JEE Main January 2026

Question Paper With Text Solution

21 January | Shift-1

MATHEMATICS

MATRIX

JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

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JEE MAIN JANUARY 2026 | 21TH JANUARY SHIFT-1

SECTION – A

Question ID : 8606541138

1. The value of $\operatorname{cosec} 10^\circ - \sqrt{3}\sec 10^\circ$ is equal to :

(1) 4 (2) 6 (3) 2 (4) 8

Ans. Official answer NTA (1)

Sol.

Question ID : 8606541128

2. The sum of all the roots of the equation $(x-1)^2 - 5|x-1| + 6 = 0$, is :

(1) 5 (2) 4 (3) 3 (4) 1

Ans. Official answer NTA (2)

Sol.

Question ID : 8606541126

3. The number of relations, defined on the set {a, b, c, d}, which are both reflexive and symmetric, is :

(1) 1024 (2) 64 (3) 256 (4) 16

Ans. Official answer NTA (2)

Sol.

Question ID : 8606541145

4. Let $f : R \to (0, \infty)$ be a twice differentiable function such that $f(3) = 18$, $f'(3) = 0$ and $f''(3) = 4$. Then

$\lim\limits_{x\to 1}\left(\log_e\left(\frac{f(2+x)}{f(3)}\right)^{\frac{18}{(x-1)^2}}\right)$ is equal to :

(1) 9 (2) 18 (3) 2 (4) 1

Ans. Official answer NTA (3)

Sol.

Question ID : 8606541133

5. Let the mean and variance of 7 observations 2, 4, 10, x, 12, 14, y, x > y, be 8 and 16 respectively. Two numbers are chosen from {1, 2, 3, x – 4, y, 5} one after another without replacement, then the probability, that the smaller number among the two chosen numbers is less than 4 , is :

(1) $\frac{4}{5}$ (2) $\frac{3}{5}$ (3) $\frac{2}{5}$ (4) $\frac{1}{3}$

Ans. Official answer NTA (1)

Sol.

Question ID : 8606541131

6. The number of strictly increasing functions f from the set {1, 2, 3, 4, 5, 6} to the set {1, 2, 3, ..., 9} such that $f(i) \neq i$ for $1 \leq i \leq 6$, is equal to :

(1) 22 (2) 28 (3) 27 (4) 21

Ans. Official answer NTA (2)

Sol.

Question ID : 8606541143

7. The area of the region, inside the ellipse $x^2 + 4y^2 = 4$ and outside the region bounded by the curves $y = |x| - 1$ and $y = 1 - |x|$, is :

(1) $3(\pi - 1)$ (2) $2\pi - \frac{1}{2}$ (3) $2(\pi - 1)$ (4) $2\pi - 1$

Ans. Official answer NTA (3)

Sol.

Question ID : 8606541144

8. Let $y = y(x)$ be the solution curve of the differential equation $(1 + x^2)dy + (y - \tan^{-1} x)dx = 0$, $y(0) = 1$. Then the value of $y(1)$ is :

(1) $\frac{2}{e^{\pi/4}} + \frac{\pi}{4} - 1$ (2) $\frac{2}{e^{\pi/4}} - \frac{\pi}{4} - 1$ (3) $\frac{4}{e^{\pi/4}} - \frac{\pi}{2} - 1$ (4) $\frac{4}{e^{\pi/4}} + \frac{\pi}{2} - 1$

Ans. Official answer NTA (1)

Sol.

Question ID : 8606541142

9. The value of $\int_{-\pi/6}^{\pi/6}\left(\frac{\pi+4x^{11}}{1-\sin\left(|x|+\frac{\pi}{6}\right)}\right)dx$ is equal to :

(1) 4π (2) 2π (3) 8π (4) 6π

Ans. Official answer NTA (1)

Sol.

