UNIVERSITY OF AGRICULTURE, FAISALABAD

ASSIGNMENT

Data Structure and Algorithm

CS-410

SUBMITTED TO:

Dr. Nayyar Iqbal SB

SUBMITTED BY:

Muhammad Hamza (2020-ag-6492)

Insertion Sort

```cpp
#include<iostream>
using namespace std;
int main ()
{
    int myarray[8] = { 77,33,44,11,88,22,66,55};

    cout<<"Given array: \n";
    for(int i=0;i<8;i++)
    {
        cout <<myarray[i]<<"\t";
    }
    for(int k=1; k<8; k++)
    {
        int temp = myarray[k];
        int j= k-1;
        while(j>=0 && temp <= myarray[j])
        {
            myarray[j+1] = myarray[j];
            j = j-1;
        }
        myarray[j+1] = temp;
    }
    cout<<"\nSorted array: \n";
    for(int i=0;i<8;i++)
    {
        cout <<myarray[i]<<"\t";
    }
}
```

```
Given array:
77      33      44      11      88      22      66      55
Sorted array:
11      22      33      44      55      66      77      88
--------------------------------
Process exited after 0.08201 seconds with return value 0
Press any key to continue . . .
```

Selection Sort

```cpp
#include <bits/stdc++.h>
using namespace std;
void swap(int *xp, int *yp)
{
    int temp = *xp;
    *xp = *yp;
    *yp = temp;
}
void selectionSort(int arr[], int n)
{
    int i, j, min_idx;
    for (i = 0; i < n-1; i++)
    {
        min_idx = i;
        for (j = i+1; j < n; j++)
        if (arr[j] < arr[min_idx])
            min_idx = j;

        swap(&arr[min_idx], &arr[i]);
    }
}
void printArray(int arr[], int size)
{
    int i;
    for (i=0; i < size; i++)
        cout << arr[i] << ", ";
    cout << endl;
}
int main()
{
    cout<<"Given array;\n77, 33, 44, 11, 88, 22, 66, 55\n";
    int arr[] = {77,33,44,11,88,22,66,55};
    int n = sizeof(arr)/sizeof(arr[0]);
    selectionSort(arr, n);
    cout << "Sorted array: \n";
    printArray(arr, n);
    return 0;
```

```
Given array;
77, 33, 44, 11, 88, 22, 66, 55
Sorted array:
11, 22, 33, 44, 55, 66, 77, 88,

--------------------------------
Process exited after 0.07889 seconds with return value 0
Press any key to continue . . .
```

Merge Sort

```cpp
#include <iostream>
using namespace std;
void merge(int arr[], int p, int q, int r) {
  int n1 = q - p + 1;
  int n2 = r - q;

  int L[n1], M[n2];

  for (int i = 0; i < n1; i++)
    L[i] = arr[p + i];
  for (int j = 0; j < n2; j++)
    M[j] = arr[q + 1 + j];
  int i, j, k;
  i = 0;
  j = 0;
  k = p;
  while (i < n1 && j < n2) {
    if (L[i] <= M[j]) {
      arr[k] = L[i];
      i++;
    } else {
      arr[k] = M[j];
      j++;
    }
    k++;
  }
  while (i < n1) {
    arr[k] = L[i];
    i++;
    k++;
  }

  while (j < n2) {
    arr[k] = M[j];
    j++;
    k++;
  }
}
```

