Lab Exercise #5 (File I/O)

Assignment Overview

This lab exercise provides practice with file processing.

Part A: Data Processing

Given a data file, find the max, min, and average values of columns. Also, create an addition column that is based on the other columns. There will be no error checking required for this lab.

You are provided with a data file named (surprise!) `data.txt`. Data is arranged in columns where each item of data is twelve columns wide (so it is easy to extract data items using slicing):

```
Name        Height(m)    Weight(kg)
Joe         1.82         72.57
Mary        1.60         63.50
Dion        1.90         90.71
Kayla       1.72         66.31
Jose        1.78         70.23
Sofia       1.63         65.12
Erik        1.98         92.21
Sara        1.57         65.77
```

Your task is read the file `data.txt` and calculate the max, min, and average of the height and weight columns and to add an additional column that has the BMI calculated based on each height and weight. Your output will look like this (and needs to be formatted like this). The format string is : `"{:<12s}{:<12.2f}{:<12.2f}{:<12.2f}"`

```
Name        Height(m)    Weight(kg)    BMI
Joe         1.82         72.57         21.91
Mary        1.60         63.50         24.80
Dion        1.90         90.71         25.13
Kayla       1.72         66.31         22.41
Jose        1.78         70.23         22.17
Sofia       1.63         65.12         24.51
Erik        1.98         92.21         23.52
Sara        1.57         65.77         26.68

Average     1.75         73.30         23.89
Max         1.98         92.21         26.68
Min         1.57         63.50         21.91
```

The formula for BMI is simple in the metric system: `BMI = weight/height**2`

How do we find the max and min?

The basic concept is similar to counting that you have done multiple times: initialize a value before a loop and the update the value every time through the loop.

Based on that concept here is the algorithm to find the minimum of a set of values:
1. Initialize `minimum` to be much larger than any data value in your data, e.g. `10**6`.
2. When you consider each data item, if the data item is smaller than the current `minimum`, you have a new `minimum` (so update it).
3. After considering all data items your `minimum` will contain the smallest.

The algorithm to find the maximum is a tiny variation.

To find the average, add up all the values and count how many values there are. Divide those two to get the average.

Hint: build this program incrementally
1. Begin by simply opening the file and printing every line – now you know that you are correctly working with the correct file.
2. Next ignore the header line—use either `readline()` before the loop or `continue` in the loop.
3. Next find the average of a column: collect a total and count, remembering to initialize before the loop.
4. Next find the minimum of a column using the algorithm above.
5. Continue in such small increments to do the remainder of the program.

Part B: Create a data file

The second task is to write that output to a file. The steps are

1. Open a file for writing, e.g. `outfile = open("output.txt","w")`
2. Whenever you print, include the argument `file = outfile`
   For example, if you previously had `print(x)`
   you will now have `print(x, file = outfile)`
3. Close the file, e.g. `outfile.close()`
   If you forget this step, nothing will be written to the file. Also, don't forget the parentheses.