Class 12 Maths Chapter 3: Matrices - Notes, Important Questions and MCQs (2026-27)

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These Class 12 Maths Chapter 3 notes cover “Matrices” from the NCERT Mathematics Part I textbook (2026-27): order and types of matrices, equality, addition, scalar multiplication and multiplication of matrices with their properties, transpose, symmetric and skew-symmetric matrices, and invertible matrices – with tables, solved examples, Q&A, 10 MCQs and a free PDF.

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Chapter Overview

A matrix is an ordered rectangular array of numbers or functions. A matrix with m rows and n columns has order m × n and is written $A = [a_{ij}]_{m \times n}$.

Matrices can be added (same order), multiplied by scalars and multiplied together when the number of columns of the first equals the number of rows of the second. Matrix multiplication is associative and distributive but not commutative in general.

Important Topics and Concepts

Types of Matrices

- Column matrix: one column (m × 1); row matrix: one row (1 × n).
- Square matrix: m = n.
- Diagonal matrix: square, all non-diagonal elements zero.

- Scalar matrix: diagonal with equal diagonal elements.
- Identity matrix I: diagonal elements 1, others 0.
- Zero matrix O: all elements zero.
- Two matrices are equal if they have the same order and corresponding elements are equal.

Operations on Matrices

- Addition: $(A + B)_{ij} = a_{ij} + b_{ij}$ – only for same order.
- Properties: commutative $A + B = B + A$, associative, additive identity O, additive inverse $-A$.
- Scalar multiplication: $kA = [k\, a_{ij}]$; $k(A + B) = kA + kB$; $(k + l)A = kA + lA$.
- Difference: $A - B = A + (-1)B$.

Multiplication of Matrices

- If A is $m \times n$ and B is $n \times p$, AB is $m \times p$ with $(AB)_{ik} = \Sigma\, a_{ij}\, b_{jk}$.
- Not commutative: $AB \neq BA$ in general; AB may exist while BA does not.
- $AB = O$ does not imply $A = O$ or $B = O$.
- Associative: $(AB)C = A(BC)$; distributive: $A(B + C) = AB + AC$.
- Identity: $AI = IA = A$ for square A.

Transpose, Symmetric and Skew-symmetric

- Transpose A' (or A^T): interchange rows and columns.
- $(A')' = A$; $(kA)' = kA'$; $(A + B)' = A' + B'$; $(AB)' = B'A'$.
- Symmetric: $A' = A$. Skew-symmetric: $A' = -A$ (diagonal elements are zero).
- For square A, $A + A'$ is symmetric and $A - A'$ is skew-symmetric.
- Every square matrix = $\frac{1}{2}(A + A') + \frac{1}{2}(A - A')$ – sum of symmetric and skew-symmetric parts uniquely.

Invertible Matrices

- A square matrix A is invertible if there is B with $AB = BA = I$; $B = A^{-1}$.
- Inverse of a square matrix, if it exists, is unique.
- $(AB)^{-1} = B^{-1}A^{-1}$.
- A rectangular matrix has no inverse.

Solved Examples

Board-pattern practice.

- $A = [[1, 2], [3, 4]]$, $B = [[0, 1], [1, 0]]$. Find AB and BA. $AB = [[2, 1], [4, 3]]$; $BA = [[3, 4], [1, 2]]$; so $AB \neq BA$.
- Express $A = [[3, 5], [1, -1]]$ as sum of symmetric and skew-symmetric matrices. $P = \frac{1}{2}(A + A') = [[3, 3], [3, -1]]$; $Q = \frac{1}{2}(A - A') = [[0, 2], [-2, 0]]$.
- If A is 2×3 and B is 3×4, order of AB? 2×4; BA is not defined.
- Construct a 2×2 matrix with $a_{ij} = (i + j)^2/2$. $[[2, 9/2], [9/2, 8]]$.

Types of Matrices

Type	Condition	Example
Row	$1 \times n$	[1 2 3]

Type	Condition	Example
Column	m × 1	[1; 2]
Square	m = n	2 × 2
Diagonal	$a_{ij} = 0$ for i ≠ j	[[2, 0], [0, 5]]
Scalar	Diagonal, equal entries	[[3, 0], [0, 3]]
Identity	Diagonal entries 1	I_2
Zero	All entries 0	O

Important Definitions and Terms

Term	Meaning
Matrix	Rectangular array of numbers
Order	Rows × columns
Square matrix	Equal rows and columns
Identity matrix	Diagonal 1s, rest 0
Transpose	Rows and columns interchanged
Symmetric matrix	A′ = A
Skew-symmetric matrix	A′ = –A
Scalar multiple	Each element multiplied by k
Invertible matrix	Square matrix with AB = BA = I
Zero matrix	All elements zero

Short Answer Questions

Q1. When can two matrices be added?

