

Sample Paper(Mathematics)

Year 2020

Class 12th

(Topic-wise Break Up)

Topic	No.Of 1 Mark Questions	No.Of 2 Marks Questions	No.Of 4 Marks Questions	No of 6 Marks Questions	Total Marks
Relations and functions	02	---	02	---	10
Matrices and Determinants	01	01	01	01	13
Calculus	---	03	05	03	44
Vectors and Three Dimensional Geometry	01	01	02	01	17
Linear Programming	--	01	01	---	06
Probability	---	02	---	01	10
Total Questions	04	08	11	06	100Marks 29 Questions

- ❖ Note for Paper Setters:
- ❖ The sample question papers comprises of 29 Questions, divided into (04) four sections A, B,C,D.
- ❖ Section A comprises of Multiple Choice Questions from (Q.1 to Q.4) each of 1 Marks
- ❖ Section B comprises of 8 questions (Q 5 to Q. 12) each of 2 marks.
- ❖ Section C comprises of 11 Questions (Q 13 to Q23) each of 4 marks.
- ❖ Section D comprises of 6 Questions (Q24 to Q 29) each of 6 marks.

Subject: Mathematics. Class 12th. Max.Marks=100, Time: 3 hours.

Section A (Multiple Choice Questions) 4Qx1M= 4 marks

Q.No.1) In the set $A = \{1,2,3,4,5\}$ a relation R defined by $R = \{(x,y) : x,y \in A, x < y\}$ then R is:

- (a) Reflexive (b) Symmetric (c) Transitive (d) Anti symmetric.

Q.2) If $f(x) = (a - x^n)^{1/n}$ then $f(f(x)) =$

- (a) x (b) $a-x$ (c) x^n (d) $x^{1/n}$

Q.3) A and B are two square matrices such that $AB=A$ and $BA=B$ then $A^2 =$

- (a) B (b) A (c) I (d) 0

Q.4) If \vec{a} is a vector perpendicular to \vec{b} and \vec{c} then

- (a) $\vec{a} \cdot (\vec{b} \times \vec{c}) = 0$ (b) $\vec{a} \times (\vec{b} \times \vec{c}) = 0$
(c) $\vec{a} \times (\vec{b} + \vec{c}) = 0$ (d) $\vec{a} + (\vec{b} + \vec{c}) = 0$

Section B (very short answer type Question) 8Qx2M=16 marks

Q.5) Define Symmetric and skew symmetric Matrices.

Q.6) Evaluate $\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx$

Q.7) Evaluate $\int_2^3 \frac{1}{x^2-1} dx$.

Q.8) Define Order and Degree of a differential Equation.

Q.9) Find the projection of \vec{a} on \vec{b} where $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$.

Q.10) Define the term Optimization.

Q.11) $p(A) = \frac{6}{11}$ $p(B) = \frac{5}{11}$ $p(A \cup B) = \frac{7}{11}$, find $p(B \setminus A)$

Q.12) A die is rolled, if the outcome is an even number, what is the probability that it is a prime number.

Sec C (Short Answer Type Questions) 11Qx4M=44 marks

Q.13) Let $f: X \rightarrow Y$ be invertible function, show that f has unique inverse.

Q.14) Write in the simplest form $\tan^{-1} \left(\frac{\cos x - \sin x}{\cos x + \sin x} \right)$

Q.15) Find the inverse of a matrix A if

$$A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$$

Q.16) At what point of the curve $y=x^2$ does the tangent make an angle 45° with the x-axis.

Q.17) Using differentials find the approximate value up to 3 decimal places of $26^{1/3}$.

Q.18) Prove that $\int \sqrt{x^2 + a^2} dx = x \frac{\sqrt{x^2 + a^2}}{2} + \frac{a^2}{2} \log|x + \sqrt{x^2 + a^2}| + c$

Q.19) Prove that $\int_a^b f(x) dx = \int_a^b f(a + b - x) dx$

Q.20) If $y = \cos^{-1} x$, Find $\frac{d^2y}{dx^2}$ in terms of y alone.

Q.21) If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to \vec{c} , then find the value of λ .

Q.22) Find the coordinates of the foot of the perpendicular drawn from the origin to the plane $2x + 3y + 4z - 1 = 0$

Q.23) Solve graphically ,

Minimize or Maximize $Z = 5x + 10y$

Subject to : $x + 2y \leq 120$, $x + y \geq 60$, $x - 2y \geq 0$, $x, y \geq 0$

Section D (Long Answer Type Questions) 6Qx6M=36marks

Q.24) Using the properties of determinants, prove that

$$\begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{vmatrix} = 4a^2b^2c^2$$

(OR)

Solve the system of equations;

$$2x + 3y + 3z = 5,$$

$$x - 2y + z = -4,$$

$$3x - y - 2z = 3$$

Q.25) If $y=(x\cos x)^x + (x\sin x)^{1/x}$, Find $\frac{dy}{dx}$

(OR)

Find the values of 'a' and 'b' such that the function defined by:

$$f(x)=\begin{cases} 5, & x \leq 2 \\ ax + b, & 2 < x < 10 \\ 21, & x \geq 10 \end{cases} \text{ is a continuous function.}$$

Q.26) Evaluate $\int \frac{\sin^8 x - \cos^8 x}{1 - \sin^2 x \cos^2 x} dx$

(OR)

Find the area of the region enclosed by the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Q.27) Solve the Linear differential equation $\frac{dy}{dx} + \frac{y}{x} = x^2$

(OR)

Find the equation of the curve passing through the point (0,0) and whose differential Equation is $\frac{dy}{dx} = e^x \sin x$.

Q.28) Find the vector equation of the line passing through (1,2,3) and parallel to the planes $\vec{r} \cdot (\hat{i} - \hat{j} + 2\hat{k}) = 5$ and

$$\vec{r} \cdot (3\hat{i} + \hat{j} + \hat{k}) = 6$$

(OR)

Find the shortest distance between the lines l_1 and l_2 whose vector equations are:

$$\vec{r} = \hat{i} + \hat{j} + \lambda(2\hat{i} - \hat{j} + \hat{k}) \quad \text{and} \quad \vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu(3\hat{i} - 5\hat{j} + 2\hat{k})$$

Q.29) From a lot of 16 bulbs, which include 4 defective bulbs, a sample of 3 bulbs is drawn at random without replacement. Find the probability distribution of no. of defective bulbs drawn.

(OR)

A die is thrown 6 times. If "getting an odd number" is a success, what is the probability of

(i) 5 successes

(ii) at least 5 successes

(iii) at most 5 successes