

CLASS XII

SAMPLE PAPER

MATHEMATICS

Time allowed: 3 hours

Maximum Marks : 100

General Instructions:

- 1 General Instructions:
- 2 (i) All questions are compulsory.
- 3 (ii) The question paper consists of 26 questions divided into three sections – A, B & C
Section A contains 6 questions of 1 mark each. Section B contains 13 questions of 4 marks each. Section C contains 7 questions of 6 marks each.
- (iii) Use of calculators is not permitted.

SECTION-A

- Q.1 Give an example of a relation which is symmetric but neither reflexive nor transitive .
- Q.2 Write the principal value of $\sin^{-1}\left(\frac{-1}{2}\right) + \cos^{-1}\left(\frac{-1}{2}\right)$.
- Q.3 Find matrix A, if $\begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix} A = \begin{bmatrix} 0 & 4 \\ 10 & 3 \end{bmatrix}$
- Q.4 How many number of all possible matrices of order 2×2 with each entry can be placed by either of one digit 0 ,1 or 2.
- Q.5 If A is a square matrix of order 4×4 and $|A| = 5$ then find the value of $|adj(A)|$
- Q.6 Find the value of λ if vectors $\vec{a} = 2\hat{i} - \hat{j} + \lambda\hat{k}$ and $\vec{b} = -\hat{i} + 3\hat{j} + \hat{k}$, are perpendicular to each other

SECTION-B

- Q.7 Check whether the relation R in set of real number R defined by $R = \{ (a, b) : a \leq b^3 \}$, is reflexive symmetric and transitive
- Q8 Solve the following for x : $\cos^{-1}\left(\frac{x^2-1}{x^2+1}\right) + \tan^{-1}\left(\frac{2x}{x^2-1}\right) = \frac{2\pi}{3}$.

Q.9 Prove that by using properties of determinates

$$\begin{vmatrix} a+b+c & -c & -b \\ -c & a+b+c & -a \\ -b & -a & a+b+c \end{vmatrix} = 2(a+b)(b+c)(c+a)$$

Q.10 Find the values of a and b such that the function f defined by

$$f(x) = \begin{cases} \frac{x-4}{|x-4|} + a, & \text{if } x < 4 \\ a+b & \text{if } x = 4 \\ \frac{x-4}{|x-4|} + b & \text{if } x > 4 \end{cases} \text{ is continuous function at } x = 4.$$

OR

$$\text{if } f(x) = \begin{cases} x^2 + ax + b & \text{if } 0 \leq x \leq 2 \\ 3x + 2 & \text{if } 2 < x \leq 4 \\ 2ax + 5b & \text{if } 4 < x \leq 8 \end{cases} \text{ is a continuous function } [0, 8]$$

then find the value of a and b.

Q.11 If $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ prove that $\frac{dy}{dx} = -\sqrt[3]{\frac{y}{x}}$

Q.12 Find the distance of a point $(1, -2, 3)$ from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$

Q.13 If $y = [\log(x + \sqrt{1+x^2})]^2$, show that $(1+x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - 2 = 0$

Q.14 $\int \frac{\sqrt{x^2+1}}{x^4} [\log(x^2+1) - 2\log x] dx$

Q.15 $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$

Q.16 $\int \frac{1}{x^4-1} dx$

- Q.17 A girl walks 4 km towards west, then she walks 3 km in a direction 30° east of north and stops. Determine the girl's displacement from her initial point of departure.
- Q.18 Find the coordinates of point where the line through $(3, -4, -5)$ and $(2, -3, 1)$ crosses the plane $2x + y + z = 7$
- Q.19 A and B toss a coin alternately till one of them tosses a head and wins the game. If A starts the game, find their respective probabilities of winning.

SECTION-C

- Q.20 A jet of enemy is flying along the curve $y = x^2 + 2$ and a soldier is placed at the point $(3, 2)$. Find the minimum distance between the soldier and the jet.
- Q.21 An amount of ₹ 600 crores is spent by the government in three schemes. Scheme A is for saving girl child from cruel parents who don't want girl child and get the abortion before her birth. Scheme B is for saving of newlywed girls from death due to dowry. Scheme C is for planning for good health for senior citizens. Now, twice the amount on scheme C together with amount spent on scheme A and scheme B is ₹ 700 crores. And three times the amount spent on scheme A together with amount spent on scheme B and scheme C is ₹ 1200 crores. Find the amount spent on each scheme using matrices? What is the importance of saving girl child from cruel parents who don't want girl child and get the abortion before her birth?
- Q.22 Find the vector equation of the plane passing through three points with position vectors $\hat{i} + \hat{j} - 2\hat{k}$, $2\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$. Also find the coordinates of the point of intersection of this plane and the line $\vec{r} = 3\hat{i} - \hat{j} - \hat{k} + \lambda(2\hat{i} - 2\hat{j} + \hat{k})$
- Q.23 Using integration, find area bounded by curve $x^2 = 4y$ and the line $x = 4y - 2$
- Q.24 In a bank, principal increases continuously at rate of 5% per year. An amount of Rs 1000 is deposited with this bank, how much will it be worth after 10 years ($e^{0.5} = 1.648$)
- Q.25 Given three identical boxes I, II and III each containing two coins. In box-I both coins are gold coins, in box-II, both are silver coins and in the box-III, there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold.

Q.26 There are two factories located one at place P and other at Q .From these locations ,a certain commodity is to be delivered to each of the three depots situated at A ,B and C .The weekly requirements of the depots are respectively 5 , 5 and 4 units of commodity while the production capacity of the factories at P and Q are respectively 8 and 6 units . The cost of transportation per unit is given below :

From/ To	Cost (in Rs)		
	A	B	C
P	160	100	150
Q	100	120	100

How many units should be transported from each factory to each depot in order that the transportation cost is minimum. What will be minimum transportation cost.

OR

A dietician wishes to mix together two kind of food X and Y in such a way that the mixture contain at least 10 unit of vitamin A , 12 unit of vitamin B and 8 unit of vitamins C . The vitamins contents of one kg food is given below :

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

One kg of food X cost Rs 16 and one kg of food Y cost Rs 20.Find the least cost of the mixture which will produced the required diet.