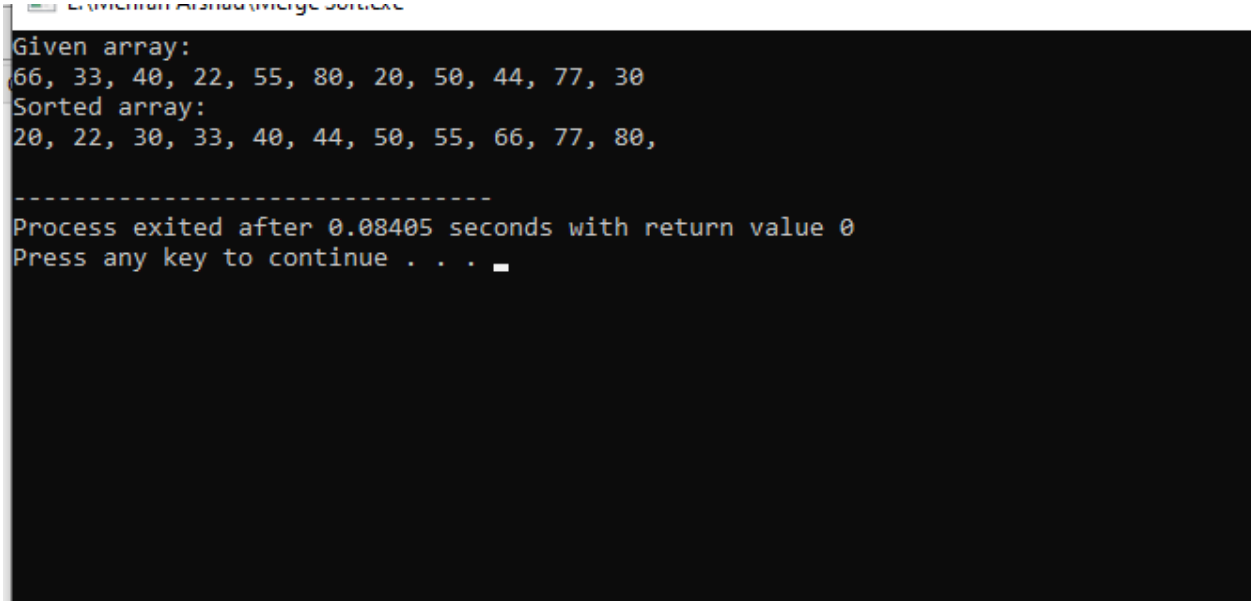
```cpp
  }
  while (i < n1) {
    arr[k] = L[i];
    i++;
    k++;
  }

  while (j < n2) {
    arr[k] = M[j];
    j++;
    k++;
  }
}
void mergeSort(int arr[], int l, int r) {
  if (l < r) {
    int m = l + (r - l) / 2;

    mergeSort(arr, l, m);
    mergeSort(arr, m + 1, r);
    merge(arr, l, m, r);
  }
}
void printArray(int arr[], int size) {
  for (int i = 0; i < size; i++)
    cout << arr[i] << ", ";
  cout << endl;
}
int main() {
    cout<<"Given array: \n66, 33, 40, 22, 55, 80, 20, 50, 44, 77, 30 \n";
  int arr[] = {66,33,40,22,55,80,20,50,44,77,30};
  int size = sizeof(arr) / sizeof(arr[0]);

  mergeSort(arr, 0, size - 1);

  cout << "Sorted array: \n";
  printArray(arr, size);
  return 0;
}
```



