Announcements

• Read Chapter 7, Sec 1 for next time
• Don’t use copy to copy an object
  – We will learn why later
  – Instead, import the object twice from the class folder

What we will do today

• Lecture on Chap 6, Tips and Techniques
  – Random numbers and random motion
  – We will also learn about variables
• Classwork

Random Numbers

• Random numbers are used in certain kinds of computer programs
• Examples
  – Security for web applications
  – Encryption for satellite transmissions
  – Gaming programs
• We will look at examples of using random numbers in animations
Built-in functions

- Alice provides built-in functions for generating random numbers

Example

- Move chicken forward a random amount
- The random number function returns a fractional value between 0 and 1

Demo: A range of values

- Can specify a different range of values by specifying a **minimum** and **maximum** value
- In this example, the random number will be a fractional value between 1 and 5

Demo: Integers (whole numbers)

- To generate a random **integer** value
  - Select `integerOnly` from the `more` option and make it `true`
  - Random value selected from 1, 2, 3, or 4 - not 5!
Random Hopping

- Rabbit hops (moves up) a random amount
- Rabbit comes back down to the ground, the same random amount

- What happens? How do we fix it?

Variable - in a method

- A variable in a method
  - Stores a value
  - Has an initial value
  - Its value can be changed (set)
  - Its value can be used only in this method
- To create a variable in a method
  - Click on create variable
  - Give an initial value
- To use a variable’s value
  - Drag the variable into place

Example – create a variable

- distance – will store distance bunny is to move up

Setting a Variable’s value

- Drag variable down and select value

- Result
Use Variable’s value - Demo

- Drag and drop distance into places where you want to use its value

Set Variable to Random Value - Demo

- Distance is set a random value
- Same value is then used to move up and down
- Use print to print out the value of the variable

Class Variables

- Use “create new variable” under properties to create a class variable for an object
- This “class variable” will maintain the value throughout the running of the world unless you reset it

Random Motion

- In some animations, we want an object to move to a random location. We call this random motion.
- For example, a goldfish swimming in a random motion.
Six Possible Directions

- Six move directions are possible
  - Forward, backward, left, right, up, down
- We will eliminate backward, fish do not swim backward
- To simplify code, take advantage of negative numbers
  - This instruction moves the goldfish right

Storyboard

- Only three move instructions needed
  - Up (move down if negative)
  - Left (move right if negative)
  - Forward (no backward motion)
- Two parameters (min, max) to restrict motion of fish to nearby location

```
fish.randomMotion
Parameters: min, max
Do together
  fish move up (or down) random distance
  fish move left (or right) random distance
  fish move forward random amount
```

randomMotion

- Minimum distance for move forward is 0

Demo

- To call randomMotion method, specify min and max values
Demo

- Repeating the random fish motion over and over again…. (more on this next chapter)

- Change world.my first method

Classwork today

- Event handlers
- Random values
- Variables

- NO LOOPS