JEE MAINS MATHS SOLUTIONS

YEAR 2010

Ques No.	Question
1	**JEE MAINS MATHS SOLUTIONS - 2010** Let $\cos(\alpha+\beta)=\frac{4}{5}$ and let $s \in (\alpha\beta)=\frac{5}{13}$ where $0 \le \alpha, \beta \le \frac{\pi}{4}$, then $tan2\alpha =$ (1) $\frac{56}{33}$ (2) $\frac{19}{12}$ (3) $\frac{20}{7}$ (4) $\frac{25}{16}$ Watch Free Video Solution on Doubtnut
2	**JEE MAINS MATHS SOLUTIONS - 2010** Let S be a non-empty subset of R. Consider the following statement: P: There is a rational number $x \in S$ such that $x > 0$. Which of the following statements is the negation of the statement P ? There is no rational number $x \in S$ such that $x \le 0$ (9) Every rational number $x \in S$ satisfies $x \le 0$ (18) $x \in S$ and $x \le 0 \Rightarrow x$ (27) is not rational There is a rational number $x \in S$ such that $x \le 0$ (36) Watch Free Video Solution on Doubtnut
3	**JEE MAINS MATHS SOLUTIONS - 2010** Let $\vec{a}=\hat{j}-\hat{k}$ and $\vec{c}=\hat{i}-\hat{j}-\hat{k}$. Then vector $\vec{b}$ satisfying $\vec{a}\times\vec{b}+\vec{c}=\vec{0}$ and $\vec{a}\cdot\vec{b}=3$ is (1) $2\vec{i}-\vec{j}+2\vec{k}$ (2) $\hat{i}-\hat{j}-2\hat{k}$ (3) $\hat{i}+j-2\hat{k}$ (4) $-\hat{i}+\hat{j}-2\hat{k}$ Watch Free Video Solution on Doubtnut

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4	**JEE MAINS MATHS SOLUTIONS - 2010** The equation of the tangent to the curve $y = x + \frac{4}{x^2}$, that is parallel to the x-axis, is (1) $y = 1$ (2) $y = 2$ (3) $y = 3$ (4) $y = 0$ Watch Free Video Solution on Doubtnut
5	**JEE MAINS MATHS SOLUTIONS - 2010** Solution of the differential equation $\cos x dy = y(\sin x$ $- y)dx, 0 < x < \frac{\pi}{2}$ Watch Free Video Solution on Doubtnut
6	**JEE MAINS MATHS SOLUTIONS - 2010** The area bounded by the curves $y = \cos x and y$ $= \sin x$ between the ordinates $x = 0 and x = \frac{3\pi}{2}$ is (1) $4\sqrt{2} + 2$ (2) $4\sqrt{2}1$ (3) $4\sqrt{2} + 1$ (4) $4\sqrt{2}2$ Watch Free Video Solution on Doubtnut
7	**JEE MAINS MATHS SOLUTIONS - 2010** If two tangents drawn from a point P to the parabola $y^2 = 4x$ are at right angles, then the locus of P is Watch Free Video Solution on Doubtnut

8

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If the vectors
$\vec{a} = \hat{i} - \hat{j} + 2\vec{k}$,
$\vec{b} = 2\hat{i} + 4\hat{j}$
$+ \hat{k} and \vec{c} = \lambda\hat{i} + \hat{j}$
$+ m\hat{k}$
are mutually orthogonal, then $(\lambda, \mu) =$ (1) $(2, 3)$ (2) $(2, 3)$ (3) $(3, 2)$ (4) $(3, 2)$

9

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Consider the following relations: R = {(x, y) | x, y are real numbers and x = wy for some rational number w};
S
$= \left\{ \left(\frac{m}{n}, \right.\right.$
$\frac{p}{q}$
$\left.\left. \right) \mathrm{m, n, pandq are integers such that n, q \neq 0 and q m = p n} \right\}$
. Then (1) neither R nor S is an equivalence relation (2) S is an equivalence relation but R is not an equivalence relation (3) R and S both are equivalence relations (4) R is an equivalence relation but S is not an equivalence relation

