DSA Lab04

23K2001

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BCS-3J

Q1:

```cpp
//23K2001 - Muzammil
#include<iostream>
using namespace std;

void sortByRange(int *arr,int n,int x,int y){
    if(x>n || y>n || x<0 || y<0){
        cout<<"Exceeded bounds!"<<endl;
        return;
    }
    if(x==y)
    return;

    if(x<y){
        for(int i=x;i<y;i++){
            int min_index = i;

            for(int j=i+1;j<y+1;j++){
                if(arr[j]<arr[min_index])
                    min_index = j;
            }
            int temp = arr[i];
            arr[i] = arr[min_index];
            arr[min_index] = temp;
        }
    }
    else{
        for(int i=x;i<n-1;i++){
            int min_index = i;
            for(int j=i+1;j<n;j++)
                if(arr[j] < arr[min_index])
                    min_index = j;

            int temp = arr[i];
            arr[i] = arr[min_index];
            arr[min_index] = temp;
        }
        for(int i=0;i<y;i++){
            int min_index = i;
            for (int j=i+1;j<y+1;j++)
                if (arr[j] < arr[min_index])
                    min_index = j;
```

```
            int temp = arr[i];
            arr[i] = arr[min_index];
            arr[min_index] = temp;
        }
    }
}

int main(){
    int *m = nullptr;
    int n;
    cout<<"How many elements: ";
    cin>>n;
    m = new int[n];
    cout<<"Enter "<<n<<" elements:"<<endl;
    for(int i=0;i<n;i++)
    cin>>m[i];

    int a,b;
    cout<<endl<<"Enter range [a,b] to sort: ";
    cin>>a>>b;
    sortByRange(m,n,a,b);
    cout<<"After sorting in range:"<<endl;
    for(int i=0;i<n;i++)
      cout<<m[i]<<"\t";
    delete[] m;
    return 0;
}
```

```
How many elements: 5
Enter 5 elements:
7 8 4 5 2

Enter range [a,b] to sort: 1 4
After sorting in range:
7       2       4       5       8
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structures (LAB)\
a Structures (LAB)\Lab Tasks\Lab04 - Sorting\" ; if ($?) { g++ Q1_23K2001.cpp
How many elements: 4
Enter 4 elements:
20 10 3 8

Enter range [a,b] to sort: 3 1
After sorting in range:
10      20      3       8
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structures (LAB)\
```

Q2:

```cpp
//23K2001 - Muzammil
#include<iostream>
using namespace std;

void largestToMiddle(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--;
        }
        arr[j+1] = key;
    }
    int mid = n/2;
    int temp = arr[n-1];
    int j=n-1;
    while(j>mid){
        arr[j] = arr[j - 1];
        j--;
    }
    arr[mid] = temp;
}
int main(){
    int *m = nullptr;
    int n;
    cout<<"How many elements: ";
    cin>>n;
    m = new int[n];
    cout<<"Enter "<<n<<" elements:"<<endl;
    for(int i=0;i<n;i++)
    cin>>m[i];

    largestToMiddle(m,n);
    cout<<endl<<"After sorting, & largest to middle:"<<endl;
    for(int i=0;i<n;i++)
      cout<<m[i]<<"\t";
    delete[] m;
    return 0;
}
```

```
How many elements: 9
Enter 9 elements:
20 12 15 2 10 1 13 9 5

After sorting, & largest to middle:
1       2       5       9       20      10      12      13      15
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structures (
LAB)\Lab Tasks\Lab04 - Sorting>
```

Q3:

```cpp
//23K2001 - Muzammil
#include<iostream>
using namespace std;

void sortString(string *s,int n){
    for(int i=0;i<n-1;i++){
        for(int j=0;j<n-1;j++){
            if(s[j] > s[j+1]){
                string temp = s[j];
                s[j] = s[j+1];
                s[j+1] = temp;
            }
        }
    }
}
int main(){
    string *m = nullptr;
    int n;
    cout<<"How many elements: ";
    cin>>n;
    m = new string[n];
    cout<<"Enter "<<n<<" words:"<<endl;
    for(int i=0;i<n;i++)
    cin>>m[i];

    sortString(m,n);
    cout<<endl<<"After sorting:"<<endl;
    for(int i=0;i<n;i++)
      cout<<m[i]<<"\t";
    delete[] m;
    return 0;
}
```

```
How many elements: 5
Enter 5 words:
banana
apple
cherry
date
grape

After sorting:
apple   banana  cherry  date    grape
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structures (LAB)\
er-3\Data Structures (LAB)\Lab Tasks\Lab04 - Sorting\" ; if ($?) { g++ Q3_23K
How many elements: 6
Enter 6 words:
banana
apple
date
cherry
orange
grape

After sorting:
apple   banana  cherry  date    grape   orange
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structures (LAB)\
```

