CDS - I 2017
Elementry Maths Question Paper

1. What is $\sqrt{\frac{0.064 \times 6.25}{0.081 \times 4.84}}$ equal to?

   A. $\frac{10}{99}$ B. $\frac{100}{99}$

   C. 9 D. 99

2. $(x+4)$ is a factor of which one of the following expressions?

   A. $x^2 - 7x + 44$ B. $x^2 + 7x - 44$

   C. $x^2 - 7x - 44$ D. $x^2 + 7x + 44$

3. If α and β are the roots of the quadratic equation $2x^2 + 6x + k = 0$, where $k < 0$, then what is the maximum value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$?

   A. 2 B. - 2

   C. 9 D. -9

4. Consider the following statements :

   1. If $a = bc$ with HCF (b, c) = 1, then HCF (c, bd) = HCF (c, d).
   2. If a = bc with HCF (b, c) = 1,then LCM (a, b) = LCM (c, bd)

   ` Which of the above statements is/are correct?

   A. 1 only B. 2 only

   C. Both 1 and 2 D. Neither 1 nor 2

5. What is the square root of $\frac{(0.35)^2 + 0.70 + 1}{2.25} + 0.19$?

   A. 1 B. 2

   C. 3 D. 4

6. What is the number of digits in 2^{40} ?
   (Given that $\log_{10} 2 = 0.301$)

   A. 14 B. 13

   C. 12 D. 11

7. If one root of

   $(a^2 - 5a + 3)x^2 + (3a - 1)x + 1 = 0$

   is twice the other, then what is the value of 'a'?

   A. $\frac{2}{3}$ B. $-\frac{2}{3}$

   C. $\frac{1}{3}$ D. $-\frac{1}{3}$

8. What is the remainder when the number $(4444)^{4444}$ is divided by 9?

   A. 4 B. 6

   C. 7 D. 8

9. If $x = \frac{\sqrt{a+b} - \sqrt{a-b}}{\sqrt{a+b} + \sqrt{a-b}}$, then what is $bx^2 - 2ax + b$ equal to $(b \neq 0)$?

   A. 0 B. 1

   C. ab D. 2ab

10. What is the value of $\frac{(443+547)^2 + (443-547)^2}{443 \times 443 + 547 \times 547}$?

    A. 0 B. 1

    C. 2 D. 3

11. If $x = t^{\frac{1}{t-1}}$ and $y = t^{\frac{t}{t-1}}, t > 0, t \neq 1$, then what is the relation between x and y?

    A. $y^x = x^{1/y}$ B. $x^{1/y} = y^{1/x}$

    C. $x^y = y^x$ D. $x^y = y^{1/x}$

12. If A : B = 3 : 4, then what is the value of the expression $\left(\frac{3A^2 + 4B}{3A - 4B^2}\right)$?

    A. $\frac{43}{55}$

    B. $-\frac{43}{55}$

    C. $\frac{47}{55}$

    D. Cannot be determined

13. If A = {x : x is a multiple of 7},
    B = {x : x is a multiple of 5} and
    C = {x : x is a multiple of 35},
    Then which one of the following is a null set?

    A. $(A - B) \cup C$ B. $(A - B) - C$

    C. $(A \cap B) \cap C$ D. $(A \cap B) - C$

14. If $x = 2 + 2^{2/3} + 2^{1/3}$, then what is the value of $x^3 - 6x^2 + 6x$?

    A. 3 B. 2

    C. 1 D. 0

15. If $\sqrt{\frac{x}{y}} = \frac{24}{5} + \sqrt{\frac{y}{x}}$ and $x + y = 26$, then what is the value of xy?

    A. 5 B. 15

    C. 25 D. 30

16. What is the solution of the equation $x \log_{10}\left(\frac{10}{3}\right) + \log_{10} 3 = \log_{10}(2 + 3^x) + x$?

    A. 10 B. 3

    C. 1 D. 0

17. If α and β are the roots of the equation $x^2 + px + q = 0$, then what is $\alpha^2 + \beta^2$ equal to?

A. $p^2 - 2q$ B. $q^2 - 2p$

C. $p^2 + 2q$ D. $q^2 - q$

18. If $a^3 = 335 + b^3$ and $a = 5 + b$, then what is the value of $a + b$ (given that $a > 0$ and $b > 0$)?

A. 7 B. 9

C. 16 D. 49

19. If $9^x 3^y = 2187$ and $2^{3x} 2^{2y} - 4^{xy} = 0$, then what can be the value of $(x + y)$?

A. 1 B. 3

C. 5 D. 7

20. The pair of linear equations $kx + 3y + 1 = 0$ and $2x + y + 3 = 0$ intersect each other, if

A. $k = 6$ B. $k \neq 6$

C. $k = 0$ D. $k \neq 0$

21. The number of prime number which are less than 100 is

A. 24 B. 25

C. 26 D. 27

22. The cost of a diamond varies directly as the square of its weight .A diamond broke into four pieces with their weights in the ratio of 1 : 2 : 3 : 4. If the loss in total value of the diamond was ₹ 70,000, what was the price of the original diamond?

A. ₹ 1,00,000 B. ₹ 1,40,000

C. ₹ 1,50,000 D. ₹ 1,75,000

23. In a 100 m race, A runs at a speed of $\frac{5}{3}$ If A gives a start of 4 m to B and still beats him by 12 seconds, what is the speed of B?

A. $\frac{5}{4}$ m/s B. $\frac{7}{5}$ m/s

C. $\frac{4}{3}$ m/s D. $\frac{6}{5}$ m/s

24. If 15 men take 21 days of 8 hours each to do a piece of work, then what is the number of days of 6 hours each that 21 women would take, if 3 women would do as much work as 2 men?

A. 18 B. 20

C. 25 D. 30

25. What number must be subtracted from both the numerator and the denominator of the fraction $\frac{27}{35}$ so that it becomes $\frac{2}{3}$?

A. 6 B. 8

C. 9 D. 11

26. A sum of ₹ 8,400 was taken as a loan. This is to be paid in two equal instalments. If the rate of interest is 10% per annum, compounded annually, then the value of each instalment is

A. ₹ 4,200 B. ₹ 4,480

C. ₹ 4,840 D. None of the above

27. Leela got married 6 years ago. Today her age is $1\frac{1}{4}$ times her age at the time of her marriage. Her son's age is $\frac{1}{10}$ times her age.

What is the present age of her son?

A. 1 years B. 2 years

C. 3 years D. 4 years

28. A and B working together can finish a piece of work in 12 days while B alone can finish it in 30 days. In how many days can A alone finish the work?

A. 18 days B. 20 days

C. 24 days D. 25 days

29. The value of x which satisfy the equation $5^{1+x} + 5^{1-x} = 26$ are

A. -1, 1 B. 0, 1

C. 1, 2 D. -1, 0

30. If 5 men can do a piece of work in 10 days and 12 women can do the same work in 15 days, the number of days required to complete the work by 5 men & 6 women is

A. $7\frac{1}{2}$ days B. 8 days

C. $9\frac{1}{2}$ days D. 12 days

31. A passenger train departs from Delhi at 6 p.m. for Mumbai. At 9 p.m., an express train, whose average speed exceeds that of the passenger train by 15 km/hour leaves Mumbai for Delhi. Two trains meet each other mid-route. At what time do they meet, given that the distance between the cities is 1080 km?

A. 4 p.m. B. 2 a.m.

C. 12 midnight D. 6 a.m.

32. In a class of 49 students, the ratio of girls to boys is 4 : 3. If 4 girls leave the class, the ratio of girls to boys would be
A. 11 : 7 B. 8 : 7
C. 6 : 5 D. 9 : 8

33. If $a+b=5$ and $ab=6$, then what is the value of?
A. 35 B. 40
C. 90 D. 125

34. Rajendra bought a mobile with 25% discount on the selling price. If the mobile cost him ₹ 4,875, what is the original selling price of the mobile?
A. ₹ 6,300 B. ₹ 6,400
C. ₹ 6,500 D. ₹ 6,600

35. A 225 m long train is running at a speed of 30 km/hour. How much time does it take to cross a man running at 3 km/hours in the same direction?
A. 40 seconds B. 30 seconds
C. 25 seconds D. 15 seconds

36. Which one among the following is the largest?
A. $\frac{7}{9}$ B. $\frac{11}{14}$
C. $\frac{3}{4}$ D. $\frac{10}{13}$

37. The difference between the simple and the compound interest on a certain sum of money at 4% per annum in 2 years is ₹ 10. What is the sum?
A. ₹ 5,000 B. ₹ 6,000
C. ₹ 6,250 D. ₹ 7,500

38. If a% of $a+b$% of $b=2$% of ab, then what percent of a is b?
A. 50%
B. 75%
C. 100%
D. Cannot be determined

39. $\frac{5}{9}^{th}$ part of the population in a village are males. If 30% of the males are married, the percentage of unmarried females in the total population is
A. $20\frac{2}{9}$ B. $27\frac{2}{9}$
C. $27\frac{7}{9}$ D. $29\frac{2}{9}$

40. Sunil wants to speed ₹ 200 on two types of sweets, costing ₹ 7 and ₹ 10 respectively. What is the maximum number of sweets he can get so that no money is left over?
A. 25 B. 26
C. 27 D. 28

41. What is the LCM of x^3+8, x^2+5x+6 and x^3+4x^2+4x?
A. $x(x+2)^2(x+3)(x^2-2x+4)$
B. $x(x-2)^2(x-3)(x^2+2x+4)$
C. $(x+2)^2(x+3)(x^2-2x+4)$
D. $(x-2)^2(x-3)(x^2-2x+4)$

42. The HCF of two expressions p and q is 1. What is the reciprocal of their LCM?
A. $p+q$ B. $p-q$
C. pq D. $(pq)^{-1}$

43. What is the value of $\sqrt[3]{4\frac{12}{125}}$?
A. $1\frac{3}{5}$ B. $1\frac{2}{5}$
C. $1\frac{4}{5}$ D. $2\frac{2}{5}$

44. A thief is spotted by a policeman from a distance of 100 m. When the policeman starts the chase, the thief also starts running. If the speed of the thief is 8 km/hours and that of the policeman is 10 km/hour, then how far will the thief have to run before he is overtaken?
A. 200 m B. 300 m
C. 400 m D. 500 m

45. Aman and Alok attempted to solve a quadratic equation. Aman made a mistake in writing down the constant term and ended up in roots (4, 3). Alok made a mistake in writing down the coefficient of X to get roots (3, 2). The correct roots of the equation are
A. -4, -3 B. 6, 1
C. 4, 3 D. -6, -1

46. Consider the following statements :
1. Of two consecutive integers, one is even.
2. Square of an odd integer is of the form $8n+1$.
Which of the above statements is/are correct?
A. 1 only B. 2 only
C. Both 1 and 2 D. Neither 1 nor 2

47. The system of equations $2x + 4y = 6$ and $4x + 8y = 8$ is
A. Consistent with a unique solution
B. Consistent with infinitely many solutions
C. Inconsistent
D. None of the above

48. $\left(N^{p-1} - 1\right)$ is a multiple of p, if N is prime to p and p is a
A. Prime number
B. Rational number
C. Real number
D. Composite number

