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EdLoop JEE

MATHEMATICS · JEE MAIN

Matrices

Previous Year Questions with answers

312 questions · **193** papers · **2003–2026** · newest paper first

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What is in this PDF: every Matrices question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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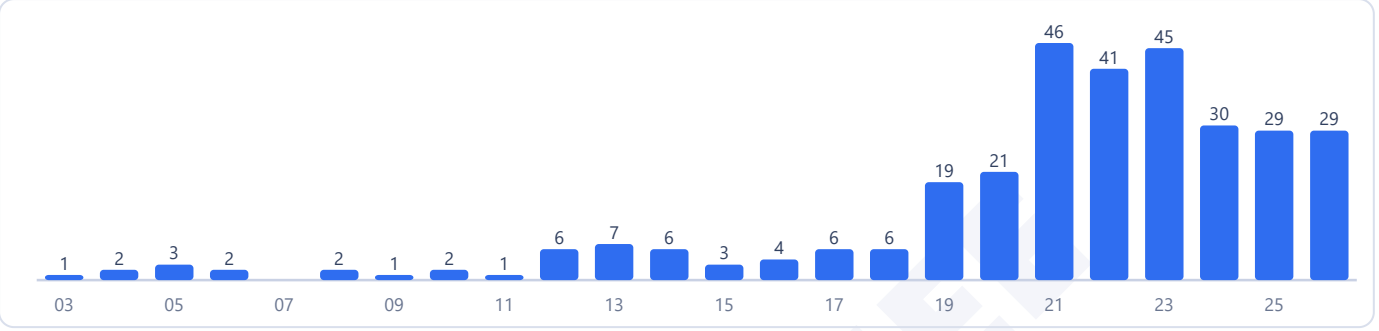
Chapter at a glance

5.7%	312	158 of 162	246 / 66
of Mathematics questions, 2019–2026	questions, 2003–2026	papers asked it, 2019–2026	MCQ / numerical, 2003–2026

Trend. Steady: 1.5 questions per paper in 2024–2026 against 1.7 in 2019–2023.

Questions per year



Counts are the questions we hold: 312 in 193 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2003–2026)

Systems of Linear Equations	118
Inverse & Adjoint	115
Matrix Algebra	79

How often it comes up

Matrices provides tools for linear transformations and solving systems of linear equations under Unit 3: Matrices and Determinants in the Class 12 curriculum, standing at rank 4 of 29 chapters with a 5.7% share of all mathematics questions. In the 2019 to 2026 testing cycle, Matrices contributed 260 questions across 162 exam papers, delivering 5.7% of all mathematics questions and standing at rank 4 of 29 chapters. During the earlier 2002 to 2018 timeframe, it produced 52 questions across 38 papers with a 4.0% share. In the recent 2024 to 2026 window, question volume reached 88 questions across 58 papers, accounting for a 5.7% share. Comparing 2002 to 2018 against 2024 to 2026, the trend is up, whereas comparing 2019 to 2026 against 2024 to 2026, its testing share has remained about the same.

The chapter has appeared every year from 2019 to 2026. Across 2019 to 2026, candidates faced an average of 1.6 questions per paper, and 1.5 questions per paper between 2024 and 2026. It yielded 66 numerical answer questions from 2019 to 2026, making it one of the largest numerical question sources in the exam.

Most-asked topics

The syllabus organizes across three core topics:

- Systems of Linear Equations: The highest-volume topic with 118 total questions (104 in 2019 to 2026), evaluated consistently through 2026. Focuses on homogeneous and non-homogeneous linear systems in three variables, using determinant conditions to identify unique solutions, infinite solutions (consistency), and no solutions (inconsistency).
- Inverse & Adjoint: Contributed 115 total questions (93 in 2019 to 2026), tested through 2026. Explores determinant identities involving adjoints: |adj A| = |A|^(n-1), |adj(adj A)| = |A|^((n-1)^2), adj(kA) = k^(n-1) adj A, inverse properties (AB)^-1 = B^-1 A^-1, and orthogonal matrices.

- Matrix Algebra: Generated 79 total questions (63 in 2019 to 2026), active through 2026. Centers on non-commutativity of matrix multiplication, symmetric and skew-symmetric decompositions (A = 1/2(A + A^T) + 1/2(A - A^T)), mathematical induction for high powers A^n, characteristic equations, and trace identities.

What the questions look like

Examiners test both algorithmic determinant equations and multi-step matrix identity simplifications. A very common pattern gives a system of three linear equations in x, y, and z containing unknown parameters, asking students to determine parameter values that produce infinitely many solutions or no solution.

Another prominent question style involves nested adjoint expressions, such as computing the determinant of adj(k adj(A^m adj(pA))) for an n by n matrix with known determinant. Questions on matrix powers often provide a matrix A whose square reveals a simple periodic pattern or nilpotence, allowing rapid evaluation of A^15 or higher powers.

How to practise it

Prepare for matrices by mastering algebraic determinant shortcuts alongside linear system consistency criteria:

1. Memorize adjoint formulas for order n: |adj A| = |A|^(n-1); adj(adj A) = |A|^(n-2) * A; |adj(adj A)| = |A|^((n-1)^2); adj(AB) = (adj B)(adj A); adj(kA) = k^(n-1) adj A. 2. Analyze linear systems systematically: For a 3x3 system AX = B, calculate Delta. If Delta is non-zero, the system has a unique solution. If Delta = 0, evaluate Delta_x, Delta_y, and Delta_z: if at least one is non-zero, the system has no solution; if all are zero, investigate plane co-linearity or parallel planes to distinguish infinite solutions from no solution. 3. Exploit Cayley-Hamilton theorem: Every square matrix satisfies its own characteristic polynomial det(A - lambda I) = 0. Use this to express high powers A^n as linear combinations of A and the identity matrix I. 4. Remember skew-symmetric determinant properties: The determinant of any odd-order skew-symmetric matrix is always zero. 5. Practise rapid 3x3 determinant expansions: Calculation precision without algebraic sign errors is paramount for the 66 numerical questions set in recent years.

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Q1 JEE Main 2026 · 8 Apr · Shift 2 MCQ

If the system of linear equations :

$x + y + z = 6,$

$x + 2y + 5z = 10,$

$2x + 3y + \lambda z = \mu$

has infinitely many solutions, then the value of $\lambda + \mu$ equals :

(A) 12

(B) 16

(C) 22

(D) 28

Answer: (C) 22 · Official NTA final key

Q2 JEE Main 2026 · 8 Apr · Shift 2 MCQ

Let $\mathrm{A} = \begin{bmatrix} \alpha & 1 & 2 \\ 2 & 3 & 0 \\ 0 & 4 & 5 \end{bmatrix}$ and $\mathrm{B} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -5\alpha & 0 \\ 0 & 4\alpha & -2\alpha \end{bmatrix} + \mathrm{adj}(\mathrm{A})$. If $\det(\mathrm{B}) = 66$, then $\det(\mathrm{adj}(\mathrm{A}))$ equals :

(A) 289

(B) 361

(C) 441

(D) 529

Answer: (C) 441 · Official NTA final key

Q3 JEE Main 2026 · 6 Apr · Shift 1 Numerical

Let $A = \begin{bmatrix} -1 & 1 & -1 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ satisfy

$A^2 + \alpha\,(\mathrm{adj}(\mathrm{adj}(A))) + \beta\,(\mathrm{adj}(A)\,(\mathrm{adj}(\mathrm{adj}(A)))) = \begin{bmatrix} 2 & -2 & 2 \\ -2 & 0 & -1 \\ 0 & 0 & -1 \end{bmatrix}$ for some $\alpha, \beta \in \mathbb{R}$.

Then $(\alpha - \beta)^2$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 4. · Official NTA final key

Q4 JEE Main 2026 · 6 Apr · Shift 2 MCQ

The sum of all possible values of $\theta \in [0, 2\pi]$, for which the system of equations :

$x\cos 3\theta - 8y - 12z = 0$

$x\cos 2\theta + 3y + 3z = 0$

$x + y + 3z = 0$

has a non-trivial solution, is equal to :

(A) π

(B) 2π

(C) 3π

(D) 4π

Answer: (D) 4π · Official NTA final key

Q5 JEE Main 2026 · 6 Apr · Shift 2 MCQ

Let $\mathrm{A} = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 0 \\ 9 & 3 & 1 \end{bmatrix}$ and $\mathrm{B} = [b_{ij}]$, $1 \le i, j \le 3$. If $\mathrm{B} = \mathrm{A}^{99} - \mathrm{I}$, then the value of $\frac{b_{31} - b_{21}}{b_{32}}$ is :

(A) 99

(B) 199

(C) 149

(D) 159

Answer: (C) 149 · Official NTA final key

Q6 JEE Main 2026 · 5 Apr · Shift 1 MCQ

Let A be a 3×3 matrix such that

$\mathrm{A}^{\mathrm{T}} \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 5 \\ 2 \\ 2 \end{bmatrix}$, $\mathrm{A}^{\mathrm{T}} \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix}$, $\mathrm{A} \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \\ 4 \end{bmatrix}$ and $\mathrm{A} \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix}$.

If $\det(\mathrm{A}) = 1$, then $\det(\mathrm{adj}(\mathrm{A}^2 + \mathrm{A}))$ is equal to:

(A) 16

(B) 25

(C) 49

(D) 64

Answer: (D) 64 · Official NTA final key

Q7 JEE Main 2026 · 5 Apr · Shift 1 MCQ

Consider the system of linear equations in x, y, z:

$x + 2y + tz = 0$,

$6x + y + 5tz = 0$,

$3x + t^2 y + f(t)\, z = 0$,

where $f : \mathbb{R} \to \mathbb{R}$ is a differentiable function. If this system has infinitely many solutions for all $t \in \mathbb{R}$, then f

(A) is a constant function
(B) is strictly increasing on $\mathbb{R}$
(C) is strictly decreasing on $\mathbb{R}$
(D) has two critical points

Answer: (B) is strictly increasing on $\mathbb{R}$ · Official NTA final key

Q8 JEE Main 2026 · 5 Apr · Shift 2 MCQ

Let M be a 3×3 matrix such that $\mathrm{M}\begin{pmatrix}1\\0\\0\end{pmatrix} = \begin{pmatrix}1\\2\\3\end{pmatrix}$, $\mathrm{M}\begin{pmatrix}0\\1\\0\end{pmatrix} = \begin{pmatrix}0\\1\\2\end{pmatrix}$ and $\mathrm{M}\begin{pmatrix}0\\0\\1\end{pmatrix} = \begin{pmatrix}-1\\1\\1\end{pmatrix}$. If $\mathrm{M}\begin{pmatrix}x\\y\\z\end{pmatrix} = \begin{pmatrix}1\\7\\11\end{pmatrix}$, then $x+y+z$ equals :

(A) 4
(B) 5
(C) 7
(D) 11

Answer: (B) 5 · Official NTA final key

Q9 JEE Main 2026 · 4 Apr · Shift 1 MCQ

Let $S = \left\{A = \begin{bmatrix}a & b\\ c & d\end{bmatrix} : a,b,c,d \in \{0,1,2,3,4\} \text{ and } A^2 - 4A + 3I = 0\right\}$ be a set of 2×2 matrices.
Then the number of matrices in S, for which the sum of the diagonal elements is equal to 4, is:

(A) 20
(B) 17
(C) 21
(D) 19

Answer: (D) 19 · Official NTA final key

Q10 JEE Main 2026 · 4 Apr · Shift 1 MCQ

Let $A = \begin{bmatrix}1 & 1 & 2\\ -2 & 0 & 1\\ 1 & 3 & 5\end{bmatrix}$. Then the sum of all elements of the matrix $\mathrm{adj}\left(\mathrm{adj}\left(2(\mathrm{adj}\,A)^{-1}\right)\right)$ is equal to:

(A) 3
(B) 4
(C) -4
(D) -3

Answer: (D) -3 · Official NTA final key

Q11 JEE Main 2026 · 4 Apr · Shift 2 MCQ

If the system of equations:

$x + y + z = 5$

$x + 2y + 3z = 9$

$x + 3y + \lambda z = \mu$

has infinitely many solutions, then the value of $\lambda + \mu$ is:

(A) 16

(B) 18

(C) 19

(D) 21

Answer: (B) 18 · Official NTA final key

Q12 JEE Main 2026 · 4 Apr · Shift 2 MCQ

Let $A = \begin{bmatrix} 1 & 2 & 7 \\ 4 & -2 & 8 \\ 3 & 8 & -7 \end{bmatrix}$ and $\det(A - \alpha I) = 0$, where α is a real number. If the largest possible value of α is p, then the circle $(x - p)^2 + (y - 2p)^2 = 320$, intersects the co-ordinate axes at

(A) 1 point

(B) 2 points

(C) 3 points

(D) 4 points

Answer: (C) 3 points · Official NTA final key

Q13 JEE Main 2026 · 2 Apr · Shift 1 MCQ

Let $\alpha, \beta \in \mathbf{R}$ be such that the system of linear equations

$x + 2y + z = 5$

$2x + y + \alpha z = 5$

$8x + 4y + \beta z = 18$

has no solution. Then $\frac{\beta}{\alpha}$ is equal to :

(A) -4

(B) 4

(C) 8

(D) -8

Answer: (B) 4 · Official NTA final key

Q14 JEE Main 2026 · 2 Apr · Shift 1 MCQ

Let $A=\begin{bmatrix}1 & 2\\ 1 & \alpha\end{bmatrix}$ and $B=\begin{bmatrix}3 & 3\\ \beta & 2\end{bmatrix}$. If $A^2-4A+I=O$ and $B^2-5B-6I=O$, then among the two statements :

(S1): $[(B-A)(B+A)]^T=\begin{bmatrix}13 & 15\\ 7 & 10\end{bmatrix}$

and

(S2): $\det(\text{adj}(A+B))=-5$,

(A) only (S1) is correct

(B) only (S2) is correct

(C) both (S1) and (S2) are correct

(D) both (S1) and (S2) are wrong

Answer: (B) only (S2) is correct · Official NTA final key

Q15 JEE Main 2026 · 2 Apr · Shift 2 MCQ

If the system of equations

$x+5y+6z=4$,

$2x+3y+4z=7$,

$x+6y+\mathrm{a}z=\mathrm{b}$

has infinitely many solutions, then the point (a, b) lies on the line

(A) $y-x=3$

(B) $x-y=3$

(C) $x+y=11$

(D) $x+y=12$

Answer: (B) $x-y=3$ · Official NTA final key

Q16 JEE Main 2026 · 2 Apr · Shift 2 Numerical

Consider the matrices $\mathrm{A}=\begin{bmatrix}2 & -2\\ 4 & -2\end{bmatrix}$ and $\mathrm{B}=\begin{bmatrix}3 & 9\\ 1 & 3\end{bmatrix}$. If matrices P and Q are such that $\mathrm{PA}=\mathrm{B}$ and $\mathrm{AQ}=\mathrm{B}$, then the absolute value of the sum of the diagonal elements of $2(\mathrm{P}+\mathrm{Q})$ is _____.

Numerical value type: the answer is a number.

Answer: 34. · Official NTA final key

Q17 JEE Main 2026 · 28 Jan · Shift 1 MCQ

Let A, B and C be three 2×2 matrices with real entries such that $\mathrm{B}=(\mathrm{I}+\mathrm{A})^{-1}$ and $\mathrm{A}+\mathrm{C}=\mathrm{I}$. If $\mathrm{BC}=\begin{bmatrix}1 & -5\\ -1 & 2\end{bmatrix}$ and $\mathrm{CB}\begin{bmatrix}x_1\\ x_2\end{bmatrix}=\begin{bmatrix}12\\ -6\end{bmatrix}$, then x_1+x_2 is

(A) 4
(B) 0
(C) -2
(D) 2

Answer: (B) 0 · Official NTA final key

Q18 JEE Main 2026 · 28 Jan · Shift 2 Numerical

Let $\mathrm{A}=\begin{bmatrix}3 & -4\\ 1 & -1\end{bmatrix}$ and B be two matrices such that $\mathrm{A}^{100}=100\mathrm{B}+\mathrm{I}$. Then the sum of all the elements of B^{100} is _____.

Numerical value type: the answer is a number.

Answer: 00. · Official NTA final key

Q19 JEE Main 2026 · 24 Jan · Shift 1 Numerical

The number of 3×2 matrices A, which can be formed using the elements of the set $\{-2,-1,0,1,2\}$ such that the sum of all the diagonal elements of $\mathrm{A}^{\mathrm{T}}\mathrm{A}$ is 5, is _____.

Numerical value type: the answer is a number.

Answer: 312. · Official NTA final key

Q20 JEE Main 2026 · 24 Jan · Shift 2 MCQ

Let $\mathrm{P}=[p_{ij}]$ and $\mathrm{Q}=[q_{ij}]$ be two square matrices of order 3 such that $q_{ij}=2^{(i+j-1)}p_{ij}$ and $\det(\mathrm{Q})=2^{10}$. Then the value of $\det(\mathrm{adj}(\mathrm{adj}\,\mathrm{P}))$ is:

(A) 81
(B) 16
(C) 32
(D) 124

Answer: (B) 16 · Official NTA final key

Q21 JEE Main 2026 · 23 Jan · Shift 1 Numerical

Let $|\mathrm{A}|=6$, where A is a 3×3 matrix. If $|\mathrm{adj}(3\mathrm{adj}(\mathrm{A}^2\cdot\mathrm{adj}(2\mathrm{A})))|=2^m\cdot 3^n$, $m,n\in\mathbf{N}$, then $m+n$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 62. · Official NTA final key

Q22 JEE Main 2026 · 23 Jan · Shift 2 MCQ

The system of linear equations

$x+y+z=6$

$2x + 5y + az = 36$

$x + 2y + 3z = b$

has

(A) infinitely many solutions for $a = 8$ and $b = 14$

(B) infinitely many solutions for $a = 8$ and $b = 16$

(C) unique solution for $a = 8$ and $b = 16$

(D) unique solution for $a = 8$ and $b = 14$

Answer: (A) infinitely many solutions for $a = 8$ and $b = 14$ · Official NTA final key

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Q23 JEE Main 2026 · 23 Jan · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q24 JEE Main 2026 · 22 Jan · Shift 1 Numerical

Let A be a 3×3 matrix such that $\mathrm{A} + \mathrm{A}^{\mathrm{T}} = \mathrm{O}$. If $\mathrm{A}\begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 3 \\ 3 \\ 2 \end{bmatrix}$, $\mathrm{A}^2\begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} -3 \\ 19 \\ -24 \end{bmatrix}$ and $\det(\mathrm{adj}(2\,\mathrm{adj}\,(\mathrm{A} + \mathrm{I}))) = (2)^{\alpha} \cdot (3)^{\beta} \cdot (11)^{\gamma}$, α, β, γ are non-negative integers, then $\alpha + \beta + \gamma$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 18. · Official NTA final key

Q25 JEE Main 2026 · 22 Jan · Shift 2 MCQ

Let n be the number obtained on rolling a fair die. If the probability that the system

$x - ny + z = 6$

$x + (n-2)y + (n+1)z = 8$

$(n-1)y + z = 1$

has a unique solution is $\frac{\mathrm{k}}{6}$, then the sum of k and all possible values of n is :

(A) 21
(B) 24
(C) 20
(D) 22

Answer: (D) 22 · Official NTA final key

Q26 JEE Main 2026 · 22 Jan · Shift 2 MCQ

If $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ is a solution of the system of equations $AX = B$, where $\text{adj}\, A = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & 5 \\ 1 & -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix}$, then $|x + y + z|$ is equal to :

(A) 1
(B) $\frac{3}{2}$
(C) 3
(D) 2

Answer: (D) 2 · Official NTA final key

Q27 JEE Main 2026 · 21 Jan · Shift 1 Numerical

For some $\alpha, \beta \in \mathbf{R}$, 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 _____.

Numerical value type: the answer is a number.

Answer: 225. · Official NTA final key

Q28 JEE Main 2026 · 21 Jan · Shift 2 MCQ

For the matrices $\mathrm{A} = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ and $\mathrm{B} = \begin{bmatrix} -29 & 49 \\ -13 & 18 \end{bmatrix}$, if $(\mathrm{A}^{15} + \mathrm{B}) \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$, then among the following which one is **true** ?

