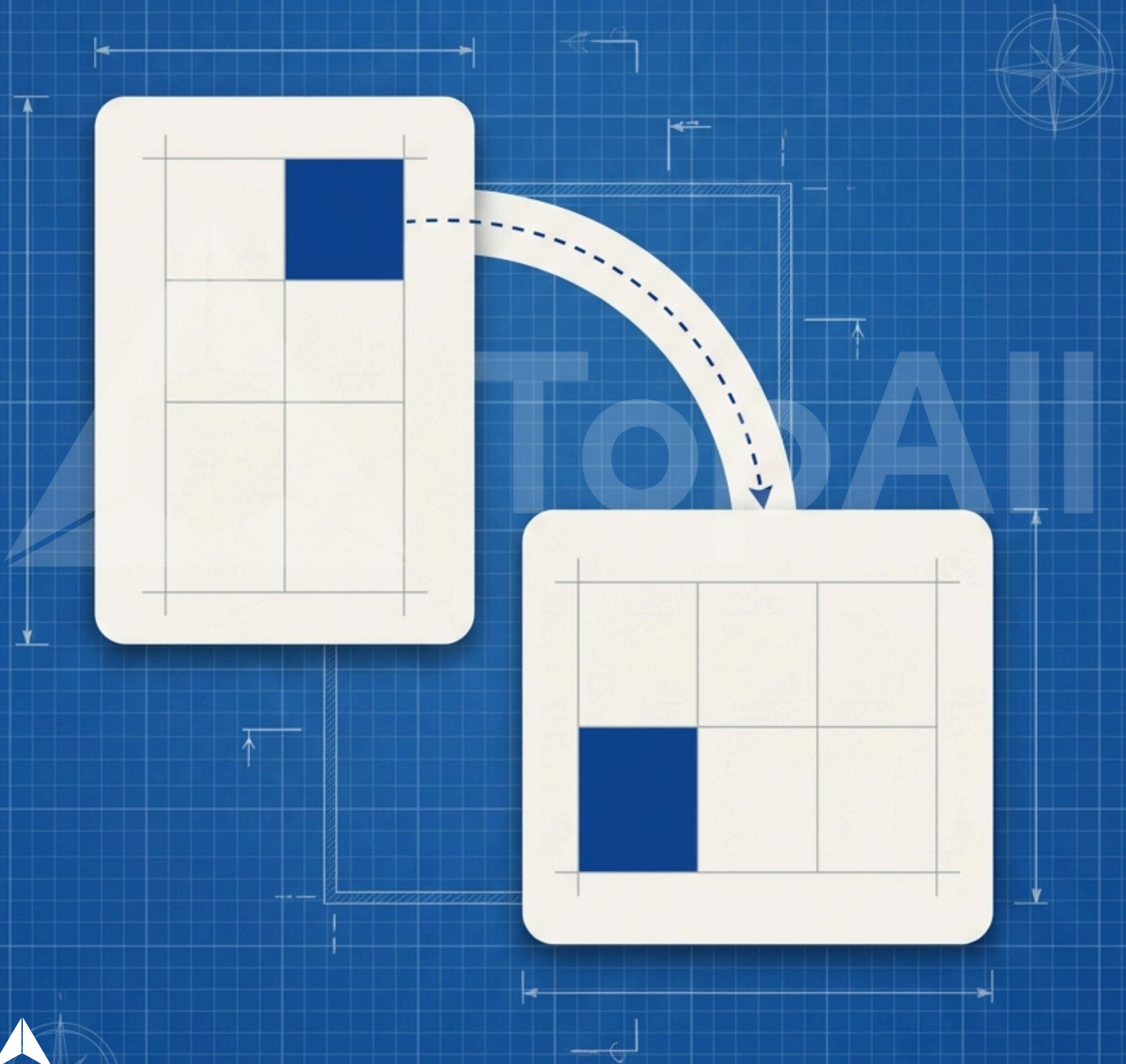


Transpose of a Matrix

Concept Capsule • JEE Class 12 Mathematics



Rows Become Columns

A physical rotation and flip across the main diagonal transforms the entire structure of the data.



The Mathematical Framework

The visual transformation is codified by defining the exact placement of every element.

