CENTRE FOR PEDAGOGICAL STUDIES IN MATHEMATICS (CPSM)
ACHIEVEMENT-CUM-DIAGNOSTIC TEST IN MATHEMATICS-2022

INSTRUCTION: Write your Name, Class Roll No. etc. in the answersheet. Select the correct answer out of (a), (b), (c) and (d) of particular item and blaken the specific rectangle ■ with H.B. pencil denoting the correct answer. For example, if (c) is the correct answer to Q. No. X: blacken like this: Q. No. X: □ □ ■ □ Rough work is to be done on separate paper. Marks will be deducted for wrong answer. Don't waste time for answering a question which appears difficulat to you, better try the next question.

1. O is a point inside a parallelogram $ABCD$ and $\Delta AOB + \Delta COD = 9$ cm^2. Find the area of the parallelogram $ABCD$.

   (a) 27 cm^2 (b) 36 cm^2 (c) 18 cm^2 (d) 24 cm^2

2. O is the incentre of ΔABC and $\angle BAC = \theta$, find $\angle BOC$

   (a) $90° - \frac{\theta}{2}$ (b) $90° + \frac{\theta}{2}$ (c) $90° + \theta$ (d) $90° - \theta$

3. The circumradius of an equilateral triangle is 4 cm. The length of each side of the triangle is

   (a) $4\sqrt{2}$ cm (b) 6 cm (c) 8 cm (d) $4\sqrt{3}$ cm

4. The orthocentre of a ΔABC is at C. If $AC = 5$ cm and $BC = 12$ cm, find AB.

   (a) 13 cm (b) 6.5 cm

   (c) 8.5 cm (d) none of these

5. A polygon has 35 diagonals, the number of sides of the polygon is

   (a) 15 (b) 8 (c) 9 (d) 10

6. The lengths of the medians of a triangle are 9 cm, 12 cm and 15 cm; the area of the triangle is

   (a) 36 cm^2 (b) 72cm^2

   (c) 108 cm^2 (d) 154 cm^2

7. The ratio of the sides of a triangle is 12 : 5 : 13. The triangle is

   (a) acute angled (b) right angled isosceles

   (c) obtuse angled (d) right angled

8. O is a point inside a rectangle $ABCD$. If $OA = 5$ cm, $OB = 6$ cm and $OD = 8$ cm, then $OC =$

   (a) 5.5 cm (b) 7.5 cm (c) $5\sqrt{3}$ cm (d) 6.5 cm

9. ABC is a right angled triangle in which $\angle ABC = 90°$. If $AB = 4$ cm and $BC = 3$ cm find the length of the perpendicular from B on AC.

   (a) 2.5 cm (b) 2.4 cm (c) 4.8 cm (d) 3 cm

10. In ΔABC, $AB = 10$ cm, $BC = 12$ cm and $AC = 14$ cm and the centriod is at G. Find AG.

    (a) $\frac{5\sqrt{7}}{9}$ cm (b) $\frac{4\sqrt{7}}{9}$ cm (c) $\frac{8\sqrt{7}}{3}$ cm (d) none of these

11. The coordinates of extrimities of a diameter of a circle are (7, 9) and (–1, –1). The coordinates of the centre is

    (a) (3, 4) (b) (4, 5) (c) (6, 8) (d) $\left(\frac{3}{2}, 2\right)$

12. The coordinates of the mid-points of the sides of a triangle are (4, 3), (0, 11) and (–2, 7). The coordinates of the centroid is

    (a) $\left(1, \frac{21}{2}\right)$ (b) $\left(\frac{2}{3}, 7\right)$ (c) (2, 21) (d) none of these

13. Find the value of h for which the area of the triangle with vertices (–1, –4), (h, 1) and (h, –4) is $12\frac{1}{2}$ square units.

(a) – 4 or – 6 (b) 4 or 6 (c) 4 or – 6 (d) – 4 or 6

14. For what value of k the points (1, 2), (2, 4) and (k, 6) will be collinear.

(a) –3 (b) 3 (c) 6 (d) 1

15. The triangle formed by the points (7, 9), (3, –7) and (–3, 3) is

(a) isosceles (b) equilateral

(c) right angled isoscles (d) scalene

16. The centre of the circle passing through the points (6, – 6), (3, 7) and (3, 3) is

(a) (3, –2) (b) (3, 2) (c) (–3, 2) (d) (–3, –2)

17. The area of the triangle whose vertices are (a, $b + c$), (b, $c + a$) and (c, $a + b$) is

(a) 1 sq unit (b) 2 sq unit (c) abc sq unit (d) 0

18. A straight line cuts intercepts a units and b units from the x-axis and y-axis respectively. If the length of the perpendicular on this straight line from the origin be p units then

