Variables, Operators: Recipes for Art

Intro
- Introduce ourselves
- Course overview:
  - what we’ll learn: programming, writing algorithms for art, python, bits of Maya
  - what we won’t: Maya, special effects, virtual environments, making things pretty
  - where we’ll start: etch a sketch
  - where we’re going (depending on how the class progresses): flocking & fractals
- Syllabus/Schedule

Conversation
- what is a computer?
  - input, do something (algorithm or program), output
  - black box drawing
  - interpreter: type something, get the result (>>> 2 + 2)
- writing a recipe (whiteboard)
  - you = chef, computer = assistant, user = hungry
  - plan ingredients, sketch it out, cook in small steps (tasting at each step)
- the basics (values and types, expressions and operators, variables)

<table>
<thead>
<tr>
<th>First Experiments:</th>
<th>Return Value Type Experiments:</th>
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<tbody>
<tr>
<td>&gt;&gt;&gt; print &quot;howdy&quot;</td>
<td>&gt;&gt;&gt; 21 / 4</td>
</tr>
<tr>
<td>&gt;&gt;&gt; 2 + 2</td>
<td>&gt;&gt;&gt; 21 / 4.0</td>
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<tr>
<td>&gt;&gt;&gt; 3 * 2</td>
<td>&gt;&gt;&gt; 5 + 7</td>
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<tr>
<td>&gt;&gt;&gt; 12 - 3</td>
<td>&gt;&gt;&gt; &quot;5&quot; + &quot;7&quot;</td>
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<tr>
<td>&gt;&gt;&gt; 20 / 4</td>
<td>&gt;&gt;&gt; 5 + &quot;7&quot;</td>
</tr>
<tr>
<td>&gt;&gt;&gt; 21 % 4</td>
<td>&gt;&gt;&gt; &quot;stuff&quot;</td>
</tr>
<tr>
<td>&gt;&gt;&gt; 3**2</td>
<td>&gt;&gt;&gt; 5 &gt; 4</td>
</tr>
<tr>
<td></td>
<td>&gt;&gt;&gt; 5 &lt; 4</td>
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<tr>
<td></td>
<td>&gt;&gt;&gt; &quot;cat&quot; == &quot;dog&quot;</td>
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<td></td>
<td>&gt;&gt;&gt; &quot;cat&quot; == &quot;cat&quot;</td>
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<tr>
<td></td>
<td>&gt;&gt;&gt; stuff</td>
</tr>
<tr>
<td></td>
<td>&gt;&gt;&gt; stuff = 42</td>
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<tr>
<td></td>
<td>&gt;&gt;&gt; stuff + 5</td>
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Variables
- Variables are places to store things. A variable can hold a single value (like an integer or a string) or it can hold a list of values.
- Use the ‘=’ sign to assign a value to a variable.

Basic Return Types
- Integer - a whole number: 0, 1, 2, 3 ...
- Floating Point - a number with decimal values: 3.14159
- String - a series of characters: "stuff"
- Boolean - either True or False (usually as the result of a comparison, i.e. 4 > 5 or 5 == 6)

- **Using modules**
  - >>> sqrt(4)
  - >>> import math
  - >>> sqrt(4)
  - >>> math.sqrt(4)
  - >>> from math import sqrt
  - >>> sqrt(4)
  - >>> sqrt(-1)

- **Code-to-visuals connection** (idle - turtle)
  - 2D coordinates (draw cartesian axes)
  - turtle drawing (pen metaphor) (automaton from Hugo)
    - up/down
    - forward backward
    - right/left
  - Example: draw a line
  - Example: recipe for a square (sequencing)
  - Challenge: draw an equilateral triangle (60 degree corners, equal-length sides)
  - Example: draw a 5 point star (explain the math for the corner angle)
  - Challenge: draw a 6 point star
    - this is really two triangles
    - need a transformation in between (translation + rotation) -- define these terms!
    - translation first - half of the length of a side
    - rotate to look up, then move up, how far?
    - pythagorean theorem: a**2 + b**2 = c**2
    - solve for b! (PEMDASR -- order of operations)
    - rotate again
    - recap steps of transformation (write pseudocode) then write the recipe

- **Assignment**
  - Read Think Python 1-2
  - Draw your dream house/car/something-man-made with the turtle

- **Next time...**
  - [Spirographs](#)