15B17CI371 – Data Structures Lab

ODD 2024

Week 4-LAB B

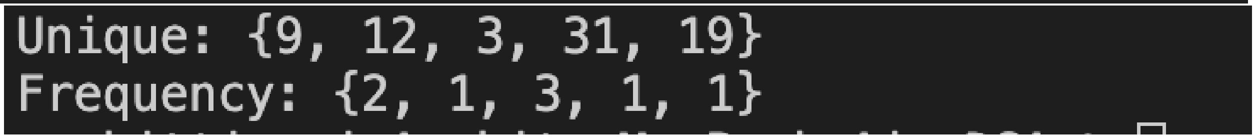
Practice Lab

[CO: C270.2]

1.

```
#include <iostream>
using namespace std;
#define MAX_SIZE 100
void countFrequencies(int arr[], int size) {
int uniqueElements[MAX_SIZE];
int frequencies[MAX_SIZE];
int uniqueCount = 0;
for (int i = 0; i < MAX_SIZE; ++i) {
uniqueElements[i] = -1;
frequencies[i] = 0;
}
for (int i = 0; i < size; ++i) {
int element = arr[i];
bool found = false;
for (int j = 0; j < uniqueCount; ++j) {
if (uniqueElements[j] == element) {
frequencies[j]++;
found = true;
break;
}
}
if (!found) {
uniqueElements[uniqueCount] = element;
frequencies[uniqueCount] = 1;
uniqueCount++;
}
}
cout << "Unique: {";
for (int i = 0; i < uniqueCount; ++i) {
```

```
cout << uniqueElements[i];
if (i < uniqueCount - 1) cout << ", ";
}
cout << "}" << endl;
cout << "Frequency: {";
for (int i = 0; i < uniqueCount; ++i) {
cout << frequencies[i];
if (i < uniqueCount - 1) cout << ", ";
}
cout << "}" << endl;
}
int main() {
int array[] = {9, 12, 3, 31, 3, 19, 9, 3};
int size = sizeof(array) / sizeof(array[0]);
countFrequencies(array, size);
return 0;
}
```

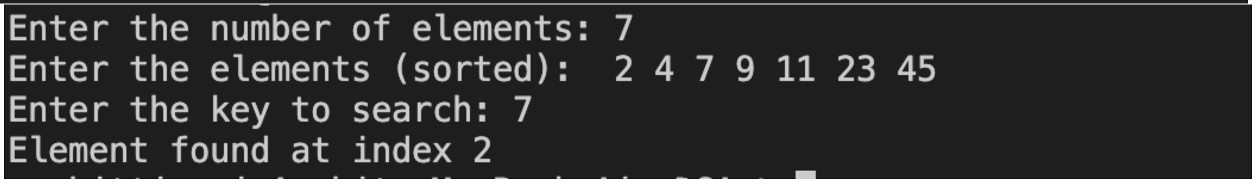


```
Unique: {9, 12, 3, 31, 19}
Frequency: {2, 1, 3, 1, 1}
```

2.

```
#include <iostream>
#include <cmath>
using namespace std;
int jumpSearch(int arr[], int size, int key) {
int step = sqrt(size);
int prev = 0;
while (arr[min(step, size) - 1] < key) {
prev = step;
step += sqrt(size);
if (prev >= size) return -1;
}
while (arr[prev] < key) {
prev++;
if (prev == min(step, size)) return -1;
}
if (arr[prev] == key) return prev;
return -1;
}
```

```
int main() {
int size;
cout << "Enter the number of elements: ";
cin >> size;
if (size <= 0) {
cout << "Array size must be positive." << endl; return 1;
}
int* array = new int[size];
cout << "Enter the elements (sorted): ";
for (int i = 0; i < size; ++i) {
cin >> array[i];
}
int key;
cout << "Enter the key to search: ";
cin >> key;
int index = jumpSearch(array, size, key);
if (index != -1) {
cout << "Element found at index " << index << endl; } else {
cout << "Element not found" << endl;
}
delete[] array;
return 0;
}
```