(a) $p^2 = a^2 + b^2$ (b) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

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

19. The coordinates of P and Q are (–3, 4) and (2, 1) respectiely. If PQ is extended to R such that $PR = 2QR$, then the coordinates of R is

(a) (2, 4) (b) (7, –2) (c) $\left(-\frac{1}{2}, \frac{5}{2}\right)$ (d) (3, 7)

20. If $A \equiv (0, b)$, $B \equiv (0, 0)$ and $C \equiv (a, 0)$ and if the medians of the triangle ABC are mutually perpendicular then

(a) $a = b$ (b) $b^2 = 2a^2$ (c) $a^2 = 2b^2$ (d) $a^2 = 4b^2$

21. If a, b, c are distinct positive real numbers and $a^2 + b^2 + c^2 = 1$ then the value of ($bc + ca + ab$) is

(a) equal to 1 (b) greater than 1

(c) less than 1 (d) equal to zero

22. If $ab = 2a + 3b$, $a > 0$, $b > 0$ then the minimum value of ab is

(a) 36 (b) 24 (c) 18 (d) $\frac{1}{4}$

23. The condition that $x^3 - 3px + 2q$ may be divisible by an expression of the form $x^2 + 2ax + a^2$ is

(a) $3p = 2q$ (b) $27p^3 = 4p^2$ (c) $3p + 2q = 0$ (d) $p^3 = q^2$

24. If $\frac{a+b}{b+c} = \frac{c+d}{d+a}$ then

(a) $a = c$

(b) either a = c or $a + b + c + d = 0$

(c) $a = c$ and $b = d$

(d) $a + b + c + d = 0$

25. If $\log_2 3 = a$, then $\log_8 27 =$

(a) $3a$ (b) $\frac{1}{a}$ (c) $2a$ (d) a

26. If $3 \times (27)^x = 9^{x+4}$ then $x =$

(a) 7 (b) 3 (c) 9 (d) $3\frac{1}{2}$

27. If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$ then $x^a y^b z^c =$

(a) 0 (b) 1

(c) –1 (d) none of these

28. If $x^5 - 1$ is divided by $2x + 1$, then the remainder free from x is

(a) $-\frac{1}{32}$ (b) $\frac{33}{32}$ (c) $-\frac{33}{32}$ (d) – 33

29. If $23x - 29y = 98$ and $29x - 23y = 110$, find $\sqrt{x^2 + y^2}$

(a) 7 (b) 10 (c) $\sqrt{5}$ (d) $\sqrt{10}$

30. I am currently 5-times as old as my son. In 6 years time I will be three times as old as he will be then. What is my age now?

(a) 35 yrs (b) 30 yrs (c) 25 yrs (d) 40 yrs

31. If $2a = 3b = 4c$ then $a : b : c =$

(a) 6 : 4 : 3 (b) 2 : 3 : 4 (c) 3 : 4 : 6 (d) 12 : 8 : 3

32. The value of n for which the expression $x^4 + 4x^3 + nx^2 + 4x + 1$ becomes a perfect square is

(a) 3 (b) 4 (c) 5 (d) 6

33. If $\sqrt{3^n} = 81$ then $\frac{n^2 - 8}{n} =$

(a) 10 (b) 8 (c) 7 (d) none of these

34. a, b, c are such that $a + b + c = 0$. Then the value of $\frac{a^2}{2a^2 + bc} + \frac{b^2}{2b^2 + ca} + \frac{c^2}{2c^2 + ab}$ is

(a) 1 (b) –1 (c) 0 (d) $\frac{1}{2}$

35. If $4x^{10} - x^9 - 3x^8 + 5x^7 + kx^6 + 2x^5 - x^3 + kx^2 + 5x - 5$ gives a remainder –14, when divided by $(x + 1)$. Then the value of k is

(a) 2 (b) –2 (c) 7 (d) 0

36. If $f(x) = \frac{4^x}{4^x + 2}$ then $f(x) + f(1 - x) =$

(a) –1 (b) 1 (c) 0 (d) none of these

37. One factor of $(x^2 - x)y^2 + y - (x^2 + x)$ is

(a) $(x - y - 1)$ (b) $(x + y - 1)$ (c) $(xy - x - 1)$ (d) $(xy - y - 1)$

38. My age is four times the difference of my age after four years and my age three years back. How old am I?

(a) 28 yrs (b) 32 yrs (c) 24 yrs (d) 30 yrs

39. The sum of two numbers is 2490, if 6.5% of one number is equal to 8.5% of the other, the larger number is

(a) 1079 (b) 9171 (c) 1381 (d) 1411

40. Find the length of each side of a square playground whose are is equal to the area of a rectangular field of dimensions 72 m and 338 m.

