	Department of Computer Science and Engineering Faculty of Engineering, South Eastern University of Sri Lanka			
	Subject	**CS53003: Data Structure and Algorithms**		
	Batch	**E18**	**Semester**	**5**

Lab no and title : Hands-on Lab 8 – Arrays and Linked Lists
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01.

Start here | Ex01.cpp

```cpp
#include<iostream>

using namespace std;

int main(){
    int n;
    cout<<"Enter the no. of income sources :";
    cin>>n;
    int arr[n];
    int tcount=0;
    cout<<"Enter the income from various sources :"<<endl;

    for(int i=0; i<n; i++){
        cin>>arr[i];
    }
    for(int i=0; i<n; i++){
        if(arr[i]>9950){
            tcount++;
        }
    }
    if(tcount>0){
        cout<<"No. of taxable income(s) : "<< tcount;
    }
    else{
        cout<<"Not liable to pay income tax";
    }
}
```

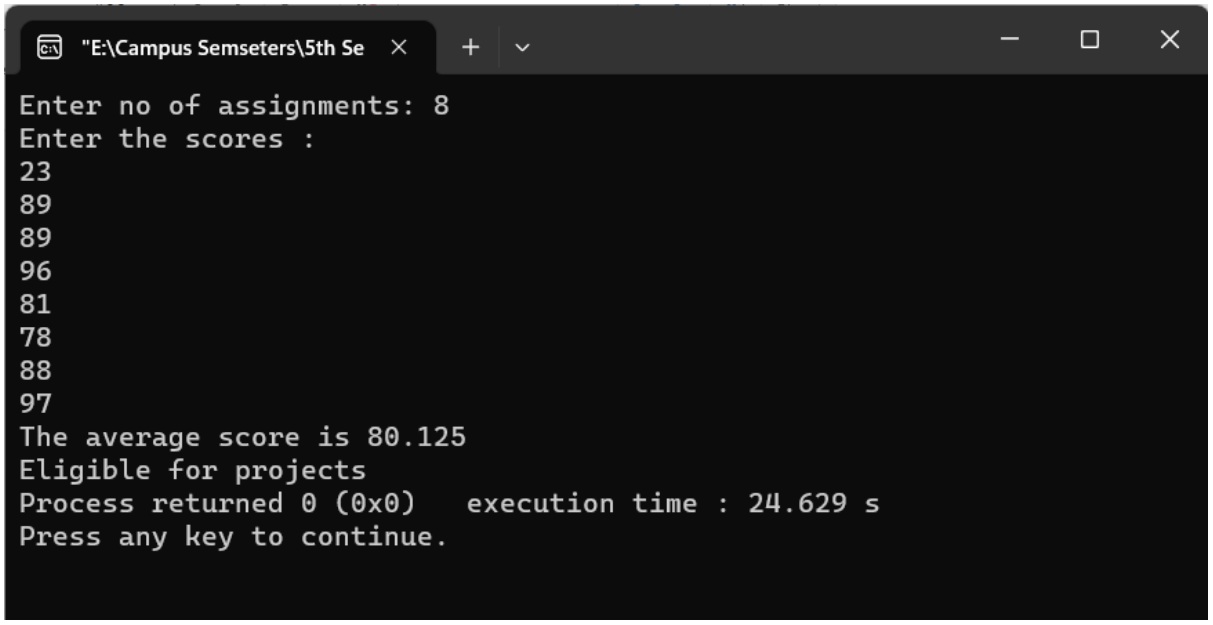
```
"E:\Campus Semseters\5th Se
Enter the no. of income sources :3
Enter the income from various sources :
390
9951
12000
No. of taxable income(s) : 2
Process returned 0 (0x0)   execution time : 16.213 s
Press any key to continue.
```

