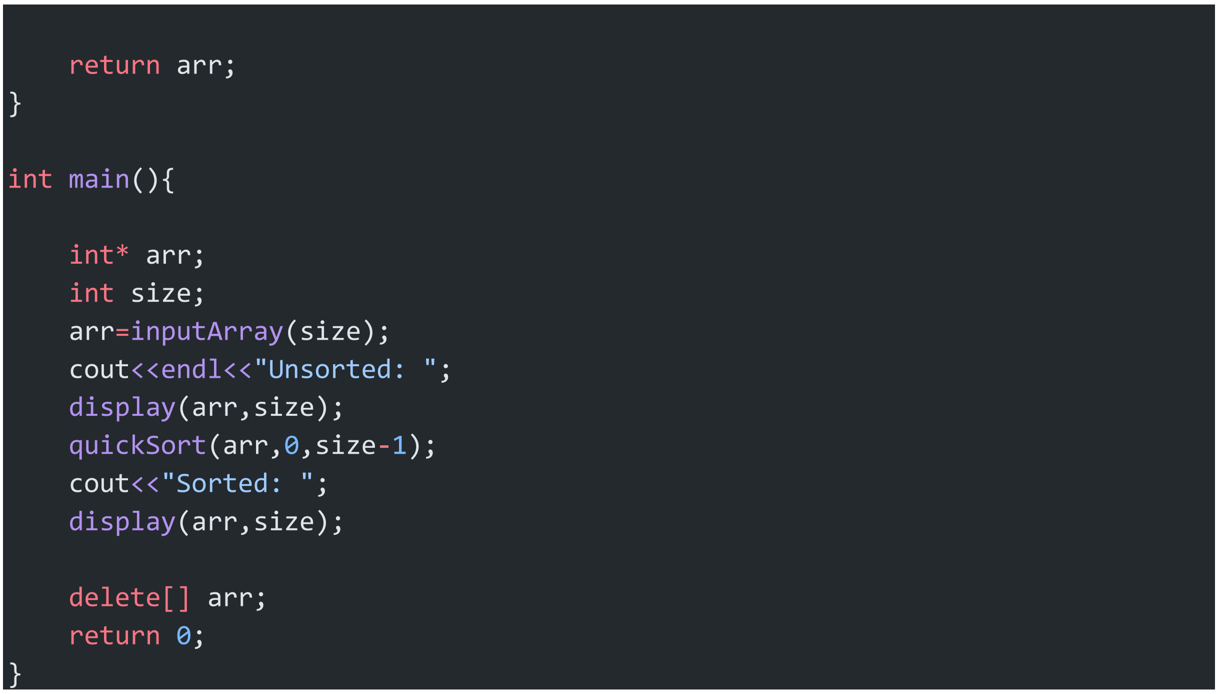
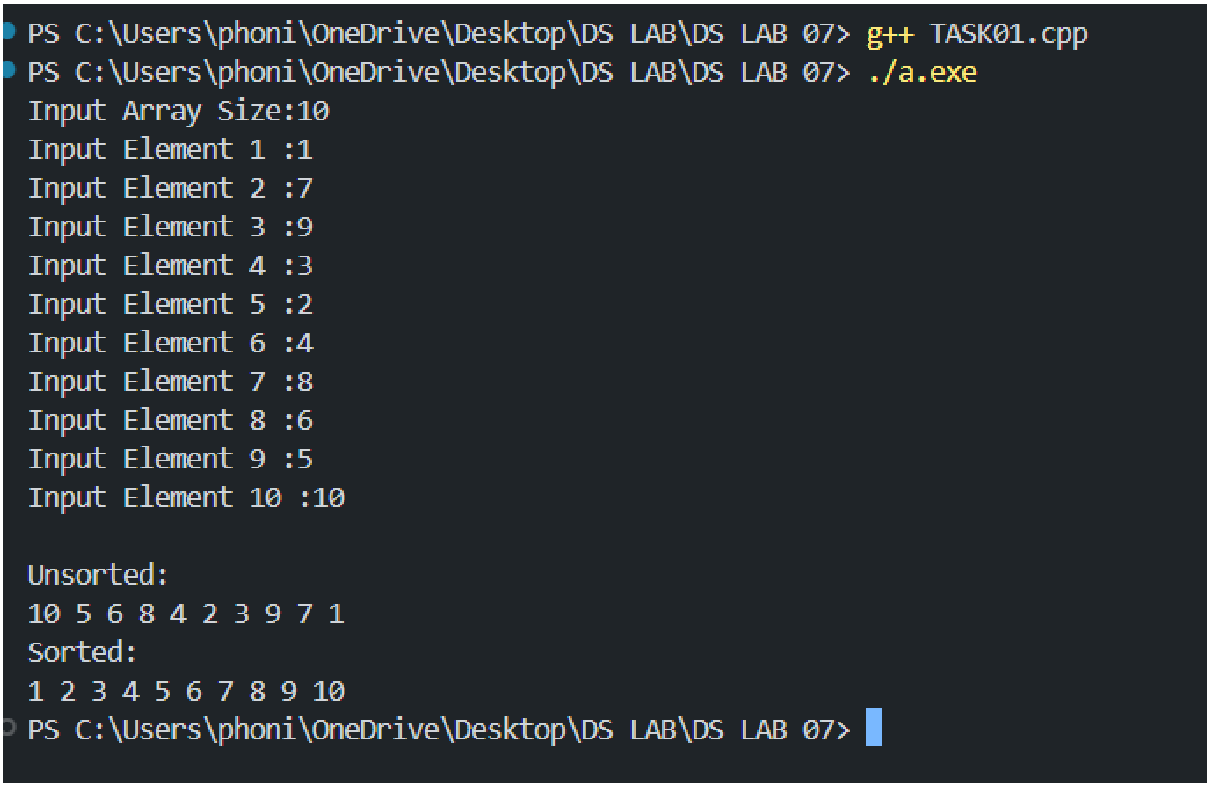
LAB 07

TASK 01

```
#include <iostream>
#include <climits>

using namespace std;

void swap(int &a, int &b){
    int tmp=a;
    a=b;
    b=tmp;
}

int partition(int* arr, int low, int high){
    int mid=(low+high)/2;
    swap(arr[mid],arr[high]);
    int pivot=arr[high];
    int index=low-1;
    for (int i=low; i<high; i++) if (arr[i]<=pivot) swap(arr[++index],
arr[i]);
    swap(arr[++index], arr[high]);
    return index;
}

void quickSort(int* arr, int low, int high){
    if(low>=high) return;
    int pi=partition(arr, low, high);

    quickSort(arr, low, pi-1);
    quickSort(arr, pi+1, high);
}

void display(int* arr,int size){
    cout<<endl;
    for (int i=0; i<size; i++) cout<<arr[i]<<" ";
