

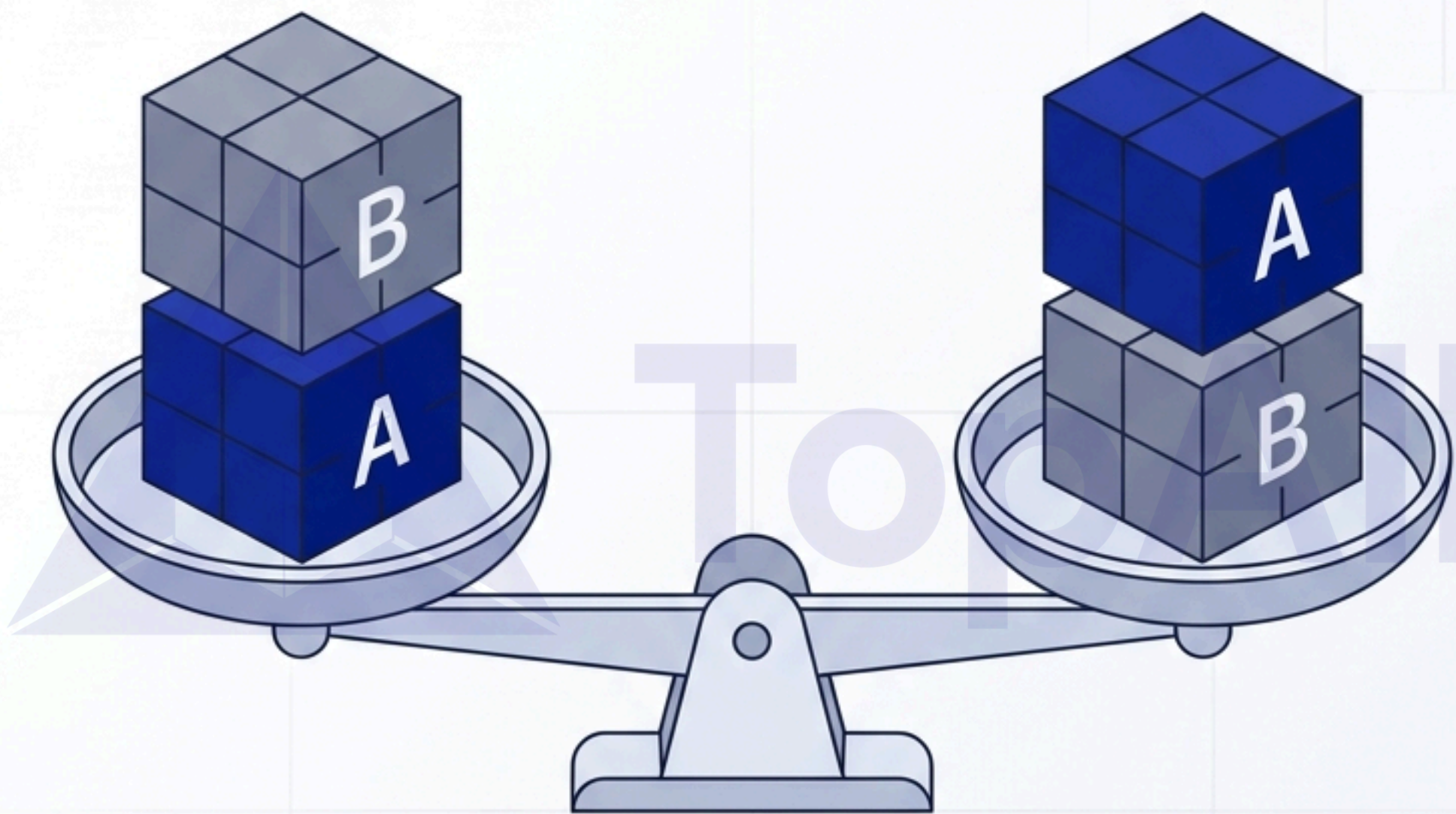
Chapter 3.4.3

Matrix Addition Properties

The Axiomatic Toolkit
for JEE Mathematics

Commutative Law

$$A + B = B + A$$

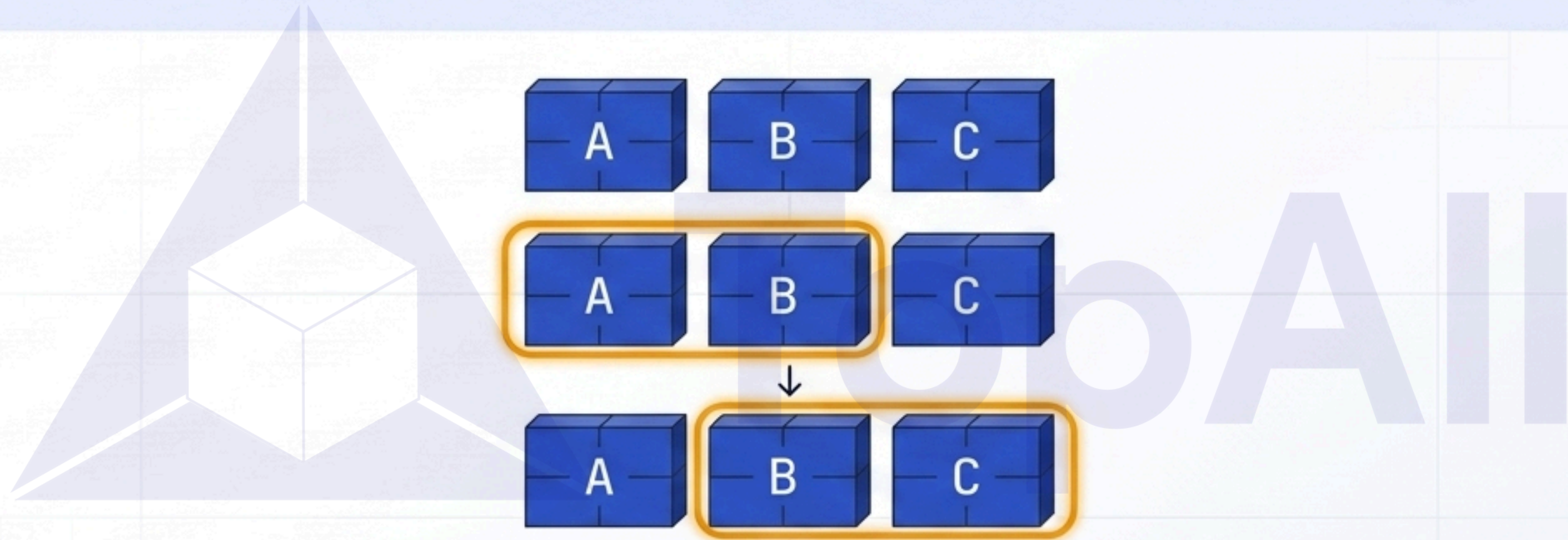


Swapping the order of matrices does not change their sum. This works because scalar addition inside the matrix elements is naturally commutative.

$$a_{ij} + b_{ij} = b_{ij} + a_{ij}$$

Associative Law

$$(A + B) + C = A + (B + C)$$



Regrouping the order of operations does not change the final matrix. The brackets can shift without altering the outcome.

