

# JKBOSE Class 12 Maths Sample Paper

## MATHEMATICS

### Model Paper

### Class 12<sup>th</sup>

Maximum Marks: 75

Paper "B"

Time: 3 hrs

Attempt all the questions:

### Section A\_ [Long Answer Type] 5 x 5 = 25 marks

1. Prove that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc + ab + bc + ca.$$

Or

Using properties of determinants, prove that

$$\begin{vmatrix} x & x^2 & y^2 \\ y & y^2 & zx \\ z & z^2 & xy \end{vmatrix} = (x-y)(y-z)(z-x)(xy + yz + zx).$$

2. Solve the following system of equations

$$x - y + z = 4$$

$$2x + y - 3z = 0.$$

$$x + y + z = 2$$

Or

Find the inverse of matrix

$$A = \begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 1 \\ -1 & 1 & 1 \end{bmatrix}$$

3. Differentiate  $\sec\sqrt{x}$  by using first principle method.

Or

$$\text{Differentiate } \cos^{-1}\left(\frac{a + b\cos x}{b + a\cos x}\right).$$

4. Find the shortest distance between the lines  $\vec{r} = \vec{a}_1 + \lambda \vec{b}_1$  &  $\vec{r} = \vec{a}_2 + \delta \vec{b}_2$ .

Or

Prove that

$$\begin{bmatrix} \vec{a} \times \vec{b} & \vec{b} \times \vec{c} & \vec{c} \times \vec{a} \end{bmatrix} = 2 \begin{bmatrix} \vec{a} & \vec{b} & \vec{c} \end{bmatrix}.$$

5. Differentiate  $e^{\sqrt{x}}$  by using 1st principle method.

Or

Prove that  $(AB) = B' A'$ .

**Section B** [Short Answer Type]  $8 \times 3 = 24$  marks

6. Find adjoint ( $A$ ) when  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ .

7. Prove that  $a \cdot (a + b) = a$ .

8. If  $A$  and  $B$  are independent events  $P(A') = P(A \cup B) = 0.65$   
 $P(B) = x$

Find the value of  $x$ .

9. Find the domain of a function  $f(x) = \frac{1}{\sqrt{(x-2)(x-5)}}$

10. Prove that  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$ .

11. Differentiate  $(\log x)^x$ .

12. Find  $\left(\frac{1}{x}\right)^x + x^{1/x}$ .

13. Find the angle between a line  $\vec{r} = (3\vec{i} + 2\vec{j}) + \lambda(6\vec{i} + \vec{j} - \vec{k})$  and

a plane  $\vec{r} \cdot (3\vec{i} + 2\vec{j}) = 5$ .

**Section C** [Very Short Type Answers]  $10 \times 2 = 20$  marks

14. Define inversal law of matrices.

15. Define symmetric matrix.

16. Assume that  $a \cdot a' = 0$  for every  $a \in B$   
 $a + a' = 1$

Prove that  $a + a = a$ .

17. Define independent event.

18. Define probability distribution function.

19. Differentiate  $\sin^{-1} \sqrt{x}$

20. Find  $\lim_{x \rightarrow a} [x]$  when  $a$  is an integer.

21. Prove that  $\begin{bmatrix} \vec{a} + \vec{b} & \vec{b} + \vec{c} & \vec{c} + \vec{a} \end{bmatrix} = 0$ .

22. Find the volume of a parallelopiped when its edges are represented by

$$\vec{a} = \vec{i} + 2\vec{j}, \quad \vec{b} = \vec{j} + 2\vec{k}, \quad \vec{c} = \vec{i} + 2\vec{j} + 3\vec{k}.$$

23. Find the angle between the plane  $\vec{r} \cdot (3\vec{i} + 2\vec{j} + 5\vec{k}) = 7$  &  $\vec{r} \cdot (\vec{i} - \vec{j}) = 6$

**Section D [Objective type Questions] 6 x 1 = 6 marks**

24. If  $A$  is a non-singular matrix, then the system of equations  $AX = B, B \neq 0$

is said to be

- a] Consistent
- b] Inconsistent \_\_\_\_\_
- c] None of the above

25. If  $A$  and  $B$  are two independent events, then  $P(A' \cap B')$  is equal to

- a]  $P(A')P(B')$
- b]  $P(A') + P(B')$  \_\_\_\_\_
- c]  $1 - P(A \cap B)'$
- d]  $P(A \cup B)$

26.  $P(E)$  Where  $E$  is the event of getting a black 7 out of 52 cards drawn

- a]  $\frac{1}{26}$
- b]  $\frac{2}{25}$  \_\_\_\_\_
- c]  $\frac{2}{26}$
- d]  $\frac{1}{52}$

27. Which of the following are independent laws

- a]  $a + a = a$   
 $a \cdot a = a$  \_\_\_\_\_
- b]  $a \cdot 1 = a$   
 $a + 0 = a$  \_\_\_\_\_
- c]  $a + 1 = 1$   
 $a \cdot 0 = 0$
- d] None of the above

28. The projection of  $\vec{a}$  on  $\vec{b}$  is

- a]  $\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|}$

b]  $\frac{\vec{a} \cdot \vec{b}}{|\vec{a}|}$

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c]  $\frac{\vec{a} + \vec{b}}{|\vec{a}|}$

d] None of the above

29. The angle between the vector  $\vec{a} = \vec{i} + \vec{j} + \vec{k}$  & one of the axes is

a]  $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

b]  $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

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c]  $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$

d]  $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$