

Unit –III
Arrays

Definition:- An Array is a collection of similar data items that are stored under a single name or common name.

We can define an array salary to represents a set of salaries of a group of employees. A particular value is indicated by working a number called index or subscript value after the array index starts with zero.

1. One – Dimensional Array: A list of items can be given one variable name using only one subscript such as a variable is called *one dimensional array*.

In mathematics we often deal with variable that are single subscripted we use the equation

$$A = \frac{\sum_{i=1}^n x_i}{n}$$

To calculate the average of n values of X. the subscript variable x_i refers to the i^{th} element of X. in C, single subscripted variable X_i can be expressed as

$X[0], X[1], X[2], \dots, X[n]$.

For example if we want to represent as of five number 30,40,20,10,50 by an array variable number then we may declare as

```
int number[5]; int number[]=new int[5];
```

and the computer receives 5 storage locations.

	Number[0]
	Number[1]
	Number[2]
	Number[3]
	Number[4]

The values to array elements can be assigned as follows

```
Number[0]=30
Number[1]=40
Number[2]=20
Number[3]=10
Number[4]=50
```

This would cause the array number to store the values as

30	Number[0]
40	Number[1]
20	Number[2]
10	Number[3]
50	Number[4]

Declaration of Array: like any other variable arrays must be declared before they are used. The general syntax for array declaration is

Type1:	Data type array name[size];
Type2:	Data type [] array name;

The data type specifies built-in data types like int, float, char etc.

For example

```
float x[]=new float[50];
float x[50];
```

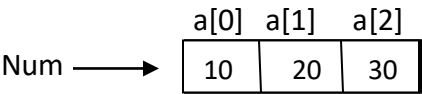
Declares the x as an float array and it can store 50 real numbers from 0 - 49.

```
char x[50]; char x[]=new x[50];
```

The C language treats character strings simply as array of character. It can store 50 character from 0 – 49.
Initialization of Array: We can initialize the elements of array in the same way as the ordinary variable. The general syntax is

Syntax: datatype array name[size]={List of values}

For Example: int num[3]={10,20,30}



Char[7]={‘w’,‘e’,‘l’,‘c’,‘o’,‘m’,‘e’}

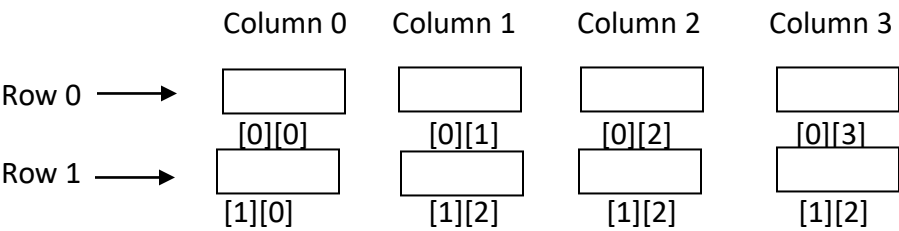


Two dimensional arrays: The array variable that can store a list of values. These will be a situation where a table of values will be stored. Consider the following data table.

North	East	West	South
80	72	60	40
95	24	36	84

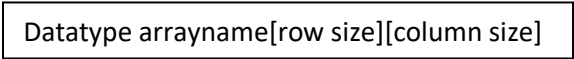
The table contains a total of 8 values, 4 in each lin. We can think in mathematics a matrix consisting of rows and columns. We represents a particulars values in matrix by using two subscripts such as a_{ij} . Here a denotes the entire matrix and ‘ij’ refers to the values in the i^{th} row and j^{th} column.

In C Language we represent as $a[i][j]$ the computer reserve space as follows.



The values to the 2D-Array assigned as
 $a[0][1]=80$ $a[1][0]=95$
 $a[0][1]=72$ $a[1][1]=24$
 $a[0][2]=60$ $a[1][2]=36$
 $a[0][3]=40$ $a[1][3]=84$

Declaration of Array: Two dimensional array is declared as



The data type specifies int, float, char etc. the row size specifies number of rows and column size specifies number of columns.

For example: int x[2][2];

Declares x as integer 2D-Array and it can store $2 \times 2=4$, integer values.

Float y[10][10];

Declares y as float 2D array and it can store $10 \times 10=100$ values.

Like 1D array 2D array initialized as follows.

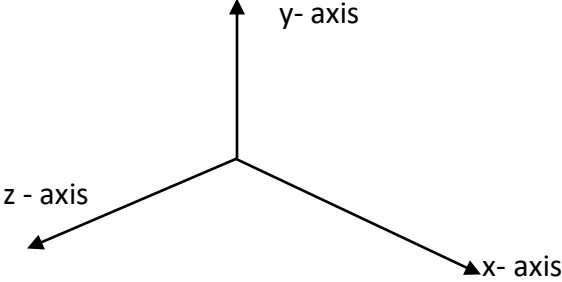
Syntax: datatype arrayname[row size][column size]={list of values}

Ex: int a[2][2]={1,0,1,0}

ND-Array or Multi Dimensional Array:

A group of values that are stored under a single name by using ‘n’ subscript values.