49. The ratio of two numbers is 1 : 5 and their product is 320. What is the difference between the square of these two numbers?
A. 1024 B. 1256
C. 1536 D. 1640

50. 25 kg of alloy X is mixed with 125 kg of alloy Y. If the amount of lead and tin in the alloy X is in the ratio 1 : 2 and the amount of lead and tin in the alloy Y is in the ratio 2 : 3, then what is the ratio of lead to tin in the mixture?
A. 1 : 2 B. 2 : 3
C. 3 : 5 D. 7 : 11

51. The mean of 5 numbers is 15. If one more number is included, the mean of the 6 numbers becomes 17. What is the included number?
A. 24 B. 25
C. 26 D. 27

52. The mean marks obtained by 300 students in a subject are 60. The mean of top 100 students was found to be 80 and the mean of last 100 students was found to be 50. The mean marks of the remaining 100 students are
A. 70 B. 65
C. 60 D. 50

53. Consider the following distribution :

Class	Frequency
0 – 20	17
20 – 40	28
40 – 60	32
60 – 80	F
80 – 100	19

If the mean of the above distribution is 50, what is the value of f?
A. 24 B. 34
C. 56 D. 96

54. In a pie diagram, there are four slices with angles 150°, 90°, 60° and 60°. A new pie diagram is formed by deleting one of the slices having angle 60 in the given pie diagram. In the new pie diagram
A. The largest slice has angle 150°
B. The smallest slice has angle 70°
C. The largest slice has angle 180°
D. The smallest slice has angle 90°

55. In an asymmetrical distribution, if the mean and median of the distribution are 270 and 220 respectively, then the mode of the data is
A. 120 B. 220
C. 280 D. 370

56. Let a, b, c, d, e, f, g be consecutive even numbers and j, k, l, m, n be consecutive odd numbers. What is the average of all the numbers?
A. $\frac{3(a+n)}{2}$
B. $\frac{(5l+7d)}{4}$
C. $\frac{(a+b+m+n)}{4}$
D. None of the above

57. An individual purchases three qualities of pencils. The relevant data is given below :

Quality	Price per pencil (in ₹)	Money spent (in ₹)
A	1.00	50
B	1.50	x
C	2.00	20

It is known that the average price per pencil is ₹ 1.25. Wwhat is the value of x?
A. ₹ 10 B. ₹ 30
C. ₹ 40 D. ₹ 60

58. Consider the following frequency distribution :

x	Frequency	Cumulative frequency
1	8	8
2	10	18
3	F_1	29
4	F_2	45

What are the values of f_1 and f_2 respectively?
A. 10 and 17 B. 17 and 10
C. 11 and 16 D. 16 and 11

59. If D is the number of degrees and R is the number of radians in an angle θ, then which one of the following is correct?

A. $\pi D = 180R$ B. $\pi D = 90R$

C. $\pi R = 180D$ D. $\pi R = 90D$

60. What is the minimum value of $9\tan^2\theta + 4\cot^2\theta$?

A. 6 B. 9

C. 12 D. 13

61. If $x\sin\theta = y\cos\theta = \frac{2z\tan\theta}{1-\tan^2\theta}$, then what is $4z^2\left(x^2+y^2\right)$ equal to?

A. $\left(x^2+y^2\right)^3$ B. $\left(x^2-y^2\right)^2$

C. $\left(x^2-y^2\right)^3$ D. $\left(x^2+y^2\right)^2$

62. If $\cos\theta_1 + \cos\theta_2 + \cos\theta_3 = 3$, then what is $\sin\theta_1 + \sin\theta_2 + \sin\theta_3$ equal to?

A. 0 B. 1

C. 2 D. 3

63. What is the value of θ which satisfies the equation $\cos\theta + \tan\theta = 1$?

A. 0^o B. 30^o

C. 45^o D. 60^o

64. What is the value of $\sin x\sqrt{\frac{1}{1+\cos x}+\frac{1}{1-\cos x}}$?

A. $\sqrt{2}$ B. $2\sqrt{2}$

C. $\sqrt{2}\tan x$ D. 0

65. What is $\frac{\cos^4 A - \sin^4 A}{\cos^2 A - \sin^2 A}$ equal to?

A. $\cos^2 A - \sin^2 A$

B. $\cos A - \sin A$

C. 1

D. 2

66. If $7\sin^2 x + 3\cos^2 x = 4$, $0 < x < 90^o$, then what is the value of tan x?

A. $\sqrt{2}$ B. 1

C. $\frac{\sqrt{3}}{2}$ D. $\frac{1}{\sqrt{3}}$

67. An aeroplane flying at a height of 300 m above the ground passes vertically above another plane at an instant when the angles of elevation of the two planes from the same point on the ground are 60 and 45 respectively. What is the height of the lower plane from the ground?

A. $100\sqrt{3}$ m B. $\frac{100}{\sqrt{3}}$ m

C. $50\sqrt{3}$ m D. $150\left(\sqrt{3}+1\right)$ m

68. If $x = a\cos\theta + b\sin\theta$ and $y = a\sin\theta - b\cos\theta$, then what is $x^2 + y^2$ equal to?

A. 2ab B. $a+b$

C. a^2+b^2 D. a^2-b^2

69. From the top of a building 90 m high, the angles of depression of the top and the bottom of a tree are 30 and 45 respectively. What is the height of the tree?

A. $30\sqrt{3}$ m B. $90-30\sqrt{3}$ m

C. $90+30\sqrt{3}$ m D. $60+30\sqrt{3}$ m

70. Which one of the following triples does not represent the sides of a triangle?

A. (3, 4, 5) B. (4, 7, 10)

C. (3, 6, 8) D. (2, 3, 6)

71. If the perimeter of a rectangle is 10 cm and the area is 4 cm^2, then its length is

A. 6 cm B. 5 cm

C. 4.5 cm D. 4 cm

72. The angles of a triangle are in the ratio 2 : 4 : 3. The smallest angle of the triangle is.

A. 20^o B. 40^o

C. 50^o D. 60^o

73. A ball of radius 1 cm is put into a cylindrical pipe so that it fits inside the pipe. If the length of the pipe is 14 m, what is the surface area of the pipe?

A. 2200 square cm

B. 4400 square cm

C. 8800 square cm

D. 17600 square cm

74. The areas of two circular fields are in the ratio 16 : 49. If the radius of the bigger field is 14 m, then what is the radius of the smaller field?

A. 4 m B. 8 m

C. 9 m D. 10 m

75. Let ABCD be a rectangle. Let P, Q, R, S be the mid-points of sides AB, BC, CD, DA respectively. Then the quadrilateral PQRS is a

A. Square

B. Rectangle, but need not be a square

C. Rhombus, but need not be a square

D. Parallelogram, but need not be a rhombus

76. Let P, Q, R be the mid-points of sides AB, BC, CA respectively of a triangle ABC. If the area of the triangle ABC is 5 square units, then the area of the triangle PQR is

A. $\frac{5}{3}$ square units

B. $\frac{5}{2\sqrt{2}}$ square units

C. $\frac{5}{4}$ square units

D. 1 square units

77. If each of the dimensions of a rectangle is increased by 200%, the area is increased by

A. 300% B. 400%

C. 600% D. 800%

78. Three circles each of radius 3.5 cm touch one another. The area subtended between them is

A. $6\left(\sqrt{3}\pi - 2\right)$ square units

B. $6\left(2\pi - \sqrt{3}\right)$ square units

C. $\frac{49}{8}\left(2\sqrt{3} - \pi\right)$ square units

D. $\frac{49}{8}\left(\sqrt{3} - \pi\right)$ square units

79. The area of a regular hexagon of side 'a' is equal to

A. $\frac{\sqrt{2}}{3}a^2$ square units

B. $\frac{3\sqrt{3}}{2}a^2$ square units

C. $\frac{1}{3}a^2$ square units

D. $\frac{\sqrt{3}}{2}a^2$ square units

80. ABCDEF is a regular polygon. Two poles at C and D are standing vertically and subtend angles of elevation 30^o and 60^o at A respectively. What is the ratio of the height of the pole at C to that of the pole at D?

A. 1 : 1 B. $1:2\sqrt{3}$

C. $2\sqrt{3}:1$ D. $2:\sqrt{3}$

81. Two parallel chords of a circle whose diameter is 13 cm are respectively 5 cm and 12 cm in length. If both the chords are on the same side of the diameter, then the distance between these chords is

A. 5.5 cm B. 5 cm

C. 3.5 cm D. 3 cm

82. If the radius of a right circular cone is increased by p% without increasing its height, then what is the percentage increase in the volume of the cone?

A. p^2 B. $2p^2$

C. $\frac{p^2}{100}$ D. $p\left(2 + \frac{p}{100}\right)$

83. A copper wire when bent in the form of a square encloses an area of 121 cm^2. If the same wire is bent in the form of a circle, it encloses an area equal to

A. 121 cm^2 B. 144 cm^2

C. 154 cm^2 D. 168 cm^2

84. ABC is a triangle and D is a point on the side BC. If BC = 12 cm, BD = 9 cm and $\angle ADC = \angle BAC$, then the length of AC is equal to

A. 5 cm B. 6 cm

C. 8 cm D. 9 cm

85. If the surface area of a sphere is reduced to one-ninth of the area, its radius reduces to

A. One-fourth B. One-third

C. One-fifth D. One-ninth

86. In a trapezium ABCD, AB is parallel to CD and the diagonals intersect each other at O. What is the ratio of OA to OC equal to?

A. Ratio of OB to OD

B. Ratio of BC to CD

C. Ratio of AD to AB

D. Ratio of AC to BD

87. Ice-cream, completely filled in a cylinder of diameter 35 cm and height 32 cm, is to be served by completely filling identical disposable cones of diameter 4 cm and height 7 cm. The maximum number of persons that can be served in this way is

A. 950 B. 1000

C. 1050 D. 1100

88. The radius of a circle is increased so that its circumference increases by 15%. The area of the circle will increase by

A. 31.25% B. 32.25%

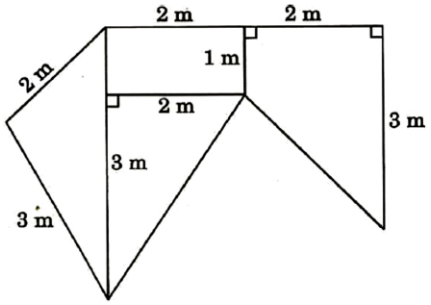
C. 33.25% D. 34.25%

89. ABCD is a rectangle. The diagonals AC and BD intersect at O. If AB = 32 cm and AD = 24 cm, then what is OD equal to?

A. 22 cm B. 20 cm

C. 18 cm D. 16 cm

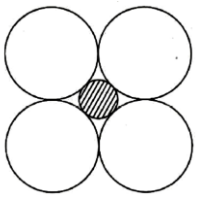
90. A field is divided into four regions as shown in the given figure. What is the area of the field in square metre?



