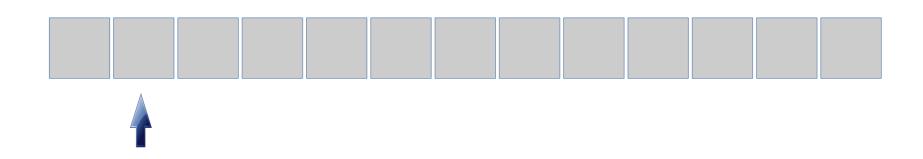


Lab Assignment

- Implement the two searching approaches (more specifically, linear search and binary search) discussed in the following. You are supposed to compare these two searching approaches based on the average number of comparisons. Execute these approaches (at least) 10 times for (at least) 50 numbers.
- Input: Number of elements in the array and a key to search.
- Output: Average number of comparisons by both approaches. For each run print, whether the key has been found or not.
- -- You are encouraged to use random number generator to generate the elements of the array.
- -- You are encouraged to use dynamically allocated arrays.
- [Helps provided at the end].
- [Search approaches are described in the following].

















6 11 14 18 24 26 29 34 38 44 49 51 83

Search key = 38



6 | 11 | 14 | 18 | 24 | 26 | 29 | 34 | 38 | 44 | 49 | 51 | 83

Search key = 38

Compare with element in middle = 29

Same?



6 11 14 18 24 26 29 34 38 44 49 51 83

Search key = 38

Compare with element in middle = 29

Same? No



6 | 11 | 14 | 18 | 24 | 26 | 29 | 34 | 38 | 44 | 49 | 51 | 83

Search key = 38

Compare with element in middle = 29

Same? No

Smaller or Larger than key?



6 | 11 | 14 | 18 | 24 | 26 | 29 | 34 | 38 | 44 | 49 | 51 | 83

Search key = 38

Compare with element in middle

Same? No

Smaller or Larger than key? Smaller



6 | 11 | 14 | 18 | 24 | 26 | 29 | 34 | 38 | 44 | 49 | 51 | 83

Search key = 38

Compare with element in middle

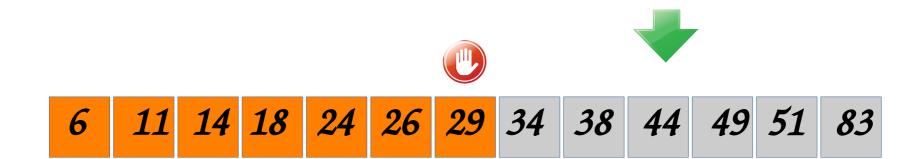
Same? No

Smaller or Larger than key? Smaller Search in right subarray



Search key = 38

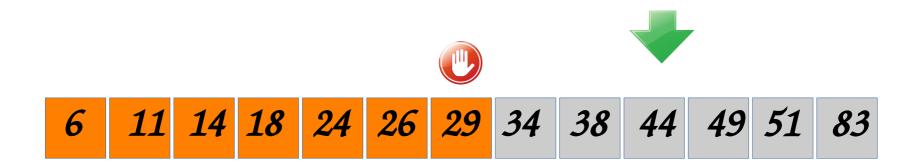
Only right subarray to be considered



Search key = 38

Compare with element in middle = 44

Same?



Search key = 38

Compare with element in middle = 44

Same? No



Search key = 38

Compare with element in middle = 44

Same? No

Smaller or Larger than key?



Search key = 38

Compare with element in middle = 44

Same? No

Smaller or Larger than key? Larger



Search key = 38

Compare with element in middle = 44

Same? No

Smaller or Larger than key? Larger

Search in left subarray



Search key = 38

Compare with element in middle = 44

Same? No

Smaller or Larger than key?

Larger

Search in left subarray



Search key = 38

Compare with element in middle = 38

Same? Yes

Success

```
Binary Search (A, n, key)
l = 0
r = n - 1
while l \leq r do
    mid = floor((l + r)/2)
    if A[mid] < key then
        l = mid + 1
    else if A[mid] > key then
        r = mid - 1
    else
        return mid
```

return unsuccessful

Help

```
Random Number Generation
```

```
#include <stdlib.h>
#include <time.h>

srand(time(NULL)); //once

rand()%30; //everytime
```

Generating in sorted order

```
arr[0] = rand()%100;
//for sorted order
for(int i = 1; i < arr_size; i++){
    arr[i] = arr[i - 1] + rand()%30;
}</pre>
```

Dynamic Array Allocation

```
int *arr;
int arr_size;
printf("enter number of elements\n");
scanf("%d",&arr_size);
arr = (int*)malloc(arr_size*sizeof(int));
if(arr == NULL){
    printf("MEMORY ALLOCATION ERROR\n");
    exit(0);
}
```

