Class Today

- Asking questions and making decisions
- Using functions
- If statements

Review 1

- We have five objects in the world: clownFish, BlueTang, PajamaFish, Tortoise, Caiman
- We write the `dance` procedure as a `Swimmer` procedure

They all have tails. Who can call the Dance method?

Review 2

- Suppose we want to modify the dance procedure so that the object waves its tail not once but three times? How would we do that?
Review 3
• Suppose we want each object to choose how many times to wave the tail? What type of parameter do we add?

Review 4
• In Dance, suppose we want the fish to turn to face any of the other 4 objects in the world and that object turn to face the fish.
• What type of parameter do we need to add?

Thinking - More Advanced Worlds
• How do you build animations like simulations and video games?
• Need to write code that involves decisions
• Example car-race simulation
  – If the car stays on the road the score increases
  – If the car goes off the road into the stands, the car crashes
  – If the driver gets the car over the finish line, the time is posted and the driver wins!

Logical Expressions
• Decision is made based on current conditions.
• Condition is checked in a logical expression that evaluates to true or false (Boolean) value.
  – car on road → true
  – car over finish line → false
Format of an if

If (condition is true?)
   Action 1 if condition is true
Else
   Action 2 if condition is false

• You will do one of the actions, but not both
• Which action is determined by the condition

If/Else as a picture

• In Alice, a logical expression is used as the condition in an If/Else control structure
• If condition is true do one thing, or if it is false, do something else

Is the Pig to the Panda’s right?

• If pig is to the Panda’s right, we want Pig to move to the other side of Panda
• If pig is to Panda’s left, we want pig to say she is to Panda’s left

How do we make a decision?

• Use an if statement
• The “if statement” is a tile at the bottom. Drag it in and select “True”
• Now we need a condition that evaluates to true or false
Alice has built-in functions!
• Functions calculate a value, may help you answer a question.
• What is the pig’s width?
  – getWidth results in a number
• Is the pig to the Panda’s right?
  – isToTheRightOf results in a true or false value

Example: is the pig to panda’s right?
• Drag in isToTheRightOf from functions into the word true
• Then add in an action for true and one for false

Scenarios for when the code executes
• What happens in this case?
• What happens in this case?

If Panda is greater than 5 units from birch tree, then move closer to it
• Click on true part of if
• Lots of true/false conditions you can select
Relational operators allow a comparison of two items

- $>$, $<$, $\geq$, $\leq$, $==$, $\neq$
- If pig’s height $>$ 3
- If pig’s width $==$ 4 (means “equal to”)
- If pig’s depth $\neq$ 5 (means “not equal to”)

If Panda is greater than 4 units from birch tree, then move closer to it

If panda’s distance to birchTree $>$ 4
    Move Panda 3 units closer to the birchTree
Else
    Do nothing

- You can leave the else part blank if you don’t have anything to do if it is false

How to create this if?

- Drag the “if” in
- Click on “true” and select “relational operators”, then the $>$,
- Then 2 numbers

How to create this if?

- Drag in function `getDistanceTo` over the first number
- Also change second number to 4.0
Result - If with only one action

• It is ok to not have an action for the else

```plaintext
if (this.panda.getDistanceTo(this.birchTree) > 4.0) is true then
  this.panda.move(LEFT, 3.0) add detail
else
  drop statement here
```

Nested If

• What does this code do?

```plaintext
if (this.panda.isFacing(this.birchTree)) is true then
  this.panda.say("what a lovely tree") add detail
else
  this.panda.turnToFace(this.birchTree) add detail
  this.panda.move(FORWARD, 3.0) add detail
else
  this.panda.say("I like trees") add detail
```

How does the pig say how tall she is?

• First have the pig say “I’m this tall”
• Then click on the saying to add a number also

```plaintext
this.pig.say("I’m this tall") add detail
```

• And you get two things to say:

```plaintext
this.pig.say("I’m this tall: +2.0") add detail
```

But wait, that is not the pig’s height? How do we get that height?

```plaintext
I’m this tall: 2.0
```
Get the pig’s correct height

- Use a built-in function, drag in “getHeight” over the number 2.0

- Run

Adding Math

- Suppose the pig wants to cheat and say it’s 1 unit taller than it really is.

- Click on the down arrow to add more to the number with math

Here is how to add math

- Click on down arrow by number to add to

Pig vs Cheating Pig

- I’m this tall: 1.1726043852633745

- I’m this tall: 2.1726043852633745
This lecture covered

• Built-in functions
• Making decisions with an if statement
• Dragging in functions from the function tab for true or false conditions for an if statement
• Combining a string with a number value to create a new string, that could be shown as a string
• Use Math to change a number