(A) $x = 16, y = 3$
(B) $x = 18, y = 11$
(C) $x = 5, y = 7$
(D) $x = 11, y = 2$

Answer: (D) $x = 11, y = 2$ · Official NTA final key

Q29 JEE Main 2026 · 21 Jan · Shift 2 MCQ

If the system of equations

$3x + y + 4z = 3$

$2x + \alpha y - z = -3$

$x + 2y + z = 4$

has no solution, then the value of α is equal to :

(A) 19

(B) 13

(C) 4

(D) 23

Answer: (A) 19 · Official NTA final key

Q30 JEE Main 2025 · 8 Apr · Shift 2 MCQ

Let $A = \begin{bmatrix} 2 & 2+p & 2+p+q \\ 4 & 6+2p & 8+3p+2q \\ 6 & 12+3p & 20+6p+3q \end{bmatrix}$. If $\det(\text{adj}(\text{adj}(3A))) = 2^m \cdot 3^n, m, n \in \mathbb{N}$, then $m+n$ is equal to

(A) 22

(B) 20

(C) 26

(D) 24

Answer: (D) 24 · Key from source paper

Q31 JEE Main 2025 · 7 Apr · Shift 1 MCQ

Let A be a 3×3 matrix such that $|\text{adj}(\text{adj}(\text{adj}\, A))| = 81$.

If $S = \left\{ n \in \mathbb{Z} : (|\text{adj}(\text{adj}\, A)|)^{\frac{(n-1)^2}{2}} = |A|^{(3n^2-5n-4)} \right\}$, then $\sum_{n \in S} \left| A^{(n^2+n)} \right|$ is equal to

(A) 732

(B) 750

(C) 820

(D) 866

Answer: (A) 732 · Key from source paper

Q32 JEE Main 2025 · 7 Apr · Shift 1 MCQ

Let the system of equations :

$2x + 3y + 5z = 9$

$7x + 3y - 2z = 8$

$12x + 3y - (4+\lambda)z = 16 - \mu$

have infinitely many solutions. Then the radius of the circle centred at (λ, μ) and touching the line $4x = 3y$ is

(A) $\frac{17}{5}$
(B) 7
(C) $\frac{7}{5}$
(D) $\frac{21}{5}$

Answer: (C) $\frac{7}{5}$ · Key from source paper

Q33 JEE Main 2025 · 7 Apr · Shift 2 MCQ

Let the system of equations

$x + 5y - z = 1$

$4x + 3y - 3z = 7$

$24x + y + \lambda z = \mu$

$\lambda, \mu \in \mathbf{R}$, have infinitely many solutions. Then the number of the solutions of this system, if x, y, z are integers and satisfy $7 \leqslant x + y + z \leqslant 77$, is :

(A) 3
(B) 5
(C) 6
(D) 4

Answer: (A) 3 · Key from source paper

Q34 JEE Main 2025 · 4 Apr · Shift 1 Numerical

Let $A = \begin{bmatrix} \cos\theta & 0 & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{bmatrix}$. If for some $\theta \in (0, \pi)$, $A^2 = A^T$, then the sum of the diagonal elements of the matrix $(A + I)^3 + (A - I)^3 - 6A$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q35 JEE Main 2025 · 4 Apr · Shift 2 MCQ

Let the matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ satisfy $A^n = A^{n-2} + A^2 - 1$ for $n \geqslant 3$. Then the sum of all the elements of A^{50} is :

(A) 39
(B) 44
(C) 53
(D) 52

Answer: (C) 53 · Key from source paper

Q36 JEE Main 2025 · 3 Apr · Shift 1 MCQ

Let A be a matrix of order 3×3 and $|A| = 5$. If $|2\,\text{adj}(3A\,\text{adj}(2A))| = 2^{\alpha} \cdot 3^{\beta} \cdot 5^{\gamma}, \alpha, \beta, \gamma \in \mathbb{N}$, then $\alpha + \beta + \gamma$ is equal to

(A) 28

(B) 27

(C) 26

(D) 25

Answer: (B) 27 · Key from source paper

Q37 JEE Main 2025 · 3 Apr · Shift 2 Numerical

Let I be the identity matrix of order 3×3 and for the matrix $A = \begin{bmatrix} \lambda & 2 & 3 \\ 4 & 5 & 6 \\ 7 & -1 & 2 \end{bmatrix}$, $|A| = -1$. Let B be the inverse of the matrix $\text{adj}\left(A\,\text{adj}\left(A^2\right)\right)$. Then $|(\lambda B + I)|$ is equal to _____

Numerical value type: the answer is a number.

Answer: -38. · Checked by our team

Q38 JEE Main 2025 · 2 Apr · Shift 1 MCQ

Let $A = \begin{bmatrix} \alpha & -1 \\ 6 & \beta \end{bmatrix}, \alpha > 0$, such that $\det(A) = 0$ and $\alpha + \beta = 1$. If I denotes 2×2 identity matrix, then the matrix $(I + A)^8$ is :

(A) $\begin{bmatrix} 766 & -255 \\ 1530 & -509 \end{bmatrix}$

(B) $\begin{bmatrix} 257 & -64 \\ 514 & -127 \end{bmatrix}$

(C) $\begin{bmatrix} 4 & -1 \\ 6 & -1 \end{bmatrix}$

(D) $\begin{bmatrix} 1025 & -511 \\ 2024 & -1024 \end{bmatrix}$

Answer: (A) $\begin{bmatrix} 766 & -255 \\ 1530 & -509 \end{bmatrix}$ · Key from source paper

Q39 JEE Main 2025 · 2 Apr · Shift 1 MCQ

Let $a \in R$ and A be a matrix of order 3×3 such that $\det(A) = -4$ and $A + I = \begin{bmatrix} 1 & a & 1 \\ 2 & 1 & 0 \\ a & 1 & 2 \end{bmatrix}$, where I is the identity matrix of order 3×3. If $\det((a+1)\,\text{adj}((a-1)A))$ is $2^m 3^n, m, n \in \{0, 1, 2, \ldots, 20\}$, then $m + n$ is equal to :

(A) 14
(B) 16
(C) 17
(D) 15

Answer: (B) 16 · Key from source paper

Q40 JEE Main 2025 · 2 Apr · Shift 1 MCQ

If the system of linear equations

$3x + y + \beta z = 3$

$2x + \alpha y - z = -3$

$x + 2y + z = 4$

has infinitely many solutions, then the value of $22\beta - 9\alpha$ is :

(A) 31
(B) 43
(C) 49
(D) 37

Answer: (A) 31 · Key from source paper

Q41 JEE Main 2025 · 2 Apr · Shift 2 MCQ

Let A be a 3×3 real matrix such that $A^2(A - 2I) - 4(A - I) = O$, where I and O are the identity and null matrices, respectively. If $A^5 = \alpha A^2 + \beta A + \gamma I$, where α, β, and γ are real constants, then $\alpha + \beta + \gamma$ is equal to :

(A) 4
(B) 12
(C) 76
(D) 20

Answer: (B) 12 · Key from source paper

Q42 JEE Main 2025 · 2 Apr · Shift 2 MCQ

If the system of equations

$2x + \lambda y + 3z = 5$

$3x + 2y - z = 7$

$4x + 5y + \mu z = 9$

has infinitely many solutions, then $(\lambda^2 + \mu^2)$ is equal to :

(A) 26
(B) 18
(C) 22
(D) 30

Answer: (A) 26 · Key from source paper

Q43 JEE Main 2025 · 29 Jan · Shift 1 MCQ

Let $\mathrm{A}=[\mathrm{a}_{ij}]=\begin{bmatrix}\log_5 128 & \log_4 5\\ \log_5 8 & \log_4 25\end{bmatrix}$. If A_{ij} is the cofactor of a_{ij}, $\mathrm{C}_{ij}=\sum_{\mathrm{k}=1}^{2}\mathrm{a}_{ik}\mathrm{A}_{jk}$, $1\le i,j\le 2$, and $\mathrm{C}=[\mathrm{C}_{ij}]$, then $8|\mathrm{C}|$ is equal to :

(A) 288
(B) 222
(C) 242
(D) 262

Answer: (C) 242 · Key from source paper

Q44 JEE Main 2025 · 29 Jan · Shift 1 Numerical

Let $\mathrm{S}=\left\{\mathrm{m}\in\mathbf{Z}:\mathrm{A}^{\mathrm{m}^2}+\mathrm{A}^{\mathrm{m}}=3\mathrm{I}-\mathrm{A}^{-6}\right\}$, where $\mathrm{A}=\begin{bmatrix}2 & -1\\ 1 & 0\end{bmatrix}$. Then n(S) is equal to _____ .

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q45 JEE Main 2025 · 29 Jan · Shift 2 MCQ

Let $A=[a_{ij}]$ be a matrix of order 3×3, with $a_{ij}=(\sqrt{2})^{i+j}$. If the sum of all the elements in the third row of A^2 is $\alpha+\beta\sqrt{2},\alpha,\beta\in\mathbf{Z}$, then $\alpha+\beta$ is equal to :

(A) 280
(B) 224
(C) 210
(D) 168

Answer: (B) 224 · Key from source paper

Q46 JEE Main 2025 · 29 Jan · Shift 2 MCQ

Let $\alpha,\beta(\alpha\neq\beta)$ be the values of m , for which the equations $x+y+z=1$; $x+2y+4z=\mathrm{m}$ and $x+4y+10z=m^2$ have infinitely many solutions. Then the value of $\sum_{n=1}^{10}\left(n^{\alpha}+n^{\beta}\right)$ is equal to :

(A) 3080
(B) 560
(C) 3410
(D) 440

Answer: (D) 440 · Key from source paper

Q47 JEE Main 2025 · 28 Jan · Shift 1 Numerical

Let M denote the set of all real matrices of order 3×3 and let $S = \{-3, -2, -1, 1, 2\}$. Let

$S_1 = \{A = [a_{ij}] \in M : A = A^T \text{ and } a_{ij} \in S, \forall i, j\}$,

$S_2 = \{A = [a_{ij}] \in M : A = -A^T \text{ and } a_{ij} \in S, \forall i, j\}$,

$S_3 = \{A = [a_{ij}] \in M : a_{11} + a_{22} + a_{33} = 0 \text{ and } a_{ij} \in S, \forall i, j\}$.

If $n(S_1 \cup S_2 \cup S_3) = 125\alpha$, then α equals _____ .

Numerical value type: the answer is a number.

Answer: 1613. · Key from source paper

Q48 JEE Main 2025 · 28 Jan · Shift 2 MCQ

Let $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & -2 \\ 0 & 1 \end{bmatrix}$ and $P = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, $\theta > 0$. If $B = PAP^T$, $C = P^T B^{10} P$ and the sum of the diagonal elements of C is $\frac{m}{n}$, where gcd(m, n) = 1, then m + n is :

(A) 127
(B) 258
(C) 65
(D) 2049

Answer: (C) 65 · Key from source paper

Q49 JEE Main 2025 · 24 Jan · Shift 1 MCQ

If the system of equations

$2x - y + z = 4$

$5x + \lambda y + 3z = 12$

$100x - 47y + \mu z = 212$

has infinitely many solutions, then $\mu - 2\lambda$ is equal to

(A) 57
(B) 59
(C) 55
(D) 56

Answer: (A) 57 · Key from source paper

Q50 JEE Main 2025 · 24 Jan · Shift 1 Numerical

Let A be a 3×3 matrix such that $X^T AX = O$ for all nonzero 3×1 matrices $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$. If $\mathbf{A} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ -5 \end{bmatrix}$, $\mathbf{A} \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 4 \\ -8 \end{bmatrix}$, and $\det(\text{adj}(2(\mathbf{A} + \mathbf{1}))) = 2^\alpha 3^\beta 5^\gamma$, $\alpha, \beta, \gamma \in N$, then $\alpha^2 + \beta^2 + \gamma^2$ is _____ .

Numerical value type: the answer is a number.

Answer: 44. · Key from source paper

Q51 JEE Main 2025 · 24 Jan · Shift 2 MCQ

If the system of equations

$x + 2y - 3z = 2$

$2x + \lambda y + 5z = 5$

$14x + 3y + \mu z = 33$

has infinitely many solutions, then $\lambda + \mu$ is equal to :

(A) 13
(B) 10
(C) 12
(D) 11

Answer: (C) 12 · Key from source paper

Q52 JEE Main 2025 · 23 Jan · Shift 1 MCQ

If A, B, and $\left(\text{adj}\left(\mathrm{A}^{-1}\right) + \text{adj}\left(\mathrm{B}^{-1}\right)\right)$ are non-singular matrices of same order, then the inverse of $\mathrm{A}\left(\text{adj}\left(\mathrm{A}^{-1}\right) + \text{adj}\left(\mathrm{B}^{-1}\right)\right)^{-1} \mathrm{B}$, is equal to

(A) $\mathrm{AB}^{-1} + \mathrm{A}^{-1}\mathrm{B}$
(B) $\text{adj}\left(\mathrm{B}^{-1}\right) + \text{adj}\left(\mathrm{A}^{-1}\right)$
(C) $\frac{\mathrm{AB}^{-1}}{|\mathrm{A}|} + \frac{\mathrm{BA}^{-1}}{|\mathrm{B}|}$
(D) $\frac{1}{|\mathrm{AB}|}(\text{adj}(B) + \text{adj}(A))$

Answer: (D) $\frac{1}{|\mathrm{AB}|}(\text{adj}(B) + \text{adj}(A))$ · Key from source paper

Q53 JEE Main 2025 · 23 Jan · Shift 1 MCQ

If the system of equations

$(\lambda-1)x+(\lambda-4)y+\lambda z=5$

$\lambda x+(\lambda-1)y+(\lambda-4)z=7$

$(\lambda+1)x+(\lambda+2)y-(\lambda+2)z=9$

has infinitely many solutions, then $\lambda^2+\lambda$ is equal to

(A) 6
(B) 10
(C) 20
(D) 12

Answer: (D) 12 · Key from source paper

Q54 JEE Main 2025 · 23 Jan · Shift 2 MCQ

The system of equations

$x+y+z=6$

$x+2y+5z=9$

$x+5y+\lambda z=\mu,$

has no solution if :

(A) $\lambda=15, \mu\neq 17$
(B) $\lambda\neq 17, \mu\neq 18$
(C) $\lambda=17, \mu\neq 18$
(D) $\lambda=17, \mu=18$

Answer: (C) $\lambda=17, \mu\neq 18$ · Key from source paper

Q55 JEE Main 2025 · 23 Jan · Shift 2 MCQ

Let $A=[a_{ij}]$ be 3×3 matrix such that $A\begin{bmatrix}0\\1\\0\end{bmatrix}=\begin{bmatrix}0\\0\\1\end{bmatrix}$, $A\begin{bmatrix}4\\1\\3\end{bmatrix}=\begin{bmatrix}0\\1\\0\end{bmatrix}$ and $A\begin{bmatrix}2\\1\\2\end{bmatrix}=\begin{bmatrix}1\\0\\0\end{bmatrix}$, then a_{23} equals :

(A) -1
(B) 2
(C) 1
(D) 0

Answer: (A) -1 · Key from source paper

Q56 JEE Main 2025 · 22 Jan · Shift 1 Numerical

Let A be a square matrix of order 3 such that $\det(A) = -2$ and $\det(3\,\mathrm{adj}(-6\,\mathrm{adj}(3A))) = 2^{m+n} \cdot 3^{mn}$, $m > n$. Then $4m + 2n$ is equal to _____

Numerical value type: the answer is a number.

Answer: 34. · Key from source paper

Q57 JEE Main 2025 · 22 Jan · Shift 2 MCQ

For a 3×3 matrix M, let trace (M) denote the sum of all the diagonal elements of M. Let A be a 3×3 matrix such that $|A| = \frac{1}{2}$ and trace $(A) = 3$. If $B = \mathrm{adj}(\mathrm{adj}(2A))$, then the value of $|B|+$ trace (B) equals :

(A) 56
(B) 132
(C) 174
(D) 280

Answer: (D) 280 · Key from source paper

Q58 JEE Main 2025 · 22 Jan · Shift 2 MCQ

If the system of linear equations :

$x + y + 2z = 6$

$2x + 3y + az = a + 1$

$-x - 3y + bz = 2b$

where $a, b \in \mathbf{R}$, has infinitely many solutions, then $7a + 3b$ is equal to :

(A) 16
(B) 12
(C) 22
(D) 9

Answer: (A) 16 · Key from source paper

Q59 JEE Main 2024 · 9 Apr · Shift 1 MCQ

Let $\lambda, \mu \in \mathbf{R}$. If the system of equations

$$3x + 5y + \lambda z = 3$$
$$7x + 11y - 9z = 2$$
$$97x + 155y - 189z = \mu$$

has infinitely many solutions, then $\mu + 2\lambda$ is equal to :

(A) 24
(B) 25
(C) 22
(D) 27

Answer: (B) 25 · Key from source paper

Q60 JEE Main 2024 · 9 Apr · Shift 1 Numerical

Let A be a non-singular matrix of order 3 . If $\det(3\,\mathrm{adj}(2\,\mathrm{adj}((\det A)A))) = 3^{-13}\cdot 2^{-10}$ and $\det(3\,\mathrm{adj}(2\,\mathrm{A})) = 2^{\mathrm{m}}\cdot 3^{\mathrm{n}}$, then $|3\,\mathrm{m}+2\mathrm{n}|$ is equal to _____

Numerical value type: the answer is a number.

Answer: 14. · Key from source paper

Q61 JEE Main 2024 · 9 Apr · Shift 2 MCQ

Let $B=\begin{bmatrix}1 & 3\\ 1 & 5\end{bmatrix}$ and A be a 2×2 matrix such that $AB^{-1}=A^{-1}$. If $BCB^{-1}=A$ and $C^4+\alpha C^2+\beta I=O$, then $2\beta-\alpha$ is equal to

(A) 16
(B) 2
(C) 8
(D) 10

Answer: (D) 10 · Key from source paper

Q62 JEE Main 2024 · 8 Apr · Shift 1 MCQ

Let $A=\begin{bmatrix}2 & a & 0\\ 1 & 3 & 1\\ 0 & 5 & b\end{bmatrix}$. If $A^3=4A^2-A-21I$, where I is the identity matrix of order 3×3, then $2a+3b$ is equal to

(A) -9
(B) -13
(C) -10
(D) -12

Answer: (B) -13 · Key from source paper

Q63 JEE Main 2024 · 8 Apr · Shift 1 Numerical

Let $A=\begin{bmatrix}2 & -1\\ 1 & 1\end{bmatrix}$. If the sum of the diagonal elements of A^{13} is 3^n, then n is equal to _____

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Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q64 JEE Main 2024 · 8 Apr · Shift 2 MCQ

If the system of equations $x + 4y - z = \lambda$, $7x + 9y + \mu z = -3$, $5x + y + 2z = -1$ has infinitely many solutions, then $(2\mu + 3\lambda)$ is equal to :

(A) 3
(B) -3
(C) -2
(D) 2

Answer: (B) -3 · Key from source paper

Q65 JEE Main 2024 · 6 Apr · Shift 2 MCQ

Let A be a square matrix of order 3 such that $\det(A) = 3$ and $\det(\text{adj}\,(-4\,\text{adj}\,(-3\,\text{adj}\,(3\,\text{adj}\,((2\,A)^{-1})))))) = 2^m 3^n$, then m + 2n is equal to :

(A) 2
(B) 3
(C) 6
(D) 4

Answer: (D) 4 · Key from source paper

Q66 JEE Main 2024 · 6 Apr · Shift 2 Numerical

If the system of equations
$2x + 7y + \lambda z = 3$
$3x + 2y + 5z = 4$
$x + \mu y + 32z = -1$
has infinitely many solutions, then $(\lambda - \mu)$ is equal to _____

Numerical value type: the answer is a number.

