CIS 2723 – Computer Science II Lab 6

# Lab Exercise 1 – Recursive Exponentiation

This problem is intended to be solved in a closed-lab session with a teaching assistant or instructor present.

The problem is divided into six parts:

1. Lab Objectives
2. Description of the Problem
3. Sample Output
4. Program Template (Fig. L 8.1)
5. Follow-Up Questions and Activities

The program template represents a complete working C++ program, with one or more key lines of code replaced with comments. Read the problem description and examine the sample output; then study the template code.

Using the problem-solving tips as a guide, replace the /\* \*/ comments with C++ code. Compile and execute the program. Compare your output with the sample output provided. Then answer the follow-up questions. The source code for the template is available from the Companion Website for *C++ How to Program, Ninth Edition* at [www.pearsonhighered.com/deitel/](http://www.pearsonhighered.com/deitel/).

# Description of the Problem

Write a recursive function power(base, exponent) that, when invoked, returns

*base* exponent

For example, power(3,4) = 3 \* 3 \* 3 \* 3. Assume that exponent is an integer greater than or equal to 1. Hint:

The recursive step would use the relationship

*base* exponent = *base* \* *base* exponent -1

and the terminating (or base) case occurs when the exponent is equal to 1, because

*base*1 = *base*

# Sample Output

Enter a base and an exponent: 3 4

3 raised to the 4 is 81

# Template

// Lab 6

// Recursive exponentiation.

import java.util.Scanner;

public class RecursiveExponents {

public static void main(String [] args)

{

long b = 0;

long e = 0;

Scanner scan = new Scanner(System.in);

System.out.println("Enter a base and an exponent: ");

b = scan.nextLong();

e = scan.nextLong();

System.out.println(b + " raised to the " + e + " is " /\*Write a call to function power using b and e as arguments\*/);

}

//power recursively calculates base^exponent, assume exponent >= 1

/\*Write the function header for the power function definition\*/

{

if(/\*Write the condition for the base case of the exponent equaling 1\*/)

/\*Write a return statement that returns the value of base\*/

else//recursion step

/\*Write a return statement that returns the value of base \*/

}//end function power

}

**Fig. L 8.1** | RecursiveExponents.java.

# Follow-Up Questions and Activities

1. Rewrite the power function to solve the problem iteratively (with a repetition structure) instead of recursively.