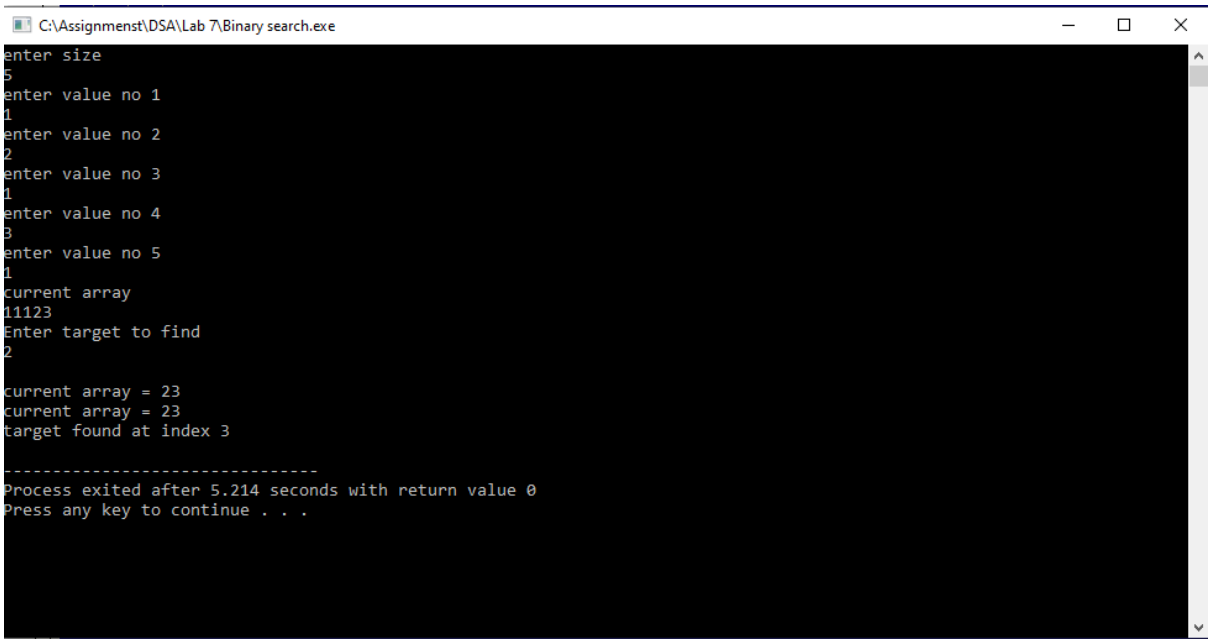
1. **Given a sorted array of n integers and a target value, find the index of the target value in the array. Show the all active items [divided half] at every stage. Handle the situation when the target value is not found**

```
#include <iostream>
using namespace std;
int main(){
int lower=0,upper,size,targ,index=-1,temp=0;;
cout<<"enter size"<<endl;
cin>>size;
int arr[size];
upper=size-1;
for(int i=0;i<size;i++){
    cout<<"enter value no "<<i+1<<endl;
    cin>>arr[i];
}
 for (int i = 0; i < size; i++) {
       for (int j = i + 1; j < size; j++) {
          if (arr[i] > arr[j]) {
             temp = arr[i];
             arr[i] = arr[j];
             arr[j] = temp;
          }
       }
   }
   cout<<"current array "<<endl;
   for(int i=0;i<size;i++){
    cout<<arr[i];
```

```
    }
cout<<"\nEnter target to find\n";
cin>>targ;
while(lower<=upper){
    int mid=(lower+upper)/2;
    if(arr[mid]==targ){
            index=mid;
            cout<<"\ncurrent array = ";
    for(int i=lower;i<=upper;i++){
            cout<<arr[i];}
            break;
    }
    else if(arr[mid]>targ){
            upper=mid-1;
    }
    else{
            lower=mid+1;
    }
    cout<<"\ncurrent array = ";
    for(int i=lower;i<=upper;i++){
            cout<<arr[i];
    }
}
if(index<0){
    cout<<"\ntarget not found"<<endl;
}
```

```
else{
    cout<<"\ntarget found at index "<<index<<endl;
}


}
```



2. **Given a sorted array of n integers and a target value, find the first occurrence of the target value in the array.**

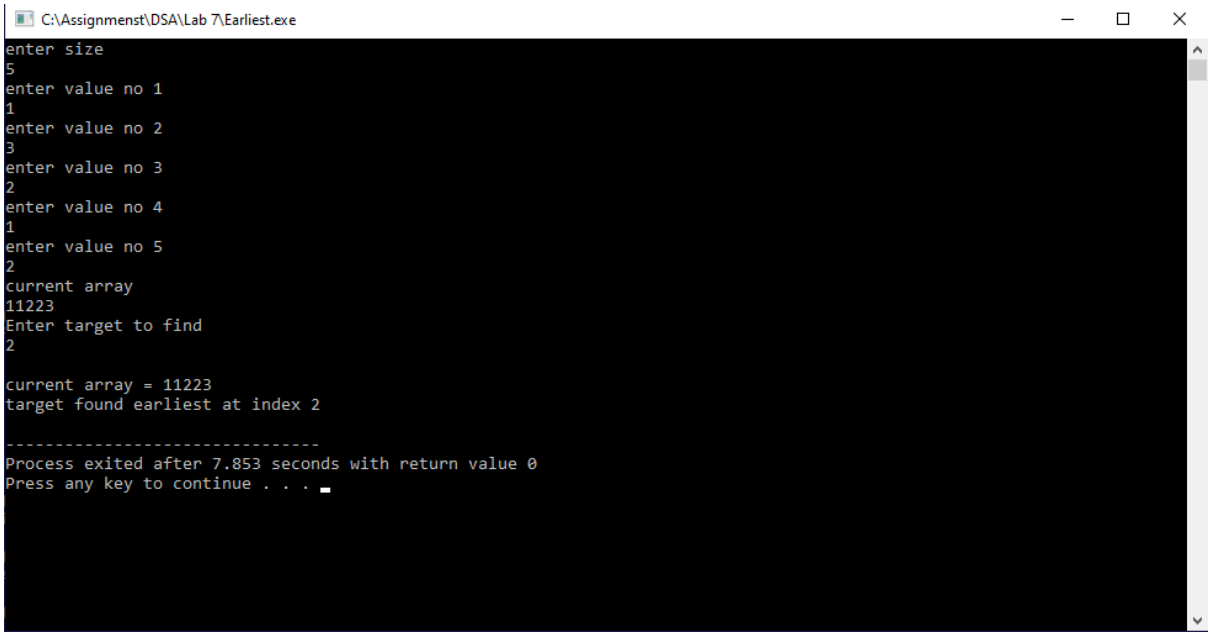
```
#include <iostream>
using namespace std;
int main(){
int lower=0,upper,size,targ,index=-1,temp=0,mid;
cout<<"enter size"<<endl;
cin>>size;
int arr[size];
upper=size-1;
for(int i=0;i<size;i++){
        cout<<"enter value no "<<i+1<<endl;
        cin>>arr[i];
```

```
}
 for (int i = 0; i < size; i++) {
       for (int j = i + 1; j < size; j++) {
          if (arr[i] > arr[j]) {
             temp = arr[i];
             arr[i] = arr[j];
             arr[j] = temp;
          }
       }
    }