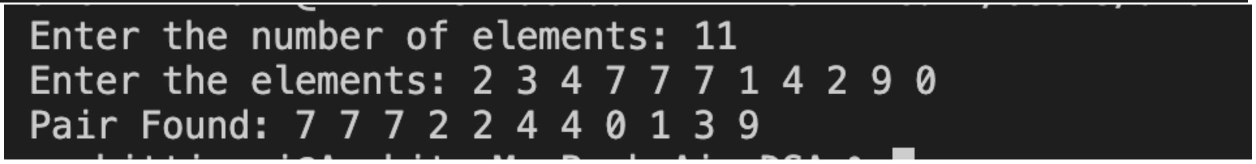


```
Enter the number of elements: 7
Enter the elements (sorted):  2 4 7 9 11 23 45
Enter the key to search: 7
Element found at index 2
```

3.

```
#include <iostream>
using namespace std;
const int MAX_SIZE = 100;
void countFrequency(int arr[], int n, int unique[], int freq[], int& uniqueCount) {
uniqueCount = 0;
for (int i = 0; i < n; ++i) {
bool found = false;
for (int j = 0; j < uniqueCount; ++j) {
if (arr[i] == unique[j]) {
freq[j]++;
found = true;
break;
}
}
if (!found) {
unique[uniqueCount] = arr[i];
freq[uniqueCount] = 1;
uniqueCount++;
}
}
}
void sortByFrequency(int unique[], int freq[], int n) {
for (int i = 0; i < n - 1; ++i) {
for (int j = i + 1; j < n; ++j) {
if (freq[i] < freq[j] || (freq[i] == freq[j] && unique[i] > unique[j])) {
swap(freq[i], freq[j]);
swap(unique[i], unique[j]);
}
}
}
}
void sortArrayByFrequency(int input[], int size) {
int freq[MAX_SIZE];
int unique[MAX_SIZE];
int uniqueCount;
countFrequency(input, size, unique, freq, uniqueCount);
sortByFrequency(unique, freq, uniqueCount);
cout << "Pair Found: ";
for (int i = 0; i < uniqueCount; ++i) {
for (int j = 0; j < freq[i]; ++j) {
cout << unique[i] << " ";
}
}
cout << endl;
}
int main() {
int size;
cout << "Enter the number of elements: ";
cin >> size;
if (size <= 0 || size > MAX_SIZE) {
cout << "Invalid size. Size must be positive and less than or equal to " << MAX_SIZE
<< endl; return 1;
}
int array[MAX_SIZE];
```

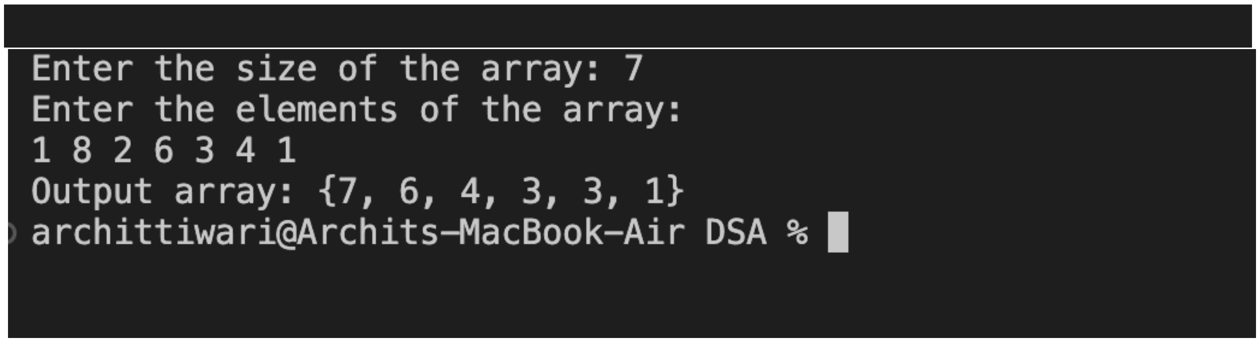
```
cout << "Enter the elements: ";
for (int i = 0; i < size; ++i) {
cin >> array[i];
}
sortArrayByFrequency(array, size);
return 0;
}
```



```
Enter the number of elements: 11
Enter the elements: 2 3 4 7 7 7 1 4 2 9 0
Pair Found: 7 7 7 2 2 4 4 0 1 3 9
```

4.

