SET 9

SOLVED PAPER

SSC COMBINED GRADUATE LEVEL TIER-I EXAM

Held on : 04.09.2011

PAPER-I

ARITHMETICAL ABILITY

1. In a division sum, the divisor is 4 times the quotient and twice the remainder. If a and b are respectively the divisor and the dividend, then

(1) $\frac{4b-a^2}{a}=3$

(2) $\frac{4b-2a}{a^2}=2$

(3) $(a+1)^2=4b$

(4) $\frac{a(a+2)}{b}=4$

2. If 738A6A is divisible by 11, then the value of A is

(1) 6 (2) 3
(3) 9 (4) 1

3. The product of two numbers is 1575 and their quotient is 9/7. Then the sum of the numbers is

(1) 74 (2) 78
(3) 80 (2) 90

4. The value of $\frac{(81)^{3.6}\times(9)^{2.7}}{(81)^{4.2}\times(3)}$ is

(1) 3 (2) 6
(3) 9 (4) 8.2

5. $\sqrt{6+\sqrt{6+\sqrt{6+\ldots.}}}$ is equal to

(1) 2 (2) 5
(3) 4 (4) 3

6. The sum of the squares of two natural consecutive odd numbers is 394.The sum of the numbers is

(1) 24 (2) 32
(3) 40 (4) 28

7. When $(67^{67}+67)$ is divided by 68, the remainder is

(1) 1 (2) 63
(3) 66 (4) 67

8. A can do a piece of work in 24 days, B in 52 days and C in 64 days. All begin to do it together, but A leaves after 6 days and B leaves 6 days before the completion of the work. How many days did the work last ?

(1) 15 (2) 20
(3) 18 (4) 30

9. The square root of

$\frac{(0.75)^3}{1-0.75}+[0.75+(0.75)^2+1]$ is

(1) 1 (2) 2
(3) 3 (4) 4

10. Given that $\sqrt{4096}=64$, the value of $\sqrt{4096}+\sqrt{40.96}+\sqrt{0.004096}$ is

(1) 70.4 (2) 70.464
(3) 71.104 (4) 71.4

11. The least positive integer that should be subtracted from 3011 × 3012 so that the difference is a perfect square is

(1) 3009 (2) 3010
(3) 3011 (4) 3012

12. P, Q, R are employed to do a work for ₹ 5750. P and Q together finished $\frac{19}{23}$ of work and Q and R together finished $\frac{8}{23}$ of work. Wage of Q, in rupees, is

(1) 2850 (2) 3750
(3) 2750 (4) 1000

13. While selling, a businessman allows 40% discount on the marked price and there is a loss of 30%. If it is sold at the marked price, profit percent will be

(1) 10% (2) 20%
(3) $16\frac{2}{3}\%$ (4) $16\frac{1}{3}\%$

14. A cistern has 3 pipes A, B and C. A and B can fill it in 3 and 4 hours respectively, and C can empty it in 1 hour. If the pipes are opened at 3 p.m., 4 p.m. and 5 p.m. respectively on the same day, the cistern will be empty at

(1) 7:12 p.m.
(2) 7:15 p.m.
(3) 7:10 p.m.
(4) 7:18 p.m.

15. If A works alone, he would take 4 days more to complete the job than if both A and B worked together. If B worked alone, he would take 16 days more to complete the job than if A and B work together. How many days would they take to complete the work if both of them worked together ?

(1) 10 days (2) 12 days
(3) 6 days (4) 8 days

16. 250 men can finish a work in 20 days working 5 hours a day. To finish the work within 10 days working 8 hours a day, the minimum number of men required is

(1) 310 (2) 300
(3) 313 (4) 312

17. 2 men and 5 women can do a work in 12 days. 5 men and 2 women can do that work in 9 days. Only 3 women can finish the same work in

(1) 36 days (2) 21 days
(3) 30 days (4) 42 days

18. By selling an article at $\frac{3}{4}$ th of the marked price, there is a gain of 25%. The ratio of the marked price and the cost price is

(1) 5 : 3 (2) 3 : 5
(3) 3 : 4 (4) 4 : 3

19. A and B earn in the ratio 2 : 1. They spend in the ratio 5 : 3 and save in the ratio 4 : 1. If the total monthly savings of both A and B are ₹ 5,000, the monthly income of B is

(1) ₹ 7,000
(2) ₹ 14,000
(3) ₹ 5,000
(4) ₹ 10,000

20. The ratio of the sum of two numbers and their difference is 5 : 1. The ratio of the greater number to the smaller number is

(1) 2 : 3 (2) 3 : 2
(3) 5 : 1 (4) 1 : 5

21. Successive discounts of 10%, 20% and 50% will be equivalent to a single discount of
(1) 36% (2) 64%
(3) 80% (4) 56%

22. A retailer offers the following discount schemes for buyers on an article.
I. Two successive discounts of 10%.
II. A discount of 12% followed by a discount of 8%.
III. Successive discounts of 15% and 5%,.
IV. A discount of 20%.
The selling price will be minimum under the scheme
(1) I (2) II
(3) III (4) IV

23. A mixture contains 80% acid and rest water. Part of the mixture that should be removed and replaced by same amount of water to make the ratio of acid and water 4 : 3 is
(1) $\frac{1}{3}$ rd (2) $\frac{3}{7}$ th
(3) $\frac{2}{3}$ rd (4) $\frac{2}{7}$ th

24. An employer reduces the number of his employees in the ratio 9 : 8 and increases their wages in the ratio 14:15. If the original wage bill was₹ 18,900, find the ratio in which the wage bill is decreased.
(1) 20 : 21 (2) 21 : 20
(3) 20 : 19 (4) 19 : 21

25. The batting average for 40 innings of a cricketer 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 (2) 170
(3) 172 (4) 174

26. A and B are two alloys of gold and copper prepared by mixing metals in the ratio 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) 5 : 7 (2) 5 : 9
(3) 7 : 5 (4) 9 : 5

27. In a laboratory, two bottles contain mixture of acid and water in the ratio 2 : 5 in the first bottle and 7 : 3 in the second. The ratio in which the contents of these two bottles be mixed such that the new mixture has acid and water in the ratio 2 : 3 is
(1) 4 : 15 (2) 9 : 8
(3) 21 : 8 (4) 1 : 2

28. The average of three numbers is 154. The first number is twice the second and the second number is twice the third. The first number is
(1) 264 (2) 132
(3) 88 (4) 66

29. The average salary of all the staff in an office of a corporate house is₹ 5,000. The average salary of the officers is₹ 14,000 and that of the rest is₹ 4,000. If the total number of staff is 500, the number of officers is
(1) 10 (2) 15
(3) 25 (4) 50

30. The average marks of 40 students in an English exam is 72. Later it is found that three marks 64, 62 and 84 were wrongly entered as 68, 65 and 73. The average after mistakes were rectified is
(1) 70 (2) 72
(3) 71.9 (4) 72.1

31. Of three numbers, the second is thrice the first and the third number is three-fourth of the first. If the average of the three numbers is 114, the largest number is
(1) 72 (2) 216
(3) 354 (4) 726

32. A car covers $\frac{1}{5}$ of the distance from A to B at the speed of 8 km/hr, $\frac{1}{10}$ of the distance at 25 km per hour and the remaining at the speed of 20 km per hour. Find the average speed of the whole journey.
(1) 12.625 km/hr
(2) 13.625 km/hr
(3) 14.625 km/hr
(4) 15.625 km/hr

33. A jar contains 10 red marbles and 30 green ones. How many red marbles must be added to the jar so that 60% of the marbles will be red?
(1) 25 (2) 30
(3) 35 (4) 40

34. If a number multiplied by 25% of itself gives a number which is 200% more than the number, then the number is
(1) 12 (2) 16
(3) 20 (4) 24

35. The value of an article depreciates every year at the rate of 10% of its value. If the present value of the article is₹ 729, then its worth 3 years ago was
(1) ₹1250 (2) ₹1000
(3) ₹1125 (4) ₹1200

36. The price of onions has been increased by 50%. In order to keep the expenditure on onions the same the percentage of reduction in consumption has to be
(1) 50% (2) $33\frac{1}{3}$ %
(3) 33% (4) 30%

37. Walking at 3 km per hour, Pintu reaches his school 5 minutes late. If he walks at 4 km per hour he will be 5 minutes early. The distance of Pintu's school from his house is
(1) $1\frac{1}{2}$ km (2) 2 km
(3) $2\frac{1}{2}$ km (4) 5 km

38. Nitin bought some oranges at ₹ 40 a dozen and an equal number at₹ 30 a dozen. He sold them at₹ 45 a dozen and made a profit of₹ 480. The number of oranges, he bought, was
(1) 48 (2) 60
(3) 72 (4) 84

