TWO DIMENSIONAL ARRAYS

There are 3 types of arrays:-

1. 1 D Array
2. 2 D Array
3. Multi – Dimensional Array

- Maximum limit of Arrays is compiler dependent.

If we want to represent an array in a matrix form we will be using 2 D Arrays.

General form of an 2D array is

Datatype array_ name[row_size][column_size];

Ex: int i[4][3];

An array 'i' is declared which contains 12 integer values in 4 rows and 3 columns.

Initializing a 2D array in program:

```
int  i[4][3] = { { 1,2,3 } , { 4,5,6 } , { 7,8,9 } , { 10,11,12 } };
```

or

```
int  i[4][3] = { 1,2, 3,4, 5, 6 , 7, 8, 9,10,11,12 };
```

or

```
int  i[][3] = { { 1,2,3 } , { 4,5,6 } , { 7,8,9 } , { 10,11,12 } };
```

NOTE: It is important to remember that while intialising an array it is necessary to mention the second(column) dimension, whereas the first dimension(row) is optional

	c1	c2	c3	
r1	1	2	3	
r2	4	5	6	
r3	7	8	9	
r4	10	11	12	4 X 3

MEMORY OF 2 D ARRAY:

In memory it is not possible to store elements in form of rows and columns. Whether it is a 1 D (or) 2 D Array, the elements are stored in continuous memory locations. The arrangement of elements of a 2 D is shown below:

int a[4][3] = = { { 10,20,30 } , { 4,8,9 } , { 23,41,32 } , { 15,18,24 } };

a[0][0] a[0][1] a[0][2] a[1][0] a[1][1] a[1][2] ……
…..a[3][2]

10	20	30	4	8	9	23	41	32	15	18	24

1000 1002 1004 1006 1008 ……..
1022

// WAP to read a 2-D Array and print it.

```
Void main()
{
int a[10][10] , i , j , m , n ;
Printf "enter the order of matrix  \n ");
Scanf( " %d%d " , &m, &n);
Printf " \n enter the elements of array:  \n ");
for(i=0;i<m;i++)                    //     for rows.
{
for (j=0;j<n;j++)                   //     for columns.
{
Scanf("%d", &a[i][j]);
}
}
for(i=0;i<m;i++)                    //     for rows.
{
for (j=0;j<n;j++)                   //     for columns.
{   printf("%d", a[i][j]);
}
print( " \n ");
} }
```

// Write a program for ADDITION OF 2 MATRICES

```
# include <stdio.h>
# include <conio.h>
void main()
{
   int a[10][10],b[10][10],c[10][10];
   int i,j;
   int r1,r2,c1,c2;
   printf("Enter the size of the first matrix ( rows and coloums)\n");
   scanf("%d%d",&r1,&c1);
   printf("Enter the size of the seond matrix (rows and coloums)\n");
   scanf("%d%d",&r2,&c2);
   printf("Enter the elements in matrix one");
   for(i=0;i<r1;i++)
  {    for(j=0;j<c1;j++)
  {
   scanf("%d",&a[i][j]);
}
}
```

```
printf("Enter the elements in matrix two");
for(i=0;i<r2;i++)
{
for(j=0;j<c2;j++)
{
scanf("%d",&b[i][j]);
}  }
for(i=0;i<r1;i++)
{
for(j=0;j<c1;j++)
{
c[i][j]=a[i][j]+b[i][j];
}
}
printf("The sum of the two matrices is \n");
for(i=0;i<r1;i++)
{
for(j=0;j<c2;j++)
{
```

```
printf("    %d",c[i][j]);
}
printf("\n");
}
}
```

// Program for MULTIPLICAION OF 2 MATRICES

```
#include<stdio.h>
#include<conio.h>
void main()
{
        int a[10][10],b[10][10],c[10][10],r1,c1,r2,c2,i,j,k;
        printf("Enter the number of rows and columns in 1st matrix\n");
        scanf("%d%d",&r1,&c1);
        printf("Enter the number of rows and columns in 2nd matrix\n");
        scanf("%d%d",&r2,&c2);
      if(c1 == r2)
        {       printf("Enter the elements of the matrix of a\n");
                for(i=0;i<r1;i++)
                {
                        for(j=0;j<c1;j++)
                        {
                                scanf("%d",&a[i][j]);
                        }
                }
```

```
printf("Enter the elements of the matrix of b\n");
for(i=0;i<r2;i++)
{
	for(j=0;j<c2;j++)
	{
		scanf("%d",&b[i][j]);
	}
}
for(i=0;i<r1;i++)
{
	for(j=0;j<c2;j++)
	{
		c[i][j]=0;
		for(k=0;k<c2;k++)
		{
			c[i][j] =c[i][j] + (a[i][k] * b[k][j]);
		}
	}
}
```

```
            printf("\nProduct of the two matrices is\n");
            for(i=0;i<r1;i++)
            {
                  for(j=0;j<c2;j++)
                  {
                        printf("  %d",c[i][j]);
                  }
                  printf("\n");
            }
      }
      else
            printf("Matrix multiplication not possible");
}
```

