Introduction:

- An array is a collection of items of same data type stored at contiguous memory locations.
- Array of character is a string.
- Each data item of an array is called an element.
- And each element is unique and located in separated memory location.
- Each of elements of an array share a variable but each element having different index no. known as subscript.

Any element in an array can be accessed using

1. **Name of the array**
2. **Position of the element in an array.**

There are 2 types of array

1. **Single dimensional array**
2. **Multi-dimensional array**

Declaration of 1-Dimensional arrays

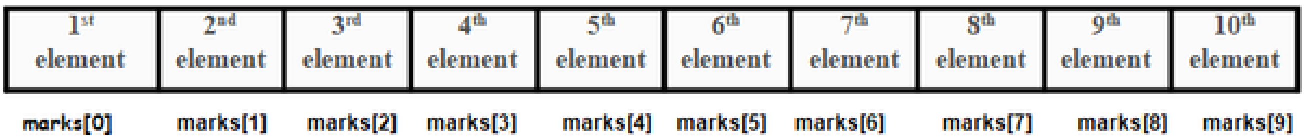
- Arrays are declared using following syntax:

data_type array_name[size];

where,type can be int, float or char. name is the name of the array.

size indicates number of elements in the array.

Example: int marks[10];



1st element	2nd element	3rd element	4th element	5th element	6th element	7th element	8th element	9th element	10th element
marks[0]	marks[1]	marks[2]	marks[3]	marks[4]	marks[5]	marks[6]	marks[7]	marks[8]	marks[9]

Calculating the address of Array

- Address of data element, **A[k] = BA(A) + w(k – lower_bound)**

Here,

A is the **array**

k is the **index of the element of which we have to calculate the address**

BA is the **base address of the array A.**

w is the **word size of one element in memory, for example, size of int is 2. Example 1:**

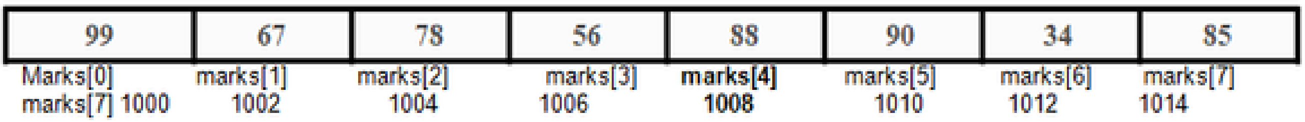
Given an array int marks[ ]={99,67,78,56,88,90,34,85}. Calculate the address of marks[4] if base address=1000.

Address(Marks[4])=1000+2(4-0)// size of int=2

=1000+2*4

=1000+8

=1008



99	67	78	56	88	90	34	85
Marks[0] marks[7] 1000	marks[1] 1002	marks[2] 1004	marks[3] 1006	**marks[4]** **1008**	marks[5] 1010	marks[6] 1012	marks[7] 1014

Example 2:

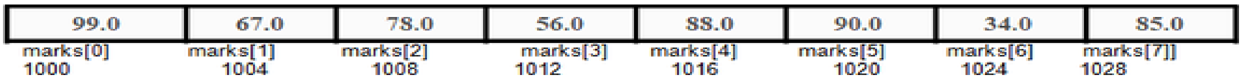
Given an array float avg[ ]={99.0,67.0,78.0,56.0,88.0,90.0,34.0,85.0}. Calculate the address of avg[4] if base address=1000.

Address(Avg[4])=1000+4(4-0)// size of float=4

=1000+4*4

=1000+16

=1016



Calculating the length of Array

Length of the array is given by:

Length= upper_bound - lower_bound+1

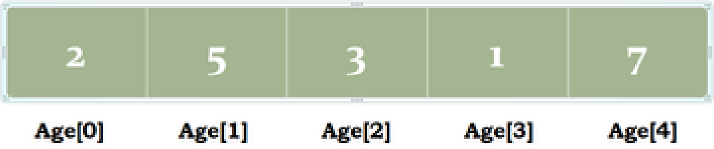
where

Upper_bound=index of the last element Lower_bound=index of the first element

Usually Lower_bound is zero but this is not a compulsion.

