CS 150 Lab 08

Loops! Ifs! Increments! Oh my!

Date: Tuesday, October 14, 2008

The purpose of today's lab is to for you to get some hands-on experience with the different things you can do with loops.
- Be sure to answer the given questions before you start.
- Be sure your output looks **exactly** like the specified output.
- Be sure to submit each project to **CS150-01 Lab** when you are done.
- Show the instructor to TA your solution to each problem before submitting it.

Lab 8.1

For this lab, you will need to create a new Visual Studio project that will contain your source code. Name this project "08_1SumsXXXXXXXX", replacing the XXXXXXXX with your PUNetID.

Write a program that will produce **two** values. Ask the user to input a positive integer less than 100. If the user does not input a positive integer that is less than 100 print the message "**That is not a positive integer less than 100!**" and terminate the program. Next, ask the user if they want to use odd or even integers to produce a sum. The user should be able to enter either E or e for even number and O or o for odd numbers.

Once the user has answered your questions, you need to calculate:
- The sum of the even (or odd) integers from 1 to the user's number
- The average of the even (or odd) integers from 1 to the user's number (to one decimal place)

Only use **one** loop in your program. You may use either a while or for loop, whichever you think is more appropriate.

Sample Input and Output:

```
 ****************
/ Sums &         \
\        Averages /
 ****************


Please enter a positive integer less than 100: 10
Do you want to use the Even or Odd integers? E


Sum of even integers: 30
Average of even integers: 6.0
```

```
  ****************
/ Sums &          \
\         Averages /
 ****************


Please enter a positive integer less than 100: 10
Do you want to use the Even or Odd integers? O

Sum of odd integers: 25
Average of odd integers: 5.0
```

What data will you need to track in your program? What data types will you need to use? What running totals are important?

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What loop will you have in your program? What is your counter? Write an outline here.

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Challenge Program!

For this lab, you will need to create a new Visual Studio project that will contain your source code. Name this project "08_2PiXXXXXXXX", replacing the XXXXXXXX with your PUNetID. Since this problem is a *challenge* you do not need to submit it.

You can approximate Pi by using Leibniz's formula:

$$1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \cdots = \frac{\pi}{4}.$$

(from http://en.wikipedia.org/wiki/Leibniz_formula_for_pi)

Your program needs to approximate Pi using the formula above until the denominator is 593. Print the table shown below for each denominator used (from 1 to 593). All of the floating point numbers are to be displayed with 16 digits past the decimal point.

Sample input and output follow:

```
    *********************************
   / Leibniz's Pi Approximator-o-izer /
   *********************************

Denominator                 Pi/4                    Pi
   -------------------------------------------------
           1 1.0000000000000000 4.0000000000000000
           3 0.6666666666666667 2.6666666666666670

           ----- 5 to 589 OUTPUT HERE -----

         591 0.7845535712127520 3.1382142848510082
         593 0.7862399118535615 3.1449596474142458
```

What loop will you have in your program? What is your counter? Write an outline here?

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What running totals will you need to keep track of?

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