Q4:

```cpp
//23K2001 - Muzammil
#include<iostream>
using namespace std;
template<class T>
bool haveDuplicates(T *arr,int n){
    for(int i=0;i<n;i++){
        for(int j=i+1;j<n;j++){
            if(arr[i]==arr[j])
            return true;
        }
    }
    return false;
}

int main(){
    int *m = nullptr;
    int n;
    cout<<"How many elements: ";
    cin>>n;
    m = new int[n];
    cout<<"Enter "<<n<<" elements:"<<endl;
    for(int i=0;i<n;i++)
    cin>>m[i];

    cout<<endl<<"Checking for duplicates:"<<endl;
    if(haveDuplicates(m,n)==true)
    cout<<endl<<"inputted array has duplicates."<<endl;
    else
    cout<<endl<<"no duplicates."<<endl;

    for(int i=0;i<n;i++)
        cout<<m[i]<<"\t";
    delete[] m;
    return 0;
}
```

```
How many elements: 5
Enter 5 elements:
27 30 2001 27 2

Checking for duplicates:

inputted array has duplicates.
27      30      2001    27      2
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structur
er-3\Data Structures (LAB)\Lab Tasks\Lab04 - Sorting\" ; if ($?) { g
How many elements: 5
Enter 5 elements:
1 3 2 6 8

Checking for duplicates:

no duplicates.
1       3       2       6       8
```

```
How many elements: 5
Enter 5 elements:
apple
banana
cherry
apple
grape

Checking for duplicates:

inputted array has duplicates.
apple   banana  cherry  apple   grape
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\
```

```cpp
int main(){
    string *m = nullptr;
    int n;
    cout<<"How many elements: ";
    cin>>n;
    m = new string[n];
```

Q5:

```cpp
//23K2001 - Muzammil
#include<iostream>
using namespace std;

void sortYear(int *arr,int n){
    for(int i=0;i<n-1;i++){
        for(int j=0;j<n-1;j++){
            if(arr[j] > arr[j+1]){
                int temp = arr[j];
                arr[j] = arr[j+1];
                arr[j+1] = temp;
            }
        }
    }
}
int main(){
    int *m = nullptr;
    int n;
    cout<<"How many children: ";
    cin>>n;
    m = new int[n];
    cout<<"Enter "<<n<<" birth years:"<<endl;
    for(int i=0;i<n;i++)
    cin>>m[i];

    sortYear(m,n);
    cout<<endl<<"After sorting:"<<endl;
    for(int i=0;i<n;i++)
        cout<<m[i]<<"\t";
    delete[] m;
    return 0;
}
```

```
How many children: 6
Enter 6 birth years:
2022 2023 2024 2022 2023 2024

After sorting:
2022    2022    2023    2023    2024    2024
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data
```

