What's in a Variable?

A variable is a name you create and use in your program to ***reference*** an object (i.e., the in-memory representation of a value). Executing an assignment ***binds*** the variable on the left side of the assignment to the object produced by evaluating the expression on the right side of the assignment. The variable references this object until it is reassigned a new value by another assignment statement.

Python keeps track of the variables that you create and the objects they are bound to using ***name spaces***.

In this exercise, you will use PythonTutor, an on-line tool to help beginning programmers visualize how the Python shell executes a program. The goal is to develop a better understanding of how the shell creates and maintains name spaces, objects, and variables.

To get started, press the "Visualization" link in the artifacts section of the CTL web site.

The visualization shows:

- the program that will be executed (left)
- a 'Print output' box where the program output will be displayed (upper right)
- an area in memory , labeled "Frames," where the shell stores name spaces
- an area in memory, labeled "Objects," where the shell stores objects created by evaluating expressions in the program
- the next statement that the shell will execute (red arrow)
- the most recent statement that the shell executed, if any (green arrow)

Beneath the program, Python Tutor provides a progress bar and four buttons for you to use to explore a visualization of an execution.

Press the "Forward" button to see how the visualization shows the effects of executing the first assignment (Step 1 of the execution).

Discuss what will change if you press the "Forward" button a second time. Then press the button to check your understanding (Step 2).

Continue to step to the end of the visualization.

Q: How does PythonTutor show a reference to an object?

Q: Why do you think it might be important to explicitly show references?