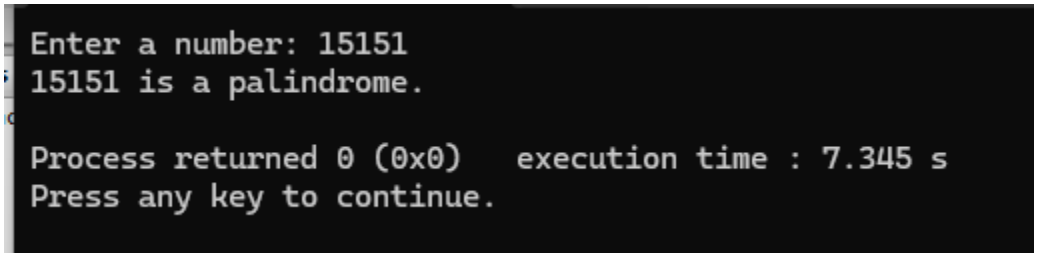
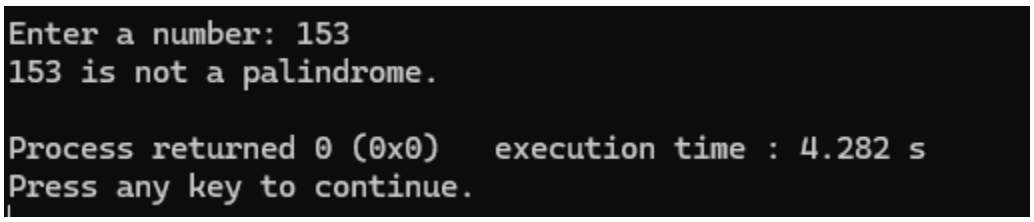
15B17CI371 – Data Structures Lab
ODD 2024
Week 5-LAB B
Practice Lab

1.

```
#include <iostream>

using namespace std;


int reversenum(int num, int temp) {

   if (num == 0)

      return temp;

   temp = (temp * 10) + (num % 10);

   return reversenum(num / 10, temp);

}




bool ispalindrome(int num) {


   int reversednum = reversenum(num, 0);

   return (num == reversednum);

}


int main() {

   int num;

   cout << "Enter a number: ";
```

```
    cin >> num;

    if (ispalindrome(num))
        cout << num << " is a palindrome." << endl;
    else
        cout << num << " is not a palindrome." << endl;

    return 0;
}
```





2.

```
#include <iostream>
using namespace std;
int sum(int num,int temp)
{
```

```
    if(num==0)
    {
        return temp;
    }
    else{
        temp=temp+(num%10);
        return sum(num/10,temp);
    }
}
int main() {
    int num;
    cout << "Enter a number: ";
    cin >> num;
    cout<<"sum of the digits of  "<<num<<"  is  "<<sum(num,0);
    return 0;

}
```

```
Enter a number: 153
sum of the digits of  153  is  9
Process returned 0 (0x0)   execution time : 13.619 s
Press any key to continue.
```

3.

```
#include <iostream>
```

```
using namespace std;
int fmin(int arr[] ,int n)
{
   if (n==1)
   return arr[0];
      return min(arr[n-1],fmin(arr,n-1));

}
int main() {
   int num;
   cout << "Enter size: ";
   cin >> num;
   int arr[num];
   for(int i=0;i<num;i++)
   {
      cin>>arr[i];
   }
   for(int i=0;i<num;i++)
   {
      cout<<arr[i]<<" ";
   }
   cout<<"min is  "<<fmin(arr,num);
   return 0;
```

}

```
Enter size: 4
-1
-7
4
0
-1 -7 4 0 min is  -7
Process returned 0 (0x0)   execution time : 8.072 s
Press any key to continue.
```

```
#include <iostream>


using namespace std;

int fmax(int arr[] ,int n)

{

   if (n==1)

   return arr[0];

      return max(arr[n-1],fmax(arr,n-1));


}

int main() {

   int num;

   cout << "Enter size: ";

   cin >> num;

   int arr[num];

   for(int i=0;i<num;i++)

   {
```