39. A man buys two chairs for a total cost of₹ 900. By selling one for $\frac{4}{5}$ of its cost and the other for $\frac{5}{4}$ of its cost, he makes a profit of ₹ 90 on the whole transaction. The cost of the lower priced chair is
(1) ₹ 360 (2) ₹ 400
(3) ₹ 420 (4) ₹ 300

40. By selling 100 oranges, a vendor gains the selling price of 20 oranges. His gain percent is

(1) 20 (2) 25
(3) 30 (4) 32

41. 60% of the cost price of an article is equal to 50% of its selling price. Then the percentage of profit or loss on the cost price is
(1) 20% loss
(2) $16\frac{2}{3}$ % profit
(3) 20% profit
(4) 10% loss

42. Maninder bought two horses at ₹ 40,000 each. He sold one horse at 15% gain, but had to sell the second horse at a loss. If he had suffered a loss of ₹ 3,600 on the whole transaction, then the selling price of the second horse is
(1) ₹ 30,000 (2) ₹ 30,200
(3) ₹ 30,300 (4) ₹ 30,400

43. A fruit-seller buys x guavas for ₹ y and sells y guavas for ₹ x. If $x > y$, then he made
(1) $\frac{x^2-y^2}{xy}$ % loss
(2) $\frac{x^2-y^2}{xy}$ % gain
(3) $\frac{x^2-y^2}{y^2}$ % loss
(4) $\frac{x^2-y^2}{y^2}$ % gain

44. If the simple interest on ₹ x at a rate of a% for m years is same as that on ₹ y at a rate of a^2% for m^2 years, then $x : y$ is equal to
(1) $m : a$ (2) $am : 1$
(3) $\frac{1}{m} : \frac{1}{a}$
(4) $\frac{1}{am} : 1$

45. A took two loans altogether of ₹ 1200 from B and C. B claimed 14% simple interest per annum, while C claimed 15% per annum. The total interest paid by A in one year was ₹ 172. Then, A borrowed
(1) ₹ 800 from C
(2) ₹ 625 from C
(3) ₹ 400 from B
(4) ₹ 800 from B

46. If a regular polygon has each of its angles equal to $\frac{3}{5}$ times of two right angles, then the number of sides is
(1) 3 (2) 5
(3) 6 (4) 8

47. A square is of area 200 sq. m. A new square is formed in such a way that the length of its diagonal is $\sqrt{2}$ times of the diagonal of the given square. Then the area of the new square formed is
(1) $200\sqrt{2}$ sq.m (2) $400\sqrt{2}$ sq.m
(3) 400 sq.m (4) 800 sq.m .

48. The heights of a cone, cylinder and hemisphere are equal. If their radii are in the ratio 2:3:1, then the ratio of their volumes is
(1) 2 : 9 : 2 (2) 4 : 9 : 1
(3) 4 : 27 : 2 (4) 2 : 3 : 1

49. A motor-boat can travel at 10 km/hour in still water. It travelled 91 km downstream in a river and then returned to the same place, taking altogether 20 hours. Find the rate of flow of river.
(1) 3 km/hour (2) 4 km/hour
(3) 2 km/hour (4) 5 km/hour

50. A man driving at $\frac{3}{4}$ th of his original speed reaches his destination 20 minutes later than the usual time. Then the usual time is
(1) 45 minutes
(2) 60 minutes
(3) 75 minutes
(4) 120 minutes

51. A motor boat, travelling at the same speed, can cover 25 km upstream and 39 km downstream in 8 hours. At the same speed, it can travel 35 km upstream and 52 km downstream in 11 hours. The speed of the stream is
(1) 2 km/hr (2) 3 km/hr
(3) 4 km/hr (4) 5 km/hr

52. If a sum of money placed at compound interest, compounded annually, doubles itself in 5 years, then the same amount of money will be 8 times of itself in
(1) 25 years (2) 20 years
(3) 15 years (4) 10 years

53. A person has left an amount of ₹1,20,000 to be divided between his two sons aged 14 years and 12 years such that they get equal amounts when each attains 18 years of age. If the amount gets a simple interest of 5% per annum, the younger son's share at present is
(1) ₹ 48,800
(2) ₹ 57,600
(3) ₹ 62,400
(4) ₹ 84,400

54. If $a^2 + b^2 + c^2 = 2(a - b - c) - 3$, then the value of $(a - b + c)$ is
(1) –1 (2) 3
(3) 1 (4) –2

55. If $x^2 + 3x + 1 = 0$, then the value of $x^3 + \frac{1}{x^3}$ is
(1) –18 (2) 18
(3) 36 (4) –36

56. If $x^a . x^b . x^c = 1$ then the value of $a^3 + b^3 + c^3$ is
(1) 9 (2) abc
(3) $a + b + c$ (4) $3abc$

57. Base of a right pyramid is a square, length of diagonal of the base is $24\sqrt{2}$ m. If the volume of the pyramid is 1728 cu.m, its height is
(1) 7 m (2) 8 m
(3) 9 m (4) 10 m

58. The height of a right circular cone and the radius of its circular base are respectively 9 cm and 3 cm. The cone is cut by a plane parallel to its base so as to divide it into two parts. The volume of the frustum (i.e., the lower part) of the cone is 44 cubic cm. The radius of the upper circular surface of the frustum (taking $\pi = \frac{22}{7}$) is
(1) $\sqrt[3]{12}$ cm (2) $\sqrt[3]{13}$ cm
(3) $\sqrt[3]{6}$ cm (4) $\sqrt[3]{20}$ cm

59. The ratio of radii of two right circular cylinders is 2 : 3 and their heights are in the ratio 5 : 4. The ratio of their curved surface areas is
(1) 5 : 6 (2) 3 : 4
(3) 4 : 5 (4) 2 : 3

60. A solid cylinder has total surface area of 462 sq. cm. Curved surface area is $\frac{1}{3}$ rd of its total surface area. The volume of the cylinder is
(1) 530 cm^3 (2) 536 cm^3
(3) 539 cm^3 (4) 545 cm^3

61. A cylinder and a cone have equal radii of their bases and equal heights. If their curved surface areas are in the ratio 8 : 5, the ratio of their radius and height is
(1) 1 : 2 (2) 1 : 3
(3) 2 : 3 (4) 3 : 4

62. A solid is hemispherical at the bottom and conical above. If the surface areas of the two parts are equal, then the ratio of radius and height of its conical part is
(1) 1 : 3 (2) 1 : 1
(3) $\sqrt{3}$: 1 (4) 1 : $\sqrt{3}$

63. Base of a right prism is an equilateral triangle of side 6 cm. If the volume of the prism is $108\sqrt{3}$ cc, its height is
(1) 9 cm (2) 10 cm
(3) 11 cm (4) 12 cm

64. If $a+\frac{1}{a}+2=0$, then the value of $\left(a^{37}-\frac{1}{a^{100}}\right)$ is
(1) 0 (2) –2
(3) 1 (4) 2

65. The value of k for which the graphs of $(k-1)x+y-2=0$ and $(2-k)x-3y+1=0$ are parallel is
(1) $\frac{1}{2}$ (2) $-\frac{1}{2}$
(3) 2 (4) –2

66. The length of a shadow of a vertical tower is $\frac{1}{\sqrt{3}}$ times its height. The angle of elevation of the Sun is
(1) 30° (2) 45°
(3) 60° (4) 90°

67. The graphs of $x+2y=3$ and $3x-2y=1$ meet the Y-axis at two points having distance
(1) $\frac{8}{3}$ units (2) $\frac{4}{3}$ units
(3) 1 unit (4) 2 units

68. If $x+\frac{1}{16x}=1$, then the value of $64x^3+\frac{1}{64x^3}$ is
(1) 4 (2) 52
(3) 64 (4) 76

69. If a, b, c are three non-zero real numbers such that $a+b+c=0$, and $b^2 \neq ca$, then the value of $\frac{a^2+b^2+c^2}{b^2-ca}$ is
(1) 3 (2) 2
(3) 0 (4) 1

70. If $a^4+a^2b^2+b^4=8$ and $a^2+ab+b^2=4$, then the value of ab is
(1) –1 (2) 0
(3) 2 (4) 1

71. If $a=25$, $b=15$, $c=-10$, then the value of $\frac{a^3+b^3+c^3-3abc}{(a-b)^2+(b-c)^2+(c-a)^2}$ is
(1) 30 (2) –15
(2) –30 (4) 15

