CS1120

Recursion Worksheet
(This worksheet solution does not need to be turned in).

Historical Significance:
Euclidean Algorithm is one of the oldest algorithms – at least 300 BCE in Ancient Greece. It contains one of the “most famous” recursion functions and is used to compute the greatest common divider (GCD) of any two integers. It is extremely popular because it does not require any factoring. (For more information: http://en.wikipedia.org/wiki/Euclidean_algorithm).

How GCD work:
Given two integers (let’s call them x and y. Both x and y are not equal to zero). If y is equal to 0, then x is the GCD. Otherwise, repetitively do through the process using y and the remainder of dividing x by y (commonly referred to as: x mod y). Normally, the definition is written in the following format:
\[ \text{gcd}(x, y) = \begin{cases} x & \text{if } y = 0 \\ \text{gcd}(y, \text{remainder}(x, y)) & \text{if } x > y \text{ and } y > 0 \end{cases} \]

Writing the Program:
Today, we are going to write a C# console application (using recursion) to implement the above algorithm. (Note: This algorithm can be written iteratively, but we will be focusing on recursion).

2. Begin by creating a new class called RecursionGCD (Project → Add Class → C# Class). This class should have a default constructor (i.e., an empty constructor).
3. Inside RecursionGCD create a method called gcd that takes two integer arguments and returns an integer. (This will be the recursive method). Using the above formula for GCD, create an equivalent in C#. Remember that == is used for comparison for numbers and % is used for mod in C#.
4. Inside the class Program (i.e., the default class created by Visual Studio that contains the main program) write a quick console application. The program should display to the user a welcome message (Welcome to the GCD Recursion Program). The program should prompt the user to enter the first number (and read this number). The program should prompt the user to enter the second number (and read this number). After receiving the numbers from the user, create an instance of the class RecursionGCD and call the gcd method. The program should display a final message containing the GCD of the two numbers entered by the user.

Challenge Question: Can you write the gcd method from RecursionGCD as only one line of code?