5.1 Many Names

Instructor Guide

Overview

This week students will learn about the wonders of lists. Using a fun giant list of names, students will be challenged to think outside the box, and use all of the tools available to them to try and figure out answers to the syntax practice and other challenges. The day will start off with a quick paper programming followed by the **Syntax Practice** activity, then finished off with the **Many Names Activity**.

This week is different from many others and will require the use of pulling together multiple tools such as loops, conditionals, and now lists! It is important to give students adequate time to problem solve solutions to these challenges on their own.

Learning Goals

- You create a list by setting a variable equal to a specific list
- Lists are a type
- Lists are a mutable sequence of elements
- You can add to and subtract from lists
- List can contain elements of different types
- You can loop through a list using a for loop
- You can loop through a list using its index
- The append operator adds elements to the ends of lists, while the pop operator removes elements from the list, destructively

Personal Growth Goals

- Humility: Students will be gaining a very powerful tool this week, and it important for them to understand the versatility that lists can provide.

Skills Required

- Understanding of variables, conditionals, ints, strings, functions with parameters (how to follow variables through functions)
- General understand of how and when to use for loops and while loops

Resources Required

- Computers for either every student or every pair of students
- Python 3 needs to be installed on all the computers
- One mentor per 2-3 students
- A projector to project the central instructor's computer
- List Life Paper Programming
- Pencils for each student

Instructor Preparation

- Make sure all the computers students will use have Python and a text editor (right now, we use Pyzo) installed (check to see that students have a way to save/access files)
- Load the following programming files onto each computer:
    a. 05_01_01_syntax_practice.py
    b. 05_01_02_many_names.py
- Also, have one **List Life Paper Programming** printed out for each student.

In Depth Description of Lab Activities

Phase 1: Setup

1. Before the students arrive, open the following files in a text editor on each computer:
    a. 05_01_01_syntax_practice.py
    b. 05_01_02_many_names.py
2. Have one printed out **List Life Paper Programming** for each student on the desks, and pencils available if needed.

Phase 2: Introduction | Review

1. Review for and while loops:
    a. Using a projector to project the teachers computer review the following material.
        i. Syntax for the different loops
        ii. In what scenario would you use a while loop, ask for an example
        iii. In a for loop, is the second number included in the range?

            iv. What kind of statement is used for a while loop?

Phase 3: List Life Paper Programming

1. The purpose of this paper programming is to introduce kids to the syntax and overall idea of lists before writing any code.
2. As a class complete the short paper programming one section at a time. With the List Life Paper Programming in front of them, progress through with the following questions.
    a. Question: “In everyday life, could someone think of what kind of lists you see?”
        i. Possible Answers: “A list of…” : favorite ‘something,’ names, animals, largest cities, colors, oceans, books, football players, crustacean, etc.
    b. Activity: With that, have the students then fill out the next blank with a few examples of one of their lists.
        i. For example: A list of colors could look like [blue, red, pink, green]
    c. Have a few of the kids give say their list and the examples.
    d. Now have the kids look at the list provided, and have them fill out the remaining questions on their own:
        i. Answer to: What the the types in the list above? Ints, Strings
            1. Types refers to types in programming.
        ii. Answer to: How many elements are in the list? Five
        iii. Answer to : What is the element in the third index? ____
    e. The last question is going to confuse the students? What is the index?
        i. Use that to move into the general lecture on

Phase 4: General List Lecture

1. A list is a sequence of elements. There can be different *types* inside of a list. Lists are *mutable*. Meaning lists have the ability to change. For example, you could set the first element in your list equal to the second, or something completely different. You can add elements, or subtract elements from your list too!
2. From the syntax guide a teacher should project their computer and teach the following topics, giving examples for each:
    a. List syntax:
        i. Lists are created with opened and closed brackets, with each element in the list being separated by commas.
            1. names = [“Scooby”, “Shaggy”, “Daphne”, “Wilma”]
    b. List creation and basic operators:
        i. You create a list by creating and setting a variable equal to whatever list you want. (see example above)
        ii. You can find the length of the list by using the len() operator. For example:
            1. len(names) = 4
        iii. Creating an empty list
            1. variableName = [ ]

   c. List Accessing:
      i. You can see what is in a certain spot, or index, in the list by indexing into it.
         1. **The 1st element in the list is in the 0th index.** The 2nd element is in the 1st index, etc.
         2. Use the syntax guide for related examples.
   d. List looping:
      i. Use the syntax guide for related examples.
   e. List mutability:
      i. You can add things to the list by using append.
         1. Example: names.append(“Fred”)
         2. print(names) #prints → [“Scooby”, “Shaggy”, “Daphne”, “Wilma”, “Fred”]
      ii. You can remove things from a list by using pop.
         1. names.pop() → pops the last element in the list
         2. names.pop(0) → pops the first element in the list
3. Save time at the end for specific questions that could arise from any students, lists can become very complicated.

Phase 5: Syntax Practice Activity

1. Using the syntax guide for reference, the students should now try to complete the Syntax Practice on their own getting help from mentors if needed.

Phase 6: Many Names Activity

1. Start this activity by having the main instructor go over what the students are looking at.
   a. The instructor should quickly ‘demystify’ the big list of names, and walk through the first challenge with the students.
2. The students should then try to complete this activity on their own with help from the Syntax Guide and mentors.
3. It is okay if the students do not complete this lesson. There will be time scheduled next class for students to finish it.

Phase 7: Pack up | Review

1. Mentors should lead a discussion with their students based on the question: What do you think that you can do with these tools now?
2. This question may be useful to use this as a form of review, and can also be used to increase interest in the subject.

Lesson Plan

(:10) means that this part should be done by the tenth minute of the lesson

1. Setup (:0)
2. Introduction | Review (:10)
3. List Life Paper Programming(:15)
4. General List Lecture (:25)
5. Syntax Practice Activity (:40)
6. Many Names Activity (:55)
7. Pack up | Review (:End)

Take Away

By the end of this lesson students should be able to understand how to create, manipulate and loop through a list. They should also be able to use loops and conditionals to strategically solve a basic problem involving lists.