Indices Swap

$$A = [a_{ij}]_{m \times n}$$

T

Dimensions Reverse

$$A' = [a_{ji}]_{n \times m}$$



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$$E=mc^2$$



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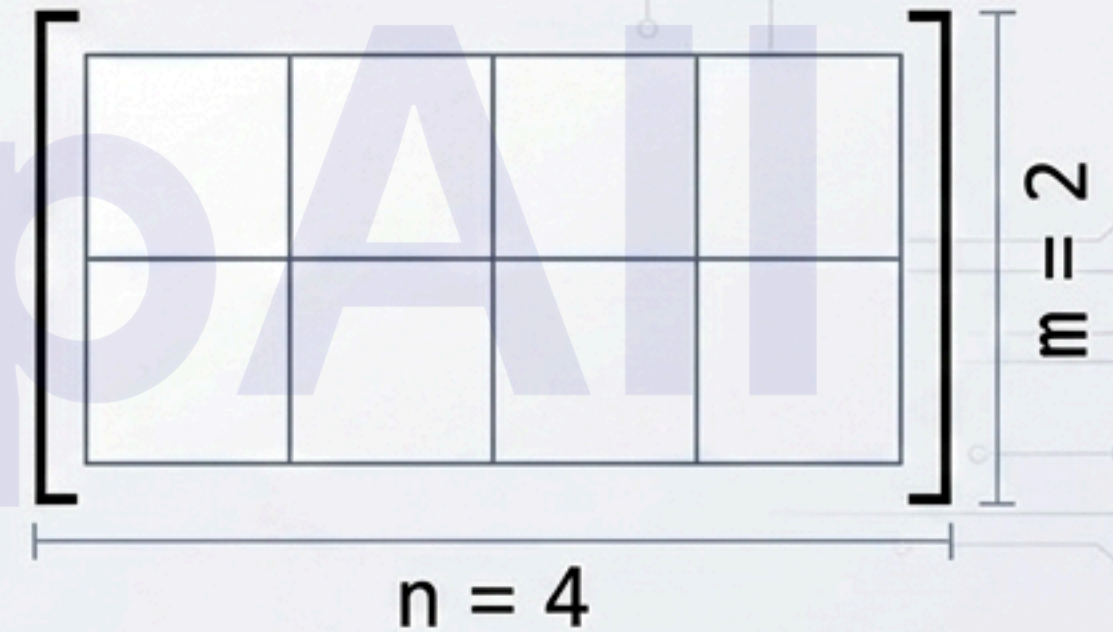
The Order Flips

The dimensions of the bounding box reverse entirely.
A tall matrix becomes wide; a wide matrix becomes tall.



