SSC GRADUATE LEVEL TIER-2 EXAM (SOLVED PAPER)
Held on: 16.09.2012

PAPER-I : QUANTITATIVE ABILITIES

1. If $a^3b = abc = 180$, a, b, c are positive integers, then the value of c is
(1) 110 (2) 1
(3) 4 (4) 25

2. Insert the missing number
3, 18, 12, 72, 66, 396, ?
(1) 300 (2) 380
(3) 350 (4) 390

3. $2\sqrt[3]{40} - 4\sqrt[3]{320} + 3\sqrt[3]{625} - 3\sqrt[3]{5}$ is equal to
(1) $-2\sqrt[3]{340}$ (2) 0
(3) $\sqrt[3]{340}$ (4) $\sqrt[3]{660}$

4. The sum $11^2 + 12^2 + ... + 21^2$ = ?
(1) 2926 (2) 3017
(3) 3215 (4) 3311

5. In four consecutive prime numbers that are in ascending order, the product of the first three is 385 and that of the last three is 1001. The largest given prime number is
(1) 11 (2) 13
(3) 17 (4) 19

6. 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) $\frac{24}{105}$

7. There are five bells which start ringing together at intervals of 3, 6, 9, 12 and 15 seconds respectively. In 36 minutes, how many times will the bells ring simultaneously?
(1) 13 (2) 12
(3) 6 (4) 5

8. n is a whole number which when divided by 4 gives the remainder 3. The remainder when $2n$ is divided by 4 is
(1) 1 (2) 2
(3) 3 (4) 0

9. 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

10. A and B started a business by investing ₹ 3,50,000 and ₹ 1,40,000 respectively. A gets 20% of the yearly profit for managing the business. Thereafter the profit is divided in the ratio of the capital. If A receives totally ₹ 38,000 more than B at the end of a year, then the profit is
(1) ₹ 28,000 (2) ₹ 2,80,000
(3) ₹ 1,05,000 (4) ₹ 70,000

11. A does one-fifth of a work in a week. B finishes the same in a fortnight. B starts the work and works only for 3 days. Thereafter A completes the job. He will finish it in
(1) 10 days (2) 7 days
(3) 12 days (4) 28 days

12. 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.

13. 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

14. 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) $\frac{80}{13}$ (2) $\frac{70}{13}$
(3) $\frac{75}{13}$ (4) $\frac{60}{13}$

15. 2 men and 4 boys can do a piece of work in 10 days, while 4 men and 5 boys can do it in 6 days. Men and boys are paid wages according to their output. If the daily wage of a man is ₹ 40, then the ratio of daily wages of a man and a boy will be
(1) 5 : 3 (2) 5 : 2
(3) 7 : 4 (4) 7 : 3

16. 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

17. 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

18. 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%

19. A discount series of 10%, 20% and 40% is equal to a single discount of
(1) 56.80% (2) 50%
(3) 70% (4) 43.20%

20. Tarun bought a T.V. with 20% discount on the labelled price. Had he bought it with 25% discount, he would have saved ₹ 500. At what price did he buy the T.V. ?
(1) ₹ 7,500 (2) ₹ 8,500
(3) ₹ 8,000 (4) ₹ 7,400

21. 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

22. 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) 96 (2) 76
(3) 100 (4) 114

23. 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

24. Annual incomes of Amit and Veeti are in the ratio 3:2, while the ratio of their expenditures 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

25. P varies inversely with the product of Q and R. When Q = 6 and R = 12, P = 75. When Q = 5, R = 10, then P is
(1) 75 (2) 6
(3) 108 (4) 12

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

27. 5 members of a team are weighed consecutively and their average weight calculated after each member is weighed. I. 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

28. 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

29. 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

30. 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 was 90 and not 100. Then what is the correct mean ?
(1) 50 (2) 50.7
(3) 52 (4) 52.7

31. Average rainfall on Monday, Tuesday, Wednesday and Thursday is 420.5 cm and average on Tuesday, Wednesday, Thursday and Friday is 440.5 cm. If the ratio of rainfall for Monday and Friday is 20 : 21, find the rainfall in cm on Monday and Friday.
(1) 1800, 1890
(2) 1600, 1680
(3) 1700, 1470
(4) 1682, 1762

32. 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) $\frac{2n+9}{2}$

33. 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

34. 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

35. 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) $17\frac{1}{2}\%$

36. 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

37. 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%

38. 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 A is
(1) ₹ 600 (2) ₹ 500
(3) ₹ 720 (4) ₹ 800

39. 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

40. 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

41. In an examination, 52% of the candidates failed in English and 42% failed in Mathematics. If 17% failed in both the subjects, then the percentage of candidates, who passed in both the subjects, was
(1) 23 (2) 21
(3) 25 (4) 22

42. 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

43. P and Q are 27 km away. Two trains with speeds 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

44. 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

45. 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

46. 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 per hr, then the same distance is covered in 48 minutes. The distance between stations A and B is
(1) 60 km (2) 64 km
(3) 80 km (4) 55 km

47. 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%

48. 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%

49. 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 (2) 27
(3) 6 (4) 3

50. 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

51. 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 (2) 4
(3) 25 (4) 16

52. If a solid cone of volume 27π 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) 3π cm^3
(2) 18π cm^3
(3) 54π cm^3
(4) 81π cm^3

53. 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) $\frac{11}{2}$

54. 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

55. Two 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

56. 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

57. The lengths 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

58. 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) $\frac{3}{2}$

59. The volume of a right circular cone is 1232 cm³ and its vertical height is 24 cm. Its curved surface area is
(1) 154 cm²
(2) 550 cm²
(3) 604 cm²
(4) 704 cm²

60. 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 cm² (2) 230 cm²
(3) 550 cm² (4) 616 cm²

61. 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

62. 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

63. The height of a right prism with a square base is 15 cm. If the area of the total surfaces of the prism is 608 sq. cm, its volume is
(1) 910 cm³
(2) 920 cm³
(3) 960 cm³
(4) 980 cm³

64. If the diagonals of a rhombus are 8 and 6, then the square of its size is
(1) 25 (2) 55
(3) 64 (4) 36

65. The volume of a solid hemisphere is 19404 cm³. Its total surface area is
(1) 4158 cm² (2) 2858 cm²
(3) 1738 cm² (4) 2038 cm²

66. 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

67. 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

68. 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

69. 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) $-2\sqrt{3}$

70. 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

71. 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

72. 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

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

(3) $\frac{9}{2}$ (4) $\frac{11}{2}$

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(3) 1,500 (4) 2,200

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(3) $\frac{7}{3}$ cm (4) $\frac{14}{3}$ cm

57. The lengths 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

58. 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) $\frac{1}{2}$
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$\left[\text{Take } \pi = \frac{22}{7}\right]$
(1) 125 cm^2 (2) 230 cm^2
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(1) 3 cm (2) 5 cm
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(1) 10 (2) 8
(3) 12 (4) 6