    cout<<endl;
}

int* inputArray(int& size){
    cout<<"Input Array Size:";
    cin>>size;

    int* arr=new int[size];
    for(int i=0 ; i<size ; i++){
        cout<<"Input Element "<<i+1<<" :";
        cin>>arr[size-i-1];
    }
```

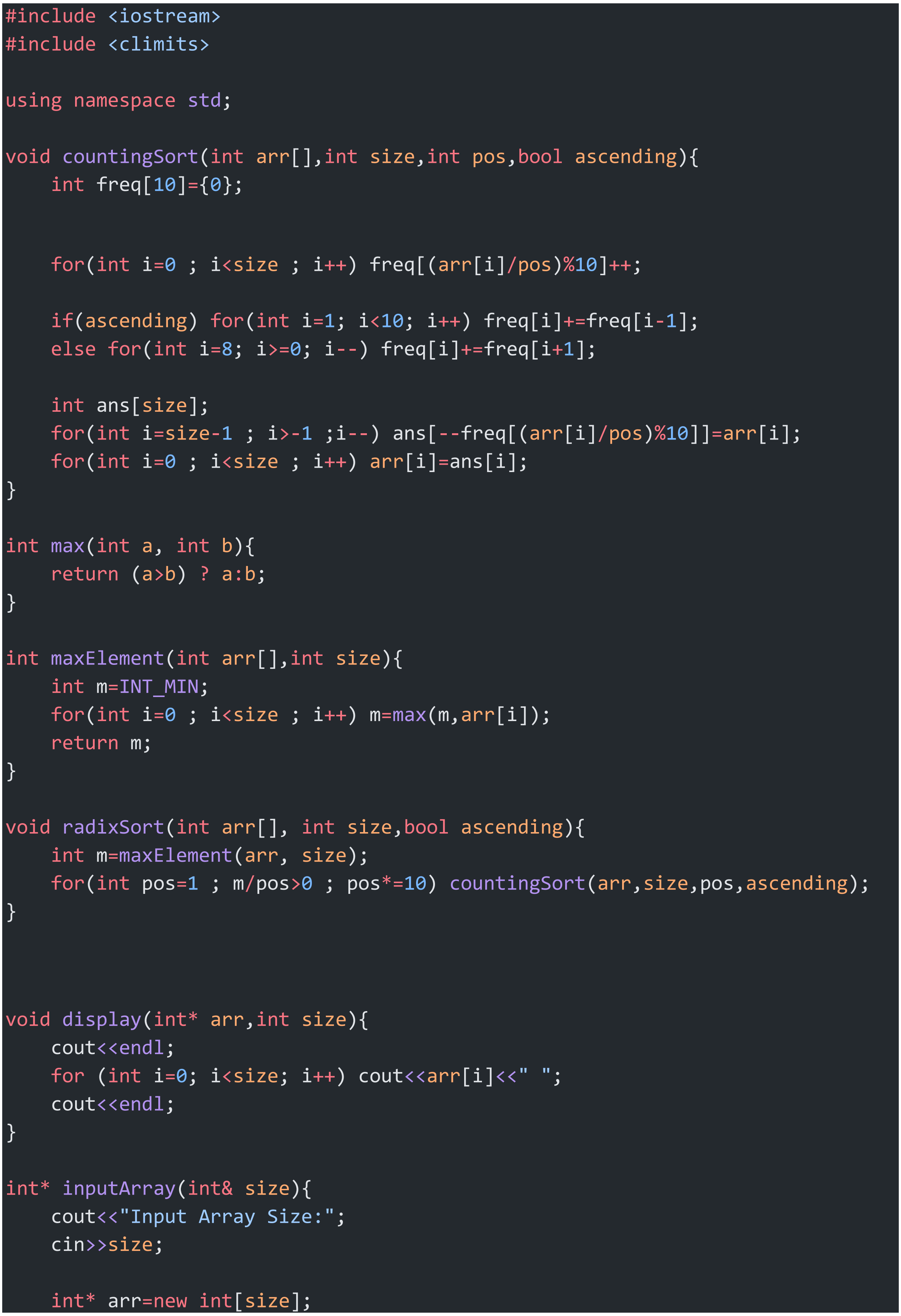


```cpp
    return arr;
}

int main(){

    int* arr;
    int size;
    arr=inputArray(size);
    cout<<endl<<"Unsorted: ";
    display(arr,size);
    quickSort(arr,0,size-1);
    cout<<"Sorted: ";
    display(arr,size);

    delete[] arr;
    return 0;
}
```

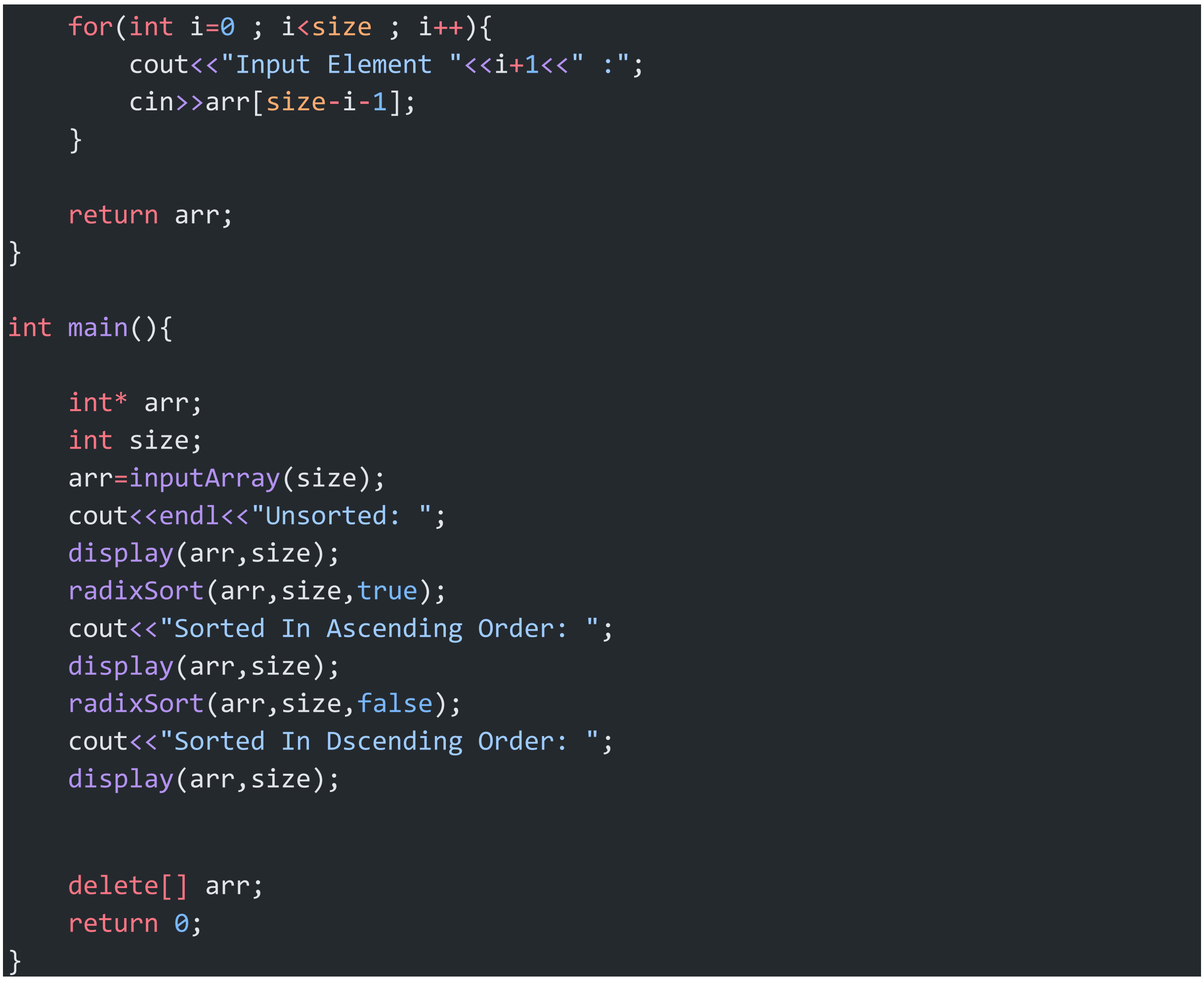


```
PS C:\Users\phoni\OneDrive\Desktop\DS LAB\DS LAB 07> g++ TASK01.cpp
PS C:\Users\phoni\OneDrive\Desktop\DS LAB\DS LAB 07> ./a.exe
Input Array Size:10
Input Element 1 :1
