CS 101 **Lab 1** **Summer 2017**

Before completing this lab, you must be able to access the C++ language in either of these ways:

- Install a Unix-style system on your laptop.
- Connect to the cs-intro.ua.edu server.

Instructions for doing both of these options can be found on Blackboard.

Write two C++ programs hollow.cpp and solid.cpp that behave as follows. Each program accepts one command line argument which is an integer N. The program hollow.cpp uses nested loops to display the three hollow shapes as shown on the left below. The program solid.cpp uses recursion (no loops) to display the three solid shapes as shown on the right below. Each shape has exactly N characters 'X' on each side. Hint: as part of your recursive solution, write a recursive helper function that displays m copies of character c. To verify that you are not using any loops in the solid.cpp program, use the Unix grep command as shown.

`g++ hollow.cpp –o hollow`
`./hollow 5`
	`grep while solid.cpp`
	`grep for solid.cpp`
	`g++ solid.cpp –o solid`
	`./solid 5`

Hollow parallelogram leaning left: XXXXX X...X X...X X...X XXXXX Hollow parallelogram leaning right: XXXXX X...X X...X X...X XXXXX Hollow diamond: X X.X X...X X.....X X.....X X...X X.X X	Solid parallelogram leaning left: XXXXX XXXXX XXXXX XXXXX XXXXX Solid parallelogram leaning right: XXXXX XXXXX XXXXX XXXXX XXXXX Solid diamond: X XXX XXXXX XXXXXXX XXXXXXXXX XXXXXXX XXXXX XXX X

The solid diamond shape is considered optional, and can earn extra credit.

Please carefully read the following requirements:

- Try to write the program individually, because you will learn more that way. However, if you get stuck and don't know how to proceed, you can ask the instructor or a classmate for assistance.
- You may demonstrate your program either on your local machine or on the cs-intro.ua.edu server.
- Once you believe your program runs correctly using all the above examples, demonstrate your program to the instructor. If the instructor agrees that your program works correctly, you are done.