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then the value of $(x^{72} + x^{66} + x^{54} + x^{36} + x^{24} + x^6 + 1)$ is
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72. 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

73. 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

74. 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

75. If $\left(x + \frac{1}{x}\right)^2 = 3$, then the value of $x^{206} + x^{200} + x^{90} + x^{84} + x^{18} + x^{12} + x^6 + 1$ is
(1) 0 (2) 1
(3) 84 (4) 206

76. 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

77. Suppose ΔABC be a right-angled triangle where $\angle A = 90°$ and $AD \perp BC$. If $\Delta ABC = 40$ cm^2, $\Delta ACD = 10$ cm^2 and $\overline{AC} = 9$ cm, then the length of BC is
(1) 12 cm (2) 8 cm
(3) 4 cm (4) 6 cm

78. Two circles touch each other externally at P. AB is a direct common tangent to the two circles. A and B are points of contact and $\angle PAB = 35°$. Then $\angle ABP$ is
(1) 35° (2) 55°
(3) 65° (4) 75°

79. The length of the common chord of two intersecting circles is 24 cm. If the diameters of the circles are 30 cm and 26 cm, then the distance between the centres in cm is
(1) 13 (2) 14
(3) 15 (4) 16

80. In ΔABC, D and E are points on AB and AC respectively such that $DE \parallel BC$ 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) $1 : \sqrt{2} + 1$

81. 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

82. X and Y are centres of circles of radii 9 cm and 2 cm respectively. XY = 17 cm. Z is the centre of a circle of radius r cm which touches the above circles externally. Given that $\angle XZY = 90°$, the value of r is
(1) 13 cm
(2) 6 cm
(3) 9 cm
(4) 8 cm

83. I is the incentre of a triangle ABC. If $\angle ABC = 65°$ and $\angle ACB = 55°$, then the value of $\angle BIC$ is
(1) 130° (2) 120°
(3) 140° (4) 110°

84. 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

85. 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

86. 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) $\frac{x}{\sqrt{2}}$

87. If θ is a positive acute angle such that $\sin 2\theta \tan 3\theta = 1$, then the value of $\left(2\cos^2\frac{5\theta}{2} - 1\right)$ is
(1) $-\frac{1}{2}$ (2) 1
(3) 0 (4) $\frac{1}{2}$

88. 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) $\frac{y^2}{x\sqrt{x^2 - y^2}}$

89. 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) $\frac{\sqrt{6}}{2}$

90. 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

91. 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

92. The angles of a triangle are in Arithmetic Progression. The ratio of the least angle in degrees to the number of radians in the greatest angle is 60 : π. The angles in degrees are

(1) 30°, 60°, 90°

(2) 35°, 55°, 90°

(3) 40°, 50°, 90°

(4) 40°, 55°, 85°

93. The expression $\frac{\tan 57^\circ+\cot 37^\circ}{\tan 33^\circ+\cot 53^\circ}$ is equal to

(1) tan 33° cot 57°

(2) tan 57° cot 37°

(3) tan 33° cot 53°

(4) tan 53° cot 37°

94. 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

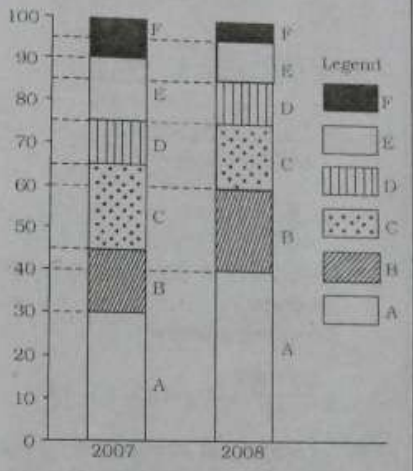
95. If $2\sin\left(\frac{\pi x}{2}\right) = x^2 + \frac{1}{x^2}$, then the value of $\left(x-\frac{1}{x}\right)$ is

(1) –1 (2) 2

(3) 1 (4) 0

Directions (96–100) : 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.

Percentage of six different types of mobiles manufactured by a company over two years



96. 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

97. 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

98. 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

99. 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

100. 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

ANSWERS

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

EXPLANATIONS

1. (2) $180 = 2 \times 2 \times 3 \times 3 \times 5$

$a^3b = abc$

$\Rightarrow a^2 = bc$

$\therefore a^3b = abc = 180 = 1^2 \times 180 \times 1$

$= 1^3 \times 180$

$\Rightarrow c = 1$

2. (4) The pattern is :

$3 \times 6 = 18$

$18 - 6 = 12$

$12 \times 6 = 72$

$72 - 6 = 66$

$66 \times 6 = 396$

$396 - 6 = \boxed{390}$

3. (2) $2.\sqrt[3]{40} = 2.\sqrt[3]{2 \times 2 \times 2 \times 5}$

$= 4\sqrt[3]{5}$

$4.\sqrt[3]{320}$

$= 4.\sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5}$

$= 16.\sqrt[3]{5}$

$= 3.\sqrt[3]{625}$

$= 3.\sqrt[3]{5 \times 5 \times 5 \times 5} = 15.\sqrt[3]{5}$

$\therefore$ Expression $= 4.\sqrt[3]{5} - 16\sqrt[3]{5}$

$+ 15.\sqrt[3]{5} - 3.\sqrt[3]{5}$

$= 19.\sqrt[3]{5} - 19.\sqrt[3]{5} = 0$

4. (1) $1^2 + 2^2 + 3^2 + ... + n^2$

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

$\therefore 11^2 + 12^2 + ... + 21^2$

$= (1^2 + 2^2 + 3^2 + ... + 21^2) -$

$(1^2 + 2^2 + ... + 10^2)$

$= \frac{21(21+1)(42+1)}{6} - \frac{10 \times 11 \times 21}{6}$

$= \frac{21 \times 22 \times 43}{6} - \frac{10 \times 11 \times 21}{6}$

$= 3311 - 385 = 2926$

5. (2) Let the four consecutive prime numbers be a, b, c and d where $a < b < c < d$.

$\therefore abc = 385$ and $bcd = 1001$

$\therefore$ HCF $= bc$

$385\,)1001(\,2$
$\frac{770}{231})\,385\,(1$
$\frac{231}{154})\,231(1$
$\frac{154}{77})\,154\,(2$
$\frac{154}{\times}$

$\therefore bc = 77$

$\because bcd = 1001$

$\therefore d = \frac{bcd}{bc} = \frac{1001}{77} = 13$

6. (2) HCF of $\frac{2}{3}, \frac{4}{5}$ and $\frac{6}{7}$

$= \frac{\text{HCF of 2, 4 and 6}}{\text{LCM of 3, 5 and 7}}$

$= \frac{2}{105}$

7. (1) LCM of 9, 12 and 15 = 180 seconds

$\therefore$ Required answer

$= \frac{36 \times 60}{180} + 1 = 12 + 1 = 13$

8. (1) Required remainder = Remainder obtained on dividing the given remainder by 4 = 2

Illustration : If 19 is divided by 4, remainder = 3.