Example 1:

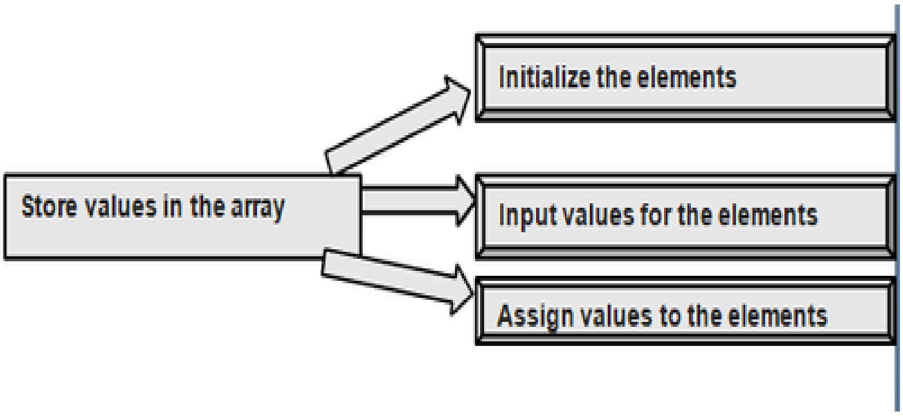
Let Age[5] be Age[0]=2, Age[1]=5, Age[2]=3, Age[3]=1, Age[4]=7.



Length=Upper_bound-Lower_bound+1

=4-0+1=5

Storing values in an Array

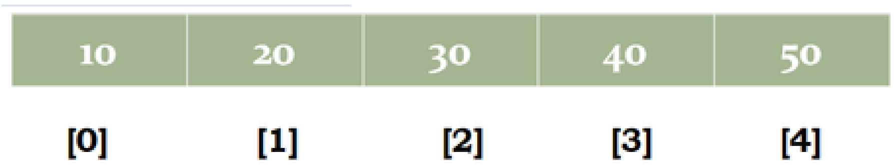

Store values in the array
Initialize the elements
Input values for the elements
Assign values to the elements

Initialization can be done using the following syntax:

type array_name[size]={list of values};

1. **Initializing all specified memory location:**

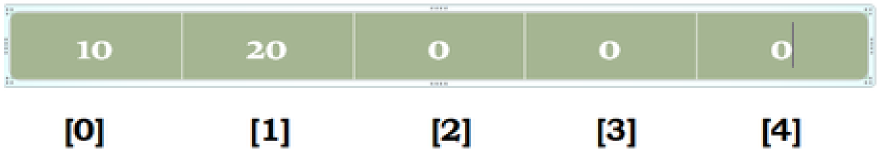
int a[5]={10,20,30,40,50}



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

1. **Partial array initialization**

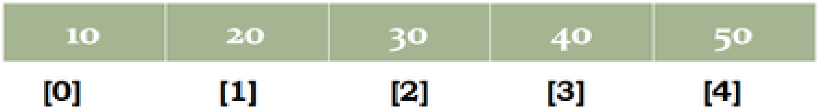
int a[5]={10,20}



10	20	0	0	0
[0]	[1]	[2]	[3]	[4]

1. **Array initialization without size:**

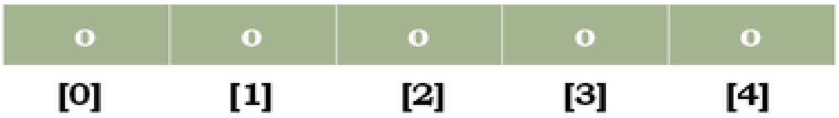
int a[ ]={10,20,30,40,50}



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

1. **Array initialization without elements**

int a[5]={0}



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

```
}
```

Inputting values from keyboard

```
int i, marks[10]; for(i=0;i<10;i++)

scanf(“%d”, &marks[i]);
```

Assigning values to Individual Elements int i, arr1[10], arr2[10]; arr1[i]={0,1,2,3,4,5,6,7,8,9};

```
for(i=0;i<10;i++)

arr2[i] = arr1[i];
```