10

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Let $f: R \to R$ be defined by
$f(x) = \{k - 2x,$
$\text{if } \ x \leq \ -12x$
$+ 3, fx \succ 1\}$
. If f has a local minimum at $x = 1$, then a possible value of k is (1) 0 (2) $-\frac{1}{2}$ (3)

-1 (4) 1

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11

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The number of 3 ´ 3 non-singular matrices, with four entries as 1 and all other entries as 0, is (1) 5 (2) 6 (3) at least 7 (4) less than 4

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Four numbers are chosen at random (without replacement) from the set {1, 2, 3, ..., 20}. Statement-1: The probability that the chosen numbers when arranged in some order will form an AP Is $\frac{1}{85}$. Statement-2: If the four chosen numbers from an AP, then the set of all possible values of common difference is {1, 2, 3, 4, 5}.

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Statement-1: The point A(3, 1, 6) is the mirror image of the point B(1, 3, 4) in the plane $xy + z = 5$. Statement-2: The plane x $xy + z = 5$ bisects the line segment joining A(3, 1, 6) and B(1, 3, 4). (1) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1 (2) Statement-1 is true, Statement-2 is false (3) Statement-1 is false, Statement-2 is true (4) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1

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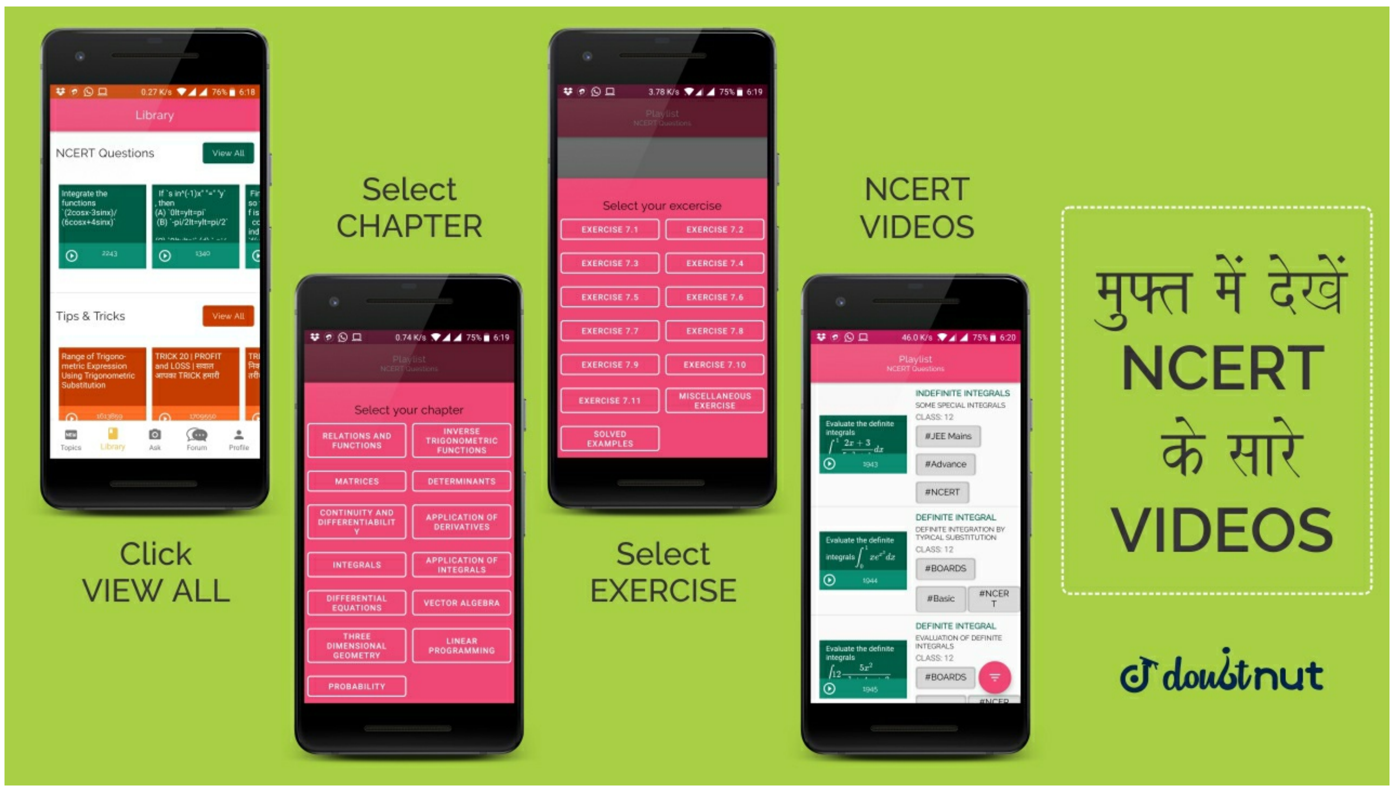
14	Let $S_1 = \sum_{j=1}^{10} j(j-1)^{10}C_j, S_2 = \sum_{j=1}^{10} j^{10}C_i(\text{andS})_3 = \sum_{j=1}^{10} j^{2\,10}\mathrm{C_{j.}}$ Statement-1: $S_3 = 55 \times 2^9$ Statement-2: $S_1 = 90 \times 2^8 and S_2 = 10 \times 2^8$. (1) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1 (2) Statement-1 is true, Statement-2 is false (3) Statement-1 is false, Statement-2 is true (4) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1 Watch Free Video Solution on Doubtnut
15	**JEE MAINS MATHS SOLUTIONS - 2010** Let A be a 2×2 matrix with non-zero entries and let $A^2 = I$, where I is 2×2 identity matrix. Define Tr(A) = sum of diagonal elements of A and |A| = determinant of matrix A. Statement-1: $Tr(A) = 0$ Statement-2: $\|A\| = 1$ (1) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1 (2) Statement-1 is true, Statement-2 is false (3) Statement-1 is false, Statement-2 is true (4) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1 Watch Free Video Solution on Doubtnut
	
