

60-141 – Introduction to Programming II Winter, 2017

Lab #2: Algorithm, Recursive Function

(Due at the beginning of the next lab period)

Objectives:

- Practice designing/implementing algorithms using recursion
- Practice use of recursive functions

Pre-requisite(s):

- Read and review chapters 1-5.

In this Lab #2, you must code and document the following functions using **RECURSION** only.

As with the last Lab #1, test the functions by calling them from a simple interactive **main()** function using a **menu**, with different values. Overall, you should have one C program (call it **Lab2.c**) containing one **main()** function and 5 other functions listed in the table below, where the functions are called based on the user input to the **menu** choices. The program should contain a loop that permits users to enter a new choice of function for each loop, until exit from the loop is explicitly chosen.

1	Summation: $\sum_{k=1}^n k = 1 + 2 + 3 + \dots + n$; $n \geq 1$; reject with error message otherwise [Note that this sum is equal to $n(n+1)/2$. DO NOT program the function – program the series.]
2	Factorial(0) = 1; Factorial(n) = $n * (n-1) * \dots * 2 * 1$ Requirement: $n \geq 0$; reject with error message otherwise
3	Fibonacci(0) = 0; Fibonacci(1) = 1; Fibonacci(n) = Fibonacci(n-1) + Fibonacci(n-2); Requirement: $n \geq 0$; reject with error message otherwise
4	$\text{gcd}(x, y) = x$, if $y=0$ $\text{gcd}(x, y) = \text{gcd}(y, x \text{ MOD } y)$, if $y > 0$ Requirement: x and y both ≥ 0 ; reject with error message otherwise
5	Power(a,b) = a^b Requirement: $a > 0$, $b \geq 0$, b is an integer; reject with error message otherwise

How to document functions?

/* **Objective:** Describe the function/its purpose briefly
 Input: Describe the input parameters, or the

assumptions/requirements for the function.

Output: Describe the output of the function. (What does it return? What does it print, if anything?)

*/

EVALUATION OF WORK AND ATTENDANCE: Total 5 marks.

You need to show to your lab instructor the work you have completed for this lab assignment, generally in the form of a working program. The marks you will receive for the lab are made of two parts, the programming part and lab attendance. Do not email your work to the Instructor or to any teaching assistant.

Lab Work Mark: You will be evaluated based on your solution for the problem assigned, using the following scheme: You must attend the lab and show your work in order to earn any of the following marks.

0 mark = No appreciable and relevant work done.

1 marks = Incomplete code / does not compile, with no, little or invalid documentation.

2 marks = Complete running program with no, little or invalid documentation.

3 marks = Incomplete code / does not compile, with suitable documentation.

4 marks = Complete running program with suitable documentation (minor errors may be accepted).

Attendance Mark: You will receive 1 mark for attendance during the lab period.

IMPORTANT:

ASK QUESTIONS IF YOU GET STUCK, BUT DO YOUR OWN CODING.
SUBMITTING WORK COPIED FROM OTHER STUDENTS WILL RESULT IN A MARK OF ZERO (0) FOR THE LAB WORK MARK.