A. $6+\frac{3}{4}\sqrt{5}$ B. $5+\frac{3}{2}\sqrt{3}$

C. $9+\frac{3}{4}\sqrt{15}$ D. $7+2\sqrt{2}$

91. In the figure given below, D is the diameter of each circle. What is the diameter of the shaded circle?



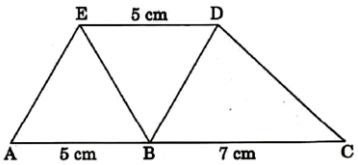
A. $D\left(\sqrt{2}-1\right)$ B. $D\left(\sqrt{2}+1\right)$

C. $D\left(\sqrt{2}+2\right)$ D. $D\left(2-\sqrt{2}\right)$

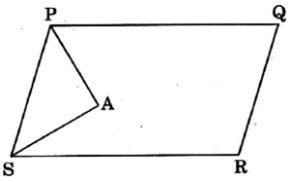
92. In the figure given below, AC is perellel to ED and AB = DE= 5 cm and BC = 7 cm. What is the area ABDE : area BDE : area BCD equal to?

A. 10 : 5 : 7 B. 8 : 4 : 7

C. 2 : 1 : 2 D. 8 : 4 : 5



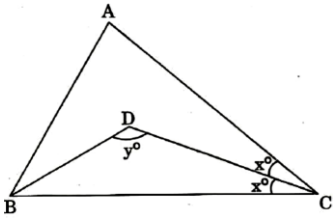
93. In the figure given below, PQRS is a parallelogram. PA bisects angle P and SA bisects angle S. What is angle PAS equal to?



A. 60° B. 75°

C. 90° D. 100°

94. In the figure given below, $\angle A = 80^\circ$ and $\angle ABC = 60^\circ$. BD and CD bisect angles B and C respectively. What are the values of X and Y respectively?



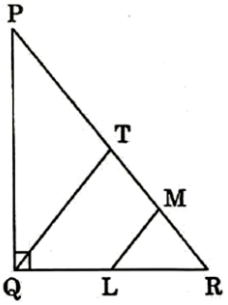
A. 10 and 130

B. 10 and 125

C. 20 and 130

D. 20 and 125

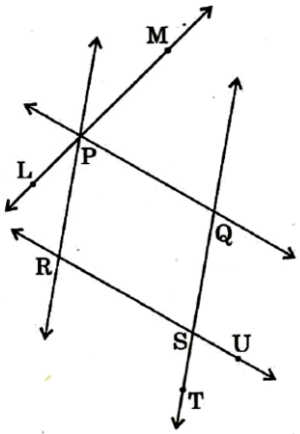
95. In the figures given below, PQR is a non-isosceles right-angled triangle, right angled at Q. If LM and QT are parallel and $QT = PT$, then what is $\angle RLM$ equal to?



A. $\angle PQT$ B. $\angle LRM$

C. $\angle RML$ D. $\angle QPT$

96. In the figure given below, PQ is parallel to RS and PR is parallel to QS. If $\angle LPR = 35^\circ$ and $\angle UST = 70^\circ$, then what is $\angle MPQ$ equal to?



A. 55° B. 70°

C. 75° D. 80°

97. In the figure given below, ABC is a triangle with AB = BC and D is an interior point of the triangle ABC such that

Consider the following statements :

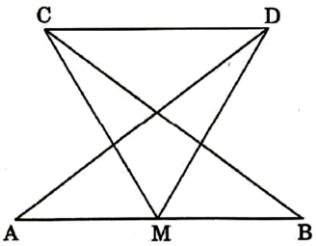
1. Triangle ADC is an isosceles triangle.
2. D is the centroid of the triangle ABC.
3. Triangle ABD is congruent to the triangle CBD.

Which of the above statements are correct?

A. 1 and 2 only B. 2 and 3 only

C. 1 and 3 only D. 1, 2 and 3

98. In the figure given below, M is the mid-point of AB and $\angle DAB = \angle CBA$ and $\angle AMC = \angle BMD$. Then the triangle ADM is congruent to the triangle BCM by



A. SAS rule B. SSS rule

C. ASA rule D. AAA rule

99. ABCD is a square. X is the mid-point of AB and Y is the mid-point of BC.

Consider the following statements :

1. Triangles ADX and BAY are congruent.
2. $\angle DXA = \angle AYB$.
3. DX is inclined at an angle 60° with AY.
4. DX is not perpendicular to AY.

Which of the above statements are correct?

A. 2, 3 and 4 only B. 1, 2 and 4 only

C. 1, 3 and 4 only D. 1 and 2 only

100. From an aeroplane vertically over a straight horizontal road, the angles of depression of two consecutive kilometer-stones on the opposite sides of the aeroplane are observed to be α and β. The height of the aeroplane above the road is

A. $\frac{\tan\alpha + \tan\beta}{\tan\alpha \tan\beta}$ B. $\frac{\tan\alpha \tan\beta}{\tan\alpha + \tan\beta}$

C. $\frac{\cot\alpha \cot\beta}{\cot\alpha + \cot\beta}$ D. $\frac{\cot\alpha + \cot\beta}{\cot\alpha \cot\beta}$

Solutions

1. Answer. C

As, $\sqrt{\frac{0.064\times6.25}{0.081\times4.84}}$

$=\sqrt{\frac{\left(\frac{64}{1000}\right)\times\left(\frac{625}{100}\right)}{\left(\frac{81}{1000}\right)\times\left(\frac{484}{100}\right)}}$

$=\sqrt{\frac{64\times625}{81\times484}}$

$=\frac{8\times25}{9\times22}=\frac{100}{99}$

Hence option (c)

2. Answer. C

As $x+4$ is a factor

i.e. $x+4=0$

$=>x=-4$ is a root of equation.

Option (a)

$f(x)=x^2-7x+44$

$f(-4)=(-4)^2-7(-4)+44$

$=16+28+44$

$=88\neq0$

Option (b)

$f(x)=x^2+7x-44$

$=(-4)^2+7(-4)+44$

$=16-28+44$

$=32\neq0$

Option (c)

$f(x)=x^2-7x-44$

$=(-4)^2-7(-4)-44$

$=16+28-44$

$=0$

Hence $(x+4)$ is a factor of $x^2-7x-44$

Hence option (c)

3. Answer. B

As α and β are the roots of equation $2x^2+6x+k=0,\ k<0$ ……. (i)

Now, $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{\alpha^2+\beta^2}{\alpha\beta}$……. (ii)

From (i)

Sum of roots $(\alpha+\beta)=-\frac{6}{2}=-3$

Products of roots $(\alpha\beta)=\frac{k}{2}$

Now, $(\alpha+\beta)^2=\alpha^2+\beta^2+2\alpha\beta$

⇨ $(-3)^2=\alpha^2+\beta^2+\frac{2k}{2}$

⇨ $\alpha^2+\beta^2=9-k$

From (ii)

$\frac{\alpha^2+\beta^2}{\alpha\beta}=\frac{9-k}{\frac{k}{2}}$

$=\frac{2(9-k)}{k}=\frac{18}{k}-2$ [As,$k<0$]

So, mean value be -2

$f'(k)=-\frac{18}{k^2}$

$f'(k)=0$

$=>-\frac{18}{k^2}=0$

$=>k=\infty$

So, maximum value of $f(k)=-2$

Hence option (b)

4. Answer. A

We can solve this question by taking arbitrary values

As $a=b\times c$

Let $a=6,b=2,c=3$

Statement 1:

HCF$(3,2\times6)$

$=HCF(3,12)=3$

$HCF(3,6)=3$

Hence statement 1 is correct.

Statement 2:

$LCM(6,6)=6$

$LCM(3,12)=12$

i.e. $LCM(6,6)\neq LCM(3,12)$

Hence statement 2 is incorrect.

Hence option (a)

5. Answer. A

$\frac{(0.35)^2+0.70+1}{2.25}+0.19$

$=\frac{0.1225+0.70+1}{2.25}+0.19$

$=\frac{1.8225}{2.25}+0.19$

$=0.81+0.19=1$

Hence option (a)

6. Answer. B

As, $x=2^{40}$

Taking log both sides

$\log x=\log(2^{40})$

⇨ $\log x=40\log2$

⇨ $\log x=40\times0.301$

⇨ $\log x=12.04$

As, $\log13=12.04$

Then $x=13$

So, number of terms be 13

Hence option (b)

7. Answer. A

Given,

$(a^2-5a+3)x^2+(3a-1)x+2=0$

Having roots α *and* β and $\beta = 2\alpha$ (Given)

Now,

Sum of roots $= \frac{-(3a-1)}{(a^2-5a+3)}$

$\Rightarrow \alpha+2\alpha = \frac{-(3a-1)}{(a^2-5a+3)}$

$\Rightarrow 3\alpha = \frac{-(3a-1)}{(a^2-5a+3)}$..... (i)

Products of roots $= \frac{2}{(a^2-5a+3)}$

$\Rightarrow \alpha(2\alpha) = \frac{2}{(a^2-5a+3)}$

$\Rightarrow 2\alpha^2 = \frac{2}{(a^2-5a+3)}$

$\Rightarrow \alpha^2 = \frac{1}{(a^2-5a+3)}$..... (ii)

From (i) and (ii)

$\frac{(3a-1)^2}{a(a^2-5a+3)^2} = \frac{1}{(a^2-5a+3)}$

$\Rightarrow (3a-1)^2 = a(a^2-5a+3)$

$\Rightarrow 9a^2+1-6a = 9a^2-45a+27$

$\Rightarrow 45a-6a = 27-1$

$\Rightarrow 39a = 26$

$\Rightarrow a = \frac{26}{39} = \frac{2}{3}$

Hence option (a)

8. Answer. C

$\frac{(4444)^{4444}}{9}$

$= \frac{(7)^{4444}}{9}$ [When 4444 is divided by 9]

$= \frac{(-2^4)^{1111}}{9}$ [Remainder will be 7]

$= \frac{(16)^{1111}}{9}$ [Or (-2) negative remainder]

$= \frac{(-2)^{1110}\times(-2)}{9}$ [-2 negative remainder]

$= \frac{(-2^6)^{185}\times(-2)}{9}$

$= \frac{(64)^{185}\times(-2)}{9}$

$= \frac{(1)^{185}\times(-2)}{9}$

$= \frac{1\times(-2)}{9}$

$= \frac{7}{9}$

Hence remainder be 7

Hence option (c)

9. Answer. A

As,

$x = \frac{\sqrt{a+b}-\sqrt{a-b}}{\sqrt{a+b}+\sqrt{a-b}}$

Rationing,

$x = \frac{(\sqrt{a+b}-\sqrt{a-b})(\sqrt{a+b}-\sqrt{a-b})}{(\sqrt{a+b}+\sqrt{a-b})(\sqrt{a+b}-\sqrt{a-b})}$

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

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

$= \frac{2a-2\sqrt{a^2-b^2}}{2b}$

$= \frac{a}{b}-\frac{\sqrt{a^2-b^2}}{b}$

$bx^2 = b\left[\frac{a}{b}-\frac{\sqrt{a^2-b^2}}{b}\right]^2$

$= b\left[\frac{a^2}{b^2}+\frac{a^2-b^2}{b^2}-\frac{2a\sqrt{a^2-b^2}}{b^2}\right]$

$= \frac{a^2}{b}+\frac{a^2-b^2}{b}-\frac{2a\sqrt{a^2-b^2}}{b^2}$ ..... (i)

