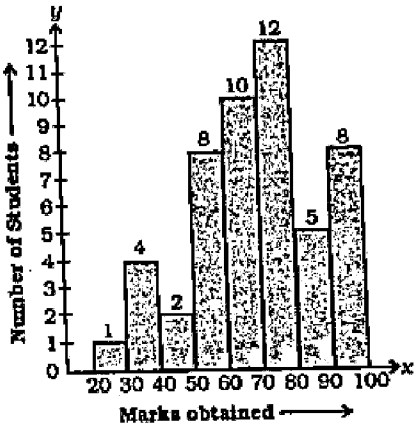
Monthly wages in Rupees



11. The total number of workers in the factory is
    (1) 42 (2) 48
    (3) 50 (4) 46
12. The ratio of the number of workers placed in the lowest wage group to that of the workers in the highest wage group is
    (1) 3 : 7 (2) 8 : 9
    (3) 3 : 4 (4) 2 : 3
13. The total amount of money (approximately) needed to pay the monthly wages of all the workers is
    (1) ₹ 69,100 (2) ₹ 71,600
    (3) ₹ 70,500 (4) ₹ 69,500
14. In which wage group, is the amount of money needed to pay the monthly wages the highest ?
    (1) 1400 –1500 (2) 1500 –1600
    (3) 1700 –1800 (4) None of these

Directions (15-16) : The Histogram shown the marks of 50 students in an examination. Examine the diagram and answer the questions. [Marks are given in integers only].

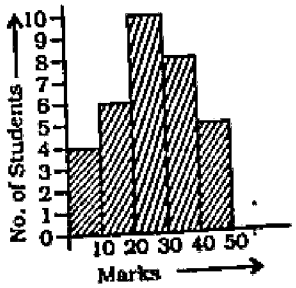
[SSC Multi-Tasking Staff Exam. 10.03.2013, Ist Sitting : Patna]



15. How many students obtained more than 39 but below 60?
    (1) 8 (2) 6
    (3) 10 (4) 12
16. What per cent of students did obtain marks above 60?
    (1) 60% (2) 80%
    (3) 70% (4) 75%

Directions (17-20) : Study the following Histogram and answer the following questions.

(SSC Graduate Level Tier-I Exam. 21.04.2013)



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17. The total number of students involved in the data is
(1) 33 (2) 32
(3) 43 (4) 42

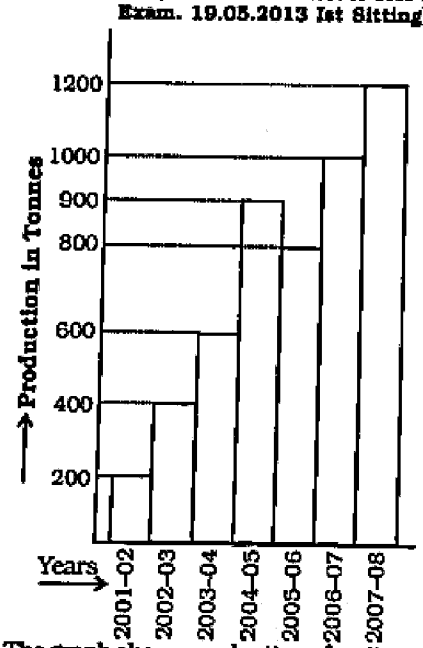
18. The maximum number of students got the marks in the interval of
(1) 10 – 20 (2) 20 – 30
(3) 30 – 40 (4) 40 – 50

19. The least number of students got the marks in the interval
(1) 40 – 50 (2) 20 – 30
(3) 10 – 20 (4) 0 – 10

20. The ratio of the students obtaining marks in the first and the last interval is
(1) 5 : 4 (2) 6 : 5
(3) 4 : 5 (4) 3 : 4

Directions (21– 24) : Study the graph carefully and answer the questions.

(SSC Graduate Level Tier-I Exam. 19.05.2013 1st Sitting)



The graph shows production of an item (in tonnes) during certain years

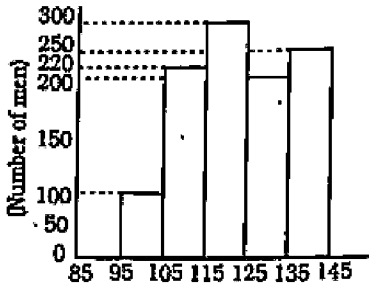
21. The production in 2006-07 in comparison to the production in 2002-03 increased by
(1) 150% (2) 110%
(3) 120% (4) 125%

22. The production decreased from 2004-05 to 2005-06 by
(1) $11\frac{1}{9}\%$ (2) $8\frac{1}{9}\%$
(3) $9\frac{1}{9}\%$ (4) $10\frac{1}{9}\%$

23. The year in which production increased the lowest as compared to the previous year is
(1) 2007 – 08 (2) 2003 – 04
(3) 2004 – 05 (4) 2006 – 07

24. The production from 2003 – 04 to 2007 – 08 increased by
(1) 125% (2) 50%
(3) 75% (4) 100%

Direction (25) : Study the histogram of weight distribution of different men and answer question based on it.

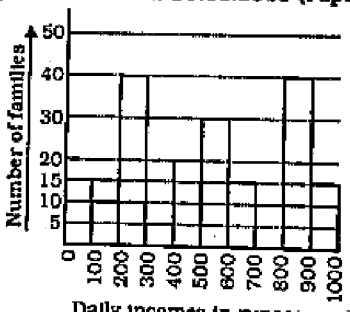


25. Average number of men per interval who participated in this survey is
(1) 200 (2) 180
(3) 214 (4) 194

(SSC Graduate Level Tier-II Exam. 29.09.2013

Directions (26-30) : The histogram, given below, shows the number of families of a locality having various daily incomes, as obtained by a survey. Observe the graph and answer the questions based on it.

(SSC SAS Exam. 26.06.2010 (Paper-I)



26. In all, how many families were surveyed ?
(1) 235 (2) 220
(3) 200 (4) 195

27. The number of families, whose daily incomes are ₹ 800 or above, is
(1) 50 (2) 55
(3) 65 (4) 80

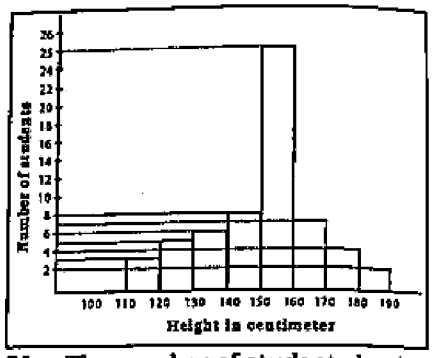
28. The number of families, whose daily incomes are below ₹ 200, is
(1) 25 (2) 20
(3) 15 (4) 10

29. The number of families, whose daily incomes are between ₹ 500 and ₹ 800, is
(1) 35 (2) 40
(3) 45 (4) 55

30. What per cent of families have their daily incomes less than ₹ 500 ?
(1) 90% (2) 45%
(3) 30% (4) 20%

Directions (31-33) : Following histogram depicts the range of heights of students in a class of 60 students. Study the same and answer the questions.

(SSC CGL Tier-I Re-Exam. (2013) 27.04.2014)



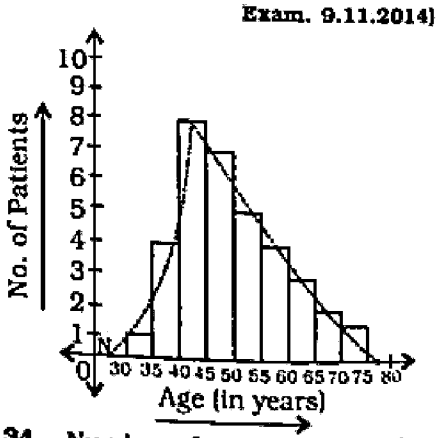
31. The number of students having height more than 150 cms is
(1) 25 (2) 8
(3) 38 (4) 13

32. The number of students with their heights between 130 to 150 cms is
(1) 8 (2) 6
(3) 14 (4) 22

33. Group which contains maximum number of students is
(1) 130 – 140 (2) 150 – 160
(3) 140 – 150 (4) 160 – 170

Directions (34 – 38) : The diagram shows the age-distribution of the patients admitted to a hospital on a particular day. Study the diagram and answer the questions.

(SSC CHSL DEO & LDC Exam. 9.11.2014)



34. Number of patients of age between 55 years to 60 years, who got admitted to the hospital on that day is

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(1) 6 (2) 4
(3) 24 (4) 8

35. Total number of patients of age more than 55 years, who got admitted to the hospital is
(1) 4 (2) 7
(3) 9 (4) 10

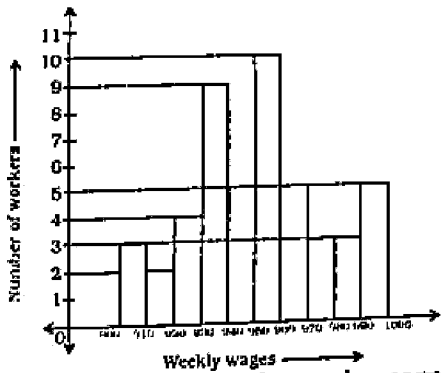
36. Number of patients of age more than 40 years and less than 55 years, who got admitted to the hospital on that day is
(1) 20 (2) 30
(3) 15 (4) 12

37. Percentage of patients of age less than 45 years, who got admitted to the hospital on that day is approximately equal to
(1) 14% (2) 20%
(3) 37% (4) 62%

38. About 11% of the patients who got admitted to the hospital on that particular day were of age
(1) either between 35 years and 40 years or between 55 years and 60 years
(2) between 60 years and 65 years
(3) between 35 years and 40 years
(4) between 35 years and 40 years and between 55 years and 60 years.

Directions (39 – 43) : Study the following histogram of wage distribution of different number of workers and answer the given questions.

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014 , Ist Sitting (TF No. 333 LO 2)



39. Number of workers who earn more than Rs. 950 is
(1) 40 (2) 31
(3) 26 (4) 16

40. Number of workers who earn less than Rs. 950 is
(1) 23 (2) 26
(3) 16 (4) 31

41. Total number of workers surveyed is
(1) 44 (2) 40
(3) 49 (4) 39

42. The number of workers earning more than Rs. 940 but less than Rs. 960 is
(1) 15 (2) 16
(3) 23 (4) 26

43. The percentage of workers who earn between Rs. 950 to Rs. 960 is
(1) 25.5% (2) 20.4%
(3) 17.6% (4) 13.25%

TYPE-VII

Directions (1-5) : A survery of film watching habits of people living in five cities P, Q, R, S and T is summarised below in a table. The coulmn I in the table gives percentage of film-watchers in each city who see only one film a week. The column II gives the total number of film-watchers who see two or more films per week.

(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

Read the table and answer the following questions.

City	I	II
P	60	24,000
Q	20	30,000
R	85	24,000
S	55	27,000
T	75	80,000

1. How many film-watchers in city R see only one film in a week ?
(1) 24850 (2) 36000
(3) 136000 (4) 160000

2. Which city has the highest number of film watchers who see only one film in a week?
(1) P (2) R
(3) S (4) T

3. A city with the lowest number of film-watchers is :
(1) P (2) Q
(3) R (4) S

4. The highest number of film-watchers in any given city is :
(1) Q (2) R
(3) S (4) T

5. The total number of all film-watchers in the five cities who see only one film in a week is
(1) 113000 (2) 425200
(3) 452500 (4) 500000

Directions (6-10) : The table given here shows production of five types of cars by a company in the year 1989 to 1994. Study the table and answer questions.

(SSC CGL Prelim Exam. 27.02.2000 (IInd Sitting) & (SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting)

PRODUCTION OF CARS BY A COMPANY

Year→ / Type↓	1989	1990	1991	1992	1993	1994	Total
P	8	20	16	17	21	6	88
Q	16	10	14	12	12	14	78
R	21	17	16	15	13	8	90
S	4	6	10	16	20	31	87
T	25	18	19	30	14	27	133
Total	74	71	75	90	80	86	476

6. In which year the production of cars of all types taken together was **approximately** equal to the average of the total production during the period?
(1) 1989 (2) 1991
(3) 1993 (4) 1994

7. In which year the total production of cars of types P and Q together was equal to the total production of cars of types R and S together?
(1) 1990 (2) 1991
(3) 1994
(4) None of the above

8. During the period 1989-94, in which type of cars was a continuous increase in production?
(1) P (2) Q
(3) R (4) S

9. The production of which type of car was 25% of the total production of all types of cars during 1993?
(1) S (2) R
(3) Q (4) P

10. The percent increased in total production of all types of cars in 1992 to that in 1991 was :
(1) 15% (2) 20%
(3) 25% (4) 30%

Directions (11-15) : Following table gives the population of a locality from 1988 to 1992. Read the table and answer the questions.

(SSC CGL Prelim Exam. 24.02.2002 (Ist Sitting & SSC CHSL DEO Exam. 02-11-2014)

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Years	Men	Increase (+) or Women	Children	Total	decrease (–) over preceding year
1988	65104	60387	—	146947	—
1989	70391	62516	—	—	+ (11630)
1990	—	63143	20314	153922	—
1991	69395	—	21560	—	– (5337)
1992	71274	659935	23789	16098	—

11. The number of children in 1988 is :
(1) 31236 (2) 125491
(3) 14546 (4) 21456

12. The total population in 1989 is :
(1) 144537 (2) 158577
(3) 146947 (4) 149637

13. Number of children in 1989 is :
(1) 25670 (2) 14040
(3) 13970 (4) 15702

14. Number of women in 1991 is :
(1) 57630 (2) 56740
(3) 52297 (4) 62957

15. Increase or decrease of population in 1992 over 1991 is :
(1) – (12413) (2) + (12413)
(3) + 155661 (4) + 7086

Directions (16-20) : Study the table carefully and answer the questions given below.

(SSC CGL Prelim Exam. 08.02.2004 (Second Sitting)

Yearly production (in thousands) of scooters in different factories.

Factory	1985	1986	1987	1988	1989
P	20	15	24	13	17
Q	16	23	41	20	15
R	14	21	30	16	12
S	25	17	15	12	22
T	40	32	39	41	35
Total	115	108	149	102	101

16. In which year, the production of scooters of all factories was equal to the yearly average number of scooters produced during 1985-89 ?
(1) 1985 (2) 1986
(3) 1987 (4) 1988

17. Which factory/factories showed a decrease of 25% in the production of scooters in 1989 as compared to 1988 ?
(1) P (2) S
(3) Q and R (4) P and T

18. The ratio of the production of scooters by factory P to that by factory T in 1985 is
(1) 2 : 3 (2) 1 : 2
(3) 3 : 2 (4) 2 : 1

19. In which year, the total production of scooters was maximum ?
(1) 1989 (2) 1986
(3) 1987 (4) 1985

20. In which year the total production of scooters of all factories was 20% of the total production of scooters during 1985-1989 ?
(1) 1988 (2) 1985
(3) 1986 (4) 1989

Directions (21-24) : Study the following table and answer the questions based on it :

(SSC CGL Prelim Exam. 13.11.2005 (Ist Sitting)

(In lakhs of ₹)

XYZ Co. Pvt. Ltd.			
Year	**Total Sales**	**Gross Profit**	**Net Profit**
1990	351.6	155.5	54.2
1991	407.9	134.3	42.6
1992	380.1	149.9	38.9
1993	439.7	160.5	50.3
1994	485.9	203.3	65.8

21. In which year the difference between the total sales and the gross profit is the least ?
(1) 1990 (2) 1991
(3) 1992 (4) 1993

22. The total sales in 1993 is **approximately** what per cent of the total sales of 1990 ?
(1) 75% (2) 85%
(3) 110% (4) 125%

23. Which years show increase in all categories simultaneously i.e., total sales, gross profit and net profit as compared to the previous year?
(1) 1993 and 1994 both
(2) 1994 and 1992 both
(3) 1992 and 1993 both
(4) 1990 and 1991 both

24. The per cent increase in the gross profit was the maximum in which year as compared to the previous one ?
(1) 1991 (2) 1992
(3) 1993 (4) 1994

Directions (25-28) : Study the table and answer the questions:

(SSC CGL Prelim Exam. 04.02.2007 (IInd Sitting)

The table given below shows the highest and average marks of a class in four subjects in four years. The maximum marks in each subject are 100.

Year	SUBJECTS							
	English		Maths		Science		Social Science	
	Highest	Average	Highest	Average	Highest	Average	Highest	Average
1993	80	70	94	60	89	70	65	55
1994	82	65	85	62	95	64	66	58
1995	71	56	92	68	97	68	68	48
1996	75	52	91	64	92	75	77	58

25. What is the overall average of marks in the four subjects in the year 1995 ?
(1) 63 (2) 64
(3) 65 (4) 60

26. Supposing that there were 40 students in science in the year 1995, how much total of marks did they receive combined together?
(1) 2800 (2) 2720
(3) 2560 (4) 3000

27. In which year, the difference between the highest and the average marks in Mathematics was maximum ?

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(1) 1995 (2) 1993
(3) 1994 (4) 1996

28. In which year, the difference between the highest and average marks in Social Science was the least ?
(1) 1996 (2) 1995
(3) 1994 (4) 1993

Directions (29–32) : The table given below depicts the export of a commodity through four ports in the years 1998 and 1999.

Study the table and answer the questions.

(SSC CGL Prelim Exam. 27.07.2008 (Ist Sitting)

Port	Export in 1998 (in crore rupees)	Export in 1999 (in crore rupees)
A	57	61
B	148	160
C	229	234
D	146	150

29. The percentage increase in the export of the commodity from the year 1998 to 1999 was the highest from which port ?
(1) A (2) B
(3) C (4) D

30. What was the change in the aggregate export of the commodity in the year 1999 as compared to the year 1998 ?
(1) Nearly 4.3% increase
(2) Nearly 4.3% decrease
(3) Nearly 0.04% increase
(4) Nearly 0.04% decrease

31. What was the average increase in the export of the commodity from the ports in the year 1999 as compared to the year 1998 ?
(1) ₹ 82500000
(2) ₹ 80000000
(3) ₹ 75000000
(4) ₹ 62500000

32. The percentage increase in the export of the commodity from the year 1998 to 1999 was the lowest from which port ?
(1) A (2) B
(3) C (4) D

Directions (33-36) : A survey of movie going habits of city dwellers from 5 cities A, B, C, D and E is given below. The first column gives the percentage of viewers in each city who watch less than two movies a week. The second column gives the total number of viewers who view two or more movies per week. Study the table and answer the questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (North Zone)

City	I	II
A	60	2400
B	20	3000
C	85	2400
D	55	2700
E	75	8000

33. How many vieweres in city C watch less than two movies a week ?
(1) 2040 (2) 13600
(3) 16000 (4) 3600

34. The city with the lowest number of movie watchers is
(1) City E (2) City D
(3) City B (4) City C

35. The highest number of movie watchers in any given city (in the survey) is
(1) 36000 (2) 32000
(3) 6000 (4) 16000

36. Which two cities have the same number of movie watchers ?
(1) C and E (2) C and D
(3) A and B (4) D and A

Directions (37–40) : Number of toys of five types (A to E) manufactured over the years (in thousands) is given below. Study the table and answer the following questions.

(SSC CHSL DEO & LDC Exam. 04.12.2011 (IInd Sitting (East Zone)

Type / Year	A	B	C	D	E
2002	200	150	78	90	65
2003	150	80	100	105	70
2004	180	175	92	110	85
2005	195	160	120	125	75
2006	220	185	130	135	80

37. The approximate percentage increase in production of D type of toys from 2003 to 2005 was
(1) 5% (2) 19%
(3) 29% (4) 25%

38. The percentage drop in production of A type of toys from 2002 to 2004 was
(1) 10% (2) 20%
(3) 25% (4) 30%

39. The approximate percentage increase of the production of all types of toys from 2005 to 2006 was
(1) 9% (2) 10%
(3) 11% (4) 12%

40. The difference of the average number of toys (in thousands) of the type B and C, manufactured over the years, was
(1) 52 (2) 66
(3) 68 (4) 72

Directions (41–44) : Study the following table which shows the number of students appeared and passed in different streams in a University and answer the questions given below it

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (Delhi Zone)

	Engineering		Medical		Management		Commerce	
Year	App eared	Pass	App eared	Pass	App eared	Pass	App eared	Pass
2001	324	289	469	246	96	69	1467	1310
2002	356	312	430	364	74	62	1246	1129
2003	284	212	384	326	124	102	1387	1176
2004	310	246	395	298	106	92	1180	1074
2005	426	382	424	382	92	74	1562	1326
2006	380	286	466	405	78	63	1374	1207

41. Approximately what per cent of students appearing in medical, passed in 2003 ?
(1) 75% (2) 85%
(3) 78% (4) 88%

42. Approximately what per cent of total students appearing in 2004, appeared in commerce stream?
(1) 55.3% (2) 64.4%
(3) 52.5% (4) 59.3%

43. The number of students appearing in all streams was minimum in the year
(1) 2002 (2) 2003
(3) 2004 (4) 2006

44. The number of students passing in all streams was maximum in the year.
(1) 2001 (2) 2005
(3) 2006 (4) 2004

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Directions (45–48) : The following table shows the production of food grains (in million tonnes) in a State for the period 1988 to 1992. Read the table and answer the following questions.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (IInd Sitting (East Zone)

Year	Production in million tonnes				Total
	Wheat	Rice	Maize	Other Cereals	
1988	580	170	150	350	1250
1989	600	220	234	400	1454
1990	560	240	228	420	1448
1991	680	300	380	460	1820
1992	860	260	340	500	1960
Total	3280	1190	1332	2130	7932

45. During 1990, the percentage of decrease in production of maize as against the previous year was:
(1) 2.63% (2) 2.56%
(3) 2.71% (4) 2.47%

46. In 1991, the increase in production over the previous year was maximum for :
(1) Wheat (2) Rice
(3) Maize (4) Other Cereals

47. The increase in the production of other cereals (over the previous year) was minimum during the year :
(1) 1989 (2) 1990
(3) 1991 (4) 1992

48. During 1992, the percentage of increase in the production of wheat, over the previous year was:
(1) 26.47% (2) 20.92%
(3) 23.67% (4) 18.74%

49. Different choices made by a group of 200 students are given below in percentage. The number of students who have taken neither Science nor Commerce is

Percentage of Students in different streams	
Name of Streams	*Intake Ratio*
Science	29%
Arts	29%
Commerce	31%
Home Science	6%
Others	5%

(1) 80 (2) 120
(3) 60 (4) 40

(SSC Multi-Tasking Staff Exam. 17.03.2013, IInd Sitting)

Directions (50) : The table given below shows production of five types of cars by a company from the year 1998 to 2003. Study the table and answer the question.

Years / Types	1998	1999	2000	2001	2002	2003	Total
P	10	18	16	15	11	18	88
Q	14	12	13	12	11	14	76
R	16	20	14	13	15	12	90
S	5	8	12	14	20	31	90
T	26	18	24	20	23	21	132
Total	71	76	79	74	80	96	476

In which year the production of cars of all types taken together was approximately equal to the average of the total production during the period:

(1) 1999 (2) 2000
(3) 2002 (4) 1998

(SSC Graduate Level Tier-I Exam. 21.04.2013)

Directions (51–52) : The following table gives the result of a survey based on newspaper reading habits. Study the table and answer the questions.

(SSC Constable (GD) Exam. 12.05.2013 1st Sitting)

Income Group (Salary/ Income per month)	Does not read news-papers	Reads news-papers published in regional languages only	Reads only English paper	Reads both in regional and English languages
Below ₹ 5,000	162	271	123	52
₹ 5,000 – ₹ 10,000	13	285	206	82
Above ₹ 10,000	21	209	325	187

51. The number of people who read only English newspapers.
(1) 975 (2) 654
(3) 1086 (4) 221

52. The total number of people surveyed are
(1) 2040 (2) 1086
(3) 12961 (4) 1936

Directions (53-56) : The following table shows the productions of foodgrains (in million tons) in a state for the period 1999 - 2000 to 2003 - 2004. Read the table and answer the questions.

(SSC CAPFs SI & CISF ASI Exam. 23.06.2013)

Year	Production (in million tons)			
	Wheat	Rice	Barley	Other cereals
1999-2000	680	270	250	450
2000-2001	800	420	440	300
2001-2002	680	350	320	460
2002-2003	720	400	380	500
2003-2004	820	560	410	690

53. In 2002 – 2003, the percentage increase in the production of barley as compared to the previous year was :
(1) 14.20% (2) 17.85%
(3) 18.75% (4) 7.90%

54. During the period 1999 - 2000 to 2003 – 2004, x per cent of the total production is production of wheat. The value of x is about :
(1) 12.6 (2) 37.4
(3) 37.8 (4) 20.2

55. In the year 2003 – 2004, the increase in production was maximum over the previous year for :
(1) Rice
(2) Barley
(3) Other cereals
(4) Wheat

56. The difference of average production of rice and the average production of barley over the years is (in million tonnes) :
(1) 50 (2) 60
(3) 80 (4) 40

Directions (57-60) : The following questions are based on the table given below which represents the distance (in km) travelled by two persons A and B in the same direction :

(SSC Section Officer (Commercial Audit) Exam. 16.11.2003)

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Hour	Distance Travelled (in Km)	
	A	B
1st	20	25
2nd	30	40
3rd	20	35
4th	15	25
5th	25	35
6th	15	10
7th	25	25
8th	35	15
9th	20	25
10th	30	45

57. B's average speed (km/hour) during the first four hours is
(1) 21.25 (2) 22
(3) 31.25 (4) 32

58. The ratio of A's speed during the first five hours and the last five hours is
(1) 25 : 22 (2) 22 : 25
(3) 15 : 22 (4) 20 : 21

59. What is the distance (in km) between A and B at the end of 8th hour?
(1) 30 (2) 25
(3) 15 (4) 12

60. The distance between A and B is maximum at the end of
(1) 2 hours (2) 3 hours
(3) 4 hours (4) 5 hours

Directions (61–64) : Study the following table and answer the questions given below.

