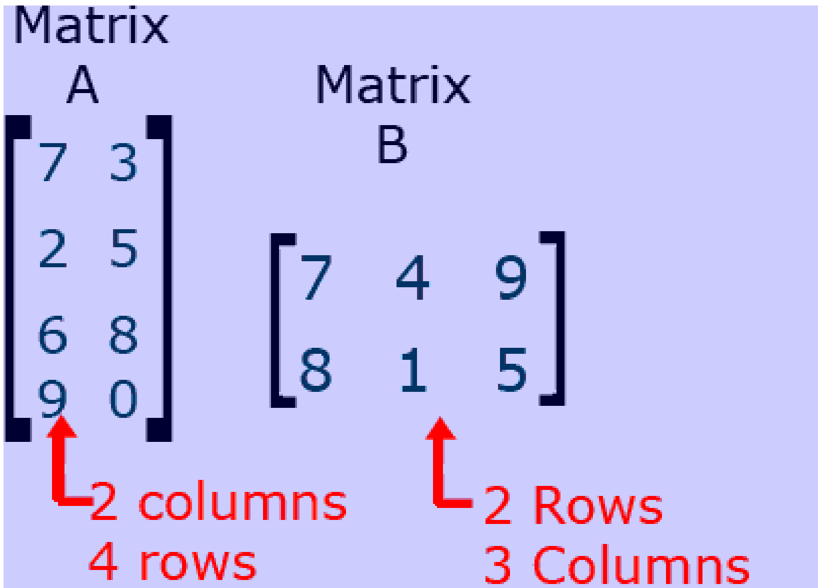
MATRICES

- Matrices are shown in the following way:



The digits shown horizontally are called ROWS

The digits shown vertically are in COLUMNS

The ORDER of the matrix is given by [ROWS x COLUMNS]

- For addition and subtraction of matrices, the order of the matrices has to be same and the corresponding values are added or subtracted under the given circumstances.

a

$$\begin{bmatrix} 1 \\ 0.6 \\ -2 \end{bmatrix} + \begin{bmatrix} -1 \\ 0 \\ 0.2 \end{bmatrix} + \begin{bmatrix} 3 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 3 \\ 1.6 \\ -1.8 \end{bmatrix}$$

b

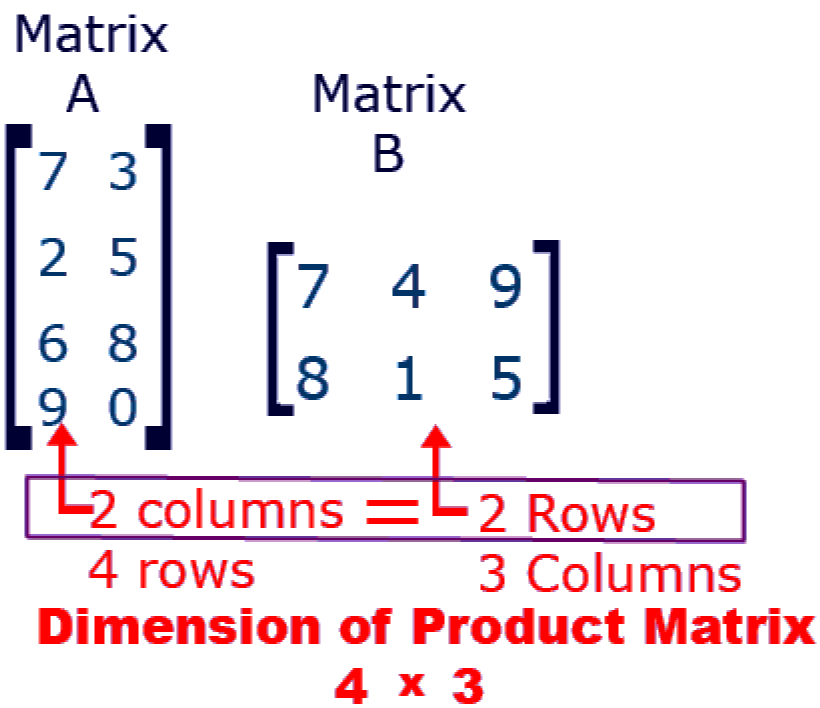
$$\begin{bmatrix} 1 & 0 \\ -1 & 0 \end{bmatrix} + \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -2 & 0 \end{bmatrix}$$

- There are 2 types of multiplication. Firstly, scalar, which is demonstrated in the following:

$$3\begin{bmatrix} 5 & 2 & 11 \\ 9 & 4 & 14 \end{bmatrix} = \begin{bmatrix} 3*5 & 3*2 & 3*11 \\ 3*9 & 3*4 & 3*14 \end{bmatrix} = \begin{bmatrix} 15 & 6 & 33 \\ 27 & 12 & 42 \end{bmatrix}$$

The number outside the matrix is multiplied to all the numbers inside.

The second type is matrix multiplication, the following:



It is necessary for the number of columns of first matrix to be equal to number of rows of second. Otherwise multiplication cant be done.

The product of 2 matrices

$$\begin{bmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \end{bmatrix} \times \begin{bmatrix} 1 & 8 & 9 \\ 2 & 7 & 10 \\ 3 & 6 & 11 \\ 4 & 5 & 12 \end{bmatrix} = \begin{bmatrix} 50 & 94 & 178 \\ 60 & 120 & 220 \end{bmatrix}$$

he product is found by multiplying the first row of matrix A with first column of matrix B with corresponding values to give answer 50. [(1*1)+(3*2)+(5*3)+(7*4)]=50. Likewise the first column is multiplied with second row and then third row.

Then the second column is multiplied with first, second, and third rows respectively.

- These are identity matrices:

$$I_1 = \begin{bmatrix}1\end{bmatrix},\ I_2 = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix},\ I_3 = \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix},\ \cdots,\ I_n = \begin{bmatrix}1 & 0 & \cdots & 0\\ 0 & 1 & \cdots & 0\\ \vdots & \vdots & \ddots & \vdots\\ 0 & 0 & \cdots & 1\end{bmatrix}$$

Multiplication of matrices with identity matrix gives the same matrix as an answer.

- A zero matrix is one with all numbers 0 and addition or subtraction gives the same matrix as answer.

- Finally the inverse:

$$\mathbf{B} = \begin{bmatrix}A & B\\ C & D\end{bmatrix}$$ If $AD - BC \neq 0$, then B has an inverse, denoted B^{-1}

$$\mathbf{B}^{-1} = \frac{1}{AD-BC}\begin{bmatrix}D & -B\\ -C & A\end{bmatrix}$$

AD-BC is known as determinant and it is multiplied with the matrix with digits of main diagonal displaced nd signs of the other changed.