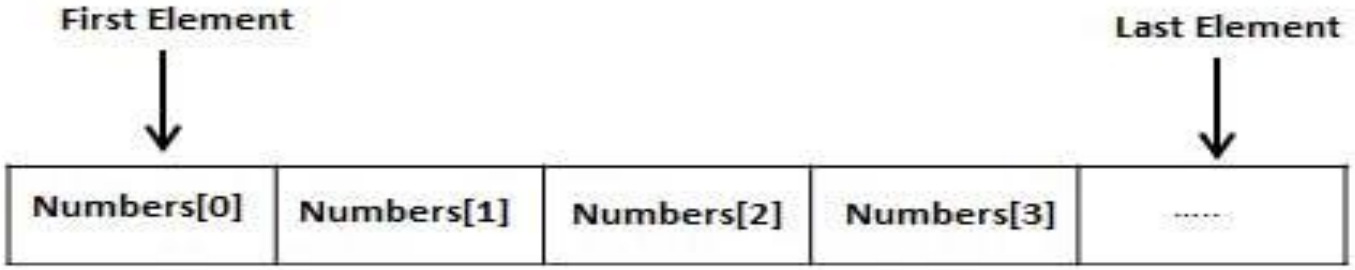
ARRAYS

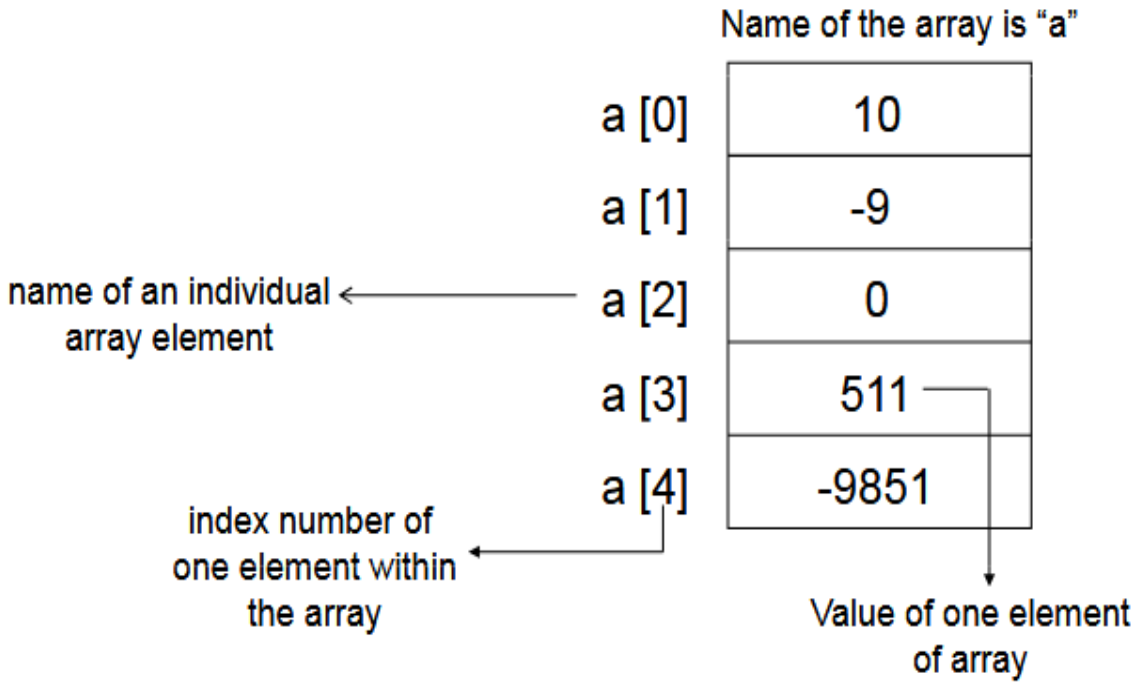
Arrays

- An array is a data structure.
- The data structure in which data elements occupy the adjacent memory locations
- Data structure in which the data elements form a sequential list
- An array is a sequential set of homogenous data that can be referred to collectively by a single name.



Arrays in C++

- Here, the name of the array is “a” and it has 5 elements, all of type “integer”.