(SSC CHSL DEO & LDC Exam. 11.12.2011 (Ist Sitting (East Zone)

Annual income of five schools.
(Figures in '000 rupees)

Source of Income	Schools				
	A	B	C	D	E
Tuition Fee.	120	60	210	90	120
Term Fee	24	12	45	24	30
Donation	54	21	60	51	60
Grants	60	54	120	42	55
Miscellaneous	12	3	15	3	15
Total	270	150	450	210	280

61. For school E, what per cent of the income from miscellaneous is the income from donation ?
(1) 25% (2) 40%
(3) $\frac{1}{4}$% (4) 400%

62. Which school has the highest percentage of income from tuition fee out of its total income ?
(1) A (2) B
(3) C (4) D

63. In case of how many schools, is the income by way of tuition fee, is less than four times of term fee ?
(1) 0 (2) 1
(3) 2 (4) 3

64. Which school has the lowest ratio of income by way of grants and tuition fee ?
(1) E (2) B
(3) C (4) D

Directions (65–69) : Refer to the following table. Read the table and answer the questions.

(SSC CGL Prelim Exam.: 24.02.2002 (Second Sitting)

Food Grains Production in a country in 1999 (in lakh tons)

State	Rice	Wheat	Jowar	Pulses	Others
P	45	103	—	27	29
Q	48	86	73	19	15
R	59	32	67	14	31
S	41	37	59	21	15
T	37	22	41	13	11
U	68	15	12	—	18
V	57	8	7	12	10
W	38	28	31	22	45

65. Which State had the highest grain production ?
(1) P (2) Q
(3) R (4) S

66. What was the proportion of rice production to wheat production in the country ?
(1) 1 : 1 (2) 0.8 : 1
(3) 1.2 : 1 (4) 2 : 1

67. Jowar was the most important food grain in the State/States :
(1) Q, R, S (2) Q
(3) R, S (4) R, S, T

68. State P alone accounted for approximately what percentage of wheat production in the country ?
(1) 73% (2) 50%
(3) 41% (4) 30%

69. If the average per hectare yield of rice in the country was 30 tons, then the area (approx.) under rice cultivation during the year was approx. (in lakh hectares)
(1) 1.5 (2) 8
(3) 13 (4) 40

Directions (70-74) : Read the following table and answer the questions below it:

(SSC CGL Prelim Exam. 24.02.2002 (Middle Zone) & (SSC CGL Prelim Exam. 13.11.2005) (IInd Sitting)

Loans Disbursed by Four Banks in crores of ₹ during the years

Rupees (in crores)

Banks	Years 1996	1996	1997	1998
A	18	23	45	30
B	27	33	18	41
C	29	29	22	17
D	13	19	28	32
Total	87	104	113	120

70. In which year the disbursement of loans by all the banks combined together was nearest to the average disbursement of loans over the years ?
(1) 1995 (2) 1996
(3) 1997 (4) 1998

71. What was the percentage increase of disbursement of loans of all banks together from 1997 to 1998 ?
(1) 6% (2) $6\frac{22}{113}$%
(3) $6\frac{11}{113}$% (4) $7\frac{11}{113}$%

72. In which year was the total disbursement of loans of banks A and B exactly equal to the total disbursement of loans of banks C and D ?
(1) 1995 (2) 1996
(3) 1998 (4) None of these

73. In which of the following banks, there was a continued increase in loan disbursement throughout the years ?
(1) A (2) B
(3) C (4) D

74. In which bank was the loan disbursement more than 30% of the disbursement of all banks combined together in 1998 ?
(1) A (2) B
(3) C (4) D

Directions (75-79) : A table showing the percentage of the total population of a State by age groups for the year 1991 is given below. Answer the questions given below it.

(SSC CGL Prelim Exam. 11.05.2003 (Ist Sitting)

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Age group (in years)	Per cent
up to 15	30.00
16 – 25	17.75
26 – 35	17.25
36 – 45	14.50
46 – 55	14.25
56 – 65	5.12
66 & above	1.13
Total	**100.00**

75. Which age group accounts for the maximum population in the State?
(1) 16 – 25 (2) 26 – 35
(3) 36 – 45 (4) 56 – 65

76. Out of every 4200 persons, the number of persons below 26 years is :
(1) 2006 approx.
(2) 1260 approx.
(3) 746 approx.
(4) 515 approx.

77. There are 200 million people below 36 years. How many millions (approx.) people are in the age group 56 – 65 ?
(1) 30.07 (2) 15.75
(3) 12.72 (4) 59.30

78. If there are 10 millions people in the age group 56 years and above, what is the difference between the number of people in the age group 16 – 25 and 46 – 55 ?
(1) 6.8 millions
(2) 5.6 millions
(3) 28.4 millions
(4) 34.7 millions

79. If the difference between the number of people in the age groups (46 – 55) and (26 – 35) is 11.75 millions, then the total population of the State is approximately :
(1) 360.23 millions
(2) 391.67 millions
(3) 400 millions
(4) 460.67 millions

Directions (80-81) : Study the following table and answer the questions.

(SSC CHSL DEO & LDC Exam. 27.10.2013 IInd Sitting)

Year	Percentage of Candidates Qualified under discipline					Total Number of Candidates qualified
	Arts	Science	Commerce	Agriculture	Engineering	
2006	24	40	19	09	08	780
2007	15	42	18	13	12	650
2008	20	45	20	08	07	500
2009	15	45	16	14	10	620
2010	19	35	15	19	12	900
2011	18	42	14	12	14	850

80. The decrease in the number of candidates qualified under Arts discipline from 2010 to 2011 was
(1) 11 (2) 18
(3) 42 (4) 69

81. The difference in the average number of candidates qualified in Science discipline per year from 2006 to 2008 and the average number of candidates qualified in the same discipline from 2009 to 2011 was
(1) 47 (2) 57
(3) 74 (4) 141

Directions (82-83) : Study the table and answer the questions.

(SSC CHSL DEO & LDC Exam. 10.11.2013, Ist Sitting)

Height (in cm)	Number of girls
less than 140	4
less than 145	11
less than 150	29
less than 155	40
less than 160	46
less than 165	51

82. The number of girls whose height is above 150 cm is
(1) 22 (2) 29
(3) 86 (4) 97

83. Average height (in cm) of the girls whose heights are 155cm and above is about
(1) 158.7 (2) 159.8
(3) 160.4 (4) 162.6

Directions (84-85) : The table shows the percentage of total population of a city in different age groups. Study the table and answer the questions.

(SSC CHSL DEO & LDC Exam. 10.11.2013, IInd Sitting)

Age group	Percent
Up to 15	20.00
16 – 25	18.25
26 – 35	16.75
36 – 45	16.25
46 – 55	15.00
56 – 65	12.50
66 and above	1.25

84. If there are 22 million people below 36 years, then the number of people (in millions) in the age group (56 – 65) is
(1) 5 (2) 5.5
(3) 3 (4) 3.5

85. If the difference between the number of people in the age groups (46 – 55) and (16 – 25) is 0.975 million, then the total population (in millions) of the city is
(1) 27 (2) 30
(3) 22 (4) 25

Directions (86-88) : The following table gives zonewise survey report of the people of a country who take coffee. Study the table and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014)

Take coffee	Zone			
	North	East	West	South
More than 3 times a day	410	310	700	1450
1 to 3 times a day	1220	830	1250	1120
Twice a week	1640	710	950	420
Only once a week	620	540	530	350
Never	950	430	620	50

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86. The percentage of people of south zone who take coffee at least once a day is close to
(1) 33.51 (2) 42.72
(3) 75.81 (4) 80.82

87. The percentage of people from non-west zone who take coffee 'only once a week' is approximately
(1) 11 (2) 12
(3) 13 (4) 14

88. The ratio of the total number of people surveyed who take coffee more than 3 times a day to the total number of people who do not take coffee at all is
(1) 1 : 1.4 (2) 1.4 : 1
(3) 1.5 : 1 (4) 1 : 1.1

Directions (189-91): Study the following table and answer the questions.

(SSC CGL Tier-I Exam. 19.10.2014 TF No. 022 MH 3)

School	No. of students scoring marks less than 50%	Percentage of students scoring marks more than 50%	No. of students appeared
A	240	55	600
B	220	40	400
C	300	20	375
D	280	10	350
E	210	25	300

89. The ratio of the total number of students scoring marks less than 50% to that of scoring marks exactly 50% is
(1) 50 : 3 (2) 25 : 2
(3) 25 : 4 (4) 35 : 2

90. Which school has the highest number of students scoring exactly 50% marks?
(1) D (2) E
(3) B (4) A

91. The total number of students scoring 50% or more marks is
(1) 1250 (2) 875
(3) 775 (4) 675

Directions (92 - 95): The following questions are based on the table given below which shows production of the number of scooters by a company during the first half of 1992. Study the table and answer the questions.

(SSC CHSL (10+2) DEO & LDC Exam. 16.11.2014, Ist Sitting TF No. 333 LO 2)

Production of Scooters by a Company during first half of 1992

Month / Type	January	February	March	April	May	June
X	25	25	18	40	20	15
Y	25	27	50	45	30	20
Z	25	27	15	25	30	20
T	25	26	25	0	30	35
Total	100	105	108	110	110	90

92. In which month, was the production of all types of scooters the lowest?
(1) January (2) February
(3) March (4) June

93. In which month, did the company produce equal number of all types of scooters?
(1) January (2) March
(3) May (4) June

94. The total number of scooters produced by the company, during the first half of 1992 is
(1) 90 (2) 143
(3) 623 (4) 197

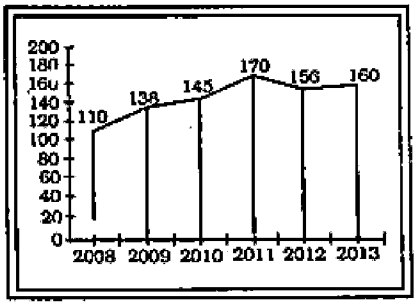
95. In which two months, was the number of scooters produced by the company the same?
(1) January, February
(2) April, May
(3) January, March
(4) January, May

TYPE-VIII

Directions (1 - 3): Study the following frequency polygon and answer the questions.

Given a line graph showing the number of students passed in Higher Secondary Examination in a school over the years 2008 to 2013.

(SSC CGL Tier-I Exam, 09.08.2015 (IInd Sitting) TF No. 4239378)



1. The average of passed students in the years 2008, 2009, 2012 approximately is
(1) 134.32 (2) 134.41
(3) 134.56 (4) 134.67

2. The increase in percentage of passed students from 2008 to 2011 approximately is
(1) 55% (2) 50.5%
(3) 54.5% (4) 53.05%

3. The decrease in percentage of passed students from 2011 to 2012 approximately is
(1) 8.25% (2) 8.27%
(3) 8.24% (4) 8.22%

Directions (4 – 5): Study the following data and answer the questions.

(SSC Constable (GD) Exam. 04.10.2015, Ist Sitting)

The score of students of a class are given as follows :

IQ Score	80-90	90-100	100-110	110-120	120-130	130-140
No. of Students	6	9	16	13	4	2

4. Number of students whose IQ score is 140 is
(1) undeterminable from given data
(2) 2
(3) 1 (4) 0

5. The number of students whose IQ score is 100 and more is
(1) 29 (2) 35
(3) 36 (4) 46

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SHORT ANSWERS

TYPE-I

1. (2)	2. (1)	3. (4)	4. (1)
5. (3)	6. (4)	7. (2)	8. (3)
9. (2)	10. (2)	11. (1)	12. (3)
13. (1)	14. (2)	15. (4)	16. (3)
17. (1)	18. (3)	19. (2)	20. (4)
21. (3)	22. (2)	23. (3)	24. (4)
25. (4)	26. (1)	27. (2)	28. (3)
29. (3)	30. (1)	31. (1)	32. (1)
33. (3)	34. (4)	35. (3)	36. (2)
37. (1)	38. (2)	39. (1)	40. (2)
41. (2)	42. (4)	43. (2)	44. (1)
45. (2)	46. (3)	47. (2)	48. (1)
49. (3)	50. (2)	51. (1)	52. (3)
53. (4)	54. (1)	55. (2)	56. (4)
57. (3)	58. (3)	59. (4)	60. (2)
61. (3)	62. (3)	63. (1)	64. (3)
65. (4)	66. (1)	67. (1)	68. (2)
69. (3)	70. (1)	71. (2)	72. (3)
73. (2)	74. (2)	75. (3)	76. (1)
77. (4)	78. (3)	79. (1)	80. (1)
81. (3)	82. (2)	83. (4)	84. (2)
85. (4)	86. (1)	87. (2)	88. (2)
89. (1)	90. (2)	91. (3)	92. (3)
93. (3)	94. (1)	95. (2)	96. (4)
97. (1)	98. (4)	99. (4)	100. (2)
101. (3)	102. (1)	103. (3)	104. (2)
105. (3)	106. (4)	107. (2)	108. (1)
109. (4)	110. (3)	111. (4)	112. (1)
113. (3)	114. (4)	115. (2)	116. (4)
117. (3)	118. (4)	119. (1)	120. (4)
121. (1)	122. (4)	123. (1)	124. (1)
125. (1)	126. (3)	127. (1)	128. (4)
129. (2)	130. (3)	131. (1)	132. (2)
133. (*)	134. (4)	135. (3)	136. (1)
137. (3)	138. (4)	139. (1)	140. (4)
141. (1)	142. (2)	143. (2)	144. (4)
145. (3)	146. (2)	147. (3)	148. (3)
149. (2)	150. (1)	151. (1)	152. (2)
153. (2)	154. (2)	155. (4)	156. (1)
157. (1)	158. (1)	159. (*)	160. (*)
161. (1)	162. (1)	163. (1)	164. (1)
165. (1)	166. (4)	167. (3)	168. (3)
169. (3)	170. (4)	171. (1)	172. (2)
173. (2)	174. (1)	175. (1)	176. (2)
177. (1)	178. (4)	179. (4)	180. (4)
181. (4)	182. (4)	183. (1)	184. (2)
185. (2)	186. (1)	187. (2)	188. (1)
189. (4)	190. (2)	191. (4)	192. (3)
193. (1)	194. (3)	195. (3)	196. (2)
197. (3)	198. (1)	199. (1)	200. (3)
201. (4)			

TYPE-II

1. (3)	2. (3)	3. (4)	4. (2)
5. (2)	6. (2)	7. (2)	8. (1)
9. (4)	10. (1)	11. (2)	12. (3)
13. (4)	14. (4)	15. (1)	16. (3)
17. (4)	18. (4)	19. (2)	20. (2)
21. (4)	22. (4)	23. (4)	24. (1)
25. (3)	26. (1)	27. (2)	28. (3)
29. (4)	30. (1)	31. (3)	32. (2)
33. (3)	34. (4)	35. (2)	36. (1)
37. (2)	38. (3)	39. (1)	40. (3)

TYPE-III

1. (4)	2. (2)	3. (3)	4. (3)
5. (1)	6. (3)	7. (1)	8. (4)
9. (2)	10. (2)	11. (1)	12. (4)
13. (2)	14. (1)	15. (2)	16. (4)
17. (3)	18. (2)	19. (3)	20. (1)
21. (1)	22. (3)	23. (2)	24. (3)
25. (3)	26. (4)	27. (3)	28. (1)
29. (3)	30. (2)	31. (2)	32. (3)
33. (4)	34. (1)	35. (3)	36. (2)
37. (3)	38. (1)	39. (4)	40. (4)
41. (1)	42. (2)	43. (1)	44. (2)
45. (2)	46. (4)	47. (2)	48. (3)
49. (4)	50. (2)	51. (1)	52. (2)
53. (2)	54. (2)	55. (2)	56. (4)
57. (3)	58. (3)	59. (4)	60. (3)
61. (2)	62. (3)	63. (2)	64. (4)
65. (3)	66. (1)	67. (3)	68. (4)
69. (3)	70. (3)	71. (2)	72. (2)
73. (4)	74. (4)	75. (3)	76. (3)
77. (1)	78. (3)	79. (4)	80. (4)
81. (2)	82. (3)	83. (2)	84. (3)
85. (2)	86. (3)	87. (2)	88. (4)
89. (2)	90. (2)	91. (3)	92. (1)
93. (1)	94. (1)	95. (2)	96. (2)

TYPE-IV

1. (4)	2. (3)	3. (4)	4. (1)
5. (2)	6. (2)	7. (3)	8. (4)
9. (2)	10. (3)	11. (4)	12. (1)
13. (2)	14. (3)	15. (4)	16. (4)
17. (1)	18. (2)	19. (1)	20. (3)
21. (3)	22. (1)	23. (4)	24. (1)
25. (2)	26. (3)	27. (2)	28. (1)
29. (4)	30. (1)	31. (3)	32. (1)
33. (3)			

TYPE-V

1. (2)	2. (1)	3. (3)	4. (3)
5. (4)	6. (1)	7. (2)	8. (3)
9. (2)	10. (3)	11. (1)	12. (3)
13. (4)	14. (1)	15. (4)	16. (3)
17. (3)	18. (2)	19. (4)	20. (3)
21. (1)	22. (2)	23. (1)	24. (3)
25. (1)	26. (1)	27. (1)	28. (3)
29. (4)	30. (1)	31. (3)	32. (1)
33. (3)	34. (2)	35. (4)	36. (3)
37. (3)	38. (2)	39. (1)	40. (1)
41. (3)	42. (2)	43. (1)	44. (1)
45. (2)	46. (4)	47. (1)	48. (1)
49. (4)	50. (3)	51. (4)	52. (1)
53. (2)	54. (4)	55. (1)	56. (2)
57. (4)	58. (1)	59. (2)	60. (1)
61. (3)	62. (2)	63. (2)	64. (4)
65. (3)	66. (4)	67. (3)	68. (2)
69. (4)	70. (4)	71. (3)	72. (2)
73. (3)	74. (1)	75. (4)	76. (4)
77. (1)	78. (1)	79. (1)	80. (4)
81. (1)	82. (2)	83. (2)	84. (2)
85. (2)	86. (3)	87. (4)	88. (3)
89. (3)	90. (2)	91. (4)	92. (3)
93. (1)	94. (2)	95. (2)	96. (2)
97. (1)	98. (3)	99. (4)	100. (1)
101. (2)	102. (*)	103. (2)	104. (4)
105. (1)	106. (3)	107. (3)	108. (2)
109. (3)	110. (4)	111. (2)	112. (4)
113. (1)	114. (4)	115. (3)	116. (2)
117. (2)	118. (1)	119. (2)	120. (3)
121. (4)	122. (2)	123. (2)	124. (3)
125. (2)	126. (1)	127. (3)	128. (4)
129. (4)	130. (1)	131. (1)	132. (1)
133. (4)	134. (2)	135. (3)	136. (1)
137. (1)	138. (3)	139. (2)	140. (1)
141. (2)	142. (2)	143. (3)	144. (4)
145. (3)	146. (2)	147. (3)	148. (2)
149. (3)	150. (1)	151. (2)	152. (2)
153. (3)	154. (4)	155. (3)	156. (4)
157. (1)	158. (3)	159. (4)	160. (3)
161. (1)	162. (*)	163. (1)	164. (3)
165. (*)	166. (3)	167. (1)	168. (4)
169. (3)	170. (1)	171. (4)	172. (2)
173. (1)	174. (3)	175. (*)	176. (4)
177. (*)	178. (2)	179. (1)	180. (2)
181. (3)	182. (*)	183. (*)	184. (1)
185. (1)	186. (*)	187. (2)	188. (1)
189. (4)	190. (2)	191. (3)	192. (2)
193. (2)	194. (1)	195. (1)	196. (4)

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TYPE-VI

1. (4)	2. (3)	3. (2)	4. (1)
5. (1)	6. (3)	7. (2)	8. (3)
9. (2)	10. (4)	11. (3)	12. (1)
13. (2)	14. (1)	15. (3)	16. (3)
17. (1)	18. (2)	19. (4)	20. (3)
21. (1)	22. (1)	23. (1)	24. (4)
25. (3)	26. (3)	27. (2)	28. (1)
29. (4)	30. (2)	31. (3)	32. (3)
33. (2)	34. (2)	35. (4)	36. (1)
37. (3)	38. (4)	39. (3)	40. (1)
41. (3)	42. (1)	43. (2)	

TYPE-VII

1. (3)	2. (4)	3. (2)	4. (4)
5. (3)	6. (3)	7. (4)	8. (4)
9. (1)	10. (2)	11. (4)	12. (2)
13. (1)	14. (1)	15. (2)	16. (1)
17. (3)	18. (2)	19. (3)	20. (2)
21. (1)	22. (4)	23. (1)	24. (4)
25. (4)	26. (2)	27. (2)	28. (3)
29. (2)	30. (1)	31. (4)	32. (3)
33. (2)	34. (3)	35. (2)	36. (4)
37. (2)	38. (1)	39. (3)	40. (2)
41. (2)	42. (4)	43. (3)	44. (2)
45. (2)	46. (3)	47. (1)	48. (1)
49. (1)	50. (2)	51. (2)	52. (4)
53. (3)	54. (2)	55. (1)	56. (4)
57. (3)	58. (2)	59. (2)	60. (4)
61. (4)	62. (3)	63. (2)	64. (1)
65. (2)	66. (3)	67. (1)	68. (4)
69. (3)	70. (2)	71. (2)	72. (4)
73. (4)	74. (2)	75. (1)	76. (1)
77. (2)	78. (2)	79. (2)	80. (2)
81. (1)	82. (1)	83. (2)	84. (1)
85. (2)	86. (3)	87. (4)	88. (2)
89. (3)	90. (3)	91. (4)	92. (4)
93. (1)	94. (3)	95. (2)	

TYPE-VIII

1. (4)	2. (3)	3. (3)	4. (1)
5. (2)			

EXPLANATIONS

TYPE-I

1. (2) Total amount spent
= ₹ 46,000
Amount spent on food
= 23% of 46,000

$= \frac{23}{100} \times 46{,}000 = ₹\ 10580$

2. (1) Total amount spent
= ₹ 46,000
Amount spent clothing and housing together
= (10% + 15%) of ₹ 46000

$= \frac{25}{100} \times 46000 = ₹\ 11500$

3. (4) $\frac{\text{Expenditure on Housing}}{\text{Expenditure on Education}}$

$= \frac{15\%}{12\%} = \frac{15}{12} = \frac{5}{4} = 5:4$

4. (1) Maximum expenditure is 23% and it is on Food.

5. (3) Total expenditure
= ₹ 46,000
Amount saved
= 15% of ₹ 46000

$= \frac{15}{100} \times ₹\ 46000 = ₹\ 6900$

6. (4) 100% = 360°

$\therefore 1\% = \frac{360°}{100}$

$\therefore 10\% = \frac{360° \times 10}{100} = 36°$

7. (2) 35% total cost = ₹ 17500
∴ 15% of total cost

$= ₹ \frac{17500 \times 15}{35} = ₹\ 7500$

8. (3) Difference in per cent cost of 'binding and cutting charges' and 'royalty'
= (18 – 15)% = 3%
Now, ∵ 4% of total cost
= ₹ 6000
∴ 3% of total cost

$= ₹ \frac{6000 \times 3}{4} = ₹\ 4500$

9. (2) Difference in per cent expenses on printing cost and advertisement charges
= (35 – 18)% = 17%
Now, 1 % = 3.6°
∴ 17% = 3.6° × 17 = 61.2°

10. (2) The required per cent

$= \frac{10 \times 100}{35} = 28.6\%$ (approx.)

11. (1) Maximum expenditure of the family is on food, i.e., 23%.

