National University of Computer and Emerging Sciences, Lahore Campus

Course: Program:	Programming Fundamentals BDS	Course Code: Semester:	CS 1002 Fall 2021
Date Section:	27-10-2021 BSE-1A, BSE-1B	Due Date Weight	30-10-2020 … 2%

Assignment No 4

Problem:
Writing functions for some simple tasks

Submission Instruction: For each problem a due date is specified. Your solutions will be submitted on google classroom using the proper assignment submission link available at the classroom.

Warning: As discussed in class, **plagiarism** is not acceptable in any form. Although you are encouraged to discuss the assignment problems and possible solution with your class fellows but sharing your code or copy code from others or from internet might result earning an **F grade** in the entire course.

Suggestions: You can always use google to learn more about any problem if needed.

Problem 1: Computing LCH and GCD of TWO NUMBERS	DUE DATE: 30/10/2021 Before 11:59 pm

The LCM and GCD are two commonly used values needed by high-school students. The GCD of two positive Integers **m** and **n** can be easily computed by using a very old procedure commonly known as Euclidian Algorithm. It works as follows

Euclidian Algorithm

Inputs:

Two integers m and n

Algorithm:

```
1. Remainder = m mod n
2. WHILE Remainder > 0 DO
      2.1.    m = n
      2.2.    n = Remainder
      2.3.    Remainder = m mod n
   END OF WHILE
3. GCD = n
```

FOR EXAMPLE IF m = 100 and n = 45

Remainder = 10   [i.e. 100 mod 45]

m becomes 45 and n becomes 10

Remainder = 5 [i.e. 45 mod 10]

m becomes 10 and n becomes 5

Remainder = 0 [i.e. 10 mod 5]

HENCE GCD = 5

You job is to write a C++ function that will have the following form

int Euclid_GCD(int m, int n)

This function must compute the GCD of m and n using the Euclidian algorithm and return the answer.

If the user of this function sends negative numbers as parameters then the function must return the GCD of the absolute values.

Also write the main function that will allow the user to enter pairs of non-zero numbers repeatedly and display the square root of each pair. The user must be able to stop the program by entering a 0 as first or second number.

Problem 2: Computing Square root of a non-negative number	**DUE DATE: 30/10/2021 Before 11:59 pm**

We discussed two methods of computing square root of a number in class. One of the method works as follows.

```
                    Euclidian Algorithm
Inputs:
A non-negative real number R
AND a Limit on Accuracy
Algorithm:
   1. Set Left = 0 and Right = R + 1
   2. WHILE Right - Left > Limit DO
         2.1.    Mid =(Left + Right)/2
         2.2.    IF (Mid* Mid > R)
         2.3.        Right = Mid
                 ELSE
         2.4.        Left = Mid
                 END IF
      END OF WHILE
Square root is (Left + Right)/2
```

Write a C++ function that uses the above procedure to find the square root of a number passed to it as parameter. Also write the main function that must allow the users to keep on entering non-negative numbers and display the square root of each number entered by the user. The main unction must terminate when the user enters a negative number.

Problem 3: Calculate Factorial of a non-negative number n	**DUE DATE: 30/10/2021 Before 11:59 pm**

The factorial of a number n is given as n! = n*(n-1)*(n-2)*…*2*1

Write a function that computes factorial of a number passed to it as parameter. Your function must have the following form

int fact(int N)

Also write a main function to check if the values computed by your function are correct. Once again you must allow the user to enter a sequence of non-negative values and for each value entered by the user the program must display the factorial of the number. User must be able to exit the program by entering a negative number.

Problem 4: Mouse and Cats

DUE DATE: 30/10/2021 Before 11:59 pm

Two cats and a mouse are at various positions on a line. You will be given their starting positions. Your task is to write a function named **catsAndMouse** in C++ that will determine which cat will reach the mouse first, assuming the mouse does not move and the cats travel at equal speed. If the cats arrive at the same time, the mouse will be allowed to move and it will escape while they fight.

Your function must return

1	if the Cat A reaches mouse first
-1	if the Cat B reaches mouse first
0	if the mouse escapes

Also write a main function to check if the values computed by your function are correct. Once again you must allow the user to enter the inputs till the user enters all zeros. The main program must use the function to decide and produce the following output

If cat catches the mouse first, output **Cat A**.

If cat catches the mouse first, output **Cat B**.

If both cats reach the mouse at the same time, output **Mouse C** as the two cats fight and mouse escapes.

Sample I/O

```
Input: 1 2 3
Output: Cat B

Input: 1 10 4
Output: Cat A

Input: 1 3 2
Output: Mouse C
```

The first two numbers in the input specify the positions of the two cats and the third number gives the position of the mouse.