WAP to read and write one dimensional array.

```
#include<stdio.h> void main()

{

int  i,a[5];

printf("Enter the elements: "); for(i=0;i<5;i++)

{

scanf("%d",&a[i]);

}

for(i=0;i<5;i++)

{

printf("Array  a[%d]=%d\n",i,a[i]);

}

}
```

Output:

```
Enter the elements: 1 2 3 4 5 Array a[0]=1
```

```
Array  a[1]=2


Array a[2]=3 Array a[3]=4 Array  a[4]=5
```

WAP to search an element in an array.

```
#include<stdio.h> void main()

{

int i,a[20],n,key;




printf("Enter the number of elements: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++)

{

scanf("%d",&a[i]);

}

printf("Enter the key element to be searched: "); scanf("%d",&key);

for(i=0;i<n;i++)

{

if(key==a[i])

printf("Element found at position %d\n",i+1);

}

}
```

Output:

```
Enter the number of elements: 5 Enter the elements:  1 2 3 4 5

Enter the key element to be searched: 5 Element found at position 5
```

WAP to print the position of smallest of numbers using array.

```
#include<stdio.h> void main()

{

int i,a[20],n,small,pos;

printf("Enter the number of elements: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++)

{

scanf("%d",&a[i]);

}

small=a[0]; pos=0; for(i=0;i<n;i++)

{

if(a[i]<small)

{

small=a[i]; pos=i;

}

}

printf("The smallest element is %d and the position is %d",small,pos+1);

}
```

Output:

```
Enter the number of elements: 5 Enter the elements:  2 3 4 5 6

The smallest element is 2 and the position is 1
```

Operations on array

1. **Traversing an array**
2. **Inserting an element in an array**
3. **Deleting an element from an array**
4. **Merging 2 arrays**
5. **Searching an element in an array**
6. **Sorting an array in ascending or descending order**
7. **Traversing an array**

   - Traversing an array means accessing each and every element of the array for a specific purpose.

Algorithm for Array Traversal:

```
Step 1: [Initialization] SET I=lower_bound
Step 2: Repeat steps 3 and 4 while I<=upper_bound
Step 3: Apply process to A[I]
Step 4: Set I=I+1;
Step 5: Exit
```

1. **Inserting an element in an array**
   - Inserting an element in an array means adding a new data element to an already existing array.

Algorithm to insert a new element to the end of the array:

```
Step 1: Set upper_bound= upper_bound+1//Increment the value of Upper bound
Step 2: Set A[upper_bound]= VAL(Value that has to be inserted]//New value is stored
Step 3: EXIT
```

Algorithm to insert a new element in middle of the array:

```
Step 1: Set I=N//N=Number of elements
Step 2: Repeat 3 and 4 while I>=POS//POS=position at which element has to be inserted
Step 3: Set A[I+1]=A[I]
Set A[I+1]=A[I]
Step 4: Set N=N+1
Step 5: Set A[POS]=VAL
Step 6: EXIT
```

WAP to insert a number at a given location in an array.

```
#include<stdio.h> void main()

{

int i,a[20],n,num,pos;

printf("Enter the number of elements: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++)

{

scanf("%d",&a[i]);

}

printf("Enter the number to be inserted: "); scanf("%d",&num);

printf("Enter the postion at which number has to be inserted: ");  scanf("%d",&pos);

for(i=n-1;i>=pos;i--)

a[i+1]=a[i]; a[pos]=num; n++;

printf("The array after insertion of %d is :",num);


for(i=0;i<n;i++) printf("\t%d",a[i]);

}
```

Output:

```
Enter the number of elements: 5 Enter  the  elements:  1  2  4  5  6 Enter the number to be inserted: 3

Enter the postion at which number has to be inserted: 2

The array after insertion of 3 is :123456
```