12. (3) ∵ Expenditure on housing
= Savings = 15%

13. (1) % Expenditure on transport and other items = (20 + 5)%
= 25%

14. (2) Expenditure on the education of children
= 12% of ₹ 100000

$= ₹ \frac{12 \times 100000}{100}$

= ₹ 12000

15. (4) The percentage difference in expenditure on housing and transport = (15 – 5)% = 10%
The required difference
= 10% of ₹ 100000
= ₹ 10000

16. (3) House rent per month

= 18% of ₹ 33650

$= ₹ \frac{18 \times 33650}{100} = ₹\ 6057$

17. (1) Annual provident fund savings
= 12% of (₹ 33650 × 12)

$= ₹ \frac{12 \times 33650 \times 12}{100} = ₹\ 48456$

18. (3) Remaining monthly income
= [100 – (12 + 18)]% of ₹ 33650

$= ₹ \frac{70 \times 33650}{100} = ₹\ 23555$

19. (2) Amount spent on food and entertainment together
= 34% of ₹ 33650

$= ₹ \frac{34 \times 33650}{100} = ₹\ 11441$

20. (4) Expenditure on children = 23%
Provident fund savings
= 12%
For no children, total savings = 35%
∴ Required savings
= 35% of ₹ 33650

$= ₹ \frac{35 \times 33650}{100} = ₹\ 11777.50$

21. (3) Amount spent on cement

$= \left(\frac{100}{360} \times 72\right)\%$ of 600000

$= \frac{20}{100} \times 600000 = ₹\ 1,20,000$

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22. (2) Difference (%)

$= \left(\frac{100}{360}\times 90\right)\% - \left(\frac{100}{360}\times 54\right)\%$

$= 25\% - 15\%$

$= 10\%$ of the total cost

23. (3) Required per cent

$= \frac{100}{360^\circ} \times (72^\circ + 54^\circ + 54^\circ)$

$= \frac{100}{360^\circ} \times 180^\circ = 50$ per cent

24. (4) Differences in percentage

$= \left(\frac{100}{360^\circ}\times 90^\circ\right) - \left(\frac{100}{360^\circ}\times 54^\circ\right)\%$

$\therefore$ Required difference

$= 600000 \times \frac{10}{100} = ₹\ 60{,}000$

25. (4) Corresponding angle of labour $= 90^\circ$

Clearly, $90^\circ \equiv \frac{1500000\times 90}{360}$

$= ₹\ 375000$

26. (1) Corresponding angle on the expenditure on bricks, steel and cement

$= 54 + 54 + 72 = 180^\circ$

$\because\ 360^\circ \equiv 100\%$

$\therefore\ 180^\circ \equiv \frac{100}{360}\times 180 = 50\%$

27. (2) Required percentage

$= \frac{36}{72}\times 100 = 50\%$

28. (3) Corresponding angle of labour and supervision combined

$= 90^\circ + 54^\circ = 144^\circ$

$\because\ 360^\circ \equiv 1500000$

$\therefore\ 144^\circ \equiv \frac{1500000}{360}\times 144$

$= ₹\ 600000$

29. (3) Yasin got the minimum votes.

$\because\ 360^\circ \equiv 720$

$\therefore\ 60^\circ \equiv \frac{720}{360}\times 60 = 120$

30. (1) Sivaraman got the maximum votes. i.e.

$\frac{720}{360}\times 120 = 240$ votes

$\therefore$ He was the winner.

31. (1) Angle of the difference of votes of the winner and the nearest rival $= 120 - 100 = 20^\circ$

$\because\ 360^\circ \equiv 720$

$\therefore\ 20^\circ \equiv \frac{720}{360}\times 20 = 40$

32. (1) $\because\ 45^\circ \equiv ₹\ 9000$

Angle of diff. of money spent of Hockey and Football $= 55^\circ$

$\therefore\ 55^\circ = \frac{9000}{45^\circ}\times 55^\circ = ₹\ 11000$

33. (3) $\because\ 45^\circ \equiv ₹\ 9000$

$\therefore\ 160^\circ \equiv \frac{9000}{45^\circ}\times 160^\circ \equiv ₹\ 32000$

34. (4) $\because\ 45^\circ \equiv ₹\ 9000$

$\therefore\ 360^\circ \equiv \frac{9000}{45}\times 360^\circ \equiv ₹\ 72000$

35. (3) $\because\ 32\% \equiv 800000$

$\therefore\ 3\% \equiv \frac{800000}{32}\times 3 \equiv 75000$

36. (2) Required percentage

$= \frac{3}{25}\times 100 = 12\%$

37. (1) Required ratio $= 3 : 7$ (clear from the chart)

38. (2) $\because\ 100\% \equiv ₹\ 25000$

Total % spent on food and rent $= (45 + 14)\%$

$\therefore\ 59\% \equiv \frac{25000}{100}\times 59 = ₹\ 14750$

39. (1) Required ratio $= 15 : 45 = 1 : 3$

40. (2) Required percentage

$= \frac{14}{9}\times 100 \equiv 156\%$

41. (2) $\because\ 360^\circ \equiv 100\%$

$\therefore\ 108^\circ \equiv \frac{100}{360}\times 108 = 30\%$

Fuel + Education + Others

$= 9 + 15 + 6 = 30\%$

42. (4) $\because\ 540 \equiv 360^\circ$

$\therefore\ 105 \equiv \frac{360}{540}\times 105 = 70^\circ$

Hence, the student obtained 105 marks in Hindi

43. (2) Corresponding angle for science

$= 360^\circ - (90^\circ + 65^\circ + 55^\circ + 70^\circ)$

$= (360^\circ - 280^\circ) = 80^\circ$

44. (1) Difference of corresponding angles $= 90^\circ - 70^\circ = 20^\circ$

$\because\ 360^\circ \equiv 540$

$\therefore\ 20^\circ \equiv \frac{540}{360}\times 20 = 30$

45. (2) Corresponding angle for science $\equiv 80^\circ$

$\because\ 360^\circ \equiv 540$

$\therefore\ 80^\circ \equiv \frac{540}{360}\times 80 = 120$

46. (3) $\because\ 60^\circ \equiv ₹\ 8000$

$\therefore$ Expenditure on Education

$= 30 \times \frac{8000}{60} \equiv ₹\ 4{,}000$

47. (2) Ratio of degree of expenditure on food to savings $= 120^\circ : 60^\circ = 2 : 1$

48. (1) Total expenditure

$= \frac{8000}{60}\times (105 + 120 + 45 + 30)$

$= \frac{8000}{60}\times 300$

$= ₹\ 40000$

49. (3) Difference in degree of amount spent on food & housing $= (120 - 105) = 15^\circ = \frac{8000}{60}\times 15^\circ \equiv ₹\ 2000$

50. (2) $\because\ 35\% \equiv 17500$

$\therefore\ 15\% \equiv \frac{17500}{35}\times 15 = ₹\ 7500$

51. (1) $\because\ 100\% \equiv 360^\circ$

$\therefore\ 35\% \equiv \frac{360}{100}\times 35 = 126^\circ$

52. (3) Required percentage

$= \frac{4}{10}\times 100 = 40\%$

53. (4) Central angle for binding charges

$= \frac{360}{100}\times 18 = 64.8^\circ$

Central angle for advertisement charges

$= \frac{360}{100}\times 18 = 64.8^\circ$

$\therefore$ Required difference $= 0^\circ$

Method 2 :

Percentage value for both is same. Therefore, difference between angles is same.

54. (1) Required ratio $= 120^\circ : 90^\circ = 4 : 3$

55. (2) $\because\ 360^\circ \equiv 100\%$

$\therefore\ 1^\circ \equiv \frac{100}{360}$

$\therefore\ 90^\circ \equiv \frac{100}{360}\times 90 = 25\%$

56. (4) $\because\ 360^\circ \equiv 7200$ acres

$\therefore\ 1^\circ \equiv \frac{7200}{360} = 20$ acres

$\therefore\ 70^\circ \equiv 70 \times 20 = 1400$ acres

57. (3) Required percentage

$= \frac{20}{60}\times 100 = \frac{100}{3} = 33\frac{1}{3}\%$

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58. (3) Difference in percentage
= (68 – 32)% = (36)%
∴ Required answer
$= \frac{36 \times 500}{100} = 180$

59. (4) ∵ 100% = 360°
$\therefore 30\% = \frac{360}{100} \times 30 = 108°$

60. (2) Percentage of failure in Maths, Language and Science = 30 + 36 + 32 = 98%
∴ Required no. of students
$= \frac{500 \times 98}{100} = 490$

61. (3) Required answer
$= \frac{500 \times 6}{100} = 30$

62. (3) Required percentage
= 30 + 36 = 66%

63. (1) Students enrolled in NCC activities
$= \frac{1200 \times 15}{100} = 180$

64. (3) Total students in HRD & Debating club
$= 1200 \times \frac{(13+11)}{100} = 288$

65. (4) Required per cent
$= \frac{22}{21} \times 100 = 104.76\%$

66. (1) Required ratio
= (18 + 21) : 13
= 39 : 13 = 3 : 1

67. (1) Eco-club: Human resource development club
= 22 : 11 = 2 : 1

68. (2) Required ratio = 144 : 72
= 2 : 1

69. (3) Required difference
$= (144 - 72) \times \frac{600}{360}$
$= \frac{72 \times 600}{360} = 120$

70. (1) ∵ 360° ≡ 100%
$\therefore 54° \equiv \frac{100}{360} \times 54 = 15\%$

71. (2) Required difference
$= (90 - 54) \times \frac{600}{360}$
$= \frac{36 \times 600}{360} = 60$

72. (3) ∵ 360° = 100%
$\therefore 144° = \frac{100}{360} \times 144 = 40\%$

73. (2) Percentage of crop B exported
$= \frac{72}{360} \times 100 = 20\%$

74. (2) ∵ 45° = 1.5 million quintals
$\therefore 360° = \frac{1.5 \times 360}{45} = 12$ million quintals

75. (3) A + B + C = 72° + 72° + 36° = 180°

76. (1) ∵ 45° = 1.5 million quintals
$\therefore 36° = \frac{1.5 \times 36}{45}$
= 1.2 million quintals

77. (4) A : C = 3 × 72° : 36°
= 6 : 1

78. (3) Required ratio = $30 : \frac{25}{2}$
= 60 : 25 = 12 : 5

79. (1) Expenditure on clothes
$= 50000 \times \frac{25}{200} = ₹ 6250$

80. (1) Expenditure on the study of children and food
$= 35000 \times \frac{55}{100} = ₹ 19250$

81. (3) ∵ 100% = 360°
$\therefore 10\% = \frac{360}{100} \times 10 = 36°$

82. (2) ∵ $\left(\frac{25}{2} - 10\right)\% = ₹ 1500$
$\Rightarrow \frac{5}{2}\% \equiv ₹1500$
$\therefore 10\% \equiv 1500 \times \frac{2}{5} \times 10$
= ₹ 6000

83. (4) ∵ 100% = 360°
$\therefore 15\% = \frac{360}{100} \times 15 = 54°$

84. (2) ∵ 55% = ₹ 110
$\therefore 100\% = \frac{110}{55} \times 100 = ₹ 200$

85. (4) ∵ 100% = ₹ 200
$\therefore 25\% = \frac{200}{100} \times 25 = ₹ 50$

86. (1) ∵ 360% = 100%
$\therefore 108° = \frac{100}{360} \times 108 = 30\%$
i.e. Paper + Miscellaneous (A + D)

87. (2) Average expenditure percentage = 20%
Expenditure on Printing + Binding is more than average expenditure.

88. (2) Corresponding angle of average expenditure
$= \frac{360°}{5} = 72° \equiv$ cement

89. (1) Required ratio
= 36 : 72 : 54
= 2 : 4 : 3

90. (2) ∵ 360° = 100%
$\therefore 108° = \frac{100}{360} \times 108 = 30\%$

91. (3) ∵ 360° = 1
$\therefore 90° = \frac{90}{360} = \frac{1}{4}$

92. (3) Required percent
$= \frac{36+54}{360} \times 100 = 25\%$

93. (3) People who prefer flute
$= 60000 \times \frac{11}{100} = 6600$
New number of people who prefer flute
= 6600 – 2100 = 4500
∴ New percentage
$= \frac{4500}{60000} \times 100 = 7.5\%$

94. (1) Difference of percentage
= 22 + 14 – 20 – 14 = 2%
∴ Required answer
$= 60000 \times \frac{2}{100} = 1200$

95. (2) People who prefer Sarod
$= \frac{60000 \times 14}{100} = 8400$

96. (4) People who prefer Piano
$= 60000 \times \frac{9}{100} = 5400$
∴ New number of people who prefer flute
$= 6600 + 5400 \times \frac{50}{300}$
= 6600 + 900 = 7500

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∴ Required percentage

$= \frac{7500 \times 100}{60000}$

$= 12.5\%$

97. (1) Required no. of people
$= (22 - 11 - 9)\%$ of 60000

$= \frac{60000 \times 2}{100} = 1200$

98. (4) ∵ $100\% \equiv 360°$

$\therefore 16\% \equiv \frac{360}{100} \times 16 = 57.6°$

99. (4) Percentage decrease

$= \frac{18 - 15}{18} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}\%$

100. (2) ∵ $4\% \equiv ₹ 1848$

$\therefore 100\% \equiv ₹ \frac{1848}{4} \times 100$

$= ₹ 46200$

$\therefore$ C.P. of each book $= \frac{46200}{5500}$

$= ₹ 8.4$

∴ Marked price of each copy

$= \frac{8.4 \times 125}{100} = ₹ 10.50$

101. (3) ∵ $35\% \equiv ₹ 17500$

$\therefore 15\% \equiv ₹ \frac{17500}{35} \times 15 = ₹ 7500$

102. (1) ∵ $4\% \equiv ₹ 6000$

$\therefore 18\% \equiv \frac{6000}{4} \times 18 = ₹ 27000$

103. (3) Number of students who come to school by car.

$= \frac{70}{360} \times 2160 = 420$

104. (2) Car : Bus $= 70° : 90°$
$= 7 : 9$ or $21 : 27$

105. (3) No. of students coming by (bus + walking)

$= \frac{80 + 90}{360} \times 2160 = 1020$

106. (4) No. of students do not come by train

$= \frac{360 - 120}{360} \times 2160 = 1440$

107. (2) (Bus – Walking)%

$= \frac{90 - 80}{80} \times 100 = 12.5\%$

108. (1) Difference between the students of commerce and science
$= 200$
[∵ $100° \equiv 1000$
$\therefore 1° \equiv 10$
$\therefore 20° \equiv 200$]

109. (4) Required ratio
$= 100 : 120$
$= 5 : 6$

110. (3) ∵ $100° \equiv 1000$

$\therefore 360° \equiv \frac{1000}{100} \times 360 = 3600$

111. (4) Expenditure on education in April

$= 24000 \times \frac{47}{100} = ₹ 11280$

Expenditure on education in May

$= \frac{25000 \times 50}{100} = ₹ 12500$

Percentage increase

$= \frac{12500 - 11280}{11280} \times 100$

$= 10.82\%$

112. (1) Required ratio

$= \frac{24000 \times 18}{100} : \frac{25000 \times 2}{100}$

$= 24 \times 18 : 25 \times 2$
$= 216 : 25$

113. (3) Expenditure on grocery

$= \frac{25000 \times 14}{100} = ₹ 3500$

Expenditure on electricity

$= \frac{25000 \times 9}{100} = ₹ 2250$

114. (4) Required average

$= \frac{1}{3} \times 24000 \times (47 + 4 + 18)\%$

$= \frac{1}{3} \times \frac{24000 \times 69}{100} = ₹ 5520$

115. (2) ∵ $(81 + 63)° \equiv 80000$

$\therefore 360° \equiv \frac{80000}{144°} \times 360°$

$= ₹ 200000$

116. (4) Required percentage

$= \frac{63 - 36}{36} \times 100 = 75\%$

117. (3) Required percentage

$= \frac{81 - 54}{81} \times 100$

$= \frac{27}{81} \times 100 = 33\frac{1}{3}\%$

118. (4) Expenditure on agriculture sector $= \frac{72°}{360} \times 1000$

$= ₹ 200$ crores

119. (1) ∵ $360° \equiv ₹ 96000$

$\therefore 115.2° \equiv \frac{96000}{360°} \times 115.2$

$= ₹ 30720$

120. (4) Difference of respective angles
$= 144° - 43.2°$
$= 100.8°$

∴ Required difference

$= \frac{96000}{360°} \times 100.8° = ₹ 26880$

121. (1) Difference of corresponding angles :
Physics and Chemistry
$= 85 - 70 = 15°$
Chemistry and social science
$= 70 - 55 = 15°$

122. (4) Sum of corresponding angles of Maths and Chemistry
$= 90 + 70 = 160°$
Sum of corresponding angles of Physics and Social Science
$= 85 + 55 = 140°$
Difference $= 20°$
∵ $360° \equiv 810$

$\therefore 20° \equiv \frac{810}{360} \times 20 = 45$

123. (1) ∵ $360° \equiv 810$

$\therefore 1° \equiv \frac{810}{360} = \frac{9}{4}$

$\therefore 60° \equiv \frac{9}{4} \times 60 = 135$

124. (1) English + Physics + Social Science $= 200°$
Maths + Chemistry $= 160°$
Required percentage

$= \frac{40}{360} \times 100 = \frac{100}{9}\%$ or $11\frac{1}{9}\%$

125. (1) ∵ $360° \equiv 9000$ tonnes

$\therefore 110° \equiv \frac{9000 \times 110}{360}$

$= 2750$ tonnes

126. (3) C.P. $= \frac{180\times100}{120} = ₹\ 150$

$\therefore$ Cost of paper $= \frac{150\times15}{100}$

$= ₹\ 22.50$

127. (1) Required percentage

$= \frac{20-15}{20}\times100 = 25\%$

128. (4) Expenses on food

$= 40000\times\frac{17}{100} = ₹\ 6800$

129. (2) Expenses on clothes

$= 48000\times\frac{30}{100}\times\frac{10}{100}$

$= ₹\ 1440$

130. (3) Savings per month $= 8\%$

$\therefore$ Required savings

$= \frac{48000\times8}{100} = ₹\ 3840$

131. (1) Difference of percentage

$= 25 - (5 + 15) = 5\%$

$\therefore$ Required difference

$= \frac{48000\times5}{100} = ₹\ 2400$

132. (2) $\because$ $360° \equiv 100\%$

$\therefore\ 108° \equiv \frac{100}{360}\times108 = 30\%$

133. (*) Expenditure on labourers :

Year 1991 $\Rightarrow \frac{360000\times90}{360}$

$= ₹\ 90000$

Year 2001 $\Rightarrow \frac{864000\times100}{360}$

$= ₹\ 240000$

Percentage increase

$= \frac{240000-90000}{90000}\times100$

$= \frac{1500}{9} = 166.7\%$

134. (4) Expenditure on steel :

Year 1991 $\Rightarrow \frac{360000}{360}\times50$

$= ₹\ 50000$

Year 2001 $\Rightarrow \frac{864000}{360}\times60$

$= ₹\ 144000$

135. (3) Two wheelers : cars

$= 15 : 21$

$= 5 : 7$

136. (1) Required difference

$= (36 - 21)\%$ of 1400

$= \frac{1400\times15}{100} = 210$

137. (3) Number of Metro rail users

$= \frac{1400\times8}{100} = 112$

138. (4) Number of car users

$\Rightarrow \frac{1400\times21}{100} = 294$

139. (1) Food + Rent + Clothing + Miscellaneous

$\Rightarrow 108° + 90° + 36° + 72°$

$= 306°$

$\therefore$ Savings $\Rightarrow 360° - 306° = 54°$.

140. (4) Expenditure of food $= 25\%$

Savings $= 15\%$

$\because$ $15\% \equiv ₹\ 3000$

$\therefore\ 25\% \equiv \frac{3000}{15}\times25 = ₹\ 5000$

141. (1) Number of employees in HR department

$= \frac{800\times5}{100} = 40$

142. (2) Number of employees in Marketing department

$= \frac{800\times24}{100} = 192$

$\therefore$ Required percentage

$= \frac{165}{192}\times100 = 86$

143. (2) Number of employees in IT department

$= \frac{800\times20}{100} = 160$

Number of females

$= 160 - 74 = 86$

$\therefore$ Required percentage

$= \frac{86}{800}\times100$

$= 10.75$

144. (4) Total employees in Marketing department $= 192$

Males $= 165$

Females $= 192 - 165 = 27$

$\therefore$ Required ratio $= 165 : 27$

$= 55 : 9$

145. (3) $\because$ $30\% \equiv$ Rs. 9000

$\therefore\ 1\% \equiv \frac{9000}{30}$

$\therefore\ 18\% \equiv \frac{9000\times18}{30}$

$=$ Rs. 5400

146. (2) $\because$ $100\% \equiv 360°$

$\therefore\ 1\% \equiv \frac{360}{100}$

$\therefore\ 15\% \equiv \frac{360}{100}\times15 = 54°$

147. (3) Percentage expenditure on house rent + education

$= 38\%$

Remaining expenses

$= 100 - 38 = 62\%$

$\because$ $15\% \equiv$ Rs. 3000

$\therefore\ 62\% \equiv \frac{3000}{15}\times62$

$=$ Rs. 12400

148. (3) $30\% = x\%$ of $(12 + 18 + 15)\%$

$\Rightarrow 30 = \frac{x\times45}{100}$

$\Rightarrow x = \frac{30\times100}{45} = \frac{200}{3}$

$= 66\frac{2}{3}\%$

149. (2) House rent + clothing + fuel

$\Rightarrow 20 + 12 + 15 = 47\%$

Food $\Rightarrow 30\%$

Difference $= 47 - 30 = 17\%$

150. (1) Corresponding angle for children who go on walking

$= 360 - 120 - 72 - 24 = 144°$

151. (1) Corresponding angle for children using scooter $= 72°$

$\because$ $360° \equiv 100\%$

$\therefore\ 72° \equiv \frac{100}{360}\times72 = 20\%$

152. (2) $\because$ $24° \equiv 10$ students

$\therefore\ 120° \equiv \frac{10}{24}\times120°$

$= 50$ students

153. (2) $\because$ $144° \equiv 180$ students

$\therefore\ 360° \equiv \frac{180}{144}\times360$

$= 450$ students

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154. (2) Corresponding angle to the number of students who travel by public bus = 54°

$\because 360° \equiv 800$

$\therefore 54° \equiv \frac{800}{360} \times 54° = 120$

155. (4) Corresponding angle to number of students who do not use institute bus

$= 360° - 216° = 144°$

$\because 360° \equiv 800$

$\therefore 144° \equiv \frac{800}{360} \times 144 = 320$

156. (1) Corresponding angle to the number of students who go to institute on foot

$= 360° - (216° + 54° + 18°)$

$= 72°$

$\therefore$ Required answer

$= \frac{72 \times 800}{360} = 160$

157. (1) $\because 100\% \equiv 360°$

$\therefore 10\% \equiv \frac{360}{100} \times 10 = 36°$

$\therefore$ Corresponding angle for expenditure on health and education

$\equiv 36 + 54 = 90°$

$\because 360° \equiv$ Rs. 100000 crores

$\therefore 90° \equiv \frac{100000}{360} \times 90°$

= Rs. 25000 crores

158. (1) Expenditure on state development $\Rightarrow 15\%$

$\because 100\% \equiv 360°$

$\therefore 15\% \equiv \frac{360}{100} \times 15 = 54°$

$\therefore$ Expenditure on (state development – sports)

$\equiv 54° - 18° = 36°$

$\therefore$ Required amount

$\equiv$ Rs. $\left(\frac{36}{360} \times 300000\right)$ crores

= Rs. 30000 crores

159. (*) Expenditure on defence

$\equiv 15\% \equiv 54°$

$\therefore$ Required per cent

$= \frac{54 - 36}{54} \times 100 = \frac{100}{3}\%$

160. (*) Expenditure on others

$= 30\% = 108°$

Required per cent

$= \frac{108 - 18}{18} \times 100$

$= \frac{90}{18} \times 100 = 500\%$

161. (1)

Expenditure on health = 54°

$\because 360° \equiv 100\%$

$\therefore 54° \equiv \frac{100}{360} \times 54 = 15\%$

162. (1) Number of A-type employees in the year 1998

$\Rightarrow \frac{48640 \times 22}{100} = 10700$

Number of C and D-type employees in the year 1997

$\Rightarrow \frac{42980 \times 25}{100}$

= 10745

163. (1) It is obvious from the pie-chart.