Answer: 38. · Key from source paper

Q67 JEE Main 2024 · 5 Apr · Shift 1 MCQ

Let A and B be two square matrices of order 3 such that $|A| = 3$ and $|B| = 2$. Then $\left|\mathrm{A^T A(adj(2\,A))^{-1}(adj(4\,B))(adj(AB))^{-1}AA^T}\right|$ is equal to :

(A) 108
(B) 32
(C) 81
(D) 64

Answer: (D) 64 · Key from source paper

Q68 JEE Main 2024 · 5 Apr · Shift 1 MCQ

If the system of equations $\begin{cases} 11x + y + \lambda z = -5 \\ 2x + 3y + 5z = 3 \\ 8x - 19y - 39z = \mu \end{cases}$ has infinitely many solutions, then $\lambda^4 - \mu$ is equal to :

(A) 51
(B) 45
(C) 47
(D) 49

Answer: (C) 47 · Key from source paper

Q69 JEE Main 2024 · 5 Apr · Shift 2 MCQ

Let $\alpha\beta \neq 0$ and $A = \begin{bmatrix} \beta & \alpha & 3 \\ \alpha & \alpha & \beta \\ -\beta & \alpha & 2\alpha \end{bmatrix}$. If $B = \begin{bmatrix} 3\alpha & -9 & 3\alpha \\ -\alpha & 7 & -2\alpha \\ -2\alpha & 5 & -2\beta \end{bmatrix}$ is the matrix of cofactors of the elements of A, then $\det(AB)$ is equal to :

(A) 64
(B) 216
(C) 343
(D) 125

Answer: (B) 216 · Key from source paper

Q70 JEE Main 2024 · 5 Apr · Shift 2 MCQ

The values of m, n, for which the system of equations $\begin{cases} x + y + z = 4, \\ 2x + 5y + 5z = 17, \\ x + 2y + mz = n \end{cases}$ has infinitely many solutions, satisfy the equation:

(A) $m^2+n^2-mn=39$

(B) $m^2+n^2-m-n=46$

(C) $m^2+n^2+m+n=64$

(D) $m^2+n^2+mn=68$

Answer: (A) $m^2+n^2-mn=39$ · Key from source paper

Q71 JEE Main 2024 · 4 Apr · Shift 1 MCQ

Let $\alpha \in (0,\infty)$ and $A=\begin{bmatrix}1 & 2 & \alpha \\ 1 & 0 & 1 \\ 0 & 1 & 2\end{bmatrix}$. If $\det\left(\text{adj}\left(2A-A^T\right)\cdot \text{adj}\left(A-2A^T\right)\right)=2^8$, then $(\det(A))^2$ is equal to:

(A) 36

(B) 16

(C) 1

(D) 49

Answer: (B) 16 · Key from source paper

Q72 JEE Main 2024 · 4 Apr · Shift 1 Numerical

Let A be a square matrix of order 2 such that $|A|=2$ and the sum of its diagonal elements is -3 . If the points (x,y) satisfying $\mathrm{A}^2+x\,\mathrm{A}+y\mathrm{I}=\mathrm{O}$ lie on a hyperbola, whose length of semi major axis is x and semi minor axis is y, eccentricity is e and the length of the latus rectum is l, then $81\left(e^4+l^2\right)$ is equal to _____

Numerical value type: the answer is a number.

Answer: 745. · Checked by our team

Q73 JEE Main 2024 · 4 Apr · Shift 2 MCQ

Let $A=\begin{bmatrix}1 & 2 \\ 0 & 1\end{bmatrix}$ and $B=I+\text{adj}(A)+(\text{adj}\,A)^2+\ldots+(\text{adj}\,A)^{10}$. Then, the sum of all the elements of the matrix B is:

(A) -124

(B) 22

(C) -88

(D) -110

Answer: (C) -88 · Key from source paper

Q74 JEE Main 2024 · 4 Apr · Shift 2 Numerical

Let A be a 2×2 symmetric matrix such that $A \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 7 \end{bmatrix}$ and the determinant of A be 1. If $A^{-1} = \alpha A + \beta I$, where I is an identity matrix of order 2×2, then $\alpha + \beta$ equals _____

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q75 JEE Main 2024 · 1 Feb · Shift 1 MCQ

If the system of equations

$2x + 3y - z = 5$

$x + \alpha y + 3z = -4$

$3x - y + \beta z = 7$

has infinitely many solutions, then $13\alpha\beta$ is equal to

(A) 1110
(B) 1120
(C) 1210
(D) 1220

Answer: (B) 1120 · Key from source paper

Q76 JEE Main 2024 · 1 Feb · Shift 2 MCQ

Let the system of equations $x + 2y + 3z = 5, 2x + 3y + z = 9, 4x + 3y + \lambda z = \mu$ have infinite number of solutions. Then $\lambda + 2\mu$ is equal to:

(A) 28
(B) 17
(C) 22
(D) 15

Answer: (B) 17 · Key from source paper

Q77 JEE Main 2024 · 1 Feb · Shift 2 Numerical

Let $A = I_2 - 2MM^T$, where M is real matrix of order 2×1 such that the relation $M^T M = I_1$ holds. If λ is a real number such that the relation $AX = \lambda X$ holds for some non-zero real matrix X of order 2×1, then the sum of squares of all possible values of λ is equal to:

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

EdLoop JEE

Q78 JEE Main 2024 · 31 Jan · Shift 1 MCQ

If the system of linear equations

$x - 2y + z = -4$

$2x + \alpha y + 3z = 5$

$3x - y + \beta z = 3$

has infinitely many solutions, then $12\alpha + 13\beta$ is equal to

(A) 60
(B) 64
(C) 54
(D) 58

Answer: (D) 58 · Key from source paper

Q79 JEE Main 2024 · 31 Jan · Shift 2 MCQ

Let A be a 3×3 real matrix such that $A\begin{pmatrix}1\\0\\1\end{pmatrix} = 2\begin{pmatrix}1\\0\\1\end{pmatrix}$, $A\begin{pmatrix}-1\\0\\1\end{pmatrix} = 4\begin{pmatrix}-1\\0\\1\end{pmatrix}$, $A\begin{pmatrix}0\\1\\0\end{pmatrix} = 2\begin{pmatrix}0\\1\\0\end{pmatrix}$.

Then, the system $(A - 3I)\begin{pmatrix}x\\y\\z\end{pmatrix} = \begin{pmatrix}1\\2\\3\end{pmatrix}$ has

(A) unique solution
(B) exactly two solutions
(C) no solution
(D) infinitely many solutions

Answer: (A) unique solution · Key from source paper

Q80 JEE Main 2024 · 31 Jan · Shift 2 Numerical

Let A be a 3×3 matrix and $\det A = 2$. If $n = \det \underbrace{\operatorname{adj}\operatorname{adj}\ldots\operatorname{adj}}_{2024-\text{times}} A$, then the remainder when n is divided by 9 is equal to _____.

Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q81 JEE Main 2024 · 30 Jan · Shift 1 MCQ

Consider the system of linear equation $x + y + z = 4\mu$, $x + 2y + 2\lambda z = 10\mu$, $x + 3y + 4\lambda^2 z = \mu^2 + 15$, where $\lambda, \mu \in \mathrm{R}$. Which one of the following statements is NOT correct?

(A) The system has unique solution if $\lambda \neq \frac{1}{2}$ and $\mu \neq 1, 15$

(B) The system is inconsistent if $\lambda = \frac{1}{2}$ and $\mu \neq 1$

(C) The system has infinite number of solutions if $\lambda = \frac{1}{2}$ and $\mu = 15$

(D) The system is consistent if $\lambda \neq \frac{1}{2}$

Answer: (B) The system is inconsistent if $\lambda = \frac{1}{2}$ and $\mu \neq 1$ · Key from source paper

Q82 JEE Main 2024 · 30 Jan · Shift 2 MCQ

Let $R = \begin{pmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{pmatrix}$ be a non-zero 3×3 matrix, where $x \sin\theta = y \sin\theta + \frac{2\pi}{3} = z \sin\theta + \frac{4\pi}{3} \neq 0, \theta \in (0, 2\pi)$. For a square matrix M, let Trace$M$ denote the sum of all the diagonal entries of M. Then, among the statements:

I Trace$(R) = 0$

(II) If Trace$(\text{adj}(\text{adj}(R))) = 0$, then R has exactly one non-zero entry.

(A) Both (I) and (II) are true

(B) Only (II) is true

(C) Neither (I) nor (II) is true

(D) Only (I) is true

Answer: (C) Neither (I) nor (II) is true · Key from source paper

Q83 JEE Main 2024 · 30 Jan · Shift 2 MCQ

Consider the system of linear equations $x + y + z = 5, x + 2y + \lambda^2 z = 9$ and $x + 3y + \lambda z = \mu$, where $\lambda, \mu \in R$. Then, which of the following statement is NOT correct ?

(A) System has infinite number of solution if $\lambda = 1$ and $\mu = 13$

(B) System is inconsistent if $\lambda = 1$ and $\mu \neq 13$

(C) System has unique solution if $\lambda \neq 1$ and $\mu \neq 13$

(D) System is consistent if $\lambda \neq 1$ and $\mu = 13$

Answer: (C) System has unique solution if $\lambda \neq 1$ and $\mu \neq 13$ · Key from source paper

Q84 JEE Main 2024 · 29 Jan · Shift 1 MCQ

Let A be a square matrix such that $\mathrm{AA}^{\mathrm{T}} = \mathrm{I}$. Then $\frac{1}{2}\mathrm{A}\left[\left(\mathrm{A} + \mathrm{A}^{\mathrm{T}}\right)^2 + \left(\mathrm{A} - \mathrm{A}^{\mathrm{T}}\right)^2\right]$ is equal to

(A) $\mathrm{A}^2 + \mathrm{I}$

(B) $\mathrm{A}^3 + \mathrm{I}$

(C) $\mathrm{A}^2 + \mathrm{A}^{\mathrm{T}}$

(D) $\mathrm{A}^3 + \mathrm{A}^{\mathrm{T}}$

Answer: (D) $\mathrm{A}^3 + \mathrm{A}^{\mathrm{T}}$ · Key from source paper

Q85 JEE Main 2024 · 29 Jan · Shift 2 Numerical

Let for any three distinct consecutive terms a, b, c of an A.P, the lines $ax + by + c = 0$ be concurrent at the point P and $Q(\alpha, \beta)$ be a point such that the system of equations $x + y + z = 6$, $2x + 5y + \alpha z = \beta$ and $x + 2y + 3z = 4$, has infinitely many solutions. Then $(PQ)^2$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 113. · Key from source paper

Q86 JEE Main 2024 · 27 Jan · Shift 1 MCQ

Consider the matrix $f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$. Given below are two statements :

Statement I: $f(-x)$ is the inverse of the matrix $f(x)$.

Statement II: $f(x)\ f(y) = f(x + y)$.

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

(A) Statement I is false but Statement II is true

(B) Both Statement I and Statement II are false

(C) Statement I is true but Statement II is false

(D) Both Statement I and Statement II are true

Answer: (D) Both Statement I and Statement II are true · Key from source paper

Q87 JEE Main 2024 · 27 Jan · Shift 1 Numerical

Let $A = \begin{bmatrix} 2 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$, $B = [B_1\ \ B_2\ \ B_3]$, where B_1, B_2, B_3 are column matrices, and $AB_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, $AB_2 = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}$, $AB_3 = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$

If $\alpha = |B|$ and β is the sum of all the diagonal elements of B, then $\alpha^3 + \beta^3$ is equal to

Numerical value type: the answer is a number.

Answer: 28. · Key from source paper

Q88 JEE Main 2024 · 27 Jan · Shift 2 Numerical

Let A be a 2×2 real matrix and I be the identity matrix of order 2. If the roots of the equation $|A - xI| = 0$ be -1 and 3, then the sum of the diagonal elements of the matrix A^2 is _____.

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q89 JEE Main 2023 · 15 Apr · Shift 1 MCQ

Let the determinant of a square matrix A of order m be $m-n$, where m and n satisfy $4m+n=22$ and $17m+4n=93$. If $det(n\ adj(adj(mA)))=3^a5^b6^c$, then $a+b+c$ is equal to

(A) 84
(B) 96
(C) 101
(D) 109

Answer: (B) 96 · Key from source paper

Q90 JEE Main 2023 · 15 Apr · Shift 1 MCQ

Let the system of linear equations
$-x+2y-9z=7$
$-x+3y+7z=9$
$-2x+y+5z=8$
$-3x+y+13z=\lambda$
has a unique solution $x=\alpha$, $y=\beta$, $z=\gamma$. Then the distance of the point (α,β,γ) from the plane $2x-2y+z=\lambda$ is

(A) 11
(B) 7
(C) 9
(D) 13

Answer: (B) 7 · Key from source paper

Q91 JEE Main 2023 · 13 Apr · Shift 1 MCQ

The number of symmetric matrices of order 3, with all the entries from the set $\{0,1,2,3,4,5,6,7,8,9\}$ is

(A) 6^{10}
(B) 10^6
(C) 9^{10}
(D) 10^9

Answer: (B) 10^6 · Key from source paper

Q92 JEE Main 2023 · 13 Apr · Shift 1 MCQ

Let $B=\begin{bmatrix}1&3&\alpha\\1&2&3\\\alpha&\alpha&4\end{bmatrix}$, $\alpha>2$ be the adjoint of a matrix A and $|A|=2$. Then $\begin{bmatrix}\alpha&-2\alpha&\alpha\end{bmatrix}B\begin{bmatrix}\alpha\\-2\alpha\\\alpha\end{bmatrix}$ is equal to

(A) 0
(B) 16
(C) -16
(D) 32

Answer: (C) -16 · Key from source paper

Q93 JEE Main 2023 · 13 Apr · Shift 1 MCQ

For the system of linear equations
$2x + 4y + 2az = b$
$x + 2y + 3z = 4$
$2x + 5y + 2z = 8$
which of the following is NOT correct?

(A) It has unique solution if $a = b = 6$
(B) It has infinitely many solutions if $a = 3, b = 6$
(C) It has infinitely many solutions if $a = 3, b = 8$
(D) It has unique solution if $a = b = 8$

Answer: (B) It has infinitely many solutions if $a = 3, b = 6$ · Key from source paper

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Q94 JEE Main 2023 · 13 Apr · Shift 2 MCQ

Let for $A = \begin{pmatrix} 1 & 2 & 3 \\ \alpha & 3 & 1 \\ 1 & 1 & 2 \end{pmatrix}$, $A = 2$. If $|2\,\mathrm{adj}(2\,\mathrm{adj}(2A))| = 32^n$, then $3n + \alpha$ is equal to

(A) 9
(B) 11
(C) 12
(D) 10

Answer: (B) 11 · Key from source paper

Q95 JEE Main 2023 · 13 Apr · Shift 2 MCQ

If the system of equations
$2x + y - z = 5$
$2x - 5y + \lambda z = \mu$
$x + 2y - 5z = 7$
has infinitely many solutions, then $(\lambda + \mu)^2 + (\lambda - \mu)^2$ is equal to

(A) 904
(B) 916
(C) 912
(D) 920

Answer: (B) 916 · Key from source paper

Q96 JEE Main 2023 · 12 Apr · Shift 1 MCQ

Let $A=\begin{bmatrix}1 & \frac{1}{51}\\ 0 & 1\end{bmatrix}$. If $B=\begin{bmatrix}1 & 2\\ -1 & -1\end{bmatrix}A\begin{bmatrix}-1 & -2\\ 1 & 1\end{bmatrix}$, then the sum of all the elements of the matrix $\sum_{n=1}^{50}B^n$ is equal to

(A) 75
(B) 125
(C) 50
(D) 100

Answer: (D) 100 · Key from source paper

Q97 JEE Main 2023 · 11 Apr · Shift 1 MCQ

Let A be a 2×2 matrix with real entries such that $A'=\alpha A+1$, where $\alpha\in R--1,1..$ If det $A^2-A=4$, the sum of all possible values of α is equal to

(A) 0
(B) $\frac{3}{2}$
(C) 2
(D) $\frac{5}{2}$

Answer: (D) $\frac{5}{2}$ · Key from source paper

Q98 JEE Main 2023 · 11 Apr · Shift 1 Numerical

Let $A=\begin{pmatrix}0 & 1 & 2\\ a & 0 & 3\\ 1 & c & 0\end{pmatrix}$, where $a,c\in R$. If $A^3=A$ and the positive value of a belongs to the interval $(n-1,\ n]$, where $n\in\mathbb{N}$, then n is equal to _____.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q99 JEE Main 2023 · 11 Apr · Shift 2 MCQ

If the system of linear equations
$7x+11y+\alpha z=13$
$5x+4y+7z=\beta$

$175x + 194y + 57z = 361$
has infinitely many solutions, then $\alpha + \beta + 2$ is equal to

(A) 4
(B) 3
(C) 5
(D) 6

Answer: (A) 4 · Key from source paper

Q100 JEE Main 2023 · 10 Apr · Shift 1 MCQ

If A is a 3×3 matrix and $A = 2$, then $3 \operatorname{adj} 3AA^2$ is equal to

(A) $3^{12} \cdot 6^{11}$
(B) $3^{12} \cdot 6^{10}$
(C) $3^{10} \cdot 6^{11}$
(D) $3^{11} \cdot 6^{10}$

Answer: (D) $3^{11} \cdot 6^{10}$ · Key from source paper

Q101 JEE Main 2023 · 10 Apr · Shift 1 MCQ

For the system of linear equations
$2x - y + 3z = 5$
$3x + 2y - z = 7$
$4x + 5y + \alpha z = \beta$,
which of the following is NOT correct?

(A) The system has infinitely many solutions for $\alpha = -5$ and $\beta = 9$
(B) The system has infinitely many solutions for $\alpha = -6$ and $\beta = 9$
(C) The system in inconsistent for $\alpha = -5$ and $\beta = 8$
(D) The system has a unique solution for $\alpha \neq -5$ and $\beta = 8$

Answer: (B) The system has infinitely many solutions for $\alpha = -6$ and $\beta = 9$ · Key from source paper

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Q102 JEE Main 2023 · 10 Apr · Shift 2 MCQ

If $A = \frac{1}{5!6!7!}\begin{bmatrix} 5! & 6! & 7! \\ 6! & 7! & 8! \\ 7! & 8! & 9! \end{bmatrix}$, then $\operatorname{adj} \operatorname{adj} 2A$ is equal to

(A) 2^{20}
(B) 2^{8}
(C) 2^{12}
(D) 2^{16}

Answer: (D) 2^{16} · Key from source paper

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Q103 JEE Main 2023 · 10 Apr · Shift 2 Numerical

Let S be the set of values of λ, for which the system of equations $6\lambda x - 3y + 3z = 4\lambda^2$, $2x + 6\lambda y + 4z = 1$ and $3x + 2y + 3\lambda z = \lambda$ has no solution. Then, $12\sum_{\lambda \in S} \lambda$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 24. · Key from source paper

Q104 JEE Main 2023 · 8 Apr · Shift 1 MCQ

Let $\begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$. If $|\text{adj}(\text{adj}(\text{adj}\, 2A))| = (16)^n$, then n is equal to

(A) 8
(B) 10
(C) 9
(D) 12

Answer: (B) 10 · Key from source paper

Q105 JEE Main 2023 · 8 Apr · Shift 1 MCQ

Let $P = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}$, $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $Q = PAP^T$. If $P^T Q^{2007} P = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then $2a + b - 3c - 4d$ is equal to

(A) 2004
(B) 2005
(C) 2007
(D) 2006

Answer: (B) 2005 · Key from source paper

Q106 JEE Main 2023 · 8 Apr · Shift 2 MCQ

If $A = \begin{bmatrix} 1 & 5 \\ \lambda & 10 \end{bmatrix}$, $A^{-1} = \alpha A + \beta I$ and $\alpha + \beta = -2$, then $4\alpha^2 + \beta^2 + \lambda^2$ is equal to :

(A) 12
(B) 19
(C) 14
(D) 10

Answer: (C) 14 · Key from source paper

Q107 JEE Main 2023 · 8 Apr · Shift 2 MCQ

Let S be the set of all values of $\theta \in [-\pi, \pi]$ for which the system of linear equations

$x + y + \sqrt{3}z = 0$

$-x + (\tan\theta)y + \sqrt{7}z = 0$

$x + y + (\tan\theta)z = 0$

has non-trivial solution. Then $\frac{120}{\pi}\sum_{\theta\in S}\theta$ is equal to

(A) 20
(B) 40
(C) 30
(D) 10

Answer: (A) 20 · Key from source paper

Q108 JEE Main 2023 · 6 Apr · Shift 1 MCQ

Let $A = [a_{ij}]_{2\times 2}$, where $a_{ij} \neq 0$ for all i, j and $A^2 = I$. Let a be the sum of all diagonal elements of A and $b = |A|$. Then $3a^2 + 4b^2$ is equal to

(A) 4
(B) 14
(C) 7
(D) 3

Answer: (A) 4 · Key from source paper

Q109 JEE Main 2023 · 6 Apr · Shift 1 MCQ

If the system of equations

$x + y + az = b$

$2x + 5y + 2z = 6$

$x + 2y + 3z = 3$

has infinitely many solutions, then $2a + 3b$ is equal to

(A) 25
(B) 20
(C) 23
(D) 28

Answer: (C) 23 · Key from source paper

Q110 JEE Main 2023 · 6 Apr · Shift 2 MCQ

Let P be a square matrix such that $P^2 = I - P$. For $\alpha, \beta, \gamma, \delta \in \mathbb{N}$, if $P^\alpha + P^\beta = \gamma I - 29P$ and $P^\alpha - P^\beta = \delta I - 13P$, then $\alpha + \beta + \gamma - \delta$ is equal to

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(A) 18
(B) 40
(C) 22
(D) 24

Answer: (D) 24 · Key from source paper

Q111 JEE Main 2023 · 6 Apr · Shift 2 MCQ

For the system of equations

$x + y + z = 6$

$x + 2y + \alpha z = 10$

$x + 3y + 5z = \beta$, which one of the following is NOT true?

