

CSE 1321L: Programming and Problem Solving I Lab

Lab 7

Repetition Structures

What students will learn:

- Using nested for-loops

Overview: If there's one thing computers are good at, it's repeating something over and over. The concept of repetition (which some call "iteration" and others "looping") is not terribly difficult since we humans repeat things in our daily lives. Any decent programming language is going to support iteration and usually allows for three different kinds of "looping templates". These templates are exactly what this lab is going to cover.

The three kinds of loops we'll cover are the for, while and do-while loop. You want to memorize the templates for these. Before that, it's important to know when to use them. Here's an overall guideline to help you out:

1. Use a for loop when you want to repeat something a certain number of times. For example, if you want to repeat something 100 times, and a for loop is a good candidate for that. Or, if you wanted to count from 50 to 3000 in increments of 10, you could do that too.
2. Use a while loop is useful when you don't know how many times something will repeat; the loop could "go on forever". As an example, if you ask a user to enter a number between 1-10 and they consistently enter 45, this could go on forever. Eventually (and hopefully), the user would enter a valid number.
3. Use a do-while loop when the loop must execute at least one time. The loops above can execute 0 times, but not this one! The reason is because, for all loops, there is a test to see if the loop should continue repeating. With a do-while loop, that test is at the bottom.

In this Lab we are specifically concerned with the for-loop. In addition to what we learned in the last Lab, for-loops just like the if-statements can be nested and can be used to produce some interesting results.

Nested for-loop statements allows us to traverse 2-D arrays, which we will learn about later in the semester. Amongst other things, it can allow us to draw interesting shapes with only a few lines.

In this lab we have three exercises, the first will ask you to draw a "n" x "n" grid using stars (where "n" is a user input), the second will ask you to code a program that will draw a right triangle that has its hypotenuse side on the right, and lastly you are going to be asked to code a program that will draw a right triangle that has its hypotenuse side facing the left.

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Lab7A (Warmup): Please write a program that asks the user for a value. Based on the value given to the program by the user please use nested for-loop to draw a box that has the length and the width of the value specified by the user.

Remember, the class name should be Lab7A.

The user input is indicated in **bold**.

Sample Output #1:

Please enter a value for the size: **4**

This is the requested 4x4 box:

```
****
****
****
****
```

Sample Output #2:

Please enter a value for the size: **5**

This is the requested 5x5 box:

```
*****
*****
*****
*****
*****
```

Sample Output #3:

Please enter a value for the size: **8**

This is the requested 8x8 box:

```
*****
*****
*****
*****
*****
*****
*****
*****
```

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Lab7B: Right-Triangle (Right): Please write a program that asks the user for a value. Based on the value given to the program by the user please use **nested for-loop** to draw a right-triangle that has the length and the width of the value specified by the user. Make sure that this right-triangle's vertical side is facing left and its hypotenuse is facing right. Please refer to the below sample outputs for examples.

Remember, the class name should be Lab7B.

The user input is indicated in **bold**.

Sample Output #1:

```
Please enter a value for the size: 4
This is the requested 4x4 right-triangle:
*
**
***
****
```

Sample Output #2:

```
Please enter a value for the size: 5
This is the requested 5x5 right-triangle:
*
**
***
****
*****
```

Sample Output #3:

```
Please enter a value for the size: 8
This is the requested 8x8 right-triangle:
*
**
***
****
*****
*****
*****
*****
*****
```

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Lab7C: Right-Triangle (Left): Please write a program that asks the user for a value. Based on the value given to the program by the user please use **nested for-loop** to draw a right-triangle that has the length and the width of the value specified by the user. Make sure that this right-triangle's vertical side is facing right, and its hypotenuse is facing left. Please refer to the below sample outputs for examples.

Remember, the class name should be Lab7C.

The user input is indicated in **bold**.

Sample Output #1:

Please enter a value for the size: **4**

This is the requested 4x4 right-triangle:

```
 *
  **
   ***
    ****
```

Sample Output #2:

Please enter a value for the size: **5**

This is the requested 5x5 right-triangle:

```
 *
  **
   ***
    ****
     *****
```

Sample Output #3:

Please enter a value for the size: **8**

This is the requested 8x8 right-triangle:

```
 *
  **
   ***
    ****
     *****
      *******
       ********
        ********
```

Instructions:

- Programs must be working correctly.
- **Programs must be saved in files with the correct file name.**
- If working in Java or C#, class names must be correct.
- Programs must be working and checked by the end of the designated lab session.
- **Programs (only .java, .cs or .cpp files) must be uploaded to Gradescope by due date.**