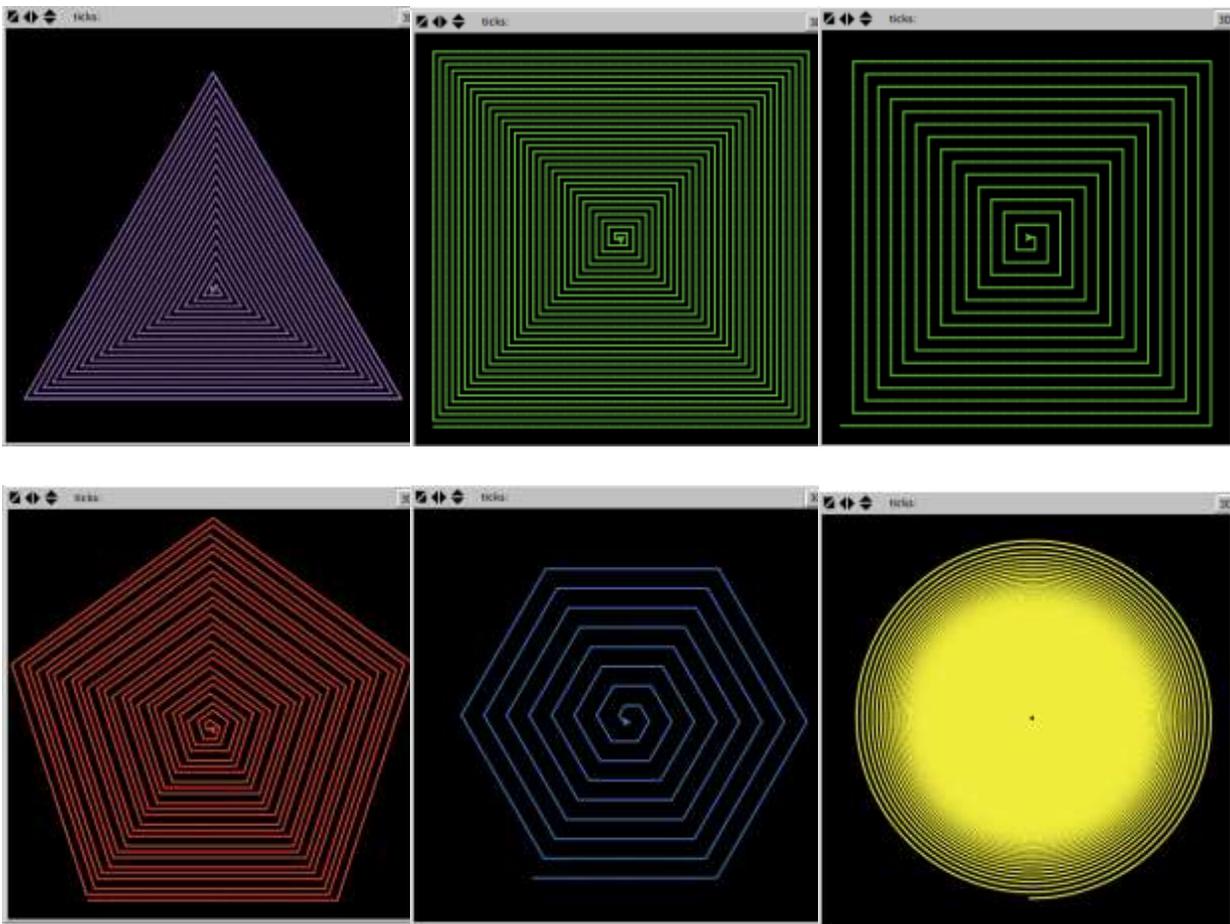


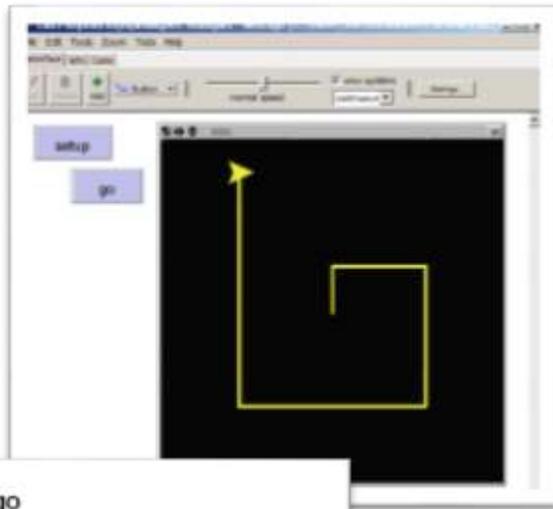
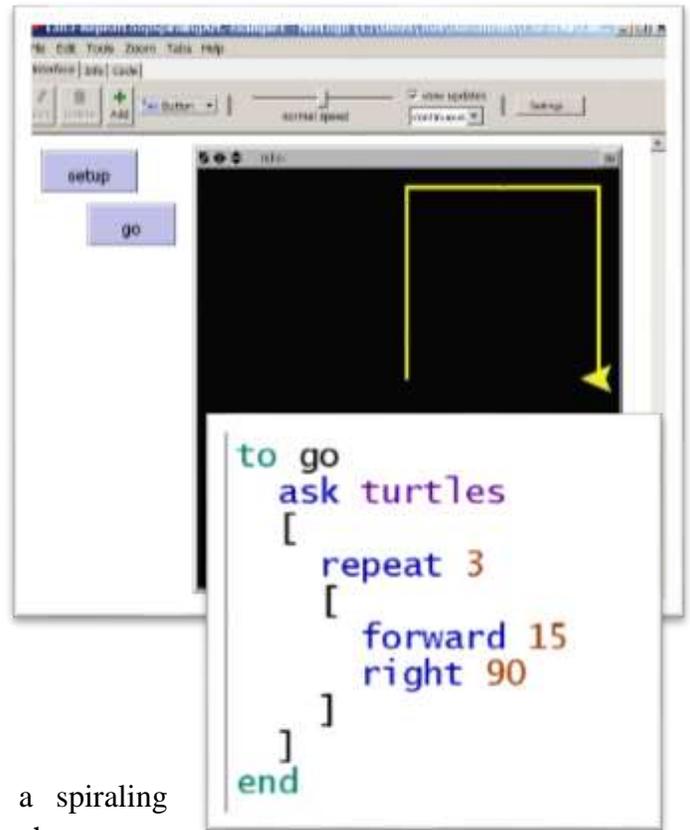
CS108L Computer Science for All

Module 3: Spiraling Geometry using Repeat Loops

In this lab, your assignment is to use NetLogo's *repeat loops* and *local variables* to draw your own cool spiraling geometric shapes! Don't worry; you don't need to know any geometry to do this. All the information you need here in the lab.



In this lab you will be drawing geometric shapes (like triangles, squares, pentagons, etc.) using a NetLogo turtle in and at least one repeat loop. A repeat loop is a block of code that is repeated a set number of times. In the example below, the three yellow lines making part of a box are drawn using a repeat loop. The loop asks the turtle to move **forward 15** steps and turn **right 90** degrees and repeat that process three times (**repeat 3**). Notice that square brackets following the repeat command are used to tell the turtle which code is included in the repeat loop. Also notice that, unlike in Lab 1, the “go” button is **NOT set to go forever**.



To make a spiraling geometric shape you will need to do at least three things inside the repeat loop: (1) draw a line, (2) change the heading of the turtle and (3) change the length of the line drawn.

The four-sided spiral shown to the left uses the same basic drawing commands as the image above: move forward and turn right by 90°. An **iteration** of a repeat loop means that the turtle completes the commands in the command block (within the square blocks) of the repeat loop one time. In each **iteration** of the loop below, the turtle moves forward, farther than it moved in the previous iteration.

This can be done by replacing the “hardcoded” value of 15 in the forward command with a **local variable** that gets larger with each iteration of the **repeat** loop. This requires using two new NetLogo commands:

```
to go
ask turtles
[
let x (4.5)
repeat 5
[
forward x
right 90
set x (x + 4.5)
]
]
end
```

