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## **JEE-MAIN EXAM APRIL, 2025**

Date: - 07-04-2025 (SHIFT-2)

## MATHEMATICS

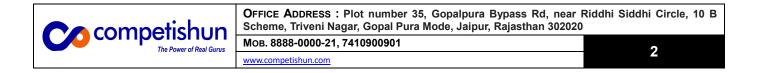
## SECTION-A

Consider the lines  $L_1: x-1=y-2=z$  and  $L_2: x-2=y=z-1$ . Let the feet of the perpendiculars 1. from the point P(5,1,-3) on the lines  $L_1$  and  $L_2$  be Q and R respectively. If the area of the triangle PQR is A, then  $4A^2$  is equal to: (1) 143(2) 151(3) 147 (4) 139Let the system of equations 2. x + 5y - z = 14x + 3y - 3z = 7 $24x + y + \lambda z = \mu$  $\lambda, \mu \in \mathbf{R}$ , have infinitely many solutions. Then the number of the solutions of this system, if x, y, z are integers and satisfy  $7 \leq x + y + z \leq 77$ , is : (3) 6(2)5(4) 4(1)3Let the length of a latus rectum of an ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  be 10. If its eccentricity is the minimum 3. value of the function  $f(t) = t^2 + t + \frac{11}{12}$ ,  $t \in \mathbf{R}$ , then  $a^2 + b^2$  is equal to : (1) 126 (3) 125 (4) 120 (2) 115 Let  $\vec{a}$  and  $\vec{b}$  be the vectors of the same magnitude such that  $\frac{|\vec{a}+\vec{b}|+|\vec{a}-\vec{b}|}{|\vec{a}+\vec{b}|-|\vec{a}-\vec{b}|} = \sqrt{2}+1$ . Then 4.  $\frac{|\vec{a}+\vec{b}|^2}{|\vec{a}|^2}$  is : (2)  $4 + 2\sqrt{2}$  (3)  $2 + \sqrt{2}$  (4)  $1 + \sqrt{2}$ (1)  $2 + 4\sqrt{2}$ If the equation of the line passing through the point  $\left(0,-\frac{1}{2},0\right)$  and perpendicular to the lines 5.  $\vec{r} = \lambda(\hat{i} + a\hat{j} + b\hat{k})$  and  $\vec{r} = (\hat{i} - \hat{j} - 6\hat{k}) + \mu(-b\hat{i} + a\hat{j} + 5\hat{k})$  is  $\frac{x-1}{-2} = \frac{y+4}{d} = \frac{z-c}{-4}$ , then a+b+c+d is equal to : (1) 14(2) 13 (3) 10 (4) 12 OFFICE ADDRESS : Plot number 35, Gopalpura Bypass Rd, near Riddhi Siddhi Circle, 10 B Scheme, Triveni Nagar, Gopal Pura Mode, Jaipur, Rajasthan 302020 competishun

