

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. A bag contains 3 red and 4 white balls. Three balls are drawn at random, one-by-one without replacement from the bag. If the first ball drawn is red in colour, then find the probability that the remaining two balls drawn are also red in colour.

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. 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.

4. (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.

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

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

Section B

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

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

OR

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

9. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are mutually perpendicular vectors of equal magnitude, then prove that the vector $(2\vec{a} + \vec{b} + 2\vec{c})$ is equally inclined to both $\vec{a}$ and $\vec{c}$. Also, find the angle between $\vec{a}$ and $(2\vec{a} + \vec{b} + 2\vec{c})$.

10. (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.

Section C

11. 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.

12. (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

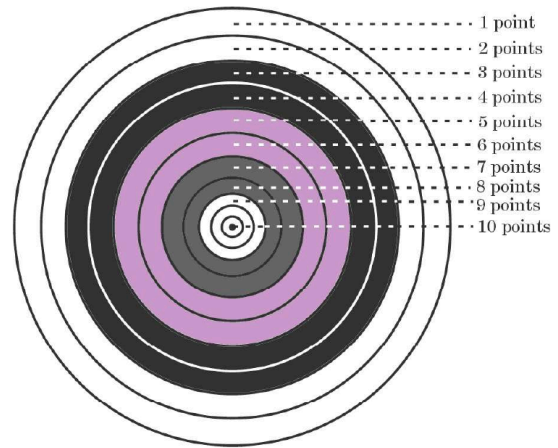
(b) Find the general solution of the differential equation $x(y^3 + x^3) dy = (2y^4 + 5x^3y) dx$.

13. Evaluate: $\int_0^{\pi/2} (2 \log \cos x - \log \sin 2x) dx$.

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 -