Practical-5

Implement a function of binary search and count the steps executed by function on various inputs for best case and worst case. Also write complexity in each case and draw a comparative chart.

Code :

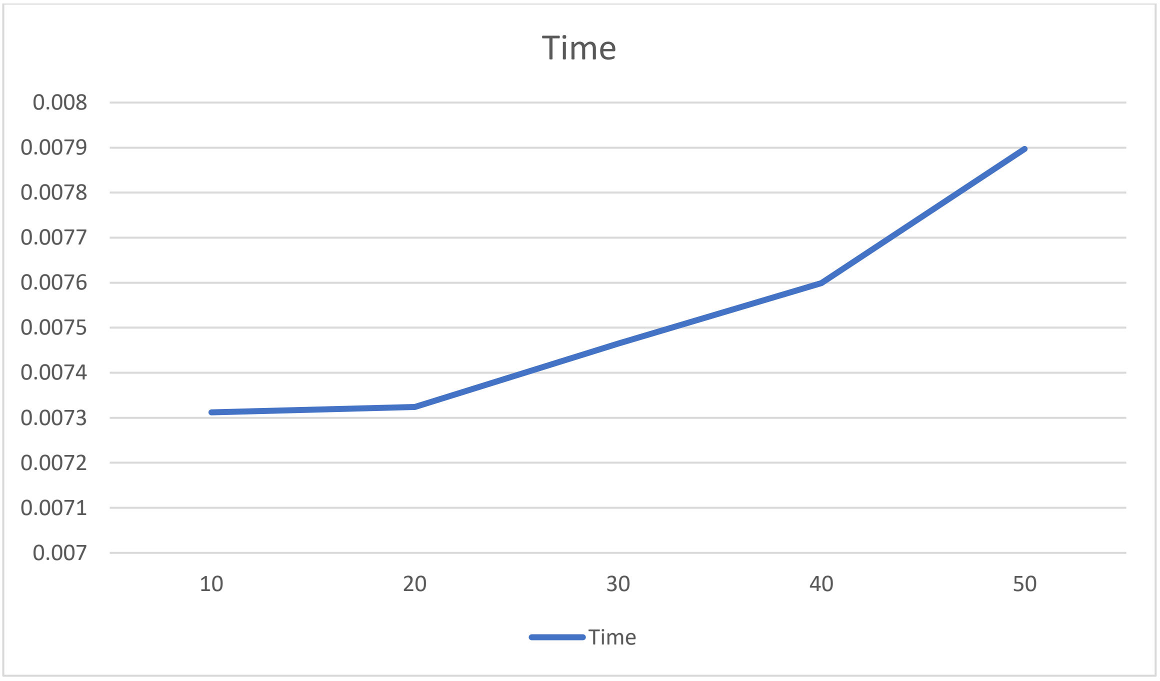
```
#include <iostream>

using namespace std;
void bs(int *arr,int f,int l,int key)
{
    if(l<f)
    {
      printf("element not found");
      return;
    }
    int mid=f+(l-f)/2;
    if(key==arr[mid])
    {
     printf("element %d found at index: %d ",key,mid);
     return;
    }
    else if(key<arr[mid])
    {
     l=mid-1;
     mid=f+(l-f)/2;
     bs(arr,f,l,key);
    }
    else if(key>arr[mid])
    {
     f=mid+1;
     mid=f+(l-f)/2;
     bs(arr,f,l,key);
    }
}
int main()
{
    int
arr[]={5,13,23,25,26,27,31,33,35,39,46,48,49,53,54,56,57,62,68,72,79,80,83,84,88,90,92,94,
95,96,98,100};
    int size=sizeof(arr)/sizeof(arr[0]);
    bs(arr,0,size-1,48);
    return 0;
}
```

Output :

