

JEE Main January 2026
Question Paper With Text Solution
23 January | Shift-2

MATHEMATICS



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

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**JEE MAIN JANUARY 2026 | 23TH JANUARY SHIFT-2****SECTION – A**

Question ID : 444792457

1. The number of ways, in which 16 oranges can be distributed to four children such that each child gets at least one orange, is :

(1) 455 (2) 429 (3) 403 (4) 384

Ans. Official answer NTA(1)

Sol.

Question ID : 444792451

2. Let $A = \{0, 1, 2, \dots, 9\}$. Let R be a relation on A defined by $(x, y) \in R$ if and only if $|x - y|$ is a multiple of 3.

Given below are two statements :

Statement-I : $n(R) = 36$.

Statement-II : R is an equivalence relation.

In the light of the above statements, choose the correct answer from the options given below :

- (1) Statement I is incorrect but Statement II is correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Both Statement I and Statement II are correct

Ans. Official answer NTA(1)

Sol.

Question ID : 444792453

3. The sum of all the real solutions of the equation $\log_{(x+3)}(6x^2 + 28x + 30) = 5 - 2\log_{(6x+10)}(x^2 + 6x + 9)$ is equal to :

(1) 0 (2) 1 (3) 4 (4) 2

Ans. Official answer NTA(1)

Sol.

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Question ID : 444792464

4. Let $\frac{\pi}{2} < \theta < \pi$ and $\cot \theta = -\frac{1}{2\sqrt{2}}$. Then the value of

$\sin\left(\frac{15\theta}{2}\right)(\cos 8\theta + \sin 8\theta) + \cos\left(\frac{15\theta}{2}\right)(\cos 8\theta - \sin 8\theta)$ is equal to :

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

Ans. Official answer NTA(1)**Sol.**

Question ID : 444792466

5. Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $\vec{a} \times \vec{b} = 2(\vec{a} \times \vec{c})$. If $|\vec{a}| = 1, |\vec{b}| = 4, |\vec{c}| = 2$, and the angle between \vec{b} and \vec{c} is 60° , then $|\vec{a} \cdot \vec{c}|$ is equal to :

- (1) 4 (2) 1 (3) 0 (4) 2

Ans. Official answer NTA(2)**Sol.**

Question ID : 444792469

6. Let $I(x) = \int \frac{3dx}{(4x+6)(\sqrt{4x^2+8x+3})}$ and $I(0) = \frac{\sqrt{3}}{4} + 20$. If $I\left(\frac{1}{2}\right) = \frac{a\sqrt{2}}{b} + c$, where $a, b, c \in \mathbb{N}$,

$\gcd(a, b) = 1$, then $a + b + c$ is equal to :

- (1) 30 (2) 31 (3) 28 (4) 29

Ans. Official answer NTA(2)**Sol.**

Question ID : 444792456

7. Let $\sum_{k=1}^n a_k = \alpha n^2 + \beta n$. If $a_{10} = 59$ and $a_6 = 7a_1$, then $\alpha + \beta$ is equal to :

- (1) 3 (2) 12 (3) 7 (4) 5

Ans. Official answer NTA(4)**MATRIX JEE ACADEMY**

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**Sol.**

Question ID : 444792458

8. Bag A contains 9 white and 8 black balls, while bag B contains 6 white and 4 black balls. One ball is randomly picked up from the bag B and mixed up with the balls in the bag A. Then a ball is randomly drawn from the bag

A. If the probability, that the ball drawn is white, is $\frac{p}{q}$, $\gcd(p, q) = 1$, then $p + q$ is equal to :

- (1) 22 (2) 23 (3) 24 (4) 21

Ans. Official answer NTA(2)**Sol.**

Question ID : 444792452

9. Consider two sets $A = \{x \in \mathbb{Z} : ||x-3|-3| \leq 1\}$ and $B = \left\{x \in \mathbb{R} - \{1, 2\} : \frac{(x-2)(x-4)}{x-1} \log_e(|x-2|) = 0\right\}$.

Then the number of onto functions $f: A \rightarrow B$ is equal to :

- (1) 79 (2) 32 (3) 62 (4) 81

Ans. Official answer NTA(3)**Sol.**

Question ID : 444792461

10. An equilateral triangle OAB is inscribed in the parabola $y^2 = 4x$ with the vertex O at the vertex of the parabola.

Then the minimum distance of the circle having AB as a diameter from the origin is :

- (1) $2(3 + \sqrt{3})$ (2) $4(6 + \sqrt{3})$ (3) $2(8 - 3\sqrt{3})$ (4) $4(3 - \sqrt{3})$

Ans. Official answer NTA(4)**Sol.**

Question ID : 444792465

11. Let $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} - \hat{k}$, $\vec{c} = \lambda\hat{i} + \hat{j} + \hat{k}$ and $\vec{v} = \vec{a} \times \vec{b}$. If $\vec{v} \cdot \vec{c} = 11$ and the length of the projection of \vec{b} on \vec{c} is p , then $9p^2$ is equal to :