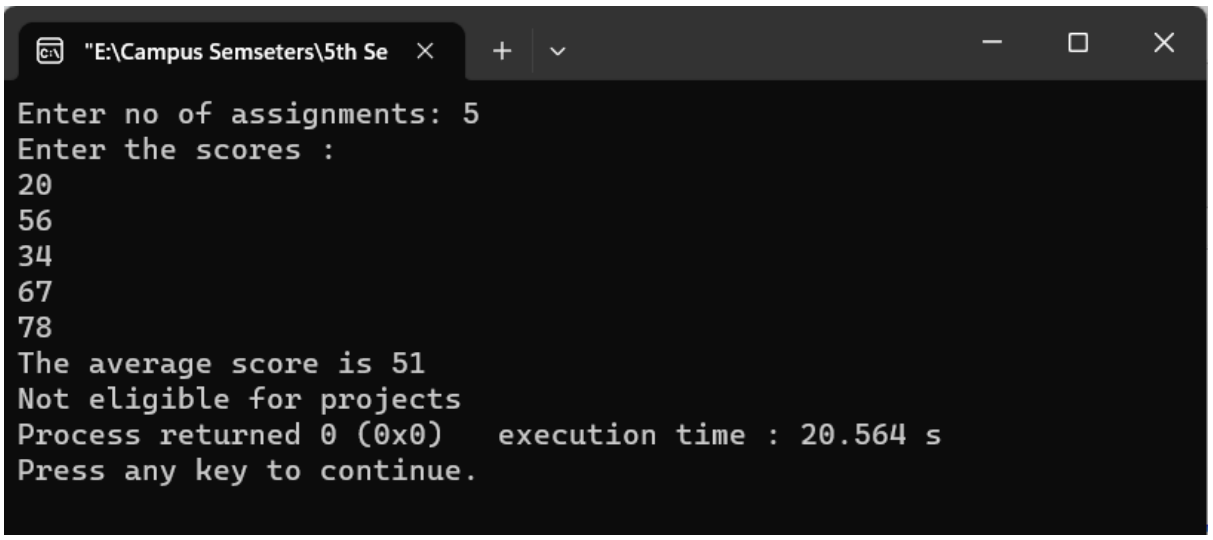
```
"E:\Campus Semseters\5th Se
Enter the no. of income sources :5
Enter the income from various sources :
9950
1290
9000
1500
2890
Not liable to pay income tax
Process returned 0 (0x0)   execution time : 21.539 s
Press any key to continue.
```

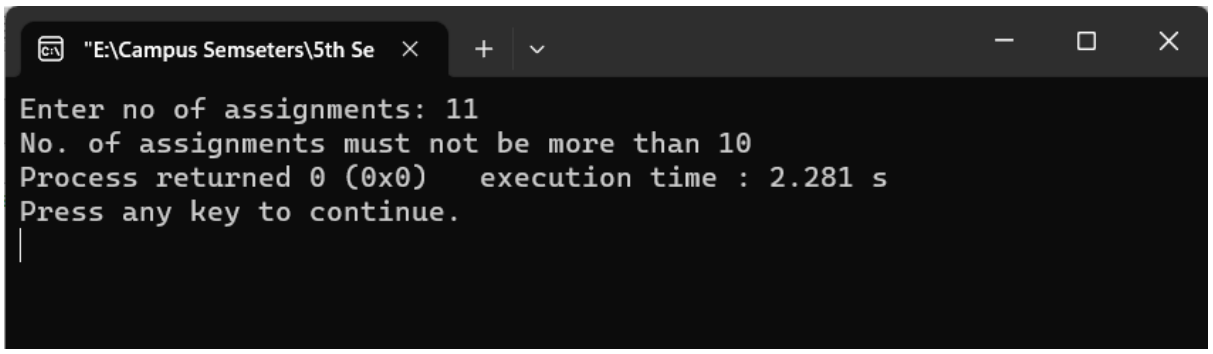
02.

