

SAMPLE PAPER (2010-11)

CLASS XII

MATHS

Time 3 Hours

Max Marks 100

General Instructions

- All questions are compulsory
- Q 1 – 10 carries 1 marks, Q 11 – 22 carries 4 marks Q-23 to 29 carries 6 marks

1. Let L be the set of all lines in a plane and R be the relation defined as $R = \{(m,n) \in L \times L / m \text{ is perpendicular to } n\}$. Show that R is not reflexive, not transitive and symmetric.
2. Find the value of $\tan^{-1}(2 \cos(2 \sin^{-1}(1/2)))$
3. Express a matrix $A = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix}$ as the sum of a symmetric and a skew symmetric matrix
4. If $A = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{pmatrix}$ then show that $|3A| = 27 |A|$
5. Discuss the applicability of L.M.V for the function $f(x) = |x|$ in $[-1,1]$
6. Find $\int \frac{\sqrt{3 + \log x}}{x} dx$
7. Find the order and degree of differential equation is $(d^3y/dx^3)^{2/3} = \sin x$
8. If $|a| = 5$ and $|b| = 13$ and $|axb| = 25$ Find a . b
9. Find the direction cosines of a unit vector perpendicular to the plane $r \cdot (6i - 3j - 2k) - 1 = 0$
10. An urn contains 7 red, 4 blue balls. Two balls are drawn at random without replacement. Find the probability of getting one red and one blue ball.
11. Let $A = \{-1, 0, 1, 2\}$, $B = \{-4, -2, 0, 2\}$ and $f, g : A \rightarrow B$ be the function defined by $f(x) = x^2 - x$,

A and $g(x) = 2 \left| x - \frac{1}{2} \right| - 1, x \in A$; are f and g equal. Justify your answer. (or)

Verify that $f : \mathbb{N} \rightarrow \mathbb{N}$ $f(x) = x+1$ if x is odd
 $x - 1$ if x is even is a bijection

12. Differentiate $\sin^{-1}[\sqrt{x} \sqrt{1-x} - \sqrt{x} \sqrt{1-x^2}]$

13. Using properties prove that
$$\begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a) (ab+bc+ca)$$

14 Find the point of discontinuity of the function $f(x) = \begin{cases} |x| + 3 & x \leq -3 \\ -2x & -3 < x < 3 \\ 6x+2 & x > 3 \end{cases}$

15. Water is running out of conical funnel at the rate of $5 \text{ (cm)}^3 \text{ s}^{-1}$. When the slant height of the water cone is 4 cm , find the rate of decrease of the slant height of the water cone given that the semi vertical angle of funnel has measure $\pi/3$. (or)
 Find the approximate value of $f(5.0001)$ where $f(x) = x^3 - 7x^2 + 15$

16 Evaluate $\int (5+\log x) / (6+\log x)^2 dx$

17. $\int \frac{dx}{\cos(x+a)\cos(x+b)}$

18. Using limit as a sum $\int_0^3 (2x^2+3x+5) dx$ as a limit of sum (or)
 Prove that $\int_a^b f(x) dx = \int_a^b f(a+b-x) dx$ Hence evaluate $\int_{\pi/6}^{\pi/3} \frac{dx}{1 + \sqrt{\tan x}}$

19. Show that $\sin^{-1}(3/5) - \sin^{-1}(8/17) = \cos^{-1}(84/85)$

20. If a, b, c are the vectors such that $a+b+c = 0, |a| = 3, |b| = 4, |c| = 5$, Find $a \cdot b + b \cdot c + c \cdot a$

21. Find the vector and cartesian forms of the equation of the plane passing through the Point $(1, 2, -4)$ and parallel to the lines $r = i+2j-4k+\lambda(2i+3j+6k)$ and $r = i-3j+5k+\mu(i+j-k)$

22. A and B throw a dice alternatively till one of them gets a 6 and wins the game. Find their respective probabilities of winning if A starts first

23. Solve by matrix method

$$\begin{matrix} \underline{2} & + & \underline{3} & + & \underline{10} & = & 4, & \underline{4} & - & \underline{6} & + & \underline{5} & = & 1, & \underline{6} & + & \underline{9} & - & \underline{20} & = & 2 \\ x & y & z & & x & y & z & & x & y & z & & x & y & z & & x & y & z \end{matrix}$$

24. A cylinder is such that the sum of its height and the circumference of its base is 10 find the greatest volume of the cylinder.
25. Find the area bounded by the curve $y = x^2 - 3x$ and the line $y = 2x$ (or) Draw a sketch of the region and find the area $\{(x,y) / x^2 + y^2 \leq 1 \leq x+y\}$
26. The slope of a tangent to a curve at a point (x,y) on it is given by $(y/x) - \cot(y/x)\cos(y/x)$ ($x>0, y>0$) and curve passes through the point $(1, \pi/4)$. Find the equation of the curve. (or) Show that the differential equation $2ye^{x/y} dx + (y - 2xe^{x/y})dy = 0$ is homogeneous and find its particular solution, given that when $x=0$, when $y = 1$
27. Find the equation of the planes passing through the points $(0, -1, -1)$, $(4, 5, 1)$ and $(3, 9, 4)$ And also find the distance of the plane from the origin.
28. A wishes to mix two kinds of foods X and Y, in such a way that the mixture contains at least 10 units of vitamin A, 12 units of Vitamin B and 8 Units of C. The Vitamin contents of one kg of food is given below

	Vitamin A	Vitamin B	Vitamin C
Food X	1	2	3
Food Y	2	2	1

One kg of food X costs Rs 6 and one kg of food Y costs Rs 10. Formulate the above problem as LPP problem to find the least cost of mixture which will produce the diet.

29. 3 defective bulbs are mixed up with 7 good ones. 3 bulbs are drawn at random. Find the probability distribution of the defective bulbs, mean and variance of the distribution. (or)

In a class having 60% of the boys 5% of the boys and 10% of the girls have an IQ of more than 150. A student is selected at random and found to have an IQ more than 150. Find the probability that the selected student is a boy.