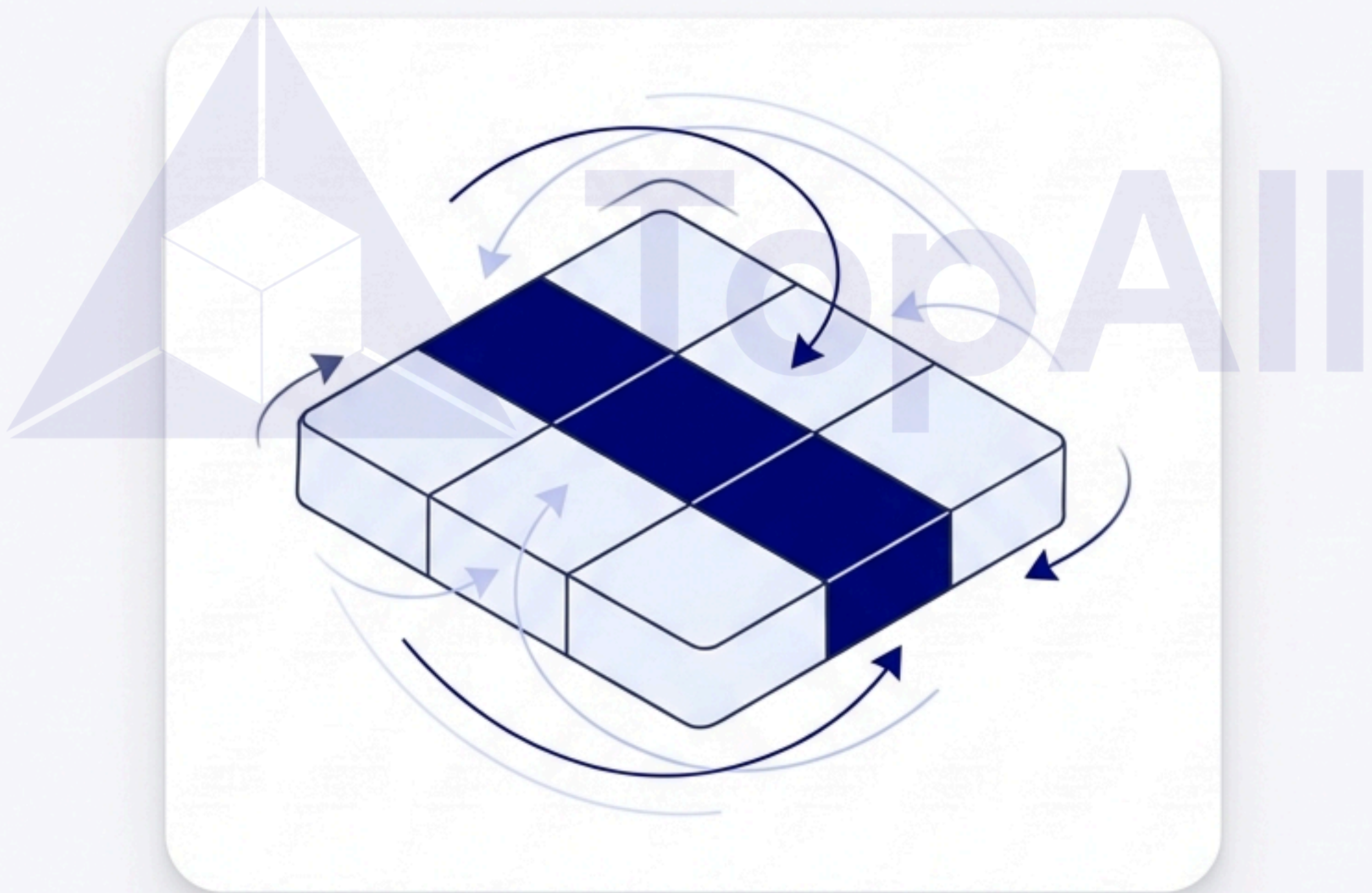


4 Properties of Transpose



Essential Matrix Algebra for JEE

Double Transpose

$$(A')' = A$$

Taking the transpose of a matrix reflects it across its main diagonal.