(a) 169 m (b) 156 m (c) 312 m (d) 624 m

41. The number of zeros at the end of $15^{30} \times 10^{12}$ is

(a) 30 (b) 42 (c) 12 (d) 6

42. The area of the smallest square which can be formed with rectangles of dimension 6 cm × 4 cm is

(a) 144 cm^2 (b) 36 cm^2 (c) 96 cm^2 (d) 216 cm^2

43. The average of first one thousand natural numbers is

(a) 500 (b) 515 (c) 500.1 (d) 500.5

44. A Salesman sold two pens at Rs. 12 each. His profit in one is 20% and on the other his loss was 20%. Then on the whole he

(a) lost Re. 1 (b) gaind Re 1

(c) neither gained nor lost (d) none of these

45. A man invests Rs. 10000 for a year. Of this Rs. 4000 is invested at the interest rate of 5% per year, Rs. 3500 at 4% per year and the rest at r% per year. If his total interest for one year be Rs. 500 then r is equal to

(a) 6.2 (b) 6.3 (c) 6.4 (d) 6.5

46. If the cost price of 25 chairs is equal to the selling price of 30 chairs; find the loss percent.

(a) 20% (b) 16% (c) 15% (d) $16\frac{2}{3}\%$

47. A shopkeeper allows a discount of 10% to his customers and still gains 20%. Find the marked price of an article which costs Rs. 450 to the shopkeeper.

(a) Rs. 620 (b) Rs. 600

(c) Rs. 540 (d) none of these

48. Ramu bought pens at the rate of 8 pens for Rs. 34 and sold them at 12 pens for Rs. 57. The number of pens that he should sell to have a profit of Rs. 900 must be

(a) 2200 (b) 1600 (c) 2000 (d) 1800

49. A shopkeeper claims to sell his articles at a discount of 10%, but he marks his articles by increasing the cost of each by 20%. His gain percent is

(a) 12% (b) 10% (c) 8% (d) 6%

50. Fresh grapes contains 80% water while dry grapes contains 10% water. If the weight of dry grapes is 250 kg, what was the total weight when it was fresh?

(a) 1000 kg (b) 1100 kg (c) 1125 kg (d) 1225 kg

51. Each side of a rhombus is 6 cm and one angle is 60°. The area of te rhombus is

(a) $36\sqrt{3}$ cm^2 (b) 24 cm^2 (c) 18 cm^2 (d) $18\sqrt{3}$ cm^2

52. The difference between the diameter and the circumference of a circle is 60 m. The area of the circle is

(a) 661 m^2 (b) 616 m^2 (c) 484 m^2 (d) 1078 m^2

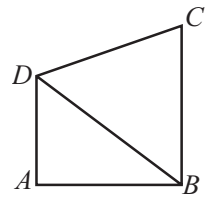
53. In the adjoining figure $ABCD$ is a quadrilateral in which $\angle BAD = 90°$, $AB = 12$ cm, $AD = 5$ cm and $BC = CD = 13$ cm. The area of the quadrilateral $ABCD$ is

(a) $\frac{1}{2}(120 + 169\sqrt{3})$ cm^2

(b) $\frac{1}{2}(60 - 169\sqrt{3})$ cm^2

(c) $\frac{1}{4}(120 + 169\sqrt{3})$ cm^2

(d) $\frac{1}{2}(60 + 169\sqrt{3})$ cm^2



54. The lengths of the diagonals of a rhombus are 10 cm and 24 cm. Find the inradius of the rhombus.

(a) 4 cm (b) $4\frac{8}{13}$ cm (c) $7\frac{1}{2}$ cm (d) 7 cm

55. The radius of a circle is decreased by 20%, find the percentage decrease in its area.

(a) 36% (b) 40% (c) 60% (d) 18%

56. A square and a rhombus stand on the same base, the ratio of the areas of the square and the rhombus is

(a) greater than 1 (b) equal to 1

(c) less than 1 (d) equal to $\frac{1}{2}$

57. The radius of the wheel of a vehicle is 70 cm. The wheel makes 10 revolutions in 5 seconds. The speed of the vehicle is

(a) 29.46 km/hr (b) 32.72 km/hr

(c) 36.25 km/hr (d) 31.68 km/hr

58. The area of the equilateral triangle inscribed in a circle of unit radius is

(a) $3\sqrt{3}$ sq unit (b) $\frac{3\sqrt{3}}{2}$ sq unit

(c) $\frac{3\sqrt{3}}{16}$ sq unit (d) $\frac{3\sqrt{3}}{4}$ sq unit

59. A circle is inscribed in a square. An equilateral triangle of side 4 $\sqrt{3}$ cm is inscribed in that circle. The length of the diagonal of the square is