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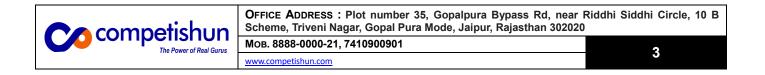
6.	Let $A = \{(\alpha, \beta) \in \mathbb{R} \times \mathbb{R} :  \alpha - 1  \leq 4 \text{ and }  \beta - 5  \leq 6\}$ and								
	$B = \{(\alpha, \beta) \in \mathbf{R} \times \mathbf{R} : 16(\alpha - 2)^2 + 9(\beta - 6)^2 \leq 144\}$ . Then								
	(1) $A \cup B = \{(x, y) : -4 \le x \le 4, -1 \le y \le 11\}$ (2) $B \subset A$								
	(3) neither $A{\subset}B$	nor $B \subset A$	(4) A ⊂ B						
7.	Let $a_n$ be the $n^{\text{th}}$ term of an A.P. If $S_n = a_1 + a_2 + a_3 + \ldots + a_n = 700, a_6 = 7$ and $S_7 = 7$ , then $a_n$ is								
	equal to:								
	(1) 64	(2) 70	(3) 56	(4) 65					
8.	If the range of the function $f(x) = \frac{5-x}{x^2-3x+2}, x \neq 1,2$ , is $(-\infty, \alpha] \cup [\beta, \infty)$ , then $\alpha^2 + \beta^2$ is equal								
	to:		-						
	(1) 192	(2) 190	(3) 194	(4) 188					
9.			-	e terms is 21 and the sum of its					
	-	velfth terms is 15309 , then							
40	(1) 755	(2) 757	(3) 760	(4) 750					
10.		sgion $\left\{(x,y): 1+x^2 \leqslant y \leqslant m\right\}$							
	(1) 46	. ,	(3) 49	(4) 50					
11.	If the locus of $z \in C$ , such that $\operatorname{Re}\left(\frac{z-1}{2z+i}\right) + \operatorname{Re}\left(\frac{\overline{z}-1}{2\overline{z}-i}\right) = 2$ , is a circle of radius r and center (a,b),								
	then $\frac{15ab}{r^2}$ is equa	al to :							
	$r^2$ is equal $r^2$	a 10 .							
	(1) 24	(2) 18	(3) 16	(4) 12					
12.	The number of solu	utions of the equation $\cos 2$	$\theta \cos \frac{\theta}{2} + \cos \frac{5\theta}{2} = 2 \cos \frac{\theta}{2}$	$\cos^3 \frac{5\theta}{2}$ in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ is :					
	(1) 5	(2) 7	(3) 9	(4) 6					
13.	If the orthocenter o	f the triangle formed by the	lines $y = x + 1, y = 4x$	-8  and  y = mx + c  is at  (3, -1),					
	then $m-c$ is :								
	(1) –1	(2) 4	(3) 0	(4) 2					
14.		The number of real roots of the equation $x   x-2   +3   x-3   +1 = 0$ is :							
	(1) 3	(2) 2	(3) 1	(4) 4					
15.	Let $y = y(x)$ be	the solution of the differ	rential equation $(x^2 + 1)$	$y' - 2xy = (x^4 + 2x^2 + 1)\cos x$ ,					
	$y(0) = 1$ . Then $\int_{-3}^{3}$	y(x)dx is:							
	(1) 24	(2) 30	(3) 18	(4) 36					