(A) System has no solution for $\alpha = 3$, $\beta = 24$
(B) System has a unique solution for $\alpha = -3$, $\beta = 14$
(C) System has infinitely many solutions for $\alpha = 3$, $\beta = 14$
(D) System has a unique solution for $\alpha = 3$, $\beta \neq 14$

Answer: (D) System has a unique solution for $\alpha = 3$, $\beta \neq 14$ · Key from source paper

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Q112 JEE Main 2023 · 1 Feb · Shift 1 MCQ

Let S denote the set of all real values of λ such that the system of equations
$\lambda x + y + z = 1$
$x + \lambda y + z = 1$
$x + y + \lambda z = 1$
is inconsistent, then $\sum_{\lambda \in S} \lambda^2 + \lambda$ is equal to

(A) 2
(B) 12
(C) 4
(D) 6

Answer: (D) 6 · Key from source paper

Q113 JEE Main 2023 · 1 Feb · Shift 2 MCQ

If $A = \frac{1}{2}\begin{bmatrix} 1 & \sqrt{3} \\ -\sqrt{3} & 1 \end{bmatrix}$ then,

(A) $\mathrm{A}^{30}-\mathrm{A}^{25}=2\mathrm{I}$

(B) $\mathrm{A}^{30}+\mathrm{A}^{25}+\mathrm{A}=\mathrm{I}$

(C) $\mathrm{A}^{30}+\mathrm{A}^{25}-\mathrm{A}=\mathrm{I}$

(D) $\mathrm{A}^{30}=\mathrm{A}^{25}$

Answer: (C) $\mathrm{A}^{30}+\mathrm{A}^{25}-\mathrm{A}=\mathrm{I}$ · Key from source paper

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Q114 JEE Main 2023 · 1 Feb · Shift 2 MCQ

For the system of linear equations $ax+y+z=1, x+ay+z=1, x+y+az=\beta$, which one of the following statements is NOT correct?

(A) It has infinitely many solutions if $\alpha=2$ and $\beta=-1$

(B) It has no solution if $\alpha=-2$ and $\beta=1$

(C) $x+y+z=\dfrac{3}{4}$ if $\alpha=2$ and $\beta=1$

(D) It has infinitely many solutions if $\alpha=1$ and $\beta=1$

Answer: (A) It has infinitely many solutions if $\alpha=2$ and $\beta=-1$ · Key from source paper

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Q115 JEE Main 2023 · 31 Jan · Shift 1 MCQ

Let $A=\begin{pmatrix}1 & 0 & 0\\ 0 & 4 & -1\\ 0 & 12 & -3\end{pmatrix}$. Then the sum of the diagonal elements of the matrix $A+I^{11}$ is equal to:

(A) 6144

(B) 4094

(C) 4097

(D) 2050

Answer: (C) 4097 · Key from source paper

Q116 JEE Main 2023 · 31 Jan · Shift 1 MCQ

For the system of linear equations

$x+y+z=6$

$\alpha x+\beta y+7z=3$

$x+2y+3z=14$

which of the following is NOT true ?

(A) If $\alpha = \beta = 7$, then the system has no solution

(B) If $\alpha = \beta$ and $\alpha \neq 7$ then the system has a unique solution.

(C) There is a unique point (α, β) on the line $x + 2y + 18 = 0$ for which the system has infinitely many solutions

(D) For every point $(\alpha, \beta) \neq (7, 7)$ on the line $x - 2y + 7 = 0$, the system has infinitely many solutions.

Answer: (D) For every point $(\alpha, \beta) \neq (7, 7)$ on the line $x - 2y + 7 = 0$, the system has infinitely many solutions. · Key from source paper

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Q117 JEE Main 2023 · 31 Jan · Shift 2 Numerical

Let A be a $n \times n$ matrix such that $|A| = 2$. If the determinant of the matrix $\operatorname{Adj}\left(2.\operatorname{Adj}\left(2\,A^{-1}\right)\right)$ is 2^{84}, then n is equal to _____ .

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q118 JEE Main 2023 · 31 Jan · Shift 2 MCQ

If a point $P(\alpha, \beta, \gamma)$ satisfying $(\alpha \;\; \beta \;\; \gamma)\begin{pmatrix} 2 & 10 & 8 \\ 9 & 3 & 8 \\ 8 & 4 & 8 \end{pmatrix} = (0 \;\; 0 \;\; 0)$ lies on the plane $2x + 4y + 3z = 5$, then $6\alpha + 9\beta + 7\gamma$ is equal to

(A) $\frac{5}{4}$

(B) -1

(C) 11

(D) $\frac{11}{5}$

Answer: (C) 11 · Key from source paper

Q119 JEE Main 2023 · 30 Jan · Shift 1 MCQ

Let $A = \begin{matrix} m & n \\ p & q \end{matrix}$, $d = A \neq 0$ and $A - d\,\operatorname{Adj}\,A = 0$. Then

(A) $1 + d^2 = m + q^2$

(B) $1 + d^2 = m + q^2$

(C) $1 + d^2 = m^2 + q^2$

(D) $1 + d^2 = m^2 + q^2$

Answer: (A) $1 + d^2 = m + q^2$ · Key from source paper

Q120 JEE Main 2023 · 30 Jan · Shift 1 MCQ

Let the system of linear equations

$x + y + kz = 2$

$2x + 3y - z = 1$
$3x + 4y + 2z = k$
have infinitely many solutions. Then the system
$k + 1 \;\; x + 2k - 1 \;\; y = 7$
$2k + 1x + k + 5y = 10$ has :

(A) infinitely many solutions
(B) unique solution satisfying $x - y = 1$
(C) no solution
(D) unique solution satisfying $x + y = 1$

Answer: (D) unique solution satisfying $x + y = 1$ · Key from source paper

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Q121 JEE Main 2023 · 30 Jan · Shift 2 MCQ

If P is a 3 $\times$ 3 real matrix such that $P^T = aP + (a-1)\mathrm{I}$, where $a > 1$, then

(A) P is a singular matrix
(B) $|\text{Adj } P| > 1$
(C) $|\text{Adj } P| = \frac{1}{2}$
(D) $|\text{Adj } P| = 1$

Answer: (D) $|\text{Adj } P| = 1$ · Key from source paper

Q122 JEE Main 2023 · 30 Jan · Shift 2 MCQ

For $\alpha, \beta \in \mathbb{R}$, suppose the system of linear equations
$x - y + z = 5$
$2x + 2y + \alpha z = 8$
$3x - y + 4z = \beta$
has infinitely many solutions. Then α and β are the roots of

(A) $x^2 - 10x + 16 = 0$
(B) $x^2 + 18x + 56 = 0$
(C) $x^2 - 18x + 56 = 0$
(D) $x^2 + 14x + 24 = 0$

Answer: (C) $x^2 - 18x + 56 = 0$ · Key from source paper

Q123 JEE Main 2023 · 29 Jan · Shift 1 MCQ

Let α and β be real numbers. Consider a 3×3 matrix A such that $A^2 = 3A + \alpha I$. If $A^4 = 21A + \beta I$, then

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(A) $\alpha = 1$

(B) $\alpha = 4$

(C) $\beta = 8$

(D) $\beta = -8$

Answer: (D) $\beta = -8$ · Key from source paper

Q124 JEE Main 2023 · 29 Jan · Shift 1 MCQ

Consider the following system of questions

$\alpha x + 2y + z = 1$

$2\alpha x + 3y + z = 1$

$3x + \alpha y + 2z = \beta$

For some $\alpha, \beta \in \mathbb{R}$. Then which of the following is NOT correct.

(A) It has no solution if $\alpha = -1$ and $\beta \neq 2$

(B) It has no solution for $\alpha = -1$ and for all $\beta \in \mathbb{R}$

(C) It has no solution for $\alpha = 3$ and for all $\beta \neq 2$

(D) It has a solution for all $\alpha \neq -1$ and $\beta = 2$

Answer: (B) It has no solution for $\alpha = -1$ and for all $\beta \in \mathbb{R}$ · Key from source paper

Q125 JEE Main 2023 · 29 Jan · Shift 2 Numerical

Let A be a symmetric matrix such that $|A| = 2$ and $\begin{bmatrix} 2 & 1 \\ 3 & \frac{3}{2} \end{bmatrix} A = \begin{bmatrix} 1 & 2 \\ \alpha & \beta \end{bmatrix}$ If the sum of the diagonal elements of A is s, then $\frac{\beta s}{\alpha^2}$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q126 JEE Main 2023 · 25 Jan · Shift 1 MCQ

Let $x, y, z > 1$ and $A = \begin{bmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 2 & \log_y z \\ \log_z x & \log_z y & 3 \end{bmatrix}$. Then $|\text{adj}\,(\text{adj}\,A^2)|$ is equal to

(A) 6^4

(B) 2^8

(C) 4^8

(D) 2^4

Answer: (B) 2^8 · Key from source paper

Q127 JEE Main 2023 · 25 Jan · Shift 1 MCQ

Let S_1 and S_2 be respectively the sets of all $a \in R - \{0\}$ for which the system of linear equations

$ax + 2ay - 3az = 1$

$(2a+1)\,x+(2a+3)\,y+(a+1)z=2$
$(3a+5)\,x+(a+5)\,y+(a+2)\,z=3$
has unique solution and infinitely many solutions. Then

(A) $\mathrm{n}(S_1)=2$ and S_2 is an infinite set
(B) S_1 is an infinite set an $n(S_2)=2$
(C) $S_1=\phi$ and $S_2=\mathbb{R}-\{0\}$
(D) $S_1=\mathbb{R}-\{0\}$ and $S_2=\phi$

Answer: (D) $S_1=\mathbb{R}-\{0\}$ and $S_2=\phi$ · Key from source paper

Q128 JEE Main 2023 · 25 Jan · Shift 2 MCQ

Let A, B, C be 3×3 matrices such that A is symmetric and B and C are skew-symmetric.

Consider the statements

$(S1)$ $A^{13}B^{26}-B^{26}A^{13}$ is symmetric

$(S2)$ $A^{26}C^{13}-C^{13}A^{26}$ is symmetric

Then,

(A) Only $S2$ is true
(B) Only S1 is true
(C) Both $S1$ and $S2$ are false
(D) Both $S1$ and $S2$ are true

Answer: (A) Only $S2$ is true · Key from source paper

Q129 JEE Main 2023 · 25 Jan · Shift 2 MCQ

Let $\mathrm{A}=\begin{bmatrix}\frac{1}{\sqrt{10}} & \frac{3}{\sqrt{10}}\\ \frac{-3}{\sqrt{10}} & \frac{1}{\sqrt{10}}\end{bmatrix}$ and $\mathrm{B}=\begin{bmatrix}1 & -\mathrm{i}\\ 0 & 1\end{bmatrix}$, where $\mathrm{i}=\sqrt{-1}$. If $\mathrm{M}=\mathrm{A}^{\mathrm{T}}\mathrm{BA}$, then the inverse of the matrix $\mathrm{AM}^{2023}\,\mathrm{A}^{\mathrm{T}}$ is

(A) $\begin{bmatrix}1 & -2023i\\ 0 & 1\end{bmatrix}$
(B) $\begin{bmatrix}1 & 0\\ -2023i & 1\end{bmatrix}$
(C) $\begin{bmatrix}1 & 0\\ 2023i & 1\end{bmatrix}$
(D) $\begin{bmatrix}1 & 2023i\\ 0 & 1\end{bmatrix}$

Answer: (D) $\begin{bmatrix}1 & 2023i\\ 0 & 1\end{bmatrix}$ · Key from source paper

Q130 JEE Main 2023 · 24 Jan · Shift 1 MCQ

If A and B are two non-zero $n\times n$ matrices such that $A^2+B=A^2B$, then

(A) $AB = I$
(B) $A^2B = I$
(C) $A^2 = I$ or $B = I$
(D) $A^2B = BA^2$

Answer: (D) $A^2B = BA^2$ · Key from source paper

Q131 JEE Main 2023 · 24 Jan · Shift 1 MCQ

Let N denote the number that turns up when a fair die is rolled. If the probability that the system of equations

$x + y + z = 12x + Ny + 2z = 23x + 3y + Nz = 3$

has unique solution is $\frac{k}{6}$, then the sum of value of k and all possible values of N is

(A) 18
(B) 19
(C) 20
(D) 21

Answer: (C) 20 · Key from source paper

Q132 JEE Main 2023 · 24 Jan · Shift 2 MCQ

Let A be a 3×3 matrix such that $|adj(adj(adj.A))| = 12^4$. Then $\left|A^{-1}adj\ A\right|$ is equal to

(A) $2\sqrt{3}$
(B) $\sqrt{6}$
(C) 12
(D) 1

Answer: (A) $2\sqrt{3}$ · Key from source paper

Q133 JEE Main 2023 · 24 Jan · Shift 2 MCQ

If the system of equations $x + 2y + 3z = 3$, $4x + 3y - 4z = 4$ and $8x + 4y - \lambda z = 9 + \mu$ has infinitely many solutions, then the ordered pair (λ, μ) is equal to

(A) $\left(\frac{72}{5}, \frac{21}{5}\right)$
(B) $\left(\frac{-72}{5}, \frac{-21}{5}\right)$
(C) $\left(\frac{72}{5}, \frac{-21}{5}\right)$
(D) $\left(\frac{-72}{5}, \frac{21}{5}\right)$

Answer: (C) $\left(\frac{72}{5}, \frac{-21}{5}\right)$ · Key from source paper

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Q134 JEE Main 2022 · 29 Jul · Shift 1 MCQ

Let A and B be two 3×3 non-zero real matrices such that AB is a zero matrix. Then

(A) The system of linear equations $AX = 0$ has a unique solution

(B) The system of linear equations $AX = 0$ has infinitely many solutions

(C) B is an invertible matrix

(D) $\text{adj}(A)$ is an invertible matrix

Answer: (B) The system of linear equations $AX = 0$ has infinitely many solutions · Key from source paper

Q135 JEE Main 2022 · 29 Jul · Shift 2 MCQ

Which of the following matrices can NOT be obtained from the matrix $\begin{matrix} -1 & 2 \\ 1 & -1 \end{matrix}$ by a single elementary row operation?

(A) $\begin{matrix} 0 & 1 \\ 1 & -1 \end{matrix}$

(B) $\begin{matrix} 1 & -1 \\ -1 & 2 \end{matrix}$

(C) $\begin{matrix} -1 & 2 \\ -2 & 7 \end{matrix}$

(D) $\begin{matrix} -1 & 2 \\ -1 & 3 \end{matrix}$

Answer: (C) $\begin{matrix} -1 & 2 \\ -2 & 7 \end{matrix}$ · Key from source paper

Q136 JEE Main 2022 · 29 Jul · Shift 2 MCQ

If the system of equations

$x + y + z = 6$

$2x + 5y + \alpha z = \beta$

$x + 2y + 3z = 14$

has infinitely many solutions, then $\alpha + \beta$ is equal to

(A) 8

(B) 36

(C) 44

(D) 48

Answer: (C) 44 · Key from source paper

Q137 JEE Main 2022 · 29 Jul · Shift 2 Numerical

Let $x = \begin{matrix} 1 \\ 1 \\ 1 \end{matrix}$ and $A = \begin{matrix} -1 & 2 & 3 \\ 0 & 1 & 6 \\ 0 & 0 & -1 \end{matrix}$. For $k \in \mathbb{N}$, if $X'A^kX = 33$, then k is equal to

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q138 JEE Main 2022 · 28 Jul · Shift 1 MCQ

Let the matrix $A = \begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ and the matrix $B_0 = A^{49} + 2A^{98}$. If $B_n = \text{Adj}B_{n-1}$ for all $n \geq 1$, then $\det B_4$ is equal to

(A) 3^{28}
(B) 3^{30}
(C) 3^{32}
(D) 3^{36}

Answer: (C) 3^{32} · Key from source paper

Q139 JEE Main 2022 · 28 Jul · Shift 1 Numerical

Let $A = \begin{pmatrix} 1 & -1 \\ 2 & \alpha \end{pmatrix}$ and $B = \begin{pmatrix} \beta & 1 \\ 1 & 0 \end{pmatrix}, \alpha, \beta \in R$. Let α_1 be the value of α which satisfies $A + B^2 = A^2 + \begin{pmatrix} 2 & 2 \\ 2 & 2 \end{pmatrix}$ and α_2 be the value of α which satisfies $A + B^2 = B^2$. Then $\alpha_1 - \alpha_2$ is equal to

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q140 JEE Main 2022 · 28 Jul · Shift 2 MCQ

Let A and B be any two 3×3 symmetric and skew symmetric matrices respectively. Then which of the following is NOT true?

(A) $A^4 - B^4$ is a symmetric matrix
(B) $AB - BA$ is a symmetric matrix
(C) $B^5 - A^5$ is a skew-symmetric matrix
(D) $AB + BA$ is a skew-symmetric matrix

Answer: (C) $B^5 - A^5$ **is a skew-symmetric matrix** · Key from source paper

Q141 JEE Main 2022 · 27 Jul · Shift 1 MCQ

Let $A = \begin{pmatrix} 1 & 2 \\ -2 & -5 \end{pmatrix}$. Let $\alpha, \beta \in \mathbb{R}$ be such that $\alpha A^2 + \beta A = 2I$. Then $\alpha + \beta$ is equal to

(A) -10
(B) -6
(C) 6
(D) 10

Answer: (D) 10 · Key from source paper

Q142 JEE Main 2022 · 27 Jul · Shift 1 Numerical

Let S be the set containing all 3×3 matrices with entries from $\{-1, 0, 1\}$. The total number of matrices $A \in S$ such that the sum of all the diagonal elements of $A^T A$ is 6 is _____ .

Numerical value type: the answer is a number.

Answer: 5376. · Key from source paper

Q143 JEE Main 2022 · 27 Jul · Shift 2 MCQ

Let $A = \begin{pmatrix} 4 & -2 \\ \alpha & \beta \end{pmatrix}$. If $A^2 + \gamma A + 18I = O$, then $\det(A)$ is equal to _____ .

(A) -18
(B) 18
(C) -50
(D) 50

Answer: (B) 18 · Key from source paper

Q144 JEE Main 2022 · 27 Jul · Shift 2 Numerical

Consider a matrix $\mathrm{A} = \begin{bmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ \beta+\gamma & \gamma+\alpha & \alpha+\beta \end{bmatrix}$, where α, β, γ are three distinct natural numbers. If $\frac{\det(\mathrm{adj}(\mathrm{adj}(\mathrm{adj}(\mathrm{adj}A))))}{(\alpha-\beta)^{16}(\beta-\gamma)^{16}(\gamma-\alpha)^{16}} = 2^{32} \times 3^{16}$, then the number of such 3- tuples (α, β, γ) is _____ .

