Binary Search:

Binary search can be applied only on sorted data. It is faster than linear search. Its time complexity is O(log n)

Steps:

- First check the search element at the middle of the list
- If the middle element is the search key, then the data found. Stop the searching.
- If the key to be searched is smaller than the middle element then continue with the bottom half of the list.
- If the key to be searched is greater than the middle element then continue with the top half of the list
- Repeat the above steps till the sub array not possible further divide.

Example:

Consider the array elements

10, 15, 17, 23, 45, 60, 75

And the search element key = 15

1st Iteration:

High = 7, Low =1

Mid = (low + high) / 2 = (1 + 7) / 2 = 8/2 = 4

Array [mid] = Array[4] = 23

Here 15 < 23 search continues on the left side of the array

Therefore new High = mid -1 = 4 – 1 = 3

The sub list = 10, 15, 17

2nd iteration:

High = 3, Low = 1

Mid = (low + high) / 2 = (1 + 3) / 2 = 4 / 2 = 2

Array[mid] = Array[2] = 15

Here Array[mid] = key. i.e., 15 = 15

Thus data found at mid. i.e., at location 2.

Program : Binary Search

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int A[10], i, n, key,c=0;
    int mid, low, high;
    printf("Enter the size of an array:");
    scanf("%d", &n);
    printf("Enter the elements in ascending order :");
    for( i = 1; i <= n; i++)
        scanf("%d", &A[i]);
    low = 1; high = n;
    printf("Enter the number to be searched:");
        scanf("%d", &key);
    while ( low <= high)
    {
```

```
            mid = (low + high) / 2;
            if ( A[mid] == key)
                  c=1;
                  break;
            else if ( A[mid] < Key )
                  low = mid+ 1;
            else
                  high = mid – 1;
      }
      if(c==0)
            printf("The number is not found.");
      else
            printf("The number is found.");
      getch();
}
```

Output:

Enter the size of an array: 5

Enter the elements in ascending order: 4 7 8 11 21

Enter the number to be searched: 11

The number is found.