Programming Lab 5: Recursion

Data Structures and Advanced Programming Due: 1/21/20

Objectives

- To develop a program using recursive data structures.
- To practice working with recursive algorithms.

Choose Your Own Adventure

For this lab, you must use the objectdraw library to implement a program using recursion. You have two options available to you: If you would like to learn a bit about Java's native UI components (buttons, pull down menus, etc), you can choose to build a simple drawing program called *Scribbler*. Significant starter code is provided for you on GitHub if you choose this option. Alternatively, you may complete the *Doodler* lab, which asks you to build two smaller programs that each draw a fractal image. Starter code for *Doodler* is also available on GitHub, but it is fairly minimal.

Thought Questions

Please include solutions to the following problems in a comment at the start of your project code:

- Suppose program A takes $2^n/1000$ units of time and program B takes $1000n^2$ units. For what values of n does program A take less time than program B?
- For subtle reasons, `String` objects cannot be modified. Instead, `Strings` are used as parameters to functions that build new `Strings`. Suppose that a and b are n-character `Strings`. What is the complexity of performing `a=a+b`?
- Give a recursive algorithm that takes an integer *i* and produces the binary representation of *i* as a sequence of 0's and 1's, low-order bit first.

Submission

As ever, you should submit your work both on GitHub and on paper. Scoring rubrics for the Scribble and Doodler projects can be found on the following two pages. You should turn in your printed work with a copy of the appropriate rubric .

Data Structures, Doodler Lab

Name: _____

Honor Code: _____

Criterion	Points
Gasket Doodle is Drawn Correctly	___ / 5
Stair Doodle is Drawn Correctly	___ / 5
Doodles can be Moved Around	___ / 5
Correct Use of Recursive Data Structures	___ / 10
Good Style and Documentation	___ / 5
An Extension of Your Choice	___ / 5
Thought Questions	___ / 12
Total:	**___ / 47**

Data Structures, Scribbler Lab

Name: _____

Honor Code: _____

Criterion	Points
Color Mode Operates Correctly	___ / 5
Move Mode Operates Correctly	___ / 5
Erase Functionality Operates Correctly	___ / 5
Correct Use of Recursive Data Structures	___ / 10
Good Style and Documentation	___ / 5
An Extension of Your Choice	___ / 5
Thought Questions	___ / 12
Total:	**___ / 47**