Numerical value type: the answer is a number.

Answer: 42. · Key from source paper

Q145 JEE Main 2022 · 26 Jul · Shift 1 MCQ

Let A be a 2×2 matrix with $\det(A) = -1$ and $\det((A + I)(\mathrm{Adj}(A) + I)) = 4$. Then the sum of the diagonal elements of A can be:

(A) -1
(B) 2
(C) 1
(D) $-\sqrt{2}$

Answer: (B) 2 · Key from source paper

Q146 JEE Main 2022 · 26 Jul · Shift 1 MCQ

If the system of linear equations.
$8x + y + 4z = -2$
$x + y + z = 0$
$\lambda x - 3y = \mu$

has infinitely many solutions, then the distance of the point $\left(\lambda, \mu, -\frac{1}{2}\right)$ from the plane $8x + y + 4z + 2 = 0$ is:

(A) $3\sqrt{5}$

(B) 4

(C) $\frac{26}{9}$

(D) $\frac{10}{3}$

Answer: (D) $\frac{10}{3}$ · Key from source paper

Q147 JEE Main 2022 · 26 Jul · Shift 2 MCQ

Let $A = \begin{matrix} 1 \\ 1 \\ 1 \end{matrix}$ and $B = \begin{matrix} 9^2 & -10^2 & 11^2 \\ 12^2 & 13^2 & -14^2 \\ -15^2 & 16^2 & 17^2 \end{matrix}$, then the value of $A'BA$ is;

(A) 1224

(B) 1042

(C) 540

(D) 539

Answer: (D) 539 · Key from source paper

Q148 JEE Main 2022 · 26 Jul · Shift 2 Numerical

The number of matrices $A = \begin{matrix} a & b \\ c & d' \end{matrix}$ where $a, b, c, \mathrm{d} \in -1, 0, 1, 2, 3, \ldots, 10$, such that $A = A^{-1}$, is _____

.

Numerical value type: the answer is a number.

Answer: 50. · Key from source paper

Q149 JEE Main 2022 · 25 Jul · Shift 1 MCQ

The number of $\theta \in 0, 4\pi$ for which the system of linear equations

$3 \sin 3\theta x - y + z = 2$

$3 \cos 2\theta x + 4y + 3z = 3$

$6x + 7y + 7z = 9$ has no solution is

(A) 6

(B) 7

(C) 8

(D) 9

Answer: (B) 7 · Key from source paper

Q150 JEE Main 2022 · 25 Jul · Shift 1 Numerical

Let $A=\begin{pmatrix}2 & -1 & -1\\ 1 & 0 & -1\\ 1 & -1 & 0\end{pmatrix}$ and $B=A-I$. If $\omega=\frac{\sqrt{3}i-1}{2}$, then the number of elements in the set $\{n\in\{1,2,\ldots,100\}: A^n+(\omega B)^n=A+B\}$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 17. · Key from source paper

Q151 JEE Main 2022 · 25 Jul · Shift 2 MCQ

The number of real values of λ, such that the system of linear equations

$2x-3y+5z=9$

$x+3y-z=-18$

$3x-y+(\lambda^2-|\lambda|)z=16$ has no solutions, is

(A) 0

(B) 1

(C) 2

(D) 4

Answer: (C) 2 · Key from source paper

Q152 JEE Main 2022 · 25 Jul · Shift 2 Numerical

Let $A=\begin{bmatrix}1 & a & a\\ 0 & 1 & b\\ 0 & 0 & 1\end{bmatrix}$, $a,b\in\mathbb{R}$. If for some $n\in N$, $A^n=\begin{bmatrix}1 & 48 & 2160\\ 0 & 1 & 96\\ 0 & 0 & 1\end{bmatrix}$ then $n+a+b$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 24. · Key from source paper

Q153 JEE Main 2022 · 29 Jun · Shift 1 MCQ

Let $A=[a_{ij}]$ be a square matrix of order 3 such that $a_{ij}=2^{j-i}$, for all $i,\ j=1,2,3$. Then, the matrix $A^2+A^3+\ldots+A^{10}$ is equal to

(A) $\left(\frac{3^{10}-1}{2}\right)A$

(B) $\left(\frac{3^{10}+1}{2}\right)A$

(C) $\left(\frac{3^{10}+3}{2}\right)A$

(D) $\left(\frac{3^{10}-3}{2}\right)A$

Answer: (D) $\left(\frac{3^{10}-3}{2}\right)A$ · Key from source paper

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Q154 JEE Main 2022 · 29 Jun · Shift 1 MCQ

If the system of linear equations

$2x+y-z=7$

$x-3y+2z=1$

$x+4y+\delta z=k$, where $\delta, k \in R$

has infinitely many solutions, then $\delta+k$ is equal to

(A) -3

(B) 3

(C) 6

(D) 9

Answer: (B) 3 · Key from source paper

Q155 JEE Main 2022 · 29 Jun · Shift 2 MCQ

Let $A=\begin{pmatrix}2 & -1\\ 0 & 2\end{pmatrix}$. If $B=I-{}^5C_1(\text{adj } A)+{}^5C_2(\text{adj } A)^2-\ldots-{}^5C_5(\text{adj } A)^5$, then the sum of all elements of the matrix B is:

(A) -5

(B) -6

(C) -7

(D) -8

Answer: (C) -7 · Key from source paper

Q156 JEE Main 2022 · 29 Jun · Shift 2 Numerical

Let $M=\begin{bmatrix}0 & -\alpha\\ \alpha & 0\end{bmatrix}$, where α is a non-zero real number and $N=\sum_{k=1}^{49}M^{2k}$. If $(I-M^2)N=-2I$, then the positive integral value of α is _____.

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q157 JEE Main 2022 · 28 Jun · Shift 1 MCQ

Let A be a matrix of order 3×3 and $\det(A) = 2$. Then $\det\left(\det(A)\,\text{adj}\left(5\,\text{adj}\left(A^3\right)\right)\right)$ is equal to _____.

(A) 256×10^6
(B) 1024×10^6
(C) 512×10^6
(D) 256×10^{11}

Answer: (C) 512×10^6 · Key from source paper

Q158 JEE Main 2022 · 28 Jun · Shift 1 MCQ

If the system of linear equations
$2x + 3y - z = -2$
$x + y + z = 4$
$x - y + |\lambda|z = 4\lambda - 4$ where $\lambda \in \mathbb{R}$,
has no solution, then

(A) $\lambda = 7$
(B) $\lambda = -7$
(C) $\lambda = 8$
(D) $\lambda^2 = 1$

Answer: (B) $\lambda = -7$ · Key from source paper

Q159 JEE Main 2022 · 28 Jun · Shift 2 Numerical

Let $A = \begin{pmatrix} 1+i & 1 \\ -i & 0 \end{pmatrix}$ where $i = \sqrt{-1}$. Then, the number of elements in the set $\{n \in \{1, 2, \ldots, 100\} : A^n = A\}$ is

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q160 JEE Main 2022 · 28 Jun · Shift 2 Numerical

If the system of linear equations
$2x - 3y = \gamma + 5$
$\alpha x + 5y = \beta + 1$, where $\alpha, \beta, \gamma \in \mathbf{R}$ has infinitely many solutions, then the value of $|9\alpha + 3\beta + 5\gamma|$ is equal to

Numerical value type: the answer is a number.

Answer: 58. · Key from source paper

Q161 JEE Main 2022 · 27 Jun · Shift 1 MCQ

Let the system of linear equations $x+2y+z=2,\ \alpha x+3y-z=\alpha,\ -\alpha x+y+2z=-\alpha$ be inconsistent. Then α is equal to

(A) $\frac{5}{2}$
(B) $-\frac{5}{2}$
(C) $\frac{7}{2}$
(D) $-\frac{7}{2}$

Answer: (D) $-\frac{7}{2}$ · Key from source paper

Q162 JEE Main 2022 · 27 Jun · Shift 1 Numerical

The positive value of the determinant of the matrix A, whose $Adj(Adj(A))=\begin{bmatrix}14 & 28 & -14\\ -14 & 14 & 28\\ 28 & -14 & 14\end{bmatrix}$, is _____ .

Numerical value type: the answer is a number.

Answer: 14. · Key from source paper

Q163 JEE Main 2022 · 27 Jun · Shift 2 MCQ

Let A and B be two 3×3 matrices such that $AB=I$ and $|A|=\frac{1}{8}$ then $|adj(Badj(2A))|$ is equal to

(A) 128
(B) 32
(C) 64
(D) 102

Answer: (C) 64 · Key from source paper

Q164 JEE Main 2022 · 26 Jun · Shift 1 MCQ

Let A be a 3×3 invertible matrix. If $|\mathrm{adj}(24A)|=\mathrm{adj}(3\,\mathrm{adj}(2A))|$, then $|A|^2$ is equal to

(A) 2^6
(B) 2^{12}
(C) 512
(D) 6^6

Answer: (A) 2^6 · Key from source paper

Q165 JEE Main 2022 · 26 Jun · Shift 1 MCQ

The ordered pair (a,b), for which the system of linear equations
$3x-2y+z=b$
$5x-8y+9z=3$

$2x + y + az = -1$
has no solution, is

(A) $(3, \frac{1}{3})$
(B) $(-3, \frac{1}{3})$
(C) $(-3, -\frac{1}{3})$
(D) $(3, -\frac{1}{3})$

Answer: (C) $(-3, -\frac{1}{3})$ · Key from source paper

Q166 JEE Main 2022 · 26 Jun · Shift 2 MCQ

If the system of equations $\alpha x + y + z = 5, x + 2y + 3z = 4, x + 3y + 5z = \beta$. Has infinitely many solutions, then the ordered pair (α, β) is equal to

(A) $(1, -3)$
(B) $(-1, 3)$
(C) $(1, 3)$
(D) $(-1, -3)$

Answer: (C) $(1, 3)$ · Key from source paper

Q167 JEE Main 2022 · 26 Jun · Shift 2 Numerical

Let $X = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}, Y = \alpha I + \beta X + \gamma X^2$ and $Z = \alpha^2 I - \alpha\beta X + (\beta^2 - \alpha\gamma)X^2, \alpha, \beta, \gamma \in \mathbb{R}$.

If $Y^{-1} = \begin{bmatrix} \frac{1}{5} & \frac{-2}{5} & \frac{1}{5} \\ 0 & \frac{1}{5} & \frac{-2}{5} \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$, then $(\alpha - \beta + \gamma)^2$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q168 JEE Main 2022 · 25 Jun · Shift 1 MCQ

Let $A = \begin{pmatrix} 0 & -2 \\ 2 & 0 \end{pmatrix}$. If M and N are two matrices given by $M = \sum_{k=1}^{10} A^{2k}$ and $N = \sum_{k=1}^{10} A^{2k-1}$ then MN^2 is

(A) a non-identity symmetric matrix
(B) a skew-symmetric matrix
(C) neither symmetric nor skew-symmetric matrix
(D) an identity matrix

Answer: (A) a non-identity symmetric matrix · Key from source paper

Q169 JEE Main 2022 · 25 Jun · Shift 1 MCQ

Let A be a 3×3 real matrix such that $A\begin{pmatrix}1\\1\\0\end{pmatrix} = \begin{pmatrix}1\\1\\0\end{pmatrix}$; $A\begin{pmatrix}1\\0\\1\end{pmatrix} = \begin{pmatrix}-1\\0\\1\end{pmatrix}$ and $A\begin{pmatrix}0\\0\\1\end{pmatrix} = \begin{pmatrix}1\\1\\2\end{pmatrix}$. If $X = \begin{pmatrix}x_1 & x_2 & x_3\end{pmatrix}^T$ and I is an identity matrix of order 3, then the system $A - 2IX = \begin{pmatrix}4\\1\\1\end{pmatrix}$ has

(A) no solution
(B) infinitely many solutions
(C) unique solution
(D) exactly two solutions

Answer: (B) infinitely many solutions · Key from source paper

Q170 JEE Main 2022 · 25 Jun · Shift 2 MCQ

The system of equations
$-kx + 3y - 14z = 25$
$-15x + 4y - kz = 3$
$-4x + y + 3z = 4$
Question: is consistent for all k in the set

(A) R
(B) $R - -11, 13$
(C) $R - -13$
(D) $R - -11, 11$

Answer: (D) $R - -11, 11$ · Key from source paper

Q171 JEE Main 2022 · 25 Jun · Shift 2 Numerical

Let $A = \begin{bmatrix}2 & -2\\1 & -1\end{bmatrix}$ and $B = \begin{bmatrix}-1 & 2\\-1 & 2\end{bmatrix}$. Then the number of elements in the set $\{n, m : n, m \in 1, 2, \ldots\ldots 10$ and $nA^n + mB^m = I\}$ is _____ .

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q172 JEE Main 2022 · 24 Jun · Shift 1 MCQ

Let $S = \{\sqrt{n} : 1 \le n \le 50$ and n is odd$\}$. Let $a \in S$ and $A = \begin{bmatrix}1 & 0 & a\\-1 & 1 & 0\\-a & 0 & 1\end{bmatrix}$. If $\sum_{a \in S} \det(\text{adj } A) = 100\lambda$, then λ is equal to

(A) 218
(B) 221
(C) 663
(D) 1717

Answer: (B) 221 · Key from source paper

Q173 JEE Main 2022 · 24 Jun · Shift 1 MCQ

The number of values of α for which the system of equations

$x + y + z = \alpha$

$\alpha x + 2\alpha y + 3z = -1$

$x + 3\alpha y + 5z = 4$

is inconsistent, is

(A) 0
(B) 1
(C) 2
(D) 3

Answer: (B) 1 · Key from source paper

Q174 JEE Main 2022 · 24 Jun · Shift 2 Numerical

Let $S = \left\{ \begin{pmatrix} -1 & a \\ 0 & b \end{pmatrix} ; a, b \in \{1, 2, 3, \ldots 100\} \right\}$ and let $T_n = \{A \in S : A^{n(n+1)} = I\}$. Then the number of elements in $\bigcap_{n=1}^{100} T_n$ is _____ .

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q175 JEE Main 2021 · 1 Sep · Shift 2 MCQ

Consider the system of linear equations

$-x + y + 2z = 0$

$3x - ay + 5z = 1$

$2x - 2y - az = 7$

Let S_1 be the set of all $a \in R$ for which the system is inconsistent and S_2 be the set of all $a \in R$ for which the system has infinitely many solutions. If nS_1 and nS_2 denote the number of elements in S_1 and S_2 respectively, then

(A) $\mathrm{nS}_1 = 2, \mathrm{nS}_2 = 0$
(B) $\mathrm{nS}_1 = 2, \mathrm{nS}_2 = 2$
(C) $\mathrm{nS}_1 = 0, \mathrm{nS}_2 = 2$
(D) $\mathrm{nS}_1 = 1, \mathrm{nS}_2 = 0$

Answer: (A) $\mathrm{nS}_1 = 2, \mathrm{nS}_2 = 0$ · Key from source paper

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Q176 JEE Main 2021 · 1 Sep · Shift 2 MCQ

Let $J_{n,m} = \int_0^{1/2} \frac{x^n}{x^m - 1} dx, \forall n > m$ and $n, m \in N$. Consider a matrix $A = a_{ij_{3\times 3}}$ where $a_{ij} = \begin{cases} J_{6+i,3} - J_{i+3,3}, & i \le j \\ 0, & i > j \end{cases}$. Then adj A^{-1} is :

(A) $(15)^2 \times 2^{34}$
(B) $(15)^2 \times 2^{42}$
(C) $(105)^2 \times 2^{36}$
(D) $(105)^2 \times 2^{38}$

Answer: (D) $(105)^2 \times 2^{38}$ · Key from source paper

Q177 JEE Main 2021 · 31 Aug · Shift 1 MCQ

If the following system of linear equations
$2x + y + z = 5$
$x - y + z = 3$
$x + y + a\, z = b$
has no solution, then :

(A) $a = -\frac{1}{3}, b \neq \frac{7}{3}$
(B) $a \neq \frac{1}{3}, b = \frac{7}{3}$
(C) $a \neq -\frac{1}{3}, b = \frac{7}{3}$
(D) $a = \frac{1}{3}, b \neq \frac{7}{3}$

Answer: (D) $a = \frac{1}{3}, b \neq \frac{7}{3}$ · Key from source paper

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Q178 JEE Main 2021 · 31 Aug · Shift 2 Numerical

The number of elements in the set $\left\{A = \begin{bmatrix} a & b \\ 0 & d \end{bmatrix} : a, b, d \in \{-1, 0, 1\} \text{ and } (I - A)^3 = I - A^3\right\}$, where I is 2×2 identity matrix, is _____.

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q179 JEE Main 2021 · 27 Aug · Shift 1 MCQ

If the matrix $A = \begin{bmatrix} 0 & 2 \\ K & -1 \end{bmatrix}$ satisfies $A(A^3 + 3I) = 2I$, then the value of K is

(A) $\frac{1}{2}$
(B) 1
(C) -1
(D) $-\frac{1}{2}$

Answer: (A) $\frac{1}{2}$ · Key from source paper

Q180 JEE Main 2021 · 27 Aug · Shift 1 Numerical

If the system of linear equations
$2x + y - z = 3$
$x - y - z = \alpha$
$3x + 3y + \beta z = 3$
has infinitely many solutions, then $|\alpha + \beta - \alpha\beta|$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 5. · Checked by our team

Q181 JEE Main 2021 · 27 Aug · Shift 2 MCQ

Let $[\lambda]$ be the greatest integer less than or equal to λ. The set of all values of λ for which the system of linear equations $x + y + z = 4$, $3x + 2y + 5z = 3$, $9x + 4y + (28 + [\lambda])z = [\lambda]$ has a solution is:

(A) R
(B) $(-\infty, -9) \cup [-8, \infty)$
(C) $(-\infty, -9) \cup (-9, \infty)$
(D) $[-9, -8)$

Answer: (A) R · Key from source paper

Q182 JEE Main 2021 · 26 Aug · Shift 1 MCQ

If $A = \begin{bmatrix} \frac{1}{\sqrt{5}} & \frac{2}{\sqrt{5}} \\ \frac{-2}{\sqrt{5}} & \frac{1}{\sqrt{5}} \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ i & 1 \end{bmatrix}$, $i = \sqrt{-1}$, and $Q = A^T B A$, then the inverse of the matrix $AQ^{2021}A^{\mathrm{T}}$ is equal to:

(A) $\begin{bmatrix} 1 & -2021 \\ 0 & 1 \end{bmatrix}$
(B) $\begin{bmatrix} 1 & 0 \\ -2021i & 1 \end{bmatrix}$
(C) $\begin{bmatrix} \frac{1}{\sqrt{5}} & -2021 \\ 2021 & \frac{1}{\sqrt{5}} \end{bmatrix}$
(D) $\begin{bmatrix} 1 & 0 \\ 2021i & 1 \end{bmatrix}$

Answer: (B) $\begin{bmatrix} 1 & 0 \\ -2021i & 1 \end{bmatrix}$ · Key from source paper

Q183 JEE Main 2021 · 26 Aug · Shift 2 MCQ

Let $A=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 1\\ 1 & 0 & 0\end{bmatrix}$. Then $A^{2025}-A^{2020}$ is equal to

(A) A^6-A

(B) A^6

(C) A^5

(D) A^5-A

Answer: (A) A^6-A · Key from source paper

Q184 JEE Main 2021 · 26 Aug · Shift 2 MCQ

Two fair dice are thrown. The numbers on them are taken as λ and μ, and a system of linear equations

$x+y+z=5$

$x+2y+3z=\mu$

$x+3y+\lambda z=1$

is constructed. If p is the probability that the system has a unique solution and q is the probability that the system has no solution, then:

(A) $p=\frac{1}{6}$ and $q=\frac{5}{36}$

(B) $p=\frac{5}{6}$ and $q=\frac{1}{36}$

(C) $p=\frac{1}{6}$ and $q=\frac{1}{36}$

(D) $p=\frac{5}{6}$ and $q=\frac{5}{36}$

Answer: (D) $p=\frac{5}{6}$ and $q=\frac{5}{36}$ · Key from source paper

Q185 JEE Main 2021 · 26 Aug · Shift 2 Numerical

Let A be a 3×3 real matrix. If $\det\left(2\,\mathrm{Adj}\left(2\,\mathrm{Adj}\left(\mathrm{Adj}\left(2A\right)\right)\right)\right)=2^{41}$, then the value of $\det\left(\mathrm{A}^2\right)$ equals _____.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q186 JEE Main 2021 · 27 Jul · Shift 1 MCQ

Let $A=\begin{bmatrix}1 & 2\\ -1 & 4\end{bmatrix}$. If $A^{-1}=\alpha I+\beta A$, $\alpha,\beta\in R$, I is a 2×2 identity matrix, then $4(\alpha-\beta)$ is equal to :

(A) 5
(B) $\frac{8}{3}$
(C) 2
(D) 4

Answer: (D) 4 · Key from source paper

Q187 JEE Main 2021 · 27 Jul · Shift 1 Numerical

For real numbers α and β, consider the following system of linear equations: $x + y - z = 2$, $x + 2y + \alpha z = 1$ and $2x - y + z = \beta$. If the system has infinite solutions, then $\alpha + \beta$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q188 JEE Main 2021 · 27 Jul · Shift 2 MCQ

Let A and B be two 3×3 real matrices such that $(A^2 - B^2)$ is invertible matrix. If $A^5 = B^5$ and $A^3B^2 = A^2B^3$, then the value of the determinant of the matrix $A^3 + B^3$ is equal to :

(A) 2
(B) 4
(C) 1
(D) 0

Answer: (D) 0 · Key from source paper

Q189 JEE Main 2021 · 27 Jul · Shift 2 Numerical

If $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ and $M = A + A^2 + A^3 + \ldots + A^{20}$, then the sum of all the elements of the matrix M is equal to _____.

