

# Linear Search and Binary search

## ' Aim:

To write a program to perform linear search and binary search using python programming.

## ' Equipment's required:

1. Hardware – PCs
2. Anaconda – Python 3.7 Installation / Moodle-Code Runner

## ' Algorithm:

### ' Linear Search:

1. Start from the leftmost element of array[] and compare k with each element of array[] one by one.
2. If k matches with an element in array[] , return the index.
3. If k doesn't match with any of elements in array[], return -1 or element not found.

### ' Binary Search:

1. Set two pointers low and high at the lowest and the highest positions respectively.
2. Find the middle element mid of the array ie.  $\text{arr}[(\text{low} + \text{high})/2]$
3. If  $x == \text{mid}$ , then return mid. Else, compare the element to be searched with m.
4. If  $x > \text{mid}$ , compare x with the middle element of the elements on the right side of mid. This is done by setting low to  $\text{low} = \text{mid} + 1$ .
5. Else, compare x with the middle element of the elements on the left side of mid. This is done by setting high to  $\text{high} = \text{mid} - 1$ .
6. Repeat steps 2 to 5 until low meets high

## ' Program:

i) #Use a linear search method to match the item in a list.

```
...
Program for linear search method to match the item in a list
Developed by: SUNIL KUMAR T
RegisterNumber: 23001650
...
def linearSearch(array, n, k):
    for i in range(0, n):
```

```

        if (array[i]==k):
            return i
        return -1
array = eval(input())
k=eval(input())
n=len(array)
array.sort()
result=linearSearch(array,n,k)
if (result==-1):
    print(array)
    print('Element not found')
else:
    print(array)
    print('Element found at index: ',result)

```

ii) # Find the element in a list using Binary Search(Iterative Method).

```

'''
Program to find the element in a list using Binary Search(Iterative Method)..
Developed by:SUNIL KUMAR T
RegisterNumber: 23001650
'''
def binarySearchIter(array, k, low, high):
    while low<=high:
        mid=low+(high-low)//2
        if array[mid]==k:
            return mid
        elif array[mid]<k:
            low=mid+1
        else:
            high=mid-1
    return -1
array = eval(input())
array.sort()
k=eval(input())
result= binarySearchIter(array,k, 0, len(array)-1)
if(result==-1):
    print(array)
    print("Element not found")
else:
    print(array)
    print("Element found at index: ",result)

```

iii) # Find the element in a list using Binary Search (recursive Method).

```
'''
```

```
Program to find the element in a list using Binary Search (recursive Method).
```

```
Developed by:SUNIL KUMAR T
```

```
RegisterNumber: 23001650
```

```
'''
```

```
def binarySearchIter(array, k, low, high):  
    if low<=high:  
        mid=low+(high-low)//2  
        if array[mid]==k:  
            return mid  
  
        elif array[mid]<k:  
            low=mid+1  
            return binarySearchIter(array, k, low, high)  
        else:  
            high=mid-1  
            return binarySearchIter(array, k, low, high)  
    return -1  
array = eval(input())  
array.sort()  
k=eval(input())  
result= binarySearchIter(array,k, 0, len(array)-1)  
if(result==-1):  
    print(array)  
    print("Element not found")  
else:  
    print(array)  
    print("Element found at index: ",result)
```

# Sample Input and Output

Input	Result
[9, 6, 7, 8, 1, 3] 9	[1, 3, 6, 7, 8, 9] Element found at index: 5
[9, 10, 8, 7, 6] 20	[6, 7, 8, 9, 10] Element not found

Input	Result
[9, 6, 7, 8, 1, 3] 9	[1, 3, 6, 7, 8, 9] Element found at index: 5
[9, 10, 8, 7, 6] 20	[6, 7, 8, 9, 10] Element not found

Input	Result
[9, 6, 7, 8, 1, 3] 9	[1, 3, 6, 7, 8, 9] Element found at index: 5
[9, 10, 8, 7, 6] 20	[6, 7, 8, 9, 10] Element not found

output

```
1 '''
2 Program for linear search method to match the item in a list
3 Developed by:SUNIL KUMAR T
4 RegisterNumber:23001650
5 '''
6 def linearSearch(array,n,k):
7     for i in range(0,n):
8         if array[i]==k:
9             return i
10    return -1
11 array = eval(input())
12 k=eval(input())
13 n=len(array)
14 array.sort()
15 result=linearSearch(array,n,k)
16 if (result==-1):
17     print(array)
18     print('Element not found')
19 else:
20     print(array)
21     print('Element found at index: ',result)
22
```

