

CS 150 Lab 08

Loops! Ifs! Increments! Oh my!

Date: Tuesday, October 16, 2007

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? 0

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?

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

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:

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

(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?

What running totals will you need to keep track of?