72. A, B, C are three points on a circle. The tangent at A meets BC produced at T, $\angle BTA=40°$, $\angle CAT=44°$. The angle subtended by BC at the centre of the circle is
(1) 84° (2) 92°
(3) 96° (4) 104°

73. If the length of a chord of a circle at a distance of 12 cm from the centre is 10 cm, then the diameter of the circle is
(1) 13 cm (2) 15 cm
(3) 26 cm (4) 30 cm

74. In ΔABC, P and Q are the middle points of the sides AB and AC respectively. R is a point on the segment PQ such that PR : RQ = 1 : 2. If PR = 2cm, then BC =
(1) 4 cm (2) 2 cm
(3) 12 cm (4) 6 cm

75. If O is the circumcentre of ΔABC and $\angle OBC=35°$, then the $\angle BAC$ is equal to
(1) 55° (2) 110°
(3) 70° (4) 35°

76. If I is the incentre of ΔABC and $\angle BIC=135°$, then ΔABC is
(1) acute angled
(2) equilateral
(3) right angled
(4) obtuse angled

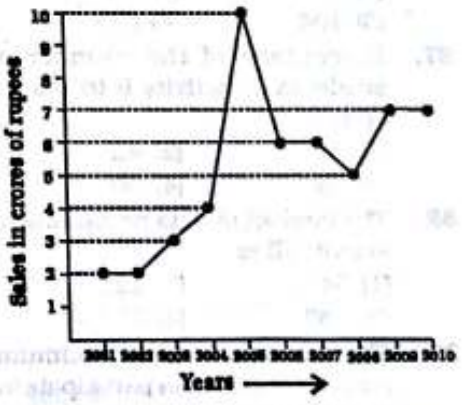
77. If $\sin^2\alpha+\sin^2\beta=2$, then the value of $\cos\left(\frac{\alpha+\beta}{2}\right)$ is
(1) 1 (2) –1
(3) 0 (4) 0.5

78. The value of $\cot\frac{\pi}{20}\cot\frac{3\pi}{20}\cot\frac{5\pi}{20}\cot\frac{7\pi}{20}\cot\frac{9\pi}{20}$ is
(1) –1 (2) $\frac{1}{2}$
(3) 0 (4) 1

79. If $\sin\theta+\cos\theta=\frac{17}{13}$, $0<\theta<90°$, then the value of $\sin\theta-\cos\theta$ is
(1) $\frac{5}{17}$ (2) $\frac{3}{19}$
(3) $\frac{7}{10}$ (4) $\frac{7}{13}$

80. If $\tan\theta \cdot \tan 2\theta=1$, then the value of $\sin^2 2\theta+\tan^2 2\theta$ is equal to
(1) $\frac{3}{4}$ (2) $\frac{10}{3}$
(3) $3\frac{3}{4}$ (4) 3

Directions (81 – 85) : The following line diagram represents the yearly sales figures of a company in the years 2001-2010. Examine the diagram and answer the questions 81 to 85.



81. By what percent did the sales in 2008 decrease in comparison to the sales in 2006?
(1) 20 (2) 18
(3) $16\frac{2}{3}$ (4) $15\frac{2}{3}$

82. The ratio of sales in 2002 to that in 2007 is
(1) 2 : 3 (2) 1 : 3
(3) 1 : 1 (4) 3 : 2

83. Average sale (in crores of ₹) of the company during the period 2003 – 2007 is
(1) 5.8 (2) 5
(3) 6 (4) 5.5

84. The percentage increase in sales in the year 2005 with respect to the previous year is
(1) 80 (2) 100
(3) 120 (4) 150

85. Total sales (in crores of ₹) from 2005 to 2008 is
(1) 17 (2) 27
(3) 22 (4) 31

Directions (86 – 90) : The following table shows the number of students of 7 colleges participating in extra curricular activities :

Extra Curricular Activities	Colleges						
	A	B	C	D	E	F	G
I	200	300	500	100	400	300	200
II	100	200	200	100	100	100	100
III	65	130	420	75	540	220	153
IV	317	155	438	105	385	280	120

Read the table and answer questions 86 to 90

86. The difference of the range of number of students in activity IV and the average of number of students in activity III per college is
(1) 111 (2) 153
(3) 104 (4) 217

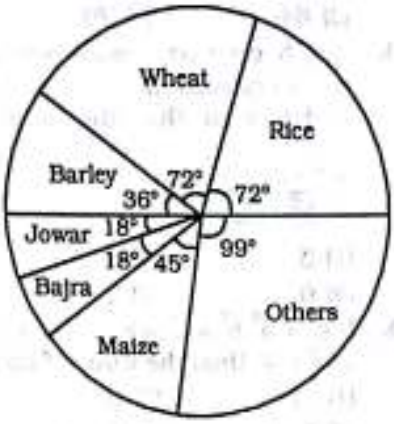
87. Percentage of the number of students in activity II to that of IV is
(1) 37 (2) 42
(3) 48 (4) 50

88. The median of data pertaining to activity III is
(1) 540 (2) 229
(3) 153 (4) 75

89. The college in which minimum number of students participate in extra curricular activities is
(1) D (2) G
(3) F (4) A

90. The ratio of total number of students in II and I is
(1) 1 : 2 (2) 9 : 20
(3) 19 : 7 (4) 21 : 10

Directions (91 – 95) : The pie-chart provided below gives the distribution of land (in a village) under various food crops. Study the pie-chart carefully and answer the questions from 91 to 95.



91. If the total area under bajra was three hundred acres, then the total area (in hundred acres) under rice and barley together is
(1) 18 (2) 12
(3) 15 (4) 20

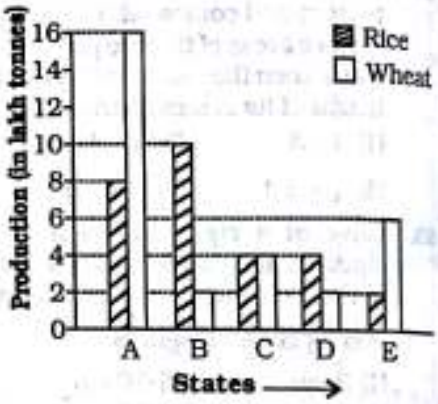
92. The combination of three crops which contribute to more than 50% of the total area under the food crops is
(1) Wheat, rice and maize
(2) wheat, rice and jowar
(3) wheat, rice and bajra
(4) rice, barley and maize

93. The ratio of the land used for rice and barley is
(1) 3 : 1 (2) 1 : 2
(3) 2 : 1 (4) 3 : 2

94. If 10% of the land reserved for rice be distributed to wheat and barley in the ratio 2 : 1, then the angle corresponding to wheat in the new pie-chart will be
(1) 38.4° (2) 76.8°
(3) 75.6° (4) 45.5°

95. If the production of rice is 5 times that of jowar and the production of jowar is 2 times that of bajra, then the ratio between the yield per acre of rice and bajra is
(1) 5 : 1 (2) 3 : 1
(3) 4 : 1 (4) 6 : 1

Directions (96 – 100) : The bar graph provided below represents the production of rice and wheat in different states of a country in a certain year. Answer questions 96 to 100 based on the bar graph.



96. The total production of rice and wheat in all the mentioned states is minimum in the state
(1) B (2) C
(3) D (4) E

97. The ratio of total production of rice in the mentioned states to that of wheat in those states, is
(1) 15 : 16
(2) 12 : 13
(3) 13 : 14
(4) 14 : 15

98. The difference between the production in rice and wheat is maximum in
(1) A only
(2) all of A, B and E
(3) B and E both
(4) A and B both

99. The state which is the largest producer of rice is
(1) A (2) B
(3) C (4) D

100. The average of production of rice in the mentioned states (in lakh tonnes) is
(1) 5.5 (2) 5.6
(3) 5.7 (4) 5.8

SOLVED PAPER-09

ANSWERS

1. (4)	2. (3)	3. (3)	4. (3)
5. (4)	6. (4)	7. (3)	8. (*)
9. (2)	10. (2)	11. (3)	12. (4)
13. (3)	14. (1)	15. (4)	16. (3)
17. (1)	18. (1)	19. (1)	20. (2)
21. (2)	22. (4)	23. (4)	24. (2)
25. (4)	26. (3)	27. (3)	28. (1)
29. (4)	30. (4)	31. (2)	32. (4)
33. (3)	34. (1)	35. (2)	36. (2)
37. (2)	38. (1)	39. (4)	40. (2)
41. (3)	42. (4)	43. (4)	44. (2)
45. (4)	46. (2)	47. (3)	48. (3)
49. (1)	50. (2)	51. (3)	52. (3)
53. (2)	54. (3)	55. (1)	56. (4)
57. (3)	58. (2)	59. (1)	60. (3)
61. (4)	62. (4)	63. (4)	64. (2)
65. (1)	66. (3)	67. (4)	68. (2)
69. (2)	70. (4)	71. (4)	72. (4)
73. (3)	74. (3)	75. (1)	76. (3)
77. (3)	78. (4)	79. (4)	80. (3)
81. (3)	82. (2)	83. (1)	84. (4)
85. (2)	86. (3)	87. (4)	88. (3)
89. (1)	90. (2)	91. (1)	92. (1)
93. (3)	94. (2)	95. (*)	96. (3)
97. (4)	98. (4)	99. (2)	100. (2)

EXPLANATIONS

1. (4) Quotient $= \frac{a}{4}$

Remainder $= \frac{a}{2}$

$\therefore$ Dividend = Divisor × Quotient + Remainder

$\Rightarrow b = \frac{a \times a}{4} + \frac{a}{2}$

$= \frac{a^2 + 2a}{4} = \frac{a(a+2)}{4}$

$\Rightarrow 4b = a(a+2)$

$\Rightarrow \frac{a(a+2)}{b} = 4$

2. (3) A number is exactly divisible by 11, if the difference between the sums of digits at even and odd places be either zero or a multiple of 11.

