LINEAR SEARCH :-

a:-searching searching an element using iteration

```c
-> # include < stdio. h >
int main ()

{
    int i, n, a[20], key, pos;
    printf (" enter n ");
    scanf (" %d ", & n);
    printf (" enter elements ");
    scanf (" %d ", & a[i]);
    printf (" enter search element ");
    scanf (" %d ", & key );
    pos = linear _ search (a, n, key );
    if ( pos > = 0 )
    printf (" element is found at place %d ", pos + 1);
    else
    printf (" unsuccessful search ");
}
int linear_ search ( int a[], int n, int key )
{
    int i;
    for ( i = 0; i < n; i++)
    {
        if ( a [i] = = key )
        return i;
    }
    return -1;
}
```

Searching an element using recursion

```c
-> main ()
{
    int i, n, a[20], key, pos;
    printf ("enter n");
    scanf ("%d", &n);
    printf ("enter elements");
    for (i=0; i<n; i++)
    scanf ("%d", &a[i]);
    printf (" enter element search ");
    scanf ("%d", &key);
    pos = linear - search (a, n, key);
    if (pos >= 0)
    printf (" element is found at place %d", pos+1);
    else
    printf (" not found ");
}

int linear_search (int a[], int n, int key, int i)
{
    if (i == n)
    return -1;
    else if (a[i] == key)
    return i;
    else
    linear-search (a, i+1, n, key);
}
```

BINARY SEARCH:- The elements must be in sorted array only.

→ main ( )   during iterations

```
{  int i, n, a[20], key, pos;
   printf ( "enter n" );
   scanf ( " %d ", &n );
   printf ( " enter elements in sorted array : " );
   for ( i = 0; i < n; i++)
   scanf ( " %d", &a[i]);
   printf ( " enter search element " );
   scanf ( " %d", &key );
   pos = binary - search ( a, n, key );
   if ( pos >= 0 )
   printf ( " element is found at place %d", pos+1 );
   else
   printf ( " Not found " );
}
int  binary - search ( int a[ ], int n, int key )

{  int low = 0, high = n-1, mid ;
   while ( low <= high )
   {
       mid = ( low + high ) / 2;
       if ( a [ mid ] == key )
       return mid;
       else if ( key < a[ mid ])
```

```
        high = mid -1;
    else
        low = mid + 1;
    }
    return -1;
}


BINARY SEARCH Using recursion:-

→ main ()
  {
    int A[20], i, m, key, pos;
    printf ("enter n");
    scanf (" %d ", &m);
    printf (" enter elements in sorted order ");
    for (i=0; i<m; i++)
    scanf ("%d", &a[i]);
    printf ("enter search element ");
    scanf ("%d ", &key);
    pos = binary_search (a, 0, m, key);
    if (pos >= 0)
        printf (" element is found at place %d", pos+1);
    else
        printf (" Not found");
  }

  int binary_search (int a[], int low, int high, int key)
  {
    int mid;
```

```
if ( low > high )
return -1;
else
{
    mid = ( low + high )/2;
    if ( a [mid] == key )
    return mid;
    else if ( key < a [mid] )
    binary_search ( a, low, mid - 1, key );
    else
    binary_search ( a, mid + 1, high, key );
}
}
```

Differences between Linear & Binary Search:-

LINEAR SEARCH	BINARY SEARCH
→ Elements are searched in sequential way	→ Elements are searched in by dividing into 2 parts
→ Elements may not be in sorted order	→ Elements must be in sorted order
→ Best case $O(1)$	→ Best case $O(1)$
→ Worst case $O(n)$	→ Worst case $O(\log_2 n)$
→ It is also called Sequential Search	→ It is also called logarithmic search