<p>let <i>variable (expression)</i></p>	<p>Creates a new LOCAL Variable AND sets its value to the value of the expression. The expression can be a single number or a calculation. For example,</p> <p>let x (0.5)</p> <p>let angle (360 / 4)</p>
<p>set <i>variable (expression)</i></p>	<p>Changes the value of a LOCAL Variable that <i>has already been created</i> to the value of the expression. For example,</p> <p>Set x (1.5)</p>

In the NetLogo code to the right:

```

to go
  ask turtles
  [
    let x (4.5)
    repeat 5
    [
      forward x
      right 90
      set x (x + 4.5)
    ]
  ]
end

```

let x (4.5) creates a new local variable **x** and sets its value to 4.5.

repeat 5 starts the repeat loop. The code within the square brackets after the repeat 5 statement is the code that is repeated 5 times.

forward x moves the turtle forward a number of steps equal to the value of **x**. The first time through the repeat loop, the value of **x** is 4.5.

set x (x + 4.5) changes the value of **x** to the result of the expression **(x + 4.5)**. The first time this command is reached, **x** has a value of 4.5 so the expression **(x + 4.5)** has a value of 9.0. Thus, the first time this command is reached, the value of **x** is changed from 4.5 to 9.0.

GOTCHA: In NetLogo, mathematical expressions (+, - must have a space before and after the operators. For example, **(x+4.5)** is an error. **(x + 4.5)** is correct.

forward x is inside the repeat loop and the second time it is reached, **x** has the value 9.0 so the second line drawn by the turtle is 9.0 steps long.



In this lab you need to create at least three geometric spiraling shapes. Each spiral has to have a minimum of 20 lines. There is a simple rule to figure out the angle the turtle needs to turn to create the shape (the interior angle for the shape):

$$\textit{Angle used} = \frac{360}{\textit{number of sides}}$$

The values for some geometric shapes are provided in the table below.

Shape	Number of sides	Interior Angle
Triangle	3	120
Square	4	90
Pentagon	5	72
Hexagon	6	60