If 38 is divided by 4, remainder = 2

9. (2) The wall clock gains 6 minutes in 36 hours, while table watch loses 2 minutes in 36 hours.

$\because$ Difference of 8 minutes is 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

10. (4) Ratio of profit

$= 350000 : 140000$

$= 5 : 2$

If the total profit be Rs. x, then

A's share $= \frac{5}{7} \times \frac{4x}{5} + \frac{x}{5}$

$= \frac{4x}{7} + \frac{x}{5}$

$= \frac{20x + 7x}{35}$

$= \text{Rs. } \frac{27x}{35}$

B's share $= \frac{2}{7} \times \frac{4x}{5} = \text{Rs. } \frac{8x}{35}$

$\therefore$ Difference

$= \frac{27x}{35} - \frac{8x}{35} = \frac{19x}{35}$

$\therefore \frac{19x}{35} = 38000$

$\Rightarrow x = \frac{38000 \times 35}{19}$

= Rs. 70000

11. (4) Time taken by A in doing the work = 35 days

Time taken by B in doing the same work = 15 days

B's 3 days' work $= \frac{3}{15} = \frac{1}{5}$

Remaining work $= 1 - \frac{1}{5} = \frac{4}{5}$

$\therefore$ Time taken by A in finishing the remaining work

$= 35 \times \frac{4}{5} = 28$ days

12. (3) Part of the tank filled in 1 hour by pipe A $= \frac{1}{2}$

Part of the tank filled by both pipes in 1 hour

$= \frac{1}{2} + \frac{1}{6} = \frac{3+1}{6} = \frac{2}{3}$

$\therefore$ Time taken to fill $\frac{2}{3}$ parts

= 60 minutes

$\therefore$ Time taken to fill $\frac{1}{2}$ part

$= \frac{60 \times 3}{2} \times \frac{1}{2}$

= 45 minutes

$\therefore$ The tank will be fileld at 11:45 A.M.

13. (1) Time taken by pipe B
$= 2x$ hours
Time taken by pipe A $= x$ hours
$\therefore$ Time taken by pipe C

$$= \frac{2}{\frac{1}{2x}+\frac{1}{x}} = \frac{2}{\frac{1+2}{2x}}$$

$$= \frac{4x}{3} \text{ hours}$$

$$\therefore \frac{1}{x}+\frac{1}{2x}+\frac{3}{4x}$$

$$= \frac{1}{6+\frac{40}{60}} = \frac{1}{6+\frac{2}{3}}$$

$$\Rightarrow \frac{4+2+3}{4x} = \frac{3}{20}$$

$$\Rightarrow 9 \times 20 = 4x \times 3$$

$$\Rightarrow x = \frac{9 \times 20}{4 \times 3} = 15 \text{ hours}$$

14. (4) Time taken by B in completing the work

$$= 12 \times \frac{100}{160} = \frac{15}{2} \text{ days}$$

$\therefore$ (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

15. (2) $(2m + 4b) \times 10$
$= (4m + 5b) \times 6$
$\Rightarrow 20m + 40b = 24m + 30b$
$\Rightarrow 4m = 10b$
$\Rightarrow 2m = 5b$
$\therefore 5b = 2 \times 40$

$$\Rightarrow 1b = \frac{2 \times 40}{5} = 16$$

$\therefore$ Required ratio $= 40 : 16 = 5 : 2$

16. (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

$$= 1 - \frac{52}{60} = \frac{8}{60} = \frac{2}{15}$$

Now, it is the turn of A and B.
(A+B)'s 1 day's work

$$= \frac{1}{30}+\frac{1}{20} = \frac{2+3}{60} = \frac{1}{12}$$

$\therefore$ Remaining work $= \frac{2}{15} - \frac{1}{12}$

$$= \frac{8-5}{60} = \frac{3}{60} = \frac{1}{20}$$

Now it is the turn of A and C.
(A+C)'s 1 day's work

$$= \frac{1}{30}+\frac{1}{10} = \frac{1+3}{30} = \frac{2}{15}$$

$$\therefore \text{Time taken} = \frac{1}{20} \times \frac{15}{2}$$

$$= \frac{3}{8} \text{ day}$$

$$\text{Total time} = 9 + \frac{3}{8} = 9\frac{3}{8} \text{ days}$$

17. (1) Marked price

$$= \frac{846 \times 100}{94} = \text{Rs. } 900$$

18. (3) C.P. of article = Rs. 100
Marked price = Rs. x
Single equivalent discount

$$= \left(20 + \frac{25}{4} - \frac{20 \times 25}{400}\right)\%$$

$= 25\%$

$$\therefore x \times \frac{75}{100} = 120$$

$$\Rightarrow x = \frac{120 \times 100}{75} = \text{Rs. } 160$$

19. (1) Single equivalent discount for 10% and 20%

$$= 20 + 10 - \frac{20 \times 10}{100} = 28\%$$

Single equivalent discount for 28% and 40%

$$= 40 + 28 - \frac{40 \times 28}{100}$$

$= 68 - 11.2$
$= 56.8\%$

20. (3) If the makred price of T.V. be Rs. x, then

$$\frac{4x}{5} - \frac{3x}{4} = 500$$

$$\Rightarrow \frac{16x - 15x}{20} = 500$$

$$\Rightarrow \frac{x}{20} = 500$$

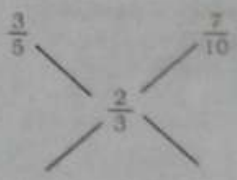
$\Rightarrow x = 10000$
$\therefore$ Required cost price

$$= \frac{10000 \times 80}{100}$$

$= \text{Rs. } 8000$

21. (2)

Milk-I Milk-II



$$\frac{7}{10} - \frac{2}{3} \qquad \frac{2}{3} - \frac{3}{5}$$

$$= \frac{21-20}{30} \qquad = \frac{10-9}{15}$$

$$= \frac{1}{30} \qquad = \frac{1}{15}$$

$\therefore$ Required ratio $= \frac{1}{30} : \frac{1}{15}$

$= 1 : 2$

22. (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
$= 19x = 19 \times 4 = 76$

23. (1) Numbers = $5x$ and $4x$ (let)

$\therefore 5x \times \frac{40}{100} = 12$

$\Rightarrow 2x = 12 \Rightarrow x = 6$

$\therefore$ Second number $= 6 \times 4 = 24$

$\therefore$ 50% of $24 = 24 \times \frac{50}{100} = 12$

24. (4) Amit's income = Rs. $3x$ and his expenditure = Rs. $5y$

Veeri's income = Rs. $2x$ and his expenditure = Rs. $3y$

$\therefore 3x - 5y = 2x - 3y$

$\Rightarrow x = 2y$

$\therefore 3x - 5y = 1000$

$\Rightarrow 6y - 5y = 1000 \Rightarrow y = 1000$

$\therefore x = 2000$

$\therefore$ Amit's income

$= 3x = 3 \times 2000$

= Rs. 6000

25. (3) $P \propto \frac{1}{QR}$

$\Rightarrow PQR = k$ (constant)

