NUST-SMME-

CS-114 Fundamentals of Programming ASSIGNMENT#01

Date of submission: - 29-11-2023

Name: - Mohammad Abdullah Tahseen

Qalam ID: - 462573

BE-ME15 Section: - A

Course Instructor: Dr. Jawad Khan

Lab Instructor: Muhammad Affan

Task 1: -

Q. Write a C++ program to display factors of a number using for loops.

```cpp
#include<iostream>
#include<string> //for questions involving strings
using namespace std;
int main()
{
cout<<"ASSINGMENT#01:- \n";

cout<<"TASK 1:- Displaying factors of a number using for loops \n";
   //Displaying factors of a number using for loops
   int num;
   cout<<"Please enter your number:- \n";
   cin>>num;
   cout<<"Your number's factors are:- \n";
   /*loop runs from 1 to the number itself */
   for(int i=1; i<=num; i++)
   {
    /*Which ever i value divides  with the number and gives 0 remainder
     gets displayed as output, i.e. the factors of the number*/
    if(num%i != 0)
    {continue;}
    cout<<i<<' ';
   }
```

OUTPUTS: -

```
TASK 1:- Displaying factors of a number using for loops
Please enter your number:-
100
Your number's factors are:-
1 2 4 5 10 20 25 50 100
```

```
ASSINGMENT#01:-
TASK 1:- Displaying factors of a number using for loops
Please enter your number:-
150
Your number's factors are:-
1 2 3 5 6 10 15 25 30 50 75 150
```

Task 2: -

Q 2. Write output of the following code;

#include <iostream>

```
int main() {
int x = 5;
int y = 10;
if (x == 5)
   if (y == 10)
                std::cout << "x is 5 and y is 10" << std::endl;
 else
       std::cout << "x is not 5" << std::endl;
return 0;
}
```

ANS 2.

The output will be;

x is 5 and y is 10

Task 3: -

Q3. Write a C++ program, take an integer value from user and check if it's greater than 10 and less than equal to 20. Print 1 if yes and print 0 if no. Use appropriate datatype for output.

```
cout<<"\n TASK 3:- \n";
   /*Check whether input value is greater than 10 and less than and equal to 20
    and print 1 if this condition is satisfied and 0 if not*/
   int num1;
   bool output; //Since output has only 2 values; 0 and 1
   cout<<"Please enter your number:- \n";
   cin>>num1;
   //if else statement and logical operation being applied
   if(num1>10 && num1<=20)
    {output = 1;
    cout<<output; //when 10<num1<=20
    }
   else
    {output = 0;
    cout<<output;
    }
```

OUTPUTS: -

```
 TASK 3:-
Please enter your number:-
15
1
```
(condition is satisfied)

```
 TASK 3:-
Please enter your number:-
21
0
```
(condition is not satisfied)

Task 4: -

Q. Write a C++ program that uses a while loop to find the largest prime number less than a given positive integer N. Your program should take the value of N as input from the user and then find the largest prime number less than or equal to N. You are not allowed to use any library or pre-existing functions to check for prime numbers.

```
cout<<"\n TASK 4:- \n";
  //Check and display the largest prime number less than or equal to a given input number
  int N;
  cout<<"Please enter your number:- \n ";
  cin>>N;
  int i1=N;
  while (i1>=2)
  {
   /*Using a decrementing while loop
     starting from i = N and going all the way down to 2.
     The first and largrest prime number that comes in this decrementing
     order breaks the loop and gets displayed*/

   //Checking for prime number for iteration
   bool isprime;
   int n=2;
   /*running another internal while loop inside our eXternal, to check
   whether number is prime or not*/
   while (n<=i1/2)
   {
       if(i1%n==0)
      {isprime = false;
       break;
       }
       else {
       isprime = true;
       }
   n++;
   }
   //If number is prime then, while loop breaks and the number is displayed
   if(isprime)
   {cout<<"The largest prime number less than or equal to your given number is:-  "<<i1;
   break;}

   i1--;
  }
```

OUTPUTS: -

```
 TASK 4:-
Please enter your number:-
 50
The largest prime number less than or equal to your given number is:-  47
```

```
 TASK 4:-
Please enter your number:-
 100
The largest prime number less than or equal to your given number is:-  97
```

Task 5: -

Q. Write a C++ program, take two strings as input from user and check if both strings are equal or not. If they are equal, make them unequal by rotating string.