Percentage increase

$= \frac{10 - 6}{6} \times 100$

$= \frac{200}{3} = 67\%$

164. (1) Required difference

$= \frac{48640 \times 10}{100} - \frac{42980 \times 6}{100}$

$= 4864 - 2579 = 2285$

165. (1) Required per cent

$= \frac{5000}{48640} \times 100 = 10$

166. (4) Number of A-type employees : Year 1997

$\Rightarrow \frac{42980 \times 20}{100} = 8596$

Year 1998 $\Rightarrow 10700$

$\therefore$ Required percent

$= \frac{10700}{8596} \times 100 = 125$

167. (3) If the amount permitted be Rs. x then,

$x \times \frac{100}{110} = 4910$

$\Rightarrow x = \frac{4910 \times 110}{100}$

= Rs. 5401 crores

168. (3) Difference

= Rs. (11486 – 9695) crores

= Rs. 1791 crores

If increase be x%, then

$29952 \times \frac{x}{100} = 1791$

$\Rightarrow x = \frac{179100}{29952} = 6\%$

169. (3) Total funds = Rs. (11486 + 5252 + 4910 + 6000 + 29952) crores

= Rs. 57600 crores

$\because 57600 \equiv 360°$

$\therefore 29952 \equiv \frac{360}{57600} \times 29952$

$= 187.2°$

170. (4) Expenditure on food : savings $= 120° : 60° = 2 : 1$

171. (1) $\because 70° - 54° \equiv$ Rs. 1600

$\because 16° \equiv$ Rs. 1600

$\therefore 1° \equiv \frac{1600}{16} \equiv$ Rs. 100

$\therefore 120° \equiv 120 \times 100$

= Rs. 12000

172. (2) $\because 360° \equiv$ Rs. 36000

$\therefore 1° \equiv \frac{36000}{360} \equiv$ Rs. 100

$\therefore 60° \equiv 60 \times 100 =$ Rs. 6000

$\therefore$ Annual savings

= Rs. (6000 × 12)

= Rs. 72000

173. (2) According to the question,

$\because$ Market tax $\equiv$ Rs. 165 crores

$\therefore 33\% \equiv$ Rs. 165 crores

$\therefore 100 - 33 = 67\% \equiv \frac{165 \times 67}{33}$

$\equiv$ Rs. 335 crores

174. (1) $\because 100\% \equiv$ Rs. 733 crores

$\therefore 35 + 10 = 45\% \equiv \frac{733}{100} \times 45$

= Rs. 329.85 crores

175. (1) $\because 100\% \equiv 360°$

$\therefore 1\% \equiv \frac{360°}{100}$

$\therefore 35\% \equiv \frac{360°}{100} \times 35 = 126°$

176. (2) $\because 360° \equiv$ Rs. 40000 crores

$\therefore 1° \equiv \frac{40000}{360}$

$\therefore 72° \equiv \frac{72 \times 40000}{360}$

= Rs. 8000 crores

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177. (1) According to the question,

Outlay on agriculture $\times \frac{x}{100}$ = Outlay of Irrigation

$\Rightarrow 108^\circ \times \frac{x}{100} = 54^\circ$

$\Rightarrow x = \frac{54 \times 100}{108} = 50\%$

178. (4) Required ratio = 54 : 45 = 6 : 5

179. (4) Maximum angle = 120°
⇒ company V

180. (4) Required difference

$= \text{Rs.}\left[\left(\frac{120^\circ - 100^\circ}{360}\right) \times 72\right]$ crores

= Rs. 4 crores

181. (4) Corresponding angle of expenditure on library = 60°
∴ Required percent

$= \frac{60}{360} \times 100$

$= \frac{50}{3} = 16.67\%$

182. (4) ∵ 100% ≡ 360°

$\therefore 1\% \equiv \frac{360}{100}$

$\therefore 25\% \equiv \frac{360}{100} \times 25 = 90^\circ$

⇒ Art and craft

183. (1) Corresponding angle of expense on library = 60°
Corresponding angle of expense on science = 60°

184. (2) Corresponding angle of expense on sports = 120°.

185. (2) Required ratio = 120° : 90° = 4 : 3

186. (1) Required percent
= (100 – 75 – 15 – 5)%
= 5%

187. (2) Non-members = 40 = 5%
= Members of cricket club only.

188. (1) Required ratio
= 5 : 15 = 1 : 3

189. (4) ∵ 5% ≡ 40

$\therefore 75\% \equiv \frac{40}{5} \times 75$

= 600

190. (2) Corresponding angle for conveyance = 90°
∵ 360° ≡ Rs. 60000

$\therefore 90^\circ \equiv \frac{60000}{360} \times 90$

= Rs. 15000

191. (4) Corresponding angle for expenditure on electricity = 72°
∵ 360° ≡ 100%

$\therefore 72^\circ \equiv \frac{100}{360} \times 72 = 20\%$

192. (3) Corresponding angle for overhead expenses = 108°
∵ 360° ≡ Rs. 60000

$\therefore 108^\circ \equiv \frac{60000}{360} \times 108$

= Rs. 18000

193. (1) Corresponding angle for raw materials = 90°
∵ 360° ≡ 100%

$\therefore 90^\circ \equiv \frac{100}{360} \times 90 = 25\%$

194. (3) Required percent

$= \left(\frac{20 - 15}{20} \times 100\right)\%$

$= \left(\frac{5}{20} \times 100\right)\% = 25\%$

195. (3) Percentage expense on royalty = 15%
∵ 100% ≡ 360°

$\therefore 15\% \equiv \frac{360}{100} \times 15 = 54^\circ$

196. (2) Transportation cost = 10%
∵ 10% ≡ Rs. 82500
∴ 100% ≡ Rs. 825000
∴ Cost for publishing 1 book =

$\frac{825000}{5500} = \text{Rs. } 150$

For a profit of 25%,

$\therefore$ Required S.P. $= \frac{150 \times 125}{100}$

= Rs. 187.50

197. (3) Percentage of printing cost = 20%
Percentage of Royalty cost = 15%
∵ 20% ≡ Rs. 30600

$\therefore 15\% \equiv \frac{30600}{20} \times 15$

= Rs. 22950

198. (1) Total amount of expenditure is not given.

199. (1) Required percent

$= \frac{30}{120} \times 100$

= 25%

200. (3) Required ratio = 150° : 30°
= 5 : 1

201. (4) Corresponding angle for expense on food = 150°
∵ 360° ≡ Rs. 7200

$\therefore 150^\circ \equiv \text{Rs.}\left(\frac{7200}{360} \times 150\right)$

= Rs. 3000

TYPE-II

1. (3) ₹ 45.7 [Clear from graph]

2. (3) 24 years [Clear from graph]

3. (4) Required premium
= 43·75 × 10 = ₹ 437·5

4. (2) Required increase

$\frac{46.544}{44} \times 100 = 5.68\%$

5. (2) Required difference
= (44 – 43.50) × 100
= 0.50 × 100 = ₹ 50

6. (2) The car covers 6 km in 1 hour.
∴ Speed = 6 kmph

7. (2) Speed = 6 kmph

$= \frac{6 \times 1000}{60}$ m/min.

= 100m/min.

8. (1) Required distance
= Speed × Time
= 6×4.5 = 27 km

9. (4) Time taken $= \frac{\text{Distance}}{\text{Speed}}$

$= \frac{15}{6} = 2\frac{1}{2}$ hours.

10. (1) Both the lines intersect when time is 10:30 a.m.

11. (2) Time $= \frac{5}{2}$ hours,

Distance = 120 km
∴ Speed of scooterist

$= \frac{120}{5} \times 2 = 48$ kmph

12. (3) Time = 11:30 – 9:00

$= 2\frac{1}{2}$ hours

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13. (4) Clear from the graph.
14. (4) Clear from table.
15. (1) Range of prices :
Year 2000 ⇒ 23 – 5 = ₹ 18
Year 2001 ⇒ 20 – 17 = ₹ 3
Year 2002 ⇒ 14 – 10 = ₹ 4
Year 2003 ⇒ 11 – 5 = ₹ 6
16. (3) Price of rice in June = ₹ 21
17. (4) Clear from table.
Difference = 23 – 5
= 18 ₹ i.e. month is December.
18. (4) Average marks

$$= \frac{10+12.5+15}{3}$$

$$= \frac{37.5}{3} = 12.5$$

19. (2) Difference between temperatures :
Sunday ⇒ 39 – 23 = 16°
Saturday ⇒ 42.5 – 24 = 18.5°
Wednesday ⇒ 32.5 – 15 = 17.5°
20. (2)

Wages	Number of workers
120	12
140	26 – 12 = 14
160	34 – 26 = 8
180	40 – 34 = 6
200	50 – 40 = 10

∴ Required per cent

$$= \frac{6}{50} \times 100 = 16\%$$

21. (4) Median

$$= \frac{\text{Lowest value + Highest value}}{2}$$

$$= \frac{120+200}{2} = ₹\ 160$$

22. (4) Definite income is not known.
23. (4) It is obvious from the graph.
24. (1) Number of students
= 15 + 30 + 35 + 30 + 25 + 22.5 + 22.5 = 180
25. (3) Percentage decrease

$$= \frac{32-27}{32} \times 100$$

$$= \frac{5 \times 100}{32} = \frac{125}{8} = 15\frac{5}{8}\%$$

26. (1) $\frac{\text{Exports}}{\text{Imports}} = 1.75$

$$= \frac{175}{100} = \frac{7}{4}$$

After 40% increase in imports,

$$\frac{\text{Exports}}{\text{Imports}} = \frac{7}{\frac{4 \times 140}{100}} = \frac{700}{4 \times 140}$$

$$= \frac{5}{4} = 1.25$$

27. (2) In the year 2005,
Imports of company X
= ₹ 180 crores
Exports = 1.75 × 180
= ₹ 315 crores
Exports of company Y
= ₹ 157.5 crores
∴ Imports of company Y

$$= \frac{157.5}{0.75}$$

= ₹ 210 crores,

28. (3) Number of examinees getting more than average marks
= 72 + 48 + 24 + 8 = 152
29. (4) Number of students who got above 80% marks = 24 + 8 = 32
∴ Required percent

$$= \frac{32}{273} \times 100 = 11.72\%$$

30. (1) Number of students who got marks above 60% and below 80%
= 72 + 48 = 120
∴ Required percentage

$$= \frac{120 \times 100}{273} = 43.95\%$$

31. (3) Number of students who got 40% or less marks
= 2 + 4 + 12 + 26 = 44
∴ Required percentage

$$= \frac{44}{273} \times 100 = 16.11\%$$

32. (2) Required percentage

$$= \frac{3150}{4500} \times 100 = 70\%$$

33. (3) Average demand

$$\left(\frac{2100+3150+2600+5000+2800+3300}{6}\right)$$

lakh tonnes

$$= \frac{18950}{6} \text{ lakh tonnes}$$

Average production

$$= \left(\frac{1450+3660+3100+4200+3700+4500}{6}\right)$$

lakh tonnes

$$= \frac{20610}{6} \text{ lakh tonnes}$$

Required difference

$$= \frac{20610}{6} - \frac{18950}{6}$$

$$= \frac{1660}{6} = 276.7 \text{ lakh tonnes}$$

∴ Required answer
= 275 lakh tonnes
34. (4) Required per cent

$$= \frac{1450}{2600} \times 100$$

$$= \frac{1450}{26} = 55.8$$

35. (2) Companies having more demand than production
⇒ A and D
Companies having more production than demand
⇒ B, C, E and F
∴ Required ratio = 2 : 4 = 1 : 2
36. (1) Average production of type P vehicles

$$= \frac{100+125+200+225+275+275}{6}$$

$$= \frac{1200}{6} = 200 \text{ thousands}$$

Required years
⇒ 2012, 2013 and 2014
37. (2) Required percentage decrease

$$= \left(\frac{150-125}{150}\right) \times 100$$

$$= \frac{25}{150} \times 100 = \frac{50}{3}$$

= 16.7%
38. (3) Total production of type P vechicles in 2009 and 2011
= 100 + 200 = 300 thousands
Total production of type Q vehicles in 2010 and 2014
= 150 + 225 = 375 thousands
∴ Required percent

$$= \frac{300}{375} \times 100 = 80\%$$

39. (1) Total production of type P vehicles = 1200 thousands
Total production of type Q vehicles
= 175 + 150 + 125 + 175 + 175 + 225 = 1025
∴ Required ratio
= 1200 : 1025 = 48 : 41
40. (3) Required percent

$$= \frac{150}{275} \times 100 = 54.5\%$$

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TYPE-III

1. (4) According to graph income spend on food is 20%.

2. (2) Percentage expenditure on clothing = 15%
Percentage savings = 12.5%
∴ Required difference
= (15 – 12.5)% = 2.5%

3. (3) Savings
= 12.5% of ₹ 100000
$= ₹ \frac{12.5 \times 100000}{100} = ₹ 12500$

4. (3) Both expenditures are equal to 20% each.

5. (1) The expenditure on housing is 10% which is less than 12.5%, the savings.

6. (3) Birth-rate of Germany = 16
Birth-rate of England = 20

$$\% \text{ Diff.} = \frac{20-16}{16} \times 100 = 25\%$$

It is 25% more than 16.

7. (1) Birth-rate of India = 33
Birth-rate of England = 20
∴ Required percentage

$$= \frac{33}{20} \times 100 = 165\ \%$$

8. (4) Birth- rate of China = 40
Birth – rate of Germany = 16
∴ Required answer

$$= \frac{40}{16} = 2.5$$

9. (2) Required ratio $= \frac{33}{15}$

$$= \frac{11}{5} = 11:5$$

10. (2) Birth-rate of England = 20
Birth-rate of New Zealand = 30
Required percentage

$$= \frac{30-20}{30} \times 100 = \frac{100}{3}\%$$

$$= 33\frac{1}{3}\%$$

11. (1) Population in 1971
= 54.80 crores
Population in 1981 = 68.40 crores
Increase = (68.40 – 54.80) crores
= 13.6 crores
∴ Increase%

$$= \frac{13.6}{54.80} \times 100 = 24.8\ \%$$

12. (4) Percentage increase in 1981 = 24.8% (From Q 11)
Percentage increase in 1971

$$= \left(\frac{54.80-43.92}{43.92}\right) \times 100$$

= 24.77%
Hence, increase is highest in 1981.

13. (2) Percentage increase in 1941

$$= \left(\frac{31.85 \times 27.90}{27.90}\right) \times 100$$

$$= \frac{3.95 \times 100}{27.90} = 14.16\%$$

Percentage increase in 1951

$$= \left(\frac{36.14 \times 31.85}{31.85}\right) \times 100$$

$$\frac{4.29 \times 100}{31.85} = 13.47\%$$

Hence, % increase is least in 1951

14. (1) Total Increase
= (68.40 – 27.90) crores
= 40.5 crores
∴ Annual increase

$$= \frac{40.5}{50} \text{ crores}$$

$$= \frac{40.5 \times 10000000}{50} = 8100000$$

15. (2) Required answer
= 16 + 8 + 20 = 44

16. (4) It is obvious from the graph.

17. (3) Required answer
= 7 + 24 + 14 = 45

18. (2) Required number of cycles
= 1060 + 920 = 1980

19. (3) Required number of cycles
= 1440

20. (1) Required number of cycles
= 800 + 1300 + 1060 + 920 + 1440 = 5520

21. (1) Percentage decrease

$$= \frac{70-25}{70} \times 100$$

$$= \frac{4500}{70} = 64.2\%$$

22. (3) It is obvious from the graph.
Required average production
= 40000 tonnes

23. (2) Percentage increase

$$= \frac{90-40}{40} \times 100 = 125\%$$

24. (3) Average production

$$= \frac{(40+30+70+25+55+50+80+90)1000}{8} \text{ tonnes}$$

$$= \frac{440}{8} \times 1000 = 55000 \text{ tonnes}$$

Years having more production than it = 2003, 2007 and 2008

25. (3) Percentage decrease

$$= \frac{60-45}{60} \times 100 = 25\%$$

26. (4) Average production

$$= \left(\frac{25+40+60+45+65+50+75+80}{8}\right)$$

ten thousand tonnes
= 55 × ten thousand tonnes
∴ Required years = 1997, 1999, 2001 and 2002.

27. (3) Percentage increase :
In Year 1996

$$\Rightarrow \frac{40-25}{25} \times 100 = 60\%$$

In Year 1997

$$\Rightarrow \frac{60-40}{40} \times 100 = 50\%$$

% increase is maximum in 1996

28. (1) Required ratio
= (40 + 60) : (25 + 45 + 50)
= 100: 120 = 5 : 6

29. (3) It is obvious from the graph.

30. (2) Required total daily payment
= 35 × 9 = ₹ 315

31. (2) Required answer

$$= \frac{4200}{2800} = 1.5$$

32. (3) Percentage increase.

$$= \frac{4200-2100}{2100} \times 100 = 100\%$$

33. (4) Percentage increase

$$1992\text{-}93 \Rightarrow \frac{3600-2600}{2600} \times 100 = 38\%$$

$$1990\text{-}91 \Rightarrow \frac{2800-2100}{2100} \times 100 = 33.3\%$$

$$1988\text{-}89 \Rightarrow \frac{3100-2200}{2200} \times 100 = 41\%$$

34. (1) Average deficit $= \frac{23200}{8}$

= ₹ 2900 crore
∴ Required ratio = 3 : 5

35. (3) Required percentage

$$= \frac{3600}{2900} \times 100 = 125\%$$

36. (2) Required difference

$$= \frac{1}{3}|(70+80+90-80-60-75)|$$

lakh tonnes

$$= \frac{25}{3} \text{ lakh tonnes}$$

$$= 8\frac{1}{3} \text{ lakh tonnes}$$

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37. (3) Required ratio
$= (70 + 90 + 60) : (80 + 80 + 75)$
$= 220 : 235 = 44 : 47$

38. (1) $(90 + 60) \times \frac{x}{100} = 80 + 75$

$\Rightarrow \frac{150 \times x}{100} = 155$

$\Rightarrow x = \frac{155 \times 100}{150} = \frac{310}{3}$

$= 103\frac{1}{3}$

39. (4) In year 2000 average production of fertilizers

$= \frac{455}{6} = 75\frac{5}{6}$ lakh tonnes

40. (4) It is obvious from the graph.

41. (1) Average sales of the branches B1 and B4

$= \frac{20 + 80}{2} = 50$ thousand

Average sales of the branches B3 and B5

$= \frac{55 + 45}{2} = 50$ thousand

42. (2) Average sales of all branches

$= \frac{300}{6} = 50$ thousand

The sale of branches B1, B2 and B5 are less than the average sales.

43. (1) New sale of books from branch B2 $= \frac{40 \times 130}{100}$

$= 52$ thousand

New sale of books from branch B4

$= \frac{80 \times 90}{100} = 72$ thousand

New average sales $= \frac{304}{6}$

$= \frac{152}{3}$ thousand

Increase $= \frac{152}{3} - 50 = \frac{2}{3}$ thousand

$\therefore$ Percentage increase

$= \frac{2}{3 \times 50} \times 100 = \frac{4}{3} = 1.33\%$

44. (2) Required total sales

$= \frac{300 \times 102}{100} = 306$ thousand

45. (2) B1 + B4 = B2 + B6
= B3 + B5 = 100000
B3 – B5 = 55 – 45
= 10 thousand
B4 – B1 = 80 – 20
= 60 thousand
B6 – B2 = 60 – 40
= 20 thousand
$\therefore$ Minimum diff. = 10

46. (4) Total number of students
$= (6 + 15 + 11 + 18 + 16) \times 10$
$= 66 \times 10 = 660$

47. (2) Bicycle and Rickshaw users
$= (18 + 16) \times 10 = 340$

48. (3) Number of students who use bus = 150
$\therefore$ Required percentage

$= \frac{150}{660} \times 100$

$= \frac{250}{11} = 22\frac{8}{11}\%$

49. (4) Required ratio = 6 : 16 = 3 : 8

50. (2) Required sales
= ₹ (1773 + 1115) crore
= ₹ 2888 crore

51. (1) It is obvious from the bar diagram.

52. (2) Clear from the graph

53. (2) Required average

$= \frac{8730 + 924}{2}$

$= \frac{9654}{2} =$ ₹ 4827 crores

54. (2) Required difference
= ₹ (5345 – 1841) crores
= ₹ 3504 crore

55. (2) It is obvious from the bar graph.
Section A = section F = 34

56. (4) Required ratio = 34 : 31

57. (3) Total number of students
= 34 + 35 + 31 + 32 + 33 + 34
= 199

58. (3) Required ratio = 35 : 31

59. (4) Required percentage

$= \frac{31}{199} \times 100 = 15.57\%$

60. (3) Required percentage

$= \frac{440}{400} \times 100 = 110\%$

61. (2) Percentage decrease(2001)

$= \frac{340 - 320}{340} \times 100 = 6\%$

Percentage decrease (2005)

$= \frac{440 - 400}{440} \times 100 = 9\%$

$\therefore$ % decrease is least in 2001

62. (3) Required difference
$= (420 - 320) \times 1000$
= ₹ 100000

63. (2) Required answer

$= \frac{320}{400} = 0.8$

64. (4) Percentage increase in 2004

$= \frac{440 - 420}{420} \times 100 = 4.76\%$

Percentage increase in 2003

$= \frac{420 - 400}{400} \times 100 = 5\%$

$\therefore$ % increase in least in 2004

65. (3) Year 1999 $\Rightarrow$ 1500 quintals

66. (1) Percentage increase

$= \frac{1000 - 500}{500} \times 100 = 100\%$

67. (3) Production in 1999
= 1500 quintal
Production in 2000
= 1300 quintal
Percentage decrease

$= \frac{1500 - 1300}{1500} \times 100$

$= \frac{40}{3} = 13\frac{1}{3}\%$

68. (4) Required total production
$= (1200 + 600 + 500 + 1000)$ quintals
= 3300 quintals

69. (3) Average production

$= \frac{8834}{7} = 1262$ quintals

Years of more than average production
= 2003, 2005 and 2006

70. (3) Per cent rate of decline :
Year 2004

$\Rightarrow \frac{400}{1640} \times 100 = 24.4\%$

Year 2002

$\Rightarrow \frac{1085 - 720}{1085} \times 100$

$= \frac{365}{1085} \times 100 = 33.64\%$

71. (2) Average marks obtained by the student.

$= \frac{60 + 30 + 80 + 50 + 60}{5}$

$= \frac{280}{5} = 56$

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72. (2) It is obvious from the bar graph.

73. (4) Required ratio = 100 : 40 = 5 : 2

74. (4) Required ratio = 80 : 60 = 4 : 3

75. (3) Required average

$$= \frac{70+40}{2} = \frac{110}{2} = 55$$

76. (3) Required number of girls = 15 + 10 = 25

77. (1) Number of girls who ate six or more servings per day = 3 + 3 + 3 = 9

∴ Required percentage

$$= \frac{9}{72} \times 100 = \frac{25}{2} = 12.5\%.$$

78. (3) Required number of girls = 10 + 8 + 5 = 23

79. (4) Required per cent

$$= \frac{(17.5-12.5)}{12.5} \times 100$$

$$= \frac{500}{12.5} = 40\%$$

80. (4) Required ratio = (20 + 12.5) : (10 + 17.5) = 32.5 : 27.5 = 13 : 11

81. (2) Difference in percentage for expenditure on transport and taxes = 12.5 – 10 = 2.5%

∵ 15 % ≡ ₹ 2.10 crore

$$\therefore 2.5\% \equiv \frac{2.10 \times 2.5}{15}$$

= ₹ 0.35 crore

= ₹ 35 lakh

82. (3) Total expenditure = 5 × N

$$\therefore N = \frac{100}{5} = 20$$

83. (2) Percentage of (Advertisement + Taxes + Research and development) = 15 + 10 + 5 = 30%

∵ 17.5% ≡ ₹ 2.45 crore

$$\therefore 30\% \equiv \frac{2.45}{17.5} \times 30$$

= ₹ 4.2 crore

84. (3) Difference of percentage expenditure on transportation and taxes = 12.5 – 10 = 2.5%

Expenditure on advertisement = 15%

∵ 15% ≡ Rs. 2.10 crores

∴ 2.5%

$$\equiv \text{Rs.}\left(\frac{2.10}{15} \times 2.5\right) \text{ crores}$$

= Rs. 0.35 crore

= Rs. 35 lakhs

85. (2) Required ratio = (20 + 12.5) : (10 + 17.5) = 32.5 : 27.5 = 13 : 11

86. (3) Percentage expenditure on loans = 17.5%

Percentage expenditure on advertisement, taxes and research and development = (15 + 10 + 5)% = 30%

∵ 17.5% ≡ Rs. 2.45 crores

$$\therefore 30\% \equiv \frac{2.45}{17.5} \times 30$$

= Rs. 4.2 crores

87. (2) Required percentage

$$= \left(\frac{17.5-12.5}{12.5}\right) \times 100$$

$$= \frac{500}{12.5} = 40$$

88. (4) According to the question,

$$\frac{x \times 100.17}{100} = 77.23 - 76.23$$

$$\Rightarrow \frac{x \times 100.17}{100} = 1$$

$$\Rightarrow x = \frac{100}{100.7} = 1$$

89. (2) Required ratio = (77.23 + 88.93) : (76.23 + 100.17) = 166.16 : 176.40 = 16616 : 17640 = 2077 : 2205

90. (2) Average production during 1920 – 1927

$$= \left(\frac{71.30+43.51+67.66+76.23+77.23+88.93+91.75+100.17}{8}\right)$$

million tonnes

$$= \frac{616.78}{8} = 77.1 \text{ million tonnes}$$

∴ Required years = 1920, 1921, 1922 and 1923

91. (3) Average production of steel = 77.1 million tonnes

92. (1) Average production =

$$\left(\frac{25+40+60+45+65+50+75+80}{8}\right)$$

ten thousand tonnes

$$= \frac{440}{8} = 55 \text{ ten thousand tonnes}$$

Required years ⇒ 1997, 1999, 2001 and 2002

93. (1) Total production in 1996 and 1997 = 40 + 60 = 100 ten thousand tonnes

Total production in 1995 and 2001 = 25 + 75 = 100 ten thousand tonnes

94. (1) Required percentage increase

$$= \left(\frac{80-25}{25}\right) \times 100$$

$$= \frac{55 \times 100}{25} = 220\%$$

95. (2) Percentage increase in 1997

$$= \frac{60-40}{40} \times 100$$

= 50%

Percentage increase in 1996

$$= \frac{40-25}{25} \times 100$$

$$= \frac{1500}{25} = 60\%$$

96. (2) Required percentage decrease

$$= \frac{60-45}{60} \times 100$$

$$= \frac{1500}{60} = 25\%$$

TYPE-IV

1. (4) Totat accidents = 230 + 150 + 120 + 160 + 40 + 200 + 100 = 1000

Percentage of accidents involving two-wheelers and two wheelers

$$= \frac{230}{1000} \times 100 = 23\%$$

Percentage of accidents involving two-wheelers and other objects

$$= \frac{770 \times 100}{1000} = 77\%$$

∴ Required difference = 77 – 23 = 54%

2. (3) Two-wheelers + Cars + Buses + Stationary Vehicles = 230 + 150 + 120 + 100 = 600 = 60%