WAP to insert a number in an array that is already sorted in ascending order.

```
#include<stdio.h> void main()

{

int i,n,j,num,a[10];
printf("Enter the number of elements: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++)

{

scanf("%d",&a[i]);

}

printf("Enter the number to be inserted: "); scanf("%d",&num);

for(i=0;i<n;i++)

{

if(a[i]>num)

{

for(j=n-1;j>=i;j--)

a[j+1]=a[j]; a[i]=num; break;

}

}

n++;

}
```

Output:

```
printf("The array after insertion of %d is: ",num); for(i=0;i<n;i++)

printf("\t%d",a[i]);
```

```
Enter the number of elements: 5 Enter  the  elements:  1  2  3  4  5 Enter the number to be inserted: 0

The array after insertion of 0 is:012345
```

Deleting an element in an array

- Deleting an element from an array means removing a data element from an already existing array.

Algorithm to delete a new element to the end of the array:

```
Step 1: Set upper_bound= upper_bound-1 Step 2: EXIT
```

Algorithm to delete element from middle of the array:

```
Step 1: Set I=POS// POS=position at which element has to be deleted  Step 2: Repeat 3 and 4 while I<=N-1//N=Number of elements in the array Step 3: Set A[I] = A[I+1]

Step 4: Set I=I+1 Step 5: Set N=N-1 Step 6: EXIT
```

WAP to delete a number from a given location in an array.

```
#include<stdio.h> void main()

{


int i,a[20],n,pos;

printf("Enter the number of elements: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++)

{scanf("%d",&a[i]);}

printf("Enter the postion from which number has to be deleted: "); scanf("%d",&pos);

for(i=pos;i<n-1;i++) a[i]=a[i+1];

n--;

printf("The array after deletion is :");  for(i=0;i<n;i++)

printf("\nA[%d]=%d",i,a[i]);

}
```

Output:

```
Enter the number of elements: 5 Enter the elements:  1 2 3 4 5

Enter the postion from which number has to be deleted: 4  The array after deletion is :
```

```
A[0]=1

A[1]=2

A[2]=3

A[3]=4
```

WAP to delete a number from an array that is already sorted in ascending order

```
#include<stdio.h> void main()

{

int i,n,j,num,a[10];

printf("Enter the number of elements: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++)

{scanf("%d",&a[i]);}

printf("Enter the number to be deleted: "); scanf("%d",&num);

for(i=0;i<n;i++)

{

                                        if(a[i]==num)

                                              {

for(j=i;j<n-1;j++) a[j]=a[j+1];

}

}

printf("The array after deletion is"); for(i=0;i<n-1;i++)    printf("\t%d",a[i]);

}
```

Output:

```
Enter the number of elements: 5 Enter  the  elements:  1  2  3  4  5 Enter the number to be deleted: 3
```

```
The array after deletion is1245
```

Merging 2 arrays

-

- Merging of 2 arrays in a third array means first copying the contents of the first array into the third array and then copying the contents of second array into the third array.
- Hence, the merged array contains contents of the second array.

WAP to merge 2 unsorted arrays.

```
#include <stdio.h> void main()

{

int a1[10],a2[10],a3[10],i,n1,n2,m,index=0; printf("Enter the number of elements in array1:");
scanf("%d",&n1);

printf("Enter the elements in array1:"); for(i=0;i<n1;i++)

scanf("%d",&a1[i]);

printf("Enter the number of elements in array2:"); scanf("%d",&n2);

printf("Enter the elements in array2:"); for(i=0;i<n2;i++)

scanf("%d",&a2[i]);



m=n1+n2;

for(i=0;i<n1;i++)

{

a3[index]=a1[i]; index++;

}

for(i=0;i<n2;i++)

{

a3[index]=a2[i]; index++;
}
printf("\n\nThe merged array is\n"); for(i=0;i<m;i++)
printf("\t  Arr3[%d]=%d\n",i,a3[i]);
}
```

Output:

```
Enter the number of elements in array1:3 Enter the elements in array1:1 2 3

Enter the number of elements in array2:3

Enter the elements in array2:4 5 6

The merged array is

Arr3[0]=1 Arr3[1]=2 Arr3[2]=3



Arr3[3]=4 Arr3[4]=5 Arr3[5]=6
```

