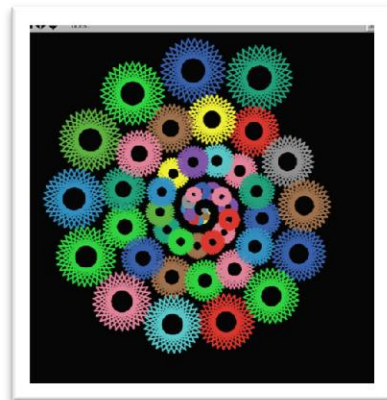
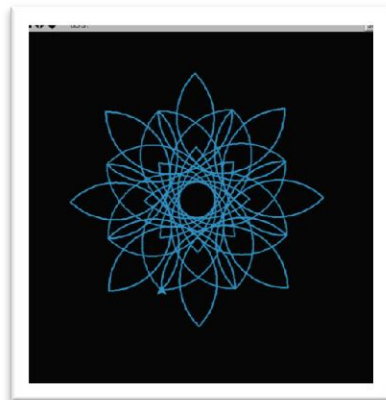
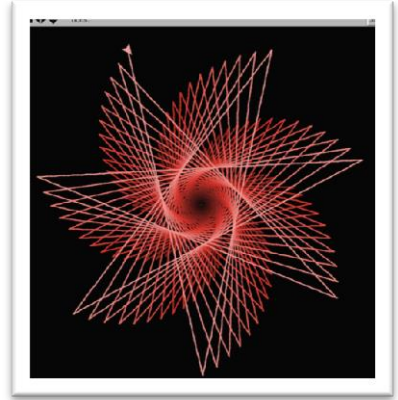
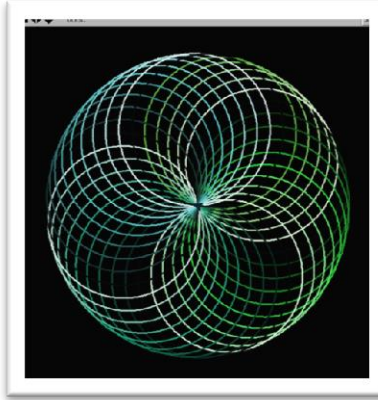
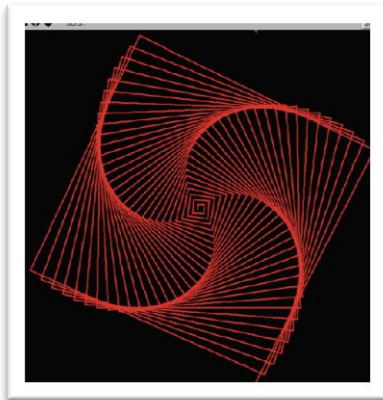
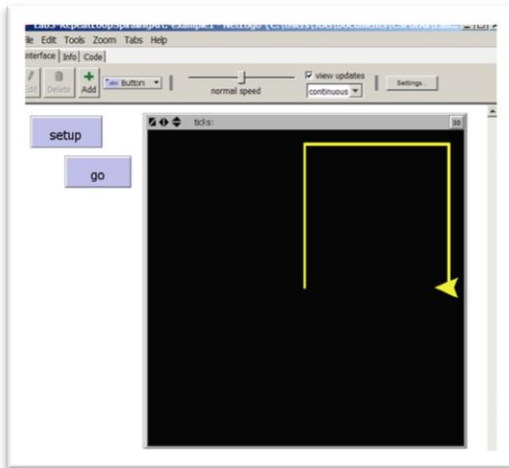


LAB 3: SPIRALING ART USING A REPEAT LOOP



In this lab, your assignment is to use Netlogo's `repeat` loop and *local variables* to draw your own creative image.

