420-SN1 Programming in Science - Lab Exercise 9

In this lab, you will practice programming with `for` loops and nested lists.

1 Using `for` loops

You will create three short programs to practice with `for` loops.

1.1 Complementing DNA

Rewrite your submission for `Lab07-P2-1.py` to use a `for` loop instead of a `while` loop. Submit this as `Lab09-P1-1.py`.

I have provided a solution to this problem if you are not happy with your prior submission, or no longer have access to it.

1.2 Multiples of 3 or 5

Rewrite your submission for `Lab08-P2-1.py` to use a `for` loop and `range` instead of a `while` loop. Submit this as `Lab09-P1-2.py`.

2 Multidimensional lists

The file `Lab09-P2.py` contains a data structure that represents the mean monthly temperature for thirteen locations across Canada.

The file defines a name, `avgtemp`, that is a list containing 13 sublists. Each sublist contains 14 items:

- a location name
- the two-letter code for the province or territory
- 12 floats giving the mean temperature in degrees C for January through December.

Your task is to add Python code to the file to compute the following:

- The mean of the temperatures for each of the 13 different locations, averaging over months. That is, compute the annual average temperature in each location.
- The standard deviation of the temperatures for each of the 13 different locations. This is a measure of how much the temperature varies over the course of the year.
- The mean temperatures for each of the 12 months, averaging over locations. That is, compute the overall average temperature for each month.

To compute the mean annual temperature for a location, you have to add all of the temperatures in that row, and divide by the number of months.

The formula for the standard deviation of a population is as follows:

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$$

, where μ is the mean of the values x_i. For a list of N numbers that are all equal, the standard deviation is zero.

Your program output should be organized into two parts. The first part should combine the two-letter codes for the locations and the mean and standard deviation per location:

```
AB 2.37 10.36
BC 10.27 4.69
MB ...
```

the second part should give the monthly average temperatures. The list `months` is provided to make it easier for you to print the month abbreviations shown:

```
Jan -11.91
Feb -11.0
Mar ...
```

Please round all values to two decimal places.

Submitting your work

Create a ZIP file containing all your 3 programs, and submit them via Omnivox.