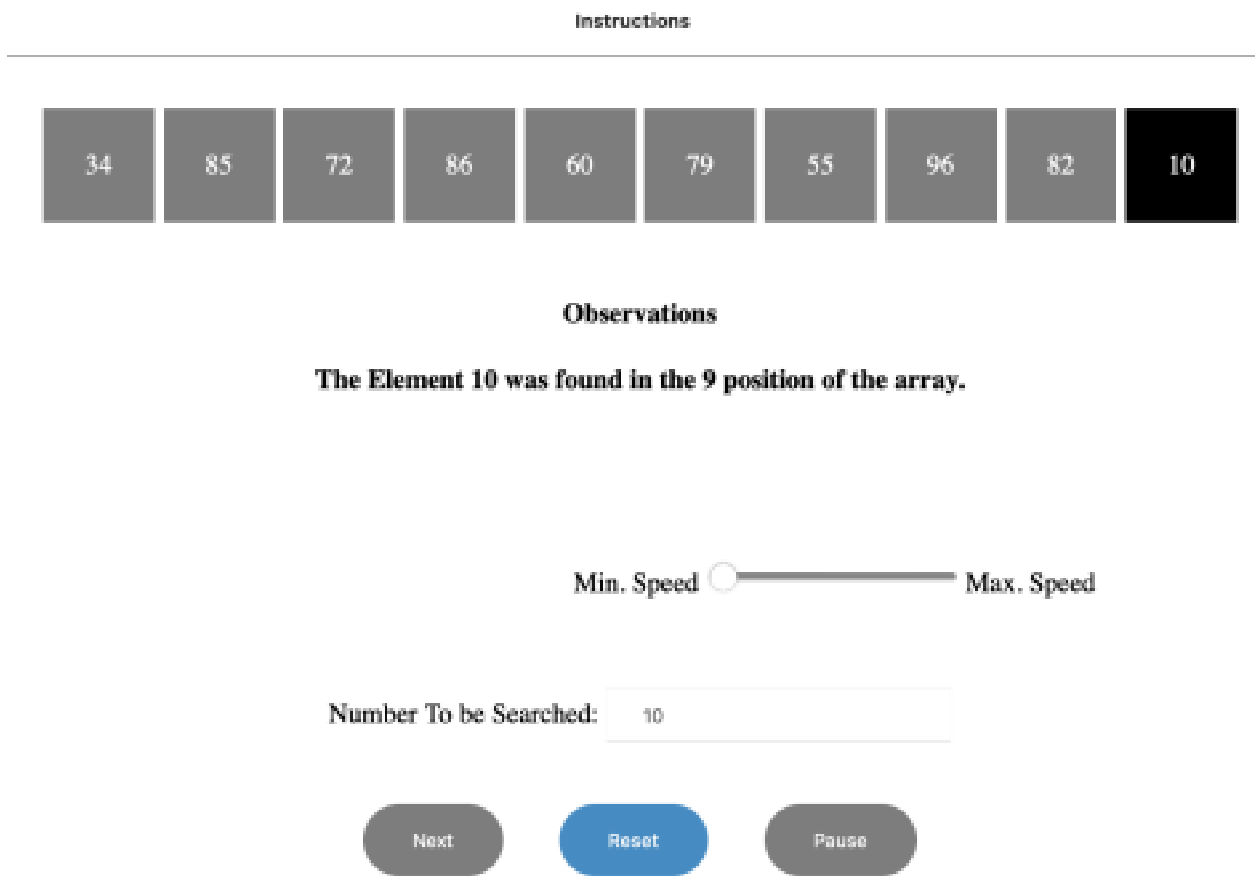
```
#include <iostream>
#include <vector>
#include <algorithm>
using namespace std;
vector<int> computeDifferencesAndSort(int arr[], int size) { vector<int> differences;
for (int i = 1; i < size; i++) {
differences.push_back(abs(arr[i] - arr[i - 1]));
}
sort(differences.begin(), differences.end(), greater<int>());
return differences;
}
int main() {
int size;
cout << "Enter the size of the array: ";
cin >> size;
int arr[size];
cout << "Enter the elements of the array:" << endl; for (int i = 0; i < size; i++) {
cin >> arr[i];
}
vector<int> result = computeDifferencesAndSort(arr, size);
cout << "Output array: {";
for (size_t i = 0; i < result.size(); i++) {
cout << result[i];
if (i < result.size() - 1) cout << ", ";
}
cout << "}" << endl;
return 0;
}
```



```
Enter the size of the array: 7
Enter the elements of the array:
1 8 2 6 3 4 1
Output array: {7, 6, 4, 3, 3, 1}
archittiwari@Archits-MacBook-Air DSA %
```