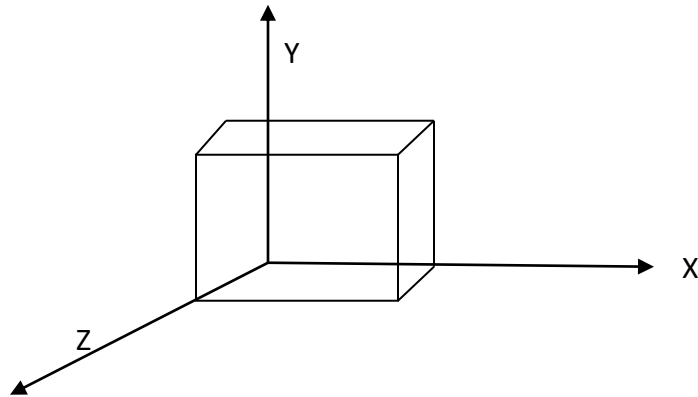
Java supports multi dimensional array. The exact limit of multi dimensional array is determined by compiler. In mathematical form a data table that represent values by using 3 axis.



the 3D - array is defined as A_{ijk} . Where A is the 3D- array and “i,j,k” is the value stored at in x-axis, y-axis, z-axis.

For example: `int a[2][2][2];`

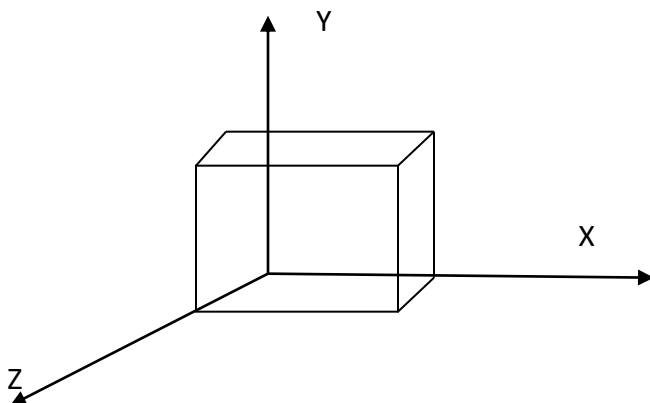
The computer reserve memory locations as follows.



The values to 3D-Array is assigned as follows

```
A[0][0][0]=10
A[0][0][1]=20
A[0][1][0]=30
A[0][1][1]=40
A[1][0][0]=50
A[1][0][1]=60
A[1][1][0]=70
A[1][1][1]=80
```

Finally 3D-Array will be appear as follows



Declaration of Array: Like 2D – Array we must define ND-Array. The general syntax is

Syntax: data type array name [] [].....[] =new datatype [size] [size]..... [size]

Ex: `int b[][][] = new int[3][2][4]`

Declares ‘b’ is a integer array and it can store $3 \times 2 \times 4 = 24$ values.

Initialization of values: like 2D-Array, the ND – array is initialized as follows

Syntax: Data type arrayname[size1][size2]....[size3]={list of values}

Ex: `int b[2][2][1]={1,0,1,0};`

1. Write a C Program to accept 5 values and display that values using 1D array?

```
#include<stdio.h>
```

```
void main( )
```

```
{
```

```
    int a[5];
```

```
    a[0]=10;
```

```
    a[1]=20;
```

```
    a[2]=30;
```

```
    a[3]=40;
```

```
    a[4]=50;
```

```
    printf("%d",a[0]);
```

```
    printf("%d",a[1]);
```

```
    printf("%d",a[2]);
```

```
    printf("%d",a[3]);
```

```
    printf("%d",a[4]);
```

```
}
```

2. Write a C Program to accept 5 floating point values and display the values?

```
#include<stdio.h>
void main( )
{
    float a[5];
    a[0]=1.5;
    a[1]=2.5;
    a[2]=3.5;
    a[3]=4.5;
    a[4]=5.5;
    printf("%f",a[0]);
    printf("%f",a[1]);
    printf("%f",a[2]);
    printf("%f",a[3]);
    printf("%f",a[4]);
}
```

3. Write a C Program to accept 5 character values and display that values?

```
#include<stdio.h>
void main( )
{
    char a[5];
    a[0]='m';
    a[1]='n';
    a[2]='o';
    a[3]='p';
    a[4]='q';
    printf("%c",a[0]);
    printf("%c",a[1]);
    printf("%c",a[2]);
    printf("%c",a[3]);
    printf("%c",a[4]);
}
```

