

# CS 150 Lab 08

## Loops! Ifs! Increments! Oh my!

**Date:** Tuesday, October 20, 2009

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.
- Save each project in a folder called 08LabPUNetID. When you have completed the required projects, drop your folder in CS150-01 Lab.
- 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 numbers and O or o for odd numbers. If the user gives something other than E, e, O, or o for this input, ask the user again for good input.

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)

### 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
```

1. List each variable declaration necessary to store the data and information in your program. The variable name and type must be enough information to describe the information the variable holds.

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2. Briefly describe the calculations you will need to perform in your program. Be sure to explain which variables from 1. will be used in each calculation.

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3. For each loop used in your program, discuss what will happen in the loop and what data and conditions will be used by the program to stop the loop.

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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\_2PiXXXXXXXXXX", replacing the XXXXXXXXX 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](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
```

1. List each variable declaration necessary to store the data and information in your program. The variable name and type must be enough information to describe the information the variable holds.

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2. Briefly describe the calculations you will need to perform in your program. Be sure to explain which variables from 1. will be used in each calculation.

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3. For each loop used in your program, discuss what will happen in the loop and what data and conditions will be used by the program to stop the loop.

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