WAP to merge 2 sorted arrays.

```
#include <stdio.h> void main()
{
int a1[10],a2[10],a3[10],i,n1,n2,m,index=0,index_1=0,index_2=0;  printf("Enter the number of elements in array1:"); scanf("%d",&n1);
printf("Enter the elements in array1:"); for(i=0;i<n1;i++)
scanf("%d",&a1[i]);
printf("Enter the number of elements in array2:"); scanf("%d",&n2);
printf("Enter the elements in array2:"); for(i=0;i<n2;i++)
   scanf("%d",&a2[i]);       m=n1+n2;
while(index_1<n1&&index_2<n2)
{
```

```
if(a1[index_1]<a2[index_2])
{
a3[index]=a1[index_1];

index_1++;
}
else
{
a3[index]=a2[index_2]; index_2++;
}
index++;
}
if(index_1==n1)//if elements of the first array are over and the second array  has some elements
{
while(index_2<n2)
{
a3[index]=a2[index_2]; index_2++;
index++;
}
}
else if(index_2==n2) //if elements of the second array are over and the  first array has some elements
{
while(index_1<n1)
{
a3[index]=a1[index_1];
index_1++; index++;

}

}

printf("\n\nThe contenets of merged array are"); for(i=0;i<m;i++)

printf("\n Arr[%d] = %d",i,a3[i]);

}
```

Output:

```
Enter the number of elements in array1:3 Enter the elements in array1:4 5 6

Enter the number of elements in array2:3 Enter the elements in array2:1 2 3

The contenets of merged array are Arr[0] = 1

Arr[1] = 2

Arr[2] = 3

Arr[3] = 4

Arr[4] = 5

Arr[5] = 6
```

Searching for a value in an array

- Searching means to find whether a particular value is present in the array or not.
- If the value is present in the array then search is said to be successful and the search process gives the location of that array.

- If the value is not present, the search process displays the appropriate message.

Linear search: ALGORITHM Step1: [Initialization] Set pos=-1 Step2: [Initialization] Set I=0 Step3:

Repeat Step 4 while I<=N Step4: IF A[I]= val

SET POS=I PRINT POS

Go to Step 6 [END OF IF]

SET I=I+1

```
[END OF LOOP] Step5:  IF POS= -1,

PRINT “VALUE IS NOT PRESENT IN THE ARRAY” [END OF IF]

Step6:   EXIT
```

Program:

```
#include<stdio.h> void main()

{

int a[10],num,i,n,found=0,pos=-1;

printf("Enter the number of elements in an array: "); scanf("%d",&n);

printf("Enter the elements: ");


for(i=0;i<n;i++) scanf("%d",&a[i]);

printf("Enter the number that has to be searched: ");  scanf("%d",&num);

for(i=0;i<n;i++)

{

if(a[i]==num)

{

found=1; pos=i;

printf("\n%d is found in the array at position %d",num,i+1);  break;

}

}

if(found==0)

printf("Element not found in the array");

}
```

Output:

```
Enter the number of elements in an array: 5   Enter the elements:  50 9 6 7 1

Enter the number that has to be searched: 6 6 is found in the array at position 3
```

Binary Search:

```
#include<stdio.h>


void main()

{

int i,low,high,mid,n,key,a[20];

printf("Enter the number of elements in an array: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++) scanf("%d",&a[i]);

printf("Enter the value to find: "); scanf("%d",&key);

low=0; high=n-1;

while(low<=high)

{

mid=(low+high)/2; if(a[mid]==key)

{

printf("%d found at location %d",key,mid+1); break;

}

else if(a[mid]<key) low=mid+1;

else high=mid-1;


}

if(low>high)

printf("%d not found in the array",key);

}
```

Output:

```
Enter the number of elements in an array: 5   Enter the elements:  1 2 3 4 5

Enter the value to find: 3 3 found at location 3
```