Radix Sort

```
}
void countingSort(int array[], int size, int place) {
  const int max = 10;
  int output[size];
  int count[max];

  for (int i = 0; i < max; ++i)
    count[i] = 0;
  for (int i = 0; i < size; i++)
    count[(array[i] / place) % 10]++;
  for (int i = 1; i < max; i++)
    count[i] += count[i - 1];
  for (int i = size - 1; i >= 0; i--) {
    output[count[(array[i] / place) % 10] - 1] = array[i];
    count[(array[i] / place) % 10]--;
  }

  for (int i = 0; i < size; i++)
    array[i] = output[i];
}
void radixsort(int array[], int size) {
  int max = getMax(array, size);
  for (int place = 1; max / place > 0; place *= 10)
    countingSort(array, size, place);
}
void printArray(int array[], int size) {
  int i;
  for (i = 0; i < size; i++)
    cout << array[i] << " ";
  cout << endl;
}
int main() {
    cout<<"Given array:\n121 432 94 873 564 23 1 45 788\nSorted array:\n";
  int array[] = {121, 432, 94, 873, 564, 23, 1, 45, 788};
  int n = sizeof(array) / sizeof(array[0]);
  radixsort(array, n);
  printArray(array, n);
}
```

```cpp
#include <iostream>
using namespace std;
int getMax(int array[], int n) {
  int max = array[0];
  for (int i = 1; i < n; i++)
    if (array[i] > max)
      max = array[i];
  return max;
}
void countingSort(int array[], int size, int place) {
  const int max = 10;
  int output[size];
  int count[max];

  for (int i = 0; i < max; ++i)
    count[i] = 0;
  for (int i = 0; i < size; i++)
    count[(array[i] / place) % 10]++;
  for (int i = 1; i < max; i++)
    count[i] += count[i - 1];
  for (int i = size - 1; i >= 0; i--) {
    output[count[(array[i] / place) % 10] - 1] = array[i];
    count[(array[i] / place) % 10]--;
  }

  for (int i = 0; i < size; i++)
    array[i] = output[i];
}
void radixsort(int array[], int size) {
  int max = getMax(array, size);
  for (int place = 1; max / place > 0; place *= 10)
    countingSort(array, size, place);
}
void printArray(int array[], int size) {
  int i;
  for (i = 0; i < size; i++)
    cout << array[i] << " ";
  cout << endl;
}
```

```
E:\Mehran Arshad\Radix output.exe
Given array:
121 432 94 873 564 23 1 45 788
Sorted array:
1 23 45 94 121 432 564 788 873

--------------------------------
Process exited after 0.07637 seconds with return value 0
Press any key to continue . . .
```

Brute Force

brute force.cpp

```cpp
#include<iostream>
using namespace std;
main(){
    //enter x-cordinates respectively
    int px[12]={2,13,4,5,4,7,7,9,11,12,14,15};
    //enter y-cordinates respectively
    int py[12]={5,3,4,1,11,7,13,10,5,12,10,7};
    int i,j;
    for(i=0;i<=11;i++){
        bool maxima=true;
        for(j=0;j<=11;j++){
            if(!(i=j)&(px[i]<=px[j])&&(py[i]<=py[j])){
                maxima = false;
                break;
            }
        }
        if(maxima=true){

                cout<<"("<<px[i]<<","<<py[i]<<")   ";
            }
    }
}
```

```
C:\Users\Lenovo\Documents\plane sweep.exe
(13,3) (12,12) (14,10) (15,7)
--------------------------------
Process exited after 2.011 seconds with return value 0
Press any key to continue . . .
```

Plane Sweep

brute force.cpp | plane sweep.cpp

```cpp
#include<iostream>
#include<stack>
using namespace std;
main(){
    //enter x-cordinates respectively
    int px[12]={2,13,4,5,4,7,7,9,11,12,14,15};
    //enter y-cordinates respectively
    int py[12]={5,3,4,1,11,7,13,10,5,12,10,7};
    int i,j;
    stack<int> stx;
    stack<int> sty;
    for(i=0;i<=11;i++){
        bool maxima=true;
        for(j=0;j<=11;j++){
            if((!(i=j))&&(px[i]<=px[j])&&(py[i]<=py[j])){
                bool maxima = false;
                break;
            }
        }
        if(maxima=true){
                stx.push(px[i]);
                sty.push(py[i]);

            }
    }
    while ((!stx.empty())&&(!sty.empty())){
            cout<<"("<<stx.top()<<","<<sty.top()<<")   ";
            stx.pop();
            sty.pop();
        }
}

```

C:\Users\Lenovo\Documents\plane sweep.exe

```
(13,3) (12,12) (14,10) (15,7)
--------------------------------
Process exited after 2.011 seconds with return value 0
Press any key to continue . . .
```