Q6:

```cpp
//23K2001 - Muzammil
#include<iostream>
using namespace std;

int binSearch(int *arr,int n,int key){
    int left = 0;
    int right = n-1;
    while(left <= right) {
        int mid = left + (right - left)/2;

        if (arr[mid] == key)
            return mid;
        else if (arr[mid] < key)
            left = mid + 1;
        else
            right = mid - 1;
    }
    return -1;
}
void sortArr(int *arr,int n){
    for(int i=0;i<n-1;i++){
        for(int j=0;j<n-1;j++){
            if(arr[j] > arr[j+1]){
                int temp = arr[j];
                arr[j] = arr[j+1];
                arr[j+1] = temp;
            }
        }
    }
}
int main(){
    int *m = nullptr;
    int n;
    cout<<"How many elements: ";
    cin>>n;
    m = new int[n];
    cout<<"Enter "<<n<<" elements:"<<endl;
    for(int i=0;i<n;i++)
    cin>>m[i];
    sortArr(m,n);
    cout<<endl;
    for(int i=0;i<n;i++)
```

```
    cout<<m[i]<<"\t";

    int x;
    cout<<endl<<"Enter value to search for: ";
    cin>>x;
    int res = binSearch(m,n,x);
    if(res!=-1)
    cout<<"Value present at index#"<<res<<endl;
    else
    cout<<"Value couldn't be found."<<endl;
    delete[] m;
    return 0;
}
```

```
How many elements: 10
Enter 10 elements:
1 3 12 14 23 34 55 65 75 78

1       3       12      14      23      34      55      65      75      78
Enter value to search for: 01                          //23K2001 - Muzammil
Value present at index#0
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structures (LAB)\Lab
er-3\Data Structures (LAB)\Lab Tasks\Lab04 - Sorting\" ; if ($?) { g++ Q6_23K2001
How many elements: 10
Enter 10 elements:
1 12 3 14 65 75 55 23 34 78

1       3       12      14      23      34      55      65      75      78
Enter value to search for: 20
Value couldn't be found.
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structures (LAB)\Lab
```

Q7:

```cpp
//23K2001 - Muzammil
#include<iostream>
using namespace std;

int binSearch(string *arr,int n,string key,int &c){
    int left = 0;
    int right = n-1;
    while(left <= right) {
        int mid = left + (right - left)/2;
        c++;
        if (arr[mid] == key)
            return mid;
        else if (arr[mid] < key)
            left = mid + 1;
        else
            right = mid - 1;
    }
    return -1;
}
int linearSearch(string *arr,int n,string key,int &c){
    for(int i=0;i<n;i++){
        c++;
        if(arr[i]==key)
        return i;
    }
    return -1;
}

int main(){
    string *m = nullptr;
    int n;
    cout<<"How many elements: ";
    cin>>n;
    m = new string[n];
    cout<<"Enter "<<n<<" elements:"<<endl;
    for(int i=0;i<n;i++)
    cin>>m[i];

    string x;
    cout<<endl<<"Enter value to search for: ";
    cin>>x;
```

```
    cout<<endl<<"By binary search:"<<endl;
    int c1 = 0;
    int res1 = binSearch(m,n,x,c1);
    if(res1!=-1)
        cout<<"Value present at index#"<<res1<<endl;
    else
        cout<<"Value couldn't be found."<<endl;
    cout<<"Steps taken: "<<c1<<endl;

    cout<<endl<<"By linear search:"<<endl;
    int c2 = 0;
    int res2 = linearSearch(m,n,x,c2);
    if(res2!=-1)
        cout<<"Value present at index#"<<res2<<endl;
    else
        cout<<"Value couldn't be found."<<endl;
    cout<<"Steps taken: "<<c2<<endl;

    delete[] m;
    return 0;
}
```

```
How many elements: 10
Enter 10 elements:
Ahmed
Ali
Basit
Karim
Rizwan
Sarwar
Tariq
Taufiq
Yasin
Zulfiqar

Enter value to search for: Aftab

By binary search:
Value couldn't be found.
Steps taken: 3

By linear search:
Value couldn't be found.
Steps taken: 10
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data
```

```
How many elements: 10
Enter 10 elements:
Ahmed
Ali
Basit
Karim
Rizwan
Sarwar
Tariq
Taufiq
Yasin
Zulfiqar

Enter value to search for: Rizwan

By binary search:
Value present at index#4
Steps taken: 1

By linear search:
Value present at index#4
Steps taken: 5
PS F:\Semester Materi
```

```
How many elements: 10
Enter 10 elements:
Ahmed
Ali
Basit
Karim
Rizwan
Sarwar
Tariq
Taufiq
Yasin
Zulfiqar

Enter value to search for: Tariq

By binary search:
Value present at index#6
Steps taken: 4

By linear search:
Value present at index#6
Steps taken: 7
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data
```

```
How many elements: 10
Enter 10 elements:
Ahmed
Ali
Basit
Karim
Rizwan
Sarwar
Tariq
Taufiq
Yasin
Zulfiqar

Enter value to search for: Muzammil

By binary search:
Value couldn't be found.
Steps taken: 4

By linear search:
Value couldn't be found.
Steps taken: 10
PS F:\Semester Material - Muzammil\FAST-KHI-Semester-3\Data Structures
```