

CBSE 12th Mathematics 2016 Unsolved Paper Outside Delhi

TIME - 3HR. | QUESTIONS - 26

THE MARKS ARE MENTIONED ON EACH QUESTION

Question numbers 1 to 6 carry 1 mark each.

SECTION - A

Q.1. If $x \in \mathbb{R}$ and $\left| \frac{x+3}{-3x} - \frac{2}{2x} \right| = 0$, then find the value of x . *1 mark*

Q.2. Use elementary column operation $C_2 \rightarrow C_2 + 2C_1$ in the following matrix equation:

$$\begin{pmatrix} 2 & 1 \\ 2 & 0 \end{pmatrix} = \frac{3}{2} \begin{pmatrix} 1 \\ 0 \end{pmatrix} - \frac{1}{1} \begin{pmatrix} 1 \\ 1 \end{pmatrix}. \quad 1 \text{ mark}$$

Q.3. Write the number of all possible matrices of order 2×2 with each entry 1, 2 or 3. *1 mark*

Q.4. Write the position vector of the point which divides the join of points with position vectors $3\vec{a} - 2\vec{b}$ and $2\vec{a} + 3\vec{b}$ in the ratio 2 : 1. *1 mark*

Q.5. Write the number of vectors of unit length perpendicular to both the vectors of unit length perpendicular to both the vectors $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + \hat{k}$. *1 mark*

Q.6. Find the vector equation of the plane with intercepts 3, -4 and 2 on x , y and z - axis respectively. *1 mark*

SECTION - B

Question numbers 7 to 19 carry 4 marks each.

Q.7. Find the coordinates of the point where the line through the points A (3, 4, 1) and B (5, 1, 6) crosses the XZ plane. Also find the angle which this line makes with the XZ plane. *4 marks*

Q.8. The two adjacent sides of parallelogram are $2\hat{i} - 4\hat{j} + 5\hat{k}$ and $2\hat{i} + 2\hat{j} + 3\hat{k}$. Find the two unit vectors parallel to its diagonals. Using the diagonal vectors, find the area of the parallelogram. *4 marks*

Q.9. In a game, a man wins Rs5 for getting a number greater than 4 and loses Rs1 otherwise, when a fair die is thrown. The man decided to throw a die thrice but to quit as and when he gets a number greater than 4. Find the expected value of the amount he win/lose. *4 marks*

OR

A bag contains 4 balls. Two balls are drawn at random (without replacement) and are found to be white. What is the probability that all balls in the bag are white?

Q.10. Differentiate $x^{\sin x} + (\sin x)^{\cos x}$ with respect to x . 4 marks

OR

If $y = 2 \cos(\log 3) + 3 \sin(\log x)$,

$$x^2 \frac{d^2 y}{dx^2} + \frac{dy}{dx} + y = 0.$$

Q.11. If $x = a \sin 2t$ (1 and $y = 2b \cos 2t$), find $\frac{dy}{dx}$ at $t = \frac{\pi}{4}$. 4 marks

Q.12. The equation to tangent at (2, 3) on the curve $y^2 = ax + b$ is $y = 4x$. Find the values of a and b . 4 marks

Q.13. Find: 4 marks

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

Q.14. Evaluate: 4 marks

$$\int_0^{\frac{\pi}{2}} \frac{\sin^2 x}{\sin x + \cos x} dx$$

OR

Evaluate:

$$\int_0^{3/2} |x \cos \pi x| dx$$

Q.15. Find: 4 marks

$$\int (3x + 1) \sqrt{14 - 3x^2} dx$$

Q.16. Solve the differential equation: 4 marks

$$y + \frac{dy}{dx} = x \frac{dy}{dx} y$$

Q.17. From the differential equation, the family of circle in the second quadrate and touching the coordinate axes. *4 marks*

Q.18. Solve the equation for x : *4 marks*

$$\sin^{-1} x + \sin^{-1}(1 - x) = \cos^{-1} x.$$

OR

If

$$\cos^{-1} \frac{x}{a} + \cos^{-1} \frac{y}{b} = \alpha,$$

Prove that:

$$\frac{x^2}{a^2} - \frac{xy}{ab} \cos \alpha + \frac{y^2}{b^2} = \sin^2 \alpha.$$

Q.19. A trust invested some money in two type of bonds. The first bond pays 10% interest and second bond pays 12% interest. The trust received Rs2,800 as interest. However, if trust had interchanged money in bonds, they would have got Rs100 as interest. Using matrix method find the amount invested by the trust. Interest received on this amount will be given to Helpage India as donation. Which value is reflected in this questions? *4 marks*

SECTION – C

Question numbers 20 to 26 carry 6 marks each.

Q.20. There are two types of fertilizers 'A' and 'B'. 'A' consists of 12% nitrogen and 5% phosphoric acid whereas 'B' consist of 4% nitrogen and 5% phosphoric acid. After testing the soil conditions, farmer finds that he needs at least 12 kg of nitrogen and 12 kg of phosphoric acid for his crops. If 'A' costs Rs 10 per kg and 'B' cost Rs 8 per kg, then graphically determine how much of each type of fertilizer should be used so that nutrient requirements are met at a minimum cost. *6 marks*

Q.21. Five bad oranges are accidentally mixed with 20 good ones. If four oranges are drawn one by one successively with replacement, then find the probability distribution of number of bad oranges drawn. Hence, find the mean and variance of the distribution. *6 marks*

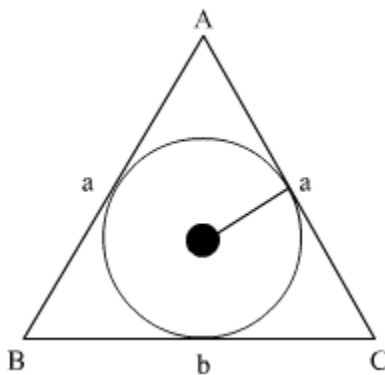
Q.22. Find the position vector of the foot of perpendicular and the perpendicular distance from the point P with position vector $2\hat{i} + 3\hat{j} + 4\hat{k}$ to the plane $\vec{r} \cdot (2\hat{i} + \hat{j} + 3\hat{k}) = 26$. Also find image of P in the plane. *6 marks*

Q.23. Show that the binary operation $*$ on $A = \mathbb{R} - \{-1\}$ defined as $a * b = a + b + ab$ for all $a, b, \in A$ is commutative and associative on A. Also find the identity element of $*$ in A and prove that every element of A is invertible. *6 marks*

Q.24. Prove that the least perimeter of an isosceles triangle in which a circle of radius r can be inscribed is $6\sqrt{3}r$. 6 marks

OR

If the sum of lengths of hypotenuse and a side of right angled triangle is given, show that area of triangle is maximum, when the angle between them is $\frac{\pi}{3}$.



Q.25. Prove that the curves $y^2 = 4x$ and $x^2 = 4y$ are in three equal parts. 6 marks

Q.26. using properties or determinants, show that ΔABC is isosceles if: 6 marks

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 + \cos A & 1 + \cos B & 1 + \cos C \\ \cos^2 A + \cos A & \cos^2 B + \cos B & \cos^2 C + \cos C \end{vmatrix} = 0$$

OR

A shopkeeper has 3 varieties of pens 'A', 'B' and 'C'. Meenu purchased 1 pen of each variety for a total of Rs 21. Jeevan purchased 4 pens of 'A' variety, 3 pens of 'B' variety and 2 pens of 'C' variety for Rs 60. While Shikha purchased 6 pens of 'A' variety, 2 pens of 'B' variety and 3 pens of 'C' variety for Rs 70. Using matrix method, find cost of each variety of pen.