WAP to sort n numbers in ascending order using bubble sort technique:

```
#include<stdio.h> void main()
{
int i,j,n,temp,a[20];
printf("Enter the number of elements in an array: "); scanf("%d",&n);
printf("Enter the elements: ");
for(i=0;i<n;i++)
scanf("%d",&a[i]); for(i=0;i<n-1;i++)
{
for(j=0;j<n-1-i;j++)
{
if(a[j]>a[j+1])

{
temp=a[j]; a[j]=a[j+1]; a[j+1]=temp;
}
}
}
printf("Array after implementing bubble sort:"); for(i=0;i<n;i++)
printf("%d\t",a[i]);
}
```

Output:

```
Enter the number of elements in an array: 5   Enter the elements:  60 9 8 5 100

Array after implementing bubble sort:58960100
```

WAP to sort n numbers in decending order using bubble sort technique:

```
#include<stdio.h>

void main()

{

int i,j,n,temp,a[20];

printf("Enter the number of elements in an array: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++)



scanf("%d",&a[i]); for(i=0;i<n-1;i++)

{

for(j=0;j<n-1-i;j++)

{



                              if(a[j]<a[j+1])

                                  {







                                  }

                                  }
}

temp=a[j]; a[j]=a[j+1]; a[j+1]=temp;

printf("Array after implememting bubble sort:"); for(i=0;i<n;i++)

printf("%d\t",a[i]);

}
```

Output:

```
Enter the number of elements in an array: 5  Enter the elements: 90 7 6 100 99

Array after implememting bubble sort:100999076
```

2-Dimensional Array

Arrays with 2 dimensions are called 2 –Dimensional array or 2-D array.

Declaration of 2-D array:

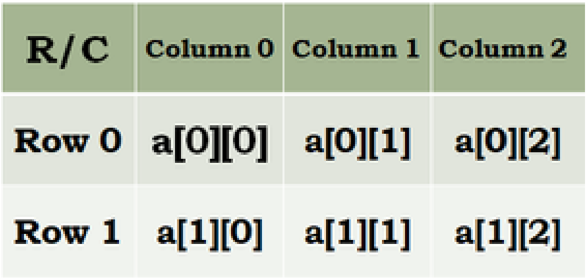
data_type array_name[row_size][column_size];

data_type can be any primitive data type. array_name is a variable name

row_size is the maximum number of rows in the array. column_size is the maximum number of column in the array. Example: int a[2][3];

This can be read as

```
}
```



R/C	Column 0	Column 1	Column 2
Row 0	a[0][0]	a[0][1]	a[0][2]
Row 1	a[1][0]	a[1][1]	a[1][2]

Initialization of 2-D array:

1. **Initialize with total number of elements:**

```
int a[2][3]={1,2,3,4,5,6}
```

1. **Initialize with sets**

```
int  a[2][3]={{1,2,3},{4,5,6}}
```

1. **Partial initialization**

```
int  a[2][3]={{1,1},{2}}
```

1. **Initialize without size**

```
int a[ ][3]={{1,2,3},{4,5,6}}
```

Initialization of 2-D array:

```
for(i=0;i<row;i++)

{

for(j=0;j<column;j++)


{

scanf("%d",&a[i][j]);

}

}
```

WAP to read and display elements from 2-D array.

```
#include<stdio.h> void main()
```

```
{

int a[20][20],m,n,i,j;

printf("Enter the number of rows and columns: "); scanf("%d,%d",&m,&n);

printf("Enter the elements of the array:"); for(i=0;i<m;i++)

{

for(j=0;j<n;j++)

{

                                                  scanf("%d",&a[i][j]);

}

}

printf("The array elements are:\n"); for(i=0;i<m;i++)

{

for(j=0;j<n;j++)

{


printf("%d\t",a[i][j]);

}

printf("\n");

}

}
```

Output:

```
Enter the number of rows and columns: 3,3 Enter the elements of the array:1 2 3 4 5  6 7 8 9  The array
elements are:
```

1	2	3
4	5	6
7	8	9

WAP to generate Pascal's triangle.

```
#include<stdio.h> void main()

{

int  a[5][5]={0},row=2,col,i,j;

a[0][0]=a[1][0]=a[1][1]=1;

while(row<5)

{

a[row][0]=1; for(col=1;col<=row;col++)

a[row][col]=a[row-1][col-1]+a[row-1][col];   row++;



}

for(i=0;i<5;i++)

{
                                                                                          }

}
```