4. Write a C Program to accept five values and display that values using loop?

```
#include<stdio.h>
void main()
{
    int a[5],i;
    printf("enter values");
    for(i=0;i<=4;i++)
    {
        scanf("%d",&a[i]);
    }
    for(i=0;i<=4;i++)
    {
        printf("%d",a[i]);
    }
}
```

5. Write a C Program to accept 52 values and display that values using loops?

```
#include<stdio.h>
void main()
{
    int a[52],i;
    printf("enter values");
```

```

    for(i=0;i<=51;i++)
    {
        scanf("%d",&a[i]);
    }
    for(i=0;i<=51;i++)
    {
        printf("%d",a[i]);
    }
}

```

6. Write a C Program to accept five values by using two 1D array?

```

#include<stdio.h>
void main()
{
    int a[5],i;
    printf("enter values");
    for(i=0;i<=4;i++)
    {
        scanf("%d",&a[i]);
    }
    for(i=0;i<=4;i++)
    {
        printf("%d",a[i]);
    }
    int b[5],i;
    printf("enter values");
    for(i=0;i<=4;i++)
    {
        scanf("%d",&b[i]);
    }
    for(i=0;i<=4;i++)
    {
        printf("%d",b[i]);
    }
}

```

7. Write a C Program to accept 4 values and display that values using 2D array?

```

#include<stdio.h>
void main()
{
    int a[2][2],i,j;
    printf("enter values");
    for(i=0;i<=1;i++)
    {
        for(j=0;j<=1;j++)
        {
            scanf("%d",&a[i][j]);
        }
    }
    for(i=0;i<=1;i++)
    {
        for(j=1;j<=1;j++)
        {
            printf("%d",a[i][j]);
        }
    }
}

```

8. Write a C Program to accept 8 values and display.

```

#include<stdio.h>
void main()
{
    int a[4][2],i,j;

```

```

printf("enter values");
for(i=0;i<=3;i++)
{
    for( j=0;j<=1;j++)
    {
        scanf("%d",&a[i][j]);
    }
}
for(i=0;i<=3;i++)
{
    for(j=0;j<=1;j++)
    {
        printf("%d",a[i][j]);
    }
}
int b[4][2],i,j;
printf("enter values");
for(i=0;i<=3;i++)
{
    for(j=0;j<=1;j++)
    {
        scanf("%d",&a[i][j]);
    }
}
for(i=0;i<=3;i++)
{
    for(j=0;j<=1;j++)
    {
        printf("%d",a[i][j]);
    }
}
}

```

9. Write a C Program to find addition of 2 matrixes?

```

#include<stdio.h>
void main()
{
    int a[50][50],b[50][50],c[50][50],m,n,x,y,i,j;
    printf("enter no.of rows for matrix a");
    scanf("%d",&m);
    printf("enter no.of columns for matrix aa");
    scanf("%d",&n);
    for(i=0;i<=m;i++)
    {
        for(j=0;j<=n;j++)
        {
            scanf("%d",&a[i][j]);
        }
    }
    printf("enter no of rows for matrix b");
    scanf("%d",&x);
    printf("enter no. of columns for matrix b");
    scanf("%d",&y);
    for(i=0;i<=x;i++)
    {
        for(j=0;j<=y;j++)
        {
            scanf("%d",&b[i][j]);
        }
    }
    for(i=0;i<=m;i++)
    {
        for(j=0;j<=n;j++)
        {

```

```

        c[i][j]=a[i][j]+b[i][j];
    }
}
for(i=0;i<=m;i++)
{
    for(j=0;j<=n;j++)
    {
        printf("%d",c[i][j]);
    }
}
}

```

10. Write a C Program to find multiplication of two matrixs?

```

#include<stdio.h>
void main()
{
    int a[50][50],b[50][50],c[50][50],m,n,x,y,i,j,k;
    printf("enter no.of rows for matrix a");
    scanf("%d",&m);
    printf("enter no.of columns for matrix aa");
    scanf("%d",&n);
    for(i=0;i<=m;i++)
    {
        for(j=0;j<=n;j++)
        {
            scanf("%d",&a[i][j]);
        }
    }
    printf("enter no of rows for matrix b");
    scanf("%d",&x);
    printf("enter no. of columns for matrix b");
    scanf("%d",&y);
    for(i=0;i<=x;i++)
    {
        for(j=0;j<=y;j++)
        {
            scanf("%d",&b[i][j]);
        }
    }
    for(i=0;i<=m;i++)
    {
        for(j=0;j<=n;j++)
        {
            for(k=0;k<=n;k++)
            {
                c[i][j]=c[i][j]+a[i][j]*b[k][j];
            }
        }
    }
    for(i=0;i<=m;i++)
    {
        for(j=0;j<=n;j++)
        {
            printf("%d",c[i][j]);
        }
    }
}

