Lab 1: C# Variables and Expressions

In this lab, you will be writing simple console-mode applications in C#.

Prelab

View the MVA video on Understanding Data Types and Variables.

Create a **lab1** folder (similar to what was done in Lab 0). Use one of your Lab 0 programs as a template.

Instructions

Solve the following programming problems. Each program should be in the form of a separate Visual Studio project (and folder). **Each program should also have a comment block at the top** (see notes for details.)

1. Write a program that computes and displays the circumference of a circle with a radius of 12.5. The circumference is 2π times the radius, or about 2 times 3.141592654 times the radius.

   Use three **double** variables: one for `pi`, another for the `radius`, and the third for the `circumference`.

   NOTE: This program will always output the *same* answer ... which is around 78.5.

2. Modify the Program 1 to prompt for and accept a radius from the person running the program.

   See M2X2.cs as an example of an interactive program.

   NOTE: This program can calculate *many* different circumferences from many different radii. For example, if the user enters 12.5, it will output a result close to 78.5, like Program 1.

   NOTE 2: Start by making a copy of the Program 1 folder using Windows Explorer. From Visual Studio, open the copy.

3. Modify Program 2 to make `pi` a **constant**, instead of a variable:

    ```
    const double PI = 3.141592654;
    ```

    (The programming convention is to use all capital letters for constant names.)

    NOTE: This is a simple change to Program 2. The `const` keyword prevents any code from accidentally or intentionally changing the value of a constant, by triggering a compiler error. Try adding the line `PI = 4 ;` to your code (anywhere in `Main` after the above line) and see what happens.

    NOTE 2: This program should give identical (or nearly-identical, some small fractions may be different) output to Program 2 for the same input!

4. Modify Program 3 to use `Math.PI` instead of the `PI` constant (remove the declaration line for the `PI` contsant and replace it in your calculation with `Math.PI`.)

5. Mortgage calculator program from the companion guide (`CSharpForBeginners2.pdf`, pp. 8-9).

    Use `String.Format( "{0:C2}", total )` to format the total amount in dollars and cents.

6. (Taken from the CTEC1184 Excel Training lab.)

    "Below you will find a formula. Convert it to a single line and place it in cells A1 and A2 respectively.   Do not use built in functions for these formulas."

    $$\frac{3x + 5}{y + 2^x} + \frac{y}{x}, where\ x = cell\ A3\ and\ y = cell\ A4$$

    Use double variables, A1, A2, A3, and A4. Initialize A3 to 5 and A4 to 3. Calculate the A1 result using the .NET `Math.Pow()` method for the 2^x term. Calculate the A2 result using the following code for the 2^x term:

    ```
    (double) (1 << (int) A3)
    ```

7. (Taken from ELEC1126.)

ELEC1126   **DC ELECTRICAL CIRCUITS**
EXPERIMENT #4   **SERIES DC CIRCUITS**

$$\text{PERCENT VARIATION} = \left| \frac{\text{MEASURED VALUE - THEORETICAL VALUE}}{\text{THEORETICAL VALUE}} \right| \times 100\ \%$$

Get the theoretical value and measured value from the user. Calculate and display the percent variation. Use the .NET `Math.Abs()` method to compute the absolute value.

Due Date

All programs should be completed and submitted by end-of-day, Friday, February 24th, 2017.

The Mid-Term Exam is on Wednesday, March 8th and is partially based on these programs.