$\therefore$ (A + A + 3) − (6 + 8 + 7) = 0

$\Rightarrow$ 2A + 3 = 21

$\Rightarrow$ 2A = 21 − 3 = 18

$\therefore$ $A = \frac{18}{2} = 9$

3. (3) Let the numbers be a and b.

$\therefore ab = 1575$

and, $\frac{a}{b} = \frac{9}{7}$

$\therefore ab \times \frac{a}{b} = 1575 \times \frac{9}{7}$

$\Rightarrow a^2 = 2025$

$\Rightarrow a = \sqrt{2025} = 45$

$\therefore ab = 1575$

$\Rightarrow b = \frac{1575}{a} = \frac{1575}{45} = 35$

$\therefore a + b = 45 + 35 = 80$

4. (3) Expression $= \frac{(81)^{3.6} \times (9)^{2.7}}{(81)^{4.2} \times 3}$

$= \frac{(3^4)^{3.6} \times (3^2)^{2.7}}{(3^4)^{4.2} \times 3}$

$= \frac{3^{14.4} \times 3^{5.4}}{3^{16.8} \times 3}$

$[\because (a^m)^n = a^{mn};$
$a^m \times a^n = a^{m+n};$
$a^m \div a^n = a^{m-n}]$

$= \frac{3^{14.4+5.4}}{3^{16.8+1}} = \frac{3^{19.8}}{3^{17.8}}$

$= 3^{19.8-17.8} = 3^2 = 9$

5. (4) Let $x = \sqrt{6 + \sqrt{6 + \sqrt{6 + ...}}}$

On squaring both sides,

$x^2 = 6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + ...}}}$

$\Rightarrow x^2 = 6 + x$

$\Rightarrow x^2 - x - 6 = 0$

$\Rightarrow x^2 - 3x + 2x - 6 = 0$

$\Rightarrow x(x-3) + 2(x-3) = 0$

$\Rightarrow (x+2)(x-3) = 0$

$\Rightarrow x = 3$ and $x \neq -2$ because numbers are positive.

6. (4) By mental operation,

$13^2 + 15^2 = 169 + 225 = 394$

$\therefore$ Required sum = 13 + 15 = 28

7. (3) Remainder when $(a-1)^n$ is divided by $a = (-1)^n$

$\therefore 67^{67} + 67 = (68 - 1)^{67} + 67$

Remainder when (68 − 1) is divided by 68

$= (-1)^{67} = -1$

$\therefore$ Required remainder

$= -1 + 67 = 66$

8. (*) Let the work be finished in x days.

$\therefore$ Work done by A in 6 days + work done by B in $(x-6)$ days + work done by C in x days = 1

$\therefore \frac{6}{24} + \frac{(x-6)}{52} + \frac{x}{64} = 1$

$\Rightarrow \frac{x-6}{52} + \frac{x}{64} = 1 - \frac{1}{4} = \frac{3}{4}$

$\Rightarrow \frac{16(x-6) + 13x}{13 \times 16 \times 4} = \frac{3}{4}$

$\Rightarrow 16x - 96 + 13x = 13 \times 16 \times 3$

$\Rightarrow 29x = 624 + 96 = 720$

$\Rightarrow x = \frac{720}{29}$

9. (2) Expression

$= \frac{(0.75)^3}{(1 - 0.75)} + [0.75 + (0.75)^2 + 1]$

$= \frac{(0.75)^3 + (1 - 0.75)[(0.75)^2 + 0.75 \times 1 + 1^2]}{1 - 0.75}$

$= \frac{(0.75)^3 + 1^3 - (0.75)^3}{0.25}$

$[\because (a-b)(a^2 + ab + b^2) = a^3 - b^3]$

$= \frac{1}{0.25} = \frac{100}{25} = 4$

$\therefore$ Required square root

$= \sqrt{4} = 2$

10. (2) $\sqrt{4096} = 64$

$\therefore \sqrt{40.96} = \sqrt{\frac{4096}{100}} = \frac{64}{10} = 6.4$

and

$\sqrt{0.004096} = \sqrt{\frac{4096}{1000000}} = \frac{64}{1000} = 0.064$

$\therefore$ Expression = 64 + 6.4 + 0.064 = 70.464

11. (3) Expression = 3011 × 3012
= 3011 (3011 + 1)
= $(3011)^2 + 3011$
$\therefore$ Required answer = 3011

12. (4) Work done by (P + Q + R) = 1 .....(i)

Work done by (P + Q) = $\frac{19}{23}$ ....(ii)

Work done by (Q + R) = $\frac{8}{23}$ ....(iii)

From equations (ii) + (iii) − (i)

$Q = \frac{19}{23} + \frac{8}{23} - 1 = \frac{27-23}{23} = \frac{4}{23}$

$\therefore$ Wage of Q = $\frac{4}{23} \times 5750$
= Rs. 1000

13. (3) Let the marked price of article be Rs. x and its C.P. be Rs. 100.

$\therefore \frac{60x}{100} = 100 - 30 = 70$

$\Rightarrow 60x = 70 \times 100$

$\Rightarrow x = \frac{70 \times 100}{60} = \frac{700}{6} = \text{Rs.}\frac{350}{3}$

On selling at marked price,

Profit = $\frac{350}{3} - 100 = \frac{50}{3} = 16\frac{2}{3}$

14. (1) Part of the cistern filled in 2 hours by pipe A = $\frac{2}{3}$

Part of the cistern filled in 1 hour by pipe B = $\frac{1}{4}$

$\therefore$ Total part filled

$= \frac{2}{3} + \frac{1}{4} = \frac{8+3}{12} = \frac{11}{12}$

When all three pipes are opened, the part filled in one hour

$= \frac{1}{3} + \frac{1}{4} - 1 = \frac{4+3-12}{12} = \frac{-5}{12}$

i.e. $\frac{5}{12}$ part will be emptied per hour.

$\therefore$ Time taken to empty $\frac{11}{12}$ part

$= \frac{11}{12} \times \frac{12}{5} = \frac{11}{5}$ hours

= 2 hours 12 minutes

$\therefore$ Required time = 5 + 2 : 12 = 7 : 12 p.m.

15. (4) Let A and B together complete the work in x days

$\therefore$ Time taken by A = $(x+4)$ days

Time taken by B = $(x+16)$ days

$\therefore \frac{1}{x+4} + \frac{1}{x+16} = \frac{1}{x}$

$\Rightarrow \frac{x+16+x+4}{(x+4)(x+16)} = \frac{1}{x}$

$\Rightarrow 2x^2 + 20x = x^2 + 20x + 64$

$\Rightarrow x^2 = 64 \Rightarrow x = \sqrt{64} = 8$ days

16. (3) $M_1D_1T_1 = M_2D_2T_2$

$\Rightarrow 250 \times 20 \times 5 = M_2 \times 10 \times 8$

$\Rightarrow M_2 = \frac{250 \times 20 \times 5}{10 \times 8} = 312.5$

$\therefore$ Minimum number of men required = 313

17. (1) (2M + 5W) × 12
= (5M + 2W) × 9
$\Rightarrow$ 24M + 60W = 45M + 18W
$\Rightarrow$ 42 W = 21M
$\Rightarrow$ 2W = 1M
$\therefore$ 2M + 5W = 9W
$\therefore M_1D_1 = M_2D_2$
$\Rightarrow 9 \times 12 = 3 \times D_2$

$\Rightarrow D_2 = \frac{9 \times 12}{3} = 36$ days

18. (1) Let the cost price be Rs. 100 and marked price be Rs. x.