Input Element 2 :7
Input Element 3 :9
Input Element 4 :3
Input Element 5 :2
Input Element 6 :4
Input Element 7 :8
Input Element 8 :6
Input Element 9 :5
Input Element 10 :10

Unsorted:
10 5 6 8 4 2 3 9 7 1
Sorted:
1 2 3 4 5 6 7 8 9 10
PS C:\Users\phoni\OneDrive\Desktop\DS LAB\DS LAB 07>
```

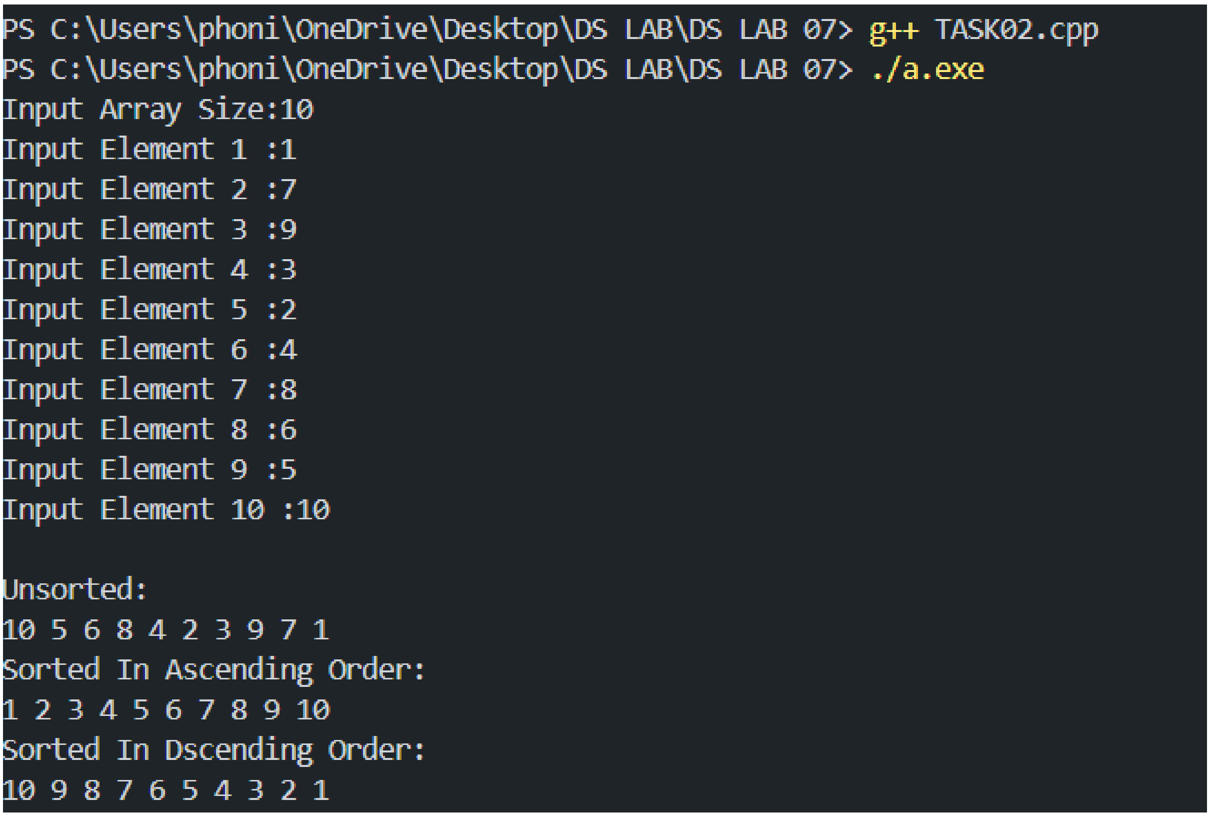
TASK 02



```
#include <iostream>
#include <climits>

using namespace std;

void countingSort(int arr[],int size,int pos,bool ascending){
    int freq[10]={0};


    for(int i=0 ; i<size ; i++) freq[(arr[i]/pos)%10]++;

    if(ascending) for(int i=1; i<10; i++) freq[i]+=freq[i-1];
    else for(int i=8; i>=0; i--) freq[i]+=freq[i+1];

    int ans[size];
    for(int i=size-1 ; i>-1 ;i--) ans[--freq[(arr[i]/pos)%10]]=arr[i];
