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BRILLIANT INTERNATIONAL
Olympiad of MATHEMATICS

Class-XII (Syllabus and Sample Question Paper)

Relations and Functions, Binary Operation, Matrix and Determinants, Continuity and Differentiability, Differentiation, Application of Derivatives, Inverse Trigonometric Function, Indefinite and Definite Integration, Application of Integral, Differential Equation, **Coordinate Geometry, Solid Geometry** : (Straight Line, Plane, Sphere), Probability, Permutation and Combination, Central Tendency, Variance and Standard Deviation, Random Variable and Its Distribution, Non-Verbal Reasoning (I.Q. Test)

The Actual Question Paper Contains 40 Questions. The Duration of the Test Paper is 60 Minutes

1. The lines $a(a^2 + 1)\,x - y + b = 0$ and $(a^2 + 1)^2\,x + (p^2 + 1)\,y + 2b$ are perpendicular to a common line for:

(A) Exactly one value of a
(B) Exactly two values of a
(C) More than two values of a
(D) No value of a
(E) None of these

2. If the pair of lines $px^2 + 2(p + q)\,xy + qy^2 = 0$ lie along diameters of a circle and divide the circle into four sectors such that the area of one of the sectors is thrice the area of another sector, then

(A) $3p^2 - 2pq + 3q^2 = 0$
(B) $3p^2 - 10pq + 3q^2 = 0$
(C) $3p2 + 2pq + 3b^2 = 0$
(D) $3p^2 + 10\,pq + 3q^2 = 0$
(E) None of these

3. There are three circles with radii 3cm, 4cm and 5cm touches each other internally. If P is the point of intersection of tangents to these circles at their point of contact, then the sum of the distances from points of contacts is?

(A) $3\sqrt{5}$ cm
(B) $12\sqrt{5}$ cm
(C) $5\sqrt{3}$ cm
(D) $4\sqrt{3}$ cm
(E) None of these

4. Read the following statements carefully:

Statement 1: Length of Latus rectum of the parabola $(x + 2y + 2)^2 = 4\sqrt{5}\,(2x - y + 1)$ is $4\sqrt{5}$

Statement 2: The length of Latus rectum of the parabola $(y - a)^2 = 4\sqrt{5}\,(x - b)$ is $4\sqrt{5}$.

(A) Statement 1 is true, but statement 2 is false.
(B) Statement 1 is false, but statement 2 is true.
(C) Both the statements are true.
(D) Both the statements are false.

5. **If α and β are eccentric angles of a focal chord of an ellipse, then the eccentricity of the ellipse is?**

(A) $\frac{Cos\alpha + Cos\beta}{Cos(\alpha+\beta)}$ (B) $\frac{Sin\alpha + Sin\beta}{Sin(\alpha-\beta)}$ (C) $\frac{Cos\alpha - Cos\beta}{Cos(\alpha-\beta)}$ (D) $\frac{Sin\alpha + Sin\beta}{Sin(\alpha+\beta)}$

(E) None of these

6. **Let $\vec{a} = 2\hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} + \hat{j}$. If $\vec{c}$ is a vector such that $\vec{a}.\vec{c} = |\vec{c}|$, $|\vec{c} - \vec{a}| = \sqrt{5}$ and the angle between $\vec{a} \times \vec{b}$ and $\vec{c}$ is 30°, then $|(\vec{a} \times \vec{b}) \times \vec{c}|$ is equal to?**

(A) $\frac{2}{3}$ (B) $\frac{\sqrt{3}}{2}$ (C) 2 (D) 3

(E) None of these

7. **The value of $\int \frac{\sin x + \cos x}{\sqrt{1 - \sin 2x}}\,dx$ is equal to?**

(A) $\sqrt{\sin 2x} + c$ (B) $\sqrt{\cos 2x} + c$

(C) $\pm(\sin x - \cos x) + c$ (D) $\log(\sin x - \cos x) + c$

(E) None of these

8. **The primitive of the function $f(x) = \left(1 - \frac{1}{x^2}\right) a^{x+\frac{1}{x}}$, a > 0 is ?**

(A) $\frac{a^{x+\frac{1}{x}}}{\log_e a}$ (B) $\log_e a$, $a^{x+\frac{1}{x}}$ (C) $\frac{a^{x+\frac{1}{x}}}{n}\log_e a$ (D) $n\frac{a^{x+\frac{1}{x}}}{\log_e a}$

(E) None of these

9. **If y (0) = 1, then the solution of $\frac{dy}{dx} = y\sin 2x$ is?**

(A) $y = e^{\sin x}$ (B) $y = e^{\sin x^2}$ (C) $y = e^{\sin^2 x}$ (D) $\log y = e^{\sin^2 x}$

(E) None of these

10. **Assume that a spherical rain drop evaporates at rate proportional to its surface area. If its radius originally is 3mm and 1 hour later it has been reduced to 2mm, then which one of the following is the expression for the radius of the rain drop at any time ?**

(A) $r = 3 - t$ and $0 \le t \le 3$ (B) $r - t = 3$ and $t \le 3$

(C) $3 - t^2$ and $0 \le + \le 3$ (D) $r^2 - t^2 = 3$ and $t \le 3$

(E) None of these

11. $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ and the position vectors of the points A, B, C, D such that no three of them are collinear and $\vec{a} + \vec{c} = \vec{b} + \vec{d}$, then ABCD is a?

(A) Rhombus
(B) Rectangle
(C) Square
(D) Parallelogram
(E) None of these

12. The shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$ is ?

(A) $\sqrt{3}$ (B) $2\sqrt{30}$ (C) $5\sqrt{30}$ (D) $3\sqrt{30}$
(E) None of these

13. A random variable has the following probability distribution.

n :	0	1	2	3	4	5	6	7
P(n) :	0	2p	2p	3P	p2	2p2	7p2	2p

The value of p is?

(A) $\frac{1}{10}$ (B) -1 (C) $-\frac{1}{10}$ (D) Both (B) and (C)
(E) None of these

14. Let R_+ be the set of all positive real numbers. Let f: R $[4, \infty[$: $f(n) = x^2 + 4$. Then the $f^{-1}$is given by?

(A) $f^{-1} : [4, \infty[\to R_+ : f^{-1}(y) = \sqrt{y-4}$
(B) $f^{-1} :]4, \infty[\to R_+ : f^{-1}(y) = \sqrt{y-4}$
(C) $f^{-1} : [4, \infty] \to R_+ : f^{-1}(y) = \sqrt{y+4}$
(D) $f^{-1} : [4, \infty[\to R_+ : f^{-1}(y) = \sqrt{y-4}$
(E) None of these

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15. If $A = \begin{bmatrix} Cos\theta & Sin\theta \\ -Sin\theta & Cos\theta \end{bmatrix}$, then A^n is equal to?

(A) $\begin{bmatrix} Cos^n\theta & Sin^n\theta \\ -Sin^n\theta & Cos^n\theta \end{bmatrix}$
(B) $\begin{bmatrix} Cos\theta^n & Sin\theta^n \\ -Sin\theta^n & Cos\theta^n \end{bmatrix}$
(C) $\begin{bmatrix} Cos\, n\theta & Sin\, n\theta \\ -Sin\, n\theta & Cos\, n\theta \end{bmatrix}$
(D) $\begin{bmatrix} Cos\, n^2\theta & Sin\, n^2\theta \\ -Sin\, n^2\theta & Cos\, n^2\theta \end{bmatrix}$
(E) None of these

ANSWERS

1. A	2. C	3. A	4. B	5. D
6. B	7. D	8. A	9. C	10. A
11. D	12. D	13. A	14. A	15. C