$\therefore x \times \frac{3}{4} = 125$

$\Rightarrow x = \frac{125 \times 4}{3} = \text{Rs.}\frac{500}{3}$

$\therefore$ Required ratio

$= \frac{500}{3} : 100 = 5 : 3$

19. (1) Let the incomes of A and B be Rs. $2x$ and Rs. x respectively and their expenditures be Rs. $5y$ and Rs. $3y$ respectively

A's savings

$= \frac{4}{5} \times 5000 = \text{Rs.}4000$

B's savings = Rs. 1000

$\therefore 2x - 5y = 4000$ .....(i)

$x - 3y = 1000$ ..... (ii)

By equation (i) × 3 − equation (ii) × 5,

$6x - 15x - (5x - 15x)$
= 12000 − 5000
$\Rightarrow 6x - 5x = 7000$
$\Rightarrow x$ = Rs. 7000

20. (2) Let the numbers be x and y where $x > y$.

$\therefore \frac{x+y}{x-y} = \frac{5}{1}$

[By componendo and dividendo]

$\Rightarrow \frac{x+y+x-y}{x+y-x+y} = \frac{5+1}{5-1}$

$\Rightarrow \frac{x}{y} = \frac{6}{4} = \frac{3}{2}$

21. (2) Single equivalent discount for two successive discounts of x% and y%

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

$\therefore$ Single equivalent discount for 10% and 20%

$= \left(10 + 20 - \frac{10 \times 20}{100}\right)\% = 28\%$

Single equivalent discount for 28% and 50%

$= \left(50 + 28 - \frac{50 \times 28}{100}\right)\%$

= (78 − 14)% = 64%

22. (4) I. Single equivalent discount

$= \left(10 + 10 - \frac{10 \times 10}{100}\right)\% = 19\%$

II. Single equivalent discount

$= \left(12 + 8 - \frac{12 \times 8}{100}\right)\% = 19.04\%$

III. Single equivalent discount

$= \left(15 + 5 - \frac{15 \times 5}{100}\right)\% = 19.25\%$

23. (4) In the beginning,
Acid : water = 4 : 1
Let x litres of mixture be replaced by x litres of water.
$\therefore$ In x litres of mixture,
milk = $\frac{4x}{5}$ litres

and, water $= \frac{x}{5}$ litres

$\therefore \frac{4-\frac{4x}{5}}{1-\frac{x}{5}+x} = \frac{4}{3}$

$\Rightarrow \frac{20-4x}{5-x+5x} = \frac{4}{3}$

$\Rightarrow 60-12x = 20+16x$

$\Rightarrow 28x = 40$

$\Rightarrow x = \frac{40}{28} = \frac{10}{7} = 5\times\frac{2}{7}$

24. (2) Required ratio
$= 9\times14 : 8\times15$
$= 21 : 20$

25. (4) Let the cricketer's highest score = x runs
$\therefore$ Minimum score
$= (x-172)$ runs
$\therefore$ Total runs scored in 40 innings $= 40\times50 = 2000$ runs
Total runs scored in 38 innings $= 38\times48 = 1824$
$\therefore x+x-172 = 2000-1824$
$= 176$
$\Rightarrow 2x = 176+172 = 348$

$\therefore x = \frac{348}{2} = 174$

26. (3) Let the weight of alloy A be 1 kg.

$\therefore$ Gold in A $= \frac{7}{9}$ kg and copper $= \frac{2}{9}$ kg

In 1 kg of alloy B, Gold $= \frac{7}{18}$ and copper $= \frac{11}{18}$ kg
$\therefore$ Required ratio
$= \left(\frac{7}{9}+\frac{7}{18}\right) : \left(\frac{2}{9}+\frac{11}{18}\right)$

$= \frac{21}{18} : \frac{15}{18} = 21:15 = 7:5$

27. (3) Let required ratio be $x : y$.

$\therefore \frac{\frac{2x}{7}+\frac{7y}{10}}{\frac{5x}{7}+\frac{3y}{10}} = \frac{2}{3}$

$\Rightarrow \frac{20x+49y}{50x+21y} = \frac{2}{3}$

$\Rightarrow 60x+147y = 100x+42y$
$\Rightarrow 100x-60x = 147y-42y$
$\Rightarrow 40x = 105y$

$\Rightarrow \frac{x}{y} = \frac{105}{40} = \frac{21}{8}$

28. (1) Let third number = x
$\therefore$ Second number $= 2x$
and First number $= 4x$
$\therefore 4x+2x+x = 154\times3$
$\Rightarrow 7x = 462$

$\Rightarrow x = \frac{462}{7} = 66$

$\therefore$ First number
$= 4x = 4\times66 = 264$

29. (4) Let the number of officers be x, then number of the rest officials $= 500-x$
$\therefore x\times14000 + (500-x)4000 = 5000\times500$
$\Rightarrow x\times14 + (500-x)4 = 5\times500$
$\Rightarrow 14x+2000-4x = 2500$
$\Rightarrow 10x = 2500-2000 = 500$

$\Rightarrow x = \frac{500}{10} = 50$

30. (4) Difference $= (64+62+84) - (68+65+73)$
$= 210-206 = 4$
$\therefore$ Correct average

$= 72+\frac{4}{40} = 72.1$

31. (2) Let the first number be x.
$\therefore$ Second number $= 3x$

Third number $= \frac{3x}{4}$

$\therefore x+3x+\frac{3x}{4} = 3\times114$

$\Rightarrow \frac{4x+12x+3x}{4} = 342$

$\Rightarrow 19x = 342\times4$

$\therefore x = \frac{342\times4}{19} = 72$

$\therefore$ Largest number
$= 3x = 3\times72 = 216$

32. (4) Let the total distance be 1 km.
$\therefore$ Total time

$= \frac{1}{5\times8}+\frac{1}{10\times25}+\left(\frac{1-\frac{1}{5}-\frac{1}{10}}{20}\right)$

$\left[\text{Time} = \frac{\text{Distance}}{\text{Speed}}\right]$

$= \frac{1}{40}+\frac{1}{250}+\left(\frac{\frac{10-2-1}{10}}{20}\right)$

$= \frac{1}{40}+\frac{1}{250}+\frac{7}{200}$

$= \frac{25+4+35}{1000} = \frac{64}{1000}$

$= \frac{8}{125}$ hours

$\therefore$ Average speed $= \frac{\text{Total distance}}{\text{Time taken}}$

$= \frac{125}{8} = 15.625$ kmph

33. (3) Let x red marbles be added.

$\therefore \frac{10+x}{40+x}\times100 = 60$

$\Rightarrow \frac{(10+x)\times5}{40+x} = 3$

$\Rightarrow 50+5x = 120+3x$
$\Rightarrow 5x-3x = 120-50$

$\Rightarrow 2x = 70 \Rightarrow x = \frac{70}{2} = 35$

34. (1) Let the number be x.

$\therefore x\times\frac{x}{4} = x\times\frac{300}{100}$

$\Rightarrow \frac{x^2}{4} = 3x \Rightarrow x = 3\times4 = 12$

35. (2) $A = P\left(1-\frac{R}{100}\right)^T$

$\Rightarrow 729 = P\left(1-\frac{10}{100}\right)^3$

$\Rightarrow 729 = P\times\left(\frac{9}{10}\right)^3 = \frac{729}{1000}P$

$\Rightarrow P = \frac{729\times1000}{729} = \text{Rs. } 1000$

36. (2) Required reduction percent

$= \frac{x}{100+x}\times100$

$= \frac{50}{150}\times100 = \frac{100}{3} = 33\frac{1}{3}\%$

37. (2) Let the distance of school be x km.

Then,

$$\frac{x}{3}-\frac{x}{4}=\frac{10}{60}$$

$$\Rightarrow \frac{4x-3x}{12}=\frac{1}{6} \Rightarrow \frac{x}{12}=\frac{1}{6}$$

$\Rightarrow x = 2$ km

38. (1) Let the number of oranges bought be $2x$ dozens.

$\therefore$ Total C.P.

$= 40x + 30x =$ Rs. $70x$

Total S.P.

$= 45 \times 2x =$ Rs. $90x$

$\therefore$ Profit $= 90x - 70x =$ Rs. $20x$

$\therefore 20x = 480$

$$\Rightarrow x = \frac{480}{20} = 24$$

$\therefore$ Number of oranges bought

$= 2 \times 24 = 48$ dozens

39. (4) Let the CP of chair sold at loss be Rs. x.