Applying the transpose a second time reflects it back to its original orientation.

▲	●	⦿
●	⦿	●
1	●	⦿

A



A

▲	⦿	1
1	▲	⦿
⦿	1	▲

A'



A

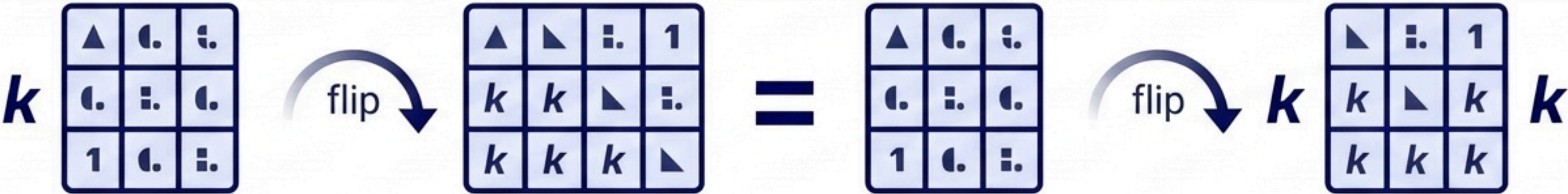
▲	●	⦿
●	⦿	●
1	●	⦿

The Scalar Commutes

$$(kA)' = kA'$$

Where k is any scalar constant.

A scalar k has no rows or columns. It only scales the magnitude of the matrix elements. Therefore, it is entirely unaffected by the transposition of the matrix indices.





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Property 3: Linearity of Transpose

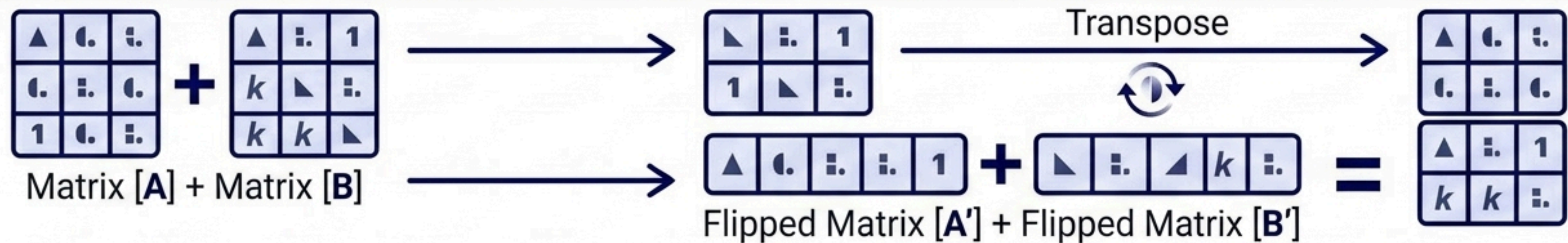
The Sum Property



$$(A + B)' = A' + B'$$

 **Note:** A and B must be of the same order.

The transpose of a sum is simply the sum of the transposes. The operation distributes evenly across addition (and subtraction).



Property 4: The Reversal Law Transpose of a Product

$$(AB)' = B'A'$$

When taking the transpose of multiplied matrices, the matrices are **transposed AND** their order of **multiplication is completely reversed**.

$[A] \times [B]$

$[B'] \times [A']$

Common Exam Trap Order Matters


$$(AB)' = A'B'$$

Why it's wrong:

Matrix multiplication is NOT commutative. Reversing the order changes the dimensions and the resulting dot products.


$$(AB)' = B'A'$$

The Rule:

Always apply the Reversal Law.

Summary

The 4 Transpose Laws



Double Transpose

$$(A')' = A$$

Scalar

$$(kA)' = kA'$$

A light blue pyramid with a white cube inside, representing the sum of two matrices.

Sum

$$(A + B)' = A' + B'$$

Product

$$(AB)' = B'A'$$

● **Key Takeaway: Transpose of product reverses order.**



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