Question ID : 8606541140

10. Let $\vec{c}$ and $\vec{d}$ be vectors such that $\left|\vec{c}+\vec{d}\right|=\sqrt{29}$ and $\vec{c}\times\left(2\hat{i}+3\hat{j}+4\hat{k}\right)=\left(2\hat{i}+3\hat{j}+4\hat{k}\right)\times\vec{d}$. If $\lambda_1, \lambda_2(\lambda_1>\lambda_2)$ are the possible values of $\left(\vec{c}+\vec{d}\right)\cdot\left(-7\hat{i}+2\hat{j}+3\hat{k}\right)$, then the equation

$K^2x^2+(K^2-5K+\lambda_1)xy+\left(3K+\frac{\lambda_2}{2}\right)y^2-8x+12y+\lambda_2=0$ represents a circle, for K equal to :

(1) 1 (2) -1 (3) 2 (4) 4

Ans. Official answer NTA (1)

Sol.

Question ID : 8606541129

11. If $x^2+x+1=0$, then the value of $\left(x+\frac{1}{x}\right)^4+\left(x^2+\frac{1}{x^2}\right)^4+\left(x^3+\frac{1}{x^3}\right)^4+\ldots+\left(x^{25}+\frac{1}{x^{25}}\right)^4$ is :

(1) 175 (2) 128 (3) 145 (4) 162

Ans. Official answer NTA (3)

Sol.

Question ID : 8606541132

12. If the coefficient of x in the expansion of $(ax^2+bx+c)(1-2x)^{26}$ is -56 and the coefficients of x^2 and x^3 are both zero, then $a+b+c$ is equal to :

(1) 1483 (2) 1300 (3) 1500 (4) 1403

Ans. Official answer NTA (4)

Sol.

Question ID : 8606541134

13. Let the foci of a hyperbola coincide with the foci of the ellipse $\frac{x^2}{36}+\frac{y^2}{16}=1$. If the eccentricity of the hyperbola is 5, then the length of its latus rectum is :

(1) 16 (2) $24\sqrt{5}$ (3) 12 (4) $\frac{96}{\sqrt{5}}$

Ans. Official answer NTA (4)

Sol.

Question ID : 8606541127

14. If the domain of the function $f(x)=\cos^{-1}\left(\frac{2x-5}{11-3x}\right)+\sin^{-1}\left(2x^2-3x+1\right)$ is the interval $[\alpha, \beta]$, then $\alpha+2\beta$ is equal to :

(1) 2 (2) 1 (3) 5 (4) 3

Ans. Official answer NTA (4)

Sol.

Question ID : 8606541139

15. Let (α, β, γ) be the co-ordinates of the foot of the perpendicular drawn from the point (5, 4, 2) on the line $\vec{r}=\left(-\hat{i}+3\hat{j}+\hat{k}\right)+\lambda\left(2\hat{i}+3\hat{j}-\hat{k}\right)$. Then the length of the projection of the vector $\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}$ on the vector $6\hat{i}+2\hat{j}+3\hat{k}$ is :

(1) $\frac{15}{7}$ (2) 4 (3) 3 (4) $\frac{18}{7}$

Ans. Official answer NTA (4)

Sol.

Question ID : 8606541136

16. Let PQ and MN be two straight lines touching the circle $x^2 + y^2 - 4x - 6y - 3 = 0$ at the points A and B respectively. Let O be the centre of the circle and $\angle AOB = \frac{\pi}{3}$. Then the locus of the point of intersection of the lines PQ and MN is :

(1) $x^2 + y^2 - 18x - 12y - 25 = 0$ (2) $3(x^2 + y^2) - 12x - 18y - 25 = 0$

(3) $3(x^2 + y^2) - 18x - 12y + 25 = 0$ (4) $x^2 + y^2 - 12x - 18y - 25 = 0$

Ans. Official answer NTA (2)

Sol.