Numerical value type: the answer is a number.

Answer: 2020. · Key from source paper

Q190 JEE Main 2021 · 25 Jul · Shift 1 MCQ

The values of a and b, for which the system of equations
$2x + 3y + 6z = 8$
$x + 2y + az = 5$
$3x + 5y + 9z = b$
has no solution, are :

(A) $a = 3, b \neq 13$

(B) $a \neq 3, b \neq 13$

(C) $a \neq 3, b = 3$

(D) $a = 3, b = 13$

Answer: (A) $a = 3, b \neq 13$ · Key from source paper

Q191 JEE Main 2021 · 25 Jul · Shift 1 Numerical

Let $S = n \in N, \begin{pmatrix} 0 & i \\ 1 & 0 \end{pmatrix}^n \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ $\forall a, b, c, d \in R$, where $i = \sqrt{-1}$. Then the number of 2 - digit numbers in the set S is

Numerical value type: the answer is a number.

Answer: 11. · Key from source paper

Q192 JEE Main 2021 · 25 Jul · Shift 2 MCQ

If $P = \begin{bmatrix} 1 & 0 \\ \frac{1}{2} & 1 \end{bmatrix}$, then P^{50} is:

(A) $\begin{bmatrix} 1 & 0 \\ 25 & 1 \end{bmatrix}$

(B) $\begin{bmatrix} 1 & 50 \\ 0 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 25 \\ 0 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 0 \\ 50 & 1 \end{bmatrix}$

Answer: (A) $\begin{bmatrix} 1 & 0 \\ 25 & 1 \end{bmatrix}$ · Key from source paper

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Q193 JEE Main 2021 · 22 Jul · Shift 1 MCQ

Let $A = [a_{ij}]$ be a real matrix of order 3×3, such that $a_{i1} + a_{i2} + a_{i3} = 1$, for $i = 1, 2, 3$. Then, the sum of all the entries of the matrix A^3 is equal to:

(A) 2

(B) 1

(C) 3

(D) 9

Answer: (C) 3 · Key from source paper

Q194 JEE Main 2021 · 22 Jul · Shift 1 MCQ

The values of λ and μ such that the system of equations $x + y + z = 6$, $3x + 5y + 5z = 26$ and $x + 2y + \lambda z = \mu$ has no solution, are:

(A) $\lambda = 3, \mu = 5$

(B) $\lambda = 3, \mu \neq 10$

(C) $\lambda \neq 2, \mu = 10$

(D) $\lambda = 2, \mu \neq 10$

Answer: (D) $\lambda = 2, \mu \neq 10$ · Key from source paper

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Q195 JEE Main 2021 · 22 Jul · Shift 1 Numerical

Let $A = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$. Then the number of 3×3 matrices B with entries from the set $\{1, 2, 3, 4, 5\}$ and satisfying $AB = BA$ is _____.

Numerical value type: the answer is a number.

Answer: 3125. · Key from source paper

Q196 JEE Main 2021 · 20 Jul · Shift 1 MCQ

Let $A = \begin{bmatrix} 2 & 3 \\ a & 0 \end{bmatrix}$, $a \in R$ be written as $P + Q$ where P is a symmetric matrix and Q is skew symmetric matrix. If $\det(Q) = 9$, then the modulus of the sum of all possible values of determinant of P is equal to:

(A) 36

(B) 24

(C) 45

(D) 18

Answer: (A) 36 · Key from source paper

Q197 JEE Main 2021 · 20 Jul · Shift 1 Numerical

Let $A = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = 7A^{20} - 20A^7 + 2I$,

where I is an identity matrix of order 3×3. If $B = [b_{ij}]$, then b_{13} is equal to

Numerical value type: the answer is a number.

Answer: 910. · Key from source paper

Q198 JEE Main 2021 · 20 Jul · Shift 2 MCQ

The value of $k \in R$, for which the following system of linear equations

$3x - y + 4z = 3$

$x + 2y - 3z = -2$

$6x + 5y + kz = -3$

has infinitely many solutions, is:

(A) 3
(B) -5
(C) 5
(D) -3

Answer: (B) -5 · Key from source paper

Q199 JEE Main 2021 · 20 Jul · Shift 2 Numerical

Let $A = \{a_{ij}\}$ be a 3×3 matrix, where $a_{ij} = \begin{cases} (-1)^{j-i} & \text{if } i < j \\ 2 & \text{if } i = j \\ (-1)^{i+j} & \text{if } i > j \end{cases}$ then $\det\left(3 \text{ Adj } \left(2A^{-1}\right)\right)$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 108. · Key from source paper

Q200 JEE Main 2021 · 18 Mar · Shift 1 MCQ

Let $A + 2B = \begin{bmatrix} 1 & 2 & 0 \\ 6 & -3 & 3 \\ -5 & 3 & 1 \end{bmatrix}$ and $2A - B = \begin{bmatrix} 2 & -1 & 5 \\ 2 & -1 & 6 \\ 0 & 1 & 2 \end{bmatrix}$. If $Tr(A)$ denotes the sum of all diagonal elements of the matrix A, then $\text{Tr}\,(A) - \text{Tr}\,(B)$ has value equal to

(A) 1
(B) 2
(C) 0
(D) 3

Answer: (B) 2 · Key from source paper

Q201 JEE Main 2021 · 18 Mar · Shift 2 Numerical

Let I be an identity matrix of order 2×2 and $P = \begin{bmatrix} 2 & -1 \\ 5 & -3 \end{bmatrix}$. Then the value of $n \in N$ for which $P^n = 5I - 8P$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q202 JEE Main 2021 · 17 Mar · Shift 1 MCQ

If $A = \begin{bmatrix} 0 & \sin\alpha \\ \sin\alpha & 0 \end{bmatrix}$ and $\det\left(A^2 - \frac{1}{2}I\right) = 0$, then a possible value of α is

(A) $\frac{\pi}{2}$
(B) $\frac{\pi}{3}$
(C) $\frac{\pi}{4}$
(D) $\frac{\pi}{6}$

Answer: (C) $\frac{\pi}{4}$ · Key from source paper

Q203 JEE Main 2021 · 17 Mar · Shift 1 MCQ

The system of equations $kx + y + z = 1, x + ky + z = k$ and $x + y + zk = k^2$ has no solution if k is equal to:

(A) 0
(B) 1
(C) -1
(D) -2

Answer: (D) -2 · Key from source paper

Q204 JEE Main 2021 · 17 Mar · Shift 1 Numerical

If $A = \begin{bmatrix} 2 & 3 \\ 0 & -1 \end{bmatrix}$, then the value of $\det\left(A^4\right) + \det\left(A^{10} - (\text{Adj}(2A))^{10}\right)$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q205 JEE Main 2021 · 17 Mar · Shift 2 Numerical

Let $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $B = \begin{bmatrix} \alpha \\ \beta \end{bmatrix} \neq \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ such that $AB = B$ and $a + d = 2021$, then the value of $ad - bc$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 2020. · Key from source paper

Q206 JEE Main 2021 · 16 Mar · Shift 1 MCQ

Let $A = \begin{bmatrix} i & -i \\ -i & i \end{bmatrix}, i = \sqrt{-1}$. Then, the system of linear equations $A^8 \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 64 \end{bmatrix}$ has :

(A) A unique solution
(B) Infinitely many solutions
(C) No solution
(D) Exactly two solutions

Answer: (C) No solution · Key from source paper

Q207 JEE Main 2021 · 16 Mar · Shift 1 Numerical

The total number of 3×3 matrices A having enteries from the set $(0, 1, 2, 3)$ such that the sum of all the diagonal entries of AA^T is 9, is equal to

Numerical value type: the answer is a number.

Answer: 766. · Key from source paper

Q208 JEE Main 2021 · 16 Mar · Shift 2 Numerical

Let $A = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix}$ and $B = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix}$ be two 2×1matrices with real entries such that $A = XB$, where $X = \frac{1}{\sqrt{3}} \begin{bmatrix} 1 & -1 \\ 1 & k \end{bmatrix}$, and $k \in R$. If $a_1^2 + a_2^2 = \frac{2}{3}\left(b_1^2 + b_2^2\right)$ and $(k^2+1)b_2^2 \neq -2\,b_1 b_2$, then the value of k is _____.

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q209 JEE Main 2021 · 26 Feb · Shift 1 MCQ

Let A be a symmetric matrix of order 2 with integer entries. If the sum of the diagonal elements of A^2 is 1, then the possible number of such matrices is:

(A) 12
(B) 4
(C) 1
(D) 6

Answer: (B) 4 · Key from source paper

Q210 JEE Main 2021 · 26 Feb · Shift 2 MCQ

Consider the following system of equations:
$x + 2y - 3z = a$
$2x + 6y - 11z = b$
$x - 2y + 7z = c$
where a, b and c are real constants. Then the system of equations :

(A) has a unique solution when $5a = 2b + c$
(B) has no solution for all a, b and c
(C) has infinite number of solutions when $5a = 2b + c$
(D) has a unique solution for all a, b and c

Answer: (C) has infinite number of solutions when $5a = 2b + c$ · Key from source paper

EdLoop JEE

Q211 JEE Main 2021 · 26 Feb · Shift 2 Numerical

If the matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 3 & 0 & -1 \end{bmatrix}$ satisfies the equation $A^{20} + \alpha A^{19} + \beta A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ for some real numbers α and β, then $\beta - \alpha$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q212 JEE Main 2021 · 25 Feb · Shift 1 Numerical

If $A = \begin{bmatrix} 0 & -\tan\left(\frac{\theta}{2}\right) \\ \tan\left(\frac{\theta}{2}\right) & 0 \end{bmatrix}$ and $(I_2 + A)(I_2 - A)^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then $13(a^2 + b^2)$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 13. · Key from source paper

Q213 JEE Main 2021 · 25 Feb · Shift 1 Numerical

Let $A = \begin{bmatrix} x & y & z \\ y & z & x \\ z & x & y \end{bmatrix}$, where x, y and z are real numbers such that $x + y + z > 0$ and $xyz = 2$. If $A^2 = I_3$, then the value of $x^3 + y^3 + z^3$ is

Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q214 JEE Main 2021 · 25 Feb · Shift 1 Numerical

If the system of equations

$kx + y + 2z = 1$

$3x - y - 2z = 2$

$-2x - 2y - 4z = 3$

has infinitely many solutions, then k is equal to _____.

Numerical value type: the answer is a number.

Answer: 21. · Key from source paper

Q215 JEE Main 2021 · 25 Feb · Shift 2 MCQ

If for the matrix, $A = \begin{bmatrix} 1 & -\alpha \\ \alpha & \beta \end{bmatrix}$, $AA^T = I_2$, then the value of $\alpha^4 + \beta^4$ is :

(A) 3
(B) 1
(C) 2
(D) 4

Answer: (B) 1 · Key from source paper

Q216 JEE Main 2021 · 25 Feb · Shift 2 MCQ

The following system of linear equations
$2x + 3y + 2z = 9$
$3x + 2y + 2z = 9$
$x - y + 4z = 8$

(A) has infinitely many solutions
(B) has a unique solution
(C) has a solution (α, β, γ) satisfying $\alpha + \beta^2 + \gamma^3 = 12$
(D) does not have any solution

Answer: (B) has a unique solution · Key from source paper

Q217 JEE Main 2021 · 24 Feb · Shift 1 MCQ

The system of linear equations
$3x - 2y - kz = 10$
$2x - 4y - 2z = 6$
$x + 2y - z = 5\,m$
is inconsistent if :

(A) $k = 3,\ m \neq \frac{4}{5}$
(B) $k = 3,\ m = \frac{4}{5}$
(C) $k \neq 3,\ m \in R$
(D) $k \neq 3,\ m \neq \frac{4}{5}$

Answer: (A) $k = 3,\ m \neq \frac{4}{5}$ · Key from source paper

Q218 JEE Main 2021 · 24 Feb · Shift 1 Numerical

Let $P = \begin{matrix} 3 & -1 & -2 \\ 2 & 0 & \alpha \\ 3 & -5 & 0 \end{matrix}$, where $\alpha \in R$. Suppose $Q = q_{ij}$ is a matrix satisfying $PQ = kI_3$ for some non-zero $k \in R$. If $q_{23} = -\frac{k}{8}$ and $Q = \frac{k^2}{2}$, then $\alpha^2 + k^2$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 17. · Key from source paper

Q219 JEE Main 2021 · 24 Feb · Shift 2 MCQ

For the system of linear equations:
$x - 2y = 1,\ x - y + kz = -2,\ ky + 4z = 6,\ k \in R$
Consider the following statements:
(A) The system has unique solution if $k \neq 2, k \neq -2$.
(B) The system has unique solution if $k = -2$.
(C) The system has unique solution if $k = 2$.
(D) The system has no-solution if $k = 2$.
(E) The system has infinite number of solutions if $k \neq -2$.
Which of the following statements are correct?

(A) (A) and (E) only
(B) (B) and (E) only
(C) (A) and (D) only
(D) (C) and (D) only

Answer: (C) (A) and (D) only · Key from source paper

Q220 JEE Main 2021 · 24 Feb · Shift 2 MCQ

Let A and B be 3×3 real matrices such that A is a symmetric matrix and B is a skew-symmetric matrix. Then the system of linear equations $\left(A^2B^2 - B^2A^2\right) X = O$, where X is a 3×1 column matrix of unknown variables and O is a 3×1 null matrix, has

(A) exactly two solutions
(B) infinitely many solutions
(C) a unique solution
(D) no solution

Answer: (B) infinitely many solutions · Key from source paper

Q221 JEE Main 2020 · 6 Sep · Shift 1 MCQ

The values of λ and μ for which the system of linear equations $x + y + z = 2$, $x + 2\,y + 3\,z = 5$, $x + 3y + \lambda z = \mu$ has infinitely many solutions, are respectively

(A) 6 and 8
(B) 5 and 7
(C) 5 and 8
(D) 4 and 9

Answer: (C) 5 and 8 · Key from source paper

Q222 JEE Main 2020 · 6 Sep · Shift 2 MCQ

Let $\theta = \frac{\pi}{5}$ and $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$. If $B = A + A^4$, then det (B) :

(A) is one
(B) lies in $(2,\ 3)$
(C) is zero
(D) lies in $(1,\ 2)$

Answer: (D) lies in $(1,\ 2)$ · Key from source paper

Q223 JEE Main 2020 · 5 Sep · Shift 1 MCQ

Let $\lambda \in R$. The system of linear equations
$2x_1 - 4x_2 + \lambda x_3 = 1$
$x_1 - 6x_2 + x_3 = 2$
$\lambda x_1 - 10x_2 + 4x_3 = 3$
is inconsistent for :

(A) exactly one positive value of λ
(B) exactly one negative value of λ
(C) every value of λ
(D) exactly two values of λ

Answer: (B) exactly one negative value of λ · Key from source paper

Q224 JEE Main 2020 · 4 Sep · Shift 1 MCQ

If $A = \begin{bmatrix} \cos\theta & i\sin\theta \\ i\sin\theta & \cos\theta \end{bmatrix}$, $\left(\theta = \frac{\pi}{24}\right)$ and $A^5 = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, where $i = \sqrt{-1}$, then which one of the following is not true?

(A) $0 \le a^2 + b^2 \le 1$
(B) $a^2 - d^2 = 0$
(C) $a^2 - c^2 = 1$
(D) $a^2 - b^2 = \frac{1}{2}$

Answer: (D) $a^2 - b^2 = \frac{1}{2}$ · Key from source paper

Q225 JEE Main 2020 · 4 Sep · Shift 1 Numerical

If the system of equations
$x - 2y + 3z = 9$
$2x + y + z = b$
$x - 7y + az = 24$, has infinitely many solutions, then $a - b$ is equal to _____

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q226 JEE Main 2020 · 4 Sep · Shift 2 MCQ

If the system of equations

$x + y + z = 2$

$2x + 4y - z = 6$

$3x + 2y + \lambda z = \mu$

has infinitely many solutions, then :

(A) $\lambda + 2\mu = 14$

(B) $2\lambda - \mu = 5$

(C) $\lambda - 2\mu = -5$

(D) $2\lambda + \mu = 14$

Answer: (D) $2\lambda + \mu = 14$ · Key from source paper

Q227 JEE Main 2020 · 3 Sep · Shift 1 Numerical

Let $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$, $x \in R$ and $A^4 = [a_{ij}]$. If $a_{11} = 109$, then a_{22} is equal to _____ .

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q228 JEE Main 2020 · 3 Sep · Shift 2 MCQ

Let A be a 3×3 matrix such that $\text{adj } A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 0 & 2 \\ 1 & -2 & -1 \end{bmatrix}$ and $B = \text{adj } (adjA)$. If $|A| = \lambda$ and $\left|(B^{-1})^T\right| = \mu$, then the ordered pair $(|\lambda|, \mu)$ is equal to

(A) $(3, \frac{1}{81})$

(B) $(9, \frac{1}{9})$

(C) $(3, 81)$

(D) $(9, \frac{1}{81})$

Answer: (A) $(3, \frac{1}{81})$ · Key from source paper

Q229 JEE Main 2020 · 3 Sep · Shift 2 Numerical

Let S be the set of all integer solutions (x, y, z) of the system of equations

$x - 2y + 5z = 0$

$-2x + 4y + z = 0$

$-7x + 14y + 9z = 0$

such that $15 \le x^2 + y^2 + z^2 \le 150$. Then, the number of elements in the set S is equal to _____

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

EdLoop JEE

Q230 JEE Main 2020 · 2 Sep · Shift 1 MCQ

Let S be the set of all $\lambda \in R$ for which the system of linear equations

$2x - y + 2z = 2$

$x - 2y + \lambda z = -4$

$x + \lambda y + z = 4$

has no solution. Then the set S

(A) Contains more than two elements

(B) Is an empty set

(C) Is a singleton

(D) Contains exactly two elements

Answer: (D) Contains exactly two elements · Key from source paper

Q231 JEE Main 2020 · 2 Sep · Shift 2 MCQ

Let $A = \{X = (x, y, z)^T : PX = 0 \text{ and } x^2 + y^2 + z^2 = 1\}$ where $P = \begin{bmatrix} 1 & 2 & 1 \\ -2 & 3 & -4 \\ 1 & 9 & -1 \end{bmatrix}$ then the set A

(A) Is a singleton.