3. (4) ∵ 1000 ≡ 360°

$$\therefore 100 \equiv \frac{360}{1000} \times 100 = 36°$$

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4. (1) Required percentage

$$= \frac{40+200}{1000} \times 100$$

$$= \frac{24000}{1000} = 24\%$$

5. (2) Required difference

$$= \frac{160-120}{1000} \times 100 = 4\%$$

6. (2) Number of Graduate job-seekers in 1974 = 525
Number of Senior secondary job-seekers in
1974 = 1050 − 525 = 525

7. (3) Number of job-seekers :
Year 1973 → 1625
Year 1977 → 4000
Difference = 4000 − 1625 = 2375

8. (4) Number of Matriculate job-seekers :
Year 1976 → 3300 − 1800 = 1500
Year 1977 → 4000 − 2200 = 1800
→ maximum

9. (2) Required number of job-seekers = 1850 − 1050 = 800

10. (3) Required answer

$$= \frac{35\times30}{100} + \frac{35\times15}{100} + \frac{35\times15}{100}$$

$$= \frac{35}{100}(30+15+15)$$

$$= \frac{35\times60}{100} = 21 \text{ lakhs}$$

11. (4) Percentage variation :

$$\text{Model A} \Rightarrow \frac{40-30}{30} \times 100 = 33\frac{1}{3}\%$$

$$\text{Model B} \Rightarrow \frac{20-15}{15} \times 100 = 33\frac{1}{3}\%$$

$$\text{Model C} \Rightarrow \frac{15-20}{20} \times 100 = -25\%$$

12. (1) Required difference

$$= \frac{44\times20}{100} - \frac{35\times15}{100}$$

$$= \frac{880-525}{100} = \frac{355}{100} \text{ lakhs}$$

$$= 355000$$

13. (2) Required production

$$= \frac{44\times30}{100} \text{ lakhs}$$

$$= 1320000$$

14. (3) Required answer

$$= 35\times\frac{10}{100}\times\frac{15}{100} + 44\times\frac{10}{100}\times\frac{15}{100}$$

$$= \frac{150}{10000}\times79 = 1.1850 \text{ lakhs}$$

$$= 118500$$

15. (4) Total students in 2008 = 170
Students passed in 1st division
= 20
∴ Required percentage

$$= \frac{20}{170} \times 100$$

$$= \frac{200}{17} = 11\frac{13}{17}\%$$

16. (4) Total students who passed in 2008 = 140
∴ Required percentage

$$= \frac{140}{170} \times 100$$

$$= \frac{1400}{17} = 82\frac{6}{17}\%$$

17. (1) Percentage of passed candidates :

$$\text{Year 2008} \Rightarrow 82\frac{6}{11}\%$$

$$\text{Year 2009} \Rightarrow \frac{140}{190} \times 100$$

$$= 73.7\%$$

$$\text{Year 2010} \Rightarrow \frac{150}{200} \times 100 = 75\%$$

18. (2) Students passed in third division in 2008 = 140 − 80 = 60

19. (1) Required percentage

$$= \frac{60}{200} \times 100 = 30\%$$

20. (3) Percentage expenditure on clothes for family B = 15
∴ Required expenditure

$$= \frac{10000\times15}{100} = ₹\ 1500$$

21. (3) Expenditure on education for family A = 20%

$$\text{Required fraction} = \frac{20}{100} = \frac{1}{5}$$

22. (1) Food + clothes + house rent
= 30 + 15 + 15 = 60%
∴ Required expenditure

$$= \frac{30000\times60}{100} = ₹\ 18000$$

23. (4) Number of students who stood second in the year 2000 = 50
∴ Required percentage

$$= \frac{50}{160}\times100$$

$$= \frac{125}{4} = 31\frac{1}{4}\%$$

24. (1) Required percentage

$$= \frac{60}{120}\times100 = 50\%$$

25. (2) Number of students who passed with third class in 2002 = 10

26. (3) Number of students who passed with second class in 2002 = 130 − 80 = 50

27. (2) Required ratio = 45 : 30 = 3 : 2

28. (1) Production of sandal perfume remained same.

29. (4) Production of jasmine perfume in 1977 = 30% of 5000

$$= \frac{5000\times30}{100} = 1500 \text{ units}$$

30. (1) Total students in year 2007 = 190
Students who passed in first division = 30
Required percent

$$= \frac{30}{190}\times100 = \frac{300}{19}$$

$$= 15\frac{15}{19}\%$$

31. (3) Total students in the year = 240
Successful students = 180
∴ Required percentage

$$= \frac{180}{240}\times100 = 75\%$$

32. (1) Students who passed in third division in 2006
= 140 − 80 = 60

33. (3) Pass percentage :

$$\text{Year 2006} \Rightarrow \frac{140}{170}\times100$$

$$= 82.35$$

$$\text{Year 2007} \Rightarrow \frac{150}{190}\times100$$

$$= 78.94$$

Year 2008 ⇒ 75%

TYPE-V

1. (2) Required percent increase

$$= \frac{7500-5300}{5300}\times100 = 41.5\%$$

2. (1) Profit in year 1996-97 = Gross Traffic Receipt − Total expenditure
= 8500 − 8000 = 500
Therefore, profit percent of Gross Traffic Receipt

$$= \frac{500}{8500}\times100 = 5.9\%$$

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3. (3) Profit percent of Gross Traffic Receipt in year 1997-98

$$=\frac{9400-8800}{9400}\times 100 = 6.38\%$$

In year 1995-1996

$$\Rightarrow \frac{7500-5900}{7500}\times 100 = 21.33\%$$

4. (3) Profit percent

$$=\frac{\text{Gross Traffic profit - Total expenditure}}{\text{Gross Traffic profit}}\times 100$$

$$\Rightarrow \frac{\text{Total Expenditure}}{\text{Gross Traffic profit}}$$

$$=1-\frac{10}{100}=0.9$$

According to question,
Total expenditure = 5800

$$\therefore \text{Gross Traffic profit} = \frac{5800}{0.9}$$

= ₹ 6444 crores

5. (4) Required increase = ₹ (8800 − 5100) crores = ₹ 3700 crore

6. (1) Growth rate per annum of expense for :

$$1995 \rightarrow \frac{100}{300}\times 100 = \frac{100}{3}\%$$

$1996 \rightarrow 0\%$

$$1997 \rightarrow \frac{200}{400}\times 100 = 50\%$$

$$1998 \rightarrow \frac{100}{600}\times 100 = \frac{50}{3}\%$$

$$\therefore \text{Average} = \frac{\frac{100}{3}+50+\frac{50}{3}+0}{4} = 25\%$$

7. (2) It was lowest in 1996 as 3 : 4.

8. (3) Required average

$$=\frac{100-200+200+300}{5}$$

= ₹ 80 crores

9. (2) Profit in
$1994 \rightarrow 100$, $1995 \rightarrow 100$, $1996 \rightarrow -100$
$1997 \rightarrow -100$, $1998 \rightarrow 100$

10. (3) Sales : capital in
$1994 \rightarrow 2 : 1$,
$1995 \rightarrow 5 : 2$,
$1996 \rightarrow 3 : 2$,
$1997 \rightarrow 5 : 3$,
$1998 \rightarrow 8 : 3$

11. (1) In Arts faculty, there was a regular decrease in students' strength as it was 600 in 1990-91, 550 in 1991-92 and 500 in 1992-93.

12. (3) Number of students in all faculties taken together in 1990-91.
= 600 + 400 + 200 + 150
= 1350
Number of students in science faculty = 400
∴ Required percentage

$$=\frac{400}{1350}\times 100 = 29.6\%$$

13. (4) Total students' strength in 1991-92
= 550 + 500 + 250 + 200 = 1500
Students' strength in commerce in 1991-92 = 250

$$\therefore \text{Required answer} = \frac{1500}{250} = 6$$

14. (1) Students' strength in Science in 1990-91 = 400
Students' strength in Science in 1992-93 = 600
Increase = 600 − 400 = 200
Per cent increase

$$=\frac{200}{400}\times 100 = 50\%$$

15. (4) Companies with more demand than production are A, C and E.
Companies with more production than demand are B and D.
∴ Required ratio = 3 : 2

16. (3) Average demand

$$=\frac{3300+1200+3000+600+2500}{5}$$

$$=\frac{10600}{5}=2120$$

Average production

$$=\frac{2200+2700+1500+1800+1000}{5}$$

$$=\frac{9200}{5}=1840$$

∴ Required difference
= 2120 − 1840 = 280

17. (3) Required percentage

$$=\frac{600}{2500}\times 100 = 24\%$$

18. (2) Average demand of companies B and D

$$=\frac{1200+600}{2}=\frac{1800}{2}=900$$

Average production of companies B and D

$$=\frac{2700+1800}{2}=2250$$

∴ Required ratio = 900 : 2250
= 2 : 5

19. (4) Required answer $= \frac{6}{15} = 0.4$

20. (3) It is obvious from the graph.

21. (1) Total cotton production in State C = (6 + 11 + 15) lac × 100 kg
= 320000000 kg

22. (2) Required states are B and E.

23. (1) Required difference
= (350 − 250) × thousand tonnes
= 100 thousand tonnes

24. (3) Required ratio

$$=\left(\frac{250+500+400}{5}\right):\left(\frac{350+400+500}{5}\right)$$

= 1150 : 1250 = 23 : 25

25. (1) Required percentage increase

$$=\frac{400-350}{350}\times 100 = \frac{100}{7}\%$$

$$=14\frac{2}{7}\%$$

26. (1) Average production :
Company X

$$=\frac{300+450+250+500+400}{5}$$

$$=\frac{1900}{5}=380 \text{ thousand tonnes}$$

Company Y

$$=\frac{250+350+350+400+500}{5}$$

$$=\frac{1850}{5}=370 \text{ thousand tonnes}$$

Company Z

$$=\frac{350+400+450+350+350}{5}$$

$$=\frac{1900}{5}=380 \text{ thousand tonnes}$$

∴ X & Z has maximum production

27. (1) In 1997,
Gross profit = ₹ 50 lakh
Net profit = ₹ 25 lakh

28. (3) Required percentage

$$=\frac{15}{40}\times 100 = 37.5\%$$

29. (4) Required difference

$$=₹\frac{1}{4}(20+25+20+25) \text{ lakhs}$$

$$=\frac{1}{4}\times 90 = ₹ 22.5 \text{ lakhs}$$

30. (1) Gross profit : net profit
In Year 1994 ⇒ 3 : 1
Year 1995 ⇒ 40 : 15 = 8 : 3
Year 1996 ⇒ 45 : 25 = 9 : 5
Year 1997 ⇒ 50 : 25 = 2 : 1

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31. (3) Required ratio
$= 165 : 75 = 11 : 5$

32. (1) Required ratio = 3300 : 2200
$= 3 : 2$

33. (3) Required percentage
$= \frac{600}{2500} \times 100 = 24\%$

34. (2) Required answer
$= \frac{2700}{1500} = 1.8$

35. (4) Required ratio = 3 : 2

36. (3) Required difference in profit
= ₹ [(50 – 30) – (40 – 30)] lakh
= ₹ 10 lakh

37. (3) Average income
$= ₹\left(\frac{30+50+40+60+60}{5}\right)$ lakh
$= \frac{240}{5}$ = ₹ 48 lakh
In the years 1983, 1985 and 1986, the income were more than the average income.

38. (2) Average profit
$= ₹\left(\frac{10+20+10+20+25}{5}\right)$ lakh
= ₹ 17 lakh
Required ratio = 48 : 17

39. (1) Required percentage increase
$= \frac{25-10}{10} \times 100$
$= \frac{15}{10} \times 100 = 150\%$

40. (1) Total income = ₹ 240 lakh
Total expenditure = ₹ 155 lakh
∴ Difference = 240 – 155
= ₹ 85 lakhs

41. (3) Required percentage drop
$= \frac{30-22.5}{30} \times 100$
$= \frac{7.5}{30} \times 100 = 25\%$

42. (2) Required difference
= [(12.5 + 27.5 + 30) – (25 + 20)] thousand
= (70 – 45) thousand
= 25 thousand

43. (1) Total production :
Year 1993 ⇒ 65 thousand (least)
Year 1994 ⇒ 75 thousand
Year 1995 ⇒ 85 thousand (maximum
Year 1996 ⇒ 75 thousand
Year 1997 ⇒ 80 thousand

44. (1) It is obvious from above answer

45. (2) Required ratio :
Year 1993 $\Rightarrow \frac{30}{65}$
Year 1994 $\Rightarrow \frac{30}{75}$
Year 1996 $\Rightarrow \frac{25}{75}$
Year 1997 $\Rightarrow \frac{22.5}{80}$

46. (4) January
$\Rightarrow \frac{2500}{1000} \times 100 = 250\%$
February $\Rightarrow \frac{100}{1300} \times 100 = \frac{100}{13}\%$
April $\Rightarrow \frac{700}{2200} \times 100 = 32\%$

47. (1) Required percentage
$= \frac{100}{2000} \times 100 = 5\%$

48. (1) Required answer
$= \frac{2200}{1000} = 2.2$

49. (4) Average demand
$= \frac{8100}{5} = 1620$
Average production
$= \frac{6800}{5} = 1360$
Required difference
= 1620 – 1360 = 260

50. (3) Required ratio = 3 : 2

51. (4) Number of Hindus
$= 80 \times \frac{25}{100} = 20$ lakhs

52. (1) Percentage decrease
$= \frac{30-15}{30} \times 100 = 50\%$

53. (2) Required difference = 15%

54. (4) Number of Muslims
= 16 lakhs

55. (1) Legal = $\frac{20}{30} = \frac{2}{3} = 0.67$
Clerical = $\frac{30}{35} = 0.86$
Medical = $\frac{10}{20} = \frac{1}{2} = 0.5$

56. (2) Required percentage
$= \frac{70+80}{205} \times 100 = 73.17\%$

57. (4) Required ratio
= (75 + 65) : (85 + 95)
= 140 : 180 = 7 : 9

58. (1) Average sales of stores B_1, B_2 and B_3 in 2001
$= \frac{105+65+110}{3} = \frac{280}{3}$
Average sales of stores B_1, B_3 and B_6 in 2000
$= \frac{80+95+70}{100} = \frac{245}{3}$
Required percentage
$= \frac{245}{280} \times 100 = 87.5\%$

59. (2) Required average
$= \frac{80+75+95+85+75+70}{6}$
$= \frac{480}{6} = 80$

60. (1) Year 2007
Decrease%
$= \frac{60-50}{60} \times 100 = 16\frac{2}{3}\%$

61. (3) Required percentage
$= \frac{60+60}{50+40} \times 100$
$= \frac{120 \times 100}{90} = 133.3\%$

62. (2) Total production :
Flavour P = 300 lakh bottles
Flavour Q = 325 lakh bottles
Flavour R = 300 lakh bottles

63. (2) Percentage decrease
$= \frac{60-40}{60} \times 100 = 33\frac{1}{3}\%$
or 33.33%

64. (4) Average production of flavour Q during 2008, 2009 and 2010
$= \frac{55+50+55}{3}$
$= \frac{160}{3}$ lakh bottles
Average production of flavour P in 2005, 2006 and 2007

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$= \frac{50+40+55}{3}$

$= \frac{145}{3}$ lakh bottles

Difference $= \frac{160}{3} - \frac{145}{3}$

$= \frac{15}{3} = 5$ lakh bottles

65. (3) Total income
= ₹ 30.75 thousand

Average $= \frac{30.75}{5}$

= ₹ 6.15 thousands = ₹ 6150

66. (4) Income range
= ₹ (8.75 – 4.25) thousand
= ₹ 4500

67. (3) Required ratio = 30 : 45
= 2 : 3

68. (2) Hindus + Muslims

$= \frac{500000 \times 55}{100} = 275000$

69. (4) Hindus $= \frac{5000000 \times 35}{100}$

= 1750000

70. (4) Total students in 2001 – 2002
= 1350
∴ Required percentage

$= \frac{400}{1350} \times 100 = 29.6\%$

71. (3) Total students in 2003-04
= 1600
∴ Required percentage

$= \frac{250}{1600} \times 100 = 15.6\%$

72. (2) Required percentage increase

$= \frac{600-400}{400} \times 100 = 50\%$

73. (3) Required percentage

$= \frac{35}{85+35} \times 100$

$= \frac{35}{120} \times 100 \approx 29\%$

74. (1) Required ratio
= 70 : 40 = 7 : 4

75. (4) Required ratio
= 50 : 85 = 10 : 17

76. (4) Difference in 2010
= 85 – 35 = 50 million

77. (1) It is obvious from the graph.

78. (1) Required average

$= \left(\frac{5+4+4+3+4}{5}\right)$ million tonnes = 4 million tonnes

79. (1) Percentage increase :
In Year 1996

$\Rightarrow \frac{(225-120)}{120} \times 100 = 87.5\%$

In Year 1997

$\Rightarrow \frac{(375-225)}{225} \times 100 = 67\%$

80. (4) Average of total investment

$= \frac{1}{6}(120+225+375+330+525+420)$

$= \frac{1}{6} \times 1995 =$ ₹ 332.5 lakhs

Average value of sales

$= \frac{1}{6}(200+300+500+400+600+460)$

$= \frac{1}{6} \times 2460$

= ₹ 410 lakhs

Difference = 410 – 332.5
= ₹ 77.5 lakh

81. (1) Students in arts = 2400
Students in commerce = 1000
Ratio = 2400 : 1000 = 24 : 10
= 12 : 5

82. (2) Percentage increase in Science students

$= \frac{500-450}{450} \times 100$

$\frac{100}{9} = 11.1\%$

83. (2) It is obvious from the bar diagram. The bar of West Bengal (W.B.) is lowest.

84. (2) The bar of West Bengal is the largest.

85. (2) Total production of rice
= 24 million tonnes

Haryana's share $= \frac{2}{24} = \frac{1}{12}$

86. (3) Total production of rice and wheat is least in
Maharashtra 5 million tonnes

87. (4) Uttar Pradesh (UP) produces 16 million tonnes of wheat that is largest.

88. (3) Required percentage

$= \frac{600}{2500} \times 100 = 24\%$

89. (3) Average demand = 2120
Average production = 1840
Difference = 2120 – 1840 = 280

90. (2) Required ratio

$= \left(\frac{1500+1800+1000}{3}\right) : \left(\frac{2700+2200}{2}\right)$

= 2 × 4300 : 4900 × 3
= 86 : 147

91. (4) Required ratio = 3 : 2

92. (3) Required answer

$= \frac{2700}{1500} = \frac{9}{5} = 1.8$

93. (1) Required average price

$= \frac{1}{2}(33 \times 120 + 33 \times 120)$

$= \frac{1}{2} \times 120 \times 66 =$ ₹ 3960

94. (2) Required cost of wheat
= 36 × 156 = ₹ 5616

95. (2) Required number of students in 2002
= 15 + 60 + 120 = 195

96. (2) Required % increase

$= \frac{120-120}{120} \times 100 = 0$

97. (1) Number of students :
Year 2000 ⇒ 20 + 50 + 90 = 160
Year 2001 ⇒ 30 + 60+110= 200
Year 2002 ⇒ 195
Year 2003 ⇒ 170

98. (3) Required ratio = 50 : 160
= 5 : 16

99. (4) It is obvious from the graph.
Minimum sales in 1989
= 60 lakh bottles.

100. (1) Average annual sales during 1988 – 1993 :
cool sip ⇒

$\left(\frac{25+6+19+15+25+30}{6}\right)$

$= \frac{120}{6} = 20$ lakh bottles

Pep – up ⇒

$\left(\frac{30+35+30+25+20+20}{6}\right)$

$= \frac{160}{6} = 26\frac{2}{3}$ lakh bottles.

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101. (2) Sales of Pep – up :
Year 1989 ⇒ 35 lakh bottles
Year 1990 ⇒ 30 lakh bottles
∴ Required percent

$$= \frac{35-30}{35} \times 100$$

$$= \frac{100}{7} \approx 14\ \%$$

102. (*) Sales of Cool – sip in 1989 = 6 lakh bottles
Sales in 1990 = 19 lakh bottles
Required percent

$$= \frac{19-6}{6} \times 100$$

$$= \frac{1300}{6} \approx 217$$

103. (2) Sales of Dew - drop in 1992 = 30 lakh bottles.

104. (4) Average annual sales of Dew - drop

$$= \left(\frac{10+15+25+15+30+25}{6}\right)$$

$$= \frac{120}{6} = 20 \text{ lakh bottles.}$$

Average annual sales of Cool - sip = 20 lakh bottles.

105. (1) Profit of company during 2007 = 45 – 40 = ₹ 5 crore
Profit of company during 2008 = 60 – 50 = ₹10 crore
Difference = 10 – 5 = ₹ 5 crore

106. (3) Average expenditure of company

$$= ₹\ \frac{1}{5}\ (25+40+40+50+55) \text{ crore}$$

$$= \frac{210}{5} = ₹\ 42 \text{ crore}$$

Required answer
⇒ Year 2008 and 2009

107. (3) Required percentage increase

$$= \frac{(60-45)}{45} \times 100$$

$$= \frac{100}{3} = 33\frac{1}{3}\%$$

108. (2) Total income of company
= ₹ (35 + 50 + 45 + 60 + 60) crore
= ₹ 250 crore
Total expenditure of company
= ₹ 210 crore
Required ratio = 250 : 210
= 25 : 21

109. (3) Number of wrist watches sold in 2010 = 28.7 lakhs
Number of table clocks sold in 2010 = 22.3 lakhs
∴ Required per cent

$$= \left(\frac{28.7-22.3}{22.3}\right) \times 100$$

$$= \frac{6.4}{22.3} \times 100 \approx 28.7\%$$

110. (4) Required ratio = 3.5 : 9.5
= 7 : 19

111. (2) Required per cent

$$= \frac{30.7-9.5}{30.7} \times 100$$

$$= \frac{21.2 \times 100}{30.7} = 69.05\%$$

112. (4) Here, decrease is evident from bar diagram.
Wrist watches : 21.3 ⇒ 28.7 lakhs
Table clocks 9.5 ⇒ 22.3 lakhs
Wall clocks 30.7 ⇒ 32.7 lakhs

113. (1) Percentage increase in the sales of table clocks

$$= \frac{(22.3-9.5)}{9.5} \times 100$$

$$= \frac{12.8}{9.5} \times 100 \approx 135$$

114. (4) More demand than production in companies A, C and E
Less demand than production in companies B and D
= B
Required ratio = 3 : 2

115. (3) Required difference

$$= \left(\frac{3300+1200+3000+600+2500}{5}\right)$$

$$- \left(\frac{2200+2700+1500+1800+1000}{5}\right)$$

= 2120 – 1840 = 280

116. (2) Required percentage

$$= \frac{600}{2500} \times 100 = 24$$

117. (2) Required ratio = 900 : 2250
= 2 : 5

118. (1) Ratio of demand and production :

$$\text{Company E} \Rightarrow \frac{2500}{1000} = 2.5$$

$$\text{Company C} \Rightarrow \frac{3000}{1500} = 2$$

$$\text{Company A} \Rightarrow \frac{3300}{2200} = 1.5$$

119. (2) Required answer

$$= \frac{9}{12} = \frac{3}{4}$$

= 0.75

120. (3) Total production of state B
= 12 + 18 + 18 = 48 lakh bales
Total production of state A
= 6 + 14 + 21
= 41 lakh bales

121. (4) Average production in 1992-93

$$= \frac{6+12+5+9+8}{5}$$

$$= \frac{40}{5} = 8 \text{ lakh bales}$$

Average production in 1993-94

$$= \frac{14+18+9+9+14}{5}$$

$$= \frac{64}{5} = 12.8 \text{ lakh bales}$$

Required answer ⇒ state A

122. (2) Required average production

$$= \frac{21+18+15+12+7}{5}$$

$$= \frac{73}{5} = 14.6 \text{ lakh bales}$$

123. (2) Percentage increase in Maths is maximum.

