

# MATRICES AND DETERMINANTS

## Real matrices:

The idea of matrices was given by **Arthur Cayley**, an English mathematician of sixteenth century who first developed, "Theory of Matrices" in 1858.

Q1. Define the following terms.

(i) Matrix

"A rectangular array or a formation of a collection of real numbers, say 0, 1, 2, 3, 4 and 7, such as:  $\begin{bmatrix} 1 & 3 & 4 \\ 7 & 2 & 0 \end{bmatrix}$  and then enclosed by brackets '[]' is said to form a matrix  $\begin{bmatrix} 1 & 3 & 4 \\ 7 & 2 & 0 \end{bmatrix}$ . Similarly  $\begin{bmatrix} 0 & 1 \\ 3 & 4 \end{bmatrix}$  is a square matrix.

The matrices are denoted conventionally by the capital letters A, B, C, ..., M, N etc. of the English alphabet.

(ii) Order of a Matrix

The number of rows and columns in a matrix specifies its order. If a matrix M has  $m$  rows and  $n$  columns then M is said to be of order,  $m$ -by- $n$ . For example,  $M = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 0 & 2 \end{bmatrix}$  is order 2-by-3,

(iii) Equal Matrices

Let A and B be two matrices. Then A is said to be equal to B, and is denoted by  $A = B$ , if and only if;

(i) The order of A = The order of B

(ii) Their corresponding entries are equal.

## Examples

(i)  $A = \begin{bmatrix} 1 & 3 \\ -4 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2+1 \\ -4 & 4-2 \end{bmatrix}$

are equal matrices.

We see that:

(a) The order of matrix A = The order of matrix B

(b) Their corresponding elements are equal.

Thus  $A = B$

(ii)  $L = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$  and  $M = \begin{bmatrix} 2 & 3 \\ -1 & -2 \end{bmatrix}$  are

not equal matrices.

We see that: order of L = order of M but entries in the second row and second column are not same, so  $L \neq M$ .

(iii)  $P = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$  and  $Q = \begin{bmatrix} 2 & 3 & 4 \\ -1 & 2 & 0 \end{bmatrix}$

are not equal matrices.

We see that order of P  $\neq$  order of Q, so  $P \neq Q$ .

## Exercise 1.1

1. Find the order of the following matrices.

$A = \begin{bmatrix} 2 & 3 \\ -5 & 6 \end{bmatrix}$ , order of A is 2-by-2

$B = \begin{bmatrix} 2 & 0 \\ 3 & 5 \end{bmatrix}$ , order of B is 2-by-2

$C = \begin{bmatrix} 2 & 4 \end{bmatrix}$  order of C is 1-by-2

$D = \begin{bmatrix} 4 \\ 0 \\ 6 \end{bmatrix}$ , order of D is 3-by-1

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