Start here | Ex01.cpp | Ex02.cpp

```cpp
#include<iostream>

using namespace std;

int main(){
    int n;
    cout<<"Enter no of assignments: ";
    cin>>n;
    if (n>10 || n<0){
        cout<<"No. of assignments must not be more than 10 ";
    }
    else{
        float arr[n];
        int total=0;
        cout<<"Enter the scores :"<<endl;

        for(int i=0; i<n; i++){
            cin>>arr[i];
        }
        for(int i=0; i<n; i++){
            total=total+arr[i];
        }
        float avg = float(total)/n;
        cout<<"The average score is "<<avg<<endl;
        if(avg>80){
            cout<<"Eligible for projects";
        }
        else{
            cout<<"Not eligible for projects";
        }
    }
}
```


"E:\Campus Semseters\5th Se
Enter no of assignments: 8
Enter the scores :
23
89
89
96
81
78
88
97
The average score is 80.125
Eligible for projects
Process returned 0 (0x0)   execution time : 24.629 s
Press any key to continue.


"E:\Campus Semseters\5th Se
Enter no of assignments: 5
Enter the scores :
20
56
34
67
78
The average score is 51
Not eligible for projects
Process returned 0 (0x0)   execution time : 20.564 s
Press any key to continue.

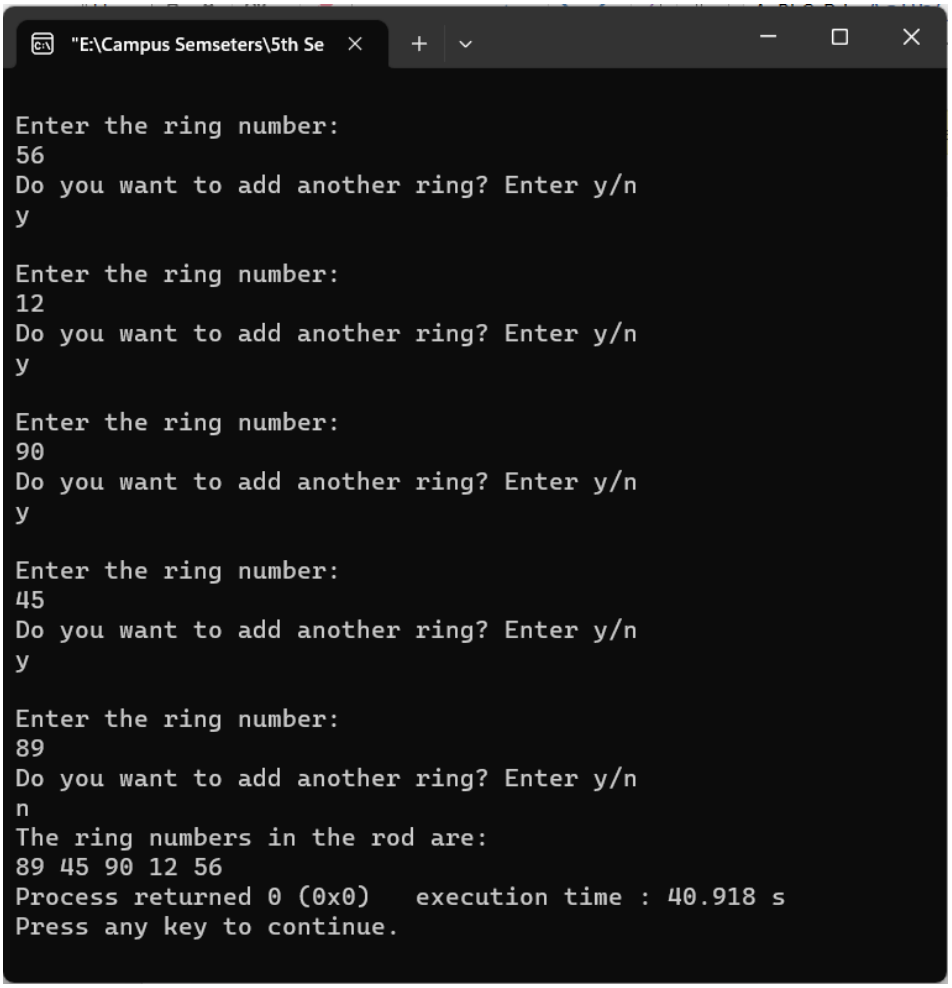

"E:\Campus Semseters\5th Se
Enter no of assignments: 11
No. of assignments must not be more than 10
Process returned 0 (0x0)   execution time : 2.281 s
Press any key to continue.