When they have the same order.

Q2. When is AB defined?

When the number of columns of A equals the number of rows of B.

Q3. Is matrix multiplication commutative?

No, in general AB ≠ BA.

Q4. What is (AB)′?

B′A′.

Q5. What are the diagonal elements of a skew-symmetric matrix?

All zero.

Q6. Define a scalar matrix.

A diagonal matrix with all diagonal elements equal.

Q7. What is $(AB)^{-1}$?

$B^{-1}A^{-1}$.

2 × 3.

Long Answer Questions

Q1. Prove that every square matrix can be written as the sum of a symmetric and a skew-symmetric matrix.

A = ½(A + A′) + ½(A – A′).

(A + A′)′ = A′ + A, so P = ½(A + A′) is symmetric.

(A – A′)′ = A′ – A = –(A – A′), so Q is skew-symmetric.

A = P + Q.

The representation is unique.

Q2. Show with an example that AB = O does not imply A = O or B = O.

Take A = [[0, 1], [0, 0]].

Take B = [[1, 0], [0, 0]].

AB = [[0, 0], [0, 0]].

Neither A nor B is zero.

So zero-product rule fails for matrices.

Q3. State the properties of transpose.

(A′)′ = A.

(kA)′ = kA′.

(A + B)′ = A′ + B′.

(AB)′ = B′A′.

Used to test symmetric and skew-symmetric matrices.

MCQs with Answers

1. Order of AB if A is 2 × 3 and B is 3 × 1(a) 3 × 3 (b) 2 × 1 (c) 1 × 2 (d) 2 × 3Answer: (b) 2 × 1

2. A′ = –A means A is(a) symmetric (b) skew-symmetric (c) diagonal (d) identityAnswer: (b) skew-symmetric

3. (AB)′ =(a) A′B′ (b) B′A′ (c) AB (d) BAAnswer: (b) B′A′

4. Diagonal elements of a skew-symmetric matrix are(a) 1 (b) 0 (c) any (d) equalAnswer: (b) 0

5. Matrix multiplication is(a) commutative (b) associative (c) neither (d) only distributiveAnswer: (b) associative

6. Number of elements in a 3 × 4 matrix(a) 7 (b) 12 (c) 34 (d) 9Answer: (b) 12

7. A diagonal matrix with equal diagonal entries is(a) identity only (b) scalar (c) zero (d) rowAnswer: (b) scalar

8. For square A, A + A′ is(a) skew-symmetric (b) symmetric (c) zero (d) identityAnswer: (b)

9. $(AB)^{-1}$ =(a) $A^{-1}B^{-1}$ (b) $B^{-1}A^{-1}$ (c) AB (d) BAAnswer: (b) $B^{-1}A^{-1}$

10. Inverse exists only for(a) rectangular matrices (b) some square matrices (c) row matrices (d) zero matrixAnswer: (b) some square matrices

Quick Revision Points

- Order m × n.
- Types of matrices.
- Addition, scalar and matrix multiplication rules.
- AB ≠ BA in general.
- Transpose properties; symmetric and skew-symmetric.
- Inverse; $(AB)^{-1} = B^{-1}A^{-1}$.

Chapter Summary

A matrix is a rectangular array with order m × n. Matrices of the same order can be added, every matrix can be multiplied by a scalar, and matrices are multiplied when columns of the first equal rows of the second – an associative and distributive but not commutative operation.

The transpose interchanges rows and columns with $(AB)' = B'A'$. Symmetric matrices satisfy $A' = A$ and skew-symmetric $A' = -A$, and every square matrix is a unique sum of the two. A square matrix with $AB = BA = I$ is invertible.

Exam Tips and PYQ Pattern

- Check orders before multiplying.
- Write row-by-column multiplication neatly.
- Remember reversal in $(AB)'$ and $(AB)^{-1}$.
- Practise symmetric + skew-symmetric decomposition.
- Verify answers by multiplication.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 12 Mathematics Part I textbook, prescribed in the CBSE 2026-27 syllabus.

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Yes. Use the free PDF link at the top of this page – no signup needed.

What is a skew-symmetric matrix?

A square matrix A with $A' = -A$; its diagonal elements are all zero.

Is matrix multiplication commutative?

No. In general AB ≠ BA, though it is associative and distributive.

Conclusion

Matrices is a quick-scoring chapter. Practise multiplication and decomposition here and save the free PDF.

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Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE maths educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 12 Maths textbook, Mathematics Part I (NCERT reprint 2026-27, rationalised syllabus), and the CBSE syllabus for the 2026-27 session. Last checked on 26 November 2026.