School of Computer Science, University of Windsor

60-141: Introduction to Algorithms and Programming II
Term: Summer 2014 (July-August)
Instructor: Dr. Asish Mukhopadhyay

Lab 1
Posted: 3rd July, 2014
Due: Beginning of lab2

Preamble: The purpose of this lab is to help you reinforce the concept of recursive computation versus iterative, covering the material of Chapters 1-5 of your textbook. For the collective set eight problems below, write two menu-based C-programs, one based on iteration (with the exception of Problem 4) and the other based on recursion. Each one of the programs should be properly commented, following the style of your textbook. All lab work is expected to be original.

Grading Scheme: Each of the two programs counts for 10 points each, for a total of 20 points. The scoring break-up for each program is: 2 points for programming style (comments, modularity etc.) + 2 points for effort + 6 for correctness.

Credits: The idea of this lab as well as the problems, except for Problem 4, is due to Dr. Ziad Kobti.

Problem 1: Compute the sum $\sum_{i=1}^{n} i$, for an input positive integer n.

Problem 2: Compute the sum $\sum_{i=0}^{n}(i+1)^2$, for an input positive integer n.

Problem 3: Compute $Fibonacci(n)$ for an input integer $n \geq 2$, given that $Fibonacci(0) = 0$ and $Fibonacci(1) = 1$ and the recurrence:

$$Fibonacci(n) = Fibonacci(n-1) + Fibonacci(n-2), n \geq 2 \tag{1}$$

Problem 4: Compute $f(x, y)$ for non-negative integers x and y, given that $f(x, y) = x - y$ if $x < 0$ or $y < 0$ and the recurrence:

$$f(x, y) = f(x-1, y) + f(x, y-1) \text{ for x} \geq 0 \text{ and y} \geq 0 \tag{2}$$

Problem 5: Compute a^b for $a > 0$ and an integer $b \geq 1$.

Problem 6: For an input positive integer n, write a routine $Print(n)$ that prints $n\ n-1$ ....2 1.

Problem 7: Write a routine $DrawTriangleInverted(n)$ that prints a triangle of *'s, with n of them on the first line, $n-1$ on the second and so on, for a positive integer n.

Problem 8: Write a routine $DrawTriangle(n)$ that prints a triangle of *'s, with n of them on the last line, $n-1$ in the second last and so on, for a positive integer n.