4.2 Graphics Galore pt. 2

Instructor Guide

Overview

Students will be reviewing for and while loops, and using them to create more complex graphics than in the previous lab. Students will first review what they know through the **Connect the Dots Paper Programming**. Then move into learning more about loops, and applying that knowledge to harder challenges. Students will end the lab with completing a fun and challenging activity using loops and graphics!

The main purpose of this lab is learning and more thoroughly understanding loops, as graphics are only a means to achieve this learning. Therefore, if there is ever a circumstance for trouble the focus should be reviewing and going over loops.

Learning Goals

- Thorough Review of materials learned in the last lab:
    - Understanding the parameters for drawing a rectangle, and what they represent on the screen.
        - canvas.create_rectangle(x0, y0, x1, y1, fill="red")
    - Understand syntactically how to write a for loop.
        - Using a colon and wording
    - The variable assigned in the for loop will take on all of the values in its range non-inclusive of the last number
    - A for loop will end after it iterates through all of the numbers in its range non-inclusive of the last number
    - Understand syntactically how to write a while loop.
        - Using a colon and wording
    - Understand the conditional statement in which a while loop will occur.
    - Understand when a while loop starts and ends.
    - random.randint(#1, #2) will return a value between the first and last number inclusively

Personal Growth Goals

- Thinking: Loops are a powerful tool, and the use of them at first can seem very simple. Students will have the opportunity to explore and create cool images with loops, and being able to think and see the power of this tool is very helpful in accomplishing these challenges.

Skills Required

- Understanding of variables, conditionals, ints, functions with parameters (how to follow variables through functions)
- Introduction to random, for loops, while loops, and graphics

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
- Connect the Dots Paper Programming
- A projector to project the central instructor's computer
- 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.
    - 04_02_01_syntax_practice.py
    - 04_02_02_square_diagonals.py
- Also, have one **Connect the Dots 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. 04_02_01_syntax_practice.py
    b. 04_02_02_square_diagonals.py
2. Have one printed out **Connect The Dots Paper Programming** for each student on the desks, and pencils available if needed.

Phase 2: Introduction | Review

1. The class should begin with a brief review of what for, and while loops do.
    a. The basic format for each, when each are used, and how to use them.
    b. Ask questions like:
        i. When would you use a for loop instead of a while loop?
        ii. If I want to iterate a fixed number of times, which loop would I use?
        iii. Describe the syntax for a for loop and while loop.

Phase 3: Connect the Dots Paper Programming

1. Students will then work through the Connect The Dots Paper Programming after a quick review of conditional statements.
2. There will be either a walk through of how to complete it or students will complete it on their own.
3. After they are done the Connect the Dots, make a few points.
    a. What was the purpose of this activity?
    b. What does it reinforce?

Phase 4: Syntax Practice

1. The students will be completing the syntax practice on their own.
2. If they have questions they should ask their mentor or refer to the syntax guide.
3. The Syntax Practice is for reinforcing solving problems on their own.
4. This practice is solely about how to create and manipulate loops.
5. If students finish early, see if they can think of some of their own problems to solve using loops, or if they can find another way to solve one of the problems they have already completed.

Phase 5: Fun Square Diagonals

1. The students will be completing Fun Square Diagonals on their own.
2. If students get to the bonus and complete it by hardcoding in all of the diagonals, an introduction to nested for loops could be applied by the mentor.
3. If they have questions they should ask their mentor or refer to the syntax guide.
4. Students may struggle to understand how to approach this problem. If that is the case, try relating what they have to do back to what they just did in the syntax practice.

Phase 6: 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 (:10)
3. Connect The Dots Paper Programming(:20)
4. Syntax Practice (:40)
5. Fun Square Diagonals(:55)
6. Pack up | Review (:End)

Take Away

After this lab students should be able to think of multiple ways to use for, and while loops, and be able to apply them to graphics and solving simple problems.