

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 2 Hours

Maximum Marks: 40

General Instructions

- (i) This question paper contains **14 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 6 carry 2 marks each.
- (iii) Section B: Questions 7 to 10 carry 3 marks each.
- (iv) Section C: Questions 11 to 14 carry 4 marks each.
- (v) Question 14 is a case study with two subparts, each carrying 2 marks.
- (vi) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (vii) Use of calculators is not allowed.

Section A

1. The foot of a perpendicular drawn from the point $(-2, -1, -3)$ on a plane is $(1, -3, 3)$. Find the equation of the plane.

2. A coin is tossed twice. The following table shows the probability distribution of number of tails:

X	0	1	2
$P(X)$	K	$6K$	$9K$

(a) Find the value of K .

(b) Is the coin tossed biased or unbiased? Justify your answer.

3. (a) If $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2 = 400$ and $|\vec{b}| = 5$, then find the value of $|\vec{a}|$.

OR

(b) Find all the possible vectors of magnitude $5\sqrt{3}$ which are equally inclined to the coordinate axes.

4. Find the general solution of the differential equation $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$.

5. Evaluate: $\int_0^1 x^2 e^x \, dx$.

6. There are two bags. Bag I contains 1 red and 3 white balls, and Bag II contains 3 red and 5 white balls. A bag is selected at random and a ball is drawn from it. Find the probability that the ball so drawn is red in colour.

Section B

7. Using integration, find the area of the region $\{(x, y) : y^2 \leq x \leq y\}$.

8. (a) If a line makes 60° and 45° angles with the positive directions of x -axis and z -axis respectively, then find the angle that it makes with the positive direction of y -axis. Hence, write the direction cosines of the line.

OR

(b) Check whether the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ are skew or not.

9. (a) Find: $\int \frac{1}{e^x + 1} dx$.

OR

(b) Evaluate: $\int_1^4 (|x| + |3-x|) dx$.

10. If $\vec{a}$ and $\vec{b}$ are two vectors of equal magnitude and θ is the angle between them, then prove that

$$\frac{|\vec{a} + \vec{b}|}{|\vec{a} - \vec{b}|} = \cot\left(\frac{\theta}{2}\right).$$

11. (a) Find the particular solution of the differential equation $x \frac{dy}{dx} + y + \frac{1}{1+x^2} = 0$, given that $y(1) = 0$.

OR

(b) Find the general solution of the differential equation $x(y^3 + x^3) dy = (2y^4 + 5x^3y) dx$.

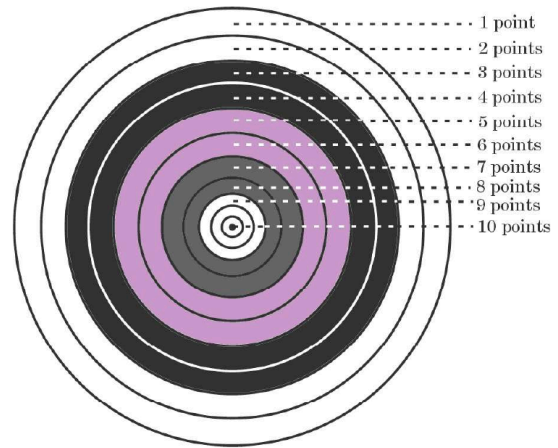
12. Evaluate: $\int_0^\pi \frac{x}{9 \sin^2 x + 16 \cos^2 x} dx$.

13. Find the equations of the planes passing through the line of intersection of the planes $\vec{r} \cdot (\hat{i} + 3\hat{j}) = 6$ and $\vec{r} \cdot (3\hat{i} - \hat{j} - 4\hat{k}) = 0$, which are at a distance of 1 unit from the origin.

14. Case-Study Based Question

In a game of Archery, each ring of the Archery target is valued. The centremost ring is worth 10 points and rest of the rings are allotted points 9 to 1 in sequential order moving outwards.

Archer A is likely to earn 10 points with a probability of 0.8 and Archer B is likely to earn 10 points with a probability of 0.9.



Based on the above information, answer the following questions:

If both of them hit the Archery target, then find the probability that

14(a). Exactly one of them earns 10 points.

14(b). Both of them earn 10 points.

- End of Question Paper -