03.

Start here | *Untitled1 | Ex3.cpp

```
1  //PLEASE DO NOT CHANGE THE GIVEN CODE TEMPLATE. WRITE YOUR CO
2
3  #include <iostream>
4  using namespace std;
5
6  class Node {
7      public:
8          int data;
9          Node* next;
10 };
11
12 class LinkedList {
13   public:
14         Node *head,*tail;
15         LinkedList()  {
16             head = NULL;
17             tail = NULL;
18         }
19         void insertAtFront(int);
20         void display();
21
22 };
23
24 void LinkedList:: insertAtFront(int value)  {
25     //Write your code here
26     Node* newNode = new Node();
27     newNode->data = value;
28     newNode->next = head;
29     head = newNode;
30
31
32 }
33
34 void LinkedList:: display(){
35
36     //Write your code here
37     Node* tmp = head;
38     while(tmp != nullptr){
39         cout<<tmp->data<<" ";
40         tmp = tmp->next;
41     }
42
43 }
44
```

```cpp
int main() {
    char choice;
    int value;
    LinkedList rod;
    do{
        cout<<"\nEnter the ring number:\n";
        cin>>value;


        //Write your code here
        rod.insertAtFront(value);

        cout<<"Do you want to add another ring? Enter y/n \n";
        cin>>choice;

    }while(choice=='y');
    cout<<"The ring numbers in the rod are: \n";


    //Write your code here
    rod.display();

    return 0;
}
```

