PROGRAMMING ASSIGNMENT # 6

Spring Semester **CSC 36000** **April 6, 2015**

PROGRAM STATEMENT: The mathematical function called **FACTORIAL** is defined as follows: Given a non negative integer n, n *factorial* (denoted **n!**) is the product of all integers between n and 1. Mathematically, we can write:

n! = 1 **if n = = 0**
n! = n * (n-1) * (n-2) * … * 1 **if n > 0**

This is the **iterative** definition. It can also be written as:

n! = 1 **if n = = 0**
n! = n * (n-1) ! **if n > 0**

This is the **recursive** definition.

You are to write a program using both the iterative definition and the recursive definition to calculate the factorial value of a given value **n** . In so doing, you are to collect data to compare the relative merits of each approach. The data you are to collect is given in the PROCESSING section below. The program is due on **April 13, 2015**.

INPUT: Input for this program will be in the form of the single digit integers 0 through 9 inclusive. There is NO INPUT FILE for this program.

PROCESSING: For each of the single digit integers 0 through 9, compute the factorial value for that integer using both iteration and recursion. For each method you are also to keep a count of the following statistical information:

1. The number of function calls
2. The number of assignment operations
3. The number of multiplication operations

YOU MAY MAKE THESE "Counter" variables global !!!

OUTPUT: Output for this program is to consist of the information listed below.

1. The original integer value. (ECHO PRINTING)
2. The statistical information using iteration.
   a. Value of the factorial function is _____.
   b. Number of function calls is _____ .
   c. Number of assignment operations is _____ .
   d. Number of multiplication operations is _____ .
2. The statistical information using recursion.
   a. Value of the factorial function _____ .
   b. Number of function calls _____ .
   c. Number of assignment operations _____ .
   d. Number of multiplication operations _____ .

Output for different integers may appear on the same page but output for a single integer IS NOT to be split between two pages. Output printed on the same page must also be separated by a row of 50-60 asterisks.

Sample Output for N = 0, 1 & 2

The number is: 0

The statistics for the iterative method for finding factorial values
The value of 0! is 1
The number of function calls is: 1
The number of assignment operations is: 0
The number of multiplication operations is: 0

The statistics for the recursive method for finding factorial values
The value of 0! is 1
The number of function calls is: 1
The number of assignments operations is: 0
The number of multiplication operations is: 0

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The number is: 1

The statistic for the iterative method for finding factorial values
The value of 1! is 1
The number of function calls is: 1
The number of assignments operations is: 1
The number of multiplication operations is: 1

The statistic for the recursive method for finding factorial values
The value of 1! is 1
The number of function calls is: 2
The number of assignments operations is: 1
The number of multiplication operations is: 1

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The number is: 2

The statistic for the iterative method for finding factorial values
The value of 2! is 2
The number of function calls is: 1
The number of assignments operations is: 2
The number of multiplication operations is: 2

The statistic for the recursive method for finding factorial values
The value of 2! is 2
The number of function calls is: 3
The number of assignments operations is: 2
The number of multiplication operations is: 2

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END OF PROGRAM OUTPUT