

# FIRST MID TERM TEST - 2024

## Standard XI

 Reg.No. 

--	--	--	--	--

## MATHEMATICS

Time : 1.30 hrs

Part - I

Marks : 60

10 x 1 = 10

I. Choose the correct answer:

1. If  $n((A \times B) \cap (A \times C)) = 8$  and  $n(B \cap C) = 2$ , then  $n(A)$  is  
 a) 6                                      b) 4                                      c) 8                                      d) 16
2. The number of constant functions from a set containing  $m$  elements to a set containing  $n$  elements is  
 a)  $mn$                                       b)  $m$                                       c)  $n$                                       d)  $m + n$
3. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be defined by  $f(x) = 1 - |x|$ . Then the range of  $f$  is  
 a)  $\mathbb{R}$                                       b)  $(1, \infty)$                                       c)  $(-1, \infty)$                                       d)  $(-\infty, 1]$
4. The number of relations on a set containing 3 elements is  
 a) 9                                      b) 81                                      c) 512                                      d) 1024
5. If  $|x + 2| = 9$ , then  $x$  belongs to  
 a)  $(-\infty, -7)$                                       b)  $[-11, 7]$                                       c)  $(-\infty, -7) \cup [11, \infty)$                                       d)  $(-11, 7)$
6. The number of roots of  $(x + 3)^4 + (x + 5)^4 = 16$  is  
 a) 4                                      b) 2                                      c) 3                                      d) 0
7. If 3 is the logarithm of 343, then the base is  
 a) 5                                      b) 7                                      c) 6                                      d) 9
8. The solution of  $5x - 1 < 24$  and  $5x + 1 > -24$  is  
 a) (4,5)                                      b) (-5,-4)                                      c) (-5,5)                                      d) (-5,4)
9.  $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \dots + \cos 179^\circ =$   
 a) 0                                      b) 1                                      c) -1                                      d) 89
10. In a triangle ABC,  $\sin^2 A + \sin^2 B + \sin^2 C = 2$ , then the triangle is  
 a) equilateral triangle                                      b) isosceles triangle  
 c) right triangle                                      d) scalene triangle

Part - II

II. Answer any 4 questions. (Q.No.16 is compulsory)

4 x 2 = 8

11. Find the number of subsets of A if  $A = \{x : x = 4n + 1, 2 \leq n \leq 5, n \in \mathbb{N}\}$ .
12. If  $f: [-2, 2] \rightarrow B$  is given by  $f(x) = 2x^3$ , then find B so that f is onto.
13. Construct a quadratic equation with root 7 and -3.
14. Express  $30^\circ$  angle in radian measure.

15. Find the principal value of  $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$

16. Solve :  $|2x - 17| = 3$  for x.

Part - III

III. Answer any 4 questions. (Q.No.22 is compulsory)

4 x 3 = 12

17. If  $n(P(A)) = 1024$ ,  $n(A \cup B) = 15$  and  $n(P(B)) = 32$ , then find  $n(A \cap B)$

18. Simplify :  $\frac{1}{3 - \sqrt{8}} - \frac{1}{\sqrt{8} - \sqrt{7}} + \frac{1}{\sqrt{7} - \sqrt{6}} - \frac{1}{\sqrt{6} - \sqrt{5}} + \frac{1}{\sqrt{5} - 2}$



19. Solve  $23x < 100$  when  
 i)  $x$  is a natural number      ii)  $x$  is an integer

20. Prove that  $\frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{1 + \sin \theta}{\cos \theta}$

21. Find the value of  $\cos 135^\circ$ .

22. Draw the followings:

i)  $y = |x|$       ii)  $y = |x - 1|$       iii)  $y = |x + 1|$

### Part - IV

#### IV. Answer all the questions.

4 x 5 = 20

23. a) In  $\Delta ABC$ , prove that  $\tan\left(\frac{A-B}{2}\right) = \frac{a-b}{a+b} \cot\left(\frac{C}{2}\right)$

(OR)

- b) If  $f: \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 2x - 3$ , prove that  $f$  is bijection and find its inverse.

24. a) Write the values of  $f$  at  $-3, 5, 2, -1, 0$  if  $f(x) = \begin{cases} x^2 + x - 5 & \text{if } x \in (-\infty, 0) \\ x^2 + 3x - 2 & \text{if } x \in (3, \infty) \\ x^2 & \text{if } x \in (0, 2) \\ x^2 - 3 & \text{otherwise} \end{cases}$

(OR)

b) Resolve into partial fractions:  $\frac{2x}{(x^2 + 1)(x - 1)}$

25. a) If  $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$ , then prove that  $xyz = 1$

(OR)

b) Prove that  $\frac{\cot(180^\circ + \theta) \sin(90^\circ - \theta) \cos(-\theta)}{\sin(270^\circ + \theta) \tan(-\theta) \operatorname{cosec}(360^\circ + \theta)} = \cos^2 \theta \cot \theta$

26. a) On the set of natural numbers let  $R$  be the relation defined by  $aRb$  if  $2a + 3b = 30$ . Write down the relation by listing all the pairs. Check whether it is

- i) Reflexive      ii) Symmetric  
 iii) Transitive      iv) Equivalence

(OR)

b) Solve the equation  $\sqrt{6 - 4x - x^2} = x + 4$

\*\*\*\*\*