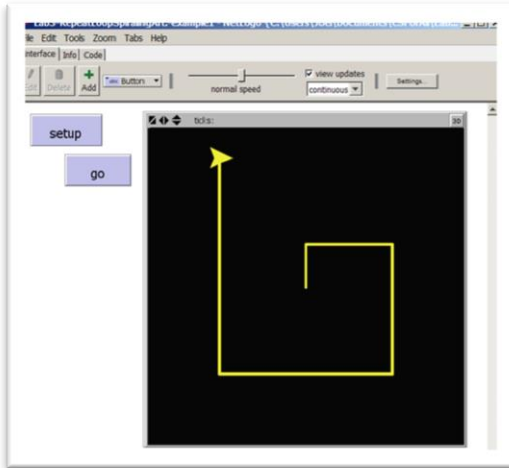
The example below (the three yellow lines making part of a box) uses a repeat loop to cause Netlogo to move forward 15 steps and turn right by 90 degrees exactly 3 times. Notice that, unlike in lab 2, the "go" button is NOT set to repeat forever. How would the image be different if the repeat 3 were changed to repeat 4 and then to repeat 100? How would the image be different if right 90 were changed to right 91? First, try to visualize this in your mind's eye, then make the change in Netlogo and run the program.



```
to go
  ask turtles
  [
    repeat 3
    [
      forward 15
      right 90
    ]
  ]
end
```

The four-sided spiral shown below uses the same basic drawing commands as the image above: move forward and turn right by 90°. However, in each *iteration* of the loop, 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 variable that gets larger with each iteration of the `repeat` loop. This requires using two new Netlogo commands:

<code>let</code> <i>variable (expression)</i>	Creates a new <i>local variable</i> AND sets its value to the value of the expression. The expression can be a single number or a calculation. For example, <code>let x (0.5)</code> <code>let angle (360 / 8)</code>
<code>set</code> <i>variable (expression)</i>	Changes the value of a variable that <i>has already been created</i> to the value of the expression.



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

In the above NetLogo code:

let x (4.5) creates a new variable **x** and sets its value to 0.5.

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 0.5.

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 and the expression **(x + 4.5)**, therefore, 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.

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.

Just as a variable can be used as the number of steps in the **forward** command, a variable can be used as the angle in the **right** command and as the color in the **set color** command. More than one variable can be used if you want!

In the green circles image, the **forward** command and **turn angle** command are both hardcoded constants, but inside the repeat loop is the command:

```
set color (color + 1)
```

HAVE FUN!



Grading Rubric [20 points total]:

- [A: 2 points]:** Submit one file to your instructor: Netlogo source code with the file name: `W3.firstname.lastname.nlogo`.
- [B: 2 points]:** The first few lines of your code tab are comments including your name, the date, your school, and the assignment name (Lab 3: Spiraling Art using a Repeat Loop).
- [C: 2 points]:** The code in the code tab of your program is appropriately documented with "inline comments".
- [D: 1 point]:** Your program includes a description of what your program does in the Info tab.
- [E: 5 points]:** When the user loads your program and clicks the "setup" button followed by the "go" button, your program draws an image that uses at least one **repeat** loop that repeats at least 100 times drawing at least one line each iteration. To get any of these points, your drawing must be different from the drawing made by every other student in your class section.
- [F: 5 points]:** The procedure in your "go" button uses at least one **let** statement AND there is at least one **set** statement in the **repeat** loop. The variable changed in the set statement must be used in at least one of the following: **forward**, **right**, **left**, or **setxy** command.
- [G: 3 points]:** Your screen capture is creative and interesting to behold. If you are not sure what constitutes "creative" and "interesting", ask your teacher.
- Extra credit [4 points]:** Use the repeat loop to change the turtle's draw color to at least 100 different shades. This can be done using a variable in at least one color command or by using Netlogo's built in scale-color function. The repeat loop used to change the draw color may be the same as the loop used in E and F.
- Extra credit [5 points]:** The Add an "extra credit" button to your program that draws a pattern that makes use of a nested loop, a loop within a loop.