Lesson 2: Loops

Welcome back!

But first…Review

Review: Variables

- What is the structure of creating a variable?
- What are some ways we have used variables so far?

- Find the mistakes in these variable initializations!
  - Double hoursOfSleep= 6;
  - int numCats= 8
  - int price= 20.42;
  - String greeting: “Hello”;

Review: If

- What is a conditional?
- what is the structure of a conditional?

```
if ( condition ){
        // code
}
else if (   condition  ){
        // code
}
else {
        // code
}
```

Review: Conditionals

- What is a conditional?
- what is the structure of a conditional?

```
if (temperature > 70 degrees){
        System.out.println(“Wear shorts.”);
}
else if (temperature > 50 degrees){
        System.out.println(“Wear long pants.”);
}
else if (temperature > 10 degrees){
        System.out.println(“Wear long pants and a jacket.”); }
else{
        System.out.println(“Don’t go outside.”);
```

Group Code!

I got home at 7:00 PM with 3 hours of homework to do. If I plan on sleeping at 11:00 PM and don’t procrastinate on my homework, will I be able to watch more than an hour of TV?

Loops

Introducing… For loops

- For loop - repeats a block of code for a specified amount of times.

```
for (  int x=0;   x < number;   x++  ){
      //code to run
}
```

- Within the parentheses is the
  initialization; condition; change in x
- Note: ‘x++’ adds 1 to x, or increments x every time the loop repeats;
  - What do you think ‘x--’ does?

For loops (example)

```
for (int cats = 0; cats < 10; cats++){
        System.out.println(“I have ” + cats + “ cats.”);
}
```

- What does the above code print out?
- how many times will the ‘for’ loop, loop?

Try it Yourselves!

J.R.R Tolkien was born in 1892. Write a for loop that prints out his age if he were alive today. (print out all the numbers 1,2,3,4 etc.)

While loops (general syntax)

- While loop - repeats code within the loop while a condition is true.

```
while(condition){
    //code to run
    //modify condition
}
```

- Runs code while a condition is true.
- The code inside the loop should do something that modifies the condition and eventually makes it false.
  - What will happen if we do not increment the condition with each loop?

Having a while loop without incrementing a number after each loop results in an ***infinite loop***.

While loops

- Infinite loops are often ***bad***; the computer would be stuck executing one thing until it crashes.
- Robotics exception: ***SENSORS***; An infinite while loop can be used to wait for a certain thing to be detected by a sensor in order to do something.
  - Example: the robot doesn't throw the ball until it sees the goal.

While loops (example)

- In the following code, it will run ***while*** the variable “number” is less than 10.

```
int number = 0;                          //initialize a variable
while (number < 10){                     //condition
        System.out.println(number);      //prints the value of “number”
        number = number + 1;             //modifier; increases “number”
}                                        //curly brace to close loop
```

- What is the output of the code above?

```
0
1                                        //program will print 0 to 9, in order
...
9
```

While loops (example)

- Is this loop infinite? Explain your answer.

```
public fillBowl(){
    int bowlAmount = 0;
    while(bowlAmount < 20){
        bowlAmount = bowlAmount + 1;
    }
}
```

Infinite while loops

- Infinite loops are dangerous, so we have to be smart about using them:

```
while(true){
    if(distance < 5){
        robot.throwBall();
        break;
    }else if(distance < 10){
        robot.throwBall();
        break;
    }else{
        robot.driveForward();
    }
}
```

While loops vs. For loops

- Generally interchangeable. Ex: you can turn a while loop into a for loop if you use a number in the condition, which you modify in the body.

```
int i = 0;
while(i < 6){
  System.out.println("i is " + i);
  i = i + 1;
}
```

```
for(i=0,i<6,i++){
  System.out.println("i is " + i);
 }
```

- There is one case where only a while loop can be used. In robotics, if you need the robot to do an action *while* a certain sensor receives an input, you can only do this with a while loop.

Homework

- Write a loop that prints out all the even numbers from 0 to 20 along with the sum of all the even numbers between 0 and 20.