Binary Search

```
#include <stdio.h>

// Function prototype
int binary_search(int arr[], int n, int x);

int main() {
   int n, x;

   // Input the size of the array
   printf("Enter the number of elements in the array: ");
   scanf("%d", &n);

   int arr[n];

   // Input the elements of the array
   printf("Enter %d elements in sorted order:\n", n);
   for (int i = 0; i < n; i++) {
      scanf("%d", &arr[i]);
   }

   // Input the element to search
   printf("Enter the element to search: ");
   scanf("%d", &x);

   // Perform Binary Search
   int index = binary_search(arr, n, x);

   if (index != -1) {
      printf("Element %d found at index %d\n", x, index);
   } else {
      printf("Element %d not found in the array\n", x);
   }

   return 0;
}

// Function to perform Binary Search
int binary_search(int arr[], int n, int x) {
   int low = 0, high = n - 1;

   while (low <= high) {
      int mid = low + (high - low) / 2;

      // Check if the element is present at mid
      if (arr[mid] == x) {
         return mid;
      }

      // If the element is larger, search in the right subarray
      if (arr[mid] < x) {
         low = mid + 1;
      }
```

```
        // If the element is smaller, search in the left subarray
        else {
            high = mid - 1;
        }
    }

    return -1; // Element not found
}
```

Interpolation Search

```
#include <stdio.h>

// Function prototype
int interpolation_search(int arr[], int n, int x);

int main() {
    int n, x;

    // Input the size of the array
    printf("Enter the number of elements in the array: ");
    scanf("%d", &n);

    int arr[n];

    // Input the elements of the array
    printf("Enter %d elements in sorted order:\n", n);
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
    }
    // Input the element to search
    printf("Enter the element to search: ");
    scanf("%d", &x);
    // Perform Interpolation Search
    int index = interpolation_search(arr, n, x);

    if (index != -1) {
        printf("Element %d found at index %d\n", x, index);
    } else {
        printf("Element %d not found in the array\n", x);
    }
    return 0;
}
// Function to perform Interpolation Search
int interpolation_search(int arr[], int n, int x) {
```

```
  int low = 0, high = n - 1;

  while (low <= high && x >= arr[low] && x <= arr[high]) {
    // Calculate the position using the interpolation formula
    int pos = low + ((double)(high - low) / (arr[high] - arr[low])) * (x - arr[low]);

    // Check if the element is found
    if (arr[pos] == x) {
      return pos;
    }
    // If the element is larger, search in the right subarray
    if (arr[pos] < x) {
      low = pos + 1;
    }
    // If the element is smaller, search in the left subarray
    else {
      high = pos - 1;
    }
  }

  return -1; // Element not found
}
```