$\therefore$ CP of second chair

$=$ Rs. $(900 - x)$

$$\therefore \frac{900-x}{4}-\frac{x}{5}=90$$

$$\Rightarrow \frac{4500-5x-4x}{20}=90$$

$\Rightarrow 4500 - 9x = 1800$

$\Rightarrow 9x = 4500 - 1800 = 2700$

$$\Rightarrow x = \frac{2700}{9} = \text{Rs. } 300$$

40. (2) Let S.P. of 100 oranges be Rs. x.

$\therefore$ SP of 20 oranges

$$= \frac{x \times 20}{100} = \text{Rs.}\frac{x}{5} = \text{Gain}$$

$$\therefore \text{C.P.} = x - \frac{x}{5} = \text{Rs.}\frac{4x}{5}$$

$\therefore$ Gain per cent

$$= \frac{\frac{x}{5}}{\frac{4x}{5}} \times 100 = \frac{100}{4} = 25\%$$

41. (3) Let the C.P. of article be Rs. 100 and its S.P. be Rs. x.

$$\therefore 100 \times \frac{60}{100} = \frac{x \times 50}{100}$$

$$\Rightarrow 60 = \frac{x}{2} \Rightarrow x = 120$$

$\therefore$ Gain% $= 20\%$

42. (4) S.P. of first horse

$$= 40000 \times \frac{115}{100} = \text{Rs. } 46000$$

$\therefore$ S.P. of second horse

$=$ Rs. $(80000 - 46000 - 3600)$

$=$ Rs. 30400

43. (4) Let the seller buy xy guavas.

$\therefore$ C.P. of xy guavas $= y^2$

S.P. of xy guavas

$$= xy \times \frac{x}{y} = x^2$$

$\therefore$ Gain $= x^2 - y^2$

$$\text{Gain\%} = \frac{x^2-y^2}{y^2} \times 100$$

44. (2) S.I. $= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$$\therefore \frac{x \times m \times a}{100} = \frac{y \times m^2 \times a^2}{100}$$

$$\Rightarrow \frac{x}{y} = \frac{m^2a^2}{ma} = \frac{ma}{1}$$

45. (4) Let A borrowed Rs. x from B.

$\therefore$ Amount borrowed from C

$=$ Rs. $(1200 - x)$

$$\therefore \frac{x \times 14 \times 1}{100} + \frac{(1200-x) \times 15 \times 1}{100} = 172$$

$\Rightarrow 14x + 18000 - 15x = 17200$

$\Rightarrow 18000 - x = 17200$

$\Rightarrow x = 18000 - 17200 =$ Rs. 800

46. (2) Each interior angle of a regular polygon

$$= 180 \times \frac{3}{5} = 108^\circ$$

Each interior angle of a regular polygon of n sides

$$= \left(\frac{2n-4}{n}\right) \times 90^\circ$$

$$\therefore \left(\frac{2n-4}{n}\right) \times 90^\circ = 108^\circ$$

$$\Rightarrow \left(\frac{2n-4}{n}\right) \times 10 = 12$$

$\Rightarrow 20n - 40 = 12n$

$\Rightarrow 20n - 12n = 40$

$\Rightarrow 8n = 40$

$\Rightarrow n = 5$

47. (3) Side of the first square

$= \sqrt{\text{Area}}$

$= \sqrt{200} = 10\sqrt{2}$ metre

Its diagonal $= \sqrt{2} \times$ side

$= 10\sqrt{2} \times \sqrt{2}$

$= 20$ metre

$\therefore$ Diagonal of new square

$= \sqrt{2} \times 20 = 20\sqrt{2}$ metre

$\therefore$ Its area $= \frac{1}{2} \times$ (diagonal)^2

$$= \frac{1}{2} \times 20\sqrt{2} \times 20\sqrt{2}$$

$= 400$ sq. metre

48. (3) Height of cone = height of cylinder = radius of hemisphere $= r$ units

$\therefore$ Ratio of the volumes of cone, cylinder and hemisphere

$$= \frac{1}{3}\pi r_1^2 h : \pi r_2^2 h : \frac{2}{3}\pi r^3$$

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

$$= \frac{4}{3} : 9 : \frac{2}{3}$$

$= 4 : 27 : 2$

49. (1) Let the rate of stream be x kmph.

$\therefore$ Rate downstream

$= (10 + x)$ kmph

Rate upstream $= (10 - x)$ kmph

$$\therefore \frac{91}{10+x} + \frac{91}{10-x} = 20$$

$$\Rightarrow 91\left(\frac{10-x+10+x}{(10+x)(10-x)}\right) = 20$$

$\Rightarrow (10 + x)(10 - x) = 91$

$\Rightarrow 100 - x^2 = 91$

$\Rightarrow x^2 = 100 - 91 = 9$

$\therefore x = \sqrt{9} = 3$ kmph

50. (2) Speed and time are inversely proportional for a fixed distance.

$\therefore \frac{4}{3}$ of usual time $-$ usual time $= 20$ minutes

$$\Rightarrow \text{Usual time} \times \frac{1}{3} = 20$$

$\therefore$ Usual time $= 3 \times 20$

$= 60$ minutes

51. (3) Let speed of motorboat in still water be x kmph and

speed of stream be y kmph.

$\therefore \frac{25}{x-y}+\frac{39}{x+y}=8$ .... (i)

$\frac{35}{x-y}+\frac{52}{x+y}=11$ .... (ii)

By equation (i) × 4 – (ii) × 3,

$\frac{100}{x-y}-\frac{105}{x-y}=32-33$

$\Rightarrow \frac{-5}{x-y}=-1 \Rightarrow x-y=5$ ... (iii)

From equation (i),

$\frac{25}{5}+\frac{39}{x+y}=8$

$\Rightarrow \frac{39}{x+y}=8-5=3$

$\Rightarrow x+y=13$ .... (iv)

By equation (iv)–(iii)

$x+y-x+y=13-5=8$

$\Rightarrow 2y=8$

$\Rightarrow y=\frac{8}{2}=4$ kmph

52. (3) Let the principal be Re. 1.

$\therefore A=P\left(1+\frac{R}{100}\right)^T$

$\Rightarrow 2=1\left(1+\frac{R}{100}\right)^5$

Cubing both sides,

$2^3=\left(1+\frac{R}{100}\right)^{5\times 3}$

$\Rightarrow 2^3=\left(1+\frac{R}{100}\right)^{15}$

$\therefore$ Time = 15 years

53. (2) Let the younger son's share be Rs. x.

$\therefore$ Elder son's share = Rs. $(120000-x)$

$\therefore x+\frac{x\times 5\times 6}{100}=(120000-x)+\frac{(120000-x)\times 4\times 5}{100}$

$\Rightarrow 20x+6x = 20\times 120000-20x+480000-4x$

$\Rightarrow 50x=2400000+480000$

$\Rightarrow 50x=2880000$

$\Rightarrow x=\frac{2880000}{50}=$ Rs.57600

54. (3) $a^2+b^2+c^2=2a-2b-2c-3$

$\Rightarrow a^2+b^2+c^2-2a+2b+2c+1+1+1=0$

$\Rightarrow (a^2-2a+1)+(b^2+2b+1)+(c^2+2c+1)=0$

$\Rightarrow (a-1)^2+(b+1)^2+(c+1)^2=0$

$\Rightarrow a-1=0 \Rightarrow a=1$

$\Rightarrow b+1=0 \Rightarrow b=-1$

$\Rightarrow c+1=0 \Rightarrow c=-1$

$\therefore a-b+c=1+1-1=1$

55. (1) $x^2+3x+1=0$

Dividing by x,

$x+3+\frac{1}{x}=0$

$\Rightarrow x+\frac{1}{x}=-3$

Cubing both sides,

$\left(x+\frac{1}{x}\right)^3=x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)$

$\Rightarrow (-3)^3=x^3+\frac{1}{x^3}+3(-3)$

$\Rightarrow -27=x^3+\frac{1}{x^3}-9$

$\Rightarrow x^3+\frac{1}{x^3}=-27+9=-18$

56. (4) $x^a \cdot x^b \cdot x^c = 1$

$\Rightarrow x^{a+b+c}=1=x^0$

$\Rightarrow a+b+c=0$

Now, $a^3+b^3+c^3-3abc$

$=(a+b+c)(a^2+b^2+c^2-ab-bc-ac)$

$\Rightarrow a^3+b^3+c^3-3abc=0$

$\Rightarrow a^3+b^3+c^3=3abc$

57. (3) Area of the base

$=\frac{1}{2}\times$ (diagonal)^2

$=\frac{1}{2}\times 24\sqrt{2}\times 24\sqrt{2}$

= 576 sq. metre.

