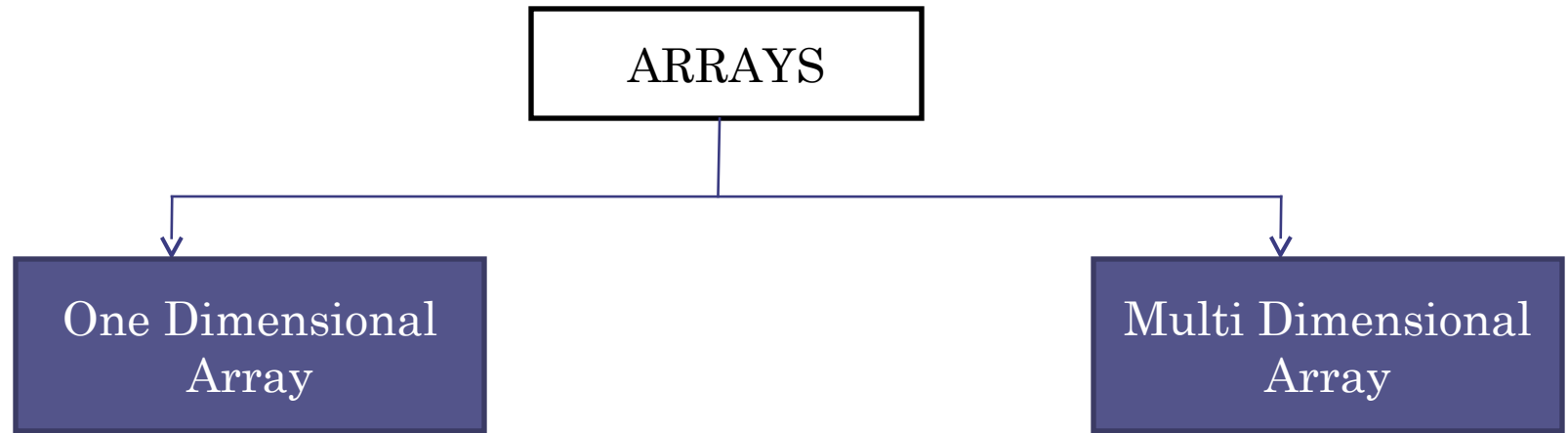


2 Dimensional Arrays

Types of Array



(An Array whose elements are specified by a single subscript
Eg. $A[0]$)

(An Array whose elements are specified by two or more than two subscripts
Eg. $A[10][10]$ is a two dimensional array)

○ Two Dimensional Array:-

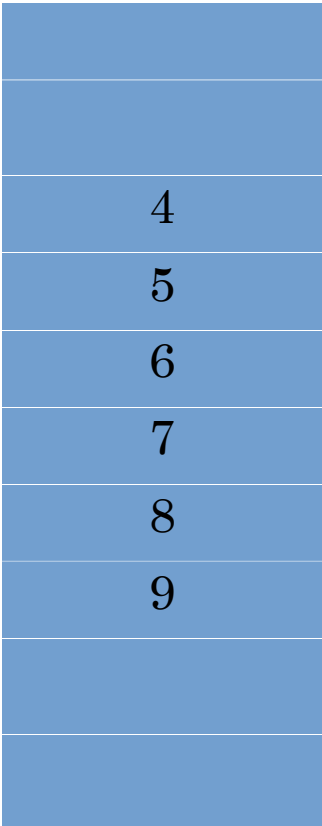
A [m] [n] represents an array A where m is no.of rows and n is no.of columns.

Eg:-

		0	1	2
A[2][3]	0	4	5	6
	1	7	8	9

m*n
1*2

Consider storage in Row Major Order-:



100	4	0,0
100+1	5	0,1
100+2	6	0,2
100+3	7	1,0
100+4	8	1,1
100+5	9	1,2

A two dimensional array in linear memory is accessed such that rows are stored one after the other.

Matrix

A matrix is a two-dimensional array of numbers

A matrix is an $m \times n$ set of number

- E.g. a 3×3 matrix could be:

1	2	3
4	5	6
7	8	9

Traversal of elements in a 2D Matrix

Algorithm Traversal (A $[][]$, M,N)

{

//Description:- A is an array of size M
X N.

1. for (i=0 to M-1)

1.1 for (j=0 to N-1)

1.1.1 Print A[i][j]

}

//Time Complexity:- $O(N^2)$

Insertion of elements in a 2D Matrix

Algorithm Insertion (A $[][]$, M,N)

{

//Description:- A is an array of size M
X N.

1. for (i=0 to M-1)

1.1 for (j=0 to N-1)

1.1.1 Input A[i][j]

}

//Time Complexity:- $O(N^2)$

Matrix Multiplication

- Matrix multiplication takes two matrices and produces a third.

$$C=A \times B = \sum_{k=0}^{k=n} A[i,k] \times B[k,i]$$

- E.g. Let A be

1	2	3
4	5	6

- Let B be

7	8
9	10
11	12

Matrix Multiplication (Example)

A

1	2	3
4	5	6

B

7	8
9	10
11	12

○ $A \times B =$

58	64
139	154

○ $A[1,1] = 1 * 7 + 2 * 9 + 3 * 11$

○ $= 7 + 18 + 33$

○ $= 58$

Multiplication of elements of two 2D Matrices;
A[][] of order M X N, B[][] of order P X Q, Result is
stored in C of order M X Q

Algorithm Multiply(A [], M,N,B [],P,Q,C [])

{

1. for (i = 0 to M-1)

1.1 for (j= 0 to Q-1)

1.1.1 sum = 0

1.1.2 for (k = 0 to P-1)

1.1.2.1sum = sum +A[i][k]*B[k][j];

1.1.3 C[i][j] = sum;

}

//Time Complexity:- $O(N^3)$