VIRTUAL LAB

Linear Search

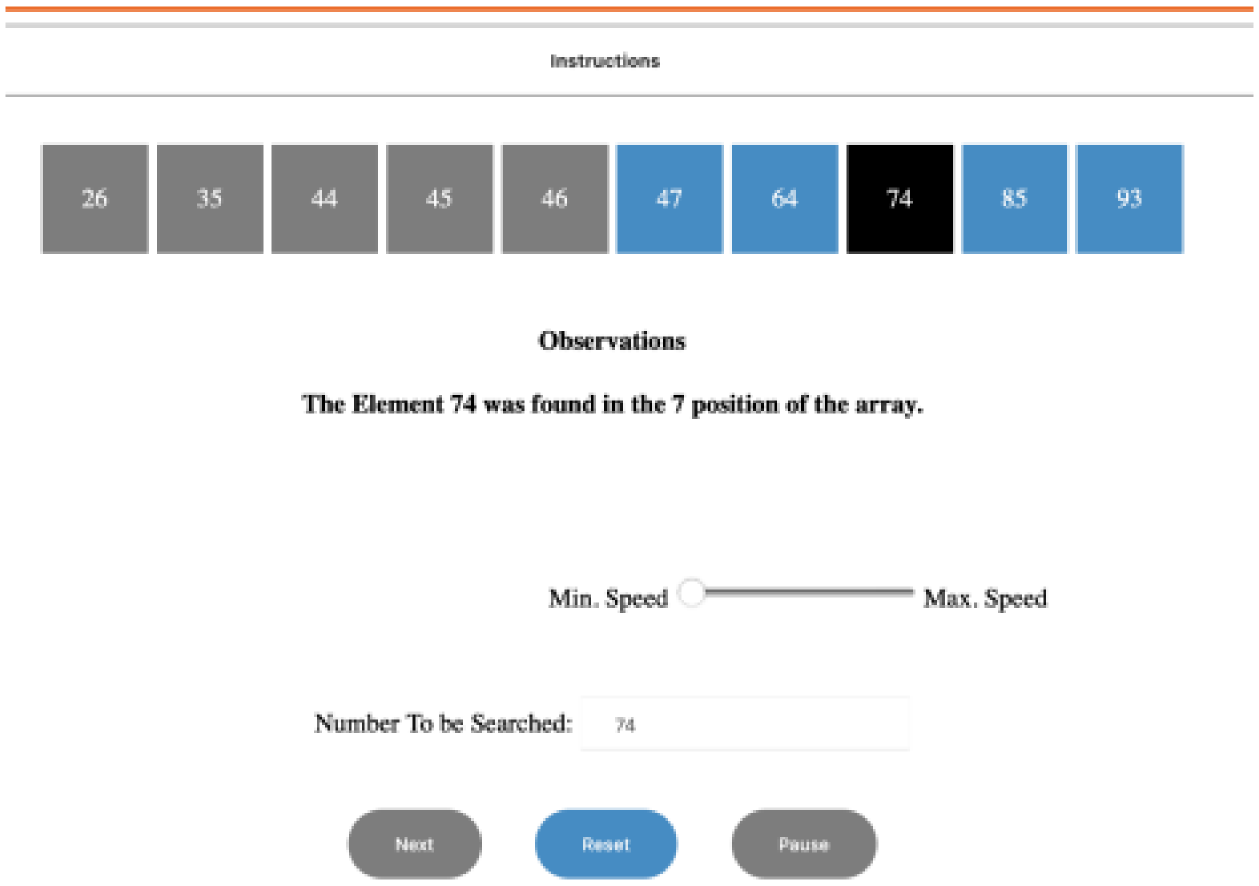


Observations

The Element 10 was found in the 9 position of the array.

Number To be Searched: 10

Binary Search



26	35	44	45	46	47	64	74	85	93

Observations

The Element 74 was found in the 7 position of the array.

Number To be Searched: 74