$-2ax = -2a\left[\frac{a}{b}-\frac{\sqrt{a^2-b^2}}{b}\right]$

$= -\frac{2a^2}{b}+\frac{2a\sqrt{a^2-b^2}}{b}$

Now,

$bx^2-2ax+b = \frac{a^2}{b}+\frac{a^2-b^2}{b}-\frac{2a\sqrt{a^2-b^2}}{b}-\frac{2a^2}{b}+\frac{2a\sqrt{a^2-b^2}}{b}+b$

$= \frac{a^2}{b}+\frac{a^2}{b}-b-\frac{2a^2}{b}+b$

$= 0$

Hence option (a)

10. Answer. C

As,

$\frac{(443+547)^2+(443-547)^2}{(443\times443)+(547\times547)}$

Let $a = 443, b = 547$

Then,

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

$= \frac{2a^2+2b^2}{a^2+b^2}$

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

$= 2\times1 = 2$

Hence option (c)

11. Answer. C

As, $= t^{\frac{1}{t-1}}$, $y = t^{\frac{t}{t-1}}$

$y = (t^t)^{\frac{1}{t-1}}$

$=> y = (t)^{(t\frac{1}{t-1})}$

$=> y = t^x$

$=> t = (y)^{\frac{1}{x}}$ ..... (i)

$x = t^{\frac{t}{t-1}}$

$=>x^t = t^{\frac{t}{t-1}}$ …… (ii)

From (i) and (ii)

$x^{\frac{y}{x}} = y$

$(x^y)^{\frac{1}{x}} = y$

$=>x^y = y^x$

Hence option (c)

12. Answer. D

As, $A: B = 3: 4$

Let $A = 3k$

$B = 4k$

Now,

$\frac{3A^2+4B}{3A-4B^2}$

$= \frac{3\times 9k^2+4\times 4k}{3\times 3k-4\times(4k)^2}$

$= \frac{27k^2+16k}{9k-64k^2}$

$= \frac{27k+16}{9-64k}$

We can't determine the value.

Hence option (d)

13. Answer. D

According to question

$A = \{7,14,21,28,35,42 \ldots\ldots..\}$

$B = \{5,10,15,20,25. \ldots\ldots..\}$

$C = \{35,70,105 \ldots\ldots\ldots\}$

Option (a):

$(A - B) \cup C = \{7,14,21,28,42 \ldots..\} \cup \{35,70,105 \ldots\ldots\} \neq \emptyset$

Option (b):

$(A - B) - C = \{7,14,21,28,42 \ldots..\} - \{35,70,105 \ldots\ldots\} \neq \emptyset$

Option (c):

$(A \cap B) \cap C = \{35,70 \ldots..\}$

Option (d):

$(A \cap B) - C = \{35,70 \ldots.\} - \{35,70 \ldots\} = \emptyset$

Hence option (d)

14. Answer. B

As,

$x = 2 + 2^{\frac{2}{3}} + 2^{\frac{1}{3}}$

$=>(x-2) = 2^{\frac{2}{3}} + 2^{\frac{1}{3}}$ …….. (i)

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

$=>x^3 - 8 - 6x^2 + 12x = 4 + 2 + 3 \times 2^{\frac{2}{3}} \times 2^{\frac{1}{3}}(2^{\frac{2}{3}} + 2^{\frac{1}{3}})$

$=>x^3 - 8 - 6x^2 + 12x = 6 + 3 \times 2^{\frac{2}{3}+\frac{1}{3}}(x-2)$ [From (i)]

$=>x^3 - 8 - 6x^2 + 12x = 6 + 6(x-2)$

$=>x^3 - 8 - 6x^2 + 12x = 6 + 6x - 12$

$=>x^3 - 8 - 6x^2 + 12x = 8 - 6$

$=>x^3 - 8 - 6x^2 + 12x = 2$

Hence option (b)

15. Answer. C

As,

$\sqrt{\frac{x}{y}} = \frac{24}{5} + \sqrt{\frac{y}{x}}$

$\Rightarrow \sqrt{\frac{x}{y}} - \sqrt{\frac{y}{x}} = \frac{24}{5}$

$\Rightarrow \frac{x-y}{\sqrt{xy}} = \frac{24}{5}$

Squaring both sides,

$\frac{(x-y)^2}{xy} = \frac{576}{25}$

$\Rightarrow (x^2 + y^2 - 2xy) = \frac{576}{25}xy$…… (i)

Also,

$x + y = 26$

Squaring both sides,

$x^2 + y^2 + 2xy = 676$ …….. (ii)

From (i) and (ii)

$\frac{576}{25}xy + 2xy = 676 - 2xy$

$\Rightarrow \left(\frac{576}{25} + 2 + 2\right)xy = 676$

$\Rightarrow \left(\frac{576+25\times 4}{25}\right)xy = 676$

$\Rightarrow xy = 25$

Hence option (c)

16. Answer. D

As,

$x\ log_{10}^{\left(\frac{10}{3}\right)} + log_{10}^{3} = log_{10}^{(2+3^x)} + x$

$=>x\ log_{10}^{10} - x\ log_{10}^{3} + log_{10}^{3} = log_{10}^{(2+3^x)} + x$

$=>x\ - log_{10}^{3^x} + log_{10}^{3} = log_{10}^{(2+3^x)} + x$

$=>log_{10}^{\left(\frac{3}{3x}\right)} = log_{10}^{(2+3^x)}$

$=>3^{1-x} = 2 + 3^x$

$=>3^{1-x} - 3^x = 2$

$=>3^{1-x} - 3^x = 3^1 - 3^0$

Comparing both sides,

$1 - x = 1$

$=>x = 1 - 1 = 0$

Hence option (d)

17. Answer. A

According to question,

Sum of root $(\alpha + \beta) = -\frac{b}{a}$

So, $(\alpha + \beta) = -p$ …….. (i)

Product of root $\left(\alpha\beta = \frac{c}{a}\right)$

$=>(\alpha\beta) = q$ ..... (ii)

From (i)

$(\alpha + \beta) = -p$

$=>(\alpha + \beta)^2 = p^2$

$=>\alpha^2 + \beta^2 + 2\alpha\beta = p^2$

$=>\alpha^2 + \beta^2 = p^2 - 2q$ $[\alpha\beta = q]$

Hence $\alpha^2 + \beta^2 = p^2 - 2q$

Hence option (a)

18. Answer. B

As, $a^3 = 335 + 63$

$=>a^3 - b^3 = 335$ ..... (i)

Also,

$a = 5 + b$

$\Rightarrow\ a - b = 5$ ..... (ii)

Cubing both sides

$a^3 - b^3 - 3ab(a - b) = 125$ ..... (iii)

From (i) and (ii) we get,

$335 - 3ab(a - b) = 125$ ..... (iv)

From (ii) and (iv) we get,

$335 - 3ab \times 5 = 125$

$\Rightarrow\ 15ab = 335 - 125$

$\Rightarrow\ 15ab = 210$

$\Rightarrow\ ab = \frac{210}{15} = 14$

Also, $(a + b)^2 = (a - b)^2 + 4ab$

$\Rightarrow\ (a - b)^2 = (5)^2 + 4 \times 14$

$= 25 + 56$

$= 81$

$\therefore a + b = 9$

Hence option (b)

19. Answer. C

As,

$a^x \times 3^y = 2187$

$\Rightarrow\ 3^{2x} \times 3^y = 2187$

$\Rightarrow\ 3^{2x+y} = 3^7$

So, $2x + y = 7$..... (i)

Also,

$2^{3x+2y} = 2^{2xy}$

$\therefore 3x + 2y = 2xy$ ..... (ii)

From (i) and (ii) we get,

$3x + 2(7 - 2x) = 2xy$

$3x + 14 - 4x = 2x(7 - 2x)$

$\Rightarrow\ -x + 14 = 14x - 4x^2$

$\Rightarrow\ 4x^2 - 15x + 14 = 0$

$\Rightarrow\ (x - 2)(4x - 7) = 0$

$\Rightarrow\ x - 2 = 0\ or\ 4x - 7 = 0$

$\Rightarrow\ x = 2\ or \frac{7}{4}$

If $x = 2$

$y = 7 - 2x = 7 - 4 = 3$

$x + y = 5$

Hence option (c)

20. Answer. B

As,

$a_1x + b_1y + c_1 = 0$ ..... (i)

$a_2x + b_2y + c_2 = 0$ ..... (ii)

Line (i) and (ii) will intersect each other

If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

According to question

$a_1 = k, a_2 = 2, b_1 = 3, b_2 = 1$

So, $\frac{k}{2} \neq \frac{3}{1}$

$\Rightarrow\ k \neq 6$

Hence option (b)

21. Answer. B

There are 25 prime numbers less than 100 are

2,3,5,7,11,13,17,19,23,29,31,37,41,43,47,53,59, 61,71,73,79,83,97

Hence option (b)

22. Answer. A

Ratio of weights of broken diamond $= 1:2:3:4$

Net weight $= x + 2x + 3x + 4x = 10x$

Price $= 100\,x^2$

Price $= x^2 + 4x^2 + 9x^2 + 16x^2 = 30x^2$

Net loss $= 100x^2 - 30x^2 = 70x^2$

Now,

$70x^2 = 70000$

$\Rightarrow\ x^2 = 1000$

Price of original diamond $= 100x^2$

$= 100 \times 1000$

$= 100000$

Hence option (a)

23. Answer. C

Time taken by A to cover 100 m

$= \frac{100}{5} \times 3$

$= 60\ sec$

Time taken by B to cover $(100 - 4)m = 60\,\text{sec} + 12\ sec$

Time taken by B to cover 96 meter $= 72\ sec$

Speed of B $= \frac{96}{72}$

$= \frac{4}{3}$m/s

Hence option (c)

24. Answer. D
As, $3W = 2M$
$1W = \frac{2}{3}M$
$21W = \frac{2}{3} \times 21M$
$= 14M$
Now,
$15 \times 21 \times 8 = D \times 6 \times 14$
⇨ $D = \frac{15 \times 21 \times 8}{6 \times 14}$
⇨ $D = 30$
Hence number of days be 30
Hence option (d)

25. Answer. D
As
$\frac{27-x}{35-x} = \frac{2}{3}$
⇨ $3(27 - x) = 2(35 - x)$
⇨ $81 - 3x = 70 - 2x$
⇨ $81 - 70 = -2x + 3x$
⇨ $x = 11$
Hence option (d)

26. Answer. C
As,
$P = \frac{x}{\left(1+\frac{r}{100}\right)} + \frac{x}{\left(1+\frac{r}{100}\right)^2}$
$8400 = \frac{x}{\frac{11}{10}} + \frac{x}{\frac{121}{100}}$
⇨ $8400 = \frac{10x}{11} + \frac{100x}{121}$
⇨ $\frac{110x+100x}{121} = 8400$
⇨ $210x = 8400 \times 121$
⇨ $x = \frac{8400 \times 121}{210}$
⇨ $x = 4840$
Hence option (c)

27. Answer. C
Let age be x years at the time of marriage
$x + 6 = \frac{5}{4}x$
⇨ $4x + 24 = 5x$
⇨ $x = 24$
Her present age $= 24 + 6 = 30\ years$
Her son's age $= \frac{30}{10} = 3\ years$
Hence option (c)