e.g., Hello is turned into olleH etc.

```
cout<<"\n \n TASK 5: - \n";
//Check equality of strings and if equal, make them unequal by rotating one of the strings
int n5, m5;
char a[n5], b[m5]; //declaring character arrays as strings
bool isequal;
//taking input of number of elements in each string
cout<<"How many characters in your 1st string?\n";
cin>>n5;
cout<<"How many characters in your 2nd string?\n";
cin>>m5;
//taking input of both the strings in the form of arrays
cout<<"Please enter your 1st string \n";
for(int j=0; j<=n5-1; j++)
{
cin>>a[j];
}
cout<<"\n Please enter your 2nd string \n";
for(int j= 0; j<=m5-1; j++)
{
cin>>b[j];
}
//Checking whether the two strings are equal or not
if(n5!=m5)
//if number of characters arent equal
```

```
}
//Checking whether the two strings are equal or not
if(n5!=m5)
//if number of characters arent equal
    {cout<<"Your strings are NOT equal \n";
    }

else{

    for(int k= 0; k<=n5-1; k++){
      if(a[k] != b[k])
    //if anyone corresponding element isn't equal
      {cout<<"Your strings are NOT equal \n";
      isequal == false;
      break;}
    //if all corresponding elements are equal
      else if(k==n5-1)
      {cout<<"Your strings are equal \n";
        cout<<"The string rotated is:- \n";
    /*if strings are equal, print out rotated string
    such that the order of elements is reversed and displayed*/
    for(int p=n5-1; p>=0; p-- )
        {
        cout<<a[p];}

        }
    }
}
```

OUTPUTS: -

```
 TASK 5: -
How many characters in your 1st string?
5
How many characters in your 2nd string?
5
Please enter your 1st string
Hello

 Please enter your 2nd string
Hello
Your strings are equal
The string rotated is:-
olleH
--------------------------------
Process exited after 58.05 seconds with return value 0
Press any key to continue . . .
```

```
 TASK 5: -
How many characters in your 1st string?
7
How many characters in your 2nd string?
8
Please enter your 1st string
happppy

 Please enter your 2nd string
supposed
Your strings are NOT equal

--------------------------------
Process exited after 1118 seconds with
Press any key to continue . . .
```

Task 6: -

Q. Perform division in C++ without / using for loops. You can use / only to display the results. Your dividend must be greater than a divisor.

```
cout<<"\n TASK 6:- \n";
//to divide wihtout using / operation and instead by using for or while loops
int dividend, divisor, dividend1;
cout<<"The two numbers to be divided are:- (note that your 1st number will be divided by the 2nd)\n";
cin>>dividend;
cin>>divisor;
dividend1 = dividend;
/*this division only gives answers in the form of quotient and remainder.
EXact values in decimal can't be displayed in this code*/
for(int n=1; n<=dividend; n++){
/*The principle used here is that; if u keep on subtracting the divisor from the
dividend upto the point where dividend < divisor. Then the amoount of times you have
subtracted gives us the qoutient and the new value of the dividend after subtraction is
remainder. */
dividend1= dividend1 - divisor;
if(dividend1 < divisor)
{
cout<<"The Qoutient is:- "<<dividend<<" / "<<divisor<<"  =  "<<n<<" and the remainder is:- "<<dividend1;
break;
}
}
```

OUTPUT: -

```
 TASK 6:-
The two numbers to be divided are:- (note that your 1st number will be divided by the 2nd)
12542
143
The Qoutient is:- 12542 / 143  =  87 and the remainder is:- 101
```

```
 TASK 6:-
The two numbers to be divided are:- (note that your 1st number will be divided by the 2nd)
50
20
The Qoutient is:- 50 / 20  =  2 and the remainder is:- 10
```

Task 7: -

Q. Write a C++program for a string which may contain lowercase and uppercase characters. The task is to remove all duplicate characters from the string and find the resultant string

```
cout<<"\n TASK:- 7 \n";
//Remove all duplicate characters from the string and find the resultant string
cout<<"Please enter the number of characters in your string\n";
int n7;
cin>>n7;
char a[n7];
//first inputting number of elements in string and the string itself
cout<<"Please enter the string\n";
for(int i=0; i<n7; i++)
{cin>>a[i];}
//now running an EXternal loop for the ith term of the string
for(int i=0; i<n7; i++)
{
    //and running an internal loop for the jth term of the string
  for(int j=0; j<n7; j++)
  //this compares the ith term to all other terms
  {
   if(i==j)  /*or else all elements will eventually fall into the else if condition
   and will be replaced by " "*/
   {continue;
   }
   /*if any two terms at different positions are equal, then the duplicate is
   terminated and replaced by " " */
   else if(a[i]==a[j])
   {
    a[i]=' ';
   }
  }
}
/*this string is then displayed but ignoring the empty spaces so to display
the whole string in a single flow. This is done by continuing the for loop
when the element is an empty space and displaying output in any other case*/
for(int i=0; i<n7; i++)
{ if(a[i]==' '){
    continue;
    }
 cout<<a[i];}
```

OUTPUT: -

The resultant string is shown in the following outputs: -

```
 TASK:- 7
Please enter the number of characters in your string
11
Please enter the string
Supposition
Supstion
```

```
 TASK:- 7
Please enter the number of characters in your string
6
Please enter the string
Cheese
Chse
```

