ANGEL'S PUBLIC SCHOOL

SAMPLE PAPER

CLASS – XII HALF YEARLY EXAM SESSION 2024 – 25

TIME : 3 HRS SUBJECT – MATHEMATICS CODE – 041 M.M : 80

General instructions.

1. All the questions are compulsory.
2. The question paper consists 38 questions divided into four sections A, B, C and D.
   (a) **Section – A** comprises **20** questions of **1** mark each.
   (b) **Section – B** comprises **6** questions of **2** mark each.
   (c) **Section – C** comprises **6** questions of **3** mark each.
   (d) **Section – D** comprises **6** questions of **5** mark each.

SECTION – A

1. Let F : R → R be defined as f (x) = 3x. Choose the correct answer.
(a) F is one–one onto. (b) F is many – one onto.
(c) F is one –one but not onto. (d) F is neither one–one nor onto.

2. Let R be the relation in the set N given by R = {(a, b): a = b – 2, b>6}.
(a) (2,4) є R (b) (3,8) є R (c) (6,8)є R (d) (8,7) є R

3. $\tan^{-1}(\sqrt{3}) + \sec^{-1}(-2)$ is equal to____________.
(a) π (b) $-\frac{\pi}{3}$ (c) $\frac{\pi}{3}$ (d) $\frac{2\pi}{3}$

4. $\sin^{-1}(\sin\frac{2\pi}{3})$ is equal to __________.
(a) $\frac{2\pi}{3}$ (b) $\frac{5\pi}{6}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

5. $A = [a_{ij}]_{m\times n}$ is a square matrix ,if _______.
(a) m < n (b) m > n (c) m=n (d) none of these

6. The matrices A and B will be the inverse of each other only if,__________.
(a) AB =BA (b) AB =BA =0 (c) AB=0, BA =I (d) AB =BA =I

7. Condition for the symmetric matrix, if A is a square matrix is_______.
(a) $A = A^t$ (b) A =B (c) AB=0, (d) $A^t = -A$

8. F(x) is said to have a minimum value, if there exists a point c on interval such that,_______.
(a) F(x)≤f(c) (b) F(x)≥f(c) (c) F(x)<f(c) (d) F(x)>f(c)

9. The minimum value of $f(x) = -(x-1)^2 + 10$ is_______.
(a) 3 (b) 2 (c) 10 (d) 0

10. The rate of change of the area of a circle with respect to its radius at r = 6cm is______.
(a) 11π (b) 12π (c) 10π (d) 8π

11. A and B will be inverse of each other if ___________.
(a) AB = BA (b) AB = BA = 0 (c) AB = 0 , BA = I (d) AB = BA = I

12. The value of $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is ______.
(a) π (b) 0 (c) π/3 (d) 2π/3

13. Let **R** be the relation in the set N given by **R = { (a , b) : a = b – 2 , b > 6 }.** Choose the correct answer.
(a) (2 , 4) R (b) (3 , 8)∈R (c) (6 , 8) ∈ R (d) (8 , 7) ∈R

14. Value of determinants $\begin{vmatrix} 1 & 2 \\ 4 & 2 \end{vmatrix}$, is ______________.
(a) – 6 (b) 4 (c) 0 (d) 2

15. The number of all possible matrices of order 3 × 3 with each entry 0 or 1 is_______.
(a) 18 (b) 512 (c) 81 (d) none of these

16. If $A^2 - A + I = 0$, then the inverse of A is _________.
(a) A (b) A + I (c) I – A (d) A – I

17. If $\sin^{-1} x = y$, then _____.
(a) $0 \le y \le \pi$ (b) $-\pi/2 \le y \le \pi/2$ (c) $0 < y < \pi$ (d) $-\pi/2 < y < -\pi/2$

18. Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as a Rb. If a congruent to b ∀ a, b ∈ T, then R is _____.
(a) reflexive but–not transitive (b) transitive but not symmetric
(c) equivalence (d) none of these

19. If A and B are two matrices of the order 3 × m and 3 × n, respectively, and m = n, then the order of The matrix (5A – 2B) is______.
(a) m x 3 (b) 3 x 3 (c) m x n (d) 3 x n

20. The value of $\sin (2 \sin^{-1} (0.6))$ is ______________________.
(a) 0.56 (b) 0.96 (c) 0.73 (d) 0.55

SECTION – B

21. Find the value of x, if: $\begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} = \begin{vmatrix} x & 3 \\ 2x & 5 \end{vmatrix}$

22. Find the adjoint of the matrix $\begin{bmatrix} 2 & 6 \\ 4 & 3 \end{bmatrix}$.

23. Examine the consistency of the following system of equations.
$x + 3y = 5$
$2x + 6y = 8$

24. Prove that the function $f(x) = 2x^2 - 1$ is continuous at $x=-3$.

25. Find the derivative of cos (sinx) w.r.t log x .

26. Find $\frac{dy}{dx}$ in the given function: $y = \sin^{-1}(2x\sqrt{(1-x^2)})$, $\frac{-1}{\sqrt{2}} < x < \frac{1}{\sqrt{2}}$.

SECTION – C

27. Differentiate $f(x) = \sin (\tan^{-1}e^{-x})$ with respect to x.

28. A balloon which always remains spherical has a variable diameter $\frac{3}{2}(2x+1)$. Find the rate of change of its volume with respect to x.

29. Find the points at which the tangent to the curve $y= x^3 - 3x^2 + 9x + 7$ is parallel to the x–axis.

30. If $y = 3 \cos(\log x) + 4\sin (\log x)$, show that $x^2y_2 + xy_1 + y = 0$.

31. Find the intervals in which the function $2x^3 + 9x^2 + 12x + 20$ is Increasing and decreasing.

32. Find the maximum and minimum values of $f(x) = 2x^3 - 24x + 107$ in the interval [1 , 3].

SECTION – D

33. Find two positive numbers x and y such that their sum is 35 and product x^2y^3 is maximum.

OR

Find the inverse of $\begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{bmatrix}$.

34. Solve the following linear equations using the matrix method.
$x - y + 2z = 7$
$3x + 4y - 5z = -5$
$2x - y + 3z = 12$

35. Differentiate the given function with respect to x: $(\log x)^x + x^{\log x}$

36. Find the intervals in which the function sinx + cos x , $0 \le x \le 2\pi$ is increasing and decreasing .

37. Prove that the radius of a right circular cylinder of the greatest curved surface which can be inscribed in a given cone is half of that of the cone .

38. If R is the relation in N x N defined by (a , b) R (c , d) if and only if a + d = b + c . Show that r is equivalence relation.