28. Answer. B
As, A and B together can do the work in 12 days.
B alone can do the work in 30 days.
So, A can do the work in
$\frac{1}{12} - \frac{1}{30} = \frac{3}{60} = \frac{1}{20}$
i.e. A can do the work in 20 days.
Hence option (b)

29. Answer. A
We can solve by using options
Option (a):
Put $x = -1\ and\ x = 1$
As $5^{1+x} + 5^{1-x} = 26$
Let $x = -1$
LHS $= 5^{1-1} + 5^{1+1}$
$= 5^2 + 5^0$
$= 25 + 1$
$= 26$
= RHS
Hence option (a)

30. Answer. A
As,
$5M \times 10 = 12W \times 15$
$M = \frac{12W \times 15}{5 \times 10}$
$M = \frac{18W}{5}$
Now,
$5W + 6W$
$= 5 \times \frac{18W}{5} + 6W$
$= 24W$
Again,
$12W \times 15\ days = 24W \times no\ of\ days$
⇨ No of days $= \frac{12 \times 15}{24}$
⇨ $7\frac{1}{2}$ days
Hence option (a)

31. Answer. D
Let time taken passenger train $= t$
Time taken by express train $= t + 3$
When distance $= 540\ Km$
Then according to question,
$\frac{540}{t} - \frac{540}{t+3} = 15$
$=>540\left[\frac{t+3-t}{t(t+3)}\right] = 15$
$=>540 \times 3 = 15(t^2 + 3t)$
$=>108 = t^2 + 3t$
$=>t^2 + 3t - 108 = 0$
$=>t^2 + 12t - 9t - 108 = 0$
$=>(t - 9)(t + 12) = 0$
$=>t = 9\ hr\ or\ t = -12\ (Not\ possible)$
Hence expression train will take 9 hr
i.e. 9 Pm + 9 hr = 6 AM
Hence option (d)

32. Answer. B

Number of girls $= 49 \times \frac{4}{7} = 28$

Number of boys $= 49 \times \frac{3}{7} = 21$

Number of girls left after 4 girls leaves $= 28 - 4 = 24$

Ratio of girls to boys $= 24:21 = 8:7$

Hence option (b)

33. Answer. A

As,

$a + b = 5$ ……. (i)

$ab = 6$ …… (ii)

Squaring both sides to (i)

$a^2 + b^2 + 2ab = 25$

⇨ $a^2 + b^2 + 2 \times b = 25$ [As, ab = b]

⇨ $a^2 + b^2 = 25 - 12 = 13$

Now,

$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

$= 5(a^2 + b^2 - ab)$

$= 5(13 - 6)$

$= 5 \times 7 = 35$

Hence option (a)

34. Answer. C

Given % discount be 25%

i.e. $\frac{25}{100} = \frac{1}{4}$th part

As, marked price $= 4$

Then discount $= 4 \times \frac{1}{4} = 1$

Then cost of mobile $= 4 - 1 = 3$

As 3 ratio cost be 4875

∴ 1 ratio costs be $\frac{4875}{3} = 1625$

Thus, original price $= (1625 \times 4) = 6500$

Hence option (c)

35. Answer. B

As speed of train $= 30$ km/hr

Speed of man $= 3$ km/hr

Relative speed $= 27$ km/hr

$= 27 \times \frac{5}{18}$m/sec

$= \frac{15}{2}$m/sec

Time taken by train to passes the man $= \frac{225}{\frac{15}{2}}$

$= \frac{225 \times 2}{15}$

$= 15 \times 2$

$= 30\ sec$

Hence option (b)

36. Answer. B

As, $\frac{7}{9} = 0.77$

$\frac{11}{14} = 0.78$

$\frac{3}{4} = 0.75$

$\frac{10}{13} = 0.76$

Arrangement in descending order be

$0.78 > 0.77 > 0.76 > 0.75$

$\frac{11}{14} > \frac{7}{9} > \frac{10}{13} > \frac{3}{4}$

Hence option (b)

37. Answer. C

Let the sum be x

$C.I. = \left[x\left(1 + \frac{4}{100}\right)^2 - x\right]$

$= \left(\frac{676}{625}x - x\right)$

$= \frac{676x - 625x}{625x}$

$= \frac{51x}{625}$

$S.I. = \frac{x \times 4 \times 2}{100} = \frac{2x}{25}$

Now,

$\frac{51x}{625} - \frac{2x}{25} = 10$

$=> \frac{51x - 50x}{625} = 10$

$=> x = 625 \times 10$

$=> x = 6250$

Hence the sum be Rs. 6250

Hence option (c)

38. Answer. C

As, $a\%\ of\ a + b\%\ of b = 2\%\ of\ ab$

$\frac{a \times a}{100} = \frac{b \times b}{100} = \frac{2 \times ab}{100}$

⇨ $a^2 + b^2 = 2ab$

⇨ $a^2 + b^2 - 2ab = 0$

⇨ $(a - b)^2 = 0$

⇨ $a = b$

Thus a is 100% of b

Hence option (c)

39. Answer. C

Let male $= \frac{5x}{9}$

Female $= \frac{4x}{9}$

Unmarried females $= \frac{4x}{9} - \frac{5x}{9} \times \frac{30}{100}$

$= \frac{4x}{9} - \frac{x}{6}$

$= \frac{8x - 3x}{18}$

$= \frac{5x}{18}$

% of unmarried females $= \frac{\frac{5x}{18}\times 100}{\frac{5x}{9}+\frac{4x}{9}}$

$= \frac{5x\times 100}{18}\times\frac{9}{9x}$

$= 27\frac{7}{9}$

Hence option (c)

40. Answer. B

Possibility 1:

Number of sweets, costing Rs. 7 be 10

Then money speed $= Rs.(10\times 7) = Rs.70$

Money left $= 200 - 70$

$= Rs.130$

Number of sweets costing Rs. 10

$= \frac{130}{10} = 13$

Number of sweets $= 10 + 13 = 23$

In this possibility no money is left over.

Possibility 2:

Number of sweets, costing Rs. 7 be 20

Then money spend $= Rs.(7\times 20) = Rs.140$

Money left $= 200 - 140 = Rs.60$

Number of sweets costing Rs. 10

$= \frac{60}{10} = 6$

Number of sweets $= 20 + 6 = 26$

Here, also no money is left over.

Hence, maximum number of sweets Sunil can get 26. So that no money is left over.

Hence option (b)

41. Answer. A

As, $x^3 + 8$

$= x^3 + 2^3$

$= (x+2)(x^2 - 2x + 2^2)$

$= (x+2)(x^2 - 2x + 4)$ ..... (i)

$x^2 + 5x + 6$

$= x^2 + 2x + 3x + 6$

$= (x+2)(x+3)$ ..... (ii)

$x^3 + 4x^2 + 4x$

$= x(x^2 + 4x + 4)$

$= x(x+2)^2$ ..... (iii)

From (i), (ii) and (iii)

LCM $= x(x+2)^2(x+3)(x^2-2x+4)$

Hence option (a)

42. Answer. D

As we know that,

The products of two numbers = LCM of two numbers × HCF of two numbers

⇨ $p\times q = LCM\times 1$

⇨ $LCM = pq$

⇨ $\frac{1}{LCM} = \frac{1}{pq} = (pq)^{-1}$

Hence option (d)

43. Answer. A

As

$\sqrt[3]{4\frac{12}{125}}$

$= \sqrt[3]{\frac{512}{125}}$

$= \sqrt[3]{\frac{8^3}{5^3}}$

$= \left(\frac{8}{5}\right)^3 \times \frac{1}{3}$

$= \frac{8}{5} = 1\frac{3}{5}$

Hence option (a)

44. Answer. C

As, relative speed of police and thief

$= (10-8)km/hr$

$= 2\ km/hr$

$= 2\times\frac{5}{18} m/sec$

$= \frac{5}{9} m/sec$

Time taken by police to catch the thief $= \frac{100}{\frac{5}{9}}$

$= \frac{100\times 9}{5} = 180sec$

$= \frac{180}{60\times 60} = \frac{1}{20}\ hour$

Distance travelled by thief before he got caught $= 8\times\frac{1}{20}$

$= \frac{2}{5}\ km$

$= \frac{2}{5}\times 1000\ m$

$= 400\ m$

Hence option (c)

45. Answer. B

Roots of Aman be (4, 3)

So, equation be

$x^2 - (sum\ of\ roots)x +$

$products\ of\ roots$ ..... (i)

$= x^2 - (4+3)x + (4\times 3)$

$= x^2 - 7x + 12$

Here constant is 12 which is wrong

Roots of Alok be (3, 2)
So, equation be
$= x^2 - (3+2)x + (3 \times 2)$
[According to (i)]
$= x^2 - 5x + 6$
Here coefficient of $x = -5$ which is wrong.
So, the correct equation be $x^2 - 7x + 6$
$= x^2 - x - 6x + 6$
$= x(x-1) - 6(x-1)$
$= (x-1)(x-6)$
For roots,
$(x-1)(x-6) = 0$
$=> x = 1 \; or \; x = 6$
Hence option (b)

46. Answer. C
Statement 1:
As we know that in two consecutive integers, the one is always odd then other is even.
Hence statement 1 is correct.
Statement 2:
By Euclid's division
$a = bq + r, 0 \leq r < b$
a and b are positive integers.
Take $b = 8$
Then $a = 8q + r$
Here, $r = 0,1,2 \ldots .7$
Case (i), if $r = 0$
$a = 8q$
Then $a^2 = 64q^2 = 8(8q^2)$
$=> a^2 = 8\,m \qquad [As\; m = 8q^2]$
Case (ii), if $r = 1$
$a = 8q + 1$ [Odd integer]
$a^2 = (8q+1)^2$
$=> a^2 = 64q^2 + 16q + 1$
$=> a^2 = 8(8q^2 + 2q) + 1$
$=> a^2 = 8m + 1$ [As, $m = 8q^2 + 2q$]
Clearly, square of an odd integer is of the term $8n + 1$
Hence statement 1 is correct.
Hence option (c)

47. Answer. C
As, $2x + 4y - 6 = 0$
$2(x + 2y - 3) = 0$
$\Rightarrow \; x + 2y - 3 = 0$ ……. (i)
And
$4x + 8y - 8 = 0$
$4(x + 2y - 2) = 0$
$\Rightarrow \; x + 2y - 2 = 0$ ……. (ii)
Here, $a_1 = 1, b_1 = 2, c_1 = -3$
$a_2 = 1, b_2 = 2, c_2 = -2$
Then,
$\frac{a_1}{a_2} = 1$
$\frac{b_1}{b_2} = 1$
$\frac{c_1}{c_2} = \frac{3}{2}$
As we know that if
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
Then lines are parallel and inconsistent no solution.
Hence solution is in consistent.
Hence option (c)

48. Answer. A
Let $p = 5$
Then $N^{p-1} - 1$
$= N^{5-1} - 1$
$= N^4 - 1$ ……. (i)
As, N is prime to p
So Let N = 3
Then from (i)
$N^4 - 1 = 3^4 - 1 = 81 - 1 = 80$
Here, $(N^{p-1} - 1)$ is a multiple of p
Here, given condition had satisfied when p is a prime number.
Hence option (a)

