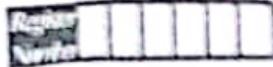


CLASS : 10 COMMON HALF YEARLY EXAMINATION-2022-23

Time Allowed : 3.00 Hours

**MATHEMATICS
SECTION - I**

(Mat. Marks : 100)

Note : Answer all the 14 questions.

Choose the correct answer from the given four alternatives and write the option code and the corresponding answer.

1. If $n(A \times B) = 6$ and $A = \{1, 3\}$ then $n(B)$ is _____
 (1) 1 (2) 2 (3) 3 (4) 6
2. If $f: A \rightarrow B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to _____
 (1) 7 (2) 49 (3) 1 (4) 14
3. If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is _____
 (1) 4 (2) 2 (3) 1 (4) 3
4. If $1 + 2 + 3 + \dots + n = K$, then $1^3 + 2^3 + 3^3 + \dots + n^3$ is equal to _____
 (1) k^2 (2) k^3 (3) $\frac{k(k+1)}{2}$ (4) $(k+1)^2$
5. If $(x-6)$ is the HCF of $x^3 - 2x^2 - 24$ and $x^2 - kx - 6$, then the value of k is _____
 (1) 3 (2) 5 (3) 6 (4) 8
6. If A is a 2×3 matrix and B is a 3×4 matrix, how many columns does AB have
 (1) 3 (2) 4 (3) 2 (4) 5
7. If $\frac{a^3}{a-b}$ is added with $\frac{b^3}{b-a}$, then the new expression is _____
 (1) $a^2 + ab + b^2$ (2) $a^2 - ab + b^2$ (3) $a^3 + b^3$ (4) $a^3 - b^3$
8. The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If $PQ = 10$ cm, then the length of AB is _____
 (1) $6\frac{2}{3}$ cm (2) $\frac{10\sqrt{6}}{3}$ cm (3) $66\frac{2}{3}$ cm (4) 15 cm
9. The area of triangle formed by the points $(-5, 0), (0, -5)$ and $(5, 0)$ is _____
 (1) 0 sq. units (2) 25 sq. units (3) 5 sq. units (4) 50 sq. units
10. If $\sin\theta = \cos\theta$, then $2\tan^2\theta + \sin^2\theta - 1$ is equal to _____
 (1) $\frac{-3}{2}$ (2) $\frac{3}{2}$ (3) $\frac{2}{3}$ (4) $\frac{-2}{3}$
11. 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 _____
 (1) 45° (2) 30° (3) 90° (4) 60°
12. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be _____
 (1) 12 cm (2) 10 cm (3) 13 cm (4) 5 cm
13. The range of the data 8, 8, 8, 8, 8, 8 is _____
 (1) 0 (2) 1 (3) 8 (4) 3
14. The probability that a student will score centum in mathematics is $\frac{4}{5}$. The probability that he will not score centum is _____
 (1) $\frac{1}{5}$ (2) $\frac{2}{5}$ (3) $\frac{3}{5}$ (4) $\frac{4}{5}$

SECTION - II

Answer any 10 questions.

Question No. 28 is compulsory. Select any 9 questions from the first 13 questions.

10x2=20

15. A Relation R is given by the set $\{(x, y) / y = x + 3, x \in \{0, 1, 2, 3, 4, 5\}\}$ Determine its domain and Range.
16. Find k if $f_0 f(k) = 5$, where $f(k) = 2k - 1$.
17. If $13824 = 2^a \times 3^b$, then find a and b .
18. In a GP 729, 243, 81, find t ,
19. Find the excluded values of $\frac{t}{t^2 - 5t + 6}$

CH/10/Mat/I

20. If $A = \begin{vmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0 & 7 \\ 8 & 3 & 1 \end{vmatrix}$ then verify $(A^T)^T = A$

21. In $\triangle ABC$, if $DE \parallel BC$, $AD = x$, $DB = x - 2$, $AE = x + 2$ and $EC = x - 1$ then find the lengths of the sides AB and AC

22. If the three points $(3, -1)$, $(a, 3)$ and $(1, -3)$ are collinear, find the value of 'a'

23. Find the equation of a straight line which is parallel to the line $3x - 7y = 12$ and passing through the point $(6, 4)$

24. Prove that $\frac{1 + \cos\theta}{1 - \cos\theta} = \operatorname{cosec}\theta + \cot\theta$

25. If the total surface area of a cone of radius 7 cm is 704 cm^2 , then find its slant height?

26. A right circular cylinder just enclose a sphere of radius r units. Find the curved surface area of the cylinder.

27. Find the standard deviation of first 21 natural numbers

28. In a two children family, find the probability that there is at least one girl in a family

SECTION - III

Answer the following any 10 questions.

Q.No.42 is compulsory select any 9 questions from the first 13 questions. $10 \times 5 = 50$

29. Let $A = \{x \in \mathbb{N} \mid 1 < x < 4\}$, $B = \{x \in \mathbb{W} \mid 0 \leq x < 2\}$ and $C = \{x \in \mathbb{N} \mid x < 3\}$ then verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$

30. If the function f is defined by $f(x) = \begin{cases} x+2, & x > 1 \\ 2, & -1 \leq x \leq 1 \\ x-1, & -3 < x < -1 \end{cases}$ find the values of

i) $f(3)$

ii) $f(0)$

iii) $f(-1.5)$

iv) $f(2) + f(-2)$

31. The sum of three consecutive terms that one in AP is 27 and their product is 288. Find the three terms

32. Find the sum to n terms of the series $5 + 55 + 555 + \dots$

33. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, find the values of a and b

34. If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ show that $A^2 - (a+d)A = (bc - ad)I_2$

35. State and prove Pythagoras theorem.

36. Find the area of the quadrilateral formed by the points $(-9, -2)$, $(-8, -4)$, $(2, 2)$ and $(1, -3)$

37. Find the equation of the altitude of $\triangle ABC$ through A where the vertices are $A(6, 2)$, $B(-5, -1)$ and $C(1, 9)$

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 m 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. A container open at the top is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends are 8 cm and 20 cm respectively. Find the cost of milk which can completely fill a container at the rate of ₹ 40 per litre.

40. A right circular cylindrical container of base radius 6 cm and height 15 cm is full of ice cream. The ice cream is to be filled in cones of height 9 cm and base radius 3 cm, having a hemispherical cap. Find the number of cones needed to empty the container.

41. Two dice are rolled once. Find the probability of getting an even number on the first die or a total of face sum 8

42. Simplify: $\frac{1/p + 1/q + r}{1/p - 1/q + r} \times \left(1 + \frac{q^2 + r^2 - p^2}{2qr}\right)$

SECTION - IV

Note: Answer both the questions choosing either of the alternatives.

$2 \times 8 = 16$

43. a) A bus is travelling at a uniform speed of 50 km/hr. Draw the distance-time graph and hence find
 (i) the constant of variation (ii) How far will it travel in $1\frac{1}{2}$ hour (iii) the time required to cover a distance of 300 km from the graph

OR

b) Draw the graph of $y = x^2 + 3x - 4$ and hence use it to solve $x^2 + 3x - 4 = 0$

44. a) Construct a $\triangle PQR$ such that $QR = 6.5$ cm, $\angle P = 60^\circ$ and the altitude from P to QR is of length 4.5 cm

OR

b) Take a point which is 11 cm away from the centre of a circle of radius 4 cm and draw the two tangents to the circle from the points.

CH / 10 / Mat. 2