Advantages of arrays

- Memory is not wasted because data elements are adjacently located
- It's a very simple data structure
- It is used as a tool for sorting process
- If we know the base address then we can easily locate its data
- The big advantage of array is that by using array we can get ride of declaring a lot of variables

Disadvantages of arrays

- Insertion and deletion in the middle are very complex as compared to stake and queue data structures
- It can represent only one type of data.

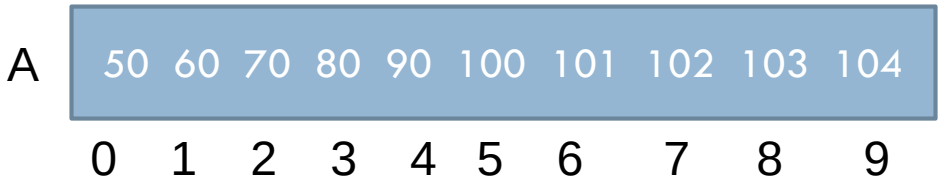
Types of Arrays

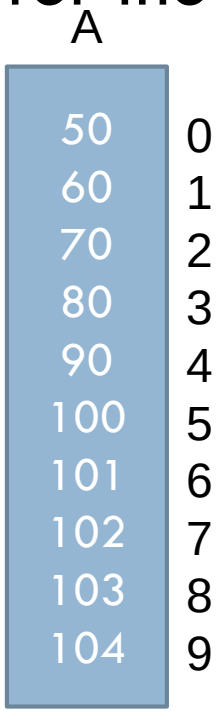
- There are two types of function

1. One-Dimensional Arrays
2. Two-Dimensional Arrays

1. One-Dimensional Arrays

- One-Dimensional Arrays consists of one column and more than one rows or one row and more than one columns
- We can use only a single subscript to refer the data elements.





Declaring One-Dimensional Arrays

- By declaring the arrays or variable means creating it in the memory of computer.
- Each programming language has its own rules for declaring arrays but the following three types of information are necessary while declaring arrays.
- Data types of arrays
- Name of the arrays
- Index set of the arrays

Syntax:

- Data type Array_Name[Size_of_Array]

Examples

```
int Array1[10];
char City[20];
float average[5];
```

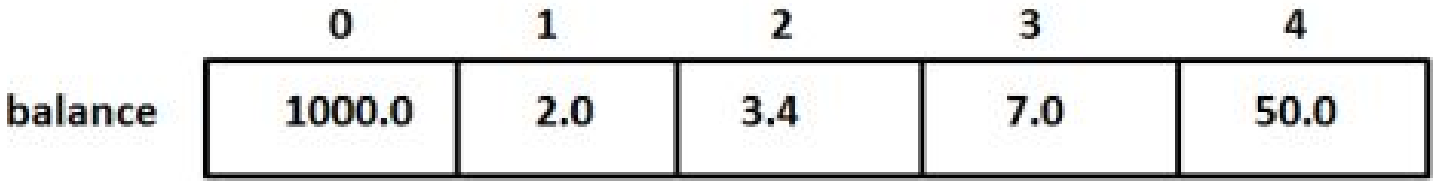
Initializing Arrays

- double balance[5] = {1000.0, 2.0, 3.4, 7.0, 50.0};

- The number of values between braces { } cannot be larger than the number of elements that we declare for the array between square brackets [ ].
- If you omit the size of the array, an array just big enough to hold the initialization is created. Therefore, if you write −
- double balance[] = {1000.0, 2.0, 3.4, 7.0, 50.0};

Initializing Arrays

- balance[4] = 50.0;



Arrays in C++

- 3rd element of array is different from array element 3.
- 3rd element of array has an index value of 2, but array element 3 has an index value of 3.
- Array index values always start from a zero.
- Array size can not be negative. This statement will produce a compile time error.
- int a[-2] //Error: size of array `a' is negative ;

A Program to declare an integer array and accessing it through its subscript/index.

```
#include <iostream>
using namespace std;
int main()
{
        int A[10]={4,8,9,6,5,3,5,1,200,3};
        cout<<A[5]<<endl;
        cout<<A[6]<<endl;
        return 0;
}
        Ouput:
        3
        5
```

