



MATHS

BOOKS - ICSE MODEL PAPER

SAMPLE PAPER 2022

Section A

1. Determine whether the binary operation $*$ on \mathbb{R} defined by $a * b = |a - b|$ is commutative. Also, find the value of $(-3) * 2$.



Watch Video Solution

2. prove that : $\tan^2(\sec^{-1} 2) + \cot^2(\cos ec^{-1} 3) = 11$.

 [Watch Video Solution](#)

3. Without expanding at any stage, find the value of the determinant :

$$\Delta = \begin{vmatrix} 20 & a & b + c \\ 20 & b & a + c \\ 20 & c & a + b \end{vmatrix}$$

 [Watch Video Solution](#)

4. If $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} 1 & -3 \\ -2 & 4 \end{bmatrix} = \begin{bmatrix} -4 & 6 \\ -9 & x \end{bmatrix}$, find x .

 [Watch Video Solution](#)

5. Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3axy$



[Watch Video Solution](#)

6. The edge of a variable cube is increasing at the rate of 10 cm/sec. How fast is the volume of the cube increasing when the edge is 5 cm long ?



[Watch Video Solution](#)

7. Evaluate : $\int_4^5 |x - 5| dx$



[Watch Video Solution](#)

8. Form a differential equation of the family of the curves $y^2 = 4ax$.



[Watch Video Solution](#)

9. A bag contains 5 white, 7 red and 4 black balls. If four balls are drawn one by one with replacement, what is the probability that none is white ?



[Watch Video Solution](#)

10. Let A and B be two events such that

$$P(A) = \frac{1}{2}, P(B) = p \text{ and } P(A \cup B) = \frac{3}{5}$$

find 'p' if A and B are independent events.



Watch Video Solution

11. If the function $f: R \rightarrow R$ be defined as

$$f(x) = \frac{3x + 4}{5x - 7}, (x \neq 7/5) \text{ and}$$

$$g: R \rightarrow R \text{ be defined as } g(x) = \frac{7x + 4}{5x - 3}, (x \neq 3/5)$$

show that $(gof)(x) = (fog)(x)$.



Watch Video Solution

12. If $\cos^{-1} \frac{x}{2} + \cos^{-1} \frac{y}{3} = \theta$, then prove that

$$9x^2 - 12xy \cos \theta + 4y^2 = 36 \sin^2 \theta$$



Watch Video Solution

13. Evaluate: $\cos(2 \cos^{-1} x + \sin^{-1} x) \text{ at } x = \frac{1}{5}$.

 [Watch Video Solution](#)

14. Using properties of determinants, show that

$$\begin{vmatrix} x & p & q \\ p & x & q \\ q & q & x \end{vmatrix} = (x - p)(x^2 + px - 2q^2)$$

 [Watch Video Solution](#)

15. Verify Rolle's theorem for the function, $f(x) = -1 + \cos x$ in the interval $[0, 2\pi]$.

 [Watch Video Solution](#)

16. If $y = e^{m \sin^{-1} x}$, prove that

$$(1 - x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} = m^2 y$$



Watch Video Solution

17. The equation of tangent at (2, 3) on the curve

$$y^2 = px^3 + q \text{ is } y = 4x - 7.$$

Find the values of 'p' and 'q'.



Watch Video Solution

18. Using L Hospital's rule, evaluate :

$$\lim_{x \rightarrow 0} \frac{xe^x - \log(1+x)}{x^2}$$



Watch Video Solution

 Watch Video Solution

19. Evaluate:

$$\int \frac{dx}{\sqrt{5x - 4x^2}}$$

 Watch Video Solution

20. Evaluate : $\int \sin^3 x \cos^4 x dx$

 Watch Video Solution

21. Solve the differential equation

$$(1 + x^2) \frac{dy}{dx} = 4x^2 - 2xy$$

 Watch Video Solution

22. Three persons A, B and C shoot to hit a target. Their probabilities of hitting the target are $\frac{5}{6}$, $\frac{4}{5}$ and $\frac{3}{4}$ respectively. Find the probability that:

(i) Exactly two persons hit the target.

(ii) At least one person hits the target.

 [Watch Video Solution](#)

23. Solve the following system of linear equations using matrices :

$$x - 2y = 10, 2x - y - z = 8, -2y + z = 7$$

 [Watch Video Solution](#)

24. Show that the radius of closed right circular cylinder of given surface area maximum volume is equal to half of its height.

 [Watch Video Solution](#)

25. Prove that the area of right-angled triangle of given hypotenuse is maximum when the triangle is isosceles.

 [Watch Video Solution](#)

26.
$$\int \tan^{-1} \sqrt{\frac{1-x}{1+x}} dx$$

 [Watch Video Solution](#)

27. Evaluate :

$$\int \frac{2x + 7}{x^2 - x - 2} dx$$



[Watch Video Solution](#)

28. The probability that a bulb produced in a factory will fuse after 150 days of use is 0.05 Find the probability that out of 5 such bulb :

None will fuse after 150 days of use.