124. (3) Percentage increase

$$= \left(\frac{265-248}{248}\right) \times 100$$

$$= \frac{1700}{248} = 6.85\%$$

125. (2) Required percentage increase

$$= \frac{(2580-2170) \times 100}{2170}$$

$$= \frac{41000}{2170} = 18.89\%$$

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126. (1) Required percentage increase

$$= \frac{(1454-1240)\times 100}{1240}$$

$$= \frac{21400}{1240} = 17.26\%$$

127. (3) Required percentage increase

$$= \frac{(2230-1870)}{1870}\times 100$$

$$= \frac{36000}{1870} = 19.25\%$$

128. (4) Total sale of branches B1, B3 and B5 together for both the years = (80 + 105 + 95 +110 + 75 + 95) thousands
= 560 thousands

129. (4) Required ratio = (75 + 65) : (85 + 95)
= 140 : 180 = 7 : 9

130. (1) Average sale of branches B1, B2 and B3 in 2001

$$= \frac{105+65+110}{3}$$

$$= \frac{280}{3} \text{ thousand}$$

Average sale of branches B1, B3 and B6 in 2000

$$= \left(\frac{80+95+70}{3}\right) \text{Thousand}$$

$$= \frac{245}{3} \text{ Thousand}$$

∴ Required percentage

$$= \frac{\frac{245}{3}}{\frac{280}{3}}\times 100$$

$$= \frac{24500}{280} = 87.5\%$$

131. (1) Required percentage

$$= \frac{(110-65)}{65} \times 100$$

$$= \frac{45\times 100}{65} = 69.2\ \%$$

132. (1) Girls in Biology = 300
Girls in all other departments
= 140 + 180 + 260 + 220 = 800
∴ Required percentage

$$= \frac{300}{800}\times 100$$

$$= \frac{75}{2} = 37\frac{1}{2}\%$$

133. (4) Total number of boys
= 60 + 220 + 100 + 160 + 120
= 660
Total number of girls = 1100
Required difference
= 1100 – 660 = 440

134. (2) Average number of boys

$$= \frac{660}{5} = 132$$

135. (3) Boys in Biology = 220
∴ Required percentage

$$= \frac{220}{660}\times 100 = \frac{100}{3} = 33\frac{1}{3}\%$$

136. (1) Required ratio = 140 : 220
= 7 : 11

137. (1) From class IX 75 students participated in exhibition.

138. (3) Average number of students participating in cultural events

$$= \frac{60+45+45+30}{4}$$

$$= \frac{180}{4} = 45$$

139. (2) Average number of students Participating in exhibition

$$= \frac{45+30+60+75}{4} = \frac{210}{4}$$

= 52.5

140. (1) Required ratio
= 75 : (75 + 30)
= 75 : 105
= 5 : 7

141. (2) Total number of participants in cultural events = 180
Students of class VIII = 45
Required percentage

$$= \frac{45}{180} \times 100 = 25\%$$

142. (2) Required ratio
= (100 + 160) : (180 + 60)
= 260 : 240 = 13 : 12

143. (3) Boys who use smart phones
= 100 + 160 + 240 + 40 = 540
∴ Required percentage

$$= \frac{100}{540}\times 100$$

= 18.52%

144. (4) Girls who use smart phones
= 180 + 60 + 120 + 20 = 380
∴ Required percentage

$$= \frac{120}{380}\times 100$$

= 31.58%

145. (3) Required difference
= (240 + 120) – (100 + 180)
= 360 – 280 = 80

146. (2) Profit of company :
Year 2006 ⇒ 60 – 35
= Rs. 25 crore
Year 2007 ⇒ 50 – 40
= Rs. 10 crore
Difference = 25 – 10
= Rs. 15 crore

147. (3) Average income of company

$$= \text{Rs.} \left(\frac{40+60+50+65+70}{5}\right) \text{crore}$$

$$= \frac{285}{5} = \text{Rs. 57 crore}$$

Required years ⇒ 2005 and 2007

148. (2) Required percent increase

$$= \frac{50-40}{40} \times 100$$

$$= \frac{100}{4} = 25\%$$

149. (3) **Profit of company :**
Year 2005 ⇒ 40 – 30
= Rs. 10 crore
Year 2006 ⇒ Rs. 25 crore
Year 2007 ⇒ 10 crore
Year 2008 ⇒ 65 – 50
= Rs. 15
Year 2009 ⇒ 70 – 60
= Rs. 10 crore

150. (1) Required ratio
= (75 + 65) : (85 + 95)
= 140 : 180 = 7 : 9

151. (2) Total sales of branch B 6 for both the years
= 70 + 80 = 150 thousand
Total sales of branch B 3 for both the years
= 95 + 110 = 205 thousand

$$\therefore\ 205 \times \frac{x}{100} = 150$$

$$\Rightarrow x = \frac{150\times 100}{205} = 73.17\%$$

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152. (2) Total sales of branches B1, B2 and B3 in 2010 = 105 + 65 + 110 = 280 thousand
Total sales of branches B1, B3 and B6 in 2009 = 80 + 95 + 70 = 245 thousand

$$\therefore \frac{280}{3} \times \frac{x}{100} = \frac{245}{3}$$

$$\Rightarrow x = \frac{245 \times 100}{280} = 87.5\%$$

153. (3) Average sales of all the branches in 2009 = $\frac{1}{6}$ (80 + 75 + 95 + 85 + 75 + 70) thousand

$$= \frac{1}{6} \times 480 = 80 \text{ thousand}$$

154. (4) Total sales of branches B1, B3 and B5 for both the years
= (80+105 + 95 + 110 + 75 + 95) thousand
= 560 thousand

155. (3) Required ratio = 100 : 70 = 10 : 7

156. (4) Required average

$$= \frac{80+80+75+65+60}{5}$$

$$= \frac{360}{5} = 72$$

157. (1) Total number of all products produced in 2006 and 2008 together
= (10 + 7.5 + 15 + 25 + 30 + 20) × 1000
= 107.5 × 1000 = 107500

158. (3) Average number of pen drives

$$= \frac{1}{5} (15 + 7.5 + 15 + 30 + 17.5) \times 1000$$

$$= \frac{85000}{5} = 17000$$

159. (4) Required difference
= (25 + 30 − 15) × 100
= 40000

160. (3) Required ratio
= 15 : 30 : 20
= 3 : 6 : 4

161. (1) Required ratio = 22.5 : 25
= 225 : 250
= 9 : 10

162. (*) Value per lakh bags :

Year 2000 $\Rightarrow \frac{500}{200}$ = Rs. 2.5 crore

Year 2001 $\Rightarrow \frac{120}{50}$ = Rs. 2.4 crore

Percentage decrease

$$= \frac{2.5-2.4}{2.5} \times 100 = 4\%$$

163. (1) Required difference
= (200 − 100) lakhs
= 100 lakhs
= 10000000

164. (3) Value per lakh bags

Year 2001 $\Rightarrow \frac{120}{50}$ = Rs. 2.4 crores

Year 1999 $\Rightarrow \frac{150}{100}$ = Rs. 1.5 crores

Year 1996 $\Rightarrow \frac{150}{120}$ = Rs. 1.25 crores

Year 1997 $\Rightarrow \frac{260}{130}$ = Rs. 2 crores

165. (*) Percentage increase

$$= \frac{150-130}{130} \times 100$$

$$= \frac{200}{13} = 15.4\%$$

166. (3) Total production of electronic items :

Year 2009 ⇒ 6000 + 7000 = 13000
Year 2010 ⇒ 9000 + 9400 = 18400
Year 2011 ⇒ 13000 + 9000

$$= \boxed{22000}$$

year 2012 ⇒ 11000 + 10000 = 21000
Year 2013 ⇒ 8000 + 12000 = 20000

167. (1) Required Ratio
= 9000 : 12000 = 3 : 4

168. (4) Average production of T.V. from 2009 to 2012

$$= \frac{6000+9000+13000+11000}{4}$$

$$= \frac{39000}{4} = 9750$$

Average production of LCD from 2009 to 2012

$$= \frac{7000+9400+9000+10000}{4}$$

$$= \frac{35400}{4} = 8850$$

Required difference
= 9750 − 8850 = 900

169. (3) Required ratio
= 6000 : 9000 = 2 : 3

170. (1) Required average runs

$$= \frac{60+80}{2} = \frac{140}{2} = 70$$

The required cricketer is M.S. Dhoni.

171. (4) The required cricketer is Cheteshwar Pujara.
∴ Required average runs

$$= \frac{70+10}{2} = \frac{80}{2} = 40$$

172. (2) Required total score
= 60 + 50 + 70 + 30 = 210

173. (1) Required average score

$$= \frac{80+50+10+20}{4} = \frac{160}{4}$$

= 40

174. (3) Average units consumption in 2012

$$= \frac{600+700+400+300+200}{5}$$

$$= \frac{2200}{5} = 440 \text{ units}$$

Required months ⇒ July, August

175. (*) Average units consumption in the year 2013

$$= \frac{550+500+400+350+500}{5}$$

$$= \frac{2300}{5} = 460 \text{ units.}$$

176. (4) In the month of November,
Difference = 500 − 200 = 300 units
In the month of August,
Difference = 700 − 500 = 200 units.

177. (*) Total consumption in 2012 = 2200 units
Total consumption in 2013 = 2300 units
Percentage increase

$$= \left(\frac{2300-2200}{2200}\right) \times 100$$

$$= \frac{100}{22} = \frac{50}{11} = 4.5\%$$

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178. (2) Percentage increase

Year 2010 $\Rightarrow \frac{70-64}{64} \times 100$

$= 9.4$

Year 2011

$\Rightarrow \frac{77-70}{70} \times 100 = 10$

Year 2012 $\Rightarrow \frac{85-77}{77} \times 100$

$= 10.4$

179. (1) Required average production

$= \left(\frac{72+90+100}{3}\right)$ thousands

$= \frac{262}{3} = 87.33$ thousands

180. (2) Required average

$= \left(\frac{70+77+85+93}{4}\right)$ thousands

$= \frac{325}{4} = 81.25$ thousands

181. (3) Required ratio

$= \left(\frac{64+70}{2}\right) : \left(\frac{72+80}{2}\right)$

$= 67 : 76$

182. (*) Total income

= Rs. (35 + 50 + 40 + 40 + 50) crores = Rs. 215 crores

Total expenditure

= Rs. (45 + 40 + 45 + 30 + 45) crores

= Rs. 205 crores

$\therefore$ Profit percent

$= \left(\frac{\text{Income} - \text{Expenditure}}{\text{Expenditure}}\right) \times 100$

$= \frac{215-205}{205} \times 100$

$= \frac{1000}{205} = 4.88\%$

183. (*) Income of company Q in 2000

$= \frac{100}{110} \times 40 = \text{Rs. } \frac{400}{11}$ crores

If expenditure in 2000 be Rs. x crores,

Profit% =

$\left(\frac{\text{Income} - \text{Expenditure}}{\text{Expenditure}}\right) \times 100$

$= \frac{\frac{400}{11} - x}{x} \times 100$

$\Rightarrow \frac{20}{100} = \frac{1}{5} = \frac{400-11x}{11x}$

$\Rightarrow 5 \times 400 - 55x = 11x$

$\Rightarrow 66x = 2000$

$\Rightarrow x = \frac{2000}{66}$

= Rs. 30.30 crores

184. (1) It is obvious from bar diagram.

Profit percent of company Q.

$= \frac{40-30}{30} \times 100$

$= \frac{100}{3} = 33\frac{1}{3}\%$

185. (1) Total income of companies M and N

= Rs. (35 + 50) crores

= Rs. 85 crores

Total expenditure

= Rs. (45 + 40) crores

= Rs. 85 crores

186. (*) Expenditure of company R in 2000

$= \frac{45 \times 100}{120} = \text{Rs. } 37.5$ crores

Let the income of company in 2000 be Rs. x crores.

$\therefore 10 = \frac{x-37.5}{37.5} \times 100$

$\Rightarrow x - 37.5 = \frac{37.5 \times 10}{100} = 3.75$

$\Rightarrow x = 37.5 + 3.75$

= Rs. 41.25 crores

187. (2) Difference between demand and production of company A = 3000 – 1500 = 1500

Difference between production and demand of company D

= 2700 – 1200 = 1500

188. (1) According to the question,

$\frac{2500 \times x}{100} = 600$

$\Rightarrow 25x = 600$

$\Rightarrow x = \frac{600}{25} = 24$

189. (4)

$h = \frac{\text{Production of company D}}{\text{Production of company A}}$

$= \frac{2700}{1500} = \frac{9}{5} = 1.8$

190. (2) Total production = 1500 + 1800 + 1000 + 2700 + 2200

= 9200

Total demand = 3000 + 600 + 2500 + 1200 + 3300 = 10600

Required difference

$= \frac{1}{5}(10600 - 9200)$

$= \frac{1}{5} \times 1400 = 280$

191. (3) Required ratio = 3 : 2

192. (2) Percentage of production of company Z to that of company Y :

Year 1998 $\Rightarrow \frac{45}{35} \times 100$

$\approx 129\%$

Year 1996 $\Rightarrow \frac{35}{25} \times 100$

$= 140\%$

193. (2) Average production during 1998 – 2000 :

Company X

$\Rightarrow \left(\frac{25+50+40}{3}\right)$ lakh tonnes

$= \frac{115}{3}$ lakh tonnes

Company Y

$\Rightarrow \left(\frac{35+40+50}{3}\right)$ lakh tonnes

$= \frac{125}{3}$ lakh tonnes

Required ratio = $\frac{115}{3} : \frac{125}{3}$

= 23 : 25

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194. (1) Average production for 5 years :

Company X

$\Rightarrow\left(\frac{30+45+25+50+40}{5}\right)$ lakh tonnes

$\Rightarrow \frac{190}{5}$ = 38 lakh tonnes

Company Y

$\Rightarrow\left(\frac{25+35+35+40+50}{5}\right)$ lakh tonnes

$= \frac{185}{5} \approx 37$ lakh tonnes

Company Z

$\Rightarrow \left(\frac{35+40+45+35+35}{5}\right)$ lakh tonnes

$= \frac{190}{5}$ = 38 lakh tonnes

195. (1) Required percentage increase

$= \left(\frac{40-25}{25}\times 100\right)$

$= \frac{15\times 100}{25} = 60\%$

196. (4) Required difference = (45 – 25) lakh tonnes = 2000000 tonnes

TYPE-VI

1. (4) Required number of students = 4 + 7 + 5 = 16

2. (3) Number of failures = 2 + 6 + 10 = 18

3. (2) Number of successful students = 45 – 18 = 27

∴ Required percentage

$= \frac{27}{45}\times 100 = 60\%$

4. (1) It is obvious from the histogram.

5. (1) Bar of class interval 30–40

6. (3) Required number of persons = 450 + 250 + 150 + 75 + 50 + 25 = 1000

7. (2) Required answer = 250 + 150 = 400

8. (3) Required ratio = 250 : 75 = 10 : 3

9. (2) Age group 15 – 20 → 450

$\Rightarrow \frac{450}{500} = \frac{9}{10}$

10. (4) Required percentage

$= \frac{25}{500}\times 100 = 5\%$

11. (3) Total number of workers = 3 + 8 + 5 + 4 + 9 + 8 + 6 + 7 = 50

12. (1) Required ratio = 3 : 7

13. (2) Required amount = 3000 + 8800 + 6000 + 5200 + 12600 + 12000 + 9600 + 11900 + 50 × 50 = ₹ 71600

14. (1) Wage group – 1400 – 1500

Amount = 1450 × 9 = ₹ 13050

15. (3) Number of students = 2 + 8 = 10

16. (3) Students obtaining above 60 = 35

∴ Required percentage

$= \frac{35}{50}\times 100 = 70\%$

17. (1) Required number of students = 4 + 6 + 10 + 8 + 5 = 33

18. (2) Students in class interval 20 – 30 = 10

19. (4) Required class interval = 0 – 10

20. (3) Required ratio = 4 : 5

21. (1) Required percentage increase

$= \frac{1000-400}{400}\times 100$

$= \frac{600}{4} = 150\%$

22. (1) Required percentage decrease

$= \frac{900-800}{900}\times 100$

$= \frac{100}{9} = 11\frac{1}{9}\%$

23. (1) Percentage increase ;

Year 2007 – 2008

$\Rightarrow \frac{200}{1000}\times 100 = 20\%$ (lowest)

Year 2006 – 2007

$\Rightarrow \frac{200}{800}\times 100 = 25\%$

24. (4) Required percentage increase

$= \frac{1200-600}{600}\times 100 = 100\%$

25. (3) Required average

$= \frac{100+220+300+200+250}{5}$

$= \frac{1070}{5} = 214$

26. (3) Number of families = 15 + 10 + 40 + 5 + 20 + 30 + 15 + 10 + 40 + 15 = 200

27. (2) Required number of families = 40 + 15 = 55

28. (1) Required number of families = 15 + 10 = 25

29. (4) Required answer = 55

30. (2) Required percentage

$= \frac{90}{200}\times 100 = 45\%$

31. (3) Required number of students = 25 + 7 + 4 + 2 = 38

32. (3) Required number of students = 6 + 8 = 14

33. (2) Number of students in 150 – 160 class interval = 25

34. (2) Required answer = 4 patients

35. (4) Required answer = 4 + 3 + 2 + 1 = 10

36. (1) Required answer = 8 + 7 + 5 = 20

37. (3) Total number of patients = 1 + 4 + 8 + 7 + 5 + 4 + 3 + 2 + 1 = 35

Patients of age less than 45 years = 1 + 4 + 8 = 13

Required percent

$= \frac{13}{35}\times 100 \approx 37\ \%$

38. (4) 11% of 35 = $\frac{35\times 11}{100}$

= 3.85 ≈ 4

Patients between 35 years and 40 years = 4

Patients between 55 years and 60 years = 4

39. (3) Number of workers who earn more than Rs. 950 = 10 + 5 + 3 + 3 + 5 = 26

40. (1) Number of workers who earn less than Rs. 950 = 3 + 2 + 4 + 9 + 5 = 23

41. (3) Total number of workers surveyed = 26 + 23 = 49

42. (1) Required number of workers = 5 + 10 = 15

43. (2) Number of workers who earn between Rs. 950 to Rs.960 = 10

Required percentage

$= \frac{10}{49}\times 100 = 20.4\%$

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TYPE-VII

1. (3) 15 per cent = 24000

$\therefore$ 85 per cent = $\frac{85 \times 24000}{15}$

= 136000

2. (4) According to table T

3. (2) According to table Q

4. (4) According to table T

5. (3) According to table 452500

6. (3) Average = $\frac{476}{6} = 79.33 \approx 80$

Which is equal to total production of all types of cars in 1993.

7. (4)

Year→	1989	1990	1991	1992	1993	1994
P+Q	24	30	30	29	33	20
R+S	25	23	26	31	33	39

Therefore, the required answer is year 1993, which is none of the above.

8. (4) From visual inspection of table it is clear that the continuous increase in production is obtained from S type of car.

9. (1) According to question,

25% of 80 = $\frac{25 \times 80}{100}$

= 20 i.e. Equal to S type of car in 1993.

10. (2) Required answer

= $\frac{(90-75)}{75} \times 100 = 20\%$

11. (4) The number of children in 1988 = 146947 – (65104 + 60387)
= 146947 – 125491 = 21456

12. (2) The total population in 1989 = population in 1988 + increase
= 146947 + 11630 = 158577

13. (1) Number of children in 1989 = Total population in 1989 – Total population of men and women
= 158577 – (70391 + 62516)
= 25670

14. (1) Number of women in 1991 = Total population in 1991 – total population of men and children in 1991
= (153922 – 5337) – (69395 + 21560) = 57630

15. (2) Total population in 1992 = 160998
Total population in 1991
= 153922 – 5337 = 148585
$\therefore$ Increase in population in 1992 over 1991
= 160998 – 148585
= 12413

16. (1) Average number of scooters produced per year (in thousands)

= $\frac{115+108+149+102+101}{5}$

= $\frac{575}{5} = 115$

Clearly, it was in the year 1985.

17. (3) Company Q produced 20 thousands scooters in 1988 and 15 thousands in 1989. Clearly, a decrease of 25%.
Similar is the case with company R also.

18. (2) Required ratio = $\frac{20}{40}$

= 1 : 2

19. (3) It was maximum in the year 1987.

20. (2) Total production of scooters during 1985 - 1989 in thousands.
= 115 + 108 + 149 + 102 + 101
= 575
Now, 20% of 575

= $\frac{20 \times 575}{100} = 115$

It was in the year 1985.

21. (1) The difference between the total sales and the gross profit is the least in the year 1990.

22. (4) Total sales in 1993
= ₹ 439.7 lakhs
Total sales in 1990
= ₹ 351.6 lakhs
$\therefore$ Required percentage

= $\frac{439.7}{351.6} \times 100$

= $\frac{440}{350} \times 100 \approx 125\%$

23. (1) It is obvious from the table.

24. (4) Percentage increase in the year,

1992 → $\frac{(149.9-134.3)}{134.3} \times 100$

= $\frac{15.6 \times 100}{134.3} = 11.6\%$

1993 → $\frac{(160.5-149.9)}{149.9} \times 100$

= $\frac{10.6 \times 100}{149.9} = 7\%$

1994 → $\frac{(203.3-160.5)}{160.5} \times 100$

= $\frac{42.8 \times 100}{160.5} = 26.6\%$

Note : It is not necessary to calculate percentage increase for every year. It can be inferred easily from the data given in the table.

25. (4) Required average of marks in 1995

= $\frac{56+68+68+48}{4} = \frac{240}{4} = 60$

26. (2) Total marks
= 68×40 = 2720

27. (2) It was maximum in the year 1993.
Highest marks = 94
Average marks = 60
Difference = 94 – 60 = 34

28. (3) It was in the year 1994.
Highest marks = 66
Average marks = 58
Difference = 66 – 58 = 8

29. (2) Percentage increase in the export from :

Port A → $\frac{61-57}{57} \times 100 = 7\%$

Port B → $\frac{160-148}{148} \times 100 = 8.1\%$

Port C → $\frac{234-229}{229} \times 100 = 2.2\%$

Port D → $\frac{150-146}{146} \times 100 = 2.74\%$

Export form B is highest.

30. (1) Aggregate export in 1998
= ₹ (57 + 148 + 229 + 146) crore
= ₹ 580 crore
Aggregate export in 1999
= ₹ (61 + 160 + 234 + 150) crore
= ₹ 605 crore
Increase = ₹ (605 – 580) crore
= ₹ 25 crore
$\therefore$ Percentage increase

= $\frac{25}{580} \times 100 = 4.3\%$

31. (4) Average increase in export

= ₹ $\frac{25}{4}$ crore

= ₹ $\frac{25}{4} \times 10000000$

= ₹ 62500000

32. (3) The Percentage increase in the export of the commodity was the lowest from port C.

33. (2) $\because$ 15% = 2400

$\therefore$ 85% = $\frac{2400}{15} \times 85 = 13600$

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34. (3) It is obvious from the table.

35. (2) In city E,

$\because$ 25% = 8000

$\therefore$ 100% $= \frac{8000}{25} \times 100 = 32000$

36. (4) City A

$\Rightarrow \frac{2400}{40} \times 100 = 6000$

City D

$\Rightarrow \frac{8000 \times 100}{75} = 6000$

37. (2) Percentage increase

$= \frac{125 - 105}{105} \times 100$

$= \frac{20}{105} \times 100 = 19\%$

38. (1) Percentage decrease

$= \frac{200 - 180}{200} \times 100$

$= \frac{20}{200} \times 100 = 10\%$

39. (3) Total production of toys in 2005 = 675 thousand
Total production of toys in 2006 = 750 thousand
Percentage increase

$= \frac{750 - 675}{675} \times 100 = 11\%$

40. (2) Difference in production of toys of type B and C :
Year 2002 $\Rightarrow$ 150 – 78 = 72 thousand
Year 2003 $\Rightarrow$ 180 – 100 = 80 thousand
Year 2004 $\Rightarrow$ 175 – 92 = 83 thousand
Year 2005 $\Rightarrow$ 160 – 120 = 40 thousand
Year 2006 $\Rightarrow$ 185 – 130 = 55 thousand
$\therefore$ Required answer

$= \frac{72 + 80 + 83 + 40 + 55}{5}$

$= \frac{330}{5} = 66$ thousand

41. (2) Required percentage

$= \frac{326}{384} \times 100 = 85\%$

42. (4) Total number of students appearing in 2004
= 310 + 395 + 106 + 1180
= 1991
Required percentage

$= \frac{1180}{1991} \times 100 = 59.3\%$

43. (3) Total number of students appearing in all streams :
Year 2002 $\Rightarrow$ 2136
Year 2003 $\Rightarrow$ 2179
Year 2004 $\Rightarrow$ 1991 (minimum)
Year 2006 $\Rightarrow$ 2298

44. (2) Total number of students passing in all streams :
Year 2001
$\Rightarrow$ 289 + 246 + 69 + 1310 = 1914
Year 2004
$\Rightarrow$ 246 + 298 + 92 + 1074 = 1710
Year 2005
$\Rightarrow$ 382 + 382 + 74 + 1326 = 2164 (maximum)
Year 2006
$\Rightarrow$ 286 + 405 + 63 + 1207 = 1961

45. (2) Percentage decrease

$= \frac{234 - 228}{234} \times 100$

$= \frac{600}{234} = 2.56\%$

46. (3) It is obvious from the table.

47. (1) It is obvious from the table.

48. (1) Percentage increase

$= \frac{860 - 680}{680} \times 100$

$= \frac{180}{680} \times 100 = 26.47\%$

49. (1) Science + Commerce Students = (29 + 31)% = 60%
Students who neither have commerce nor science

$= 200 \times \frac{40}{100} = 80$

50. (2) Average production of whole duration $= \frac{476}{6} = 79$, which is total production in 2000.