Order: 4×2

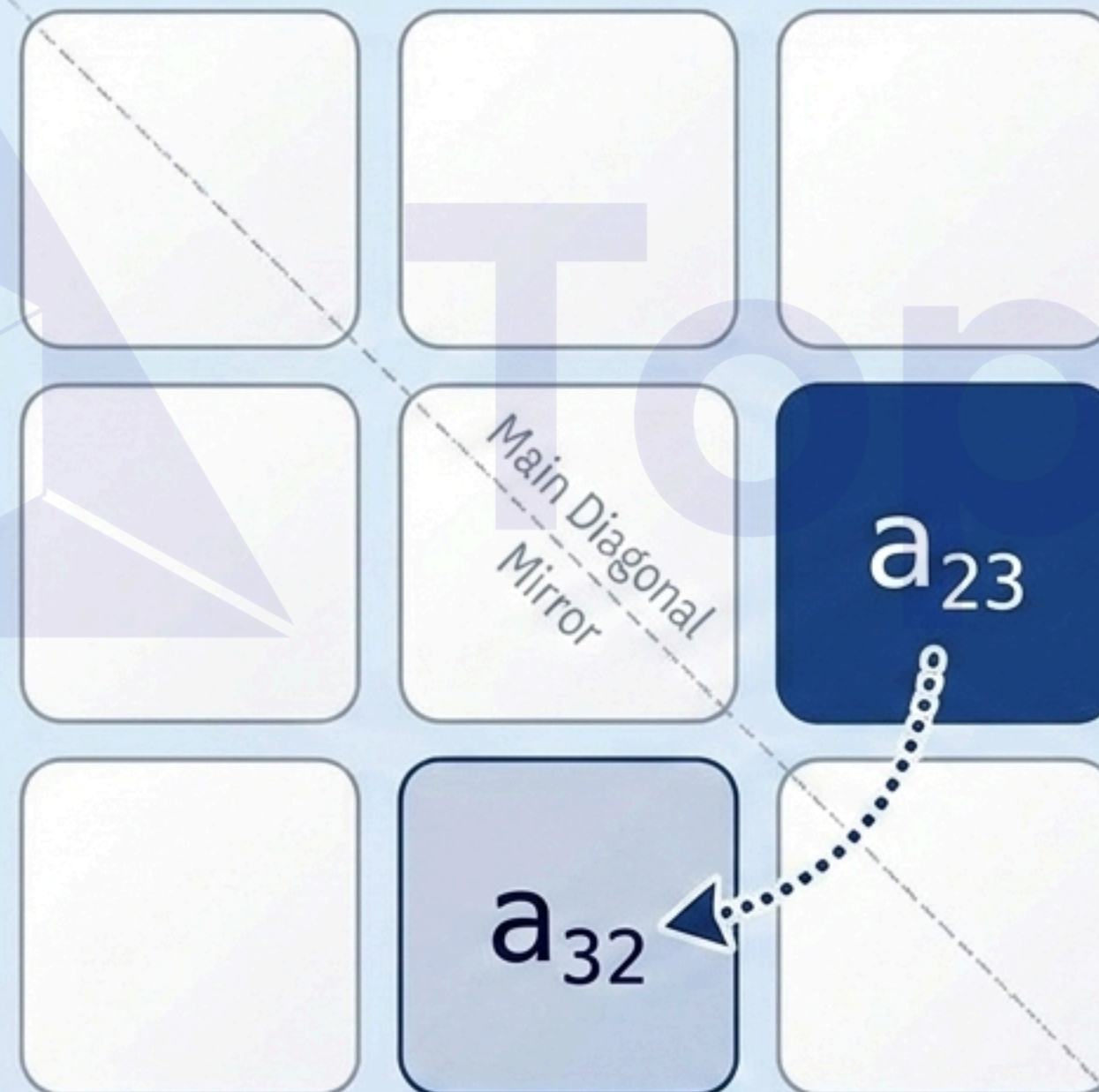
$m \times n \rightarrow n \times m$



Order: 2×4

Index Movement

The main diagonal acts as a mirror. Every individual element swaps its row and column coordinates.



$$a_{ij} \rightarrow a_{ji}$$

The Sign Trap

Transposing is purely a structural movement. It does not automatically change the mathematical signs of the elements.

Base Matrix

$$A = \begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix}$$

Transpose (A')

$$\begin{bmatrix} 1 & -3 \\ 2 & 4 \end{bmatrix}$$



Values physically move,
signs stay intact.

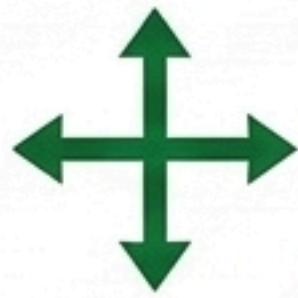
Common Error

$$\begin{bmatrix} -1 & -2 \\ 3 & -4 \end{bmatrix}$$



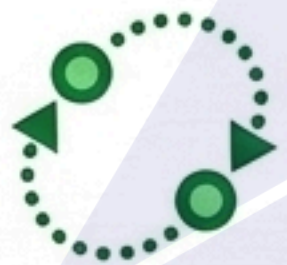
Do not confuse Transpose
with Negative (-A).

Key Takeaways



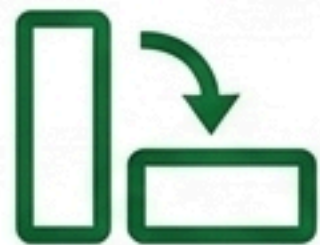
Swap rows and columns.

The fundamental physical transformation of the matrix structure.



Swap indices.

Element a_{ij} specifically relocates to position a_{ji} .



Order reverses.

A matrix of order $m \times n$ will always result in an order of $n \times m$.



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