[Watch Video Solution](#)

1. The probability that a bulb produced in a factory will fuse after 150 days of use is 0.05 Find the probability that out of 5 such bulb :

Not more than one will fuse after 150 days of use.



[Watch Video Solution](#)

2. The probability that a bulb produced in a factory will fuse after 150 days of use is 0.05 Find the probability that out of 5 such bulb :

More than one will fuse after 150 days of use.



[Watch Video Solution](#)

3. The probability that a bulb produced in a factory will fuse after 150 days of use is 0.05.

Find the probability that out of 5 such bulbs:

(iv) At least one will fuse after 150 days of use.

 [Watch Video Solution](#)

4. Write a vector of magnitude of 18 units in the direction of the vector $\hat{i} - 2\hat{j} - 2\hat{k}$.

 [Watch Video Solution](#)

5. Find the angle between the two lines:

$$\frac{x+1}{2} = \frac{y-2}{5} = \frac{z+3}{4} \quad \text{and} \quad \frac{x-1}{5} = \frac{y+2}{2} = \frac{z-1}{-5}$$

 [Watch Video Solution](#)

6. Find the equation of the plane passing through the point $(2, -3, 1)$ and perpendicular to the line joining the points $(4, 5, 0)$ and $(1, -2, 4)$.

 [Watch Video Solution](#)

7. Prove that

$$\vec{a} \left[\left(\vec{b} + \vec{c} \right) \times \left(\vec{a} + 3\vec{b} + 4\vec{c} \right) \right] = \left[\vec{a} \vec{b} \vec{c} \right]$$

 [Watch Video Solution](#)

8. Using vectors, find the area of the triangle whose vertices are:

A (3, 1, 2), B (1, 1, 3) and C (4, 3, 1)



[Watch Video Solution](#)

9. Find the image of the point (3, 2, 1) in the plane $3x - y + 4z = 2$



[Watch Video Solution](#)

10. Determine the equation of the line passing through the point (- 1, 3, - 2) and perpendicular to the lines:

$$\frac{x}{1} = \frac{y}{2} = \frac{z}{3} \text{ and } \frac{x+2}{-2} = \frac{y-1}{2} = \frac{z+1}{5}$$



Watch Video Solution

11. Draw a rough sketch of the curves $y^2 = x$ and $y^2 = 4 - 3x$ and find the area enclosed between them.



Watch Video Solution

Section C

1. The selling price of a commodity is fixed at Rs 60 and its cost function is $C(x) = 35x + 250$

(i) Determine the profit function.

(ii) Find the break even points.



[Watch Video Solution](#)

2. The revenue function is given by

$$R(x) = 100x - x^2 - x^3 . \text{ Find}$$

(i) The demand function.

(ii) Marginal revenue function.



[Watch Video Solution](#)

3. For the lines of regression

$$4x - 2y = 4 \text{ and } 2x - 3y + 6 = 0, \text{ find the mean of 'x'}$$

and the mean of 'y'.



[Watch Video Solution](#)

4. The correlation coefficient between x and y is 0.6. If the variance of x is 225, the variance of y is 400, mean of x is 10 and mean of y is 20, find

(i) the equations of two regression lines.

(ii) the expected value of y when $x = 2$



[Watch Video Solution](#)

5. Find the regression coefficients b_{yx} and b_{xy} and the two lines of regression for the following data:

x 2 6 4 7 5

y 8 8 5 6 2



[Watch Video Solution](#)

6. The marginal cost of the production of the commodity

is $30 + 2x$, it is known that fixed costs are Rs 200, find

(i) The total cost.

(ii) The cost of increasing output from 100 to 200 units.



[Watch Video Solution](#)

7. The total cost function of a firm is given by

$C(x) = \frac{1}{3}x^3 - 5x^2 + 30x - 15$ where the selling price

per unit is given as Rs 6. Find for what value of x will the profit be maximum.



Watch Video Solution

8. A company uses three machines to manufacture two types of shirts, half sleeves and full sleeves. The number of hours required per week on machine M_1 , M_2 and M_3 for one shirt of each type is given in the following table :

	M_1	M_2	M_3
Half sleeves	1	2	$8/5$
Full sleeves	2	1	$8/5$

None of the machines can be in operation for more than 40 hours per week. The profit on each half sleeve shirt is Rs 1 and the profit on each full sleeve shirt is Rs 1.50.

How many of each type of shirts should be made per week to maximize the company's profit ?



Watch Video Solution