    for(int i=0 ; i<size ; i++) arr[i]=ans[i];
}

int max(int a, int b){
    return (a>b) ? a:b;
}

int maxElement(int arr[],int size){
    int m=INT_MIN;
    for(int i=0 ; i<size ; i++) m=max(m,arr[i]);
    return m;
}

void radixSort(int arr[], int size,bool ascending){
    int m=maxElement(arr, size);
    for(int pos=1 ; m/pos>0 ; pos*=10) countingSort(arr,size,pos,ascending);
}



void display(int* arr,int size){
    cout<<endl;
    for (int i=0; i<size; i++) cout<<arr[i]<<" ";
    cout<<endl;
}

int* inputArray(int& size){
    cout<<"Input Array Size:";
    cin>>size;

    int* arr=new int[size];
```

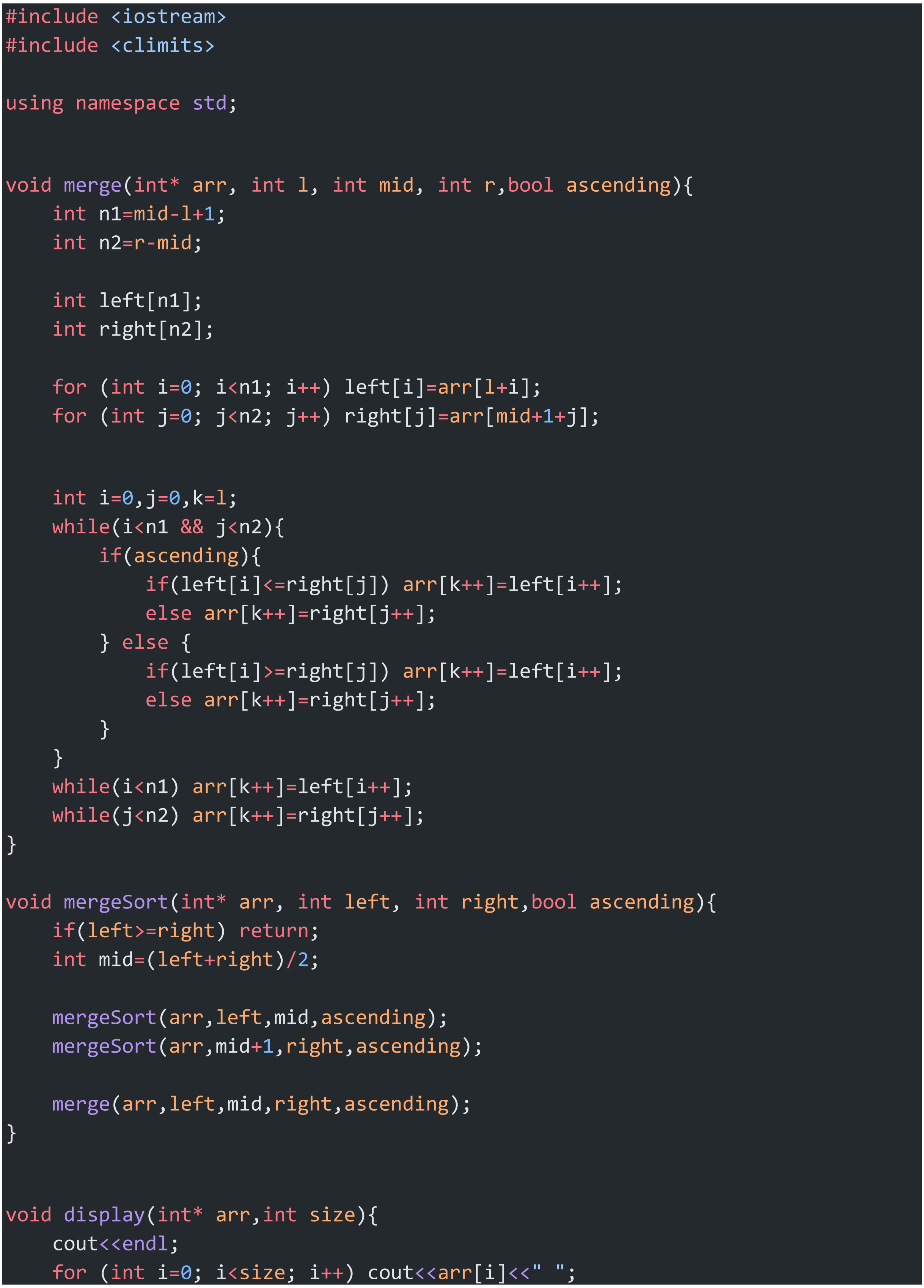


```
    for(int i=0 ; i<size ; i++){
        cout<<"Input Element "<<i+1<<" :";
        cin>>arr[size-i-1];
    }

    return arr;
}