$\therefore k = 75 \times 6 \times 12$

$\therefore PQR = 75 \times 6 \times 12$

When, Q = 5 and R = 10, then

$P \times 5 \times 10 = 75 \times 6 \times 12$

$\Rightarrow P = \frac{75 \times 6 \times 12}{5 \times 10} = 108$

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 $= \frac{2}{3+2+4} \times 864$

$= \frac{2}{9} \times 864$ = Rs. 192

27. (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

28. (3) Expenditure of 9th person = Rs. 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

= Rs. 292.5

29. (2) Number of girls = x

Number of boys = $600 - x$

$\therefore (600 - x) \times 12 + 11x$

$= 11\frac{3}{4} \times 600 = \frac{47}{4} \times 600$

$\Rightarrow 7200 - 12x + 11x = 7050$

$\Rightarrow x = 7200 - 7050 = 150$

30. (2) Required Average

$= \frac{100 \times 46 - 61 - 34 + 16 + 43}{90}$

$= \frac{4600 - 36}{90} = \frac{4564}{90} = 50.7$

31. (2) M + T + W + Th = 4×420.5

= 1682 cm. ...(i)

T + W + Th + F = 4×440.5

= 1762 cm. ....(ii)

By equation (ii) − equation (i).

F − M = 1762 − 1682 = 80

$\Rightarrow 21x - 20x = 80$

$\Rightarrow x = 80$

$\therefore$ Monday $\Rightarrow 80 \times 20 = 1600$ cm

$\therefore$ Friday $\Rightarrow 21 \times 80 = 1680$ cm

32. (1) $m + m + 1 + m + 2 + m + 3 + m + 4 = 5n$

$\Rightarrow 5m + 10 = 5n$

$\Rightarrow m + 2 = n$ ....(i)

Required average

$= m + 2 + m + 3 + m + 4$

$+m + 5 + m + 6 + m + 7$

$\over 6$

$= \frac{6m + 27}{6}$

$= \frac{2m + 9}{2} = \frac{2(n-2) + 9}{2} = \frac{2n + 5}{2}$

33. (3) If the required cost price be Rs. x, then

$x \times \frac{110}{100} \times \frac{120}{100} \times \frac{85}{100} = 56100$

$\Rightarrow x \times \frac{11}{10} \times \frac{6}{5} \times \frac{17}{20} = 56100$

$\Rightarrow x = \frac{56100 \times 10 \times 5 \times 20}{11 \times 6 \times 17}$

= Rs. 50000

34. (1) If the C.P. of article be Rs. x, then

$\frac{117x}{100} - \frac{81x}{100} = 162$

$\Rightarrow \frac{36x}{100} = 162$

$\Rightarrow x = \frac{162 \times 100}{36}$ = Rs. 450

35. (4) Required S.P. of 150 pens.

$= 150 \times 12 \times \frac{115}{100}$

= Rs. 2070

S.P. of first 50 pens

$= \frac{50 \times 12 \times 110}{100}$ = Rs. 660

Required S.P. of 100 pens

= 2070 − 660 = Rs. 1410

C.P. of 100 pens = Rs. 1200

$\therefore$ Gain per cent $= \frac{210}{1200} \times 100$

$= \frac{35}{2} = 17\frac{1}{2}\%$

36. (4) Here, S.P. is same. Hence there is always a loss.

Loss per cent $= \frac{20 \times 20}{100} = 4\%$

37. (2) Gain per cent

$= \frac{40 - 25}{25} \times 100$

$= \frac{15}{25} \times 100 = 60\%$

38. (2) If the C.P. of A be Rs. x, then

$x \times \left(1 + \frac{1}{5}\right) \times \frac{120}{100} \times \left(1 - \frac{1}{6}\right)$

= Rs. 600

$\Rightarrow x \times \frac{6}{5} \times \frac{6}{5} \times \frac{5}{6} = 600$

$\Rightarrow x = \frac{600 \times 5}{6}$ = Rs. 500

39. (4) Total amount = Rs. x

$$\therefore x - \frac{x}{5} - \frac{4x}{5} \times \frac{5}{100} = 120$$

$$= 1400$$

$$\Rightarrow x - \frac{x}{5} - \frac{x}{25} = 1520$$

$$\Rightarrow \frac{25x - 5x - x}{25} = 1520$$

$$\Rightarrow \frac{19x}{25} = 1520$$

$$\Rightarrow x = \frac{1520 \times 25}{19} = \text{Rs. } 2000$$

$\therefore$ Expenditure on transport

$$= \frac{1}{25} \times 2000 = \text{Rs. } 80$$

40. (2) Women $= \frac{43}{83} \times 311250$

$= 161250$

Men $= 311250 - 161250$

$= 150000$

$\therefore$ Total number of literate persons

$$= \frac{161250 \times 8}{100} + 150000 \times \frac{24}{100}$$

$= 12900 + 36000 = 48900$

41. (1) Percentage of candidates who failed in one or two or both subjects $= 52 + 42 - 17 = 77$

$\therefore$ Percentage of passed candidates $= 100 - 77 = 23$

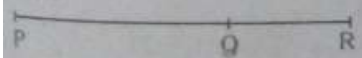
42. (3) Votes polled = x (let)

$$\therefore x \times \left(\frac{60 - 40}{100}\right) = 298$$

$$\Rightarrow x \times \frac{1}{5} = 298$$

$$\Rightarrow x = 298 \times 5 = 1490$$

43. (2)



If the trains meet after t hours, then

$24t - 18t = 27$

$\Rightarrow 6t = 27$

$$\Rightarrow t = \frac{27}{6} = \frac{9}{2} \text{ hours}$$

$$\therefore QR = 18t = 18 \times \frac{9}{2} = 81 \text{ km}$$

44. (3) If 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) $\times$ 3 – equation (ii),

$$\frac{54}{x + y} - \frac{24}{x + y} = 9 - \frac{13}{2}$$

$$\Rightarrow \frac{30}{x + y} = \frac{5}{2} \Rightarrow x + y = 12 \quad \text{... (iii)}$$