Let p be the numbe	Let p be the number of all triangles that can be formed by joining the vertices of a regular polygon $P$ of							
n sides and $q$ be the number of all quadrilaterals that can be formed by joining the								
$p\!+\!q\!=\!126$ , then	the eccentricity c	of the ellipse $\frac{x^2}{16} + \frac{y^2}{n} = 1$ i	5:					
(1) $\frac{\sqrt{7}}{4}$	(2) $\frac{1}{2}$	(3) $\frac{1}{\sqrt{2}}$	(4) $\frac{3}{4}$					
Let $f: \mathbf{R}  ightarrow \mathbf{R}$ be	a polynomial fu	nction of degree four having	g extreme values at $x = 4$ and	x = 5 . If				
$\lim_{x\to 0}\frac{f(x)}{x^2}=5, \text{ the }$	n $f(2)$ is equal t	to :						
(1) 10	(2) 8	(3) 12	(4) 14					
Let a random vari	able $X$ take va	lues 0,1,2,3 with $P(X=0)$	P(X=1) = p, P(X=2) = P	P(X=3)				
and $E(X^2) = 2E($	X) . Then the va	lue of $8p-1$ is:						
(1) 0	(2) 2	(3) 3	(4) 1					
A bag contains 19 unbiased coins and one coin with head on both sides. One coin drawn at rando								
tossed and head t	urns up. If the p	robability that the drawn c	bin was unbiased, is $\frac{m}{n}$ , gcd( $n$	(n,n)=1,				
then $n^2 - m^2$ is equivalent	ual to :							
(1) 72	(2) 64	(3) 60						
			(4) 80					
Let $\mathbf{e}_1$ and $\mathbf{e}_2$ b	e the eccentricit		(4) 80 $\frac{x^2}{5} = 1$ and the hyperbola $\frac{x^2}{16}$ -	$-\frac{y^2}{b^2}=1,$				
		ties of the ellipse $\frac{x^2}{b^2} + \frac{y}{2}$						
respectively. If b	$< 5$ and $e_1 e_2 =$	ties of the ellipse $\frac{x^2}{b^2} + \frac{y}{2}$ 1, then the eccentricity of	$\frac{x^2}{5} = 1$ and the hyperbola $\frac{x^2}{16}$ -	long the				
respectively. If b	$< 5$ and $e_1 e_2 =$	ties of the ellipse $\frac{x^2}{b^2} + \frac{y}{2}$ 1, then the eccentricity of	$\frac{x^2}{5} = 1$ and the hyperbola $\frac{x^2}{16}$ -	long the				
respectively. If be coordinate axes an	$< 5$ and $e_1 e_2 =$	ties of the ellipse $\frac{x^2}{b^2} + \frac{y}{2}$ 1, then the eccentricity of all four foci (two of the ell	$\frac{x^2}{5} = 1$ and the hyperbola $\frac{x^2}{16}$ - f the ellipse having its axes a spectrum of the hyperbola) is	long the				
respectively. If be coordinate axes are (1) $\frac{\sqrt{7}}{4}$ (2)	< 5 and $e_1e_2 =$ ad passing throug $0.\frac{4}{5}$	ties of the ellipse $\frac{x^2}{b^2} + \frac{y}{2}$ 1, then the eccentricity of the all four foci (two of the ell (3) $\frac{\sqrt{3}}{2}$ SECTION-B	$\frac{x^2}{5} = 1$ and the hyperbola $\frac{x^2}{16}$ - f the ellipse having its axes a spectrum of the hyperbola) is	long the				
respectively. If b coordinate axes and (1) $\frac{\sqrt{7}}{4}$ (2) For t > -1, let $\alpha_{t}$	< 5 and $e_1e_2 =$ and passing throug $0.\frac{4}{5}$ and $\beta_t$ be the ro	ties of the ellipse $\frac{x^2}{b^2} + \frac{y}{2}$ 1, then the eccentricity of the all four foci (two of the ell (3) $\frac{\sqrt{3}}{2}$ <b>SECTION-B</b> poots of the equation	$\frac{x^2}{5} = 1$ and the hyperbola $\frac{x^2}{16}$ - f the ellipse having its axes a spectrum of the hyperbola) is	long the				
	p+q=126, then (1) $\frac{\sqrt{7}}{4}$ Let $f: \mathbf{R} \to \mathbf{R}$ be $\lim_{x\to 0} \frac{f(x)}{x^2} = 5$ , then (1) 10 Let a random variation and $E(X^2) = 2E(x)$ (1) 0 A bag contains 19 tossed and head to then $n^2 - m^2$ is equivalent.	p+q = 126, then the eccentricity of (1) $\frac{\sqrt{7}}{4}$ (2) $\frac{1}{2}$ Let $f: \mathbf{R} \to \mathbf{R}$ be a polynomial function $\lim_{x \to 0} \frac{f(x)}{x^2} = 5$ , then $f(2)$ is equal to (1) 10 (2) 8 Let a random variable X take value and $E(X^2) = 2E(X)$ . Then the value (1) 0 (2) 2 A bag contains 19 unbiased coins a tossed and head turns up. If the polynomial function then $n^2 - m^2$ is equal to :	$p+q=126$ , then the eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{n} = 1$ is (1) $\frac{\sqrt{7}}{4}$ (2) $\frac{1}{2}$ (3) $\frac{1}{\sqrt{2}}$ Let $f: \mathbf{R} \to \mathbf{R}$ be a polynomial function of degree four having $\lim_{x\to 0} \frac{f(x)}{x^2} = 5$ , then $f(2)$ is equal to : (1) 10 (2) 8 (3) 12 Let a random variable $X$ take values 0,1,2,3 with $P(X=0)$ and $E(X^2) = 2E(X)$ . Then the value of $8p-1$ is: (1) 0 (2) 2 (3) 3 A bag contains 19 unbiased coins and one coin with head on the tossed and head turns up. If the probability that the drawn con- then $n^2 - m^2$ is equal to :	$p+q=126$ , then the eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{n} = 1$ is : (1) $\frac{\sqrt{7}}{4}$ (2) $\frac{1}{2}$ (3) $\frac{1}{\sqrt{2}}$ (4) $\frac{3}{4}$ Let $f: \mathbf{R} \to \mathbf{R}$ be a polynomial function of degree four having extreme values at $x = 4$ and $\lim_{x\to 0} \frac{f(x)}{x^2} = 5$ , then $f(2)$ is equal to : (1) 10 (2) 8 (3) 12 (4) 14 Let a random variable X take values 0,1,2,3 with $P(X=0) = P(X=1) = p, P(X=2) = F$ and $E(X^2) = 2E(X)$ . Then the value of $8p-1$ is: (1) 0 (2) 2 (3) 3 (4) 1 A bag contains 19 unbiased coins and one coin with head on both sides. One coin drawn at ratio tossed and head turns up. If the probability that the drawn coin was unbiased, is $\frac{m}{n}$ , gcd( $n$ )				