Output:

```
1

11

printf("\n"); for(j=0;j<=i;j++) printf("%d\t",a[i][j]);



121

1331

14641
```

Operations on 2-Dimensional Array

1. Transpose
2. Sum
3. Difference
4. Product

WAP to transpose 3 X 3 matrix.

```
#include<stdio.h> void main()

{

int a[20][20],m,n,i,j,b[20][20];



printf("Enter the number of rows and columns: "); scanf("%d,%d",&m,&n);

printf("Enter the elements of the array:"); for(i=0;i<m;i++)

{

for(j=0;j<n;j++)

{

                                   scanf("%d",&a[i][j]);

}
```

```
}

printf("The array elements are:\n"); for(i=0;i<m;i++)

{

for(j=0;j<n;j++)

{

                                                                                                  }

printf("\n");

                                                  }

printf("%d\t",a[i][j]);

for(i=0;i<m;i++)

                                                  {

for(j=0;j<n;j++)

{

                                              b[i][j]=a[j][i];
}

}

printf("The elemnts of transposed matrix are:\n"); for(i=0;i<m;i++)

{

for(j=0;j<n;j++)

                                                    {

}
```

Output:

```
                                                    }

printf("\n");

}

printf("%d\t",b[i][j]);
```

Enter the number of rows and columns: 3,3 Enter the elements of the array:1 2 3 4 5 6 7 8 9 The array elements are:

1	2	3
4	5	6
7	8	9

The elemnts of transposed matrix are:

1	4	7
2	5	8
3	6	9

WAP to input 2 m x n matrices and then calculate the sum of their corresponding elements and store it in third m x n matrix.

```
#include<stdio.h> void main()

{

int a[20][20],b[20][20],c[20][20],m,n,p,q,r,t,i,j;

printf("Enter the number of rows and columns in first matrix: ");  scanf("%d,%d",&m,&n);

printf("Enter the number of rows and columns in second matrix: ");   scanf("%d,%d",&p,&q);

if(m!=p||n!=q)
```

```
{
printf("Number of rows and columns of both the matrix should be
equal");
}
r=m; t=n;
printf("Enter the elements of the array 1:");
for(i=0;i<m;i++)
{
for(j=0;j<n;j++)
{
                                        scanf("%d",&a[i][j]);
}
}

printf("Enter the elements of the array 2:"); for(i=0;i<p;i++)
{
for(j=0;j<q;j++)
{
                                        scanf("%d",&b[i][j]);
}
}
for(i=0;i<r;i++)
{
for(j=0;j<t;j++)
{
```

```
                                        c[i][j]=a[i][j]+b[i][j];

}

}

printf("The elements of the resultant matrix are:\n"); for(i=0;i<r;i++)

{

for(j=0;j<t;j++)

{

                                        printf("%d\t",c[i][j]);

}

printf("\n");

}


}
```

Output:

```
Enter the number of rows and columns in first matrix: 2,2 Enter the number of rows and columns
in second matrix: 2,2 Enter the elements of the array 1:2 2 2 2

Enter the elements of the array 2:2 2 2 2 The elements of the resultant matrix are:

44



44
```

WAP to input 2 m x n matrices and then calculate the product of their corresponding elements and store it in third m x n matrix.

```
#include<stdio.h> void main()

{

int a[20][20],b[20][20],c[20][20],m,n,p,q,k,i,j;
```

```
printf("Enter the number of rows and columns in first matrix: ");  scanf("%d,%d",&m,&n);

printf("Enter the number of rows and columns in second matrix: ");   scanf("%d,%d",&p,&q);

if(n!=p)

{

printf("Matrix multiplication is not possible");

}

printf("Enter the elements of the array 1:"); for(i=0;i<m;i++)



{

for(j=0;j<n;j++)

{

                                                  scanf("%d",&a[i][j]);

}

}

printf("Enter the elements of the array 2:"); for(i=0;i<p;i++)

{

for(j=0;j<q;j++)

{

                                                  scanf("%d",&b[i][j]);

}

}

for(i=0;i<m;i++)

{

for(j=0;j<q;j++)

{
```

```
c[i][j]=0; for(k=0;k<n;k++)

c[i][j]=a[i][k]*b[k][j]+c[i][j];

}

}

printf("The elements of the resultant matrix are:\n");


for(i=0;i<m;i++)

{

for(j=0;j<q;j++)

{









                                                                                                   }

}
```