From equation (i),

$$\frac{12}{x - y} + \frac{18}{12} = 3$$

$$\Rightarrow \frac{12}{x - y} = 3 - \frac{3}{2} = \frac{3}{2}$$

$$\Rightarrow x - y = \frac{12 \times 2}{3} = 8 \quad \text{..... (iii)}$$

$$\therefore \text{Speed of current} = \frac{1}{2}(12 - 8)$$

$= 2$ kmph

45. (3) Speed of train A = x kmph

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

46. (1) If the distance between stations be x km, then speed of train $= \frac{x}{\frac{45}{60}} = \frac{4x}{3}$ kmph

$$\therefore \frac{x}{\frac{4x}{3} - 5} = \frac{48}{60}$$

$$\Rightarrow \frac{3x}{4x - 15} = \frac{4}{5}$$

$\Rightarrow 16x - 60 = 15x$

$\Rightarrow x = 60$ km

47. (4) S.I. on Rs. 12000

$$= \frac{12000 \times 8 \times 1}{100} = \text{Rs. } 960$$

Desired gain on Rs. 20000

$$= 20000 \times \frac{10}{100} = \text{Rs. } 2000$$

$\therefore$ S.I. on Rs. 8000 = 2000 – 960

= Rs. 1040

$$\therefore \text{Rate} = \frac{\text{S.I.} \times 100}{\text{Principal} \times \text{Time}}$$

$$= \frac{1040 \times 100}{8000}$$

= 13% per annum

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

$$\therefore 3840 = P\left(1 + \frac{R}{100}\right)^4 \quad \text{....(i)}$$

$$3936 = P\left(1 + \frac{R}{100}\right)^5 \quad \text{...(ii)}$$

Dividing equation (ii) by equation (i),

$$\frac{3936}{3840} = 1 + \frac{R}{100}$$

$$\Rightarrow \frac{R}{100} = \frac{3936}{3840} - 1$$

$$= \frac{3936 - 3840}{3840} = \frac{96}{3840}$$

$$\Rightarrow R = \frac{96}{3840} \times 100 = 2.5\%$$

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

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

On squaring both sides,

$$9 = 1\left(1 + \frac{R}{100}\right)^6$$

50. (3) Rate = 5%, Time = 4 half years

$$\therefore \text{C.I.} = P\left[\left(1+\frac{R}{100}\right)^T - 1\right]$$

$$= 5000\left[\left(1+\frac{5}{100}\right)^4 - 1\right]$$

$$= 5000\left(\frac{194481}{160000} - 1\right)$$

$$= \frac{5000 \times 34481}{160000} = \text{Rs. } 1077.5$$

$$\text{S.I.} = \frac{5000 \times 10 \times 2}{100} = \text{Rs. } 1000$$

Difference = 1077.5 – 1000
= Rs. 77.5

51. (1) Let radius be increased by x cm.

∴ Volume of cylinder
$= \pi(10 + x)^2 \times 4$

Again, let height be increased by x cm.

∴ 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

52. (3) Volume of required water
= 2 × volume of cone
$= 2 \times 27\pi = 54\pi$ cu.cm

53. (2) AB + BC = 12
BC + CA = 14
CA + AB = 18
∴ 2 (AB + BC + CA)
= 12 + 14 + 18 = 44
⇒ AB + BC + CA = 22
∴ $2\pi r = 22$

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

$$\Rightarrow r = \frac{7}{2} \text{ cm}$$

54. (1) Area of rectangular field

$$= \frac{1000}{\frac{1}{4}} = 4000 \text{ sq. metre}$$

$$\therefore \text{Length} = \frac{4000}{50} = 80 \text{ metre}$$

New length of field = 100 metre
Area = 100 × 50 = 5000 sq. metre
∴ Required expenditure

$$= \text{Rs. } (5000 \times \frac{1}{4})$$

= Rs. 1250

55. (2) Volume of rain water = Area of base × height

$$= 1000000 \times \frac{2}{100}$$

= 20000 cu. metre
Water stored in pool
= 10000 cu. metre
∴ Required water level

$$= \frac{10000}{1000} = 10 \text{ metre}$$

56. (3) Increase in water level

$$= \frac{\text{Volume of sphere}}{\text{Area of base of cylinder}}$$

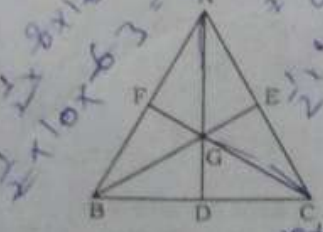
$$= \frac{\frac{4}{3}\pi r^3}{\pi r^2}$$

$$= \frac{4}{3}r = \frac{4}{3} \times 3.5 = \frac{14}{3} \text{ cm.}$$

∴ Required water level

$$= 7 - \frac{14}{3} = \frac{7}{3} \text{ cm.}$$

57. (2) AG = 6 cm.



$$BG = \frac{2}{3} \times 12 = 8 \text{ cm.}$$

$$GC = \frac{2}{3} \times 15 = 10 \text{ cm.}$$

$$\text{Area of } \Delta ABG = \frac{1}{2} \times 6 \times 8$$

= 24 sq. cm.
∴ Area of ΔABC
$= 3 \times 24 = 72$ sq. cm.

58. (1) Curved surface of cylinder
$= 2\pi rh$

Case II

$$\text{Radius} = \frac{1}{3}r \text{ ; height} = 6h$$

Curved surface

$$= 2\pi \times \frac{1}{3}r \times 6h = (2\pi rh) \times 2$$

∴ Increase will be twice.

59. (2) $\frac{1}{3}\pi r^2 h = 1232$

$$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 1232$$

$$\Rightarrow r^2 = \frac{1232 \times 3 \times 7}{22 \times 24} = 49$$

$$\therefore r = \sqrt{49} = 7 \text{ cm.}$$

$$\therefore \text{Slant height } (l) = \sqrt{h^2 + r^2}$$

$$= \sqrt{24^2 + 7^2} = \sqrt{625} = 25 \text{ cm.}$$

∴ Curved surface of cone = πrl

$$= \frac{22}{7} \times 7 \times 25 = 550 \text{ cm}^2$$

60. (4) $2\pi r = 2 (18 + 26)$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 44 \times 2$$

$$\Rightarrow r = 14 \text{ cm}$$

∴ Area of circle = πr^2

$$= \frac{22}{7} \times 14 \times 14 = 616 \text{ sq. cm.}$$

61. (1) $\pi(r + 1)^2 - \pi r^2 = 22$

$$\Rightarrow \pi(r^2 + 2r + 1 - r^2) = 22$$

$$\Rightarrow 2\pi r + \pi = 22$$

$$\Rightarrow \frac{22}{7}(2r + 1) = 22$$

$$\Rightarrow 2r + 1 = 7$$

$$\Rightarrow 2r = 6 \Rightarrow r = 3 \text{ cm.}$$

62. (4) Sum of interior angles
$= (2n - 4) \times 90°$
Sum of exterior angles = 360°
$\therefore (2n - 4) \times 90° = 360° \times 2$
$\Rightarrow 2n - 4 = 2 \times 360° \div 90 = 8$
$\Rightarrow 2n - 4 = 8 \Rightarrow 2n = 12 \Rightarrow n = 6$

63. (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)

$\Rightarrow x^2 + 30x - 304 = 0$

$\Rightarrow x^2 + 38x - 8x - 304 = 0$

$\Rightarrow x(x + 38) - 8(x + 38) = 0$

$\Rightarrow (x - 8)(x + 38) = 0$

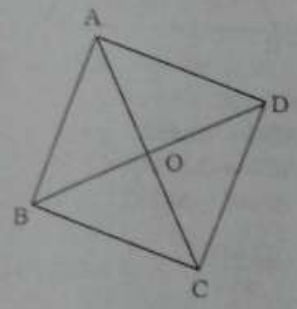
$\Rightarrow x = 8$

$\Rightarrow$ Volume of prism = Area of base × height

$= 8 \times 8 \times 15 = 960$ cu. cm.

