08: Fun with Loops

The for Loop Recap

Random Turtle Walk

The Triangle Spin

The Single Line Spiral

The for Loop Recap

## The for Loop

Take a moment to remind yourself what a for-loop looks like.

```
for (initialization; test; update) {
    statement(s);
}
```



#### Goal

- ▶ In this activity, our goal is to create a random turtle walk.
- ▶ We will need to understand arrays.

## Arrays

- ► An array is a list of variables.
- An array has n items.
- ▶ The first element in an array is always zero.
- ▶ The last element in an array is always n-1.
- ▶ If an array has 7 elements, what is the position of the first and last element?

What are the seven colors of the rainbow?

What are the seven colors of the rainbow?

- ▶ Red, Orange, Yellow, Green, Blue, Indigo, and Violet.
- ▶ If this were an array, what is the position of Red?
- ▶ If this were an array, what is the position of Green?
- If this were an array, what is the position of Violet?

What are the seven colors of the rainbow?

- ▶ Red, Orange, Yellow, Green, Blue, Indigo, and Violet.
- ▶ If this were an array, what is the position of Red? 0
- ▶ If this were an array, what is the position of Green? 3
- ▶ If this were an array, what is the position of Violet? 6

As computer scientists, we always begin counting with 0.

- Imagine that there were 100 people and you had t-shirts to give away with each of the seven colors.
- ▶ Because we are computer scientists, the first person is 0. The last person is 99.
- ► How would you pass out t-shirts so that the colors remain relatively equal?

### Solution!

- Cycle through each color when passing out the t-shirts, starting with RED to Person 0.
- Person 1 gets ORANGE.
- Person 2 gets YELLOW.
- Person 3 gets GREEN.
- ▶ Person 7 gets RED again!
- What color would person 99 get? Take a moment to think about this.

# Can we represent this with math?

- Yes!
- Compute 99 divided by 7 and find the remainder.
- ▶ In this case, it's 1. The t-shirt color corresponding to 1 is ORANGE.
- Person 99 gets an ORANGE t-shirt.
- ► The Java symbol for remainder is "%".
- ▶ 99 % 7 is equal to 1.

### New Project: Art

- Create a new project called "Art".
- ▶ Import the TurtleLog.jar library.
- ▶ We will ask the user for an integer representing the number of sides of the desired shape and draw that shape.
- ▶ Because we are starting out, we will begin with a new shape: the triangle.
- A triangle has 3 sides.
- ▶ A triangle requires that we turn 120 degrees to the left each time we move.

Just like last time.

Modify the line containing "public class Art  $\{$ " to look like this.

public class Art extends Sandbox

You will have to fix your code's imports to make the error on "Sandbox" go away.

# Start Programming.

```
In your main method, add one line of code. It will look like this.
public static void main(String[] args) {
    launch(args);
}
```

#### Place a turtle

```
Create a new method called "draw".

@Override
public void draw() {
    Random rng = new Random();
    Turtle turtle = new Turtle();
    add(turtle);
}
You will need to fix imports.
```

# Create the array of colors

Here "Color" is a type that we haven't discussed before. Yes, color can be represented as a variable!

### Move the turtle 1000 times

```
for (int i = 0; i < 1000; i++) {
   turtle.setColor(colors[i % 7]);
   int size = rng.nextInt(100) + 50;
   int degrees = rng.nextInt(360) - 180;
   turtle.forward(size);
   turtle.left(degrees);
}</pre>
```

## Watch your turtle move!

- ► This display will cause the turtle to move randomly and turn randomly around the screen.
- ▶ No one will have the same artwork on their screen!
- Each line should be one of the seven colors.

The Triangle Spin

# Next art: Triangle Spin

To get started on this, remove the for loop and all the code inside. You will need to define the size of your triangles.

```
int size = 300;
```

# Here we go.

This for loop will end in three slides. Put everything on the next few slides inside of this for loop.

```
for (int i = 0; i < 72; i++) {
   turtle.up();
   turtle.forward(size / 2);
   turtle.down();
   turtle.setColor(colors[i % 7]);
   turtle.left(150);</pre>
```

### Part 2

This draws one triangle.

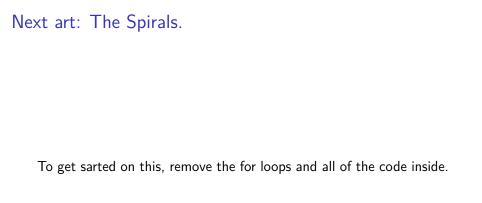
```
for (int s = 0; s < 3; s++) {
    turtle.forward(size);
    turtle.left(120);
}</pre>
```

#### Part 3

```
turtle.left(30);
turtle.up();
turtle.forward(size / 2);
turtle.down();
turtle.left(185);
} // End the for loop
```

Watch the art work happen!





## Here we go.

We will be drawing 72 spirals, each 5 degrees apart. 72 times 5 is 360. In the for loop, we select a color and draw one spiral. Notice that we do not finish this for loop.

```
for (int t = 0; t < 72; t++) {
    turtle.setColor(colors[t % 7]);
    for (int i = 0; i < 100; i++) {
        turtle.forward(i);
        turtle.left(10);
    }</pre>
```

#### Part 2

Now that we have drawn one spiral, pick up the pen, return home, put the pen back down, and turn 5 degrees to the left.

```
turtle.up();
turtle.goHome();
turtle.down();
turtle.left(5);
}
```

Watch the art work happen!