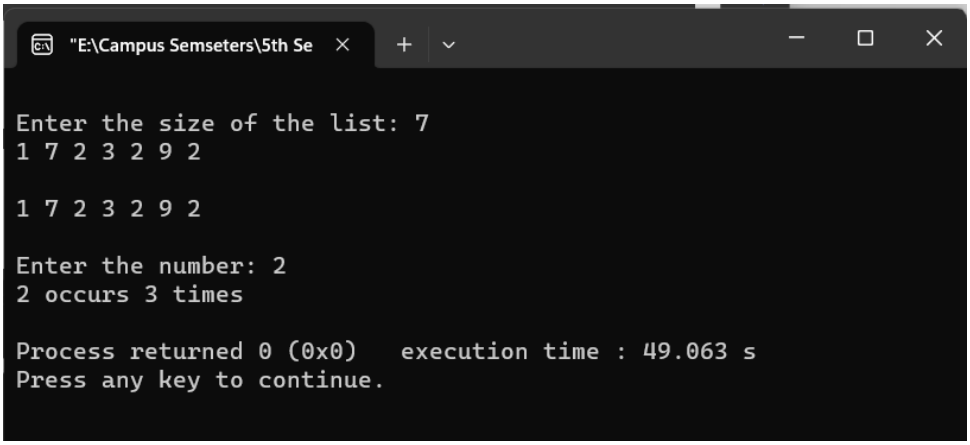


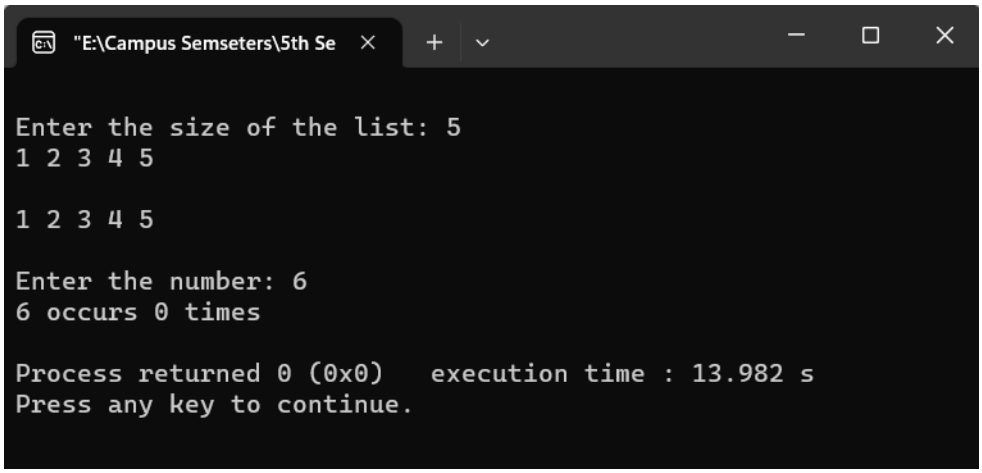
04.

Start here | *Untitled1 | Ex3.cpp | Ex4.cpp

```cpp
//PLEASE DO NOT CHANGE THE GIVEN CODE TEMPLATE. WRITE YOUR

#include <iostream>
using namespace std;

class Node {
    public:
        int data;
        Node* next;
};

class LinkedList {
  public:
        Node *head;
        LinkedList()  {
            head = NULL;
        }
        void append(int);
        void display();
        int countTheKey(int);
};

void LinkedList :: append(int value)  {
    //Write your code here
    Node* newNode = new Node();
    newNode->data = value;
    newNode->next = NULL;

    if (head == NULL) {
        head = newNode;
    }
    else {
        Node* current = head;
        while (current->next != NULL) {
            current = current->next;
        }
        current->next = newNode;
    }
}
```

```
42
43  void LinkedList :: display() {
44      //Write your code here
45      if (head == NULL) {
46          cout << "The list is empty." << endl;
47      }
48      else {
49          Node* current = head;
50          while (current != NULL) {
51              cout << current->data << " ";
52              current = current->next;
53          }
54          cout << endl;
55      }
56
57  }
58
59  int LinkedList :: countTheKey(int key){
60      //Write your code here
61      int count = 0;
62      Node* current = head;
63      while (current != NULL) {
64          if (current->data == key) {
65              count++;
66          }
67          current = current->next;
68      }
69      return count;
70
71  }
72
73  int main(){
74      cout<<"\nEnter the size of the list: ";
75      int N,value,key;
76      LinkedList lst;
77      cin>>N;
78      if(N>0){
79          for(int i=0;i<N;i++){
80              cin>>value;
81              lst.append(value);
82          }
83          cout<<"\n";
84          lst.display();
85          cout<<"\nEnter the number: ";
86          cin>>key;
87
88          //Write your code here
89      int count = lst.countTheKey(key);
90          cout <<  key << " occurs " << count << "times" << endl;
91
92      }
93      else
94      cout<<"\nInvalid Input";
95
96      return 0;
97  }
98
```


"E:\Campus Semseters\5th Se
Enter the size of the list: 7
1 7 2 3 2 9 2
1 7 2 3 2 9 2
Enter the number: 2
2 occurs 3 times
Process returned 0 (0x0) execution time : 49.063 s
Press any key to continue.


"E:\Campus Semseters\5th Se
Enter the size of the list: 5
1 2 3 4 5
1 2 3 4 5
Enter the number: 6
6 occurs 0 times
Process returned 0 (0x0) execution time : 13.982 s
Press any key to continue.