64. (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

65. (1) $\frac{2}{3}\pi r^3 = 19404$

$\Rightarrow \frac{2}{3} \times \frac{22}{7} \times r^3 = 19404$

$\Rightarrow r^3 = \frac{19404 \times 3 \times 7}{2 \times 22} = 9261$

$\therefore r = \sqrt[3]{21 \times 21 \times 21} = 21$ cm.

$\therefore$ Total surface area $= 3\pi r^2$

$= 3 \times \frac{22}{7} \times 21 \times 21$

$= 4158$ sq. cm.

66. (1) $m - n = 2p$

$m + n = 2p$

$\therefore (m - n)(m + n) = 4p^2$

$\Rightarrow m^2 - n^2 = 4p^2$

67. (1) $\left(x + \frac{1}{x}\right)^2 = 3$

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

On cubing both sides,

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

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

$\Rightarrow x^3 + \frac{1}{x^3} + 3\sqrt{3} = 3\sqrt{3}$

$\Rightarrow x^3 + \frac{1}{x^3} = 0 \Rightarrow x^6 + 1 = 0$

$\therefore x^{72} + x^{66} + x^{54} + x^{36} + x^{24} + x^6 + 1$

$= (x^6)^{12} + (x^6)^{11} + (x^6)^9 + (x^6)^6 + (x^6)^4 + x^6 + 1$

$= 1 - 1 - 1 + 1 + 1 + 0 = 1$

68. (3) $a + b + c = 0$

$\Rightarrow b + c = -a$

On squaring both sides,

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

$\Rightarrow b^2 + c^2 + 2bc = a^2$

$\Rightarrow a^2 + b^2 + c^2 + 2bc = 2a^2$

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

$= 2(a^2 - bc)$

$\therefore \frac{a^2 + b^2 + c^2}{a^2 - bc} = \frac{2(a^2 - bc)}{a^2 - bc} = 2$

69. (2) $n = 7 + 4\sqrt{3} = 7 + 2 \times 2 \times \sqrt{3}$

$= 4 + 3 + 2 \times 2 \times \sqrt{3}$

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

$\therefore \sqrt{n} = 2 + \sqrt{3}$

$\therefore \frac{1}{\sqrt{n}} = \frac{1}{2 + \sqrt{3}}$

$= \frac{1}{2 + \sqrt{3}} \times \frac{2 - \sqrt{3}}{2 - \sqrt{3}} = 2 - \sqrt{3}$

$\therefore \sqrt{n} + \frac{1}{\sqrt{n}} = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$

70. (2) $(a + b + c)^2$

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

$\Rightarrow 36 = 14 + 2(ab + bc + ca)$

$\Rightarrow ab + bc + ca = (36 - 14) \div 2$

$\Rightarrow ab + bc + ca$

$= 11$ .... (i)

$\therefore a^3 + b^3 + c^3 - 3abc$

$= (a + b + c)$

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

$\Rightarrow 36 - 3abc = 6(14 - 11)$

$\Rightarrow 36 - 3abc = 84 - 66 = 18$

$\Rightarrow 3abc = 36 - 18 = 18$

$\Rightarrow abc = 6$

71. (4) $(a - 1)\sqrt{2} + 3 = b\sqrt{2} + a$

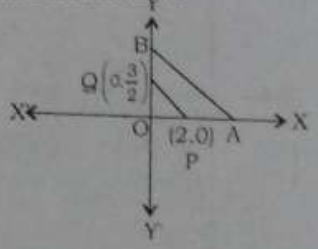
$\Rightarrow a = 3 ; a - 1 = b$

$\Rightarrow 3 - 1 = b \Rightarrow b = 2$

$\therefore a + b = 3 + 2 = 5$

72. (2) OP = 2

$OQ = \frac{3}{2}$



$\therefore PQ = \sqrt{OP^2 + OQ^2}$

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

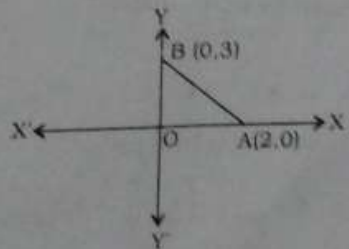
$= \sqrt{4 + \frac{9}{4}}$

$= \sqrt{\frac{16 + 9}{4}} = \sqrt{\frac{25}{4}}$

$= \frac{5}{2} = 2.5$ cm

73. (1) Putting $y = 0$ in the equation $3x + 2y = 6$,

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



$\therefore$ Point of intersection on x-axis = (2, 0)

Putting $x = 0$, in the equation $3x + 2y = 6$,

$0 + 2y = 6$

$\Rightarrow y = 3$

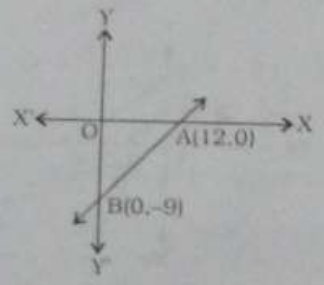
$\therefore$ Point of intersection on y-axis = (0, 3)

$\therefore$ OA = 2, OB = 3

$\therefore \Delta OAB = \frac{1}{2} \times OA \times OB$

$= \frac{1}{2} \times 2 \times 3 = 3$ sq. units

74. (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

$\therefore AB = \sqrt{OA^2 + OB^2}$

$= \sqrt{12^2 + 9^2}$

$= \sqrt{144 + 81}$

$= \sqrt{225}$

= 15 units

5. (1) $\left(x + \frac{1}{x}\right)^2 = 3$

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

On cubing both sides,

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

$\Rightarrow x^3 + \frac{1}{x^3} = 3\sqrt{3} - 3\sqrt{3} = 0$

$\Rightarrow x^6 + 1 = 0$

$\therefore x^{206} + x^{200} + x^{100} + x^{84} + x^{18} + x^{12} + x^6 + 1$

$= x^{200}(x^6+1) + x^{84}(x^6+1) + x^{12}(x^6+1) + (x^6+1)$

$= 0$

76. (2) In radius $= \frac{\text{Side}}{2\sqrt{3}}$

$\Rightarrow 3 = \frac{\text{Side}}{2\sqrt{3}} \Rightarrow$ Side $= 3 \times 2\sqrt{3}$