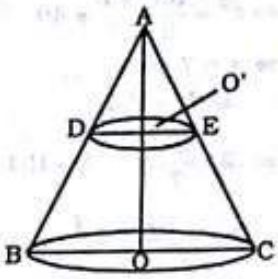
$\therefore$ Volume of pyramid

$=\frac{1}{3}\times$ height × area of base

$\Rightarrow 1728=\frac{1}{3}\times h\times 576$

$\Rightarrow h=\frac{1728\times 3}{576}=9$ metre

58. (2)



Let DO' = r cm and OO' = h cm,

From similar triangles ADO' and ABO,

$\frac{AO'}{AO}=\frac{DO'}{BO}$

$\Rightarrow \frac{9-h}{9}=\frac{r}{3}$

$\Rightarrow 9-h=3r$

$\Rightarrow h=9-3r$

Volume of frustum

$=\frac{1}{3}\pi h\left(r_1^2+r_2^2+r_1r_2\right)$

$\Rightarrow 44=\frac{1}{3}\times\frac{22}{7}(9-3r)\left(9+r^2+3r\right)$

$\Rightarrow 44=\frac{22}{7}(3-r)\left(3^2+3r+r^2\right)$

$\Rightarrow \frac{44\times 7}{22}=3^3-r^3$

$\Rightarrow 14=27-r^3$

$\Rightarrow r^3=27-14=13$

$\therefore r=\sqrt[3]{13}$ cm

59. (1)

First cylinder	Second cylinder
$r_1=2r$	$r_2=3r$
$h_1=5h$	$h_2=4h$

$\therefore$ Required ratio

$=2\pi r_1h_1 : 2\pi r_2h_2$

$=2\times 5 : 3\times 4 = 5 : 6$

60. (3) Let the height of cylinder be h cm and radius of base = r cm

$\therefore 2\pi r^2+2\pi rh=462$ ....(i)

Area of curved surfaces

$=2\pi rh=\frac{1}{3}\times 462=154$

$\therefore 2\pi r^2+154=462$

$\Rightarrow 2\pi r^2=462-154=308$

$\Rightarrow 2\times\frac{22}{7}\times r^2=308$

$\Rightarrow r^2 = \frac{308 \times 7}{2 \times 22} = 49$

$\Rightarrow r = 7$ cm

$\therefore 2\pi rh = 154$

$\Rightarrow 2 \times \frac{22}{7} \times 7 \times h = 154$

$\Rightarrow h = \frac{154}{2 \times 22} = \frac{7}{2}$ cm

$\therefore$ Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times \frac{7}{2}$

$= 539$ cm^3

61. (4)

$\frac{\text{Curved surface of cylinder}}{\text{Curved surface of cone}} = \frac{8}{5}$

$\Rightarrow \frac{2\pi rh}{\pi r\sqrt{h^2 + r^2}} = \frac{8}{5}$

$\Rightarrow \frac{h}{\sqrt{h^2 + r^2}} = \frac{4}{5}$

On squaring both sides,

$\frac{h^2}{h^2 + r^2} = \frac{16}{25} \Rightarrow \frac{h^2 + r^2}{h^2} = \frac{25}{16}$

$\Rightarrow 1 + \frac{r^2}{h^2} = \frac{25}{16}$

$\Rightarrow \frac{r^2}{h^2} = \frac{25}{16} - 1 = \frac{9}{16}$

$\therefore \frac{r}{h} = \frac{3}{4}$

62. (4) Let the radius of base $= r$ units and height of cone $= h$ units.

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

$\Rightarrow 2r = \sqrt{r^2 + h^2} \Rightarrow 4r^2 = r^2 + h^2$

$\Rightarrow 3r^2 = h^2 \Rightarrow \sqrt{3}\, r = h$

$\Rightarrow \frac{r}{h} = \frac{1}{\sqrt{3}}$

63. (4) Area of the base

$= \frac{\sqrt{3}}{4} \times \text{side}^2$

$= \frac{\sqrt{3}}{4} \times 6 \times 6 = 9\sqrt{3}$ sq.cm.

$\therefore$ Volume of the prism

= Area of base $\times$ height

$\Rightarrow 108\sqrt{3} = 9\sqrt{3} \times h$

$\Rightarrow h = \frac{108\sqrt{3}}{9\sqrt{3}} = 12$ cm

64. (2) $a + \frac{1}{a} + 2 = 0$

$a^2 + 1 + 2a = 0$

$\Rightarrow (a + 1)^2 = 0 \Rightarrow a + 1 = 0$

$\Rightarrow a = -1$

$\therefore a^{37} - \frac{1}{a^{100}} = (-1)^{37} - \frac{1}{(-1)^{100}}$

$= -1 - 1 = -2$

65. (1) The graphs of $(k-1)x + y - 2 = 0$ and $(2-k)x - 3y + 1 = 0$ are parallel.

$\therefore \frac{k-1}{2-k} = \frac{1}{-3}$

$\Rightarrow -3k + 3 = 2 - k$

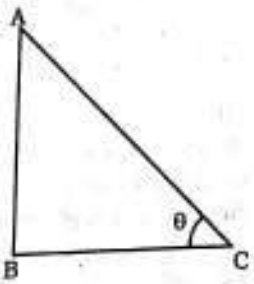
$\Rightarrow -3k + k = 2 - 3$

$\Rightarrow -2k = -1 \Rightarrow k = \frac{1}{2}$

Note : Two straight lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are parallel if

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

66. (3)



Let AB be tower and BC be its shadow.

If AB $= x$, then $BC = \frac{x}{\sqrt{3}}$

$\therefore \tan\theta = \frac{AB}{BC} = \frac{x}{\frac{x}{\sqrt{3}}} = \sqrt{3}$

$\therefore \tan\theta = \tan 60°$

$\Rightarrow \theta = 60°$

67. (4) On Y-axis, $x = 0$

Putting $x = 0$ in $x + 2y = 3$,

$2y = 3 \Rightarrow y = \frac{3}{2}$

Putting $x = 0$ in $3x - 2y = 1$,

$-2y = 1 \Rightarrow y = -\frac{1}{2}$

$\therefore$ Points on Y-axis are $\left(0, \frac{3}{2}\right)$ and $\left(0, -\frac{1}{2}\right)$.

$\therefore$ Required distance

$= \sqrt{(0-0)^2 + \left(\frac{3}{2} + \frac{1}{2}\right)^2}$

$= \sqrt{0 + 4} = 2$ units

Note : Distance $= \frac{3}{2} + \frac{1}{2} = 2$

68. (2) $x + \frac{1}{16x} = 1$

$\Rightarrow 4x + \frac{1}{4x} = 4$

cubing both sides,

$\left(4x + \frac{1}{4x}\right)^3 = (4x)^3 + \left(\frac{1}{4x}\right)^3 + 3 \times 4x \times \frac{1}{4x}\left(4x + \frac{1}{4x}\right)$

$\Rightarrow 64 = 64x^3 + \frac{1}{64x^3} + 3 \times 4$

$\Rightarrow 64x^3 + \frac{1}{64x^3} = 64 - 12 = 52$

69. (2) $a + b + c = 0$

$(a + c) = -b$

Squaring both sides,

$a^2 + c^2 + 2ac = b^2$

$\Rightarrow a^2 + c^2 = b^2 - 2ac$

$\therefore \frac{a^2 + b^2 + c^2}{b^2 - ca} = \frac{b^2 + b^2 - 2ac}{b^2 - ca}$

$= \frac{2(b^2 - ac)}{b^2 - ac} = 2$

70. (4) $a^4 + a^2b^2 + b^4 = (a^2 + ab + b^2)(a^2 - ab + b^2)$

$\Rightarrow 8 = 4(a^2 - ab + b^2)$

$\Rightarrow a^2 - ab + b^2 = 2$ ...(i)

$a^2 + ab + b^2 = 4$ ...(ii)

By equation (ii) $-$ (i)

$a^2 + ab + b^2 - a^2 + ab - b^2 = 4 - 2$

$\Rightarrow 2ab = 2 \Rightarrow ab = 1$

71. (4) $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$= \frac{1}{2}(a + b + c)[(a-b)^2 + (b-c)^2 + (c-a)^2]$

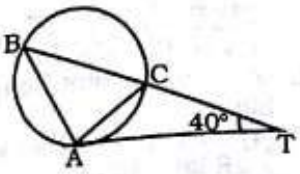
$\therefore$ Expression

$$= \frac{\frac{1}{2}(a+b+c)\left[(a-b)^2+(b-c)^2+(c-a)^2\right]}{(a-b)^2+(b-c)^2+(c-a)^2}$$

