

# ADDITION AND SUBTRACTION OF MATRICES

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## Addition of Matrices

$$A + B = \begin{bmatrix} a_{11} + b_{11} & a_{12} + b_{12} & \dots & a_{1n} + b_{1n} \\ a_{21} + b_{21} & a_{22} + b_{22} & \dots & a_{2n} + b_{2n} \\ \vdots & \vdots & & \vdots \\ a_{p1} + b_{p1} & a_{p2} + b_{p2} & \dots & a_{pn} + b_{pn} \end{bmatrix}$$

$$\begin{bmatrix} a_1 & a_2 \\ a_3 & a_4 \end{bmatrix} - \begin{bmatrix} b_1 & b_2 \\ b_3 & b_4 \end{bmatrix} = \begin{bmatrix} a_1 - b_1 & a_2 - b_2 \\ a_3 - b_3 & a_4 - b_4 \end{bmatrix}$$

The sum of two [matrices](#) is obtained by adding the corresponding elements of both the matrices. While adding two matrices, their order must be the same.

In general, if  $A = [a_{ij}]$  and  $B = [b_{ij}]$  are two matrices of same order then the sum of A and B is given by matrix  $C = [c_{ij}]$  where  $c_{ij} = a_{ij} + b_{ij}$  for all possible values of i and j.

For example: If  $A = \begin{bmatrix} 1 & -4 & 5 \\ -8 & 2 & 6 \end{bmatrix}$  and  $B = \begin{bmatrix} 0 & -2 & 4 \\ 5 & 7 & 0 \end{bmatrix}$  then

$$A + B = \begin{bmatrix} 1 + 0 & -4 + -2 & 5 + 4 \\ -8 + 5 & 2 + 7 & 6 + 0 \end{bmatrix} = \begin{bmatrix} 1 & -6 & 9 \\ -3 & 9 & 6 \end{bmatrix}$$

## Properties of Matrix addition

- i) [Commutative](#) Law: If A and B are any two matrices of same order then  $A + B = B + A$
- ii) [Associative](#) Law: If A, B and C are any three matrices of same order then  $A + (B + C) = (A + B) + C$
- iii) Existence of [additive identity](#): Let A be a matrix of order m x n and 0 be an m x n zero matrix, then  $A + 0 = 0 + A$ .
- iv) Existence of [additive inverse](#): Let A be any matrix, then we can find another matrix  $-A$  such that  $A + (-A) = 0$ . So additive inverse of A is  $-A$ .

## Difference of two matrices

If A and B are two matrices of same order, then the difference  $A - B$  is obtained by subtracting the corresponding elements of A and B.

For example: If  $A = \begin{bmatrix} 1 & 2 \\ -8 & 3 \\ 9 & 4 \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & 5 \\ 1 & -6 \\ 8 & -4 \end{bmatrix}$

Then compute  $3A - B$

$$3A - B = \begin{bmatrix} 3 & 6 \\ -24 & 9 \end{bmatrix} - \begin{bmatrix} 2 & 5 \\ 1 & -6 \end{bmatrix} = \begin{bmatrix} 3 - 2 & 6 - 5 \\ -24 - 1 & 9 - (-6) \end{bmatrix}$$

Find  $2A + B$

$$2. \text{ If } A = \begin{pmatrix} -1 & 2 & 0 \\ 0 & 3 & 6 \end{pmatrix} \text{ and } B = \begin{pmatrix} 0 & -4 & 3 \\ 9 & -4 & -3 \end{pmatrix}$$

Find  $A - B$

3. Find the values of  $x$  and  $y$  given the following equation:

$$\begin{pmatrix} -3 & x \\ 2y & 0 \end{pmatrix} + \begin{pmatrix} 4 & 6 \\ -3 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 7 \\ -5 & 1 \end{pmatrix}$$

Now try it yourself! Should you still need any help, [click here](#) to schedule live online session with e Tutor!

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## Reference Links:

[http://en.wikipedia.org/wiki/Matrix\\_\(mathematics\)](http://en.wikipedia.org/wiki/Matrix_(mathematics))

<http://en.wikipedia.org/wiki/Commutativity>

<http://en.wikipedia.org/wiki/Associativity>

[http://en.wikipedia.org/wiki/Additive\\_identity](http://en.wikipedia.org/wiki/Additive_identity)

[http://en.wikipedia.org/wiki/Additive\\_inverse](http://en.wikipedia.org/wiki/Additive_inverse)

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