CS 120: Intro to Computer Programming II

In-Class Activity - 02 References - Day 1

Activity 1 - Turn in this one

Discuss each of these questions with your group. Make sure that everybody is involved; don't just give the answers. It's important that everybody agree, and understand the answers!

- What is a "reference?" If a variable `x` is a reference to an array, does `x` actually contain the array?

- In the video and the slides, we said that the line of code

      x = [1,2,3,4,5]

  was executed in two steps. What were these steps?

- Arrays have a very special **structural** property (that is, a property of how they are built in memory) which was good for performance. What was that property, and why was that useful?

Activity 2 - Turn in this one

Draw the data structure diagram (that is, the reference diagram) for the following:

      [[1,0,0], [0,1,0], [0,0,1]]

As always, **make sure to discuss this with your group.** Make sure that everybody can see the diagram. Pay attention to see if you agree how many arrays there are, what their contents are, and where they are stored.

Activity 3 - Turn in this one

Draw the data structure diagram for the code snippet below; at each point where you see `DRAW HERE`, draw a picture of how the variables look at exactly that point.

Yes, that means that you will have to re-draw objects, multiple times - sorry about that! But I want you to show how the variables **changes** over time.

```
x = "abc"
y = ["foo", "bar", "baz"]
# DRAW HERE

y[0] = "hello"
y[1] = "world"
y[2] = [ "here", "is", "data" ]
# DRAW HERE

y = "nothing here, anymore"
# DRAW HERE
```

(activity continues on the next page)

Activity 4 - Optional

OPTIONAL. Complete this if you have time, and turn it in. If you don't have time, you may report to your TA that you ran out of time.

In the previous activity, the last line of code was interesting: it **replaced** an array entirely; it changed the variable y, which used to have an array, to point to a string instead.

Discuss with your group: What do you think happened to the old array? Where is it now? (If you know the answer, don't shout it out; let your group discuss the possible options.)

In this activity, I want you to turn in **all** of the various ideas that people in your group reported, even if you think they are wrong. Even if somebody knows the right answer (or at least, thinks they do!), report the other answers as well.

Activity 5 - Optional

OPTIONAL. Complete this if you have time, and turn it in. If you don't have time, you may report to your TA that you ran out of time.

What does the `id()` function return in Python? If two variables have different id's, what does that tell you about what's going on, inside memory? If two variables have the `same` id, what does that tell you?

Challenge Activity - Do not turn in this one

Draw the data structure diagram for the following code snippet. (Execute it in Python, and print out all of the id's, to check your work.)

```
x = [1,2,3]
y = [4,5,6]
z = x
```

Next, draw the data structure diagram for the following code snippet. Execute this in Python as well, to double-check your id's.

```
w    = [0,0,0]
w[0] = [1,2,3]
w[1] = [4,5,6]
w[2] = w[0]
```

Finally, print out `w`. What do you see?