

CBSE EXAMINATION PAPER-2022

MATHEMATICS

(Solved)

Time allowed : 3 hours

Maximum Marks : 48

General Instructions :

Read the following instructions carefully and follow them :

- i. This question paper contains **18 questions**. All questions are **compulsory**.
- ii. This question paper is divided into **4 sections**.
- iii. **Section A** – questions number **1 to 1** are case based questions
- iv. **Section B** – questions number **2 to 8** are very short answer
- v. **Section C** – questions number **9 to 14** are short answer
- vi. **Section D** – questions number **15 to 18** are long answer
- vii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.
- viii. Use of calculator is NOT allowed.

Section A

Question 1.

Electrical transmission wires which are laid down in winters are stretched tightly to accommodate expansion in summers.

Two such wires lie along the following lines:

$$l_1: x+1/3=y-3/-2=z+2/-1$$

$$l_2: x/-1=y-7/3=z+7/-2$$

(1) Find the point of intersection of the lines l_1 and l_2 .

[2 Marks]

(2) Are the lines l_1 and l_2 coplanar? Justify your answer.

[2 Marks]

Section B

Question 2.

Find the sum of the order and the degree of the differential equation. $(x + dy/dx)^2 = (dy/dx)^2 + 1$

[2 Marks]

Question 3.

In a parallelogram PQRS, $\vec{PQ} = 3\hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{PR} = \hat{i} - 2\hat{k}$. Find $|\vec{PS}|$ and $|\vec{QR}|$

[2 Marks]

Question 4.

If $d/dx[F(x)] = \sec^4 x / \operatorname{cosec}^4 x$ and $F(\pi/4) = \pi/4$ then find $F(x)$.

[2 Marks]

Question 5. Two balls are drawn at random from a bag containing 2 red balls and 3 blue balls without replacement. Let variable X denote the number of red balls drawn. Find the probability distribution of X .

[2 Marks]

Question 6. Find the values of λ for which the distance of point $(2, 1, \lambda)$ from the plane $5x + 4y + 2z = 11$ is $2\sqrt{3}$ units.

[2 Marks]

Question 7.

Let A and B be two events such that $P(A) = 5/8$, $P(B) = 1/2$ and $P(A/B) = 3/4$. Find the value of $P(B/A)$.

[2 Marks]

Question 8.

Find: $\int \log x - 3 / (\log x)^4 dx$

[2 Marks]

Section C

Question 9.

If \mathbf{a} , \mathbf{b} , \mathbf{c} and \mathbf{d} are four non-zero vectors such that $\mathbf{a} + \mathbf{b} + \mathbf{c} + \mathbf{d} = \mathbf{0}$ and $\mathbf{a} \cdot \mathbf{b} = 4\mathbf{c} \cdot \mathbf{d}$ then show that $(\mathbf{a} \cdot \mathbf{c})$ is parallel to $(\mathbf{b} \cdot \mathbf{d})$ where $\mathbf{a} \neq 2\mathbf{c}$ and $\mathbf{b} \neq 2\mathbf{d}$

[3 Marks]

Question 10.

The two adjacent sides of a parallelogram are represented by $2\mathbf{i} - 4\mathbf{j} - 5\mathbf{k}$ and $2\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$. Find the unit vectors parallel to its diagonals. Using the diagonal vectors, find the area of the parallelogram also.

[3 Marks]

Question 11.

Find the vector equation of the plane passing through the intersection of the planes $\mathbf{r} \cdot (2\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}) = 7$ and $\mathbf{r} \cdot (2\mathbf{i} + 5\mathbf{j} + 3\mathbf{k}) = 9$ and through the point $(2, 1, 3)$

[3 Marks]

Question 12.

Find $\int dx / \sqrt{x} + \sqrt[3]{x}$

[3 Marks]

Question 13.

Evaluate

[3 Marks]

Question 14.

Find the particular solution of the differential equation $x \frac{dy}{dx} + x \cos^2\left(\frac{y}{x}\right)$, given that when $x=1, y=\frac{\pi}{4}$

[3 Marks]

Section D

Question 15.

Using integration, find the area of the region $\{(x, y): 4x^2 + 9y^2 \leq 36, 2x + 3y \geq 6\}$.

[4 Marks]

Question 16.

Using integration, find the area of the region bounded by lines $x - y + 1 = 0, x = -2, x = 3$ and x -axis.

[4 Marks]

Question 17.

A card from a pack of 52 playing cards is lost. From the remaining cards, 2 cards are drawn at random without replacement, and are found to be both aces. Find the probability that lost card being an ace.

[4 Marks]

Question 18.

Evaluate :

[4 Marks]