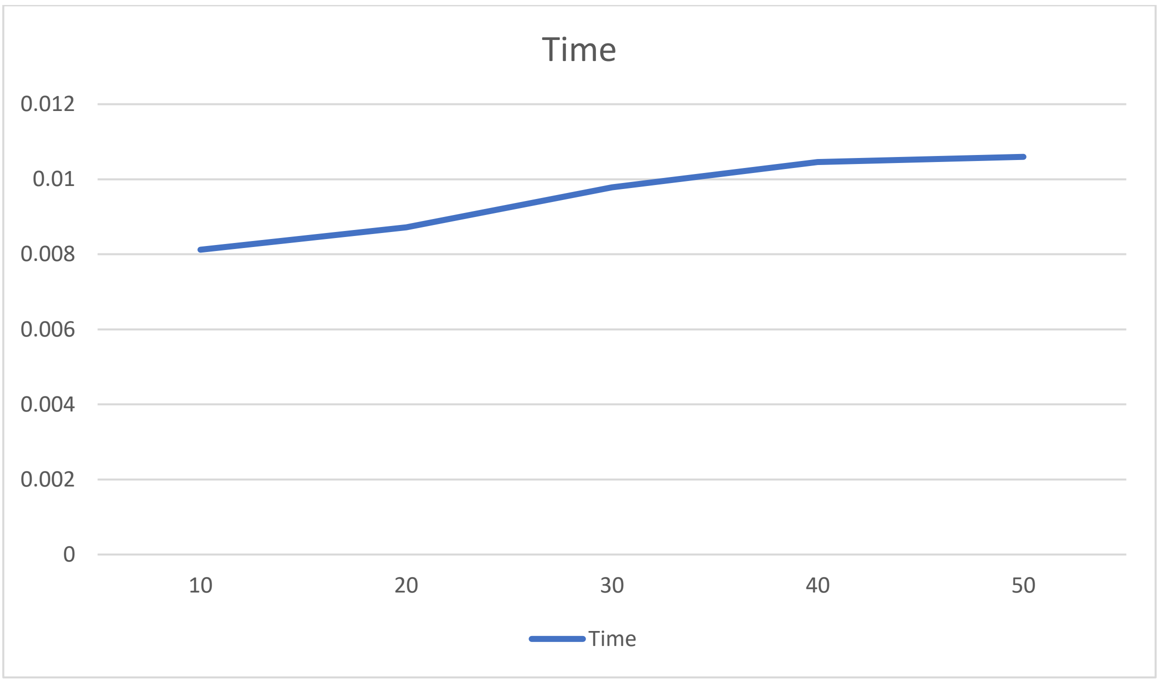
Best Case :

No of Elements	Time
10	0.007312
20	0.007324
30	0.007465
40	0.007599
50	0.007897



Worst case :

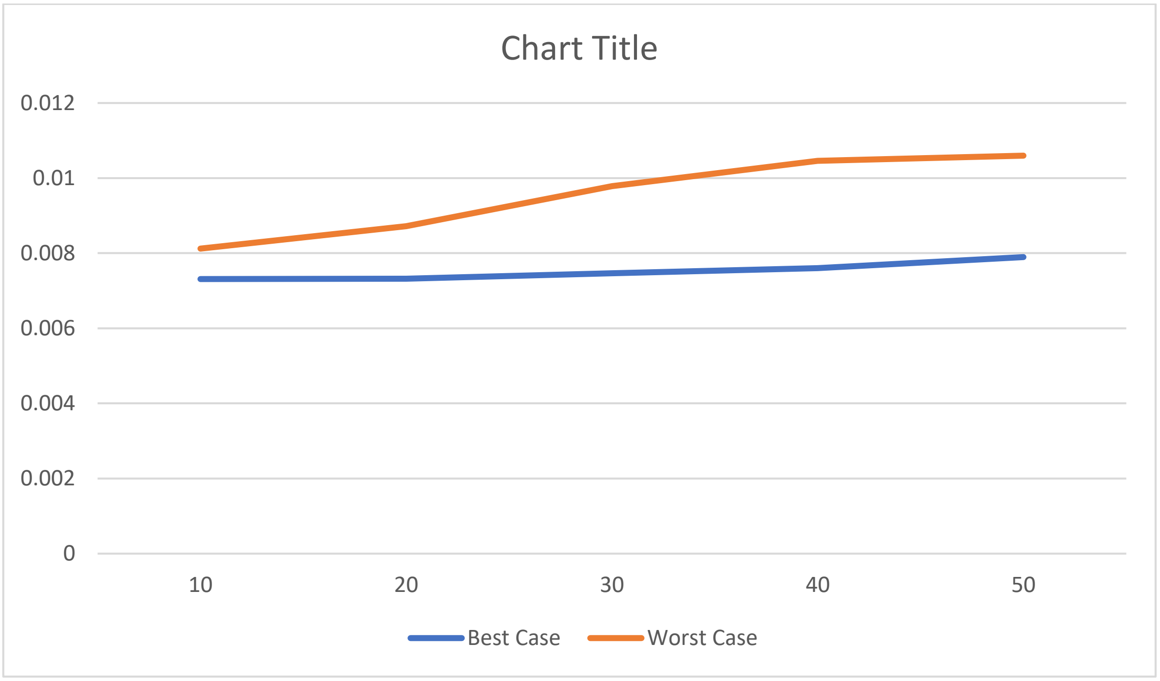
No of Elements	Time
10	0.008123
20	0.008720
30	0.009786
40	0.010457
50	0.010598



Best Case Vs Worst Case :

No of Elements	**Best Case**	**Worst Case**
10	0.007312	0.008123
20	0.007324	0.008720
30	0.007465	0.009786
40	0.007599	0.010457

50	0.007897	0.010598



Conclusion:

For Binary search best case will be when key element(element to be searched) is first element of the array and time complexity will be O(1)

And worst case will be key element is last element or not present in array in that case time complexity will be O(logn)