SAMPLE QUESTION PAPER
CLASS-XII (MATHS)

Time allowed: **3** hours | Maximum Marks: **100**

General Instructions:

(i) **All** questions are compulsory.
(ii) This question paper contains **29** questions.
(iii) Question **1- 4** in **Section A** are very short-answer type questions carrying **1** mark each.
(iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** marks each.
(v) Question **13-23** in **Section C** are long-answer-**I** type questions carrying **4** marks each.
(vi) Question **24-29** in **Section D** are long-answer-**II** type questions carrying **6** marks each.

SECTION-A

Questions from 1 to 4 are of 1 mark each.

1. What is the principal value of tan $\left(\tan —\right)$?

2. A and B are square matrices of order 3 each, |A| = 2 and |B| = 3. Find | B|

3. What is the distance of the point (p, q, r) from the x-axis?

4. Let f : R → R be defined by f(x) = $3x^2 - 5$ and g : R → R be defined by g(x) = ——. Find gof

SECTION-B

Questions from 5 to 12 are of 2 marks each.

5. How many equivalence relations on the set {1,2,3} containing (1,2) and (2,1) are there in all ? Justify your answer.

6. Let l_i, m_i, n_i ; i = 1, 2, 3 be the direction cosines of three mutually perpendicular vectors in space. Show that AA' = I_3, where A = $\begin{bmatrix} l_2 & m_2 & n_2 \end{bmatrix}$.

7. If e^y (x + 1) = 1, show that —

8. Find the sum of the order and the degree of the following differential equations:

$$—— + \sqrt{dx} + (1 + x) = 0$$

9. Find the Cartesian and Vector equations of the line which passes through the point (–2, 4,–5) and parallel to the line given by —— —— ——

10. Solve the following Linear Programming Problem graphically:

Maximize Z = 3x + 4y

subject to

x + y

11. A couple has 2 children. Find the probability that both are boys, if it is known that (i) one of them is a boy (ii) the older child is a boy.

12. The sides of an equilateral triangle are increasing at the rate of 2 cm/sec. Find the rate at which its area increases, when side is 10 cm long.

SECTION-C

Questions from 13 to 23 are of 4 marks each.

13. If A + B + C = π, then find the value of

$$\begin{vmatrix} \sin(A & & C) & & A \\ & os(A & B) & & \end{vmatrix}$$

OR

Using properties of determinant, prove that

$$\begin{vmatrix} c & & b \end{vmatrix} = 3abc -$$

14. It is given that for the function f(x) = $x^3 - 6x^2$ + ax + b Rolle's theorem holds in [1, 3] with c = 2 + $\frac{}{\sqrt{3}}$. Find the values of 'a' and 'b'

15. Determine for what values of x, the function f(x) = $x^3 + \frac{1}{3}$ (x ≠ 0) is strictly increasing or strictly decreasing

OR

Find the point on the curve y = x at which the tangent is y = x – 11

16. Evaluate $\int_0^2 (x^2 + 3)$ dx as limit of sums.

17. Find the area of the region bounded by the y-axis, y = cos x and y = sinx, 0

18. Can y = ax + – be a solution of the following differential equation?

y = x — + — ....(*)

If no, find the solution of the D.E.(*).

OR

Check whether the following differential equation is homogeneous or not

— – xy = 1 + cos $\left(-\right)$, x ≠ 0

Find the general solution of the differential equation using substitution y=vx.

19. If the vectors $\bar{p}$ $a\hat{i} + \hat{j} + \hat{k}$, $\vec{q}$ $\hat{} + b\hat{j} + \hat{k}$ $\vec{r}$ $\hat{} + \hat{j} + \widehat{CK}$ are coplanar, then for a, b, $c \neq 1$ show that

$$\text{——} + \text{——} + \text{——} = 1$$

20. A plane meets the coordinate axes in A, B and C such that the centroid of Δ ABC is the point (α, β, γ) . Show that the equation of the plane is – – –

21. If a 20 year old girl drives her car at 25 km/h, she has to spend Rs 4/km on petrol. If she drives her car at 40 km/h, the petrol cost increases to Rs 5/km. She has Rs 200 to spend on petrol and wishes to find the maximum distance she can travel within one hour. Express the above problem as a Linear Programming Problem. Write any one value reflected in the problem.

22. The random variable X has a probability distribution P(X) of the following form, where k is some number:

$$P(X) = \begin{cases} k, & \text{if } x = 0 \\ 2k, & \text{if } x = 1 \\ 3k, & \text{if } x = 2 \\ 0, & \text{otherwise} \end{cases}$$

(i) Find the value of k (ii) Find P(X <2) (iii) Find P(X 2) (iv)F P(X 2)

23. A bag contains (2n +1) coins. It is known that 'n' of these coins have a head on both its sides whereas the rest of the coins are fair. A coin is picked up at random from the bag and is tossed. If the probability that the toss results in a head is —, find the value of 'n'.

SECTION-D

Questions from 24 to 29 are of 6 marks each

24. Using properties of integral, evaluate $\int$ ——— dx

OR

Find: $\int$ ———— dx

25. Does the following trigonometric equation have any solutions? If Yes, obtain the solution(s):

$$\left(\text{—}\right) + \quad \left(\text{—}\right) =$$

OR

Determine whether the operation $*$ define below on $\mathbb{Q}$ is binary operation or not.

$$a * b = ab+1$$

If yes, check the commutative and the associative properties. Also check the existence of identity element and the inverse of all elements in $\mathbb{Q}$.

26. Find the value of x, y and z, if A = $\begin{bmatrix} x & z \end{bmatrix}$ satisfies A' = A^{-1}

OR

Verify: A(adj A) = (adj A)A = $|A||\mathrm{I}$ for matrix A = $\begin{bmatrix} 3 & 2 \end{bmatrix}$

27. Find — if y = $\left\{2\tan^{-1}\sqrt{—}\right\}$

28. Find the shortest distance between the line x – y + 1 = 0 and the curve $y^2 = x$

29. Define skew lines. Using only vector approach, find the shortest distance between the following two skew lines:

$= (8 + 3\lambda)\,\hat{\imath} - (9 + 16\lambda)\,\hat{\jmath} + (10 + 7\lambda)\,\hat{k}$

$= 15\,\hat{\imath} + 29\,\hat{\jmath} + 5\,\hat{k} + \mu\,(3\,\hat{\imath} + 8\,\hat{\jmath} - 5\,\hat{k})$