Task 8: -

Q. Suppose an integer array a[5] = {1,2,3,4,5}. Add more elements to it and display them in C++.

```
 cout<<"\n TASK:- 8 \n";
 //Suppose an integer array a[5]={1,2,3,4,5}, add more elements to it and display them in C++
  int nu = 5, m;
  int p = nu;
 int q[nu]={1,2,3,4,5}; //set number of elements in array as a variable
 cout<<"How many more elements do you want to add in the integer array a[5]={1,2,3,4,5}? \n";
 cin>>m;
 nu= m + 5;  //add into that variable so now number of elements has increased
 cout<<"Please enter the elements you want to add in the integer array a[5] \n";
 /*despite increase in number of elements and new empty slots, the first 5 elements
  still remain as {1, 2, 3, 4, 5}*/
 for(int i=p; i<nu; i++)
 {
     //we can add the elements of the new positions
     cin>>q[i];
 }
     //and display from 0th element to n=n+mth element
 for(int i=0; i<nu; i++)
 {
     cout<<q[i]<<' ';
 }
```

OUTPUT: -

The final string is displayed in the following outputs: -

```
 TASK:- 8
How many more elements do you want to add in the integer array a[5]={1,2,3,4,5}?
0
Please enter the elements you want to add in the integer array a[5]
1 2 3 4 5
```

(in case of 0 elements added, the same array with 5 elements is displayed)

```
 TASK:- 8
How many more elements do you want to add in the integer array a[5]={1,2,3,4,5}?
3
Please enter the elements you want to add in the integer array a[5]
2
4
6
1 2 3 4 5 2 4 6
```

Task 9: -

Q. Given an integer array and an integer X. Find if there's a triplet in the array which sums up to the given integer X.

CODE: -

```
cout<<"\n TASK:- 9 \n";
/*Given an integer array and an integer X. Find if there's a triplet in the array
which sums up to the given integer X*/
int n, X;
cout<<"Please enter your integer\n";
cin>>X;

//Inputting desired integer array
cout<<"How many elements in your integer array? \n";
cin>>n;
int c[n];
cout<<"Please enter the elements of your integer array\n";
for(int i=0; i<n; i++)
{cin>>c[i];}
cout<<"The triplets in the array which sum up to "<<X<<" are:- \n";
for(int i=0; i<n; i++) //loop for first term
{
    for(int j=i+1; j<n; j++) //for 2nd term. j=i+1 (to avoid repitition)
    {
        for(int k=j+1; k<n; k++)  //for 3rd term k=j+1 (to avoid repitition)
        {
            /*compares all possible summation combination of triplets
            disregarding repitions*/
            if(c[i]+c[k]+c[j]==X)
            {
                //displays all possible summation combination which sum up to X
                cout<<c[i]<<" + "<<c[j]<<" + "<<c[k]<<" = "<<X<<endl;
            }
        }
    }

}
```

OUTPUT: -

```
 TASK:- 9
Please enter your integer
15
How many elements in your integer array?
6
Please enter the elements of your integer array
1
2
3
4
5
6
The triplets in the array which sum up to 15 are:-
4 + 5 + 6 = 15
```

```
 TASK:- 9
Please enter your integer
10
How many elements in your integer array?
6
Please enter the elements of your integer array
0
1
2
3
4
5
The triplets in the array which sum up to 10 are:-
1 + 4 + 5 = 10
2 + 3 + 5 = 10
```

Task 10: -

Q. Implement bubble sorting on an array of 6 integers.

```
cout<<"\n TASK:- 10 Bubble sorting\n";
//Implement Bubble Sort on an array of 6 integers.
int d[6], l;
//sorting of an array of integers ascending order
cout<<"Please enter your 6 integer array:- \n";
//inputting array
for(int i=0; i<=5; i++){
    cin>>d[i];
}
//BUBBLE SORTING, EACH right adjacent integer should be bigger than the left integer
int counter=0;
/*integer counter declaed to show how many times to carry out the sorting process on each adjacent
term of the array in order to finally sort it */
while(counter<6) //iterations up until counter = n-1
{
for(int i=0; i<5; i++)
{
    if(d[i]>d[i+1])  //in two adjacent elements, if the left one is larger than the right one
    {   l=d[i];
        d[i] = d[i+1];
        d[i+1] = l;
        //then their values are switched
    }
}
counter++;
}
//modified arranged or bubble sorted array is displayed
for(int i=0; i<=5; i++){
    cout<<d[i]<<' ';
}
return 0;
}
```

OUTPUT: -

The sorted array has been displayed in the following outputs

```
 TASK:- 10 Bubble sorting
Please enter your 6 integer array:-
1
4
5
23
16
0
0 1 4 5 16 23
--------------------------------
Process exited after 107.3 seconds with return value 0
Press any key to continue . . .
```

```
 TASK:- 10 Bubble sorting
Please enter your 6 integer array:-
354
657
193
200
123
0
0 123 193 200 354 657
--------------------------------
Process exited after 299 seconds with return value 0
Press any key to continue . . .
```