// Program to find transpose of given matrix and print the identity matrix of order m x n

```
#include<stdio.h>
#include<conio.h>
void main()
{
	int a[10][10],b[10][10],c[10][10],r1,c1,r2,c2,i,j,k;
	clrscr();
	printf("Enter the number of rows and columns\n");
	scanf("%d%d",&r1,&c1);
	printf("Enter the %d elements\n",r1*c1);
	for(i=0;i<r1;i++)
	{
		for(j=0;j<c1;j++)
		{
			scanf("%d",&a[i][j]);
		}
	}
```

```
for(i=0;i<r1;i++)
{
        for(j=0;j<c1;j++)
        {
                b[j][i] = a[i][j];
        }
}
printf("Transpose of given matrix is\n");
for(i=0;i<c1;i++)
{
        for(j=0;j<r1;j++)
        {
                printf("%d  ",b[i][j]);
        }
        printf("\n");
}
if(r1 == c1)
{
        for(i=0;i<r1;i++)
```

```
        {       for(j=0;j<c1;j++)
                {       if(i==j)
                                a[i][j] = 1;
                        else
                                a[i][j] = 0;
                }
        }
        printf("Identity matrix of given order is\n");
        for(i=0;i<r1;i++)
        {       for(j=0;j<c1;j++)
                {
                   printf("%d  ",a[i][j]);
                }
                printf("\n");
        }
    }
    else
        printf("\nIdentity matrix should be square matrix");
}
```

// Program to check the EQUALITY OF 2 MATRICES

```
void main()
{
int a[10][10],b[10][10];
int sum,i,j,k,r1,r2,c1,c2,temp;
printf("enter rows and columns matrix-1\n");
scanf("%d %d",&r1,&c1);
printf("enter rows and columns matrix-2\n");
scanf("%d %d",&r2,&c2);
if(r1==r2&&c1==c2)
{    printf("enter elements of the matrix-1\n");
for(i=0;i<r1;i++)
{
        for(j=0;j<c1;j++)
        {
                scanf("%d",&a[i][j]);
                printf("\n");
        }
}
```

```
printf("enter elements of the matrix-2\n");
for(i=0;i<r2;i++)
{
	for(j=0;j<c2;j++)
	{
		scanf("%d",&b[i][j]);
		printf("\n");
	}
}
/*printing matrix-1*/
printf("matrix-1\n\n");
for(i=0;i<r1;i++)
{
	for(j=0;j<c1;j++)
	{
		printf("%d\t",a[i][j]);
	}
	printf("\n\n\n");
}
```

```
/* printing matrix-2*/
printf("matrix-2\n\n");
for(i=0;i<r2;i++)
{
	for(j=0;j<c2;j++)
	{
		printf("%d\t",b[i][j]);
	}
	printf("\n\n\n");
}
  /* checking equality */
	for(i=0;i<r1;i++)
	{
		for(j=0;j<c2;j++)
		{
			if(a[i][j]!=b[i][j])
			{
				temp=1;
				break;
```

```
                    }
                }
        }
}


else
printf("cannot be compared");
if(temp==1)
printf("matrices are not equal");
else
printf("matrices are equal");
}
```

// Program to check whether the given matrix is SYMMETRIC MATRIX or not

```
void main()
{
int a[10][10],b[10][10];
int sum,i,j,k,m,n,temp;
clrscr();
printf("enter size of square matrix\n");
scanf("%d %d",&m,&n);
if(m==n)
{
printf("enter elements of the matrix\n");
for(i=0;i<m;i++)
{
        for(j=0;j<n;j++)
        {
                scanf("%d",&a[i][j]);
                printf("\n");
        }
}
```

```
printf("the input matrix is\n\n\n\n");
for(i=0;i<m;i++)
{
        for(j=0;j<n;j++)
        {
                printf("%d\t",a[i][j]);


        }
        printf("\n\n\n\n\n\n\n");
}


for(i=0;i<m;i++)
{
        for(j=0;j<n;j++)
        {
          b[i][j]=a[j][i];


        }
}
```

```
printf("transpose of a matrix is\n\n\n\n\n");
for(i=0;i<m;i++)
{       for(j=0;j<n;j++)
        {
                printf("%d\t",b[i][j]);


        }
        printf("\n\n\n\n\n\n\n");
}
for(i=0;i<m;i++)
{
        for(j=0;j<n;j++)
        {
                if(a[i][j]!=b[i][j])
                {
                        temp=0;
                        //printf("matrix is symmetric");
                }
```

```
            }
        }
        if(temp==0)

        printf("matrix is not symmetric");
        else
        printf("matrix is symmetric");
}
else
printf("symmetric matrix shud be a square matrix");
}
```