A Program to declare an integer array and accessing it through its subscript.

```
#include <iostream>
using namespace std;
int main()
{
        char NAME[5]={'I','m','r','a','n'};
        for(int a=0;a<=4;a++)
        cout<<NAME[a];
        cout<<sizeof(NAME);
        return 0;
}
        Ouput:
        Imran
            5
```

- **A Program that uses for loop to display the values of an array B.**

```
#include <iostream>
using namespace std;
int main()
{
        float B[5];
        B[0]=600;
        B[1]=70.2356;
        B[2]=63524.1236985;
        B[3]=4512.2563;
        B[4]=40000;
        cout<<" The value at subscipt 4 is "<<B[4]<<endl;
        cout<< "All values are ";
                for(int k=0;k<=4;k++)
                cout<<" "<<B[k];
        return 0;
}
```

- **A Program that reads ten numbers and then displays these on the screen.**

```
#include <iostream>
using namespace std;
int main()
{
        int k,Numbers[10];
        cout<<"Enter your ten numbers ";
        for( k=0;k<=9;k++)
        cin>>Numbers[k];
        cout<<" You entered ";
        for(k=0;k<=9;k++)
        cout<<Numbers[k]<<"  ";
        return 0;
}
```

- **A Program that uses for loop to display the values of an array B.**

```
#include <iostream>
using namespace std;
int main()
{
        int NUM[15],c,Max,Min;
         cout<<"Enter any 15 values:";
       for(c=0;c<=14;c++)
       cin>>NUM[c];
        Max=NUM[0];
        Min=NUM[0];
         for(c=0;c<=14;c++)
       {
                if( NUM[c]>Max)
                 Max=NUM[c];
                if(NUM[c]<Min)
                  Min=NUM[c];
         }
       cout<<" Maximium ="<<Max<<endl;
       cout<<" Minimium ="<<Min<<endl;
         return 0;
}
```

- # A Program that searches a value in array

```
#include <iostream>
using namespace std;
int main()
{
  int NUM[8],c,value,flag;
 flag=0;
 cout<<"Enter any 8 values:";
  for(c=0;c<8;c++)
  cin>>NUM[c];
cout<<" Enter a value to search:";
cin>>value;
for(c=0;c<=7;c++)
{
                if( NUM[c]==value)
                                flag=1;
}
if(flag==1)
                cout<<" Value Found"<<endl;
else
                cout<<" Value Not Found "<<endl;
return 0;
}
```

- # A Program that Performs the bubble sort for names

```
#include <iostream>
using namespace std;
int main()
{           char NAME8],i,j,Temp;
             cout<<"Enter any 8 values:";
            for(i=0;i<8;i++)
              cin>>NUM[i];
            for(i=0;i<=7;i++)
             for(j=0;j<=6;j++)
                 if( NUM[j]>NUM[j+1])
                           {
                            Temp=NUM[j];
                           NUM[j]=NUM[j+1];
                           NUM[j+1]=Temp;
                           }
            cout<<" Sorted values:";
            for(i=0;i<8;i++)
            cout<<NUM[i];
             return 0;
}
```

Example

```
#include <iostream>
using namespace std;
int main()
{

int NUM[8]={1,2,3,4,5,6,7,8},i,sum;
   int total;
 total=0;
 for(i=0;i<8;i++)
sum=sum+NUM[i];
 cout<<" Sum of arrays elements:"<<total;
   return 0;
   }
```

1. Two-Dimensional Arrays

- One-Dimensional Arrays are also called matrix in mathematics ,vectors in physics and tables in business applications.
- It stores values in the rows and columns.
- We use two subscripts to refer the data elements.

	0	1	2	3
0	784	88	89	562
1	663	256	245	250
2	63	241	22	100

int A[3][4]

Declaring Two-Dimensional Arrays

- By declaring the arrays or variable means creating it in the memory of computer.
- Each programming language has its own rules for declaring arrays but the following three types of information are necessary while declaring arrays.
- Data types of arrays
- Name of the arrays
- Index set of the Rows and column of arrays

Syntax:

Datatype Array_Name[No,of Rows][No,of Columns]

Examples

```
int Array1[5][10];        // a table of 5 rows and 10
   columns
char City[5][20];         // 5 cities each name of 20
   alphabet
```