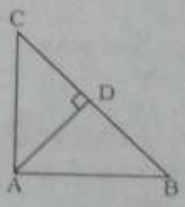
$= 6\sqrt{3}$ cm

77. (2) In Δs ACD and ABC,

$\angle CDA = \angle CAB = 90°$

$\angle C$ is common,

$\therefore \Delta ACD \sim \Delta ABC$



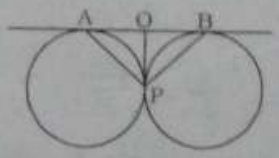
$\therefore \frac{\Delta ACD}{\Delta ABC} = \frac{AC^2}{BC^2}$

$\Rightarrow \frac{10}{40} = \frac{9^2}{BC^2}$

$\Rightarrow BC^2 = 4 \times 9^2$

$\therefore BC = 2 \times 9 = 18$ cm

78. (2)



OA = OP

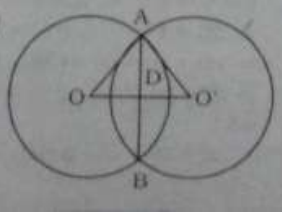
$\therefore \angle PAB = OPA = 35°$

$\therefore \angle AOP = 110° \Rightarrow \angle POB = 70°$

$\therefore \angle ABP = \frac{180° - 70°}{2} = \frac{110}{2}$

$= 55°$

79. (2)



$OD = \sqrt{15^2 - 12^2}$

$= \sqrt{225 - 144}$

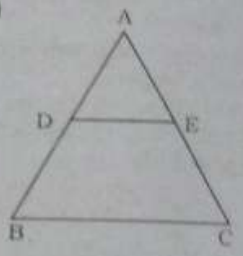
$= \sqrt{81} = 9$

$O'D = \sqrt{13^2 - 12^2}$

$= \sqrt{169 - 144} = \sqrt{25} = 5$

$\therefore OO' = 9 + 5 = 14$ cm

80. (2)



DE || BC

$\angle ADE = \angle ABC$

$\angle AED = \angle ACB$

$\therefore \Delta ADE \sim \Delta ABC$

$\therefore \frac{\square BDEC}{\Delta ADE} = \frac{1}{1}$

$\Rightarrow \frac{\square BDEC}{\Delta ADE} + 1 = 1 + 1$

$\Rightarrow \frac{\Delta ABC}{\Delta ADE} = 2 = \frac{AB^2}{AD^2}$

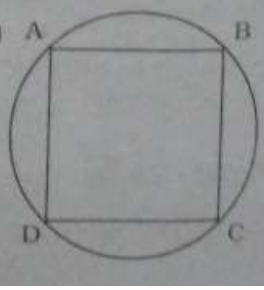
$\Rightarrow \frac{AB}{AD} = \sqrt{2}$

$\Rightarrow \frac{AB}{AD} - 1 = \sqrt{2} - 1$

$\Rightarrow \frac{BD}{AD} = \sqrt{2} - 1$

$\Rightarrow \frac{AD}{BD} = \frac{1}{\sqrt{2} - 1}$

81. (3)

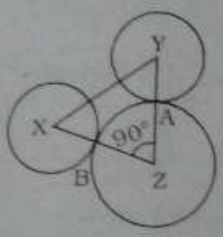


BD = Diagonal = 16 cm

Area of square = $\frac{1}{2} \times BD^2$

$= \frac{1}{2} \times 16 \times 16 = 128$ sq. cm.

82. (2) XZ = r + 9



YZ = r + 2

$\therefore XY^2 = XZ^2 + ZY^2$

$\Rightarrow 17^2 = (r + 9)^2 + (r + 2)^2$

$\Rightarrow 289 = r^2 + 18r + 81 + r^2 + 4r + 4$

$\Rightarrow 2r^2 + 22r + 85 - 289 = 0$

$\Rightarrow 2r^2 + 22r - 204 = 0$

$\Rightarrow r^2 + 11r - 102 = 0$

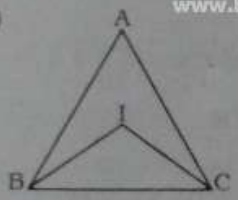
$\Rightarrow r^2 + 17r - 6r - 102 = 0$

$\Rightarrow r(r + 17) - 6(r + 17) = 0$

$\Rightarrow (r - 6)(r + 17) = 0$

$\Rightarrow r = 6$ cm

83. (2)



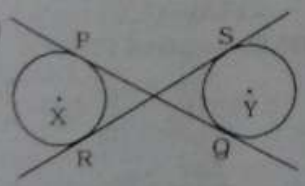
$\angle IBC = \frac{1}{2}\angle ABC = \frac{65}{2} = 32.5°$

$\angle ICB = \frac{1}{2}\angle ACB = \frac{55}{2} = 27.5°$

$\therefore \angle BIC = 180° - 32.5° - 27.5°$

$= 120°$

84. (1)



Length of transverse tangent

$= \sqrt{XY^2 - (r_1 + r_2)^2}$

$\Rightarrow 8 = \sqrt{XY^2 - 9^2}$

$\Rightarrow 64 = XY^2 - 81$

$\Rightarrow XY^2 = 64 + 81 = 145$

$\Rightarrow XY = \sqrt{145}$

85. (3) Each interior angle

$= \frac{(2n - 4) \times 90°}{n}$

$\therefore \frac{\frac{(2n - 4) \times 90°}{n}}{\frac{(4n - 4) \times 90°}{2n}} = \frac{2}{3}$

$\Rightarrow \frac{(2n - 4) \times 2}{4n - 4} = \frac{2}{3}$

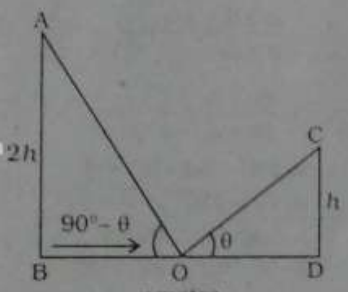
$\Rightarrow \frac{2n - 4}{4n - 4} = \frac{1}{3}$

$\Rightarrow 6n - 12 = 4n - 4$

$\Rightarrow 6n - 4n = 12 - 4 = 8$

$\Rightarrow 2n = 8 \Rightarrow n = 4$

86. (1) CD = h metre, AB = 2h metre



x metre

OB = OD = $\frac{x}{2}$ metre

From ΔOCD,

$\tan\theta = \frac{h}{\frac{x}{2}} = \frac{2h}{x}$ .... (i)

From ΔOAB,

$\tan(90° - \theta) = \frac{AB}{BO}$

$\Rightarrow \cot\theta = \frac{2h}{\frac{x}{2}} = \frac{4h}{x}$ .... (ii)

