COMMON HALF YEARLY EXAMINATION - 2023

B Standard X Reg.No. ☐☐☐☐☐☐

MATHEMATICS

Time : 3.00 hrs *Marks : 100*

Part - I

I. Choose the correct answer: 14 x 1 = 14

1. A = {a, b, p}, B = {2, 3}, C = {p, q, r, s} then n[(A ∪ C) x B] is
   a) 8 b) 20 c) 12 d) 16
2. If f : A → B is a constant function, then the range of f will have _____ elements.
   a) 2 b) 0 c) 1 d) none of these
3. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
   a) 2025 b) 5220 c) 5025 d) 2520
4. The value of $(1^3 + 2^3 + 3^3 + ... + 15^3) - (1 + 2 + 3 + ... + 15)$ is
   a) 14400 b) 14200
   c) 14280 d) 14520
5. Graph of the linear equation is a _____.
   a) straight line b) circle c) parabola d) hyperbola
6. Find the matrix X if $2X + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$
   a) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$ c) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ d) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$
7. 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
8. The slope of the line joining (12,3), (4,a) is $\frac{1}{8}$. The value of 'a' is
   a) 1 b) 4 c) –5 d) 2
9. $(\sec\theta + \tan\theta)(\sec\theta - \tan\theta)$ is _____.
   a) –1 b) $\sec^2\theta$ c) $\tan^2\theta$ d) 1
10. The angle of elevation of a cloud from a point h metres above a lake is β. The angle of depression of its reflection in the lake is 45°. The height of location of the cloud from the lake is
    a) $\frac{h(1+\tan\beta)}{1-\tan\beta}$ b) $\frac{h(1-\tan\beta)}{1+\tan\beta}$ c) $h\tan(45^\circ - \beta)$ d) none of these

11. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be

a) 12 cm b) 10 cm c) 13 cm d) 5 cm

12. The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is

a) 1 : 2 : 3 b) 2 : 1 : 3 c) 1 : 3 : 2 d) 3 : 1 : 2

13. The mean of 100 activations is 40 and their standard deviation is 3. The sum of squares of all observations is

a) 40000 b) 160900 c) 160000 d) 30000

14. Which of the following is incorrect?

a) $P(A) > 1$ b) $0 \le P(A) \le 1$ c) $P(\phi) = 0$ d) $P(A) + P(\overline{A}) = 1$

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory) $10 \times 2 = 20$

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. If the ordered pairs $(x^2 - 3x, y^2 + 4y)$ and $(-2, 5)$ are equal, then find x and y.

17. What is the time 100 hours after 7 a.m?

18. Find the 19^{th} term of an A.P. $-11, -15, -19, \ldots\ldots$

19. Simplify : $\frac{5t^3}{4t-8} \times \frac{6t-12}{10t}$

20. If $A = \begin{pmatrix} 7 & 8 & 6 \\ 1 & 3 & 9 \\ -4 & 3 & -1 \end{pmatrix}$, $B = \begin{pmatrix} 4 & 11 & -3 \\ -1 & 2 & 4 \\ 7 & 5 & 0 \end{pmatrix}$, then find $2A + B$.

21. Find the length of the tangent drawn from a point whose distance from the centre of a circle is 5 cm and the radius of the circle is 3 cm.

22. Check whether the given lines are parallel or perpendicular, $5x + 23y + 14 = 0$ and $23x - 5y + 9 = 0$

23. Show that $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} = 2\sec^2\theta$

24. From the top of a rock $50\sqrt{3}$ m high, the angle of depression of a car on the ground is observed to be 30°. Find the distance of the car from the rock.

25. Find the diameter of a sphere whose surface area is 154 m^2.

26. Find the standard deviation of first 21 natural numbers.
27. Two coins are tossed together. What is the probability of getting different faces on the coins?
28. Find the slope of a line Joining the given points (–6, 1) and (–3, 2)

Part - III

III. Answer any 10 questions. (Q.No.42 is compulsory) $10 \times 5 = 50$

29. Let $f : A \to B$ be a function defined by $f(x) = \frac{x}{2} - 1$, where $A = \{2, 4, 6, 10, 12\}$, $B = \{0, 1, 2, 4, 5, 9\}$. Represent f by
    i) Set of ordered pairs ii) a table
    iii) an arrow diagram iv) a graph
30. If $f(x) = x^2$, $g(x) = 2x$ and $h(x) = x + 4$, prove that fo(goh) = (fog)oh
31. If nine times ninth term is equal to the fifteen times fifteenth term, show that six times twenty fourth term is zero.
32. Find the sum of the following series : $10^3 + 11^3 + 12^3 + \ldots\ldots\ldots + 20^3$
33. Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$
34. State and prove Thales theorem.
35. Find the value of k, if the area of a quadrilateral is 28 sq.units, whose vertices are taken in order (–4, –2), (–3, k), (3, –2) and (2, 3)
36. If the vertices of ΔABC are A(6,2), B(–5,–1) and C(1,9), find the equation of median.
37. From the top of a tree of height 13 m the angle of elevation and depression of the top and bottom of another tree for 45° and 30° respectively. Find the height of the second tree. $(\sqrt{3} = 1.732)$
38. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.
39. Find the number of spherical lead shots, each of diameter 6 cm that can be made from a solid cuboids of lead having dimensions 24 cm x 22 cm x 12 cm.
40. The following table gives the values of mean and variance of heights and weights of the 10th standard students of a school.

	Height	*Weight*
Mean	155 cm	46.50 kg
Variance	72.25 cm^2	28.09 kg

Which is more varying than the other?

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. If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, show that $A^2 - 5A + 7I_2 = 0$

Part - IV

IV. Answer all the questions. **2 x 8 = 16**

43. a) Construct a triangle similar to a given triangle LMN with its side equal to $\frac{4}{5}$ of the corresponding sides of the triangle LMN (scale factor $\frac{4}{5} < 1$)

(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) Nishanth is the winner in a Marathon race of 12 km distance. He ran at a uniform speed of 12 km / hr and reached the destination in 1 hour. He was followed by Aradhana, Jayanth, Sathya and Swetha with their respective speed of 6 km/hr, 4 km/hr, 3km/hr and 2 km/hr. And, they covered the distance in 2 hours, 3 hours, 4 hours and 6 hours respectively.

Draw the speed-time graph and use it to find the time taken of Kaushik with his speed of 2.4 km/hr.

(OR)

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

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