

Before completing this lab, you should do the following:

- Install a Unix-style system on your laptop as described here:
<http://troll.cs.ua.edu/cs100/install.html>
(Use g++ rather than gcc.)
- Connect to the cs-intro.ua.edu server as described here:
<http://troll.cs.ua.edu/cs100/cs-intro-server.pdf>

Write a C++ program lab1.cpp that operates as follows. Your program will accept one command line argument which is an integer N. Your program will display two diamond shapes with edges of length N as shown in the examples below. Use nested loops to display the hollow diamond, and use recursion (no loops) to display the solid diamond. Hint: as part of your recursive solution, write a recursive helper function that displays n copies of character c.

Your program must read the value N from the command line, and it must write to standard output. The format of your program's output should exactly match the data as shown below and in the provided example files.

```
g++ lab1.cpp -Wall -lm -o lab1
./lab1 5
```

This hollow diamond is generated iteratively:

```
  X
 X.X
X...X
X.....X
X.....X
X.....X
X.....X
 X...X
  X.X
   X
```

This solid diamond is generated recursively:

```
  X
 XXX
XXXXX
XXXXXXX
XXXXXXXXX
XXXXXXXXX
XXXXXXX
XXXXX
XXX
X
```

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.
- Check that your program runs properly on your local machine and also on the cs-intro.ua.edu server.
- Three example output files and a test script are provided. Run the following commands to test your program. If any differences appear, then your project does not match the specifications.

```
unzip *.zip
chmod u+x testscript.sh
./testscript.sh
```

- Alternatively, instead of running the test script, you can instead enter these commands.

```
g++ lab1.cpp -Wall -lm -o lab1
./lab1 5 > temp5.txt
diff temp5.txt output5.txt
./lab1 10 > temp10.txt
diff temp10.txt output10.txt
./lab1 15 > temp15.txt
diff temp15.txt output15.txt
```

Once you believe your program runs correctly using the provided examples, demonstrate your program to the instructor. Be prepared to demonstrate your program on both your local machine and on the cs-intro.ua.edu server. If the instructor agrees that your program works correctly in both environments, you are done.