(1) 12

(2) 6

(3) 4

(4) 9

Ans. Official answer NTA(1)**Sol.**

Question ID : 444792455

12. The system of linear equations

$$x + y + z = 6$$

$$2x + 5y + az = 36$$

$$x + 2y + 3z = b \text{ has :}$$

(1) unique solution for $a = 8$ and $b = 16$ (2) unique solution for $a = 8$ and $b = 14$ (3) infinitely many solutions for $a = 8$ and $b = 14$ (4) infinitely many solutions for $a = 8$ and $b = 16$ **Ans.** Official answer NTA(3)**Sol.**

Question ID : 444792454

13. If $z = \frac{\sqrt{3}}{2} + \frac{i}{2}$, $i = \sqrt{-1}$, then $(z^{201} - i)^8$ is equal to :

(1) 0

(2) 256

(3) -1

(4) 1

Ans. Official answer NTA(2)**Sol.**

Question ID : 444792470

14. The area of the region enclosed between the circles $x^2 + y^2 = 4$ and $x^2 + (y - 2)^2 = 4$ is :

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

(2) $\frac{2}{3}(2\pi - 3\sqrt{3})$

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

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

Ans. Official answer NTA(4)**Sol.**



Question ID : 444792460

15. If the points of intersection of the ellipses $x^2 + 2y^2 - 6x - 12y + 23 = 0$ and $4x^2 + 2y^2 - 20x - 12y + 35 = 0$ lie on a circle of radius r and centre (a, b) , then the value of $ab + 18r^2$ is :

- (1) 52 (2) 55 (3) 51 (4) 53

Ans. Official answer NTA(2)**Sol.**

Question ID : 444792459

16. If the mean and the variance of the data

Class	4-8	8-12	12-16	16-20
Frequency	3	λ	4	7

are μ and 19respectively, then the value of $\lambda + \mu$ is :

- (1) 20 (2) 18 (3) 19 (4) 21

Ans. Official answer NTA(3)**Sol.**

Question ID : 444792468

17. The least value of $(\cos^2\theta - 6 \sin\theta \cos\theta + 3\sin^2\theta + 2)$ is :

- (1) $4 - \sqrt{10}$ (2) $4 + \sqrt{10}$ (3) 1 (4) -1

Ans. Official answer NTA(1)**Sol.**

Question ID : 444792467

18. If $f(x) = \begin{cases} \frac{a|x| + x^2 - 2(\sin|x|)(\cos|x|)}{x}, & x \neq 0 \\ b, & x = 0 \end{cases}$ is continuous at $x = 0$, then $a + b$ is equal to :

- (1) 1 (2) 2 (3) 0 (4) 4

Ans. Official answer NTA(2)**Sol.**



Question ID : 444792462

19. Let PQ be a chord of the hyperbola $\frac{x^2}{4} - \frac{y^2}{b^2} = 1$, perpendicular to the x-axis such that OPQ is an equilateral triangle, O being the centre of the hyperbola. If the eccentricity of the hyperbola is $\sqrt{3}$, then the area of the triangle OPQ is :

- (1) $\frac{9}{5}$ (2) $\frac{11}{5}$ (3) $\frac{8\sqrt{3}}{5}$ (4) $2\sqrt{3}$

Ans. Official answer NTA(3)

Sol.

Question ID : 444792463

20. Let A(1, 2) and C(-3, -6) be two diagonally opposite vertices of a rhombus, whose sides AD and BC are parallel to the line $7x - y = 14$. If B(α , β) and D(γ , δ) are the other two vertices, then $|\alpha + \beta + \gamma + \delta|$ is equal to :

- (1) 6 (2) 1 (3) 3 (4) 9

Ans. Official answer NTA(1)

Sol.

SECTION - B

Question ID : 444792472

21. Let S denote the set of 4-digit numbers abcd such that $a > b > c > d$ and P denote the set of 5-digit numbers having product of its digits equal to 20. Then $n(S) + n(P)$ is equal to _____.

Ans. Official answer NTA(260)

Sol.

Question ID : 444792475

22. If the solution curve $y = f(x)$ of the differential equation $(x^2 - 4)y' - 2xy + 2x(4 - x^2)^2 = 0$, $x > 2$, passes through the point (3, 15), then the local maximum value of f is _____.

Ans. Official answer NTA(16)

Sol.

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Question ID : 444792471

23. Let $A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & 1 \\ 3 & -1 & 0 \end{bmatrix}$ and B be a matrix such that $B(I - A) = I + A$. Then the sum of the diagonal elements

of $B^T B$ is equal to _____.

Ans. Official answer NTA(3)

Sol.

Question ID : 444792474

24. The number of elements in the set $S = \left\{ x : x \in [0, 100] \text{ and } \int_0^x t^2 \sin(x-t) dt = x^2 \right\}$ is _____.

Ans. Official answer NTA(16)

Sol.

Question ID : 444792473

25. If the image of the point $P(a, 2, a)$ in the line $\frac{x}{2} = \frac{y+a}{1} = \frac{z}{1}$ is Q and the image of Q in the line

$\frac{x-2b}{2} = \frac{y-a}{1} = \frac{z+2b}{-5}$ is P, then $a + b$ is equal to _____.

Ans. Official answer NTA(3)

Sol.