

CLASS 12

MATHEMATICS

EXTRA QUESTIONS

Class 12 Mathematics Chapter 3 Matrices – Extra Questions with Answers

This set of questions on Matrices moves from basics like matrix order and the null matrix through to skew-symmetric matrices and the identity matrix.

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This set of questions on Matrices moves from basics like matrix order and the null matrix through to skew-symmetric matrices and the identity matrix.

How to Approach the HOTS Questions in This Chapter

HOTS questions on Matrices often combine a matrix equation with solving a system of linear equations, or ask you to prove a property (like the symmetric/skew-symmetric decomposition of any square matrix) algebraically — practice proving properties symbolically using A and A^T , not just verifying them on numeric examples.

Very Short Answer Questions (1 mark)

Q1. What is the order of a matrix with 3 rows and 2 columns?

Ans: 3×2 .

Q2. What is a zero (null) matrix?

Ans: A matrix in which all elements are zero.

Q3. What is the condition for a skew-symmetric matrix?

Ans: $A' = -A$.

Q4. Can two matrices of different orders be added?

Ans: No, matrix addition is only defined for matrices of the same order.

Q5. What is the identity matrix of order 2?

Ans: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

Short Answer Questions (2–3 marks)

Q6. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$, find $A+B$.

Ans: $A+B = \begin{bmatrix} 1+5 & 2+6 \\ 3+7 & 4+8 \end{bmatrix} = \begin{bmatrix} 6 & 8 \\ 10 & 12 \end{bmatrix}$.

Q7. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, find A' (transpose).

Ans: $A' = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$.

Q8. Determine if AB is defined for A of order 2×3 and B of order 3×4 , and if so, state the order of AB .

Ans: Yes, defined since columns of A (3) = rows of B (3). Order of $AB = 2 \times 4$.

Higher-Order Thinking / Application Questions

Q9. Prove that every square matrix A can be uniquely expressed as the sum of a symmetric matrix and a skew-symmetric matrix, and illustrate this decomposition using $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$.

Ans: Any square matrix A can be written as $A = \frac{1}{2}(A+A') + \frac{1}{2}(A-A')$, where $\frac{1}{2}(A+A')$ is always symmetric (since its transpose equals itself) and $\frac{1}{2}(A-A')$ is always skew-symmetric (since its transpose equals its negative). For $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$, $A' = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$. $A+A' = \begin{bmatrix} 4 & 4 \\ 4 & 8 \end{bmatrix}$, so $\frac{1}{2}(A+A') = \begin{bmatrix} 2 & 2 \\ 2 & 4 \end{bmatrix}$ (symmetric, verify: its transpose is $\begin{bmatrix} 2 & 2 \\ 2 & 4 \end{bmatrix}$, same as itself). $A-A' = \begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix}$, so $\frac{1}{2}(A-A') = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ (skew-symmetric,

verify: its transpose is $[[0, -1], [1, 0]] = -[[0, 1], [-1, 0]]$. Adding these: $[[2, 2], [2, 4]] + [[0, 1], [-1, 0]] = [[2, 3], [1, 4]] = A$, confirming the decomposition. This decomposition is unique because if $A = P + Q = P' + Q'$ for symmetric P, P' and skew-symmetric Q, Q' , then $P - P' = Q' - Q$ would have to be simultaneously symmetric and skew-symmetric, which forces it to be the zero matrix, proving $P = P'$ and $Q = Q'$.

Q10. Explain why matrix multiplication is not commutative in general ($AB \neq BA$), even when both products are defined, using a concrete 2×2 example, and describe the practical implication this has for solving matrix equations.

Ans: Let $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, both 2×2 square matrices, so both AB and BA are defined and have the same order. Computing AB : row1 of A times columns of B gives $[1(1) + 1(1), 1(0) + 1(1)] = [2, 1]$; row2 of A times columns of B gives $[0(1) + 1(1), 0(0) + 1(1)] = [1, 1]$. So $AB = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$. Computing BA : row1 of B times columns of A gives $[1(1) + 0(0), 1(1) + 0(1)] = [1, 1]$; row2 of B times columns of A gives $[1(1) + 1(0), 1(1) + 1(1)] = [1, 2]$. So $BA = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$. Since $AB = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix} \neq BA = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$, this concretely demonstrates that matrix multiplication is not commutative. This has an important practical implication: when solving matrix equations, one must always carefully preserve the order in which matrices are multiplied on each side of an equation (e.g., if $AX = B$, we must multiply both sides by A^{-1} specifically on the LEFT to get $X = A^{-1}B$, since multiplying on the right, XA^{-1} , would generally give a different, incorrect result) — unlike ordinary number arithmetic where multiplication order never matters, matrix algebra requires careful attention to left versus right multiplication at every step.

Class 12 Mathematics Chapter 3 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the [Class 12 Mathematics Chapter 3 Solutions](#) and [Class 12 Mathematics Chapter 3 Revision Notes](#).

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