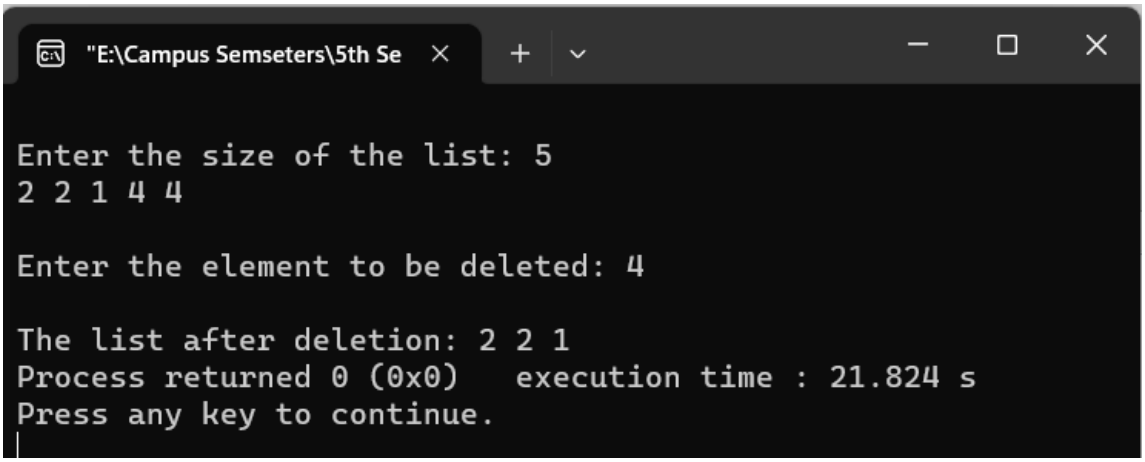
05.

Start here | *Untitled1 | Ex3.cpp | Ex4.cpp | Ex5.cpp

```cpp
//PLEASE DO NOT CHANGE THE GIVEN CODE TEMPLATE. WRITE

#include<iostream>
using namespace std;
class Node {
    public:
        //Fill your code here
        int data;
        Node* next;
};


class LinkedList {
   public:
        Node *head;
        LinkedList() {
            head = NULL;
        }
        void append(int);
        void deleteAllOccurrences(int key);
        void display();
};

void LinkedList :: append(int value){
    //Write your code here
    Node *newNode = new Node;
    newNode->data = value;
    newNode->next = NULL;

    if(head == NULL) {
        head = newNode;
        return;
    }

    Node *temp = head;
    while(temp->next != NULL)
        temp = temp->next;

    temp->next = newNode;

}
```

```
44  void LinkedList :: deleteAllOccurrences(int key){
45      //Write your code here
46      Node *temp = head, *prev = NULL;
47
48      while(temp != NULL && temp->data == key) {
49          head = temp->next;
50          delete temp;
51          temp = head;
52      }
53
54      while(temp != NULL) {
55          while(temp != NULL && temp->data != key) {
56              prev = temp;
57              temp = temp->next;
58          }
59
60          if(temp == NULL)
61              return;
62
63          prev->next = temp->next;
64          delete temp;
65          temp = prev->next;
66      }
67
68  }
69
70  void LinkedList :: display() {
71      Node *temp = head;
72      cout<<"\nThe list after deletion: ";
73      while(temp != NULL) {
74          cout<<temp->data << " ";
75          temp = temp->next;
76      }
77  }
```

```
80  int main(){
81      cout<<"\nEnter the size of the list: ";
82      int N,value;
83      LinkedList lst;
84      cin>>N;
85      for(int i=0;i<N;i++){
86          cin>>value;
87          lst.append(value);
88      }
89      cout<<"\nEnter the element to be deleted: ";
90      int delValue;
91      cin>>delValue;
92
93      // Write your here here for deleting and displaying the elements in the list
94
95      lst.deleteAllOccurrences(delValue);
96      lst.display();
97
98
99
100
101     return 0;
102 }
```


"E:\Campus Semseters\5th Se
Enter the size of the list: 5
2 2 1 4 4
Enter the element to be deleted: 4
The list after deletion: 2 2 1
Process returned 0 (0x0)   execution time : 21.824 s
Press any key to continue.

***