49. Answer. C
As ratio of numbers be $1:5$
Let numbers be $x, 5x$
Then,
$x \times 5x = 320$
$\Rightarrow \; 5x^2 = 320$
$\Rightarrow \; x^2 = 64$
$\Rightarrow \; x = 8$
Numbers be 8 and $8 \times 5 = 40$
Now, difference between their square $= (40)^2 - (8)^2$
$= 1600 - 64$
$= 1536$
Hence option (c)

50. Answer. D
As Lead : Tin
X:- 1 : 2

Y:- 2 : 3

Lead in 25 kg $= \frac{25}{1+2} = \frac{25}{3}$

Tin in 25 kg $= \frac{25\times2}{1+2} = \frac{50}{3}$

Now,

Lead in 125 kg $= \frac{125\times2}{2+3} = 50$

Tin in 125 kg $= 125 - 50 = 75$

Lead in mixture $= 50 + \frac{25}{3} = \frac{175}{3}$

Tin in mixture $= 75 + \frac{50}{3} = \frac{275}{3}$

Ratio of Lead : Tin

$= \frac{175}{3} : \frac{275}{3}$

$= 7:11$

Hence option (d)

51. Answer. D

As,

Mean $= \frac{sum\ of\ numbers}{Total\ numbers}$

⇨ $15 = \frac{sum\ of\ 5\ numbers}{5}$

⇨ $sum\ of\ 5\ numbers = 15 \times 5 = 75$ ..... (i)

$\frac{sum\ of\ 6\ numbers}{6} = 17$

⇨ $sum\ of\ 6\ numbers = 17 \times 6 = 102$ ..... (ii)

From (ii)

6^{th} number + sum of 5 numbers = 102

⇨ 6^{th} number + 75 = 102 [From (i)]

⇨ 6^{th} number = 102 – 75 = 27

Hence option (d)

52. Answer. D

As,

Mean of 300 numbers = 60

⇨ $\frac{sum\ of\ 300\ numbers}{300} = 60$

⇨ $sum\ of\ 300\ numbers = 300 \times 60 = 18000$

Sum of top 100 numbers + sum of last 100 numbers + sum of remaining numbers $= 18000$

Sum of remaining 100 numbers + 8000 + 5000 = 18000

⇨ Sum of remaining 100 numbers $= 18000 - 13000 = 5000$

Mean of remaining 100 numbers $= \frac{5000}{100} = 50$

Hence option (d)

53. Answer. A

Class	Mid value (x_i)	Frequency (f_i)	$x_i \times f_i$
0-20	10	17	170
20-40	30	28	840
40-60	50	32	1600
60-80	70	f	70f
80-100	90	19	1710

Mean $= \frac{\sum x_i \times f_i}{\sum f_i} = \frac{170+840+1600+70f+1710}{17+28+32+f+19}$

$=> \frac{4320+70f}{96+f} = 50$

$=> 4320 + 70f = 50(96 + f)$

$=> 70f - 50f = 4800 - 4320$

$=> 20f = 480$

$=> f = 24$

Hence option (a)

54. Answer. C

Given four slices be 150^0, 90^0, 60^0 and 60^0

When 60^0 be deleted

Then, remaining slices be 150^0, 90^0, 60^0

Total angle = 300^0

While making pie chart where 300^0 is taken as 100%

Then,

$\frac{150}{300} \times 100 = 50\%$

$\frac{90}{300} \times 100 = 30\%$

$\frac{60}{300} \times 100 = 20\%$

Also, 50% of 360^0 will be 180^0

Hence, largest slice will be as angle 180^0

Hence option (c)

55. Answer. A

As we know that,

Mode = 3(Median) – 2(Mean)

=>Mode = 3 ×220 – 2 × 270 = 660 – 540 = 120

Hence option (a)

56. Answer. D

As, a, b, c, d, e, f, g are consecutive even numbers then numbers are $d-6, d-4, d-2, d+2, d+4, d+6$

Total = $d - 6 + d - 4 + d - 2 + d + 2 + d + 4 + d + 6 = 7d$

Also, when j, k, l, m, n are consecutive odd numbers then numbers be

$l-4, l-2, l, l+2, l+4$

Total = $l-4+\ l-2+\ l+\ l+2+\ l+4=5l$

Average = $\frac{7d+5l}{12}$

Hence option (d)

57. Answer. B

Number of Type A pencil = $\frac{50}{1}=50$

Number of Type B pencil = $\frac{x}{1.50}$

Number of Type C pencil = $\frac{20}{2}=10$

Average = $\frac{Total\ money\ spent}{Total\ number\ of\ pencil}=\frac{50+x+20}{50+\frac{x}{1.50}+10}$

$=>\frac{50+x+20}{50+\frac{x}{1.50}+10}=1.25$

$=>70+x=1.25(60+\frac{x}{1.50})$

$=>70+x=75+\frac{1.25x}{1.50}$

$=>x-\frac{1.25x}{1.50}=5$

$=>0.25x=5\times1.50$

$=>x=30$

Hence option (b)

58. Answer. C

x	Frequency	Cumulative frequency
1	8	8
2	10	18
3	f_1	29
4	f_2	45

$f_1 = 29 - 18 = 11$

$f_2 = 45 - 29 = 16$

Hence f_1 and f_2 be 11 amd 16.

Hence option (c)

59. Answer. C

As, we know that

Π radian = 180 degree

As, R be number of radian and D be number of degree

Thus, πR = 180D

Hence option (c)

60. Answer. C

$9\tan^2\theta+4\cot^2\theta$

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

$=(3tan\theta-2cot\theta)^2+12(tan\theta cot\theta)$

$=(3tan\theta-2cot\theta)^2+12$

$since\ (3tan\theta-2cot\theta)^2\geq0$

Thus, minimum value of $(3tan\theta-2cot\theta)^2+12\ be\ 12$

Hence minimum value of $9\tan^2\theta+4\cot^2\theta$ be 12

Hence option (c)

61. Answer. B

As given $xsin\theta=ycos\theta=\frac{2ztan\theta}{1-\tan^2\theta}$

Let $\theta=30^0$

Then, $xsin30^0=ycos30^0=\frac{2ztan30^0}{1-\tan^2 30^0}$

$=>\frac{x}{2}=\frac{\sqrt{3}y}{2}=\frac{2z\times\frac{1}{\sqrt{3}}}{1-\frac{1}{3}}$

$=>\frac{x}{2}=\frac{\sqrt{3}y}{2}=\sqrt{3}z=k(say)$

$=>x=2k, y=\frac{2k}{\sqrt{3}}, z=\frac{k}{\sqrt{3}}$

Putting the value of x, y and z in $4z^2(x^2+y^2)$

$4\left(\frac{k}{\sqrt{3}}\right)^2[(2k)^2+\left(\frac{2k}{\sqrt{3}}\right)^2]$

$=\frac{4}{3}k^2[4k^2+\frac{4k^2}{3}]$

$=\frac{4}{3}k^2\left(\frac{16k^2}{3}\right)=\frac{(4k^2)(16k^2)}{9}=\frac{64k^4}{9}$

Option (b):

$(x^2-y^2)^2$

$=\left((2k)^2-\frac{(2k)^2}{(\sqrt{3})^2}\right)=\left[4k^2-\frac{4k^2}{3}\right]^2=\left(\frac{8k^2}{3}\right)^2=\frac{64k^4}{9}$

Here value of $4z^2(x^2+y^2)$ = value of $(x^2-y^2)^2$

Hence option (b)

62. Answer. A

Given,

$cos\theta_1+cos\theta_2+cos\theta_3=3$

It is only possible when $\theta_1=\theta_2=\theta_3=0^0$

Now,

$sin\theta_1+sin\theta_2+sin\theta_3=sin0^0+sin0^0+sin0^0=0+0+0=0$

Hence option (a)

63. Answer. A

Given that,

$cos\theta+tan\theta=1$

We can check from the given options.

Option (a):

$\theta = 0^0$

LHS = $cos0^0 + tan0^0 = 1 + 0 = 1$ = RHS

Hence option (a)

64. Answer. A

As,

$\sin\sqrt{\frac{1}{1+\cos x}+\frac{1}{1-\cos x}}$

$= \sin\sqrt{\frac{1-\cos x+1+\cos x}{(1+\cos x)(1-\cos x)}}$

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

$= \sin\sqrt{\frac{2}{\sin^2 x}}$

$= \sin x \times \frac{\sqrt{2}}{\sin x} = \sqrt{2}$

Hence option (a)

65. Answer. C

$\frac{\cos^4 A-\sin^4 A}{\cos^2 A-\sin^2 A}$

$= \frac{(\cos^2 A)^2-(\sin^2 A)^2}{(\cos^2 A-\sin^2 A)}$

$= \frac{(\cos^2 A-\sin^2 A)\times(\cos^2 A+\sin^2 A)}{(\cos^2 A-\sin^2 A)}$

$= (\cos^2 A + \sin^2 A)$

$= 1$

Hence option (c)

66. Answer. D

As,

$7\sin^2 x + 3\cos^2 x = 4$

⇨ $7\sin^2 x + 3(1 - \sin^2 x) = 4$

⇨ $7\sin^2 x + 3 - 3\sin^2 x = 4$

⇨ $4\sin^2 x + 3 = 4 - 3 = 1$

⇨ $\sin^2 x = \frac{1}{4}$

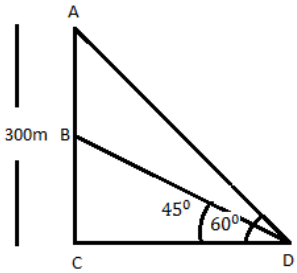
⇨ $\sin x = \frac{1}{\sqrt{2}}$

⇨ $x = 30^0$

∴ $\tan 30^0 = \frac{1}{\sqrt{3}}$

Hence option (d)

67. Answer. A



In ΔBCD:

$\tan 45^0 = \frac{BC}{CD}$

⇨ $1 \times CD = BC$

⇨ $CD = BC$ ..... (i)

In ΔACD:

$\tan 60^0 = \frac{AC}{CD}$

⇨ $\sqrt{3} = \frac{300}{CD}$

⇨ $CD = \frac{3\times100}{\sqrt{3}}$

⇨ $CD = 100\sqrt{3}$

So, $BC = CD = 100\sqrt{3}$

Hence option (a)

68. Answer. C

As,

$x = a\cos\theta + b\sin\theta$ ..... (i)

$y = a\sin\theta - b\cos\theta$ ..... (ii)

Squaring and adding (i) and (ii)

$x^2 + y^2 = (a\cos\theta + b\sin\theta)^2 +$
$(a\cos\theta - b\sin\theta)^2$

$= a^2\cos^2\theta + b^2\sin^2\theta + 2ab\sin\theta.\cos\theta +$
$a^2\sin^2\theta + b^2\cos^2\theta - 2ab\sin\theta.\cos\theta$

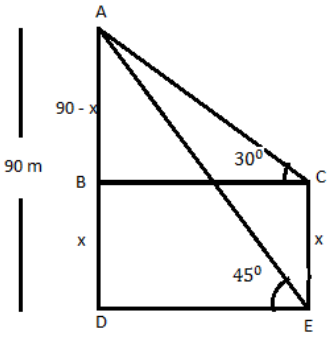
$= a^2(\cos^2\theta + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta)$

$= a^2 \times 1 + b^2 \times 1$

$= a^2 + b^2$

Hence option (c)

69. Answer. B



In ΔADE:

$\tan 45^0 = \frac{AD}{DE} = \frac{90}{DE}$

⇨ $1 = \frac{90}{DE}$

⇨ $DE = 90$

In ΔABC:

$\tan 30^0 = \frac{AB}{BC}$

⇨ $\frac{1}{\sqrt{3}} = \frac{90-x}{DE}$

⇨ $\frac{1}{\sqrt{3}} = \frac{90-x}{90}$

⇨ $\frac{90}{\sqrt{3}} = 90 - x$

⇨ $x = 90 - \frac{90}{\sqrt{3}}$

⇨ $x = 90 - \frac{3\times30}{\sqrt{3}}$

⇨ $x = 90 - 30\sqrt{3}$

Hence height of tree be $(90 - 30\sqrt{3})m$

Hence option (b)

70. Answer. D

In a triangle, Sum of two sides must be greater than the 3rd side.