int main(){

    int* arr;
    int size;
    arr=inputArray(size);
    cout<<endl<<"Unsorted: ";
    display(arr,size);
    radixSort(arr,size,true);
    cout<<"Sorted In Ascending Order: ";
    display(arr,size);
    radixSort(arr,size,false);
    cout<<"Sorted In Dscending Order: ";
    display(arr,size);


    delete[] arr;
    return 0;
}
```

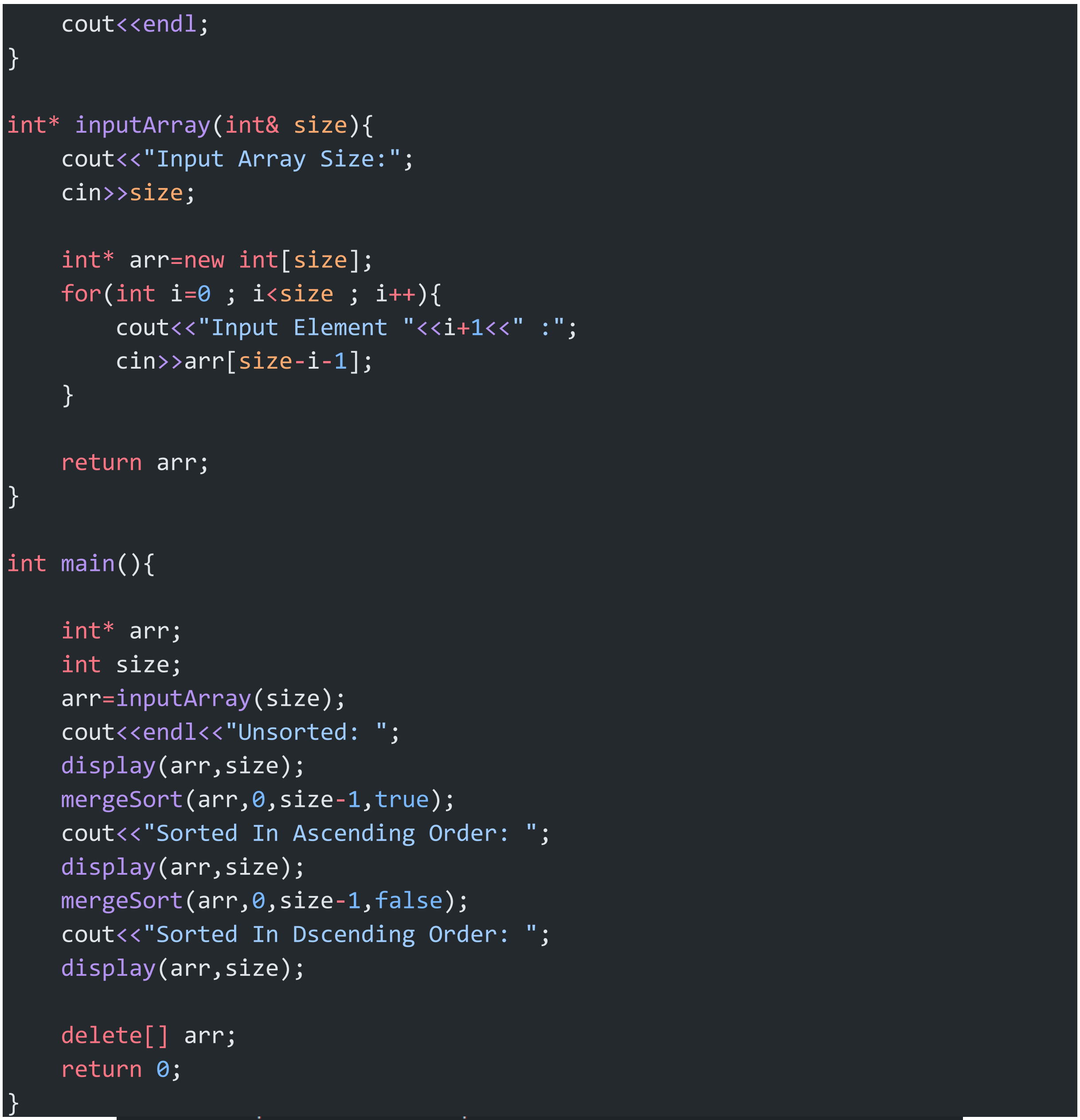


```
PS C:\Users\phoni\OneDrive\Desktop\DS LAB\DS LAB 07> g++ TASK02.cpp
PS C:\Users\phoni\OneDrive\Desktop\DS LAB\DS LAB 07> ./a.exe
Input Array Size:10
Input Element 1 :1
Input Element 2 :7
Input Element 3 :9
Input Element 4 :3
Input Element 5 :2
Input Element 6 :4
Input Element 7 :8
Input Element 8 :6
Input Element 9 :5
Input Element 10 :10

Unsorted:
10 5 6 8 4 2 3 9 7 1
