

Assigned:	Thursday, November 24 th
Due:	Tuesday, November 29 th at midnight
Submission format:	Code and test results uploaded to Canvas

Instructions

Complete this task individually. Please employ good programming style. Your programming style will factor into your grade for the assignment. Kindly put your solution files along with the input data file in a zipped folder before uploading to Canvas.

For Part 2, you may find some of the following resources on Python string formatting useful:

- Python number formatting examples: <https://queirozf.com/entries/python-number-formatting-examples>
- How to use string formatters in Python: <https://www.digitalocean.com/community/tutorials/how-to-use-string-formatters-in-python-3>
- Python string formatting best practices: <https://realpython.com/python-string-formatting/>

PART 1 - Preliminaries

1) Write a function called **min_index** that, given a list of numbers, returns the **index** of the smallest value in the list. For example, given the list [40, 50, 10, 90, 100, 70], the function will return 2.

2) Write a function called **max_index** that, given a list of numbers, returns the **index** of the largest value in the list. For example, given the list [40, 50, 10, 90, 100, 70], the function will return 4.

3) Write a function called **smaller_indices** that, given two lists of numbers of equal length, returns a new list containing all **indices** for which the value in the first list is smaller than the value in the second list. For example, given the lists [40, 50, 10, 90, 100, 70] and [60, 20, 19, 95, 30, 20],
the function will return [0, 2, 3].

4) Write a function called **pairwise_product** that, given two lists of numbers of equal length, returns a new list containing the **product** of the values in the first list with those in the second list. For example, given the lists [40, 50, 10, 90] and [6, 2, 2, 5],
the function will return [240, 100, 20, 450].

4) Write a function called **pairwise_ratio** that, given two lists of numbers of equal length, returns a new list containing the **ratio** of the values in the first list to those in the second list. For example, given the lists [40, 50, 10, 90] and [60, 20, 19, 95],
the function will return [0.666, 2.5, 0.526, 0.947].

PART 2 – Analysing Data on African Countries

You have been provided with a CSV file containing data on countries in Africa, namely:

- Country name
- Population
- Literacy rate (in %)
- Number of mobile subscriptions
- Number of internet users
- Amount of electricity production (in billions of kWh)
- Amount of electricity consumption (in billions of kWh)

A CSV file is simply a text file where the data on each line is separated by commas. You can visualize this file in Microsoft Excel or in a text editor. You'll notice that the first line has the column names and then subsequent lines contain the data.

1) Write a program that reads the provided file, and loads the data into various lists (i.e. a list of country names, a list of population values, etc.). In addition, store the country names in a dictionary, with country name as key and the index of the country in the list as value. *Hint: when you read each line of the file, you can split up the data using the string's `split()` method.*

2) Write a function that allows the user to efficiently query information about any country by entering the country name. Your function should look up the index of the given country in the dictionary, use the index to access the appropriate data for that country stored in the various lists, and report the data to the user, making use of string formatting to present the numbers in the appropriate format (e.g. with commas denoting 1000s).

An example interaction with your program is listed below. The user's input is shown as bold.

```
Hello! what country would you like information on? Ghana
Ghana has a population of 25,758,108 and a literacy rate of 72%.
The estimate of the number of mobile subscriptions is
25,618,000, while that of internet users is 1,297,000.
Ghana produces 8 billion Kwh of electricity annually, while it
consumes 5 billion Kwh of electricity.
```

2) Write a function to process the given data to create a new file with the following data. Where necessary, make use of the functions you defined in Part 1, to avoid code duplication. Use string formatting to ensure nicely aligned columns in your output text file.

- Country name
- Mobile subscriptions *per capita* (i.e. divided by the population)
- Internet users *per capita* (i.e. divided by the population)

3) Lastly, write a function to compute and report the following information. Where necessary, make use of the functions you defined in Part 1, to avoid code duplication.

- The total population of Africa
- The most populous and least populous African countries
- The countries with the highest and lowest literacy rates
- The “average” literacy rate in Africa, computed by weighting each country's literacy rate by the country's population, and dividing by the total population.
- The countries with the highest and lowest number of mobile subscriptions *per capita*
- The countries with the highest and lowest numbers of internet users *per capita*
- The countries that produce more electricity than they consume (electricity exporters)

- The countries that consume more electricity than they produce (electricity importers)