51. (2) Number of people who read only English Newspapers
= 123 + 206 + 325 = 654

52. (4) Total number of people surveyed = 608 + 586 + 742 = 1936

53. (3) Per cent increase

$= \frac{380 - 320}{320} \times 100 = 18.75\%$

54. (2) Total production :
Wheat $\Rightarrow$ 3700 million tonnes
Rice $\Rightarrow$ 2000 million tonnes
Barley $\Rightarrow$ 1800 million tonnes
Other cereals $\Rightarrow$ 2400 million tonnes

$\therefore x = \frac{3700}{9900} \times 100 = 37.4$

55. (1) Perecentage increase in

Rice $= \frac{160}{400} \times 100 = 40\%$

Cereals $= \frac{190}{500} \times 100 = 38\%$

56. (4) Required difference

$= \frac{2000}{5} - \frac{1800}{5} = 400 - 360$

= 40 million tonnes

57. (3) B's average speed

$= \left(\frac{25 + 40 + 35 + 25}{4}\right)$ kmph

= 31.25 kmph

58. (2) Required ratio of average speed

$= \frac{20 + 30 + 20 + 15 + 25}{5} : \frac{15 + 25 + 35 + 20 + 30}{5}$

= 110 : 125 = 22 : 25 km

59. (2) Required distance
= (25 + 40 + 35 + 25 + 35 + 10 + 25 + 15) – (20 + 30 + 20 + 15 + 25 + 15 + 25 + 35) = 210 – 185
= 25 km

60. (4) Distance after 2 hours
= 65 – 50 = 15 km
Distance after 3 hours
= 100 – 70 = 30 km
Distance after 4 hours
= 125 – 85 = 40 km
Distance after 5 hours
=160 – 110 = 50 km (maximum distance)

61. (4) Required percentage

$= \frac{60}{15} \times 100 = 400\%$

62. (3)

School A $\Rightarrow \frac{120}{270} \times 100 = 44\%$

School B $\Rightarrow \frac{60}{150} \times 100 = 40\%$

School C $\Rightarrow \frac{210}{450} \times 100 = 47\%$ (highest income %)

School D $\Rightarrow \frac{90}{210} \times 100 = 43\%$

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63. (2) School A $\Rightarrow 120 > 4 \times 24$
School B $\Rightarrow 60 > 12 \times 4$
School C $\Rightarrow 210 > 45 \times 4$
School D $\Rightarrow 90 < 24 \times 4$
School E $\Rightarrow 120 = 30 \times 4$

64. (1) School B $\Rightarrow \frac{54}{60} = 0.9$

School C $\Rightarrow \frac{120}{210} \approx 0.57$

School D $\Rightarrow \frac{42}{90} \approx 0.47$

School E $\Rightarrow \frac{55}{120} = 0.46$

(lowest income ratio)

65. (2) Total grain production of state
P = 45 + 103 + 27 + 29
= 240 lakh tonnes
Q = 48 + 86 + 73 + 19 + 15
= 241 lakh tonnes
R = 59 + 32 + 67 + 14 + 31
= 203 lakh tonnes
S = 41 + 37 + 59 + 21 + 15
= 173 lakh tonnes
Obviously, State Q had the highest grain production.

66. (3) Total rice Production
= 45 + 48 + 59 + 41 + 37 + 68 + 57 + 38 = 393 lakh tonnes
Total wheat production = 103 + 86 + 32 + 37 + 22 + 15 + 8 + 28
= 331 lakh tonnes
∴ Required ratio
= 393 : 331 = 1.2 : 1

67. (1) In the states Q, R and S Jowar recorded highest production (Here state Q in second highest)

68. (4) Required percentage

$= \frac{103}{331} \times 100 = 31\% = 30\%$

69. (3) Average per hectare yield of rice = 30 tonnes
Total rice production
= 393 lakh tonnes
∴ Required area

$= \frac{393}{30}$ lakh hectares

= 13.1 = 13 lakh hectares

70. (2) Average loan

$= \frac{87+104+113+120}{4}$

$= \frac{424}{4} =$ ₹ 106 crore

Required year = 1996

71. (2) Required percentage

$= \frac{120-113}{113} \times 100$

$= \frac{7}{113} \times 100 = \frac{700}{113} = 6\frac{22}{113}\%$

72. (4)

year	A + B	C + D
	(₹ in crores)	(₹ in cr
1995	45	52
1996	56	48
1997	63	50
1998	71	49

73. (4) 13 < 19 < 28 < 32

74. (2) 30% of 120 = $120 \times \frac{30}{100}$

= ₹ 36
∴ Loans disbursed by Bank B in 1998 is 30% more than the loans disbursed by all banks.

75. (1) From the table it is clear that age group up to 15 years accounts for maximum population, as its share is 30 per cent. But out of the given options, the age group (16 – 25) years accounts for maximum population.

76. (1) Below 26 years, the percent of population is (30 + 17.75)
= 47.75
∴ The required answer
= 47.75% of 4200

$= \frac{47.75 \times 4200}{100}$

= 2005.5 ≈ 2006

77. (2) Below 36 years, the percent of population is (30 + 17.75 + 17.25) = 65%
∴ The required number of people = $\frac{200 \times 5.12}{65}$ millions

= 15.75 millions

78. (2) Per cent of population in the age group 56 years and above
= 5.12 + 1.13 = 6.25
Now, 6.25% of population
= 10 millions
∴ Total Population

$= \frac{10 \times 100}{6.25}$ millions

= 160 millions
Difference in per cent of people in the age groups (16 – 25) and (46 – 55)
= 17.75 – 14.25 = 3.5%
∴ The required difference
= 3.5% of 160 millions

$= \frac{3.5 \times 160}{100}$ millions

= 5.6 millions

79. (2) Difference in per cent of people in the age groups (46 – 55) and (26 – 35)
= 17.25 – 14.25 = 3%
Now, 3% of total Population
= 11.75 million
∴ Total Population

$\frac{11.75 \times 100}{3}$

= 391.67 millions (approx.)

80. (2) Candidates qualified under arts discipline in 2010

$= \frac{900 \times 19}{100} = 171$

$= \frac{850 \times 18}{100} = 153$

Difference = 171 – 153 = 18

81. (1) Candidates qualified under science discipline in

Year 2006 $\Rightarrow \frac{780 \times 40}{100} = 312$

Year 2007 $\Rightarrow \frac{650 \times 42}{100} = 273$

Year 2008 $\Rightarrow \frac{500 \times 45}{100} = 225$

Year 2009 $\Rightarrow \frac{45 \times 620}{100} = 279$

Year 2010 $\Rightarrow \frac{35 \times 900}{100} = 315$

Year 2011 $\Rightarrow \frac{42 \times 850}{100} = 357$

Required average difference

$= \frac{1}{3}[(279 + 315 + 357) - (312 + 273 + 225)] = \frac{1}{3}(951 - 810)$

$= \frac{1}{3} \times 141 = 47$

82. (1)

Height	No. of girls
135-140	04
140-145	07
145-150	18
150-155	11
155-160	06
160-165	05

Required answer
= 11 + 6 + 5 = 22

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83. (2) Class interval (155 – 160) = 6 girls

$$\text{Mid-value} = \frac{155+160}{2} = 157.5$$

Class interval (160 – 165) = 5 girls

$$\text{Mid value} = \frac{160+165}{2} = 162.5$$

∴ Required average

$$= \frac{6\times157.5+5\times162.5}{11}$$

$$= \frac{945+812.5}{11} = \frac{1757.5}{11}$$

= 159.8 cm

84. (1) Percentage of people below 36 years = 55%
i.e. (20 + 18.25 + 16.75)%
∵ 55% ≡ 22 million

$$\therefore\ 12.50\% \equiv \frac{22}{55}\times 12.50$$

= 5 millions

85. (2) Difference = 0.975 million
⇒ (18.25 – 15)% ≡ 0.975 million

$$\therefore\ 100\% \equiv \frac{0.975}{3.25}\times 100$$

≡ 30 millions

86. (3) People in southern zone
= 1450 + 1120 + 420 + 350 + 50
= 3390
People who take coffee at least once a day = 1450 + 1120
= 2570
Required percentage

$$= \frac{2570}{3390}\times 100$$

= 75.81

87. (4) Total people in north zone = 4840
Total people in south zone = 3390
Total people in east zone = 2820
Total population = 4840 + 3390 + 2820 = 11050
People who take coffee only once a week in these zones
= 620 + 540 + 350 = 1510
Required per cent

$$= \frac{1510}{11050}\times 100 = 14$$

88. (2) Number of people who take coffee more than 3 times a day = 410 + 310 + 700 + 1450 = 2870
Total number of people who do not take coffee at all
= 950 + 430 + 620 + 50 = 2050
Required ratio = 2870 : 2050
= 1.4 : 1 = 14 : 10
= 7 : 5

89. (3) Required ratio = 1250 : 100
= 25 : 4

90. (3) School B

91. (4) Required answer = 675

92. (4) Production of all types of scooters was the lowest in June. It was 90.

93. (1) Production of equal number of all types of scooters was 25 each in January.

94. (3) Total number of scooters produced = 100 + 105 + 108 + 110 + 110 + 90 = 623

95. (2) Total production :
April ⇒ 110
May ⇒ 110

Calculations (89-91) :

Students	No. of students scoring marks less than 50%	No. of students scoring marks more than 50%	No. of students who score 50% marks
School A	240	$600\times\frac{55}{100} = 330$	600 – 330 – 240 = 600 – 570 = 30
School B	220	$\frac{400\times40}{100} = 160$	400 – 220 – 160 = 400 – 380 = 20
School C	300	$\frac{375\times20}{100} = 75$	375 – 300 – 75 = 0
School D	280	$\frac{350\times10}{100} = 35$	350 – 280 – 35 = 350 – 315 = 35
School E	210	$\frac{300\times25}{100} = 75$	300 – 210 – 75 = 15
Sum	1250	675	100

TYPE-VIII

1. (4) Required average

$$= \frac{110+138+156}{3}$$

$$= \frac{404}{3} = 134.67$$

2. (3) Required percentage increase

$$= \left(\frac{170-110}{110}\right)\times 100$$

$$= \frac{600}{11} = 54.5\%$$

3. (3) Required percentage decrease

$$= \left(\frac{170-156}{170}\right)\times 100$$

$$= \frac{140}{17} = 8.24\%$$

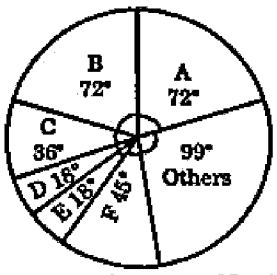
4. (1) IQ score ⇒ 130 – 140 ⇒ 2
IQ score of 140
⇒ undeterminable

5. (2) Number of students whose IQ score is 100 and more
= 16 + 13 + 4 + 2 = 35

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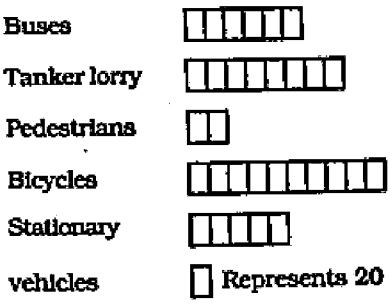
TEST YOURSELF

Directions (1–5) : The following Pie Chart shows the export of different foodgrains from India in 2010. Study the chart and answer the questions :



1. Of the total export of foodgrains, the percentage of crop B exported is
   (1) 15% (2) 20%
   (3) 18% (4) 10%
2. If a total of 1.5 million quintals of crop F was exported, the amount of total foodgrains exported (in million) quintals was
   (1) 8.7 (2) 12
   (3) 10.8 (4) 9.6
3. The three crops which combine to contribute to exactly 50% of the total export of foodgrains are
   (1) A, F and others
   (2) B, C and F
   (3) A, B and C
   (4) C, F and others
4. If a total of 1.5 million quintals of crop F was exported, then the total quantity of D and E that was exported (in million quintals) was
   (1) 1.2 (2) 1.5
   (3) 4.5 (4) 6.5
5. If the revenue from 1 quintal of crop A is thrice that from 1 quintal of crop C, then the ratio of the total revenues of A and C is
   (1) 1 : 6 (2) 2 : 3
   (3) 3 : 2 (4) 6 : 1

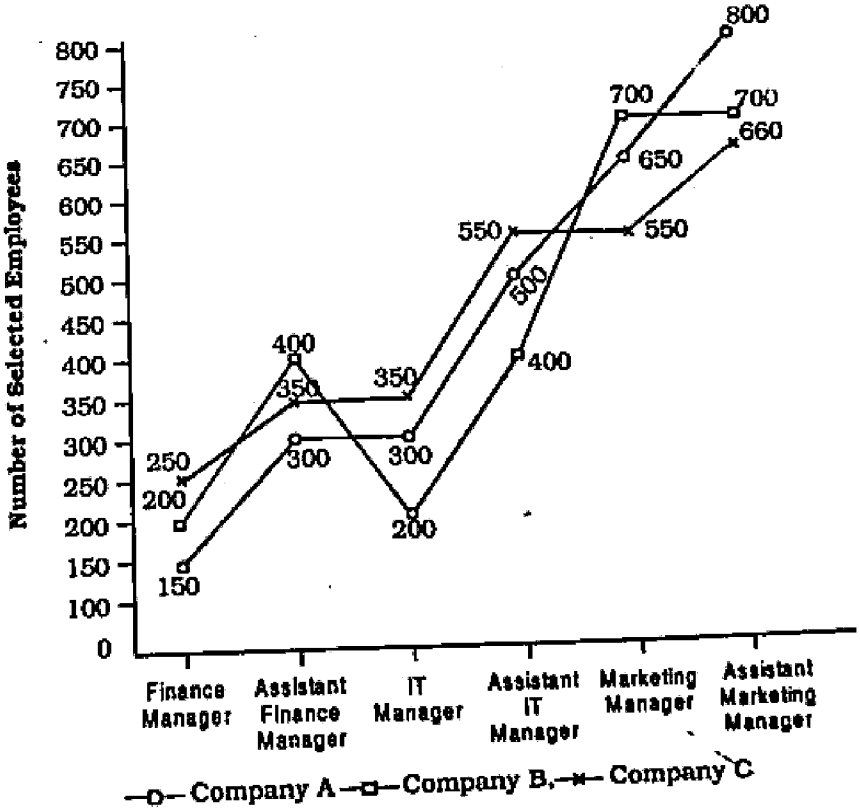
Directions (6–10) : The following is a horizontal bar diagram showing the accidents in which two-wheelers are involved with other objects. Study the diagram and answer the questions.



6. The difference in percentage between the accidents involving two-wheelers and two-wheelers and other objects is respectively.
   (1) 77% more (2) 77% less
   (3) 54% more (4) 54% less
7. 60% of the accidents are involved due to
   (1) cars, buses, tanker lorry and pedestrians
   (2) cars, tanker lorry, bicycles and stationary vehicles
   (3) two-wheelers, cars, buses and stationary vehicles
   (4) two-wheelers, cars, buses and tanker lorry
8. If the data of the bar diagram is represented by a pie-chart, and the angle of a sector of the pie-chart is 36°, then this sector represents the accidents involving
   (1) pedestrians
   (2) bicycles
   (3) buses
   (4) stationary vehicles
9. The percentage of accidents in which pedestrians and cyclists are involved is
   (1) 24% (2) 6%
   (3) 60% (4) 20.4%
10. The percentage by which the accidents involving buses is less than the accidents involving tanker lorry is
    (1) 6% (2) 4%
    (3) 40% (4) 28%

Directions (11-15) : Study the following graph carefully to answer the questions given below.

Number of selected employees in different grades/ranks by three companies during 2012



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11. What is the average number of selected employees by company A in all grades taken together?
(1) 450 (2) 460
(3) 475 (4) 375

12. What is the respective ratio of selected employees for the post of assistant IT managers by all the companies A, B and C together?
(1) 8 : 10 : 11 (2) 10 : 8 : 11
(3) 11 : 10 : 8 (4) 10 : 11 : 8

13. By what percent is the number of selected employees for finance managers by company C more than that of selected employees by company B for the same post?
(1) 35% (2) 30%
(3) 25% (4) 40%

14. What is the average number of selected employees for the post of assistant marketing managers by all companies taken together?
(1) 570 (2) 520
(3) 620 (4) 720

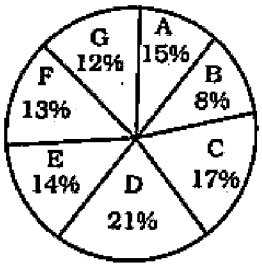
15. What is the respective ratio of selected employees for IT managers by all companies A, B and C?
(1) 6 : 4 : 7 (2) 5 : 3 : 7
(3) 4 : 7 : 9 (4) 8 : 7 : 6

Directions (16-20) : The following questions are based on the pie-charts given below.

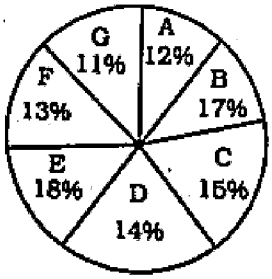
Percentagewise Distribution of students studying in Arts and commerce in seven different institutions

Different institutions — A, B, C, D, E, F and G

Total number of students studying Arts = 3800



Total number of students studying commerce = 4200



16. What is the total number of students studying Arts in institutes A and G together?
(1) 1026 (2) 1126
(3) 1226 (4) 1206

17. How many students from institute B study Arts and Commerce?
(1) 1180 (2) 1108
(3) 1018 (4) 1208

18. The respective ratio between the number of students studying Arts and commerce from institute E is
(1) 27 : 14 (2) 19 : 27
(3) 19 : 16 (4) 19 : 28

19. The ratio between the number of students studying Arts from institute E and that of students studying commerce from institute D is
(1) 12 : 17 (2) 12 : 7
(3) 19 : 21 (4) 17 : 19

20. How many students from institutes B and D together study commerce?
(1) 1320 (2) 1302
(3) 1202 (4) 1220

SHORT ANSWERS

1. (2)	2. (2)	3. (3)	4. (1)
5. (4)	6. (4)	7. (3)	8. (4)
9. (1)	10. (2)	11. (1)	12. (2)
13. (3)	14. (4)	15. (1)	16. (1)
17. (3)	18. (2)	19. (3)	20. (2)

EXPLANATIONS

1. (2) Percentage of crop B exported
$= \frac{72}{360} \times 100 = 20\%$

2. (2) $\because 45^\circ = 1.5$ million quintals
$\therefore 360^\circ = \frac{1.5 \times 360}{45} = 12$ million quintals

3. (3) A + B + C = 72° + 72° + 36° = 180°

4. (1) $\because 45^\circ = 1.5$ million quintals
$\therefore 36^\circ = \frac{1.5 \times 36}{45}$
= 1.2 million quintals

5. (4) A : C = 3 × 72° : 36°
= 6 : 1

6. (4) Total accidents = 230 + 150 + 120 + 160 + 40 + 200 + 100
= 1000
Percentage of accidents involving two-wheelers and two wheelers
$= \frac{230}{1000} \times 100 = 23\%$
Percentage of accidents involving two-wheelers and other objects
$= \frac{770 \times 100}{1000} = 77\%$
$\therefore$ Required difference
= 77 − 23 = 54%

7. (3) Two-wheelers + Cars + Buses + Stationary Vehicles
= 230 + 150 + 120 + 100
= 600 = 60%

8. (4) $\because$ 1000 ≡ 360°
$\therefore 100 \equiv \frac{360}{1000} \times 100 = 36^\circ$

9. (1) Required percentage
$= \frac{40 + 200}{1000} \times 100$
$= \frac{24000}{1000} = 24\%$

10. (2) Required difference
$= \frac{160 - 120}{1000} \times 100 = 4\%$

11. (1) Required average
$= \frac{2700}{6} = 450$

12. (2) Required average
= 500 : 400 : 550
= 10 : 8 : 11

13. (3) Required percentage
$= \frac{250 - 200}{200} \times 100 = 25\%$

14. (4) Required average
$= \frac{800 + 700 + 660}{3}$
$= \frac{2160}{3} = 720$

15. (1) Required ratio
= 300 : 200 : 350 = 6 : 4 : 7

16. (1) Required answer
$= 3800 \times \frac{27}{100} = 1026$

17. (3) Required answer
$= \frac{3800 \times 8}{100} + \frac{4200 \times 17}{100}$
= 304 + 714 = 1018

18. (2) Required ratio
$= \frac{3800 \times 14}{100} : \frac{4200 \times 18}{100}$
= 38 × 14 : 42 × 18
= 19 : 27

19. (3) Required ratio
$= \frac{3800 \times 14}{100} : \frac{4200 \times 14}{100}$
= 19 : 21

20. (2) Required answer
$= \frac{4200 \times 17}{100} + \frac{4200 \times 14}{100}$
= 714 + 588 = 1302

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22 MISCELLANEOUS

QUESTIONS ASKED IN PREVIOUS SSC EXAMS

TYPE–I

1. If log (0.57) = 1.756 then the value of log 57 + log $(0.57)^3$ + log $\sqrt{0.57}$ is :
(1) 0.902 (2) 1.902
(3) 1.146 (4) 2.146
(SSC CGL Prelim Exam. 04.07.1999 (First Sitting)

2. If $\log_{10}2 = 0.3010$ and $\log_{10}7 = 0.8451$, then the value of $\log_{10}2.8$ is :
(1) 0.4471 (2) 1.4471
(3) 2.4471 (4) 3.4471
(SSC CGL Prelim Exam. 04.07.1999 (Second Sitting)

3. If $\log_{10}2 = 0.3010$ is given, then $\log_2 10$ is equal to :
(1) 0.3010 (2) 0.6990
(3) $\frac{1000}{301}$ (4) $\frac{699}{301}$
(SSC CGL Prelim Exam. 27.02.2000 (First Sitting)

4. The simplified form of $\left(\log\frac{75}{16} - 2\log\frac{5}{9} + \log\frac{32}{243}\right)$ is :
(1) log 2 (2) 2 log 2
(3) log 3 (4) log 5
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

5. If log 2 = 0.3010, then log 5 equals :
(1) 0.3010 (2) 0.6990
(3) 0.7525
(4) Given log 2, it is not possible to calculate log 5
(SSC CGL Prelim Exam. 27.02.2000 (Second Sitting)

TYPE–II

1. Out of 450 students of a school 325 play football, 175 play cricket and 50 neither play football nor cricket. How many students play both football and cricket ?
(1) 50 (2) 100
(3) 75 (4) 225
(SSC CGL Prelim Exam. 08.02.2004 (First Sitting)

2. If the number of items of a set A be $n(A) = 40$, $n(B) = 26$ and $n(A \cap B) = 16$, then $n(A \cup B)$ is equal to
(1) 30 (2) 40
(3) 50 (4) 60
(SSC CGL Tier-II Exam. 21.09.2014)

3. If the Universal Set $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$ and $A = \{1, 2, 3, 4\}$, then A^C is equal to
(1) {5, 6, 7, 8} (2) {5, 6, 1, 2}
(3) {5, 6, 2, 3} (4) {5, 6, 3, 4}
(SSC CHSL DEO & LDC Exam. 16.11.2014)

TYPE–III

1. A die with faces numbered from 1 to 6 is thrown twice. The probability, that the numbers shown up differ by 2, is
(1) $\frac{1}{9}$ (2) $\frac{2}{9}$
(3) $\frac{3}{9}$ (4) $\frac{4}{9}$
(SSC CPO S.I. Exam. 07.09.2003)

2. A coin is tossed thrice. The probability that exactly two heads show up is
(1) $\frac{1}{8}$ (2) $\frac{2}{8}$
(3) $\frac{3}{8}$ (4) $\frac{4}{8}$
(SSC CPO S.I. Exam. 05.09.2004)

TYPE–IV

1. For a certain month, the dates of three of the Sundays are even numbers. Then, the 15th of that month falls on a
(1) Thursday (2) Friday
(3) Saturday (4) Sunday
(SSC Delhi Police S.I. (SI) Exam. 19.08.2012)

TYPE–V

1. A wall-clock takes 9 seconds in tringing at 9 O'clock. The time, it will take in tringing at 11 O'clock, is
[**Note** : The wall-clock trings 9 times at 9 O'clock and 11 times at 11 O'clock.]
(1) 10 seconds
(2) 11 seconds
(3) 11.25 seconds
(4) 10.80 seconds
(SSC CPO S.I. Exam. 05.09.2004)

2. A wall clock gains 2 minutes in 12 hours, while a table clock loses 2 minutes every 36 hours. Both are set right at 12 noon on Tuesday. The correct time when both show the same time next would be
(1) 12.30 at night, after 130 days
(2) 12 noon, after 135 days
(3) 1.30 at night, after 130 days
(4) 12 midnight, after 135 days
(SSC Graduate Level Tier-II Exam.16.09.2012)

3. From 9.00 AM to 2.00 PM, the temperature rose at a constant rate from 21°C to 36°C. What was the temperature at noon ?
(1) 27°C (2) 30°C
(3) 32°C (4) 28.5°C
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

4. The length of a minute hand of a clock is 7cm. The area swept by the minute hand in 30 minutes is :

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(1) 210 sq.cm (2) 154 sq.cm
(3) 77 sq.cm (4) 147 sq.cm
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

5. The minute hand of a big wall-clock is 35cm long. Taking $\pi = \frac{22}{7}$, length of the arc, its extremity moves in 18 seconds is :
(1) 11 cm (2) 1.1 cm
(3) 6.6 cm (4) 6 cm
(SSC CHSL DEO & LDC Exam. 04.11.2012, Ist Sitting)

6. If a clock strikes appropriate number of times at each hour, how many times will it strike a day ?
(1) 300 (2) 156
(3) 68 (4) 78
(SSC Graduate Level Tier-II Exam. 29.09.2013