Sorted In Ascending Order:
1 2 3 4 5 6 7 8 9 10
Sorted In Dscending Order:
10 9 8 7 6 5 4 3 2 1
```

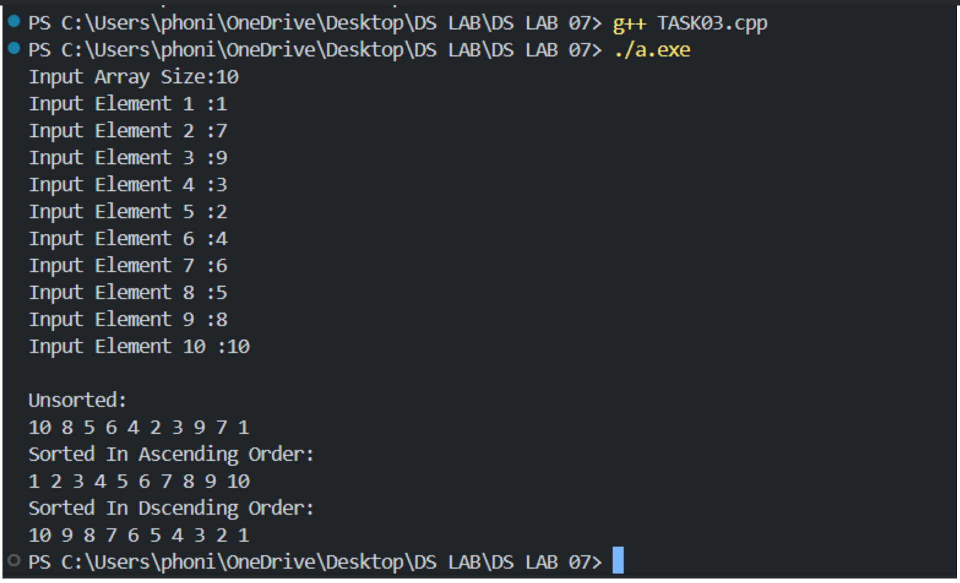
TASK 03



```cpp
#include <iostream>
#include <climits>

using namespace std;


void merge(int* arr, int l, int mid, int r,bool ascending){
    int n1=mid-l+1;
    int n2=r-mid;

    int left[n1];
    int right[n2];

    for (int i=0; i<n1; i++) left[i]=arr[l+i];
    for (int j=0; j<n2; j++) right[j]=arr[mid+1+j];


    int i=0,j=0,k=l;
    while(i<n1 && j<n2){
        if(ascending){
            if(left[i]<=right[j]) arr[k++]=left[i++];
            else arr[k++]=right[j++];
        } else {
            if(left[i]>=right[j]) arr[k++]=left[i++];
            else arr[k++]=right[j++];
        }
    }
    while(i<n1) arr[k++]=left[i++];