Multiplying both equations,

$\tan\theta . \cot\theta = \frac{2h}{x} \times \frac{4h}{x}$

$\Rightarrow x^2 = 8h^2$

$\Rightarrow h^2 = \frac{x^2}{8}$

$\Rightarrow h = \frac{x}{2\sqrt{2}}$ metre

87. (3) $\tan2\theta . \tan3\theta = 1$

$\Rightarrow \tan3\theta = \frac{1}{\tan2\theta} = \cot2\theta$

$\Rightarrow \tan3\theta = \tan(90° - 2\theta)$

$\Rightarrow 3\theta = 90° - 2\theta \Rightarrow 5\theta = 90°$

$\Rightarrow \theta = 18°$

$\therefore 2\cos^2\frac{5\theta}{2} - 1 = 2\cos^2 45° - 1$

$= 2 \times \frac{1}{2} - 1 = 0$

88. (2) $\sin 17° = \frac{x}{y}$

$\cos 17° = \sqrt{1 - \sin^2 17°}$

$= \sqrt{1 - \frac{x^2}{y^2}} = \sqrt{\frac{y^2 - x^2}{y^2}}$

$= \frac{\sqrt{y^2 - x^2}}{y}$

$\therefore \sec 17° = \frac{y}{\sqrt{y^2 - x^2}}$

$\sin 73° = \sin(90° - 17°)$

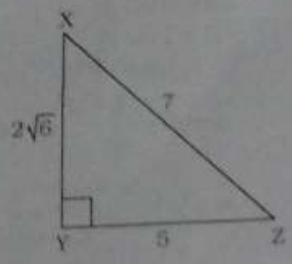
$= \cos 17°$

$\therefore \sec 17° - \sin 73°$

$= \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$

$= \frac{y^2 - y^2 + x^2}{y\sqrt{y^2 - x^2}} = \frac{x^2}{y\sqrt{y^2 - x^2}}$

89. (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,

$2 \times Z = 14 \Rightarrow XZ = 7$

$\therefore YZ = 7 - 2 = 5$

$\therefore \sec X = \frac{7}{2\sqrt{6}}$

$\tan X = \frac{5}{2\sqrt{6}}$

$\therefore \sec X + \tan X = \frac{7}{2\sqrt{6}} + \frac{5}{2\sqrt{6}}$

$= \frac{12}{2\sqrt{6}} = \sqrt{6}$

90. (2) $Z = \sin\theta + \cos\theta$

$\Rightarrow Z^2 = \sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta$

$= 1 + 2\sin\theta.\cos\theta$

$\because 0 < \theta < 90°$

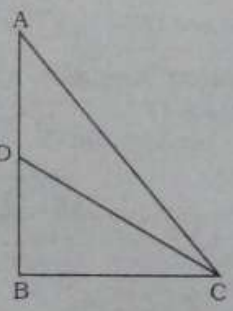
$\therefore \sin\theta < 1; \cos\theta < 1$

$\therefore 2\sin\theta . \cos\theta < 1$

$\therefore Z^2 < 2$

$\Rightarrow Z < \sqrt{2}$

91. (3)



$\angle ACB = 60°$

$\angle DCB = 45°$

$AB = 5000$ metre

$AD = x$ metre

$\therefore$ From ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\Rightarrow \sqrt{3} = \frac{5000}{BC}$

$\Rightarrow BC = \frac{5000}{\sqrt{3}}$ metre

From ΔDBC,

$\tan 45° = \frac{DB}{BC}$

$\Rightarrow DB = BC = \frac{5000}{\sqrt{3}}$

$\therefore AD = AB - BD$

$= 5000 - \frac{5000}{\sqrt{3}}$

$= 5000\left(1 - \frac{1}{\sqrt{3}}\right)$

$= 5000\left(\frac{\sqrt{3} - 1}{\sqrt{3}}\right)$ metre

92. (1) Angles of triangle

$\Rightarrow (a - d)°, a°, (a + d)°$

$\therefore a - d + a + a + d = 180°$

$\Rightarrow 3a = 180° \Rightarrow a = 60°$

$\therefore \frac{a - d}{a + d} = \frac{60}{\pi} = \frac{60}{180} = \frac{1}{3}$

$\Rightarrow \frac{60 - d}{60 + d} = \frac{1}{3}$

$\Rightarrow 180 - 3d = 60 + d$

$\Rightarrow 4d = 120° \Rightarrow d = 30°$

$\therefore$ Angles of triangle :

$a - d = 60° - 30° = 30°$

$a = 60°$

$a + d = 60 + 30 = 90°$

93. (2) $\frac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$

$= \frac{\cot 33° + \tan 53°}{\tan 33° + \cot 53°}$

$[\because \tan(90° - \theta) = \cot\theta, \cot(90° - \theta) = \tan\theta]$

$= \frac{\frac{1}{\tan 33°} + \tan 53°}{\tan 33° + \frac{1}{\tan 53°}}$

$= \frac{1 + \tan 53°.\tan 33°}{\tan 33°.\tan 53° + 1} \times \frac{\tan 53°}{\tan 33°}$

$= \tan 53° . \cot 33°$

$= \cot 37° . \tan 57°$

94. (4) $\sin^2\theta + \cos^2\theta + \sec^2\theta + \operatorname{cosec}^2\theta + \tan^2\theta + \cot^2\theta$

$= 1 + \sec^2\theta - \tan^2\theta + \operatorname{cosec}^2\theta - \cot^2\theta + 2(\tan^2\theta + \cot^2\theta)$

$= 3 + 2((\tan\theta - \cot\theta)^2 + 2) > 7$

because $(\tan\theta - \cot\theta)^2 > 0$

95. (4) $x^2 + \frac{1}{x^2} = 2\sin\left(\frac{\pi x}{2}\right)$

$\Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = 2\sin\left(\frac{\pi x}{2}\right)$

$\Rightarrow x - \frac{1}{x} = 0$

96. (3) Required answer

$= \frac{35 \times 30}{100} + \frac{35 \times 15}{100} + \frac{35 \times 15}{100}$

$= \frac{35}{100}(30 + 15 + 15)$

$= \frac{35 \times 60}{100} = 21$ lakhs

97. (4) Percentage variation :

Model A $\Rightarrow \frac{40 - 30}{30} \times 100 = 33\frac{1}{3}$

Model B $\Rightarrow \frac{20 - 15}{15} \times 100 = 33\frac{1}{3}$

Model C $\Rightarrow \frac{15 - 20}{20} \times 100 = -25\%$

98. (1) Required difference

$= \frac{44 \times 20}{100} - \frac{35 \times 15}{100}$

$= \frac{880 - 525}{100} = \frac{355}{100}$ lakhs

$= 355000$

99. (2) Required production

$= \frac{44 \times 30}{100}$ lakhs

$= 1320000$

100. (3) Required answer

$= 35 \times \frac{10}{100} \times \frac{15}{100} + 44 \times \frac{10}{100} \times \frac{15}{100}$

$= \frac{150}{10000} \times 79 = 1.1850$ lakhs

$= 118500$