7. The angle between the hands of a clock when the time is 3:20 is
(1) 6° (2) 10°
(3) 20° (4) 12°
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 IInd Sitting)

8. If a clock started at noon, then the angle turned by hour hand at 3.45 PM is
(1) $117\frac{1°}{2}$ (2) $104\frac{1°}{2}$
(3) $97\frac{1°}{2}$ (4) $112\frac{1°}{2}$
(SSC CGL Tier-I Exam, 09.08.2015 (Ist Sitting) TF No. 1443088)

9. The angle between the minute hand and hour hand of a clock when the time is 7:20 is equal to
(1) 45° (2) 90°
(3) 100° (4) 120°
(SSC CGL Tier-I Re-Exam, 30.08.2015)

TYPE–VI

1. In how many ways can a committee schedule three speakers for three different meetings if they are all available on any of five possible dates?
(1) 10 (2) 36
(3) 60 (4) 120
(SSC CPO S.I. Exam. 05.09.2004)

2. How many even three-digit numbers can be formed from the digits 1, 2, 5, 6 and 9 without repeating any of the digits ?
(1) 120 (2) 48
(3) 40 (4) 24
(SSC CPO S.I. Exam. 07.09.2003)

3. If ten friends shake hands mutually, then the total number of hand shakes is
(1) 45 (2) 50
(3) 90 (4) 100
(SSC CPO S.I. Exam. 05.09.2004)

4. The total number of integers between 200 and 400, each of which either begins with 3 or ends with 3 or both, is
(1) 10 (2) 100
(3) 110 (4) 120
(SSC CGL Prelim Exam. 04.02.2007 (First Sitting)

TYPE–VII

1. If a machine consumes $\frac{k}{5}$ kilowatts of power every t hours, how much power in kilowatts, will three such machines consume in 10 hours ?
(1) $\frac{k}{t}$ (2) $\frac{6t}{k}$
(3) $\frac{6k}{t}$ (4) $\frac{t}{k}$
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

2. I walk a certain distance and ride back taking a total time of 37 minutes. I could walk both ways in 55 minutes. How long would it take me to ride both ways ?
(1) 30 minutes (2) 19 minutes
(3) 37 minutes (4) 20 minutes
(SSC CGL Tier-I Re-Exam. (2013) 20.07.2014 (IInd Sitting)

3. A piece of cloth measured with a metre stick, one cm short, is 100 metres long. Reckoning the metre stick as being right, the actual length of the cloth (in cm) is
(1) 3, 900 (2) 9, 900
(3) 8, 000 (4) 6, 100
(SSC CGL Tier-I Exam. 26.10.2014)

4. A man having height 169 cm is standing near a pole. He casts a shadow 130 cm long. What is the length of the pole if it gives a shadow 420 cm long ?
(1) 550 cm (2) 569 cm
(3) 323 cm (4) 546 cm
(SSC CGL Tier-I Exam. 26.10.2014)

5. 11 friends went to a hotel and decided to pay the bill amount equally. But 10 of them could pay ₹60 each, as a result 11th has to pay ₹50 extra than his share. Find the amount paid by him.
(1) ₹ 105 (2) ₹ 110
(3) ₹ 115 (4) ₹ 120
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam. 22.06.2014 TF No. 999 KP0)

6. 2 km 5 m is equal to
(1) 2.05 km (2) 2.5 km
(3) 2.005 km (4) 2.0005 km
(SSC CAPFs SI, CISF ASI & Delhi Police SI Exam, 21.06.2015 (Ist Sitting) TF No. 8037731)

SHORT ANSWERS

TYPE-I

1. (1)	2. (1)	3. (3)	4. (1)
5. (2)			

TYPE-II

1. (2)	2. (3)	3. (1)	

TYPE-III

1. (2)	2. (3)		

TYPE-IV

1. (3)			

TYPE-V

1. (2)	2. (2)	3. (2)	4. (3)
5. (2)	6. (2)	7. (3)	8. (4)
9. (3)			

TYPE-VI

1. (3)	2. (4)	3. (1)	4. (3)

TYPE-VII

1. (3)	2. (2)	3. (2)	4. (4)
5. (3)	6. (3)		

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EXPLANATIONS

TYPE-I

1. (1) $\log 57 + \log (0.57)^3 + \log \sqrt{0.57}$

$= \log [(0.57) \times 100] + 3 \log 0.57 + \frac{1}{2} \log 0.57$

$= \log 100 + \log (0.57) + 3 \log (0.57) + \frac{1}{2} \log (0.57)$

$= 2 + \frac{9}{2} \log (0.57)$ [$\because \log 100 = \log 10^2 = 2 \log 10 = 2$]

$= 2 + \frac{9}{2} \times (1.756)$

$= 2 + \frac{9}{2} \times 0.756 - \frac{9}{2}$

$= 2 + 3.402 - 4.5 = 0.902$

2. (1) $\text{Log}_{10} 2.8$

$= \log_{10}\left(2 \times 2 \times \frac{7}{10}\right)$

$= \log_{10} 2 + \log_{10} 2 + \log_{10} 7 - \log_{10} 10$

$= 0.3010 + 0.3010 + 0.8451 - 1$

$= 1.4471 - 1 = 0.4471$

3. (3) Given $\log_2 10$

$= \frac{1}{\log_{10} 2} = \frac{1}{0.3010} = \frac{1000}{301}$

4. (1)

$\text{Log} \frac{75}{16} - 2 \text{Log} \frac{5}{9} + \text{Log} \frac{32}{243}$

$= \text{Log} \frac{5^2 \times 3}{2^4} - 2\text{Log} \frac{5}{3^2} + \text{Log} \frac{2^5}{3^5}$

$= 2 \text{Log} 5 + \text{Log} 3 - 4 \text{Log} 2 - 2\text{Log} 5 + 4 \text{Log} 3 + 5 \text{Log} 2 - 5 \text{Log} 3 = \text{Log} 2$

5. (2) $\text{Log} 5 = \log \frac{10}{2}$

$= \log 10 - \log 2$

$= 1 - 0.3010 = 0.6990$

TYPE-II

1. (2) Number of students who play either football or cricket or both

$A \rightarrow$ football $= 450 - 50 = 400 = n(A \cup B)$

$B \rightarrow$ Cricket $n(A \cup B)$

$= n(A) + n(B) - n(A \cap B)$

$\Rightarrow 400 = 325 + 175 - n(A \cap B)$

$\Rightarrow n(A \cap B) = 500 - 400 = 100$

2. (3) $n(A \cup B)$

$= n(A) + n(B) - n(A \cap B)$

$= 40 + 26 - 16 = 50$

3. (1) $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$

$A = \{1, 2, 3, 4\}$

$A^c = \{x : x \in U \text{ and } x \notin A\}$

$= \{5, 6, 7, 8\}$

TYPE-III

1. (2) Total possible outcomes $= 6 \times 6 = 36$

Favourable number of cases $= \{(1, 3), (3, 1), (2, 4), (4,2), (3,5), (5,3), (4,6), (6,4)\} = 8$

Required probability $= \frac{8}{36} = \frac{2}{9}$

2. (3) A coin has two faces : head and tail.

Total (Exhaustive) number of cases $= 2^3 = 8$

Possible outcomes = {HHH, HHT, HTH, THH, HTT, TTH, THT, TTT}

Favourable number of cases $= 3$

$\therefore$ Required probability $= \frac{3}{8}$

TYPE-IV

1. (3) If a sunday lies on 2nd of a month, other sundays will lie on 9, 16, 23, 30.

Hence, 15th will fall on Saturday.

TYPE-V

1. (2) 11 seconds

2. (2) The wall clock gains 6 minutes in 36 hours, while table clock loses 2 minutes in 36 hours.

$\therefore$ Difference of 8 minutes is there in $\frac{3}{2}$ days

$\therefore$ Difference of 12 hours is in

$= \frac{3}{2} \times \frac{1}{8} \times 12 \times 60 = 135$ days

Hence, both will show correct time at 12 noon after 135 days

3. (2) Temperature difference in 5 hours

$= 36 - 21 = 15°C$

$\therefore$ Temperature difference in 3 hours $= 9°C$

Hence, required temperature $= 21 + 9 = 30°C$

4. (3) Area swept by the minute hand in an hour $= \pi r^2$

$\therefore$ Required area $= \frac{\pi r^2}{2}$

$= \frac{22 \times 7 \times 7}{7 \times 2} = 77$ sq.cm.

5. (2) Traced arc length by minute hand in 60×60 seconds $= 2\pi r$

radius $= 35$ cm

$\therefore$ Length of arc made in 18 seconds

$= \frac{2\pi r}{60 \times 60} \times 18$

$= 2 \times \frac{22}{7} \times \frac{35 \times 18}{60 \times 60} = 1.1$ cm

6. (2) Required answer $= 2(1 + 2 + 3 + ... + 12)$

$= 2 \times \frac{12 \times 13}{2} = 156$

[$\because$ Sum of first n natural no.s $= \frac{n(n+1)}{2}$]

7. (3) 3 hours 20 minutes

$= 3\frac{1}{3}$ hours

$= \frac{10}{3}$ hours

Hour hand traces 360° in 12 hours.

$\therefore$ Angle traced in $\frac{10}{3}$ hours

$= \frac{360}{12} \times \frac{10}{3} = 100°$

Minute hand traces 360° in 60 minutes.

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$\therefore$ Angle traced in 20 minutes

$= \frac{360}{60} \times 20 = 120°$

$\therefore$ Required angle

$= 120° - 100° = 20°$

8. (4) The hour hand traces 30° in an hour.

$\therefore$ Angle traced in $3\frac{3}{4}$ hours i.e

$\frac{15}{4}$ hours $= \frac{15}{4} \times 30°$

$= \frac{225°}{2} = 112\frac{1}{2}°$

9. (3) At 7 : 20,

Number of hours

$= 7\frac{20}{60} = 7\frac{1}{3}$ hours

$= \frac{22}{3}$ hours

The hour-hand traces 360° in 12 hours.

$\therefore$ Angle traced by hour hand in $\frac{22}{3}$ hours

$= \frac{360°}{12} \times \frac{22}{3} = 220°$

$\because$ Minute hand traces 360° in 60 minutes.

$\therefore$ Angle traced by minute hand in

20 minutes $= \frac{360°}{60} \times 20$

$= 120°$

$\therefore$ Required angle

$= 220° - 120° = 100°$

TYPE-VI

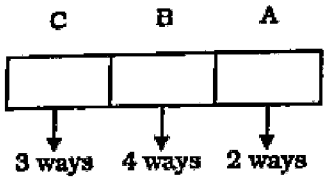
1. (3) Required number of ways = $5P_3 = 5 \times 4 \times 3 = 60$

2. (4) The unit's place will be occupied by 2 or 6 in three digit even numbers.

The remaining two places can be occupied by selecting from remaining four digits in $^4P_2$ ways

$^4P_2 = \frac{4!}{(4-2)!} = \frac{4 \times 3 \times 2}{2} = 12$

$\therefore$ Total number of even three digit numbers $= 2 \times 12 = 24$



Total ways $= 3 \times 4 \times 2 = 24$ ways.

[$\because$ Total available digits are 1, 2, 5, 6, 9.

Even digits = 2 and 6.

$\Rightarrow$ A can either be filled by 2 or 6 i.e. 2 ways.

B can either be filled by 4 ways [$\because$ Total – digit used at A i.e. 5 – 1]

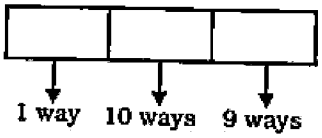
and C can either be filled by 3 ways [Total – digit used at A – digit used at B i.e. 5 – 1 – 1]

3. (1) It is to be noted that when two persons shake hands it is counted as one hand shake not two. So this is a problem on combination. The total number of hand shakes is

= The number of ways of selecting 2 persons out of 10 persons

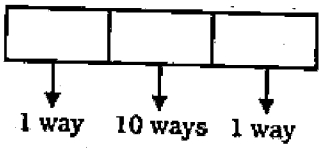
$= 10C_2 = \frac{10 \times 9}{1 \times 2} = 45$

4. (3) When 3 lies at hundreds place



$\therefore$ Total integers $= 10 \times 9 = 90$

When 3 lies at units place



Total integers = 10

When 3 lies at unit's and hundred's place

Total integers = 10

$\therefore$ Total integers

$= 90 + 10 + 10 = 110$

TYPE-VII

1. (3) Power consumed by each machine in 10 hours

$= \frac{k \times 10}{5 \times t} = \frac{2k}{t}$ Kilowatts

$\therefore$ Power consumed by three such machines

$= 3 \times \frac{2k}{t} = \frac{6k}{t}$ kilowatts

2. (2) Walking + Riding = 37 mintues

2 × Walking = 55 minutes

By equation (i) × 2 – equation (ii)

2 × Riding = 2 × 37 – 55

= 74 – 55 = 19 minutes

3. (2) $\because$ 1 metre = 99 cm

$\therefore$ 100 metre = 9900 cm

4. (4) $\frac{\text{Height of man}}{\text{Height of pole}}$

$= \frac{\text{Length of shadow of man}}{\text{Length of shadow of pole}}$

$\Rightarrow \frac{169}{\text{Height of pole}} = \frac{130}{420}$

$\Rightarrow$ Height of pole $\times$ 130

$= 169 \times 420$

$\Rightarrow$ Height of pole $= \frac{169 \times 420}{130}$

$= 546$ cm

5. (3) Total bill = Rs. x (let)

$\therefore 10 \times 60 + \frac{x}{11} + 50 = x$

$\Rightarrow 600 + 50 + \frac{x}{11} = x$

$\Rightarrow x - \frac{x}{11} = 650$

$\Rightarrow \frac{11x - x}{11} = 650$

$\Rightarrow 10x = 650 \times 11$

$\Rightarrow x = 65 \times 11 = 715$

$\therefore$ Amount paid by the eleventh person

$= \frac{x}{11} + 50 = \text{Rs.}\left(\frac{715}{11} + 50\right)$

= Rs. (65 + 50)

= Rs. 115

6. (3) $\because$ 1000 metre = 1 km

$\therefore$ 5 metre $= \frac{5}{1000} = 0.005$ km

$\therefore$ 2 km 2 metre

= (2 + 0.005) km = 2.005 km

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TEST YOURSELF

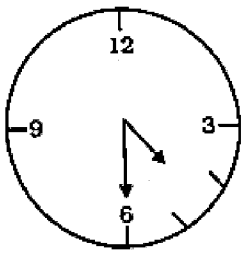
1. Find the angle in radian between the hour-hand and minute-hand of a clock at half-past 4.
   (1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$
   (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{10}$
2. A can beat B by 40m in a kilometre race, and B can beat C by 20m in a kilometre race. By how much will A beat C in a kilometre race ?
   (1) 59 metre (2) 59.2 metre
   (3) 58.2 metre (4) None of these
3. Two passengers A and B of a train have 27kg of luggage and are charged for the excess above the weight allowed free Rs. 150 and Rs. 105 respectively: If the luggage belonged to one of them, he would have been charged Rs. 330. Find the weight allowed free and also the charge per kilogram of weight.
   (1) 15 kg, Rs. 15 per kg
   (2) 16 kg, Rs. 14 per kg
   (3) 14 kg, Rs. 15 per kg
   (4) None of these
4. A man bought two heaps of oranges one for Rs. 346.50 and the other for Rs. 198. If the price of each orange be the same, and not less than three rupees and not greater than four rupees, find the possible number of oranges he bought in two heaps.
   (1) 176 (2) 140
   (3) 186 (4) 196
5. A boy bought some mangoes with his savings. If he got 20 mangoes more, the price of mango would be 25 paise less and if he got 30 mangoes less, the price of a mango would be75 paise more. How many mangoes did he buy and with how many rupees ?
   (1) Rs. 100, 80 mangoes
   (2) Rs. 80, 50 mangoes
   (3) Rs. 80, 100 mangoes
   (4) 75 mangoes, Rs. 80
6. At 5 : 45 am what will be the angle between hour hand and minute hand of a clock ?
   (1) 97.5° (2) 98.5°
   (3) 95° (4) 100°
7. A bus left with some definite number of passengers. At the first stop, half the passengers left the bus and 35 boarded the bus. At the second stop $\frac{1}{5}$ th of the passengers left and 40 boarded the bus. Then, the bus moved with 80 passengers towards its destination without stopping anywhere. How many passengers were there originally?
   (1) 40 (2) 30
   (3) 50 (4) 60
8. A sum of ₹45 is made up of 100 coins, partly of 50 paise and partly of 25 paise. How many 25 paise coins are there?
   (1) 50 (2) 20
   (3) 40 (4) 80
9. When three coins are tossed together, the probability that all coins have the same face is :
   (1) $\frac{1}{4}$ (2) $\frac{1}{6}$
   (3) $\frac{1}{3}$ (4) None of these
10. In a football championship, 153 matches were played. Every team played one match with each other. The number of teams participating in the championship is:
    (1) 16 (2) 17
    (3) 18 (4) None of these
11. A box contains 85 nuts each of 100 gms. and 94 bolts each of 150 gms. If the entire box with its contents weighs 42.5 kgs, then what is the weight of the empty box ?
    (1) 20.5 kgs. (2) 21. 5 kgs.
    (3) 18.5 kgs. (4) None of these
12. A bus consumes 25 litres of diesel in covering a distance of 90 kilometres. How much diesel is needed to cover 288 kilometres?
    (1) 70 litres (2) 78 litres
    (3) 80 litres (4) None of these
13. A stack of 1000 sheets of paper is 11.8 cm. high. The thickness of each sheet of paper is:
    (1) 11.18 cm (2) 0.0118 cm
    (3) 0.118 cm. (4) None of these
14. A cook purchased $5\frac{1}{6}$ kg potatoes, $3\frac{5}{12}$ kg tomatoes and $1\frac{5}{9}$ kg. carrots. What is the total quantity of vegetables purchased?
    (1) $10\frac{5}{36}$ (2) $9\frac{4}{35}$
    (3) $8\frac{3}{37}$ (4) $10\frac{3}{35}$
15. When a person distributed sweets among a gathering of people, each person got 7 sweets and 14 sweets remained undistributed. If two more people had joined the gathering, no sweet would have remained undistributed. How many people had gathered?
    (1) 70 (2) 56
    (3) 63
    (4) Cannot be determined
16. Out of 60 students in a class, 15 fail in English and 13 fail in Hindi. If 4 students fail both in Hindi and English, Then the number of students who pass in both the subjects is:
    (1) 34 (2) 36
    (3) 38 (4) 26

SHORT ANSWERS

1. (1)	2. (2)	3. (1)	4. (1)
5. (1)	6. (1)	7. (2)	8. (2)
9. (1)	10. (3)	11. (4)	12. (3)
13. (2)	14. (1)	15. (4)	16. (2)

EXPLANATIONS

1. (1)



At half past 4, hour hand lies in the middle of 4 and 5, and minute had lies at 6.
One division of a clock

$= \frac{360°}{12} = 30°$

$\therefore \frac{3}{2}$ divisions $= \frac{3}{2} \times 30° = 45°$

$\because 180° = \pi$ radian

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$\therefore 45° = \frac{\pi}{180} \times 45°$

$= \frac{\pi}{4}$ radian

2. (2) A : B = 1000 : 960;
B : C = 1000 : 980

$\therefore$ A : C = $\frac{1000}{960} \times \frac{1000}{980}$

$= \frac{1000000}{940800} = \frac{1000}{940.8}$

A beats C by (1000 – 940.8)
= 59.2 m

3. (1) Let A have x kg of luggage.
$\therefore$ Luggage with B = (27 – x) kg
Luggage allowed free = F kg
Rate per kg extra luggage= Rs. T
$\therefore (x - F)\,T = 150$ .....(i)
$(27 - x - F)\,T = 105$ .....(ii)
$(27 - F)\,T = 330$ .....(iii)
Equation (i) ÷ (ii)

$\frac{x-F}{27-x-F} = \frac{150}{105} = \frac{10}{7}$

$\Rightarrow 7x - 7F = 270 - 10x - 10F$
$\Rightarrow 17x + 3F = 270$ .....(iv)
Equation (i) ÷ (iii),

$\frac{x-F}{27-F} = \frac{150}{330} = \frac{5}{11}$

$\Rightarrow 11x - 11F = 135 - 5F$
$\Rightarrow 11x - 6F = 135$ .....(v)
Equation (iv) × 2 + (i)

$34x + 6F = 540$
$11x - 6F = 135$
$45x = 675$

$\Rightarrow x = 15$ kg.
From equation (iv),
$17 \times 15 + 3F = 270$
$\Rightarrow 3F = 15 \Rightarrow F = 5$kg
From equation (i),
$(15 - 5)\,T = 150$

$T = \frac{150}{10}$ = Rs. 15/kg

4. (1)

19800)34650(1
19800
14850)19800(1
14850
4950)14850(3
14850
x

HCF of 198 and 346.50 = 49.50

Minimum cost price = $\frac{49.50}{16}$

= Rs. 3.09375
Number of oranges

$= \frac{198}{3.09375} + \frac{346.50}{3.09375}$

= 64 + 112 = 176

5. (1) Let the mangoes bought be x in number and money spent by Rs. y.

Case I,

$\frac{y}{x+20} = \frac{y}{x} - \frac{1}{4}$

$\Rightarrow y\left(\frac{1}{x} - \frac{1}{x+20}\right) = \frac{1}{4}$

$\Rightarrow y\left(\frac{x+20-x}{x(x+20)}\right) = \frac{1}{4}$

$\Rightarrow y = \frac{x(x+20)}{80}$ .....(i)

Case II,

$\frac{y}{x-30} - \frac{y}{x} = \frac{3}{4}$

$\Rightarrow y\left(\frac{x-x+30}{x(x-30)}\right) = \frac{3}{4}$

$\Rightarrow y = \frac{x(x-30)}{40}$ .....(ii)

$\therefore \frac{x(x+20)}{80} = \frac{x(x-30)}{40}$

$\Rightarrow x + 20 = 2x - 60$
$\Rightarrow x = 80$
From equation (i)

$y = \frac{80\,(80+20)}{80}$ = Rs. 100

6. (1) 5 : 45 hours

$= \left(5 + \frac{45}{60}\right)$ hours

$= \left(5 + \frac{3}{4}\right)$ hours = $\frac{23}{4}$ hours

$\because$ The hour hand traces 360° in 12 hours.
$\therefore$ Angle traced by hour hand in

1 hour = $\frac{360°}{12} = 30°$

$\therefore$ Angle traced in $\frac{23}{4}$ hours

$= \frac{23}{4} \times 30° = 172.5°$

$\because$ The minute hand traces 360° in 60 minutes.
$\therefore$ Angle traced in 45 minutes

$= \frac{360}{60} \times 45 = 270°$

$\therefore$ Required angle
= 270° – 172.5° = 97.5°

7. (2) Let the original number of passengers be x.
Number of passengers in the bus after first stop

$= \frac{x}{2} + 35$

Number of passengers in the bus after second stop

$= \frac{4}{5}\left(\frac{x}{2} + 35\right) + 40$

$\therefore \frac{4}{5}\left(\frac{x}{2} + 35\right) + 40 = 80$

$\Rightarrow \frac{4}{5}\left(\frac{x}{2} + 35\right) = 40$

$\Rightarrow \frac{x}{2} + 35 = \frac{40 \times 5}{4} = 50$

$\Rightarrow \frac{x}{2} = 50 - 35 = 15$
$\Rightarrow x = 2 \times 15 = 30$

8. (2) Number of 25 paise coins = x

$\therefore \frac{x}{4} + \frac{100 - x}{2} = 45$

$\Rightarrow \frac{x + 200 - 2x}{4} = 45$

$\Rightarrow 200 - x = 45 \times 4 = 180$
$\Rightarrow x = 200 - 180 = 20$

9. (1) Total possible outcomes
$= 2 \times 2 \times 2 = 8$
Total favourable outcomes
= 2
$\therefore$ Required probability

$= \frac{2}{8} = \frac{1}{4}$

10. (3) ${}^nC_2 = 153$

$\Rightarrow \frac{n(n-1)}{2} = 153$

$\Rightarrow n^2 - n - 306 = 0$
$\Rightarrow n^2 - 18n + 17n - 306 = 0$
$\Rightarrow n(n - 18) + 17(n - 18) = 0$
$\Rightarrow (n - 18)(n + 17) = 0 \Rightarrow n = 18$

11. (4) Weight of the empty box

$= \left(42.5 - \frac{85 \times 100}{1000} - \frac{150 \times 94}{1000}\right)$kg

= (42.5 – 8.5 – 14.1) kg
= 19.9 kg

12. (3) $\because$ 90 km = 25 litres

$\therefore$ 288 km = $\frac{25}{90} \times 288$

= 80 litres

13. (2) Required thickness

$= \frac{11.8}{1000} = 0.0118$ cm

14. (1) Required sum

$= \frac{31}{6} + \frac{41}{12} + \frac{14}{9}$

$= \frac{186 + 123 + 56}{36}$

$= \frac{365}{36} = 10\frac{5}{36}$

15. (4) If the number of persons be x, then
$7x + 14 = 7(x + 2)$
No result will be obtained.

16. (2) Unsuccessful students in English or Hindi or both
= 15 + 13 – 4 = 24
$\therefore$ Number of successful students = 60 – 24 = 36