

Matrices

CBSE Class 12 Maths · Knowledge organiser

KEY DEFINITIONS

Matrix

A rectangular array of numbers with m rows and n columns.

Transpose

A^T is A with its rows and columns swapped.

Symmetric matrix

A square matrix with $A^T = A$.

KEY FORMULAS

Product $A_{m \times n} B_{n \times p}$ is $m \times p$; in general $AB \neq BA$; $AB = O$ is possible with $A, B \neq O$

$$\begin{aligned} \text{Transpose} \quad & (A^T)^T = A, \\ & (A + B)^T = A^T + B^T, \\ & (kA)^T = kA^T, \quad (AB)^T = B^T A^T \end{aligned}$$

Symmetric $A^T = A$; skew-symmetric $A^T = -A$ (diagonal entries 0)

$$\text{Any square } A \quad A = \frac{1}{2}(A + A^T) + \frac{1}{2}(A - A^T)$$

$$\begin{aligned} \text{Inverse} \quad & AB = BA = I \Rightarrow B = A^{-1}; \\ & (AB)^{-1} = B^{-1}A^{-1} \end{aligned}$$

YOU SHOULD BE ABLE TO...

- Read and construct matrices, state orders, use equality, add, scale and multiply matrices correctly.
- Handle transposes, symmetric/skew-symmetric decomposition, matrix powers and inverses from the definition at board 2- and 3-mark level.
- Write complete, step-marked solutions to 5-mark and case-based matrix questions, including context problems.
- Solve unfamiliar matrix problems: matrix equations with unknown entries, nilpotent/idempotent reasoning and pattern arguments for powers.

WORKED EXAMPLE

$$A = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}; A^2 = \begin{bmatrix} 1 & 6 \\ 0 & 1 \end{bmatrix}, \text{ and in general } A^n = \begin{bmatrix} 1 & 3n \\ 0 & 1 \end{bmatrix}$$

(each multiplication adds 3 to the corner).

COMMON MISTAKES

- ✗ Writing $(AB)^T = A^T B^T$ — the order must reverse.
- ✗ Expanding $(A + B)^2$ as $A^2 + 2AB + B^2$ or cancelling: $AB = AC$ does not give $B = C$ unless A is invertible.
- ✗ Multiplying matrices whose orders do not match, or mixing up rows $\times$ columns when stating an order.
- ✗ Checking only $AB = I$ when the question asks you to verify an inverse: show $BA = I$ as well.