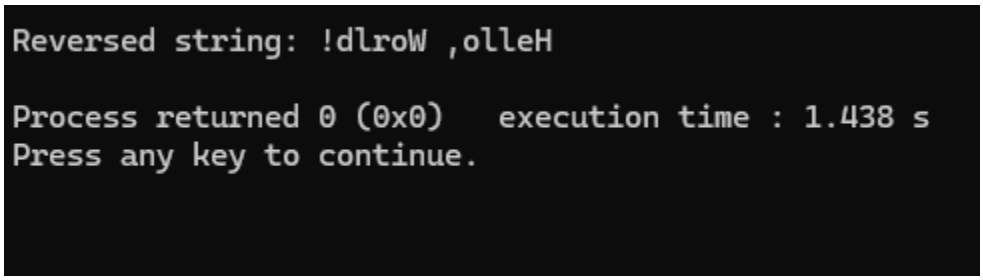
```
    cin>>arr[i];
  }
  for(int i=0;i<num;i++)
  {
    cout<<arr[i]<<" ";
  }
  cout<<"max is  "<<fmax(arr,num);
  return 0;

}
```

```
Enter size: 4
-1
-7
4
0
-1 -7 4 0 max is  4
Process returned 0 (0x0)   execution time : 10.714 s
Press any key to continue.
```

4.

```
#include <iostream>
using namespace std;

void reversestring(string &str, int start, int end) {
  if (start >= end) {
    return;
```

```
    }
    swap(str[start], str[end]);
    reversestring(str, start + 1, end - 1);
}

int main() {
    string str = "Hello, World!";
    reverseString(str, 0, str.length() - 1);
    cout << "Reversed string: " << str << endl;
    return 0;
}
```



5.

```
#include <iostream>
using namespace std;
struct Node {
    int data;
    Node* next;
};
Node* reverseList(Node* head) {
    if (head == nullptr || head->next == nullptr)
        return head;
    Node* revHead = reverseList(head->next);
```

```
    head->next->next = head;
    head->next = nullptr;
    return revHead;
}
void printList(Node* head) {
    Node* curr = head;
    while (curr != nullptr) {
        cout << curr->data << " ";
        curr = curr->next;
    }
    cout << endl;
}
Node* createNode(int data) {
    Node* newNode = new Node;
    newNode->data = data;
    newNode->next = nullptr;
    return newNode;
}
int main() {
    Node* head = nullptr;
    Node* tail = nullptr;
    int n, data;
    cout << "Enter the number of nodes: ";
    cin >> n;

    for (int i = 0; i < n; i++) {
        cout << "Enter node " << i + 1 << " data: ";
        cin >> data;
        Node* newNode = createNode(data);

        if (head == nullptr) {
            head = newNode;
            tail = head;
        } else {
            tail->next = newNode;
            tail = newNode;
        }
    }

    cout << "Original linked list: ";
    printList(head);
    head = reverseList(head);
    cout << "Reversed linked list: ";
    printList(head);
    return 0;
}
```

```
Enter the number of nodes: 5
Enter node 1 data: 1
Enter node 2 data: 2
Enter node 3 data: 3
Enter node 4 data: 4
Enter node 5 data: 5
Original linked list: 1 2 3 4 5
Reversed linked list: 5 4 3 2 1
```