(B) Is an empty set.

(C) Contains more than two elements

(D) Contains exactly two elements

Answer: (D) Contains exactly two elements · Key from source paper

Q232 JEE Main 2020 · 2 Sep · Shift 2 MCQ

Let $a, b, c \in R$ be all non-zero and satisfies $a^3 + b^3 + c^3 = 2$. If the matrix $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$ satisfies $A^T A = I$, then a value of abc can be

(A) $-\frac{1}{3}$

(B) $\frac{1}{3}$

(C) 3

(D) $\frac{2}{3}$

Answer: (B) $\frac{1}{3}$ · Key from source paper

Q233 JEE Main 2020 · 9 Jan · Shift 1 MCQ

If $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 4 \\ 1 & -1 & 3 \end{bmatrix}$, $B = adjA$ and $C = 3A$, then $\frac{|adjB|}{|C|}$ is equal to

(A) 8
(B) 16
(C) 72
(D) 2

Answer: (A) 8 · Key from source paper

Q234 JEE Main 2020 · 9 Jan · Shift 1 MCQ

If for some α and β in R, the intersection of the following three planes
$x + 4y - 2z = 1$
$x + 7y - 5z = \beta$
$x + 5y + \alpha z = 5$
is a line in R^3, then $\alpha + \beta$ is equal to:

(A) 0
(B) 10
(C) 2
(D) -10

Answer: (B) 10 · Key from source paper

Q235 JEE Main 2020 · 9 Jan · Shift 2 MCQ

The following system of linear equations
$7x + 6y - 2z = 0$
$3x + 4y + 2z = 0$
$x - 2y - 6z = 0$, has

(A) infinitely many solutions, (x, y, z) satisfying $y = 2z$
(B) no solution
(C) infinitely many solutions, (x, y, z) satisfying $x = 2z$
(D) only the trivial solution

Answer: (C) infinitely many solutions, (x, y, z) satisfying $x = 2z$ · Key from source paper

Q236 JEE Main 2020 · 8 Jan · Shift 1 MCQ

For which of the following ordered pairs (μ, δ), the system of linear equations
$x + 2y + 3z = 1$
$3x + 4y + 5z = \mu$
$4x + 4y + 4z = \delta$
is inconsistent?

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(A) $(4, 3)$
(B) $(4, 6)$
(C) $(1, 0)$
(D) $(3, 4)$

Answer: (A) $(4, 3)$ · Key from source paper

Q237 JEE Main 2020 · 8 Jan · Shift 1 Numerical

The number of all 3×3 matrices A, with entries from the set $\{-1, 0, 1\}$ such that the sum of the diagonal elements of AA^T is 3, is _____.

Numerical value type: the answer is a number.

Answer: 672. · Key from source paper

Q238 JEE Main 2020 · 8 Jan · Shift 2 MCQ

If $A = \begin{pmatrix} 2 & 2 \\ 9 & 4 \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then $10A^{-1}$, is equal to.

(A) $A - 4I$
(B) $6I - A$
(C) $A - 6I$
(D) $4I - A$

Answer: (C) $A - 6I$ · Key from source paper

Q239 JEE Main 2020 · 8 Jan · Shift 2 MCQ

The system of linear equations
$\lambda x + 2y + 2z = 5$
$2\lambda x + 3y + 5z = 8$
$4x + \lambda y + 6z = 10$ has

(A) no solution when $\lambda = 8$
(B) a unique solution when $\lambda = -8$
(C) no solution when $\lambda = 2$
(D) infinitely many solutions when $\lambda = 2$

Answer: (C) no solution when $\lambda = 2$ · Key from source paper

Q240 JEE Main 2020 · 7 Jan · Shift 1 MCQ

Let α be a root of the equation $x^2 + x + 1 = 0$ and the matrix $A = \frac{1}{\sqrt{3}} \begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha & \alpha^2 \\ 1 & \alpha^2 & \alpha^4 \end{bmatrix}$, then the matrix A^{31} is equal to

(A) A^3

(B) I_3

(C) A^2

(D) A

Answer: (A) A^3 · Key from source paper

Q241 JEE Main 2020 · 7 Jan · Shift 2 Numerical

If the system of linear equations,

$x + y + z = 6$

$x + 2y + 3z = 10$

$3x + 2y + \lambda z = \mu$

has more than two solutions, then $\mu - \lambda^2$, is equal to.

Numerical value type: the answer is a number.

Answer: 13. · Key from source paper

Q242 JEE Main 2019 · 12 Apr · Shift 1 MCQ

If $B = \begin{pmatrix} 5 & 2\alpha & 1 \\ 0 & 2 & 1 \\ \alpha & 3 & -1 \end{pmatrix}$ is the inverse of a 3×3 matix A, then the sum of all values of α for which $\det A + 1 = 0$, is:

(A) 2

(B) 1

(C) 0

(D) -1

Answer: (B) 1 · Key from source paper

Q243 JEE Main 2019 · 12 Apr · Shift 1 MCQ

If A is a symmetric matrix and B is skew- symmetric matrix such that $A + B = \begin{pmatrix} 2 & 3 \\ 5 & -1 \end{pmatrix}$, then AB is equal to:

(A) $\begin{pmatrix} -4 & 2 \\ 1 & 4 \end{pmatrix}$

(B) $\begin{pmatrix} 4 & -2 \\ 1 & -4 \end{pmatrix}$

(C) $\begin{pmatrix} 4 & -2 \\ -1 & -4 \end{pmatrix}$

(D) $\begin{pmatrix} -4 & -2 \\ -1 & 4 \end{pmatrix}$

Answer: (C) $\begin{pmatrix} 4 & -2 \\ -1 & -4 \end{pmatrix}$ · Key from source paper

Q244 JEE Main 2019 · 12 Apr · Shift 2 MCQ

If $[x]$ denotes the greatest integer $\leq x$, then the system of linear equations $[\sin\theta]x + [-\cos\theta]y = 0$, $[\cot\theta]x + y = 0$

(A) has a unique solution if $\theta \in \left(\frac{\pi}{2}, \frac{2\pi}{3}\right) \cup \left(\pi, \frac{7\pi}{6}\right)$

(B) have infinitely many solution if $\theta \in \left(\frac{\pi}{2}, \frac{2\pi}{3}\right) \cup \left(\pi, \frac{7\pi}{6}\right)$

(C) has a unique if $\theta \in \left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$ and have infinitely many solutions if $\theta \in \left(\pi, \frac{7\pi}{6}\right)$

(D) have infinitely many solutions if $\theta \in \left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$ and has a unique solution if $\theta \in \left(\pi, \frac{7\pi}{6}\right)$

Answer: (D) have infinitely many solutions if $\theta \in \left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$ and has a unique solution if $\theta \in \left(\pi, \frac{7\pi}{6}\right)$ · Key from source paper

Q245 JEE Main 2019 · 10 Apr · Shift 1 MCQ

If the system of linear equations $x + y + z = 5,\ x + 2y + 2z = 6,\ x + 3y + \lambda z = \mu,\ (\lambda,\ \mu \in \mathrm{R})$, has infinitely many solutions, then the value of $\lambda + \mu$ is:

(A) 7

(B) 10

(C) 12

(D) 9

Answer: (B) 10 · Key from source paper

Q246 JEE Main 2019 · 10 Apr · Shift 2 MCQ

Let λ be a real number for which the system of linear equations
$x + y + z = 6$,
$4x + \lambda y - \lambda z = \lambda - 2$ and
$3x + 2y - 4z = -5$
has infinitely many solutions. Then λ is a root of the quadratic equation:

(A) $\lambda^2 + 3\lambda - 4 = 0$

(B) $\lambda^2 - \lambda - 6 = 0$

(C) $\lambda^2 - 3\lambda - 4 = 0$

(D) $\lambda^2 + \lambda - 6 = 0$

Answer: (B) $\lambda^2 - \lambda - 6 = 0$ · Key from source paper

Q247 JEE Main 2019 · 9 Apr · Shift 1 MCQ

If $\begin{bmatrix}1 & 1\\0 & 1\end{bmatrix}\begin{bmatrix}1 & 2\\0 & 1\end{bmatrix}\begin{bmatrix}1 & 3\\0 & 1\end{bmatrix}\cdots\cdots\begin{bmatrix}1 & n-1\\0 & 1\end{bmatrix} = \begin{bmatrix}1 & 78\\0 & 1\end{bmatrix}$, then the inverse of $\begin{bmatrix}1 & n\\0 & 1\end{bmatrix}$ is:

(A) $\begin{bmatrix}1 & -12\\0 & 1\end{bmatrix}$

(B) $\begin{bmatrix}1 & 0\\12 & 1\end{bmatrix}$

(C) $\begin{bmatrix}1 & 0\\13 & 1\end{bmatrix}$

(D) $\begin{bmatrix}1 & -13\\0 & 1\end{bmatrix}$

Answer: (D) $\begin{bmatrix}1 & -13\\0 & 1\end{bmatrix}$ · Key from source paper

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Q248 JEE Main 2019 · 9 Apr · Shift 2 MCQ

The total number of matrices $A = \begin{pmatrix}0 & 2y & 1\\2x & y & -1\\2x & -y & 1\end{pmatrix}$, $(x, y \in R, x \neq y)$ for which $A^TA = 3I_3$ is:

(A) 6

(B) 3

(C) 4

(D) 2

Answer: (C) 4 · Key from source paper

Q249 JEE Main 2019 · 9 Apr · Shift 2 MCQ

If the system of equations $2x + 3y - z = 0$, $x + ky - 2z = 0$ and $2x - y + z = 0$ has a non-trivial solution (x, y, z), then $\frac{x}{y} + \frac{y}{z} + \frac{z}{x} + k$ is equal to

(A) $-\frac{1}{4}$

(B) $\frac{1}{2}$

(C) -4

(D) $\frac{3}{4}$

Answer: (B) $\frac{1}{2}$ · Key from source paper

Q250 JEE Main 2019 · 8 Apr · Shift 1 MCQ

Let $A = \begin{pmatrix}\cos\alpha & -\sin\alpha\\\sin\alpha & \cos\alpha\end{pmatrix}$, $\alpha \in R$ such that $A^{32} = \begin{pmatrix}0 & -1\\1 & 0\end{pmatrix}$. Then, a value of α is:

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(A) 0
(B) $\frac{\pi}{16}$
(C) $\frac{\pi}{64}$
(D) $\frac{\pi}{32}$

Answer: (C) $\frac{\pi}{64}$ · Key from source paper

Q251 JEE Main 2019 · 8 Apr · Shift 2 MCQ

If the system of linear equations
$x - 2y + kz = 1$
$2x + y + z = 2$
$3x - y - kz = 3$
has a solution $x, y, z, z \neq 0$, then x, y lies on the straight line whose equation is:

(A) $4x - 3y - 4 = 0$
(B) $3x - 4y - 4 = 0$
(C) $3x - 4y - 1 = 0$
(D) $4x - 3y - 1 = 0$

Answer: (A) $4x - 3y - 4 = 0$ · Key from source paper

Q252 JEE Main 2019 · 12 Jan · Shift 1 MCQ

Let $P = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 0 \\ 9 & 3 & 1 \end{bmatrix}$ and $Q = [q_{ij}]$ be two 3×3 matrices such that $Q - P^5 = I_3$. Then $\frac{q_{21}+q_{31}}{q_{32}}$ is equal to :

(A) 10
(B) 9
(C) 15
(D) 135

Answer: (A) 10 · Key from source paper

Q253 JEE Main 2019 · 12 Jan · Shift 1 MCQ

An ordered pair (α, β) for which the system of linear equations
$(1 + \alpha)x + \beta y + z = 2$
$\alpha x + (1 + \beta)y + z = 3$
$\alpha x + \beta y + 2z = 2$ has a unique solution, is :

(A) $(-3,\ 1)$
(B) $(1,\ -3)$
(C) $(2,\ 4)$
(D) $(-4,\ 2)$

Answer: (C) $(2,\ 4)$ · Key from source paper

Q254 JEE Main 2019 · 11 Jan · Shift 1 MCQ

Let $A = \begin{pmatrix} 0 & 2q & r \\ p & q & -r \\ p & -q & r \end{pmatrix}$. If $AA^T = I_3$, then $|p|$ is:

(A) $\frac{1}{\sqrt{5}}$
(B) $\frac{1}{\sqrt{3}}$
(C) $\frac{1}{\sqrt{2}}$
(D) $\frac{1}{\sqrt{6}}$

Answer: (C) $\frac{1}{\sqrt{2}}$ · Key from source paper

Q255 JEE Main 2019 · 11 Jan · Shift 1 MCQ

If the system of linear equations $2x + 2y + 3z = a$ $3x - y + 5z = b$ $x - 3y + 2z = c$ where, $a, b,$ care non-zero real numbers, has more than onc solution, then

(A) $b - c + a = 0$
(B) $b - c - a = 0$
(C) $a + b + c = 0$
(D) $b + c - a = 0$

Answer: (B) $b - c - a = 0$ · Key from source paper

Q256 JEE Main 2019 · 10 Jan · Shift 1 MCQ

If the system of equations $x + y + z = 5$, $x + 2y + 3z = 9$, $x + 3y + \alpha z = \beta$ has infinitely many solutions, then $\beta - \alpha$ equals

(A) 8
(B) 21
(C) 5
(D) 18

Answer: (A) 8 · Key from source paper

Q257 JEE Main 2019 · 10 Jan · Shift 2 MCQ

The number of values of $\theta \in (0,\ \pi)$ for which the system of linear equations
$x + 3y + 7z = 0$

$-x + 4y + 7z = 0$
$(\sin 3\theta)x + (\cos 2\theta)y + 2z = 0$
has a non-trivial solution, is:

(A) Two
(B) Three
(C) Four
(D) One

Answer: (A) Two · Key from source paper

Q258 JEE Main 2019 · 9 Jan · Shift 1 MCQ

If $A = \begin{matrix}\cos\theta & -\sin\theta \\ \sin\theta & \cos\theta\end{matrix}$, then the matrix A^{-50} when $\theta = \frac{\pi}{12}$, is equal to:

(A) $\begin{matrix}\frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2}\end{matrix}$
(B) $\begin{matrix}\frac{1}{2} & \frac{\sqrt{3}}{2} \\ -\frac{\sqrt{3}}{2} & \frac{1}{2}\end{matrix}$
(C) $\begin{matrix}\frac{\sqrt{3}}{2} & -\frac{1}{2} \\ \frac{1}{2} & \frac{\sqrt{3}}{2}\end{matrix}$
(D) $\begin{matrix}\frac{1}{2} & -\frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & \frac{1}{2}\end{matrix}$

Answer: (A) $\begin{matrix}\frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2}\end{matrix}$ · Key from source paper

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Q259 JEE Main 2019 · 9 Jan · Shift 1 MCQ

The system of linear equations
$x + y + z = 2$
$2x + 3y + 2z = 5$
$2x + 3y + a^2 - 1z = a + 1$

(A) is inconsistent when $a = \sqrt{3}$
(B) has a unique solution for $a = \sqrt{3}$
(C) has infinitely many solutions for $a = 4$
(D) is inconsistent when $a = 4$

Answer: (A) is inconsistent when $a = \sqrt{3}$ · Key from source paper

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Q260 JEE Main 2019 · 9 Jan · Shift 2 MCQ

If the system of linear equations $x - 4y + 7z = g$; $3y - 5z = h$; $-2x + 5y - 9z = k$ is consistent, then:

(A) $g+h+2k=0$

(B) $g+2h+k=0$

(C) $2g+h+k=0$

(D) $g+h+k=0$

Answer: (C) $2g+h+k=0$ · Key from source paper

Q261 JEE Main 2018 · 16 Apr · Online MCQ

Let $A=\begin{bmatrix}1&0&0\\1&1&0\\1&1&1\end{bmatrix}$ and $B=A^{20}$. Then the sum of the elements of the first column of B is

(A) 210

(B) 211

(C) 251

(D) 231

Answer: (D) 231 · Key from source paper

Q262 JEE Main 2018 · 16 Apr · Online MCQ

The number of values of k for which the system of linear equations $(k+2)x+10y=k$ & $kx+(k+3)y=k-1$ has no solution is

(A) 1

(B) 2

(C) 3

(D) 4

Answer: (A) 1 · Key from source paper

Q263 JEE Main 2018 · 15 Apr · Shift 1 MCQ

Let A be a matrix such that $A\cdot\begin{bmatrix}1&2\\0&3\end{bmatrix}$ is a scalar matrix and $|3A|=108$. Then A^2 equals

(A) $\begin{bmatrix}4&-32\\0&36\end{bmatrix}$

(B) $\begin{bmatrix}4&0\\-32&36\end{bmatrix}$

(C) $\begin{bmatrix}36&0\\-32&4\end{bmatrix}$

(D) $\begin{bmatrix}36&-32\\0&4\end{bmatrix}$

Answer: (D) $\begin{bmatrix}36&-32\\0&4\end{bmatrix}$ · Key from source paper

Q264 JEE Main 2018 · 15 Apr · Shift 1 MCQ

Let S be the set of all real values of k for which the system of linear equations

$x + y + z = 2$

$2x + y - z = 3$

$3x + 2y + kz = 4$

has a unique solution. Then S is

(A) an empty set

(B) equal to $\mathrm{R} - \{0\}$

(C) equal to $\{0\}$

(D) equal to R

Answer: (B) equal to $\mathrm{R} - \{0\}$ · Key from source paper

Q265 JEE Main 2018 · 15 Apr · Shift 2 MCQ

Suppose A is any 3×3 non-singular matrix and $(A - 3I)(A - 5I) = O$, where $I = I_3$ and $O = O_3$. If $\alpha A + \beta A^{-1} = 4I$, then $\alpha + \beta$ is equal to

(A) 8

(B) 12

(C) 13

(D) 7

Answer: (A) 8 · Key from source paper

Q266 JEE Main 2018 · 15 Apr · Shift 2 MCQ

If the system of linear equations

$x + ay + z = 3$

$x + 2y + 2z = 6$

$x + 5y + 3z = b$

has no solution, then

(A) $a = 1, b \neq 9$

(B) $a \neq -1, b = 9$

(C) $a = -1, b = 9$

(D) $a = -1, b \neq 9$

Answer: (D) $a = -1, b \neq 9$ · Key from source paper

Q267 JEE Main 2017 · 9 Apr · Online MCQ

For two 3×3 matrices A and B, let $A + B = 2B'$ and $3A + 2B = I_3$, where B' is the transpose of B and I_3 is 3×3 identity matrix. Then :

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(A) $10A + 5B = 3I_3$
(B) $3A + 6B = 2I_3$
(C) $5A + 10B = 2I_3$
(D) $B + 2A = I_3$

Answer: (A) $10A + 5B = 3I_3$ · Key from source paper

Q268 JEE Main 2017 · 9 Apr · Online MCQ

If $x = a$, $y = b$, $z = c$ is a solution of the system of linear equations
$x + 8y + 7z = 0$
$9x + 2y + 3z = 0$
$x + y + z = 0$
Such that the point (a, b, c) lies on the plane $x + 2y + z = 6$, then $2a + b + c$ equals:

(A) 2
(B) -1
(C) 1
(D) 0

Answer: (C) 1 · Key from source paper

Q269 JEE Main 2017 · 8 Apr · Online MCQ

Let A be any 3×3 invertible matrix. Then which one of the following is not always true?