Output:

```
}

printf("\n");

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

```
Enter the number of rows and columns in first matrix: 2,2 Enter the number of rows and columns in second matrix: 2,2 Enter the elements of the array 1:2 2 2 2

Enter the elements of the array 2:2 2 2 2  The elements of the resultant matrix are:

88

88
```

Using arrays with functions

- Putting individual elements of the array
- Passing the whole array

Passing individual elements of the array

```
#include<stdio.h> void square(int x);



void main()

{

int n,a[10],i;

printf("Enter the number of elements: "); scanf("%d",&n);

printf("Enter the elements: "); for(i=0;i<n;i++) scanf("%d",&a[i]);

printf("The square of given elements are: ");   for(i=0;i<n;i++)

square(a[i]);

}

void square(int x)

{

printf("%d\t",x*x); return;

}
```

Output:

```
Enter the number of elements: 5 Enter the elements:  1 2 3 4 5

The square of given elements are: 1   491625
```

Passing whole array

```
#include<stdio.h> void avg(int a[]);



void main()

{

int b[6]={1,2,3,4,5,6};

avg(b);

}

void avg(int a[])

{

int i,Average,sum=0; for(i=0;i<6;i++)

{

sum=sum+a[i];

}

Average=sum/6; printf("Average=%d",Average);

}
```

Output:

```
Average=3
```

Multi-Dimensional array

- A Multi-Dimensional array is an array of arrays.
- Like we have 1 index in 1-D array, 2 index in 2-D array, we have n index in n-dimensional array.

WAP to read and display 2 x 2 x 2 array.

```
#include<stdio.h> void main()

{
}
int a[2][2][2],i,j,k;
printf("Enter the elements of the matrix: "); for(i=0;i<2;i++)
{
for(j=0;j<2;j++)
{
for(k=0;k<2;k++
{
scanf("%d",&a[i][j][k]);
}
}
}
printf("The matrix is: \n"); for(i=0;i<2;i++)
{
for(j=0;j<2;j++)
{
for(k=0;k<2;k++)
{
printf("a[%d][%d][%d]=%d\t",i,j,k,a[i][j][k]);
}
printf("\n");
}
}

}
```

Output:

```
Enter the elements of the matrix: 1 2 3 4 5 6 7 8 9 The matrix is:

a[0][0][0]=1a[0][0][1]=2

a[0][1][0]=3a[0][1][1]=4

a[1][0][0]=5a[1][0][1]=6

a[1][1][0]=7a[1][1][1]=8
```

Applications of array

- **Storing and accessing data:** Arrays are used to store and retrieve data in a specific order. For example, an array can be used to store the scores of a group of students, or the temperatures recorded by a weather station.
- **Sorting:** Arrays can be used to sort data in ascending or descending order. Sorting algorithms such as bubble sort, merge sort, and quick sort rely heavily on arrays.
- **Searching:** Arrays can be searched for specific elements using algorithms such as linear search and binary search.
- **Matrices:** Arrays are used to represent matrices in mathematical computations such as matrix multiplication, linear algebra, and image processing.
- **Stacks and queues:** Arrays are used as the underlying data structure for implementing stacks and queues, which are commonly used in algorithms and data structures.
- **Graphs:** Arrays can be used to represent graphs in computer science. Each element in the array represents a node in the graph, and the relationships between the nodes are represented by the values stored in the array.

*****End*****

Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, two dimensional arrays, operations on two-dimensional arrays, twodimensional arrays to functions, multidimensional arrays, applications of arrays.