    cout<<"current array "<<endl;
    for(int i=0;i<size;i++){
          cout<<arr[i];
          }
cout<<"\nEnter target to find\n";
cin>>targ;
lab:
while(lower<=upper){
          mid=(lower+upper)/2;
          if(arr[mid]==targ){
                    index=mid;
                    cout<<"\ncurrent array = ";
          for(int i=lower;i<=upper;i++){
                    cout<<arr[i];}
                    break;
          }
          else if(arr[mid]>targ){
                    upper=mid-1;
          }
          else{
                    lower=mid+1;
          }
          cout<<"\ncurrent array = ";
          for(int i=lower;i<=upper;i++){
                    cout<<arr[i];
          }
}
```

```
for(int i=0;i<index;i++){
        if(targ==arr[i]&&i!=index){
                upper=index;

                goto lab;
        }
        else{
                continue;
        }
}
if(index<0){
        cout<<"\ntarget not found"<<endl;
}
else{
        cout<<"\ntarget found earliest at index "<<index<<endl;
}


}
```



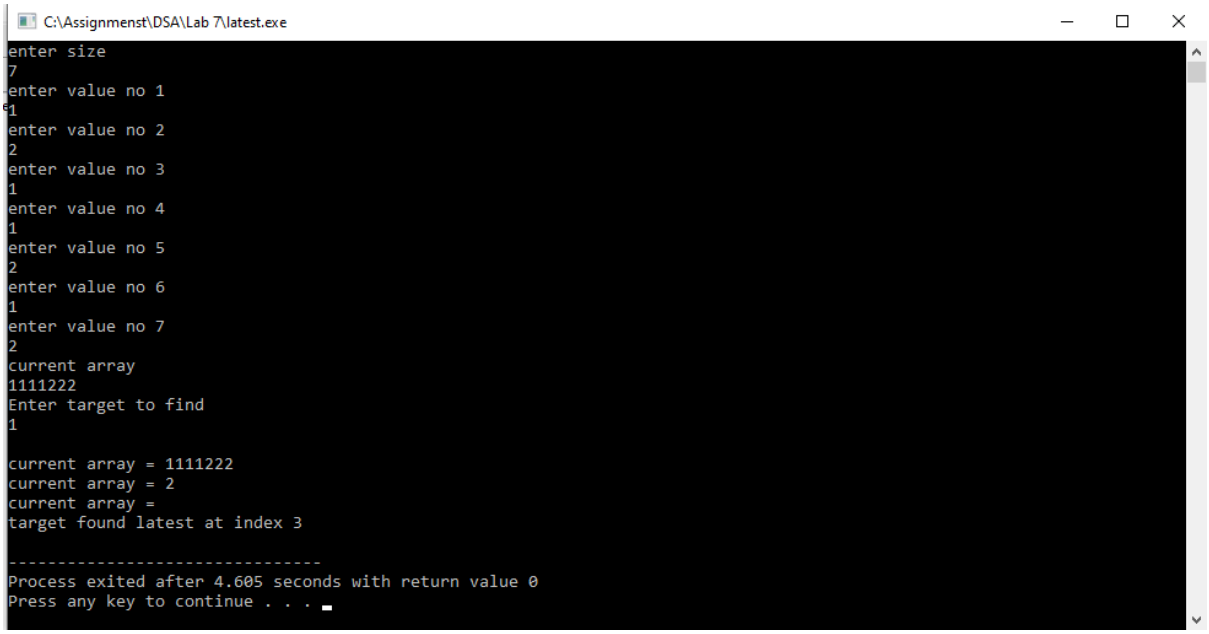
3. **Given a sorted array of n integers and a target value, find the last occurrence of the target value in the array.**

```
#include <iostream>
using namespace std;
int main(){
int lower=0,upper,size,targ,index=-1,temp=0,mid;
cout<<"enter size"<<endl;
cin>>size;
int arr[size];
upper=size-1;
for(int i=0;i<size;i++){
        cout<<"enter value no "<<i+1<<endl;
        cin>>arr[i];
}
 for (int i = 0; i < size; i++) {
      for (int j = i + 1; j < size; j++) {
         if (arr[i] > arr[j]) {
            temp = arr[i];
            arr[i] = arr[j];
            arr[j] = temp;
         }
      }
   }
   cout<<"current array "<<endl;
   for(int i=0;i<size;i++){
        cout<<arr[i];
        }
cout<<"\nEnter target to find\n";
cin>>targ;
lab:
while(lower<=upper){
        mid=(lower+upper)/2;
        if(arr[mid]==targ){
                index=mid;
                cout<<"\ncurrent array = ";
        for(int i=lower;i<=upper;i++){
                cout<<arr[i];}
```

```
                break;
        }
        else if(arr[mid]>targ){
                upper=mid-1;