16	**JEE MAINS MATHS SOLUTIONS - 2010** Let f: R R be a continuous function defined by $f(x) = \frac{1}{e^x + 2e^{-x}}$. Statement-1: $f(c) = \frac{1}{3}$, for some $c \in R$. Statement-2: $0 < f(x) \le \frac{1}{2\sqrt{2}}$, for all $x \in R$. (1) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for

	Statement-1 (2) Statement-1 is true, Statement-2 is false (3) Statement-1 is false, Statement-2 is true (4) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1 Watch Free Video Solution on Doubtnut
17	**JEE MAINS MATHS SOLUTIONS - 2010** For a regular polygon, let r and R be the radii of the inscribed and the circumscribed circles. A false statement among the following is There is a regular polygon with $\frac{r}{R}=\frac{1}{\sqrt{2}}$ (17) There is a regular polygon with $\frac{r}{R}=\frac{2}{3}$ (30) There is a regular polygon with $\frac{r}{R}=\frac{\sqrt{3}}{2}$ (47) There is a regular polygon with $\frac{r}{R}=\frac{1}{2}$ (60) Watch Free Video Solution on Doubtnut
18	**JEE MAINS MATHS SOLUTIONS - 2010** If α and β are the roots of the equation x^2-$x+1=0$, then $\alpha^{2009}+\beta^{2009}=$ (1) 1 (2) 1 (3) 2 (4) 2 Watch Free Video Solution on Doubtnut
19	**JEE MAINS MATHS SOLUTIONS - 2010** The number of complex numbers z such that $\|z1\|=\|z+1\|=\|zi\|$ equals (1) 1 (2) 2 (3) ∞ (4) 0 Watch Free Video Solution on Doubtnut
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20	**JEE MAINS MATHS SOLUTIONS - 2010** A line AB in three-dimensional space makes angles 45^o and 120^o with the positive x-axis and the positive y-axis respectively. If AB makes an acute angle q with the positive z-axis, then q equals

