Exercise Set #1
CS 1213, Fall 2018

1. Trace Euclid's algorithm for finding the greatest common divisor (GCD) of two positive integers A and B. Use the initial values A=51 and B=187. Write the name of each variable, with its value. As a variable's value changes, mark out the old value, and replace it with the new value, as we did in class.

   In this algorithm, to "interchange A and B" means to cause their values to trade places. For example, if A=14 and B=87 before interchanging, then A=87 and B=14 after interchanging. To "set A equal to B" means to change the value of A so that it is the same value as B. For example, if A=10 and B=8 before setting, then A=8 and B=8 after setting.

   - Repeat as long as A is not equal to B:
     - If A is less than B, then interchange A and B.
     - Set D equal to A-B.
     - Set A equal to B.
     - Set B equal to D.
   - Report A as the GCD.

2. Trace Euclid's algorithm again with the initial values A=42 and B=14.

3. Trace this algorithm for computing the quotient of A divided by B using repeated subtraction. Use the initial values A=35 and B=8. Write the name of each variable, with its value. As a variable's value changes, mark out the old value, and replace it with the new value, as we did in class.

   In this algorithm the "counter" is a variable just like A and B are variables. Notice that under the control of the instructions in the algorithm, it behaves like a hand-held tally counter that begins at zero and increases by 1 every time you press the button. That's why I called it "counter" instead of giving it a meaningless name like "A" or "B" or "X".

   - Set a counter to zero.
   - Repeat these steps while $A \geq B$:
     - Subtract B from A.
     - Add 1 to the counter.
   - Report the counter as the quotient.

4. Trace the algorithm in Question #3 again with the initial values A=42 and B=14.

5. Trace this algorithm for computing the product of A multiplied by B using repeated addition. Use the initial values A=5 and B=4. Write the name of each variable, with its value. As a variable's value changes, mark out the old value, and replace it with the new value, as we did in class.

   In this algorithm the "counter" and the "total" are variables just like A and B are variables.

   - Set the total to zero.
   - Set the counter to zero.
   - Repeat as long as the counter < B.
     - Add A to the total.
     - Add 1 to the counter.
   - Report the total as the product.

6. Trace the algorithm in Question #5 again with the initial values A=2 and B=6.