Announcements

• Read Chapter 7, Sec 1 for next time – Reading Quiz
• Don’t use copy to copy an object!
  – We will learn why later
  – Instead, import the object twice from the class folder
• Lecture on Chap 6, Tips and Techniques
  – Random numbers and random motion
  – We will also learn about variables
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?
Local Variable - in a method

• A *local* variable in a method
  – Stores a value
  – Has an initial value
  – Its value can be changed (set)
  – Its value can be used *only in one instance of this method*

• To create a local 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 local variable

• distance – will store distance bunny is to move up
Setting a Variable’s value

• Drag variable down and select value

• Result

```plaintext
bunny.hopRandom2

bunny.hopRandom2 No parameters

123 distance = 1

(Do Nothing)

set value

increment bunny.hopRandom2.distance by 1
decrement bunny.hopRandom2.distance by 1

<table>
<thead>
<tr>
<th>value</th>
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<tbody>
<tr>
<td>0.25</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

distance set value to 2
```
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

```python
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

```
goldfish.randomMotion min = -0.2 max = 0.2
```
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