        }
        else{
                lower=mid+1;
        }
        cout<<"\ncurrent array = ";
        for(int i=lower;i<=upper;i++){
                cout<<arr[i];
        }
}
for(int i=upper;i>lower;i--){
        if(targ==arr[i]&&i!=index){
                lower=index+1;


                goto lab;
        }
        else{
                continue;
        }
}
if(index<0){
        cout<<"\ntarget not found"<<endl;
}
else{
        cout<<"\ntarget found latest at index "<<index<<endl;
}


}
```



4. **Given a sorted array of n integers and a target value, find the number of occurrences of the target value in the array.**

```
#include <iostream>
using namespace std;
int main(){
int lower=0,upper,size,targ,index=-1,temp=0,mid,count=0;
cout<<"enter size"<<endl;
cin>>size;
int arr[size];
upper=size-1;
for(int i=0;i<size;i++){
        cout<<"enter value no "<<i+1<<endl;
        cin>>arr[i];
}
 for (int i = 0; i < size; i++) {
      for (int j = i + 1; j < size; j++) {
         if (arr[i] > arr[j]) {
            temp = arr[i];
            arr[i] = arr[j];
            arr[j] = temp;
         }
      }
   }
   cout<<"current array "<<endl;
```

```
   for(int i=0;i<size;i++){
        cout<<arr[i];
        }
cout<<"\nEnter target to find\n";
cin>>targ;
lab:
while(lower<=upper){
        mid=(lower+upper)/2;
        if(arr[mid]==targ){
                        count++;
                index=mid;
                cout<<"\ncurrent array = ";
        for(int i=lower;i<=upper;i++){
                cout<<arr[i];}
                break;
        }
        else if(arr[mid]>targ){
                upper=mid-1;
        }
        else{
                lower=mid+1;
        }
        cout<<"\ncurrent array = ";
        for(int i=lower;i<=upper;i++){
                cout<<arr[i];
        }
}
for(int i=lower;i<upper;i++){
        if(targ==arr[i]){
                lower++;

                goto lab;
        }
        else{
                continue;
        }
}
```

```
if(index<0){
        cout<<"\ntarget not found"<<endl;
}
else{
        cout<<"\ntarget found "<<count<<" times"<<endl;
}


}
```