```

11. Write a C Program to find subtraction of two matrixes?

```

#include<stdio.h>
void main()
{
    int a[50][50],b[50][50],c[50][50],m,n,x,y,i,j;
    printf("enter no.of rows for matrix a");

```

```

scanf("%d",&m);
printf("enter no.of columns for matrix aa");
scanf("%d",&n);
for(i=0;i<=m;i++)
{
    for(j=0;j<=n;j++)
    {
        scanf("%d",&a[i][j]);
    }
}
printf("enter no of rows for matrix b");
scanf("%d",&x);
printf("enter no. of columns for matrix b");
scanf("%d",&y);
for(i=0;i<=x;i++)
{
    for(j=0;j<=y;j++)
    {
        scanf("%d",&b[i][j]);
    }
}
for(i=0;i<=m;i++)
{
    for(j=0;j<=n;j++)
    {
        c[i][j]=a[i][j]-b[i][j];
    }
}
for(i=0;i<=m;i++)
{
    for(j=0;j<=n;j++)
    {
        printf("%d",c[i][j]);
    }
}
}

```

12. Write a C Program to print transpose of a square matrix?

```

#include<stdio.h>
void main()
{
    int a[50][50],x,y,i,j;
    printf("enter no.of rows for matrix a");
    scanf("%d",&x);
    printf("enter no.of columns for matrix a");
    scanf("%d",&y);
    for(i=0;i<=x;i++)
    {
        for(j=0;j<=y;j++)
        {
            scanf("%d",&a[i][j]);
        }
    }
    for(i=0;i<=y;i++)
    {
        for(j=0;j<=x;j++)
        {
            printf("%d",a[j][i]);
        }
    }
}

```

13. Write a C Program to trace of a square matrix?


```

#include<stdio.h>
void main()
{
    int a[50][50],x,y,i,j,sum;
    printf("enter no.of rows for matrix a");
    scanf("%d",&x);
    printf("enter no.of columns for matrix a");
    scanf("%d",&y);
    for(i=0;i<=x;i++)
    {
        for(j=0;j<=y;j++)
        {
            scanf("%d",&a[i][j]);
        }
    }
    for(i=0;i<=x;i++)
    {
        for(j=0;j<=y;j++)
        {
            if(i==j)
            {
                Sum=sum+a[i][j];
            }
        }
    }
    Printf("sum is %d",sum);
}

```

14. Write a C Program to sort n values ?

```

#include<stdio.h>
void main()
{
    int a[50],n,ch,i,j,t;
    printf("enter n values");
    scanf("%d",&n);
    for(i=0;i<=n;i++)
    {
        scanf("%d",&a[i]);
    }
    printf("1. ascending or 2. descending");
    printf("enter your choise");
    scanf("%d",&ch);
    switch(ch)
    {
        case 1:for(i=0;i<=n;i++)
        {
            for(j=1;j<=n;j++)
            {
                if(a[i]>a[j])
                {
                    t=a[i];
                    a[i]=a[j];
                    a[j]=t;
                }
            }
        }
        break;
        case2: for(i=0;i<=n;i++)
        {
            for(j=1;j<=n;j++)
            {
                if(a[i]<a[j])

```

```

        {
            t=a[i];
            a[i]=a[j];
            a[j]=t;
        }
    }
}
break;
default:printf("enter your option");
}
}

```

15. Write a C Program to find biggest of 2 numbers?

```

#include<stdio.h>
void main()
{
    int a,b;
    printf("enter a, b values");
    scanf("%d%d",&a,&b);
    if(a>b)
    {
        printf("a is big");
    }
    else
        printf("b is big");
}

```

16. Write a C Program to find biggest or 3 numbers using if statement?

```

#include<stdio.h>
void main()
{
    int a,b,c;
    printf("enter a, b,c values");
    scanf("%d%d%d",&a,&b,&c);
    if(a>b)&&(a>c)
    {
        printf("a is big");
    }
    elseif(b>c)
    {
        printf("b is big");
    }
    else
        printf("c is big");
}

```

17. Write a C Program to find the student details using if else statement?

```

#include<stdio.h>
void main()
{
    int m1,m2,m3,total,avg;
    printf("enter marks");
    scanf("%d%d%d",&m1,&m2,&m3);
    total=m1+m2+m3;
    avg=total/3;
    if(avg>60)
    {
        printf("first class");
    }
    else if(avg>50)
    {
        printf("second class");
    }
}

```

```
    }  
    else if(avg>35)  
    {  
        printf("pass");  
    }  
    else  
        printf("fail");  
}
```