CSCI 220L

Lab 4

Learning Objectives

- Develop Python programs that generate sequences.
- Develop Python programs that use the accumulator pattern.
- Begin working with the textbook author's graphics library.

Activities

Complete the following activities in the provided Python file. Make sure to include meaningful comments, input prompts, and output messages to receive full credit.

1. Sequences, series, and products

   Read through the attached PDF on generating sequences, series, and products. Then, complete the following functions in the starter file so that they compute the first *n* elements of the given sequence, series, or product. For a sequence, display the first *n* terms. For a series or product, display the sum/product of the first *n* terms/factors. Pattern A has been done for you. You can run your solutions individually, or all together using the provided `patterns()` function.

   a. $2\ \ 4\ \ 6\ \ 8\ \ 10 \ldots$

   b. $1 + 4 + 7 + 9 + 11 + \cdots$

   c. $0\ \ 6\ \ 0\ \ 6\ \ 0\ \ 6 \ldots$

   d. $2 - 4 + 4 - 4 + 6 - 6 + 6 - 8 + \cdots$

   e. $\frac{3}{2} * \frac{5}{4} * \frac{7}{8} * \frac{9}{16} * \frac{11}{32} * \ldots$

2. Calculating your grade

   You want to determine your average homework grade. Write a function, `hw_stats()`, that asks the user for a number of scores to be entered. The function should ask for each score and then output the mean (average), rounded to one digit. For example:

```
Enter the number of assignments: 3
Enter your grade on HW1: 85
Enter your grade on HW2: 93.3
Enter your grade on HW3: 90.5
Your overall average is 89.6
```

   Each input prompt should include the assignment number (`HW1`, `HW2`, `HW3`, ...).

3. Calculating a standard deviation

   The standard deviation of a dataset is a measurement of how spread out it is. Modify your `hw_stats()` function to also display the standard deviation of your homework scores, using the following formula:

$$SD = \sqrt{\frac{1}{n}\sum_{i=0}^{n-1}(scores[i] - mean)^2}$$

   (If you're unfamiliar with the capital sigma Σ, you can read about summation notation here.)

   Since this formula requires the mean that you computed in Exercise 2, naturally any calculations you need to perform must occur after your code for the previous exercise. Here is a possible strategy for solving this problem (you may choose another approach):

   1. Modify your original solution to also store all the homework scores in a list.
   2. After calculating the mean, loop through the list of scores and accumulate the summation part of the formula: $\sum_{i=0}^{n-1}(scores[i] - mean)^2$
   3. Divide by *n*, take the square root, and display the result.

   You can test your answer using Python's built-in `stdev()` function in the `statistics` library (don't forget to import it!). If you have a list of numbers called `values`, you can display its standard deviation like this:

```
print(statistics.stdev(values))
```

4. Getting started with graphics

   Read through the provided function `draw_shapes()`, which opens a blank window where the user can click to draw and move a circle. Try running the function to make sure you understand how it works. Then, modify it to display a 20 pixel square instead of a circle. The square should still be centered on the location the user clicks.

Upload `lab4.py` to the OAKS dropbox before the deadline. Make sure you have most of the exercises completed before your lab meeting.