CLASS : 10

Register Number | 1 | 0 | 2 | 1 | 1 | |

COMMON HALF YEARLY EXAMINATION, 2025 - 26

MATHEMATICS

Time Allowed : 3.00 Hours] [Max. Marks : 100

Instructions : 1. Check the question paper for fairness of printing. If there is any lack of fairness inform the hall supervisor immediately.
2. Use Blue or Black ink to write and underline and pencil to draw diagrams.

Note: This question paper contains four parts.

PART - I

Note : (i) Answer all the questions.
(ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer. 14×1=14

1. If there are 1024 relations from a set A = {1, 2, 3, 4, 5} to a set B, then the number of elements in B is
a) 3 b) 2 c) 4 d) 8

2. If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is
a) 4 b) 2 c) 1 d) 3

3. $74k \equiv$ _____ (mod 100)
a) 1 b) 2 c) 3 d) 4

4. If $(x - 6)$ is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ then the value of k is
a) 3 b) 5 c) 6 d) 8

5. Let $A = [a_{ij}]$ be a matrix of order m×n. If $a_{ij} = \begin{cases} \text{A non-zero real number} & \text{if } i = 0 \\ 0 & \text{else where} \end{cases}$ and if m = n. Then the matrix "A" :
a) may be a scalar matrix b) may be a unit matrix c) will be a diagonal matrix d) all the above

6. In a ΔABC, AD is the bisector of ∠BAC. If AB = 8 cm, BD = 6 cm and DC = 3 cm. The length of the side AC is
a) 6 cm b) 4 cm c) 3 cm d) 8 cm

7. The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ is
a) $7x - 3y + 4 = 0$ b) $3x - 7y + 4 = 0$ c) $3x + 7y = 0$ d) $7x - 3y = 0$

8. (2, 1) is the point of intersection of two lines.
a) $x - y - 3 = 0;\ 3x - y - 7 = 0$ b) $x + y = 3;\ 3x + y = 7$
c) $3x + y = 3;\ x + y = 7$ d) $x + 3y - 3 = 0;\ x - y - 7 = 0$

9. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3} : 1$, then the angle of elevation of the sun has measure
a) 45° b) 30° c) 90° d) 60°

10. If two solid hemispheres of same base radius r units are joined together along their bases, then curved surface area of this new solid is
a) $4\pi r^2$ sq. units b) $6\pi r^2$ sq. units c) $3\pi r^2$ sq. units d) $8\pi r^2$ sq. units

11. The volume of a right - circular cone is 60 cm^3. Then the volume of the cylinder having same radius and height as that of the cone is :
a) 60 cm^3 b) 180 cm^3 c) 20 cm^3 d) 120 cm^3

12. Kamalam went to play a lucky draw contest. 135 tickets of the lucky draw were sold. If the probability of Kamalam winning is $\frac{1}{9}$, then the number of tickets bought by Kamalam is
a) 5 b) 10 c) 15 d) 20

13. The range of first 10 composite numbers is :
a) 27 b) 9 c) 18 d) 14

14. The graph of the absolute valued function exists only in the
a) I and III Quadrant b) II and IV Quadrant c) I and II Quadrant d) III and IV Quadrant

PART - II

Answer any 10 questions. Question No. 28 is compulsory. 10×2=20

15. If B × A = {(−2, 3), (−2, 4), (0, 3), (0, 4), (3, 3), (3, 4)} find A and B.

16. Show that the function f: N → N defined by $f(m) = m^2 + m + 3$ is one-one function.

17. If a, b, c are in A.P. Then find the value of $\frac{a^2 + 4ac + c^2}{ab + bc + ca}$

18. 'a' and 'b' are two positive integers such that $a^b \times b^a = 800$. Find 'a' and 'b'.
19. Simplify: $\frac{x^3}{x-y} + \frac{y^3}{y-x}$
20. Discuss the nature of the roots of $x^2 + x - 20 = 0$
21. Find the length of the tangent drawn from a point whose distance from the centre of a circle is 5 cm and radius of the circle is 3 cm.
22. Show that the given points are collinear: (–3, –4), (7, 2) and (12, 5).
23. Find the equation of a straight line which has slope –54 and passing through the point (–1, 2).
24. Prove that $\sec\theta - \cos\theta = \tan\theta \sin\theta$.
25. If the total surface area of a cone of radius 7 cm is 704 cm^2, then find its slant height.
26. The volumes of two cones of same base radius are 3600 cm^3 and 5040 cm^3. Find the ratio of heights.
27. If the mean and coefficient of variation of a data are 15 and 48 respectively, then find the value of standard deviation.
28. A letter of the English alphabet is chosen at random. Calculate the probability that the letter so chosen follows "P" and precedes "y" and is a vowel.

PART - III

Answer any 10 questions. Question No. 42 is compulsory. **10×5=50**

29. Let $A = \{x \in W \mid x<2\}$, $B = \{x \in N \mid 1 < x \leq 4\}$ and $C = \{3, 5\}$. Verify that $A\times(B \cap C) = (A\times B) \cap (A\times C)$
30. If $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$. Prove that fo(goh) = (fog)oh
31. Find the sum to n terms of the series $3 + 33 + 333 + \ldots$ to n terms.
32. The 13^{th} term of an A.P. is 3 and the sum of first 13 terms is 234. Find the common difference and the sum of first 21 terms.
33. Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$
34. If α, β are the roots of $7x^2 + ax + 2 = 0$ and if $\beta - \alpha = \frac{-13}{7}$. Find the values of a.
35. If $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix}$ show that $(AB)^T = B^T A^T$
36. Show that in a triangle, the medians are concurrent.
37. A(–5, 7), B(–4, k), C(–1, –6) and D(4, 5) are the vertices of a quadrilateral. Find the value of k if the area of the quadrilateral is 72 square units.
38. From the top of a lighthouse, the angle of depression of two ships on the opposite sides of it are observed to be 30° and 60°. If the height of the lighthouse is h meters and the line joining the ships passes through the foot of the lighthouse, show that the distance between the ships is $\frac{4h}{\sqrt{3}}$ m.
39. An aluminium sphere of radius 12 cm is melted to make a cylinder of radius 8 cm. Find the height of the cylinder.
40. The time taken (in minutes) to complete a homework by 8 students in a day are given by 38, 40, 47, 44, 46, 43, 49, 53. Find the coefficient of variation.
41. Two unbiased dice are rolled once. Find the probability of getting (i) a doublet (equal numbers on both dice) (ii) the product as a prime number (iii) the sum as a prime number (iv) the sum as 1
42. Find the equation of the straight line having x-intercept "a" and y-intercept "b" and if the mid pint of the line segment AB is (2, 3). [HINT OA - a, OB - b]

PART - IV

Answer all the questions. **2×8=16**

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{4}$ of the corresponding sides of the triangle PQR (scale factor $\frac{7}{4} > 1$)

(OR)

b) Draw a circle of diameter 6 cm from a point P, which is 8 cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths.

44. a) A garment shop announces a flat 50% discount on every purchase of items for their customers. Draw the graph for the relation between the Marked Price and the Discount. Hence find
(i) the marked price when a customer gets a discount of ₹ 3250 (from graph)
(ii) the discount when the marked price is ₹ 2500

(OR)

b) Draw the graph of $y = x^2 + 4x + 3$ and hence find the roots of $x^2 + x + 1 = 0$.