

108709 - 108709
HALF YEARLY EXAMINATION - 2024

10 - STD**MATHS**

Marks: 100

PART - A

Time: 3Hrs

I. Choose the correct answer:**14 X 1 = 14**

1. If $f: A \rightarrow B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is
 (A) 7 (B) 49 (C) 1 (D) 14
2. If $g = \{(1,1), (2,3), (3,5), (4,7)\}$ is a function given by $g(x) = \alpha x + \beta$ then the values of α and β are
 (A) (-1,2) (B) (2,-1) (C) (-1,-2) (D) (1,2)
3. Given $F_1 = 1, F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is
 (A) 3 (B) 5 (C) 8 (D) 11
4. The value of $(1^3+2^3+3^3+\dots+15^3) - (1+2+3+\dots+15)$ is
 (A) 14400 (B) 14200 (C) 14280 (D) 14520
5. Graph of a linear equation is a
 (A) Straight line (B) circle (C) parabola (D) hyperbola
6. If number of columns and rows are not equal in a matrix then it is said to be a
 (A) Diagonal matrix (B) rectangular matrix (C) square matrix (D) identity matrix
7. The angle between the tangent to a circle and the radius through the point of contact is
 (A) 0° (B) 60° (C) 90° (D) 180°
8. The point of intersection of $3x-y = 4$ and $x+y=8$ is
 (A) (5,3) (B) (2,4) (C) (3,5) (D) (4,4)
9. Slope of the straight line $ax + by + c = 0$ is
 (A) $-\frac{a}{b}$ (B) $-\frac{b}{a}$ (C) $\frac{a}{b}$ (D) $\frac{c}{a}$
10. 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°
11. If the radius of the base of a right circular cylinder is halved keeping the same height, then ratio of the volume of the cylinder thus obtained to the volume of original cylinder is
 (A) 1:2 (B) 1:4 (C) 1:6 (D) 1:8
12. A shuttle cock used for playing badminton has the shape of the combination of
 (A) a cylinder and a sphere (B) a hemisphere and a cone
 (C) a sphere and a cone (D) frustum of a cone and a hemisphere
13. Which of the following is incorrect?
 (A) $P(A) > 1$ (B) $0 \leq P(A) \leq 1$ (C) $P(\emptyset) = 0$ (D) $P(A) + P(\bar{A}) = 1$
14. A purse contain 10 notes of Rs.2000, 15 notes of Rs.500, and 25 notes of Rs.200. One note is drawn at random. What is the probability that the note is either a Rs.500 note or Rs.200 note?
 (A) $\frac{1}{5}$ (B) $\frac{3}{10}$ (C) $\frac{2}{3}$ (D) $\frac{4}{5}$

PART - B**II. Answer any ten questions. (Q.No. 28 is compulsory):-****10 X 2 = 20**

15. Represent the function $f = \{(1,2), (2,2), (3,2), (4,3), (5,4)\}$ through an arrow diagram.
16. Find gof when $f(x) = 2x+1$ and $g(x) = x^2-2$.
17. If $13824 = 2^a \times 3^b$ then find a and b?
18. Find the 8th term of the G.P. 9,3,1,....
19. If α and β are the roots of $x^2+7x+10 = 0$ find the value of $\alpha^2 + \beta^2$.
20. If ΔABC is similar to ΔDEF such that $BC = 3$ cm, $EF = 4$ cm and area of $\Delta ABC = 54$ cm². Find the area of ΔDEF .
21. The length of the tangent to a circle from a point P, which is 25 cm away from the centre is 24 cm, What is the radius of the circle?
22. Find the slope of a line joining the points (14,10) and (14,-6).
23. If the straight lines $12y = -(p+3)x+12$, $12x-7y=16$ are perpendicular then find 'p'.
24. Prove the following identity: $\cot \theta + \tan \theta = \sec \theta \operatorname{cosec} \theta$
25. A tower stands vertically on the ground. From a point on the ground, which is 48m away from the foot of the tower, the angle of elevation of the top of the tower is 30° . Find the height of the tower.
26. A garden roller whose length is 3 m long and whose radius is 1.4 m is rolled to level a garden.. How much area will it cover in 8 revolutions?

27. Find the range and coefficient of range of the following data.
63, 89, 98, 125, 79, 108, 117, 68

28. If $A = \begin{pmatrix} 5 & 2 & -4 \\ 3 & 8 & 7 \\ -1 & 9 & 5 \end{pmatrix}$ then verify that $(A^T)^T = A$.

PART - C

III. Answer any TEN questions. (Q.No. 42 is compulsory):-

10 X 5 = 50

29. Let $A = \{x \in N: 1 < x < 4\}$, $B = \{x \in W: 0 \leq x < 2\}$ and $C = \{x \in N: x < 3\}$. 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. 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 values of m and n if the following polynomials are perfect squares:
 $36x^4 - 60x^3 + 61x^2 - mx + n$

33. Prove that the equation $x^2(p^2+q^2) + 2x(pr+qs) + r^2+s^2 = 0$ has no real roots. If $ps = qr$, then show that the roots are real and equal.

34. If $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$, $C = \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$ verify that $A(B+C) = AB+AC$.

35. State and prove Angle bisector theorem.

36. If vertices of a quadrilateral are at $A(-5,7)$, $B(-4,k)$, $C(-1,-6)$ and $D(4,5)$ and its area is 72 sq. units. Find the value of k .

37. Find the equation of a straight line through the intersection of lines $5x - 6y = 2$, $3x + 2y = 10$ and perpendicular to the line $4x - 7y + 13 = 0$.

38. Two ships are sailing in the sea on either sides of a lighthouse. The angle of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively. If the lighthouse is 200 m high, find the distance between the two ships. ($\sqrt{3} = 1.732$)

39. 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.

40. The number of televisions sold in each day of a week are 13, 8, 4, 9, 7, 12, 10. Find its standard deviation.

41. In a class of 50 students, 28 opted for NCC, 30 opted for NSS and 18 opted both NCC and NSS. One of the students is selected at random. Find the probability that
(i) The student opted for NCC but not NSS. (ii) The student opted for NSS but not NCC
(iii) the student opted for exactly one of them.

42. 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.

PART - D

IV. Answer all the questions:-

2 x 8 = 16

43. a) Construct a triangle ΔPQR such that $QR = 5$ cm, $\angle P = 30^\circ$ and the altitude from P to QR is of length 4.2 cm. (OR)

b) Draw the two tangents from a point which is 10 cm away from the centre of a circle of radius 5 cm. Also, measure the lengths of the tangents.

44. a) The following table shows the data about the number of pipes and the time taken to fill the same tank.

No. Of pipes (x)	2	3	6	9
Time taken (in min) (y)	45	30	15	10

Draw the graph for the above data and hence (i) find the time taken to fill the tank when 5 pipes are used (ii) find the number of pipes when the time is 9 minutes. (OR)

b) Draw the graph of $y = x^2 + x - 2$ and hence solve $x^2 + x - 2 = 0$. HMY-10-MAT EM -2