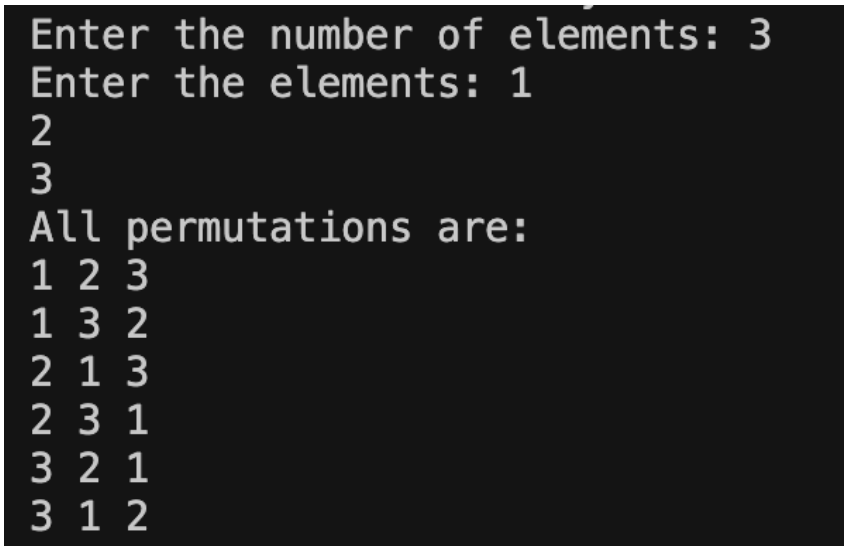
6.

```
#include <iostream>
using namespace std;
int gcd(int a, int b) {
   if (b == 0) {
      return a;
   }
   return gcd(b, a % b);
}
int lcm(int a, int b) {
   return (a * b) / gcd(a, b);
}
int main() {
   int num1, num2;

   cout << "Enter two positive integers: ";
   cin >> num1 >> num2;
   int gcdValue = gcd(num1, num2);
   int lcmValue = lcm(num1, num2);
   cout << "Greatest Common Divisor (GCD) of " << num1 << " and " << num2 << " is: " << gcdValue << endl;
   cout << "Least Common Multiple (LCM) of " << num1 << " and " << num2 << " is: " << lcmValue << endl;
   return 0;
}
```

```
Enter two positive integers: 9 25
Greatest Common Divisor (GCD) of 9 and 25 is: 1
Least Common Multiple (LCM) of 9 and 25 is: 225
```

7.

```
#include <iostream>
using namespace std;
void printPermutation(int* nums, int n) {
   for (int i = 0; i < n; i++) {
      cout << nums[i] << " ";
   }
   cout << endl;
}
void generatePermutations(int* nums, int start, int n) {
   if (start >= n) {
      printPermutation(nums, n);
      return;
   }
   for (int i = start; i < n; i++) {

      swap(nums[start], nums[i]);
      generatePermutations(nums, start + 1, n);
      swap(nums[start], nums[i]);
   }
}
int main() {
   int n;
   cout << "Enter the number of elements: ";
   cin >> n;

   int* nums = new int[n];
   cout << "Enter the elements: ";
   for (int i = 0; i < n; i++) {
      cin >> nums[i];
   }
   cout << "All permutations are:\n";
   generatePermutations(nums, 0, n);

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



8.

```
#include <iostream>
#include <string>
using namespace std;

bool isUnique(string* uniqueSubstrings, int count, const string& substring) {
    for (int i = 0; i < count; i++) {
        if (uniqueSubstrings[i] == substring) {
            return false;
        }
    }
    return true;
}

int findUniqueSubstrings(const string& str, string* uniqueSubstrings) {
    int n = str.length();
    int count = 0;
```

```
    for (int i = 0; i < n; i++) {
        for (int j = i; j < n; j++) {
            string substring = str.substr(i, j - i + 1);
            if (substring.front() == substring.back() && isUnique(uniqueSubstrings, count, substring)) {
                uniqueSubstrings[count] = substring;
                count++;
            }
        }
    }
    return count;
}

int main() {
    string input;
    cout << "Enter the input string: ";
    cin >> input;

    const int maxSubstrings = 100;
    string uniqueSubstrings[maxSubstrings];

    int uniqueCount = findUniqueSubstrings(input, uniqueSubstrings);

    cout << "Count of unique substrings with the same starting and ending characters: "
         << uniqueCount << endl;
```

```
    cout << "Unique substrings are: " << endl;
    for (int i = 0; i < uniqueCount; i++) {
        cout << uniqueSubstrings[i] << endl;
    }

    return 0;
}
```

```
Enter the input string: andisan
Count of unique substrings with the same starting and ending characters: 7
Unique substrings are:
a
andisa
n
ndisan
d
i
s
```