	Input	Expected	Got	
✓	[1, 8, 7, 9, 10] 7	[1, 7, 8, 9, 10] Element found at index: 1	[1, 7, 8, 9, 10] Element found at index: 1	✓
✓	[10, 78, 68, 67, 56] 68	[10, 56, 67, 68, 78] Element found at index: 3	[10, 56, 67, 68, 78] Element found at index: 3	✓
✓	[78, 56, 77, 98, 95] 77	[56, 77, 78, 95, 98] Element found at index: 1	[56, 77, 78, 95, 98] Element found at index: 1	✓
✓	[9, 10, 8, 7, 6] 20	[6, 7, 8, 9, 10] Element not found	[6, 7, 8, 9, 10] Element not found	✓

Passed all tests! ✓

```
1 '''
2 Program to find the element in a list using Binary Search(Iterative Method)..
3 Developed by:SUNIL KUMAR T
4 RegisterNumber: 23001650
5 '''
6 def binarySearchIter(array, k, low, high):
7     while low<=high:
8         mid=low+(high-low)//2
9         if array[mid]==k:
10            return mid
11        elif array[mid]<k:
12            low=mid+1
13        else:
14            high=mid-1
15    return -1
16 array = eval(input())
17 array.sort()
18 k=eval(input())
19 result= binarySearchIter(array,k, 0, len(array)-1)
20 if(result==-1):
21     print(array)
22     print("Element not found")
23
```

```
23 else:
24     print(array)
25     print("Element found at index: ",result)
26
```

	Input	Expected	Got	
✓	[9, 6, 7, 8, 1, 3] 9	[1, 3, 6, 7, 8, 9] Element found at index: 5	[1, 3, 6, 7, 8, 9] Element found at index: 5	✓
✓	[10, 78, 68, 67, 56] 68	[10, 56, 67, 68, 78] Element found at index: 3	[10, 56, 67, 68, 78] Element found at index: 3	✓
✓	[9, 10, 8, 7, 6] 20	[6, 7, 8, 9, 10] Element not found	[6, 7, 8, 9, 10] Element not found	✓
✓	[78, 56, 77, 98, 95] 77	[56, 77, 78, 95, 98] Element found at index: 1	[56, 77, 78, 95, 98] Element found at index: 1	✓

Passed all tests! ✓

```
1 '''
2 Program to find the element in a list using Binary Search (recursive Method)..
3 Developed by:SUNIL KUMAR T
4 RegisterNumber: 23001650
5 '''
6 def binarySearchIter(array, k, low, high):
7     if low<=high:
8         mid=low+(high-low)//2
9         if array[mid]==k:
10            return mid
11        elif array[mid]<k:
12            low=mid+1
13            return binarySearchIter(array, k, low, high)
14        else:
15            high=mid-1
16            return binarySearchIter(array, k, low, high)
17    return -1
18 array = eval(input())
19 array.sort()
20 k=eval(input())
21 result= binarySearchIter(array,k, 0, len(array)-1)
22
```

```
23 if(result!=-1):
24     print(array)
25     print("Element not found")
26 else:
27     print(array)
28     print("Element found at index: ",result)
29
30
```

	Input	Expected	Got	
✓	[9, 6, 7, 8, 1, 3] 9	[1, 3, 6, 7, 8, 9] Element found at index: 5	[1, 3, 6, 7, 8, 9] Element found at index: 5	✓
✓	[10, 78, 68, 67, 56] 68	[10, 56, 67, 68, 78] Element found at index: 3	[10, 56, 67, 68, 78] Element found at index: 3	✓
✓	[9, 10, 8, 7, 6] 20	[6, 7, 8, 9, 10] Element not found	[6, 7, 8, 9, 10] Element not found	✓
✓	[78, 56, 77, 98, 95] 77	[56, 77, 78, 95, 98] Element found at index: 1	[56, 77, 78, 95, 98] Element found at index: 1	✓

Passed all tests! ✓

## Result

Thus the linear search and binary search algorithm is implemented using python programming.