Announcements

• Read Chapter 7, Sec 1 for next time – Reading Quiz
• Assign 5 due Thur (SBoard) and Tues (program)
• 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, and 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?
• (disable this code)
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 this method*
  – Like a special property, but only for 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, so same distance can be used to move down
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

• Create an event to press H and bunny hops
Set Variable to Random Value - Demo

- Distance is set to 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.
• The variable should be associated with the class in some way.
Example

• Create an event for hopRandom to occur when you press h.

• Create another event for the bunny to say how many times it has hopped.

• We need to keep track of the number of times the bunny has hopped. How do we do that? Where do we do that?
Create class property (variable)

- Create variable to keep track of number of times hopped

![Diagram showing variable declaration](image)

- Increment it each time bunny hops

![Diagram showing increment operation](image)

- Where does the increment go?
Now have bunny say how many times hopped?

• Add an event

• Now we want to join another string with this, under World functions, string, drag in “a joined with b”
Bunny say how many times hopped (cont)

- We want the number “numberTimesHopped” displayed as a string.
- Drag over world function, string, “what as a string” over none, select “expressions”, then bunny.numberTimesHopped

- Now Play! Hop bunny then press space
Reflection

• When do you use local variable and when do you use class variable?
Another Example

• Create an event so that when you click on a kangaroo, every other time it hops or spins.

• What type of information do you need to save?
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
Fish Demo

• To call randomMotion method, create an event that will happen forever (but not interfere with anything else!)

• Create event for “When the world starts”

  ![When the world starts, do Nothing](image)

• Right click on this event and change it to:

  ![While the world is running](image)
Fish Demo (cont)

• In the “During part” drag in the method and set min to -0.2 and max to 0.2

![Diagram showing the method with min=-0.2 and max=0.2]

• While the world is running, this method will repeating the random fish motion over and over again…. (more on repeating next chapter)
Classwork today

• Discuss how to
  – Event handlers
  – Random values
  – Variables

• You do not need the event “while the world is running”

• NO LOOPS