But in option (d)

As $3 + 2 \not> 6$

Thus, (2,3,6) is not a triplet.

Hence option (d)

71. Answer. D

As, $2(a + b) = 10\ cm$

$=> a + b = \frac{10}{2} = 5$ ..... (i)

$l + b = 5$ ..... (ii)

Also, $lb = 4\ cm^2$

⇨ $b = \frac{4}{l}$ ..... (iii)

From (ii) and (iii)

$l + \frac{4}{l} = 5$

⇨ $l^2 + 4 = 5l$

⇨ $l^2 - 5l + 4 = 0$

⇨ $(l - 4)(l - 1) = 0$

⇨ $l = 4\ or\ l = 1$

$According\ to\ option, l = 4\ cm$

Hence $l = 4\ cm$

Hence option (d)

72. Answer. B

According to question,

$smallest\ angle = 180^0 \times \frac{2}{9} = \left(\frac{180^0}{9}\right) \times 2$

$= 20^0 \times 2 = 40^0$

Hence option (b)

73. Answer. C

Radius of cylinder (r) = 1 cm

Height of cylinder (h) = 14 cm

$= 14 \times 100$

$= 1400\ cm$

Surface area of cylinder $= 2\pi rh + 2\pi r^2$

$= 2\pi(1 \times 1400 + 1^2)$

$= 2\pi(1400 + 1)$

$= 2 \times \frac{22}{7} \times 1401$

$\approx 8800\ cm^2$

Hence option (c)

74. Answer. B

According to question,

$\frac{\pi r_1^2}{\pi r_2^2} = \frac{16}{49}$

⇨ $\frac{r_1^2}{14\times14} = \frac{16}{49}$

⇨ $r_1^2 = \frac{16\times14\times14}{49}$

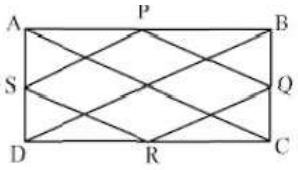
⇨ $r_1^2 = \left(\frac{4\times14}{7}\right)^2$

⇨ $r_1^2 = (4 \times 2)^2$

⇨ $r_1 = 4 \times 2 = 8\ cm$

Hence option (b)

75. Answer. C



$PQ = \frac{1}{2}AC, SR = \frac{1}{2}AC$ [From Mid point theorem]

Similarly,

$PS = \frac{1}{2}BD, QR = \frac{1}{2}BD$

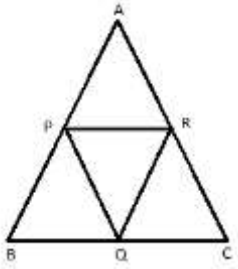
So, BD = AC [Diagonal of rectangle]

Thus, PQ = QR = RS = SP

Hence, PQRS is a Rhombus but need not be a square.

Hence option (c)

76. Answer. C



Area of $\Delta ABC = 5\ square\ units.$

Area of $\Delta PQR = \frac{1}{4} \times Area\ of\ \Delta ABC$

$= \frac{1}{4} \times 5$

$= \frac{5}{4}\ square\ units.$

Hence option (c)

77. Answer. D

According to question,

Percentage change $= 200 + 200 + \frac{200\times200}{100}$

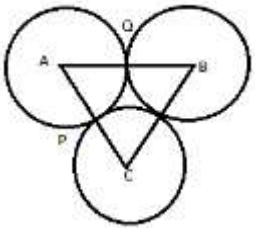
$= 400 + 200 \times 2$

$= 400 + 400$

$= 800\ \%$

Hence option (d)

78. Answer. C



Given radius of circle be $3.5\ cm$

Area enclosed = Area of equilateral triangle – 3 × Area of sector APQ

$= \frac{\sqrt{3}}{4} \times (7)^2 - 3 \times \pi \times (3.5)^2 \times \frac{60}{360}$

$= \frac{\sqrt{3}}{4} \times 49 - 3 \times \pi \times 3.5 \times 3.5 \times \frac{1}{6}$

$= \frac{49}{8}(2\sqrt{3} - \pi)$

Hence area enclosed be = $\frac{49}{8}(2\sqrt{3} - \pi) square\ unit.$

Hence option (c)

79. Answer. B

Area of regular hexagon of side a be

$= \frac{3\sqrt{3}}{2}.a^2$

Hence option (b)

80. Answer. B

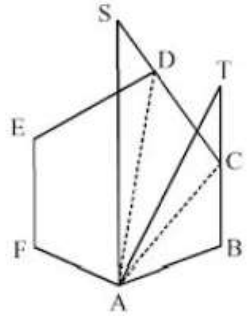
∠ABC = 120^0 [Angle of regular hexagon]

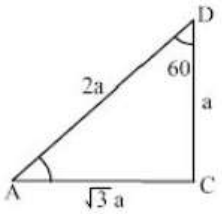
∠BAC = ∠BCA = $\frac{180^0 - 120^0}{2} = 30^0$

∠DCA = $120^0 - 30^0 = 90^0$

Thus, ⊿ ADCA is a right triangle.

Let side DC = a



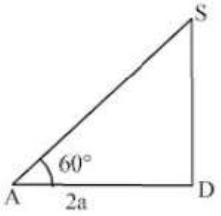


$\frac{AC}{a} = cot30^0 => AC = \sqrt{3}a$

$\frac{AD}{a} = cosec30^0 => AD = 2a$

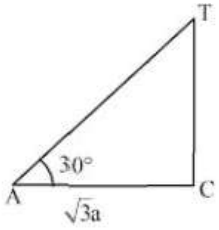
Now taking triangle ASD:

Let S is the vertex of pole



$\frac{DS}{AD} = tan60^0 => DS = 2\sqrt{3}$

In triangle TCA:



$\frac{TC}{AC} = tan30^0 => TC = \frac{\sqrt{3}a}{\sqrt{3}} = a$

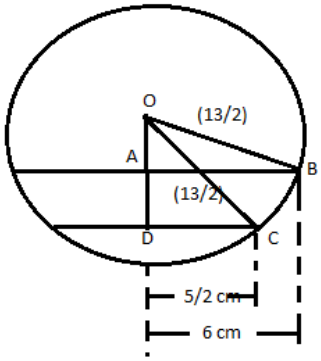
Thus, ratio ∅

$\frac{CT}{DS} = \frac{a}{2\sqrt{3}a} = \frac{1}{2\sqrt{3}}$

Hence CT : DS = 1 : 2√3

Hence option (b)

81. Answer. C



In ΔOAB:

$OA = \sqrt{\left(\frac{13}{2}\right)^2 - (6)^2}$

$= \sqrt{\frac{169}{4} - 36}$

$= \sqrt{\frac{169-144}{4}}$

$= \sqrt{\frac{25}{4}}$

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

In ΔODC:

$OD = \sqrt{\left(\frac{13}{2}\right)^2 - \left(\frac{5}{2}\right)^2}$

$= \sqrt{\frac{169}{4} - \frac{25}{4}}$

$= \sqrt{\frac{144}{4}}$

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

Distance between two chords $= OD - OA$

$= 6 - 2.5$

$= 3.5\ cm$

Hence option (c)

82. Answer. D

As,

Volume of cone $= \frac{1}{3}\pi r^2 h$ [As, r be radius h be height]

Increased radius $= r\left(\frac{100+p}{100}\right)$

Increased volume $= \frac{1}{3}\pi\left[r\left(\frac{100+p}{100}\right)\right]^2 h$

$= \frac{1}{3}\pi r^2\left(1+\frac{p}{100}\right)^2 h$

$= \frac{1}{3}\pi r^2 h\left[1+\left(\frac{p}{100}\right)^2+\frac{2p}{100}\right]$

$= \frac{1}{3}\pi r^2 h + \frac{1}{3}\pi r^2 h\left[\left(\frac{p}{100}\right)^2+\frac{2p}{100}\right]$

%change $= \frac{\left[\frac{1}{3}\pi r^2 h+\frac{1}{3}\pi r^2 h\times\left\{\left(\frac{p}{100}\right)^2+\frac{2p}{100}\right\}-\frac{1}{3}\pi r^2 h\right]}{\frac{1}{3}\pi r^2 h}\times 100$

$= \frac{p}{100}\left[\frac{p}{100}+2\right]\times 100$

$= p\left(2+\frac{p}{100}\right)$

Hence option (d)

83. Answer. C

Area of square be a^2 and $a^2 = 121$ [Given]

So, $a = \sqrt{121} = 11$

i.e. side of square be 11 cm

Perimeter of square $= 4a$

So, perimeter of circle $= 44$

⇨ $2\pi r = 44$

⇨ $2\times\frac{22}{7}\times r = 44$

⇨ $r = \frac{44\times 7}{44} = 7$

Area of circle $= \pi r^2$

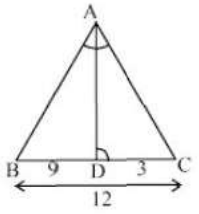
$= \frac{22}{7}\times 7^2$

$= 22\times 7$

$= 154\ cm^2$

Hence option (c)

84. Answer. B



In triangle ABC and triangle DAC

∠BAC = ∠ADC

∠ACB = ∠DCA (Common angle)

So, ⊿ABC~⊿DAC

Thus, $\frac{BC}{AC} = \frac{AC}{DC}$

$=> 12\times 3 = AC\times AC$

$=> AC^2 = 36 => AC = 6$

Hence length of AC be 6 cm

Hence option (b)

85. Answer. B

As,

Surface area of sphere $= 4\pi r^2$

$s_1 = 4\pi r_1^2$ …….. (i)

$\frac{s_1}{a} = 4\pi r_2^2$ …….. (ii)

From (i) and (ii)

$4\pi r_1^2 = 36\pi r_2^2$

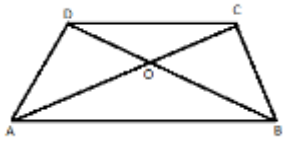
⇨ $\frac{r_1^2}{r_2^2} = \frac{36\pi}{4\pi} = \frac{9}{1}$

⇨ $\frac{r_1}{r_2} = \sqrt{\frac{9}{1}} = \frac{3}{1}$

So, radius is reduced to one third.

