This sheet is to be returned at the conclusion of the lab session.

Student Name:_____ Student Number:_____

ENG 1D04, Lab 5, Marked Assignment 2, Loops, Thursday

This assignment has to be submitted via ELM before 2:10 pm. **Assignments will not be accepted after this time.** As for the practice lab, compress the contents of your project folder, rename it, and submit one zip file. Please remember to submit your work early and resubmit often. **You should not wait until the end of the lab to start submitting.** You must do the assignment on your own. Conversations between students will not be permitted. You cannot bring reference material into the lab or access information through the Internet. You may use the Visual C# help, Notepad, and the Calculator program.

Background

Let n be a natural number. A *divisor* of n is a natural number d with $1 \leq d \leq n$ such that d divides n evenly (i.e., n `mod` $d = 0$ in mathematical notation and n `%` d `== 0` in C# notation). For example, the divisors of 6 are 1, 2, 3, and 6. The *greatest nontrivial divisor (GND)* of $n > 1$ is the greatest divisor of n other than n itself. For example, the GND of 6 is 3.

Overview

Your program will compute the greatest nontrivial divisor of a natural number > 1. Design, implement and test the application described in the requirements below. When done, compress the project and rename the zip file

MacID`_`*StudentNumber*`_`*LabSection*`_Lab5.zip`

where *MacID*, *StudentNumber*, and *LabSection* are your MacID, student number, and lab section (written as `L`*xy*), respectively. Details of what you must submit are specified below.

Requirements

1. A method with the heading

   ```
   int GND(int n)
   ```

   that, given an integer $n > 1$ as input, returns the GND of n as output.

2. A graphical user interface (GUI) consisting of a form with the controls described below. The text `Greatest Nontrivial Divisor Calculator` is at the top of the form. The form should be very similar to the form used for Marked Assignment 1.

3. One input label box with the label `Natural number =` , followed by a text box to accept the input.

4. One output label box with the label `Output`.

5. A `Calculate` button that when clicked replaces the output label `Output` by `The greatest nontrivial divisor = X` where `X` is the result of calling the `GND` method on the input value. If the input value is ≤ 1 or the input text box is empty, a message box is created which says `The input value is inadmissible.`

6. A `Clear` button that when clicked causes the input text box to be cleared of its value. It also restores the output label box back to the original value of `Output`.

7. When the application starts, the input text box is empty.

Design

In your project folder include a separate text document (using Notepad) with the file name *Name_LabNumber*`_Lab5.txt` where *Name* is your name and *LabNumber* is your lab section. The report will answer two questions, one related to design and the other related to testing. The testing question is given below. The design question is:

> Explain how the `GND` method could be made more efficient if it considered each i such that $1 \leq i \leq n-1$ from $n-1$ to 1 instead of from 1 to $n-1$ (see **Implementation in Visual C#** below).

Implementation in Visual C#

Implement the requirements listed above. Assume n is the input value. Write the `GND` method using a for loop that successively considers each i such that $1 \leq i \leq n-1$. The body of the loop checks to see if i is a divisor of n, and if so, processes it appropriately. Your `GND` method will be marked for correctness, not for efficiency.

Testing

In the *Name_LabNumber*`_Lab5.txt` file, answer the following testing question:

> Should prime numbers be included in the test cases? Justify your answer.

Side Remark

If the GND of $n > 1$ is 1, then n is a prime number. Thus the `GND` method can be used to check whether or not a natural number is prime.