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21	**JEE MAINS MATHS SOLUTIONS - 2010** The line L given by $\frac{x}{5}+\frac{y}{b}=1$ passes through the point (13, 32). The line K is parallel to L and has the equation $\frac{x}{c}+\frac{y}{3}=1$ Then the distance between L and K is (1) $\sqrt{17}$ (2) $\frac{17}{\sqrt{15}}$ (3) $\frac{23}{\sqrt{17}}$ (4) $\frac{23}{\sqrt{15}}$ Watch Free Video Solution on Doubtnut
22	**JEE MAINS MATHS SOLUTIONS - 2010** A person is to count 4500 currency notes. Let an denote the number of notes he counts in the nth minute. If $a_1 = a_2 = \dots\dots = a_{10} = 150$ and $a_{10}, a_{11}, \dots\dots$ are in A.P. with common difference 2, then the time taken by him to count all notes is (1) 34 minutes (2) 125 minutes (3) 135 minutes (4) 24 minutes Watch Free Video Solution on Doubtnut
23	**JEE MAINS MATHS SOLUTIONS - 2010** Let $f: R \to R$ be a positive increasing function with $\lim_{x \to \infty} \frac{f(3x)}{f(x)} = 1$. Then $\lim_{x \to \infty} \frac{f(2x)}{f(x)} =$ (1) $\frac{2}{3}$ (2) $\frac{3}{2}$ (3) 3 (4) 1 Watch Free Video Solution on Doubtnut
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24	Let p(x) be a function defined on R such that $p'(x) = p'(1x)$, for all $x \in [0,1], p(0) = 1$ and $p(1) = 41$. Then $\int_0^1 p(x)dx$ equals (1) 21 (2) 41 (3) 42 (4) $\sqrt{41}$ Watch Free Video Solution on Doubtnut
25	**JEE MAINS MATHS SOLUTIONS - 2010** Let $f: (1, 1) \rightarrow R$ be a differentiable function with $f(0) = -1 \quad and$ $f'(0) = 1$. Let $g(x)$ $= [f(2f(x) + 2)]^2$. Then $g'(0) =$ (1) 4 (2) 0 (3) 2 (4) 4 Watch Free Video Solution on Doubtnut