then  $72(a+b)^2$  is equal to \_\_\_\_\_.

22. Let the lengths of the transverse and conjugate axes of a hyperbola in standard form be 2a and 2b, respectively, and one focus and the corresponding directrix of this hyperbola be (-5, 0) and 5x + 9 = 0, respectively. If the product of the focal distances of a point  $(\alpha, 2\sqrt{5})$  on the hyperbola is p, then 4p is equal to \_\_\_\_\_.



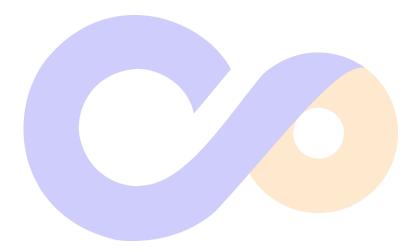
## MATHEMATICS

23. If the function 
$$f(x) = \frac{\tan(\tan x) - \sin(\sin x)}{\tan x - \sin x}$$
 is continuous at  $x = 0$ , then  $f(0)$  is equal to\_\_\_\_\_.

$$2 \times 1 \times^{20} C_4 - 3 \times 2 \times^{20} C_5 + 4 \times 3 \times^{20} C_6 - 5 \times 4 \times^{20} C_7 + \dots + 18 \times 17 \times^{20} C_{20}, \text{ is equal to} \_\_\_\_\_.$$

25. If 
$$\int \left(\frac{1}{x} + \frac{1}{x^3}\right) \left(\sqrt[23]{3x^{-24} + x^{-26}}\right) dx = -\frac{\alpha}{3(\alpha+1)} \left(3x^{\beta} + x^{\gamma}\right)^{\frac{\alpha+1}{\alpha}} + C, x > 0, (\alpha, \beta, \gamma \in \mathbb{Z}), \text{ where C is the}$$

constant of integration, then  $\alpha + \beta + \gamma$  is equal to \_\_\_\_\_ .



NTA ANSWERS													
1.	(3)	2.	(1)	3.	(1)	4.	(3)	5.	(1)	6.	(2)	7.	(1)
8.	(3)	9.	(2)	10.	(4)	11.	(2)	12.	(2)	13.	(3)	14.	(3)
15.	(1)	16.	(3)	17.	(1)	18.	(2)	19.	(4)	20.	(4)	21.	(98)
22.	(189)	23.	(2)	24.	(34)	25.	(19)						

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