

## CSE1322L - Lab 9

### Objectives

Learn the basics of recursion.

### Background

In this lab you'll write a calculator which calculates multiplication, division and modular division using recursion.

### Tasks

You'll need to write 3 methods, all of which must use recursion:

- 1) Write `recursive_multiply`. It should take in 2 integers and return an integer.

Another way to say multiply  $5*4$ , is  $5+(5*3)$ , or  $5+5+(5*2)$ , or  $5+5+5+(5*1)$ , or  $5+5+5+5+(5*0)$ . You know that any number multiplied by 0 is 0.

- 2) Write `recursive_div`. It should take in 2 integers and return an integer. Unlike regular division, `div` just returns the integer portion of division. It answers the question "how many times does the second number go into the first number". So,  $7 \text{ div } 3 = 2$ , because 3 goes in 2 times, the leftover is irrelevant to `div`.

If you are asked to divide anything by 0, you should return -1, as that's an error.

If you are asked to divide anything by itself, you should return 1. i.e.  $7 \text{ div } 7 = 1$

If you are asked to divide a small number by a bigger one, the answer is 0. i.e.  $2 \text{ div } 7 = 0$

For all other numbers, you'll keep subtracting the second number from the first number, until the first number is less than the second. You'll count how many times this happens, and return that count. Remember you **must use recursion in all 3 of these methods**.

- 3) Write `recursive_mod`. It should take in 2 integers and return an integer. Mod only cares about the remainder of division.

If you are asked to divide anything by 0, it should return -1, as that's an error.

If you are asked to divide any smaller number by a larger number, you should return the smaller number. i.e.  $2 \text{ mod } 3 = 2$

For all other cases, you'll keep subtracting the second number from the first.

For example:  $7 \text{ mod } 3$ :

$$7-3 = 4$$

$$4-3 = 1$$

Answer is 1.

- 4) Finally, write the main method, which prompts the user to either multiply, div, or mod. Then prompt the user for 2 numbers, call the appropriate method, receive a result, and print it out.

Continue to ask the user (you may use a loop here) until they choose 0 to quit.

### **Sample Output:**

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

1

Enter first number

3

Enter second number

5

Answer: 15

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

1

Enter first number

5

Enter second number

0

Answer: 0

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

2

Enter first number

15

Enter second number

5

Answer: 3

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

2

Enter first number

15

Enter second number

2

Answer: 7

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

2

Enter first number

15

Enter second number

0

Answer: -1

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

2

Enter first number

2

Enter second number

10

Answer: 0

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

3

Enter first number

7

Enter second number

2

Answer: 1

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

3

Enter first number

10

Enter second number

3

Answer: 1

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

3

Enter first number

10

Enter second number

0

Answer: -1

Choose from the following:

- 0. Quit
- 1. Multiply 2 numbers
- 2. Div 2 numbers
- 3. Mod 2 numbers

0

## **Submission Guidelines:**

You will turn in one program.

Please follow the posted submission guidelines here:

<https://ccse.kennesaw.edu/fye/submissionguidelines.php>

Ensure you submit before the deadline listed on the lab schedule for CSE1322L here:

<https://ccse.kennesaw.edu/fye/courseschedules.php>