Question ID : 8606541137

17. Let O be the vertex of the parabola $x^2 = 4y$ and Q be any point on it. Let the locus of the point P , which divides the line segment OQ internally in the ratio 2 : 3 be the conic C . Then the equation of the chord of C, which is bisected at the point (1, 2), is :

(1) $x - 2y + 3 = 0$ (2) $4x - 5y + 6 = 0$ (3) $5x - y - 3 = 0$ (4) $5x - 4y + 3 = 0$

Ans. Official answer NTA (4)

Sol.

Question ID : 8606541130

18. Let $a_1, a_2, a_3, \ldots$ be a G.P. of increasing positive terms such that $a_2.a_3.a_4 = 64$ and $a_1 + a_3 + a_5 = \frac{813}{7}$. Then $a_3 + a_5 + a_7$ is equal to :

(1) 3248 (2) 3252 (3) 3256 (4) 3244

Ans. Official answer NTA (2)

Sol.

Question ID : 8606541141

19. Let $\vec{a} = -\hat{i} + 2\hat{j} + 2\hat{k}$, $\vec{b} = 8\hat{i} + 7\hat{j} - 3\hat{k}$ and $\vec{c}$ be a vector such that $\vec{a} \times \vec{c} = \vec{b}$. If $\vec{c} \cdot \left(\hat{i} + \hat{j} + \hat{k}\right) = 4$, then $|\vec{a} + \vec{c}|^2$ is equal to :

(1) 30 (2) 27 (3) 35 (4) 33

Ans. Official answer NTA (2)

Sol.

Question ID : 8606541135

20. Let a point A lie between the parallel lines L_1 and L_2 such that its distances from L_1 and L_2 are 6 and 3 units, respectively. Then the area (in sq. units) of the equilateral triangle ABC, where the points B and C lie on the lines L_1 and L_2, respectively, is :

(1) $21\sqrt{3}$ (2) 27 (3) $12\sqrt{2}$ (4) $15\sqrt{6}$

Ans. Official answer NTA (1)

Sol.

SECTION – B

Question ID : 8606541149

21. Let $f : R \to R$ be a twice differentiable function such that the quadratic equation $f(x)m^2 - 2f'(x)m + f''(x) = 0$ in m, has two equal roots for every $x \in R$. If $f(0) = 1$, $f'(0) = 2$, and (α, β) is the largest interval in which the function $f(\log_e x - x)$ is increasing, then $\alpha + \beta$ is equal to _____.

Ans. Official answer NTA (1)

Sol.

Question ID : 8606541147

22. Let $a_1 = 1$ and for $n \geq 1$, $a_{n+1} = \frac{1}{2}a_n + \frac{n^2 - 2n - 1}{n^2(n+1)^2}$. Then $\left|\sum_{n=1}^{\infty}\left(a_n - \frac{2}{n^2}\right)\right|$ is equal to _____.

Ans. Official answer NTA (2)

Sol.

Question ID : 8606541148

23. Let $S = \{(m, n) : m, n \in \{1, 2, 3, ..., 50\}\}$. If the number of elements (m, n) in S such that $6^m + 9^n$ is a multiple of 5 is p and the number of elements (m, n) in S such that m + n is a square of a prime number is q, then p + q is equal to _____.

Ans. Official answer NTA (1333)

Sol.

Question ID : 8606541150

24. $6\int_0^{\pi}\left|\left(\sin 3x+\sin 2x+\sin x\right)\right|dx$ is equal to _____.

Ans. Official answer NTA (17)

Sol.

Question ID : 8606541146

25. For some $\alpha, \beta \in R$, let $A=\begin{bmatrix}\alpha & 2\\ 1 & 2\end{bmatrix}$ and $B=\begin{bmatrix}1 & 1\\ 1 & \beta\end{bmatrix}$ be such that $A^2-4A+2I=B^2-3B+I=O$. Then $\left(\det\left(\text{adj}\left(A^3-B^3\right)\right)\right)^2$ is equal to _____.

Ans. Official answer NTA (225)

Sol.