

Data Structure

Practice Problems 02

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1. Consider the following sorted array

2 4 7 9 13 15 21 23

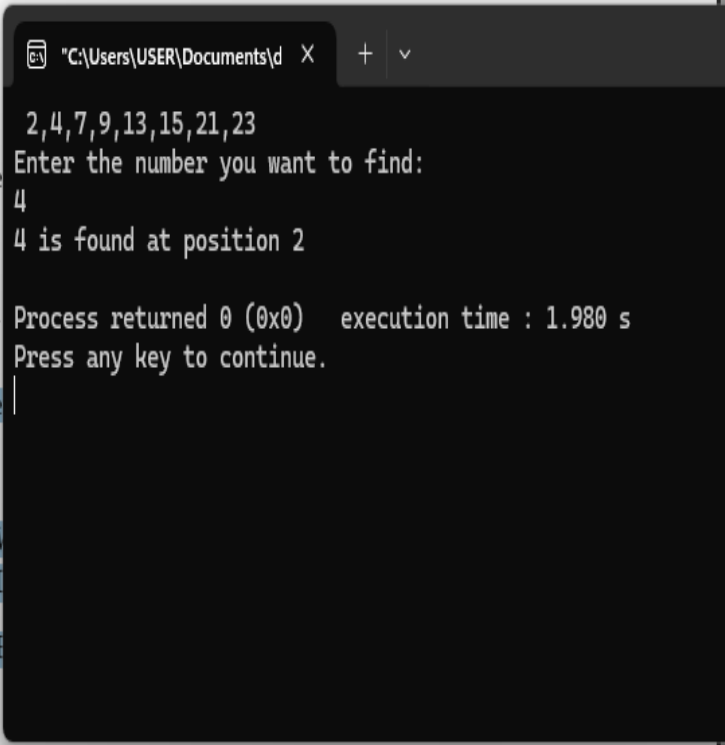
Write a code to search the value 4 following Binary Search algorithm.

Solution 1:

```
#include<stdio.h>
int main(){
int arr[]={2,4,7,9,13,15,21,23};
printf(" 2,4,7,9,13,15,21,23\n");
int n=sizeof(arr)/sizeof(arr[0]);
printf("Enter the number you want to find:\n");
int X;
scanf("%d",&X);

int START=0;
int end=n-1;
int mid=(START+end)/2;

while(START<=end){
if(X<arr[mid]){
end=mid-1;
}
else{
START=mid+1;
}
mid=(START+end)/2;
}
if(arr[mid]==X){
printf("%d is found at position %d\n",X,mid+1);
}
else{
printf("\n");
printf("Not found\n");
}
return 0;
}
```



The screenshot shows a terminal window with the following content:

```
"C:\Users\USER\Documents\d X + v
2,4,7,9,13,15,21,23
Enter the number you want to find:
4
4 is found at position 2

Process returned 0 (0x0)   execution time : 1.980 s
Press any key to continue.
|
```

2. Consider the following unsorted array

7 3 4 2 9 21 15 23

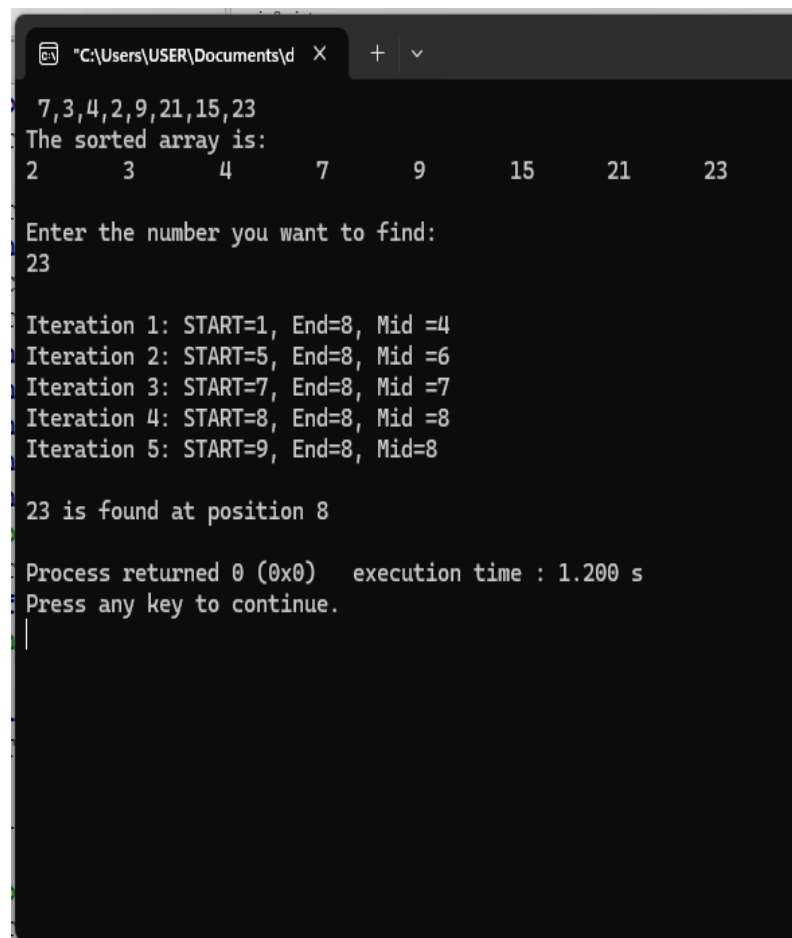
i) Write a code to search the value 23 following Binary Search algorithm.

ii) Display the changes of the value of mid-point for each iteration.

Example Output: Iteration 1, Mid = 3

Solution 2:

```
#include<stdio.h>
int main(){
int arr[]={7,3,4,2,9,21,15,23};
printf(" 7,3,4,2,9,21,15,23 \n");
int n=sizeof(arr)/sizeof(arr[0]);
for(int i=0;i<n-1;i++){          //sorted array
for(int j=i+1;j<n;j++){
if(arr[j]<arr[i]){
int tmp=arr[j];
arr[j]=arr[i];
arr[i]=tmp; } } }
printf("The sorted array is:\n");
for(int i=0;i<n;i++){
printf("%d\t",arr[i]); }
printf("\n\nEnter the number you want to find:\n");
int X;
scanf("%d",&X);          //Binary Search algorithm
printf("\n");
int START=0;
int end=n-1;
int mid=(START+end)/2;
int count=0;
while(START<=end){
count++;
printf("Iteration %d: START=%d, End=%d, Mid =%d\n",count,START+1,end+1,mid+1);
if(X<arr[mid]){
end=mid-1; }
else{
START=mid+1; }
mid=(START+end)/2; }
count++;
printf("Iteration %d: START=%d, End=%d, Mid=%d\n",count,START+1,end+1,mid+1);
if(arr[mid]==X){
printf("\n%d is found at position %d\n",X,mid+1);
} else{ printf("Not found\n"); } return 0; }
```



The screenshot shows a Windows command prompt window with the following output:

```
"C:\Users\USER\Documents\d X + v
7,3,4,2,9,21,15,23
The sorted array is:
2      3      4      7      9      15      21      23

Enter the number you want to find:
23

Iteration 1: START=1, End=8, Mid =4
Iteration 2: START=5, End=8, Mid =6
Iteration 3: START=7, End=8, Mid =7
Iteration 4: START=8, End=8, Mid =8
Iteration 5: START=9, End=8, Mid=8

23 is found at position 8

Process returned 0 (0x0)   execution time : 1.200 s
Press any key to continue.
```