Binary Search

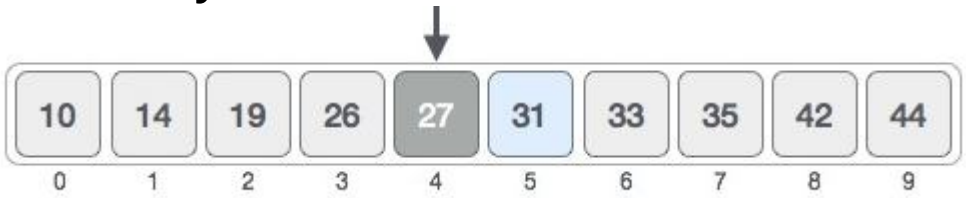
Presented By
M.Malarmathi
AP/IT

- Binary search is a fast search algorithm with run-time complexity of O(log n). This search algorithm works on the
- Algorithm works on the principle of divide and conquer
- The data collection should be in the sorted form

- Binary search looks for a particular item by comparing the middle most item of the collection.
- if a match occurs, then the index of item is returned.
- If the middle item is greater than the item, then the item is searched in the sub-array to the left of the middle item.
- Otherwise, the item is searched for in the sub-array to the right of the middle item.
- This process continues on the sub-array as well until the size of the sub array reduces to zero.

- Search the number 31
- Searching is performed in sorted array
- Formula: mid=(low+high)/2

- Here it is, (0 + 9)/ 2 = 4 (integer value of 4.5). So, 4 is the mid of the array.



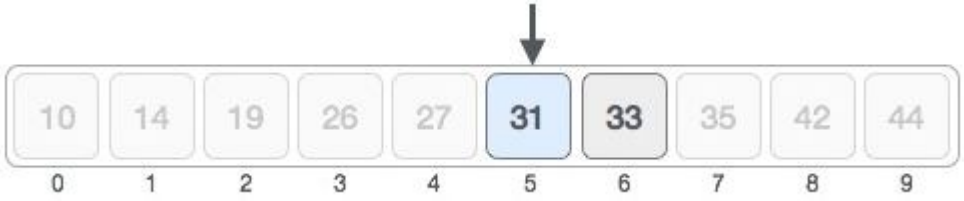
- compare the value stored at location 4, with the value being searched, i.e. 31. the value at location 4 is 27, which is not a match. the value is greater than 27

- we have a sorted array, so we also know that the target value must be in the upper portion of the array

- Find new mid value (low=mid+1)
- Mid=(5+9)/2=7 (i.e) 35

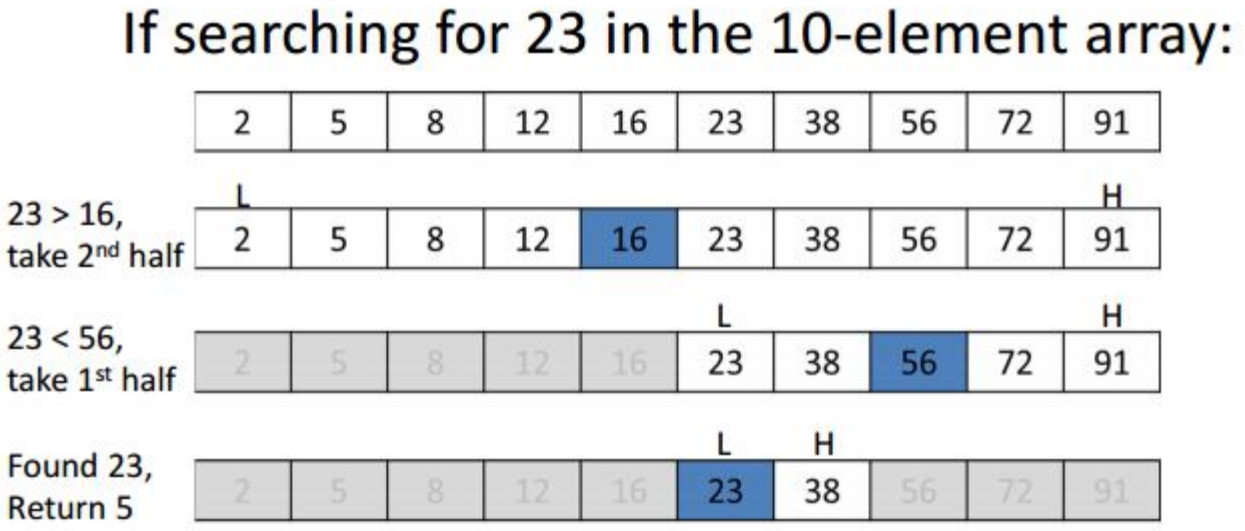
- The value stored at location 7 is not a match. So, the value must be in the lower part from this location

- Calculate the mid again. This time it is 5.



- Compare the value stored at location 5 with our target value.
- Hence, the searched element is found

Example2


If searching for 23 in the 10-element array:
2 5 8 12 16 23 38 56 72 91
23 > 16, take 2nd half
L H
2 5 8 12 16 23 38 56 72 91
23 < 56, take 1st half
L H
2 5 8 12 16 23 38 56 72 91
Found 23, Return 5
L H
2 5 8 12 16 23 38 56 72 91

Program

```
n=int(input("enter numbers insert:"))
lst=[]
print("Enter number:")
for i in range (0, n):
    lst.append(int(input()))
print("Entered list are:",lst)
for  i  in range (1, len(lst)):
    j=i
    while j>0 and lst[j-1]>lst[j]:
        temp=lst[j]
        lst[j]=lst[j-1]
        lst[j-1]=temp
        j-=1
print("sorted List:", lst)
```

```
element=int(input("enter the element to be searched"))
low=0
high=n-1
mid=(low+high)//2
while low <= high:
    if lst[mid] == element:
        print("element:", element, "found at location", mid)
        break
    elif lst[mid] < element:
        low = mid + 1
    else:
        high = mid - 1
    mid = (low+high)//2
if low>high:
    print("element:", element, "was not found")
```

Output

OUTPUT:

enter numbers insert:4

Enter number:

2

3

1

5

Entered list are: [2, 3, 1, 5]

sorted List: [1, 2, 3, 5]

enter the element to be searched2

element: 2 found at location 1