    while(j<n2) arr[k++]=right[j++];
}

void mergeSort(int* arr, int left, int right,bool ascending){
    if(left>=right) return;
    int mid=(left+right)/2;

    mergeSort(arr,left,mid,ascending);
    mergeSort(arr,mid+1,right,ascending);

    merge(arr,left,mid,right,ascending);
}


void display(int* arr,int size){
    cout<<endl;
    for (int i=0; i<size; i++) cout<<arr[i]<<" ";
```



```cpp
    cout<<endl;
}

int* inputArray(int& size){
    cout<<"Input Array Size:";
    cin>>size;

    int* arr=new int[size];
    for(int i=0 ; i<size ; i++){
        cout<<"Input Element "<<i+1<<" :";
        cin>>arr[size-i-1];
    }

    return arr;
}

int main(){

    int* arr;
    int size;
    arr=inputArray(size);
    cout<<endl<<"Unsorted: ";
    display(arr,size);
    mergeSort(arr,0,size-1,true);
    cout<<"Sorted In Ascending Order: ";
    display(arr,size);
    mergeSort(arr,0,size-1,false);
    cout<<"Sorted In Dscending Order: ";
    display(arr,size);

    delete[] arr;
    return 0;
}
```



```
PS C:\Users\phoni\OneDrive\Desktop\DS LAB\DS LAB 07> g++ TASK03.cpp
PS C:\Users\phoni\OneDrive\Desktop\DS LAB\DS LAB 07> ./a.exe
Input Array Size:10
Input Element 1 :1
Input Element 2 :7
Input Element 3 :9
Input Element 4 :3
Input Element 5 :2
Input Element 6 :4
Input Element 7 :6
Input Element 8 :5
Input Element 9 :8
Input Element 10 :10

Unsorted:
10 8 5 6 4 2 3 9 7 1
Sorted In Ascending Order:
1 2 3 4 5 6 7 8 9 10
Sorted In Dscending Order:
10 9 8 7 6 5 4 3 2 1
PS C:\Users\phoni\OneDrive\Desktop\DS LAB\DS LAB 07>
```