$= \frac{1}{2}(a+b+c) = \frac{1}{2}(25+15-10)$

$= 15$

72. (4)



$\angle CAT = 44°$

$\angle BTA = 40°$

$\angle ACT = 180° - 44° - 40° = 96°$

$\angle CAT = \angle CBA = 44°$

$\angle BCA = 180° - 96° = 84$

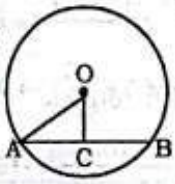
$\therefore \angle BAC = 180° - 84° - 44°$

$= 52°$

$\therefore$ Angle subtended by BC at centre

$= 2 \times 52° = 104°$

73. (3)



OC = 12 cm AC = CB = 5 cm

$\therefore$ Radius 'OA' = $\sqrt{OC^2 + AC^2}$

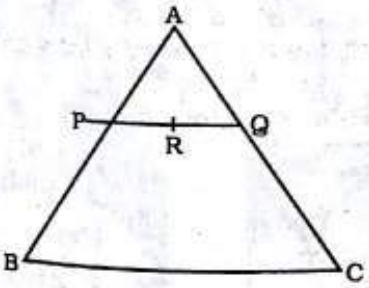
$= \sqrt{12^2+5^2} = \sqrt{144+25}$

$= \sqrt{169} = 13$ cm

$\therefore$ Diameter of circle = 2×13

= 26 cm

74. (3)



$\frac{PR}{RQ} = \frac{1}{2} \Rightarrow \frac{2}{RQ} = \frac{1}{2}$

$\therefore$ RQ = 4 cm

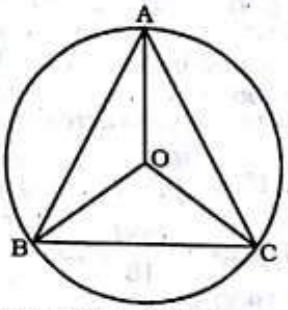
$\therefore$ PQ = PR + RQ = 2 + 4

= 6 cm

The line joining the mid – points of two sides of a triangle is parallel to and half of the third side.

$\therefore$ BC = 2PQ = 2×6 = 12 cm

75. (1) The point where the right bisectors of the sides meet, is called the circum-centre.



OB = OC = radius

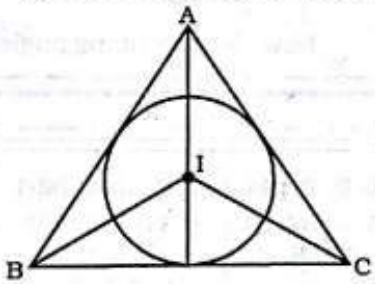
$\therefore \angle OBC = \angle OCB = 35°$

$\therefore \angle BOC = 180 - 70 = 110°$

$\therefore \angle BAC = 55°$

The angle subtended at the centre by an arc is twice to that at the circumference.

76. (3) The point where internal bisectors of angles of a triangle meet is called in-centre.



$\angle BIC = 135°$

$\therefore \frac{1}{2}(\angle B + \angle C) = 45°$

$\Rightarrow \angle B + \angle C = 90°$

$\therefore \angle A = 90°$

77. (3) $\sin^2\alpha + \sin^2\beta = 2$

$\because \sin\theta \le 1$

$\therefore \sin\alpha = \sin\beta = 1$

$\therefore \alpha = \beta = 90°$

$\therefore \cos\left(\frac{\alpha+\beta}{2}\right) = \cos 90° = 0$

78. (4)

$\cot\frac{\pi}{20}.\cot\frac{3\pi}{20}.\cot\frac{5\pi}{20}.\cot\frac{7\pi}{20}.\cot\frac{9\pi}{20}$

$= \cot 9°.\cot 27°.\cot 45°.\cot 63°.\cot 81°$ $[\because \pi^c = 180°]$

$= \cot 9°.\cot 27°.\cot 45°.\cot(90° - 27°).\cot(90° - 9°)$

$= \cot 9°.\cot 27°.\cot 45°.\tan 27°.\tan 9°$

$[\cot(90° - \theta) = \tan\theta]$

$= (\cot 9°.\tan 9°).(\cot 27°.\tan 27°).\cot 45° = 1$

$[\because \tan\theta.\cot\theta = 1]$

79. (4) $\sin\theta + \cos\theta = \frac{17}{13}$ ..... (i)

Let, $\sin\theta - \cos\theta = x$ .....(ii)

Squaring and adding both the equations,

$\sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta + \sin^2\theta + \cos^2\theta - 2\sin\theta.\cos\theta$

$= \left(\frac{17}{13}\right)^2 + x^2$

$\Rightarrow 2(\sin^2\theta + \cos^2\theta) = \frac{289}{169} + x^2$

$\Rightarrow x^2 = 2 - \frac{289}{169} = \frac{338-289}{169}$

$= \frac{49}{169}$

$\Rightarrow x = \sqrt{\frac{49}{169}} = \frac{7}{13}$

80. (3) $\tan\theta.\tan 2\theta = 1$

$\Rightarrow \tan\theta = \frac{1}{\tan 2\theta} = \cot 2\theta$

$\Rightarrow \tan\theta = \tan(90° - 2\theta)$

$\Rightarrow \theta = 90° - 2\theta$

$\Rightarrow 3\theta = 90° \Rightarrow \theta = 30°$

$\therefore \sin^2 2\theta + \tan^2 2\theta$

$= \sin^2 60° + \tan^2 60°$

$= \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\sqrt{3}\right)^2 = \frac{3}{4} + 3 = 3\frac{3}{4}$

81. (3) Percentage decrease

$= \frac{6-5}{6} \times 100$

$= \frac{50}{3} = 16\frac{2}{3}$

82. (2) Required ratio = 2 : 6 = 1 : 3

83. (1) Required average sale

$= \text{Rs.}\left(\frac{3+4+10+6+6}{5}\right)$ crore

$= \frac{29}{5}$ = Rs. 5.8 crore

84. (4) Required percentage increase $= \frac{10-4}{4} \times 100$

= 150

85. (2) Required total sales
= Rs. (10 + 6 + 6 +5) crore
= Rs. 27 crore

86. (3) Average number of students in activity III
$= \frac{65+130+420+75+540+220+153}{7}$

$= \frac{1603}{7} = 229$

Range of number of students in activity IV
= 438 – 105 = 333
∴ Required difference
= 333 – 229 = 104

87. (4) Total number of students in activity II
= 100 + 200 + 200 + 100 + 100 + 100 + 100 = 900
Total number of students in activity IV
= 317 + 155 + 438 + 105 + 385 + 280 + 120 = 1800
∴ Required percentage

$= \frac{900}{1800} \times 100 = 50$

88. (3) Arranging the observations of activity III in ascending order.
65, 75, 130, 153, 220, 420, 540
Number of observations
= 7 (odd)
∴ Median

$= \left(\frac{7+1}{2}\right)$th observation

= Fourth observation = 153

89. (1) It is obvious from table.

90. (2) Required ratio
= 900 : 2000 = 9 : 20

91. (1) Corresponding angle for rice and barley = 72 + 36
= 108°
∵ 18° ≡ 300 acres

$\therefore 1^\circ \equiv \frac{300}{18}$

$\therefore 108^\circ \equiv \frac{300}{18} \times 108$

= 1800 acres

92. (1) ∵ 100% ≡ 360°
∴ 50% ≡ 180°
∴ wheat + rice + maize
= 72° + 72° + 45°
= 189° > 180°

93. (3) Required ratio
= 72° : 36° = 2 : 1

94. (2) 10% of 72° = 7.2°
∴ Increase in the corresponding angle of wheat

$= \frac{2}{3} \times 7.2 = 4.8^\circ$

∴ New corresponding angle for wheat = 72° + 4.8° =76.8°

95. (*) If the production of bajra be x tonnes, then
Production of Jowar
= $2x$ tonnes
Production of rice
= $10x$ tonnes
∴ Required ratio

$= \frac{10x}{72} : \frac{x}{18} = 5 : 2$

96. (3) It is obvious from the table.

97. (4) Total production of rice
= 28 lakh tonnes
Total production of wheat
= 30 lakh tonnes
∴ Required ratio = 28 : 30
= 14 : 15

98. (4) Difference between the production of rice and wheat:
State A ⇒ 16 – 8
= 8 lakh tonnes
State B ⇒ 10 – 2
= 8 lakh tonnes

99. (2) State B ⇒ 10 lakh tonnes

100. (2) Average production of rice

$= \frac{8+10+4+4+2}{5}$

$= \frac{28}{5}$ lakh tonnes

= 5.6 lakh tonnes □□□