(A) $\text{adj}\,(\text{adj}\,(\text{A})) = |A|^2 \cdot (\text{adj}\,(\text{A}))^{-1}$
(B) $\text{adj}\,(\text{adj}\,(\text{A})) = |A| \cdot (\text{adj}\,(\text{A}))^{-1}$
(C) $\text{adj}\,(\text{adj}\,(\text{A})) = |A| \cdot A$
(D) $\text{adj}\,(\text{A}) = |A| \cdot A^{-1}$

Answer: (B) $\text{adj}\,(\text{adj}\,(\text{A})) = |A| \cdot (\text{adj}\,(\text{A}))^{-1}$ · Key from source paper

Q270 JEE Main 2017 · 8 Apr · Online MCQ

The number of real values of λ for which the system of linear equations, $2x + 4y - \lambda z = 0$, $4x + \lambda y + 2z = 0$ and $\lambda x + 2y + 2z = 0$, has infinitely many solutions, is:

(A) 3
(B) 1
(C) 2
(D) 0

Answer: (B) 1 · Key from source paper

Q271 JEE Main 2017 · 2 Apr · Offline MCQ

If $A = \begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix}$, then $\text{Adj}(3A^2 + 12A)$ is equal to:

(A) $\begin{bmatrix} 72 & -84 \\ -63 & 51 \end{bmatrix}$

(B) $\begin{bmatrix} 51 & 63 \\ 84 & 72 \end{bmatrix}$

(C) $\begin{bmatrix} 51 & 84 \\ 63 & 72 \end{bmatrix}$

(D) $\begin{bmatrix} 72 & -63 \\ -84 & 51 \end{bmatrix}$

Answer: (B) $\begin{bmatrix} 51 & 63 \\ 84 & 72 \end{bmatrix}$ · Key from source paper

Q272 JEE Main 2017 · 2 Apr · Offline MCQ

If S is the set of distinct values of b for which the following system of linear equations

$x + y + z = 1$

$x + ay + z = 1$

$ax + by + z = 0$

has no solution, then S is:

(A) An empty set

(B) An infinite set

(C) A finite set containing two or more elements

(D) A singleton

Answer: (D) A singleton · Key from source paper

Q273 JEE Main 2016 · 10 Apr · Online MCQ

Let A, be a 3×3 matrix, such that $A^2 - 5A + 7I = O$.

Statement - I : $A^{-1} = \frac{1}{7}(5I - A)$.

Statement - II : The polynomial $A^3 - 2A^2 - 3A + I$,can be reduced to $5(A - 4I)$. Then :

(A) Both the statements are true

(B) Both the statements are false

(C) Statement - I is true, but Statement - II is false

(D) Statement - I is false, but Statement - II is true

Answer: (A) Both the statements are true · Key from source paper

Q274 JEE Main 2016 · 10 Apr · Online MCQ

If $A = \begin{bmatrix} -4 & -1 \\ 3 & 1 \end{bmatrix}$, then the determinant of the matrix $\left(A^{2016} - 2A^{2015} - A^{2014}\right)$ is :

(A) -175

(B) 2014

(C) 2016

(D) -25

Answer: (D) -25 · Key from source paper

Q275 JEE Main 2016 · 9 Apr · Online MCQ

If $P = \begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}$, $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $Q = PAP^T$, then $P^T Q^{2015} P$ is :

(A) $\begin{bmatrix} 0 & 2015 \\ 0 & 0 \end{bmatrix}$

(B) $\begin{bmatrix} 2015 & 0 \\ 1 & 2015 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 2015 \\ 0 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} 2015 & 1 \\ 0 & 2015 \end{bmatrix}$

Answer: (C) $\begin{bmatrix} 1 & 2015 \\ 0 & 1 \end{bmatrix}$ · Key from source paper

Q276 JEE Main 2016 · 3 Apr · Offline MCQ

If $A = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}$ and $A.\,adjA = A\,A^T$, then $5a + b$ is equal to

(A) 4

(B) 13

(C) -1

(D) 5

Answer: (D) 5 · Key from source paper

Q277 JEE Main 2015 · 11 Apr · Online MCQ

If A is a 3×3 matrix such that $|5\ adjA| = 5$, then $|A|$ is equal to

(A) $\pm\frac{1}{25}$

(B) ± 5

(C) $\pm\frac{1}{5}$

(D) ± 1

Answer: (C) $\pm\frac{1}{5}$ · Key from source paper

Q278 JEE Main 2015 · 10 Apr · Online MCQ

If $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$, then which one of the following statements is not correct?

(A) $A^3 + I = A(A^3 - I)$

(B) $A^4 - I = A^2 + I$

(C) $A^2 + I = A(A^2 - I)$

(D) $A^3 - I = A(A - I)$

Answer: (C) $A^2 + I = A(A^2 - I)$ · Key from source paper

Q279 JEE Main 2015 · 4 Apr · Offline MCQ

If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying the equation $AA^T = 9I$, where I is 3×3 identity matrix, then the ordered pair (a, b) is equal to

(A) $(-2, -1)$

(B) $(2, -1)$

(C) $(-2, 1)$

(D) $(2, 1)$

Answer: (A) $(-2, -1)$ · Key from source paper

Q280 JEE Main 2014 · 19 Apr · Online MCQ

Let A and B be any two 3×3 matrices. If A is symmetric and B is skew symmetric, then the matrix $AB - BA$ is

(A) skew symmetric

(B) I or $-I$, where I is an identity matrix

(C) symmetric

(D) neither symmetric nor skew symmetric

Answer: (C) symmetric · Key from source paper

Q281 JEE Main 2014 · 12 Apr · Online MCQ

If $A = \begin{bmatrix} 1 & 2 & x \\ 3 & -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} y \\ x \\ 1 \end{bmatrix}$ be such that $AB = \begin{bmatrix} 6 \\ 8 \end{bmatrix}$, then:

(A) $y = 2x$

(B) $y = -2x$

(C) $y = x$

(D) $y = -x$

Answer: (A) $y = 2x$ · Key from source paper

Q282 JEE Main 2014 · 11 Apr · Online MCQ

Let A be a 3×3 matrix such that

$$\mathrm{A}\begin{bmatrix}1 & 2 & 3\\ 0 & 2 & 3\\ 0 & 1 & 1\end{bmatrix} = \begin{bmatrix}0 & 0 & 1\\ 1 & 0 & 0\\ 0 & 1 & 0\end{bmatrix}$$

Then A^{-1} is:

(A) $\begin{bmatrix}3 & 1 & 2\\ 3 & 0 & 2\\ 1 & 0 & 1\end{bmatrix}$

(B) $\begin{bmatrix}3 & 2 & 1\\ 3 & 2 & 0\\ 1 & 1 & 0\end{bmatrix}$

(C) $\begin{bmatrix}0 & 1 & 3\\ 0 & 2 & 3\\ 1 & 1 & 1\end{bmatrix}$

(D) $\begin{bmatrix}1 & 2 & 3\\ 0 & 1 & 1\\ 0 & 2 & 3\end{bmatrix}$

Answer: (A) $\begin{bmatrix}3 & 1 & 2\\ 3 & 0 & 2\\ 1 & 0 & 1\end{bmatrix}$ · Key from source paper

Q283 JEE Main 2014 · 9 Apr · Online MCQ

If B is a 3×3 matrix such that $B^2 = 0$, then $\det\,.\,\left[(I+B)^{50} - 50B\right]$ is equal to :

(A) 1

(B) 2

(C) 3

(D) 50

Answer: (A) 1 · Key from source paper

Q284 JEE Main 2014 · 9 Apr · Online MCQ

If $a,\ b,\ c$ are non - zero real numbers and if the system of equations

$(a-1)x = y + z$

$(b-1)y = x + z$

$(c-1)z = x+y$
has a non - trivial solution, then $ab+bc+ca$ equals :

(A) -1
(B) $a+b+c$
(C) abc
(D) 1

Answer: (C) abc · Key from source paper

Q285 JEE Main 2014 · 6 Apr · Offline MCQ

If A is a 3×3 non-singular matrix such that $AA' = A'A$ and $B = A^{-1}A'$, then BB' equals, where X' denotes the transpose of the matrix X.

(A) B^{-1}
(B) $(B^{-1})'$
(C) $I+B$
(D) I

Answer: (D) I · Key from source paper

Q286 JEE Main 2013 · 25 Apr · Online MCQ

Consider the system of equations : $x+ay=0, y+az=0$ and $z+ax=0$. Then the set of all real values of ' a ' for which the system has a unique solution is:

(A) R $-$ {1}
(B) R $-$ {-1}
(C) {1, -1}
(D) {1, 0, -1}

Answer: (B) R $-$ {-1} · Key from source paper

Q287 JEE Main 2013 · 23 Apr · Online MCQ

Let A, other than I or $-$I, be a 2×2 real matrix such that $\mathrm{A}^2 = \mathrm{I}$, I being the unit matrix. Let Tr(A) be the sum of diagonal elements of A. Statement-1: Tr(A) = 0 Statement-2: det(A) = -1

(A) Statement-1 is true; Statement- 2 is false.
(B) Statement-1 is true; Statement-2 is true; Statement-2 is not a correct explanation for Statement-1.
(C) Statement-1 is true; Statement-2 is true; Statement-2 is a correct explanation for Statement-1.
(D) Statement-1 is false; Statement- 2 is true.

Answer: (B) Statement-1 is true; Statement-2 is true; Statement-2 is not a correct explanation for Statement-1. · Key from source paper

Q288 JEE Main 2013 · 22 Apr · Online MCQ

If p, q, r are 3 real numbers satisfying the matrix equation, $[pqr]\begin{bmatrix}3 & 4 & 1\\ 3 & 2 & 3\\ 2 & 0 & 2\end{bmatrix} = [3\ \ 0\ \ 1]$ then $2p + q - r$ equals :

(A) -3

(B) -1

(C) 4

(D) 2

Answer: (A) -3 · Key from source paper

Q289 JEE Main 2013 · 22 Apr · Online MCQ

If the system of linear equations :

$x_1 + 2x_2 + 3x_3 = 6$

$x_1 + 3x_2 + 5x_3 = 9$

$2x_1 + 5x_2 + ax_3 = b$

is consistent and has infinite number of solutions, then :

(A) $a = 8$, b can be any real number

(B) $b = 15$, a can be any real number

(C) $a \in R - \{8\}$ and $b \in R - \{15\}$

(D) $a = 8, b = 15$

Answer: (D) $a = 8, b = 15$ · Key from source paper

Q290 JEE Main 2013 · 9 Apr · Online MCQ

The matrix $A^2 + 4A - 5I$, where I is identity matrix and $A = \begin{bmatrix}1 & 2\\ 4 & -3\end{bmatrix}$, equals :

(A) $4\begin{bmatrix}2 & 1\\ 2 & 0\end{bmatrix}$

(B) $4\begin{bmatrix}0 & -1\\ 2 & 2\end{bmatrix}$

(C) $32\begin{bmatrix}2 & 1\\ 2 & 0\end{bmatrix}$

(D) $32\begin{bmatrix}1 & 1\\ 1 & 0\end{bmatrix}$

Answer: (A) $4\begin{bmatrix}2 & 1\\ 2 & 0\end{bmatrix}$ · Key from source paper

Q291 JEE Main 2013 · 7 Apr · Offline MCQ

If $P = \begin{bmatrix} 1 & \alpha & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$ is the adjoint of a 3×3 matrix A and $|A| = 4$, then α is equal to

(A) 5
(B) 0
(C) 4
(D) 11

Answer: (D) 11 · Key from source paper

Q292 JEE Main 2013 · 7 Apr · Offline MCQ

The number of values of k, for which the system of equations :
$(k+1)x + 8y = 4k$
$kx + (k+3)y = 3k - 1$
has no solution, is :

(A) 2
(B) 3
(C) Infinite
(D) 1

Answer: (D) 1 · Key from source paper

Q293 AIEEE 2012 · 26 May · Online MCQ

If $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -3 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 7 & -2 & 1 \end{bmatrix}$ then AB equals

(A) I
(B) A
(C) B
(D) 0

Answer: (A) I · Key from source paper

Q294 AIEEE 2012 · 19 May · Online MCQ

If A^T denotes the transpose of the matrix $A = \begin{bmatrix} 0 & 0 & a \\ 0 & b & c \\ d & e & f \end{bmatrix}$, where a, b, c, d, e and f are integers such that $abd \neq 0$, then the number of such matrices for which $A^{-1} = A^T$ is

(A) $2(3!)$
(B) $3(2!)$
(C) 2^3
(D) 3^2

Answer: (C) 2^3 · Key from source paper

Q295 AIEEE 2012 · 12 May · Online MCQ

Let A and B be real matrices of the form $\begin{bmatrix} \alpha & 0 \\ 0 & \beta \end{bmatrix}$ and $\begin{bmatrix} 0 & \gamma \\ \delta & 0 \end{bmatrix}$, respectively. Statement 1: $AB - BA$ is always an invertible matrix. Statement 2 : $AB - BA$ is never an identity matrix.

(A) Statement 1 is true, Statement 2 is false.
(B) Statement 1 is false, Statement 2 is true.
(C) Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation of Statement 1 .
(D) Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanation of Statement 1.

Answer: (B) Statement 1 is false, Statement 2 is true. · Checked by our team

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Q296 AIEEE 2012 · 7 May · Online MCQ

If $A = \begin{pmatrix} \alpha - 1 \\ 0 \\ 0 \end{pmatrix}, B = \begin{pmatrix} \alpha + 1 \\ 0 \\ 0 \end{pmatrix}$ be two matrices, then AB^T is a non-zero matrix for $|\alpha|$ not equal to

(A) 2
(B) 0
(C) 1
(D) 3

Answer: (C) 1 · Key from source paper

Q297 AIEEE 2012 · 7 May · Online MCQ

If the system of equations

$x + y + z = 6$
$x + 2y + 3z = 10$
$x + 2y + \lambda z = 0$

has a unique solution, then λ is not equal to

(A) 1
(B) 0
(C) 2
(D) 3

Answer: (D) 3 · Key from source paper

Q298 AIEEE 2012 · Offline MCQ

Let $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}$. If u_1 and u_2 are column matrices such that $Au_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ and $Au_2 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$, then $u_1 + u_2$ is equal to

(A) $\begin{pmatrix} -1 \\ 1 \\ 0 \end{pmatrix}$

(B) $\begin{pmatrix} -1 \\ 1 \\ -1 \end{pmatrix}$

(C) $\begin{pmatrix} -1 \\ -1 \\ 0 \end{pmatrix}$

(D) $\begin{pmatrix} 1 \\ -1 \\ -1 \end{pmatrix}$

Answer: (D) $\begin{pmatrix} 1 \\ -1 \\ -1 \end{pmatrix}$ · Key from source paper

Q299 AIEEE 2011 MCQ

Let A and B be two symmetric matrices of order 3 . This question has Statement -1 and Statement -2. Of the four choices given after the statements, choose the one that best describes the two statements. Statement -1 : A(BA) and (AB)A are symmetric matrices. Statement - 2 : AB is symmetric matrix if matrix multiplication of A and B is commutative.

(A) Statement -1 is true, Statement -2 is true; Statement -2 is not a correct explanation for Statement -1

(B) Statement -1 is true, Statement -2 is false.

(C) Statement -1 is false, Statement- 2 is true.

(D) Statement -1 is true, Statement -2 is true; Statement -2 is a correct explanation for Statement -1

Answer: (A) Statement -1 is true, Statement -2 is true; Statement -2 is not a correct explanation for Statement -1 · Key from source paper

Q300 AIEEE 2010 MCQ

Let A be a 2×2 matrix with non-zero entries and let $A^2 = 1$, where 1 is 2×2 identity matrix. Define $\mathrm{Tr}(A)$ = sum of diagonal elements of A and $|A|$ = determinant of matrix A. Statement-1: $\mathrm{Tr}(A) = 0$ Statement-2: $|A| = 1$

(A) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1

(B) Statement-1 is true, Statement-2 is false

(C) Statement-1 is false, Statement-2 is true

(D) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1

Answer: (B) Statement-1 is true, Statement-2 is false · Key from source paper

Q301 AIEEE 2010 MCQ

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

(A) exactly 3 solutions

(B) a unique solution

(C) no solution

(D) infinite number of solutions

Answer: (C) no solution · Key from source paper

Q302 AIEEE 2009 MCQ

Let A be a 2×2 matrix Statement-1 : $\text{adj}(\text{adj } A) = A$ Statement-2 : $|\text{adj A}| = |\text{A}|$

(A) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1

(C) Statement-1 is true, Statement-2 is false

(D) Statement-1 is false, Statement-2 is true

Answer: (B) Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1 · Key from source paper

Q303 AIEEE 2008 MCQ

Let A be a 2×2 matrix with real entries. Let I be the 2×2 identity matrix. Denote by $\text{tr}(\text{A})$, the sum of diagonal entries of A. Assume that $A^2 = 1$. Statement -1: If $A \neq 1$ and $A \neq -1$, then $\det A = -1$. Statement -2 : If $A \neq 1$ and $A \neq -1$, then $\text{tr}(A) \neq 0$.

(A) Statement -1 is false, Statement -2 is true

(B) Statement -1 is true, Statement -2 is true, Statement -2 is a correct explanation for Statement -1

(C) Statement -1 is true, Statement -2 is true; Statement -2 is not a correct explanation for Statement -1

(D) Statement -1 is true, Statement -2 is false.

Answer: (D) Statement -1 is true, Statement -2 is false. · Key from source paper

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Q304 AIEEE 2008 MCQ

Let $\mathbf{A}$ be a square matrix all of whose entries are integers. Then which one of the following is true?

(A) If $\det A = \pm 1$, then A^{-1} exists but all its entries are not necessarily integers

(B) If $\det A \neq \pm 1$, then A^{-1} exists and all its entries are non-integers

(C) If $\det A = \pm 1$, then A^{-1} exists and all its entries are integers

(D) If $\det A = \pm 1$, then A^{-1} need not exist

Answer: (C) If $\det A = \pm 1$, then A^{-1} exists and all its entries are integers · Key from source paper

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Q305 AIEEE 2006 MCQ

If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be always true?

(A) $\mathrm{A} = \mathrm{B}$

(B) $\mathrm{AB} = \mathrm{BA}$

(C) either of A or B is a zero matrix

(D) either of A or B is an identity matrix

Answer: (B) $\mathrm{AB} = \mathrm{BA}$ · Key from source paper

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Q306 AIEEE 2006 MCQ

Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}$, $a, b \in N$. Then

(A) there cannot exist any B such that AB = BA

(B) there exist more than one but finite number of B's such that AB = BA

(C) there exists exactly one B such that AB = BA

(D) there exist infinitely many B's such that AB = BA

Answer: (D) there exist infinitely many B's such that AB = BA · Key from source paper

Q307 AIEEE 2005 MCQ

If $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then which one of the following holds for all $n \geq 1$, by the principle of mathematical induction

(A) $A^n = nA - (n-1)I$

(B) $A^n = 2^{n-1}A - (n-1)I$

(C) $A^n = nA + (n-1)I$

(D) $A^n = 2^{n-1}A + (n-1)I$

Answer: (A) $A^n = nA - (n-1)I$ · Key from source paper

Q308 AIEEE 2005 MCQ

If $A^2 - A + I = 0$, then the inverse of A is

(A) $A + I$

(B) A

(C) $A - I$

(D) $I - A$

Answer: (D) $I - A$ · Key from source paper

Q309 AIEEE 2005 MCQ

The system of equations

$\alpha x + y + z = \alpha - 1$

$x + \alpha y + z = \alpha - 1$

$x + y + \alpha z = \alpha - 1$

has no solution, if α is

(A) -2

(B) either -2 or 1

(C) not -2

(D) 1

Answer: (A) -2 · Key from source paper

Q310 AIEEE 2004 MCQ

Let $A = \begin{pmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{pmatrix}$. The only correct statement about the matrix A is

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(A) A is a zero matrix

(B) $A^2 = I$

(C) A^{-1} does not exist

(D) $A = (-1)I$, where I is a unit matrix

Answer: (B) $A^2 = I$ · Key from source paper

Q311 AIEEE 2004 MCQ

Let $A = \begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix}$ and $10B = \begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix}$. If B is the inverse of matrix A, then α is

(A) -2

(B) 5

(C) 2

(D) -1

Answer: (B) 5 · Key from source paper

Q312 AIEEE 2003 MCQ

If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A_2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$, then

(A) $\alpha = 2ab, \beta = a^2 + b^2$

(B) $\alpha = \mathrm{a_2} + \mathrm{b_2}, \beta = \mathrm{ab}$

(C) $\alpha = a^2 + b^2, \beta = 2ab$

(D) $\alpha = a^2 + b^2, \beta = a^2 - b^2$

Answer: (C) $\alpha = a^2 + b^2, \beta = 2ab$ · Key from source paper

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