$$(a_{ij} + b_{ij}) + c_{ij} = a_{ij} + (b_{ij} + c_{ij})$$



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$$E=mc^2$$



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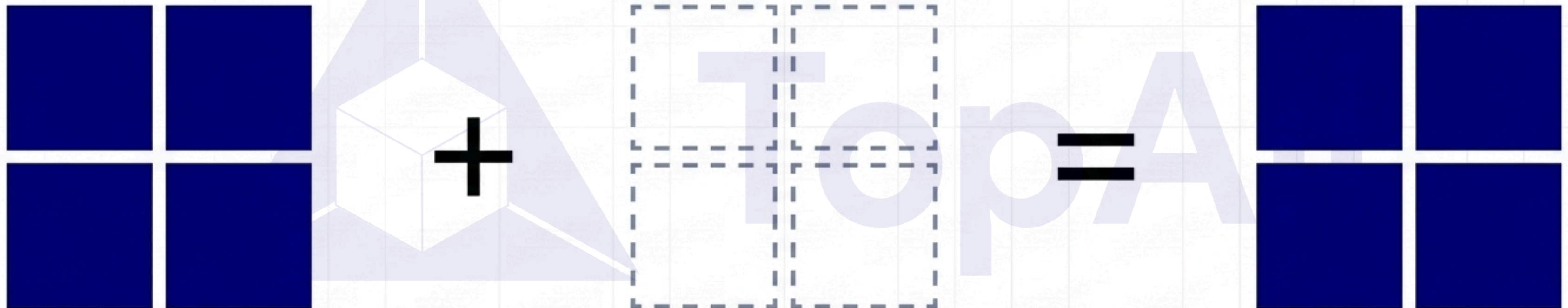
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Additive Identity

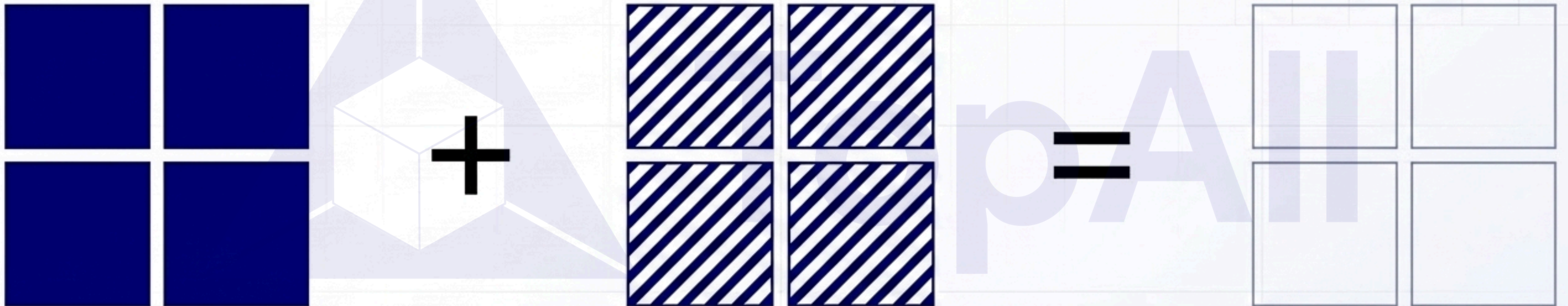
$$A + 0 = A$$



The Zero Matrix (0) acts as a mirror. Adding it to any matrix of the same order leaves the original matrix completely unaffected.

Additive Inverse

$$A + (-A) = 0$$



Every matrix has a perfect opposite. Multiplying every element by -1 creates an inverse matrix that exactly neutralizes the original into a Zero Matrix.

$$a_{ij} + (-a_{ij}) = 0$$

The Diagnostic Trap

$$-A \neq A^{-1}$$

Additive Inverse

Symbol: $-A$

Operation:
Addition

Yields:

0 (Zero Matrix)

Mechanics: Multiply
elements by -1

Multiplicative Inverse

Symbol: A^{-1}

Operation:
Multiplication

Yields:

I (Identity Matrix)

Mechanics: Complex
determinant & adjoint



Never conflate inverses! The additive inverse neutralizes via addition. The multiplicative inverse neutralizes via multiplication. They are entirely different operations.

Matrix Addition Toolkit

SWAP

Commutative

$$A+B = B+A$$

REGROUP

Associative

$$(A+B)+C = A+(B+C)$$

ZERO IDENTITY

Additive Identity

$$A+0 = A$$

NEGATIVE CANCELS

Additive Inverse

$$A+(-A) = 0$$

The core mechanics of matrix addition behave exactly like real-number arithmetic. Save this mental framework for rapid problem-solving.



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