



Matrices

Q.No.1: 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:

JEE 2015

- A. $(2, -1)$
- B. $(-2, 1)$
- C. $(2, 1)$
- D. $(-2, -1)$

Q.No.2: 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 :

JEE 2019

- A. 10
- B. 135
- C. 15
- D. 9

Q.No.3: If $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} \cdot \dots \cdot \begin{bmatrix} 1 & n-1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 78 \\ 0 & 1 \end{bmatrix}$,

then the inverse of $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$ is :

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

B. $\begin{bmatrix} 1 & -13 \\ 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 1 & -12 \\ 0 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 0 \\ 13 & 1 \end{bmatrix}$

Q.No.4: The total number of matrices

$$A = \begin{bmatrix} 0 & 2y & 1 \\ 2x & y & -1 \\ 2x & -y & 1 \end{bmatrix}$$

, ($x, y \in \mathbf{R}, x \neq y$) for which $A^T A = 3I_3$ is :

A. 2

B. 3

C. 6

D. 4

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Q.No.5:

Let $P = \begin{bmatrix} 3 & -1 & -2 \\ 2 & 0 & \alpha \\ 3 & -5 & 0 \end{bmatrix}$, where $\alpha \in \mathbf{R}$. Suppose $Q = [q_{ij}]$ is a matrix satisfying .

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Q.No.6: Let M be any 3×3 matrix with entries from the set $(0, 1, 2)$. The maximum number of such matrices, for which the sum of diagonal elements of $M^T M$ is seven is _____.

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Q.No.7:

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 $13(a^i$

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Q.No.8: 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 : **JEE 2021**

- A. 6
- B. 1
- C. 4
- D. 12

Q.No.9: Let A and B be 3×3 real matrices such that A is symmetric matrix and B is skew-symmetric matrix. Then the system of linear equations $(A^2B^2 - B^2A^2)X = O$, where X is a 3×1 column matrix of unknown variables and O is a 3×1 null matrix, has : **JEE 2021**

- A. exactly two solutions
- B. infinitely many solutions
- C. no solution
- D. a unique solution

Q.No.10: Let $A = \begin{bmatrix} i & -i \\ -i & i \end{bmatrix}$, $i = \sqrt{-1}$. Then, the system of linear equations

$$A^8 \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 64 \end{bmatrix} \text{ has}$$

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- A. Exactly two solutions
- B. No solution
- C. A unique solution
- D. Infinitely many solutions