Hence option (b)

86. Answer. A



As we know that diagonal of trapezium intersect each other in the equal ratio.

⇨ $\frac{AO}{OC} = \frac{BO}{OD} = \frac{AB}{DC}$

Hence option (a)

87. Answer. C

According to question $\pi r_1^2 h_1 = n\times\frac{1}{3}\pi r_2^2 h_2$

$=>\left(\frac{35}{2}\right)^2\times 32 = n\times\frac{1}{3}(2)^2\times 7$

[As, $r_1 = \frac{35}{2}, r_2 = 2, h_1 = 32, h_2 = 7$]

$=> n = \frac{35\times 35\times 323}{2\times 2\times 2\times 2\times 7}$

$=>n = 35 \times 10 \times 3$

$=>n = 1050$ Persons

Hence option (c)

88. Answer. B

As,

% change in circumference = % change in radius

⇨ 15% change in circumference = 15 % change in radius

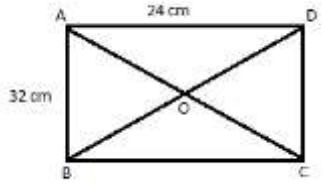
Area of circle increased $= 15 + 15 + \frac{15\times15}{100}$

$= 30 + 2.25$

$= 32.25\%$

Hence option (b)

89. Answer. B



In ΔBCD:

$BD = \sqrt{(24)^2 + (32)^2}$

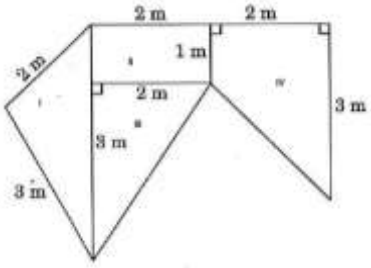
$= \sqrt{1600} = 40\ cm$

Diagonals of rectangle are equal and bisect each other.

So, $OD = \frac{BD}{2} = \frac{40}{2} = 20\ cm$

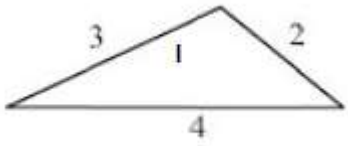
Hence option (b)

90. Answer. C



First of all whole part divides into 4 parts viz. I, II, III and IV

Part I:



Semi perimeter (S) = $\frac{2+3+4}{2} = \frac{9}{2}$

According to Heron's formula

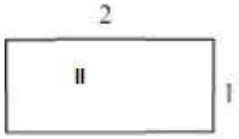
Area = $\sqrt{S(S-a)(S-b)(S-c)}$

$= \sqrt{\frac{9}{2}\left(\frac{9}{2}-2\right)\left(\frac{9}{2}-3\right)\left(\frac{9}{2}-4\right)}$

$= \sqrt{\frac{9}{2}\times\frac{5}{2}\times\frac{3}{2}\times\frac{1}{2}}$

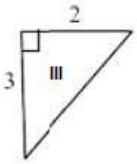
$=\frac{3\sqrt{15}}{4}$ sq. meter

Part II:



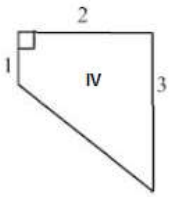
Area of rectangle = 2×1 = 2 sq. meter

Part III:



Area of triangle = $\frac{1}{2}\times 2\times 3 = 3\ sq.meter$

Part IV:

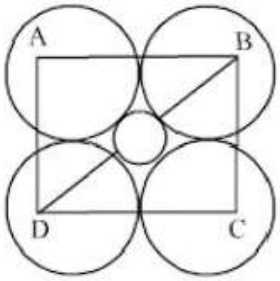


$Area = \frac{1}{2}\times(1+3)\times 2 = 4\ sq.meter$

Total Area = $\frac{3\sqrt{15}}{4} + 2 + 3 + 4 = \frac{3\sqrt{15}}{4} + 9\ sq.meter$

Hence option (c)

91. Answer. A



Let D is diameter of each circle.

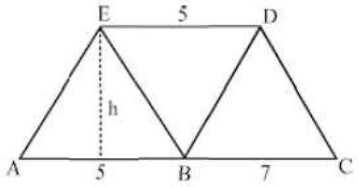
Thus, side of square = D

$Diagonal\ of\ square = \sqrt{D^2 + D^2} = D\sqrt{2}$

Diameter of shaded circle = $\sqrt{2}D - D = D(\sqrt{2} - 1)$

Hence option (a)

92. Answer. A



Here, AC parallel to ED.

So, height of all triangle be same.

Let height of triangle be h

$area\ of\ ABDE = 5 \times h$

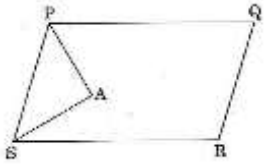
$area\ of\ triangle\ BDE = \frac{1}{2} \times 5 \times h$

$area\ of\ triangle\ BCD = \frac{1}{2} \times 7 \times h$

Required ratio = $5h : \frac{5h}{2} : \frac{7h}{2} = 10h : 5h : 7h = 10 : 5 : 7$

Hence option (a)

93. Answer. C



$\angle P + \angle S = 180^0$ [Sum of adjacent angles of parallelogram]

$\frac{\angle P}{2} + \frac{\angle S}{2} = 90^0$ .....(i)

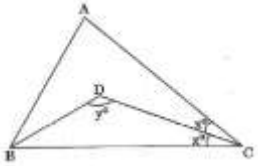
$\frac{\angle P}{2} + \frac{\angle S}{2} + \angle A = 180^0$ (Triangle law) ...(ii)

From (i) and (ii)

$\angle A = 180^0 - 90^0 = 90^0$

Hence option (c)

94. Answer. C



In triangle ABC:

$\angle A + \angle ABC + \angle BCA = 180^0$

$=> 80^0 + 60^0 + 2x^0 = 180^0$

$=> 2x^0 = 180^0 - 140^0$

$=> x^0 = \frac{40^0}{2} = 20^0$

$\angle CBD = \frac{60^0}{2} = 30^0$ [As, BD is angle bisector of $\angle ABC$]

In triangle BCD:

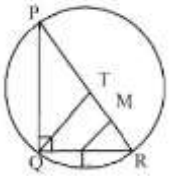
$\angle CBD + y^0 + x^0 = 180^0$

$=> y^0 = 180^0 - 30^0 - 20^0 = 130^0$

Hence, $x^0 = 20^0$ and $y^0 = 130^0$

Hence option (c)

95. Answer. B



Assuming right angled triangle be in a circle, where PR is diameter of circle.

PT = QT = TR [Radii of circle]

QT = TR

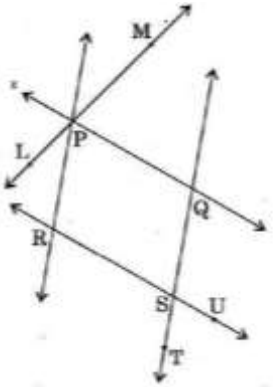
$\angle TQR = \angle TRQ$

$\angle TQR = \angle RLM$ [Corresponding angles]

$\angle RLM = \angle LRM$

Hence option (b)

96. Answer. C



$\angle UST = \angle QSR = 70^0$ [vertically opposite angle]

$\angle PQS + \angle QSR = 180^0$ [As, PQ parallel to RS]

$\angle PQS = 180^0 - 70^0 = 110^0$ [As, $\angle QSR = 70^0$]

Now,

$\angle PQS + \angle QPR = 180^0$ [As, PR parallel to QS]

$\angle QPR = 180^0 - 110^0 = 70^0$

Again,

$\angle XPL + \angle LPR + \angle RPQ = 180^0$

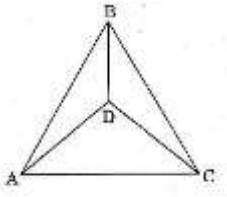
$=> \angle XPL = 180^0 - 35^0 - 70^0 = 75^0$

[As, $\angle LPR = 35^0$]

Hence, $\angle MPQ = \angle XPL = 75^0$ [Vertically opposite angle]

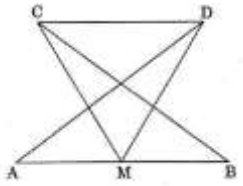
Hence option (c)

97. Answer. C



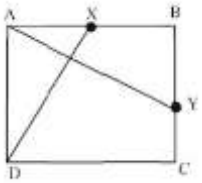
As, ∠DAC = ∠DCA
So, DA = DC
Hence triangle ADC is an isosceles triangle
Hence statement 1 is correct.
Statement 2:
As, we know that, the centroid of a triangle is the point where the three medians of the triangle meet.
Hence statement 2 is incorrect.
Statement 3:
AB = CB
AD = DC
BD = BD
Thus, triangle ABD ≅ triangle CBD [By, SSS congruence criteria]
Hence statement 3 is correct.
Hence option (c)

98. Answer. C



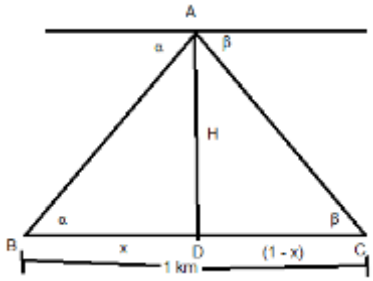
∠AMC = ∠BMD ……(i)
∠CMD = ∠CMD (common angle)…….(ii)
Adding (i) and (ii), we get
∠AMC + ∠CMD = ∠BMD + ∠CMD
∠AMD = ∠BMC
∠DAM = ∠CBM
AM = BM
By, ASA
Triangle ADM ≅triangle BCM
Hence option (c)

99. Answer. D



Statement 1:
In triangle ADC and triangle BAY
∠A = ∠B = 90^0
AX = BY [Half of the side of squre]
AD = AB
By SAS,
Triangle ABY ≅ triangle DAX
Hence statement 1 is correct.
Statement 2:
By CPCT,
Clearly, ∠DXA = ∠AYB
Hence statement 2 is correct.
Statement 3:
We can say anything about inclination of DX with AY.
Hence statement 3 is incorrect.
Statement 4:
Clearly, DX is not perpendicular to AY.
Hence statement 4 is incorrect.
Hence only statement 1 and 2 are correct.
Hence option (d)

100. Answer. B



In triangle ABD:
$tan \propto = \frac{h}{x} => x = \frac{h}{tan\propto}$
In triangle ACD:
$tan\beta = \frac{h}{1-x}$
$=>1 - x = \frac{h}{tan\beta}$
$=>1 - \frac{h}{tan\propto} = \frac{h}{tan\beta}$ [As, x = $\frac{h}{tan\propto}$]
$=>h\left(\frac{1}{tan\propto} + \frac{1}{tan\beta}\right) = 1$
$=>h\frac{tan\propto + tan\beta}{tan\alpha tan\beta} = 1$
$=>h = \frac{tan\alpha tan\beta}{tan\alpha + tan\beta}$
Hence height of aero plane be $\frac{tan\alpha tan\beta}{tan\alpha + tan\beta}$
Hence option (b)

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