Binary Search

```
#include<bits/stdc++.h>
using namespace std;

int BinarySearch(int arr[], int Start, int End, int x)
{
   while(Start <= End)
   {
      int mid = (Start + End)/2;
      if (arr[mid] == x)
         return mid;

      if (arr[mid] < x)
         Start = mid + 1;
      else
         End = mid -1;
   }
   return -1;
}

int main()
{
   int n,x;
   cout<<"Enter the number of elements: ";
   cin>>n;
   int arr[n];
   cout<<"Enter the elements in sorted order: ";
   for(int i=1; i<=n; i++)
   {
      cin>>arr[i];
   }

   cout<<"Enter the Value: ";
   cin>>x;
   int result = BinarySearch(arr,1,n,x);

   if (result == -1)
      cout<<"Value Not Found."<<endl;
   else
      cout<<"Value Found at Index: "<<result<<endl;
}
```

```
Enter the number of elements: 7
Enter the elements in sorted order: 5 9 11 25 30 44 60
Enter the Value: 30
Value Found at Index: 5
```

```
Enter the number of elements: 7
Enter the elements in sorted order: 5 9 11 25 30 44 60
Enter the Value: 40
Value Not Found.
```

Selection Sort

```
#include <bits/stdc++.h>
using namespace std;

void selectionSort(int arr[], int n)
{
   for (int i = 0; i < n - 1; i++)
   {
      int minIndex = i;
      for (int j = i + 1; j < n; j++)
      {
         if (arr[j] < arr[minIndex])
         {
            minIndex = j;
         }
      }
      int temp = arr[minIndex];
      arr[minIndex] = arr[i];
      arr[i] = temp;
   }
}

int main()
{
   int n;
   cout << "Enter the number of elements: ";
   cin >> n;
   int arr[n];

   cout << "Enter the elements: ";
   for (int i = 0; i < n; i++)
   {
      cin >> arr[i];
   }
```

```
    cout << "Original array: ";
    for (int i = 0; i < n; i++)
    {
        cout << arr[i] << " ";
    }
    cout << endl;

    selectionSort(arr, n);

    cout << "Sorted array: ";
    for (int i = 0; i < n; i++)
    {
        cout << arr[i] << " ";
    }
    cout << endl;

    return 0;
}
```

```
Enter the number of elements: 8
Enter the elements: 70 26 50 -5 1 6 75 10
Original array: 70 26 50 -5 1 6 75 10
Sorted array: -5 1 6 10 26 50 70 75
```

Insertion Sort

```
#include <bits/stdc++.h>
using namespace std;

void insertionSort(int arr[], int n)
{
    for (int i = 1; i < n; i++)
    {
        int key = arr[i];
        int j = i - 1;
        while (j >= 0 && arr[j] > key)
        {
            arr[j + 1] = arr[j];
            j = j - 1;
        }
        arr[j + 1] = key;
    }
}
```

```
int main()
{
    int n;
    cout << "Enter the number of elements: ";
    cin >> n;
    int arr[n];

    cout << "Enter the elements: ";
    for (int i = 0; i < n; i++)
    {
        cin >> arr[i];
    }

    cout << "Original array: ";
    for (int i = 0; i < n; i++)
    {
        cout << arr[i] << " ";
    }
    cout << endl;

    insertionSort(arr, n);

    cout << "Sorted array: ";
    for (int i = 0; i < n; i++)
    {
        cout << arr[i] << " ";
    }
    cout << endl;

    return 0;
}
```

```
Enter the number of elements: 9
Enter the elements: 500 80 100 90 -10 10 1 5 15
Original array: 500 80 100 90 -10 10 1 5 15
Sorted array: -10 1 5 10 15 80 90 100 500
```

Merge Sort

```
#include <bits/stdc++.h>
#include <climits>
using namespace std;

void merge(int arr[], int left, int mid, int right)
{
   int n1 = mid - left + 1;
   int n2 = right - mid;
   int L[n1 + 1], R[n2 + 1];
   for (int i = 0; i < n1; i++)
   {
      L[i] = arr[left + i]; }
   for (int j = 0; j < n2; j++)
   {
      R[j] = arr[mid + 1 + j]; }
   L[n1] = INT_MAX;
   R[n2] = INT_MAX;
   int i = 0, j = 0;
   for (int k = left; k <= right; k++)
   {
      if (L[i] <= R[j])
      {
         arr[k] = L[i];
         i++;
      }
      else
      {
         arr[k] = R[j];
         j++;
      }
   }
}
void mergeSort(int arr[], int left, int right)
{
   if (left < right)
   {
      int mid = (left + right) / 2;
      mergeSort(arr, left, mid);
      mergeSort(arr, mid + 1, right);
      merge(arr, left, mid, right);
   }
}
```

```
int main()
{
    int n;
    cout << "Enter the number of elements: ";
    cin >> n;
    int arr[n];

    cout << "Enter the elements: ";
    for (int i = 0; i < n; i++)
    {
        cin >> arr[i];
    }
    cout<<endl;

    cout << "Original array: ";
    for (int i = 0; i < n; i++)
    {
        cout << arr[i] << " ";
    }
    cout << endl;

    mergeSort(arr, 0, n - 1);
    cout << "Sorted array: ";
    for (int i = 0; i < n; i++)
    {
        cout << arr[i] << " ";
    }
    cout << endl;

    return 0;
}
```

```
Enter the number of elements: 8
Enter the elements: 100 50 10 20 -5 -10 60 30

Original array: 100 50 10 20 -5 -10 60 30
Sorted array: -10 -5 10 20 30 50 60 100
```