26	**JEE MAINS MATHS SOLUTIONS - 2010** There are two urns. Urn A has 3 distinct red balls and urn B has 9 distinct blue balls. From each urn two balls are taken out at random and then transferred to the other. The number of ways in which this can be done is (1) 36 (2) 66 (3) 108 (4) 3 Watch Free Video Solution on Doubtnut
27	**JEE MAINS MATHS SOLUTIONS - 2010** Consider the system of linear equations: $x_1 + 2x_2 + x_3 = 3$ $2x_1 + 3x_2 + x_3 = 3$ $3x_1 + 5x_2 + 2x_3$ $= 1$ The system has (1) exactly 3 solutions (2) a unique solution (3) no solution (4) infinite number of solutions Watch Free Video Solution on Doubtnut
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28	**JEE MAINS MATHS SOLUTIONS - 2010** An urn contains nine balls of which three are red, four are blue and two are green. Three balls are drawn at random without replacement from the urn. The probability that the three balls have different colour is (1) $\frac{2}{7}$ (2) $\frac{1}{21}$ (3) $\frac{2}{23}$ (4) $\frac{1}{3}$ Watch Free Video Solution on Doubtnut
29	**JEE MAINS MATHS SOLUTIONS - 2010** For two data sets, each of size 5, the variances are given to be 4 and 5 and the corresponding means are given to be 2 and 4, respectively. The variance of the combined data set is (1) $\frac{11}{2}$ (2) 2 (3) $\frac{13}{2}$ (4) $\frac{5}{2}$ Watch Free Video Solution on Doubtnut
30	**JEE MAINS MATHS SOLUTIONS - 2010** The circle $x^2 + y^2 = 4x + 8y$ $+ 5$ intersects the line $3x4y = m$ at two distinct points if (1) $35 < m < 15$ (2) $15 < m < 65$ (3) $35 < m < 85$ (4) $85 < m < 35$ Watch Free Video Solution on Doubtnut
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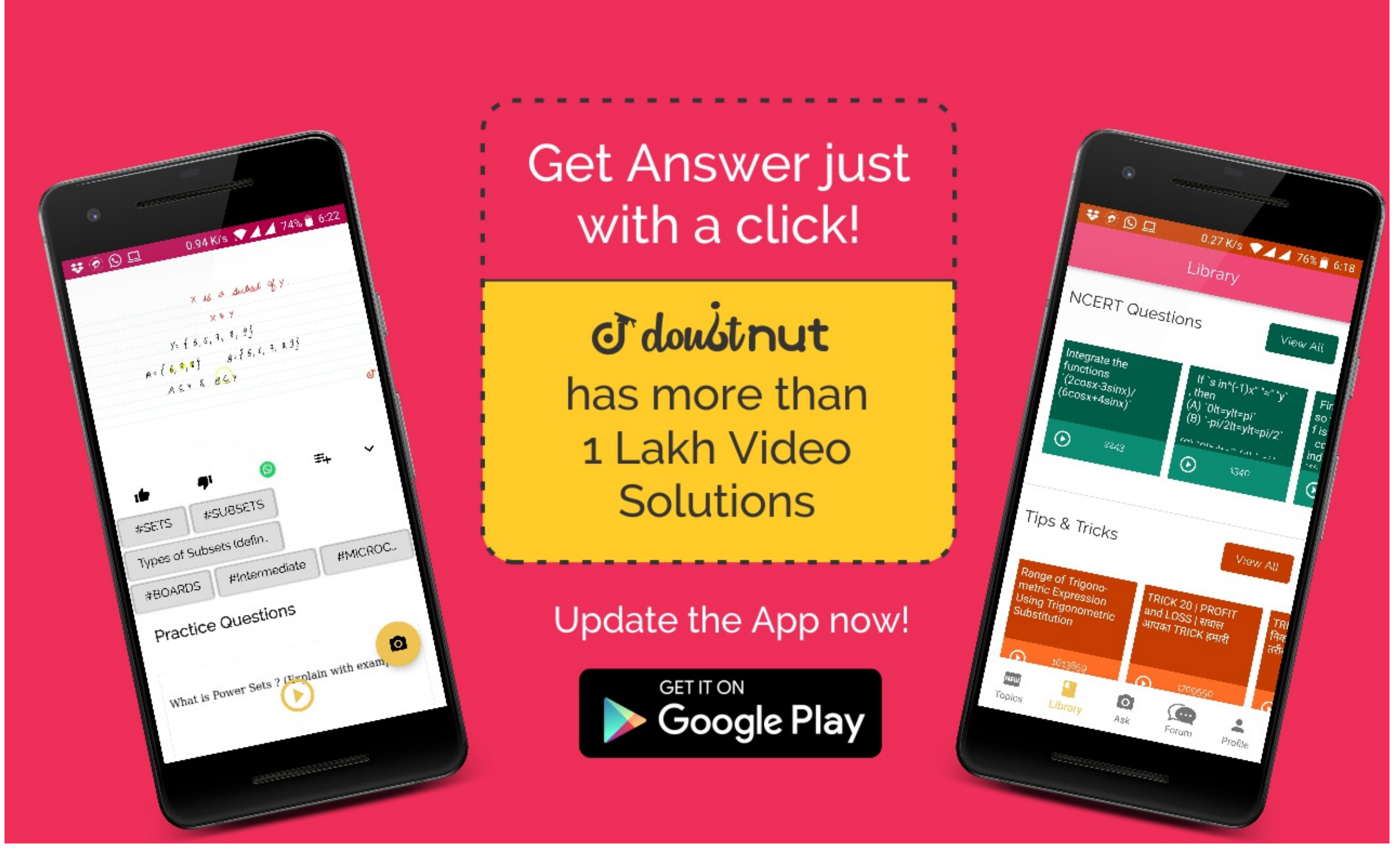

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