(a) $4\sqrt{2}$ cm (b) 8 cm (c) $8\sqrt{2}$ cm (d) 16 cm

60. The area of a circle inscribed in an equilateral triangle is 462 cm^2. The perimeter of the triangle is—

(a) $126\sqrt{3}$ cm (b) 126 cm

(c) 72.6 cm (d) 168 cm

61. Which one of the following is a correct statement?

(a) $\phi = 0$ (b) $\phi = \{0\}$ (c) $\phi = \{\phi\}$ (d) $\phi = \{\ \}$

62. The number of non-empty subsets of $\{a, b, c, d\}$ is

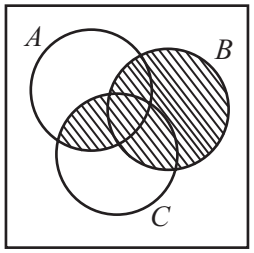
(a) 17 (b) 4 (c) 15 (d) 16

63. If $A = \{1, 2, 3, 4\}$; $B = \{2, 4, 5, 6\}$ and $C = \{1, 2, 5, 7, 8\}$ then $(A \cup C) \cap B =$

(a) $\{1, 2, 5\}$ (b) $\{2, 4, 5\}$

(c) $\{1, 2, 4, 5, 7, 8\}$ (d) $\{1, 2, 3, 4, 5, 7, 8\}$

64. The set represented by the shaded region is



(a) $(A \cap C) \cup B$

(b) $(A \cup B) \cap B$

(c) $(A \cap B) \cup C$

(d) $(A \cup B)' \cap C$

65. If A and B are two sets then $A \Delta B =$

(a) $(A \cap B) \cup (B \cap A)$ (b) $(A - B) \cup (B - A)$

(c) $(A - B) \cap (B - A)$ (d) $(A \cup B) \cap (B \cup A)$

66. A histogram is the graphical representation of the grouped data whose class-boundary and frequency are taken respectively

(a) along vertical axis and horizontal axis

(b) only along vertical axis

(c) only along horizontal axis

(d) along horizontal axis and vertical axis

67. The mean of five numbers is 18. If one number is excluded their mean is 16, the excluded number is—

(a) 23 (b) 26 (c) 21 (d) 39

68. The number of times a particular item occurs in a data is called its

(a) variation (b) frequency

(c) cumulative frequency (d) none of these

69. If l be the lower class boundary of a class in a frequency distribution and m be the mid-point of the class, then the upper class boundary of the class is

(a) $2m - l$ (b) $m - 21$ (c) $l + \frac{m+l}{2}$ (d) $m + \frac{m+l}{2}$

70. The range of the data 12, 25, 15, 18, 17, 20, 22, 26, 6, 16, 11, 8, 19, 10, 30, 20 and 32 is

(a) 13 (b) 17 (c) 24 (d) 26

71. A fair die is thrown once. Find the probability that the number on it is greater than 4.

(a) $\frac{1}{6}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

72. Two fair coins are tossed. Find the probability that tail turns up atleast once.

(a) $\frac{1}{2}$ (b) $\frac{3}{4}$ (c) $\frac{1}{4}$ (d) none of these

73. Two fair die are tossed. Find the probability that the sum of the scores is 9.

(a) $\frac{1}{18}$ (b) $\frac{1}{9}$ (c) $\frac{2}{3}$ (d) $\frac{4}{9}$

74. Four unbiased coins are tossed simultaneously. The probability that two tails occur will be

(a) $\frac{3}{16}$ (b) $\frac{1}{4}$ (c) $\frac{5}{16}$ (d) $\frac{3}{8}$

75. The greatest among $2\sqrt{2}$, $3\sqrt[3]{2}$, $2\sqrt[6]{5}$ and $\sqrt[6]{10^3}$ is

(a) $2\sqrt{2}$ (b) $3\sqrt[3]{2}$ (c) $2\sqrt[6]{5}$ (d) $\sqrt[6]{10^3}$

76. A point lies in the third-quadrant and its distance from the co-ordinate axes are 6 units and 4 units. The co-ordinate of the point is

(a) (–6, –4) (b) (–4, 6) (c) (–4, –6) (d) (–6, 4)

77. $(256)^{0.16} \times (16)^{0.18} =$

(a) 256 (b) 16384 (c) 64 (d) 4

78. $x_1, x_2, x_3, \ldots, \ldots, x_{100}$ are positive integers such that $x_i + x_{i+1} = k$, for all i, where k is a constant. If $x_{10} = 1$ then $x_1 =$

(a) 1 (b) k (c) $k - 1$ (d) $k + 1$

79. If $\frac{p}{q} = 2.52525\ldots\ldots$ (in the lowest form) then $\frac{q}{p} =$

(a) 0.4 (b) 0.396 (c) 0.0396 (d) 0.42525

80. What is the sum of two numbers whose difference is 45 and the quotient of the greater number by the smaller number is 4?

(a) 75 (b) 100 (c) 90 (d) 60