ANGEL'S PUBLIC SCHOOL

Strive for Perfection

SAMPLE PAPER

HALF YEARLY EXAMS   SESSION 2025 – 26
CLASS – XI

TIME : 3 HRS.   SUBJECT – MATHEMATICS   M.M:80

General instructions :

(a) Section – A consist of 20 objective type questions each carry 1 mark.
(b) Section – B contains 6 very short type questions each carry 2 mark.
(c) Section – C contains 6 short type questions each carry 3 marks
(d) Section – D contains 4 Long type questions each carry 5 marks.
(e) Section – E contains 2 case Based problems each carry 5 marks.

SECTION – A

1. Let n(A) = m , n(B) = n , then the total number of non empty relations defined from A to B is :

(a) m^n (b) $n^m - 1$ (c) mn – 1   (d) $2^{mn} - 1$

2. Range of $f(x) = \dfrac{1}{1-2\cos x}$ is :

(a) [1/3 , 1]   (b) [- 1/3 , 1]   (c) [- 1 , 1/3]   (d) (- ∞ -1) U [1/3 , 1]

OR

The value of tan 75° - cot 75° is :

(a) 2√3   (b) 2 + √3   (c) 2 - √3   (d) None of these

3. The value of tan1° tan2° tan3° .....tan 89° is :

(a) 0   (b) 1   (c) ½   (d) Not defined

4. The value of √-25 × √-9 is :

(a) 15   (b) -15   (c) 10   (d) 0

OR

If α + β = π/4 , then the value of (1 + tan α) (1 + tan β) is :

(a) 1   (b) 2   (c) -2   (d) Not defined

5. If $f(x) = x^{100} + x^{99} + ...+ x + 1$, then f'(1) is equals to _____.

6. If x is a real number and |x| < 3, then :

(a) x ≥ 3   (b) -3 < x < 3   (c) x ≤ - 3   (d) – 3 ≤ x ≤ 3

7. The number of possible outcomes when a coin is tossed 3 times :

(a) 36   (b) 64   (c) 12   (d) 32

8. $\dfrac{\sin x}{x - \pi}$ is equals to   :

(a) 1   (b) 2   (c) -1   (d) -2

9. Which of the following is correct ?

(a) Sin 1° > sin 1   (b) Sin 1° < sin 1   (c) Sin 1° = sin 1   (d) None of these

OR

Total number of words formed by 2 vowels and 3 consonants taken from 4 vowels and 5 consonants is :

(a) 60   (b) 120   (c) 7200   (d) 720

10. If sin x + cos x = 1 , then the value of sin 2x is equals to:

(a) 1   (b) ½   (c) 0   (d) -1

11. If | x – 1 | > 5 , then

(a) X $\in$ (-7 , 11)   (b) X $\in$ [-11 , 7]

(c) X $\in$ (- ∞ , -7) U (11 , ∞)   (d) X $\in$ (- ∞ , - 7) U [11 , ∞)

12. If $nC_{12} = nC_8$, then n is equals to

(a) 20   (b) 12   (c) 6   (d) 30

13. If $y = \dfrac{\sin x + \cos x}{\sin x - \cos x}$, then $\dfrac{dy}{dx}$ at $x = 0$:

(a) -2   (b) 0   (c) 4   (d) does not exist

14. The period of function sin 3θ is

(a) π   (b) 2π   (c) 3π   (d) None of these

OR

Number of terms in (x + a)^n , where n is a positive integer, is

(a) n   (b) n + 1   (c) – n   (d) 0

15. Modulus of complex number 3 + i is :

(a) 10   (b) √10   (c) - √10   (d) Zero

16. If f(x) = cos²x + sec²x, then :

(a) f (x) < 1   (b) f (x) = 1   (c) 2 < f (x) < 1   (d) f (x) ≥ 2

17. If sin θ = -1/2 and cos θ = -√3/2 , then θ lies in :

(a) Ist quadrant   (b) IInd quadrant   (c) III quadrant   (d) IV quadrant

18. If $\left(\dfrac{1 + i}{1 - i}\right)^n = 1$, then the smallest value of n is :

(a) 2   (b) 6   (c) 8   (d) 4

19. Out of $(1.2)^{4000}$ and 800 , we have :

    (a) $(1.2)^{4000} > 800$ (b) $(1.2)^{4000} < 800$ (c) $(1.2)^{4000} = 800$ (d) None of these

20. If $(n + 1)! = 60 (n – 1)!$, then value of n is :

    (a) 2   (b) 3   (c) 4   (d) None of these

SECTION – B

21. Prove that $2 \cos \dfrac{\pi}{13} \cos \dfrac{9\pi}{13} + \cos \dfrac{3\pi}{13} + \cos \dfrac{5\pi}{13} = 0$

22. If $x + iy = \dfrac{a + ib}{a - ib}$, prove that $x^2 + y^2 = 1$

OR

Find the domain and range of $\dfrac{1}{\sqrt{x - 5}}$.

