LA - 1.4 - Operations on Matrices

Add $A + B$

$$A = \begin{bmatrix} 1 & 2 \\ 7 & 4 \\ 5 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 6 & 1 \\ 2 & 0 \\ 1 & 8 \end{bmatrix}$$

Add/Subtract corresponding Entries

Must be the Same Size
$$r_a \times c_a = r_b \times c_b$$

$$\begin{bmatrix} 1 & 2 \\ 7 & 4 \\ 5 & 1 \end{bmatrix} + \begin{bmatrix} 6 & 1 \\ 2 & 0 \\ 1 & 8 \end{bmatrix} = \begin{bmatrix} 7 & 3 \\ 9 & 4 \\ 6 & 9 \end{bmatrix} \leftarrow \begin{bmatrix} 1+6 & 2+1 \\ 7+2 & 4+0 \\ 5+1 & 1+8 \end{bmatrix} \quad \begin{bmatrix} a_{11} + b_{11} & a_{12} + b \\ a_{21} + b_{21} & a_{22} + b_{22} \\ a_{31} + b_{31} & a_{32} + b_{32} \end{bmatrix}$$

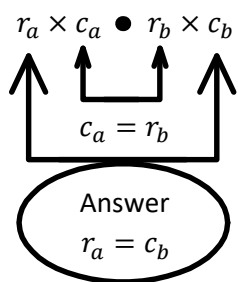$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} + \begin{bmatrix} 1 & 2 \end{bmatrix} = \text{No Solution} \qquad \text{You may only Add/Subtract Matrices of the Same Size.}$$

Multiply $A \bullet B$ | r_a ; rows in A c_a ; colunms in A | | $A \bullet B \neq B \bullet A$ |

$$r_a \times c_a \bullet r_b \times c_b$$

$c_a = r_b$

Answer
$r_a = c_b$

You may only multiply if columns in A = rows in B (If A is 1st)

$$\begin{bmatrix} a_1 & a_2 & \dots & a_n \end{bmatrix} \bullet \begin{bmatrix} b_1 \\ b_2 \\ \dots \\ b_n \end{bmatrix} = \begin{bmatrix} a_1 b_1 + a_2 b_2 + \cdots a_n b_n \end{bmatrix} = \left(\# \right)$$

$1 \times n$ $n \times 1$ 1×1 1×1

Must be Same

Answer in this Form

1×1

Point to where you look. Both Hands!

Left hand Horizontal Right Hand Vertical!

Multiply $A \bullet B$

$$A = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$$ Sales Numbers

Vancouver sells 1 apple for $4, Calgary sells 2 pears for $5 and Toronto sells 3 carrots for $6. Think about it!

$$B = \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \end{bmatrix} \bullet \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix} = \begin{bmatrix} 1 \times 4 + 2 \times 5 + 3 \times 6 \end{bmatrix} = \begin{bmatrix} 4 + 10 + 18 \end{bmatrix} = \left(32 \right)$$

City Prices

Each cities Sales!

Total Sales

In the future you will do this in your head (While Pointing!)

Useful Step!

It is not difficult to figure out the meaning of examples of larger size multiplication of matrices.

You will do matrix multiplication and then matrix subtraction for example to see changes in yearly fruit sales in the three cities.