

## **Program 1: Write a program to search an element in th array using linear search and binary search**

### **Theory:**

**I.Search Operation in Array:** Searching Algorithms are designed to check for an element or retrieve an element from any data structure where it is stored.

**II. Linear Search:** Linear Search is defined as a sequential search algorithm that starts at one end and goes through each element of a list until the desired element is found, otherwise the search continues till the end of the data set.

Linear Search Algorithm:

Step 1: Every element is considered as a potential match for the key and checked for the same.

Step 2: If any element is found equal to the key, the search is successful and the index of that element is returned.

Step 3: If no element is found equal to the key, the search yields “No match found”.

**III. Binary Search:** Binary Search is defined as a searching algorithm used in a sorted array by repeatedly dividing the search interval in half. The idea of binary search is to use the information that the array is sorted and reduce the time complexity to  $O(\log N)$ . Conditions for when to apply

Binary Search in a Data Structure:

i. To apply Binary Search algorithm:

ii. The data structure must be sorted.

Binary Search Algorithm:

Step 1: Divide the search space into two halves by finding the middle index “mid”.

Step 2: Compare the middle element of the search space with the key.

Step 3: If the key is found at middle element, the process is terminated.

Step 4: If the key is not found at middle element, choose which half will be used as the next search space.

Step 5: If the key is smaller than the middle element, then the left side is used for next search.

Step 6: If the key is larger than the middle element, then the right side is used for next search.

Step &: This process is continued until the key is found or the total search space is exhausted.

### **C Code for searching an element in th array using linear search and binary search**

```
#include<conio.h>
#include<stdio.h>
void linear_search(int[],int,int);
void binary_search(int[],int,int,int);
void main()
{
    int i,a[10],n,key,choice;
    char ch;
    clrscr();
    printf("Enter number of elements to be read, below 10\n");
    scanf("%d",&n);
    printf("Enter elements of an array\n");
    for(i=0;i<n;i++)
        scanf("%d",&a[i]);
    printf("Elements of an array are\n");
    for(i=0;i<n;i++)
```

```

        printf("%d\t",a[i]);
printf("\nEnter the element to be searched\n");
scanf("%d",&key);
do
{
    printf("Enter 1 for linear Search\n 2 for Binary Search");
    scanf("%d",&choice);
    switch(choice)
    {
        case 1:
            linear_search(a,n,key);
            break;
        case 2:
            binary_search(a,n,0,key);
            break;
        default:
            printf("Wrong choice\t");
            break;
    }
    printf("Do you want to continue press y/n");
    fflush(stdin);
    scanf("%c",&ch);
} while(ch=='y'||ch=='Y');
getch();
}

void linear_search(int a[],int n,int key)
{
    int flag,i,location;
    flag=0;
    for(i=0;i<n;i++)
    {
        if(key==a[i])
        {
            location=i;
            printf("%d is found at %d",key,location);
            flag=1;
        }
    }
    if(flag==0)
        printf("\nElement not in list");
}

void binary_search(int a[],int n,int low,int key)
{
    int flag=0,mid=0,location;
    int high=n-1;

```

```

while(low<=high)
{
    mid=(low+high)/2;
    if(key==a[mid])
    {
        location=mid;
        printf("%d is found at %d\t",key,location);
        flag=1;
    }
    if(key<a[mid])
        high=mid-1;
    else
        low=mid+1;
}
if(flag==0)
printf("\nElement not in list");
}

```

OUTPUT:

```

Enter number of elements to be read, below 10
5
Enter elements of an array
10
20
30
40
50
Elements of an array are
10      20      30      40      50
Enter the element to be searched
40

Enter 1 for linear Search
2 for Binary Search
1
40 is found at 3
Do you want to continue press y/n      y

Enter 1 for linear Search
2 for Binary Search
2

40 is found at 3      Do you want to continue press y/n

```