23. In how many ways can 5 girls and 3 boys be seated in a row so that no two boys are together?

24. Evaluate : $Lt_{x \to 0} \left(\dfrac{\sin x - 2 \sin 3x + \sin 5x}{x} \right)$

25. Expand $\left(x^2 + \dfrac{3}{x} \right)^4$ using Binomial theorm .

26. Show that $\dfrac{\cos 18° + \sin 18°}{\cos 18° - \sin 18°} = \cot 27°$.

SECTION – C

27. Prove that $\sin^2 6x - \sin^2 4x = \sin 2x \sin 4x$.

OR
Prove that $2 \cos x = \sqrt{2 + \sqrt{2 + 2 \cos 4x}}$.

28. In how many ways of distinct permutations of the letters in **MISSISSIPPI** do the four I's not come together.

29. Find the derivative of $f(x) = 2x^2 + 3x – 5$ at $x = -1$. Also Prove that $f'(0) + 3 f'(-1) = 0$

OR

Differentiate : $y = \left(\sqrt{x + \sqrt{x^2 + a^2}} \right)^n$ w.r.t x .

30. A group consists of 4 girls and 7 boys . In how many ways can a team of 5 members be selected if the team has

    (a) No girl   (b) Atleast one boy and one girl   (c) Atleast 3 girls

31. Let A = { 1 , 2 , 3 , 4 , 6 } . Let R be the relation on set A defined by R = { (a , b) : a , b ∈ A : b is exactly divisible by a } . Find the domain and range of R.

32. Find Lt x → 0 f(x) , where function f(x) given below :

$$f(x) = \begin{cases} \dfrac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

33. Find the possible values of 'a' and 'b' if Lt x→ 1 f(x) = f (1)

$$f(x) = \begin{cases} a + bx, & x < 1 \\ 4, & x = 1 \\ b - ax, & x > 1 \end{cases}$$

OR

An angle α is divided into two parts such that the ratio of the tangents of parts is k : 1 , if x is the difference of the two parts, prove that

$$\sin x = \frac{k - 1}{k + 1} \tan \alpha .$$

34. Prove that sin 10° sin 30° sin 50° sin 70° = $\dfrac{1}{16}$

35. (a) Find (a + b)⁴ - (a – b)⁴ . Hence Evaluate (√3 + √2)⁴ - (√3 - √2)⁴.

  (b) Evaluate : Lt x→0 (cosec x – cot x) .

36. (a) Find the domain and range of $\sqrt{25 - x^2}$.

  (b) Solve the inequality: $\dfrac{x}{4} \geq \dfrac{5x - 2}{3} - \dfrac{7x - 3}{5}$

OR

Prove that sin 18° = $\dfrac{\sqrt{5} - 1}{4}$ and hence Also find the value of cos 18° .

37. CASE STUDY 1

1. Let $z_1 = 2 - i$, $z_2 = -2 + i$

   Based on the above information, answer the following questions :

   (i) $z_1 z_2$ equals

   (a) $-3 + 4i$ (b) $3 + 4i$ (c) $-3 - 4i$ (d) $-2 + 4i$

   (ii) $\dfrac{z_1 z_2}{\bar{z}_1}$ equals

   (a) $\dfrac{2}{5} + \dfrac{11}{5}i$ (b) $-\dfrac{2}{5} + \dfrac{11}{5}i$ (c) $-\dfrac{2}{5} - \dfrac{11}{5}i$ (d) 0

   (iii) $\text{Re}\left(\dfrac{z_1 z_2}{\bar{z}_1}\right)$ equals

   (a) $\dfrac{2}{5}$ (b) $-\dfrac{1}{5}$ (c) $-\dfrac{2}{5}$ (d) $\dfrac{1}{5}$

   (iv) $z_1 \bar{z}_1$ equals

   (a) 2 (b) 3 (c) 4 (d) 5

   (v) $\text{Im}\left(\dfrac{1}{z_1 \bar{z}_1}\right)$ equals

   (a) 0 (b) 1 (c) 2 (d) 3

38. CASE STUDY 2

4. There is a group consisting of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has

   Based on the above information, answer the following questions :

   (i) In how many ways can a team of 5 members can be selected consisting of 1 girl and 4 boys ?

   (a) 120   (b) 130   (c) 140   (d) 150

   (ii) In how many ways can a team of 5 members can be selected 3 boys and 2 girls ?

   (a) 210   (b) 220   (c) 230   (d) 240

   (iii) In how many ways can a team of 5 members can be selected consisting of no girl ?

   (a) 18   (b) 19   (c) 20   (d) 21

   (iv) In how many ways can a team of 5 members can be selected consisting of at least of 1 boy and 1 girl ?

   (a) 441   (b) 442   (c) 443   (d) 444

   (v) In how many ways can a team of 5 members can be selected consisting of at least 3 girls ?

   (a) 90   (b) 91   (c) 92   (d) 93