

CS1026: Assignment 4: Country Classes

Due: Thursday, December 5th 2019 at 9:00pm

Weight: 12%

Learning Outcomes:

By completing this assignment, you will gain skills relating to

- Strings and text files
- Writing and using your own classes
- Testing code
- Using complex data structures (i.e., lists, sets and dictionaries)

Data files are very common in many disciplines. They form the input for a variety of different kinds of processing, analysis, summaries, etc. An associated problem is to maintain these data files – to add information, update or correct information. Manually updating data files can be tedious and can lead to errors. A common approach is to use a program – an “update” program that takes a data file and a file of “updates” and then creates a new version of the data file with the updates applied.

In this assignment you will create a complete program that will update an existing data file containing information about countries. The tasks are outlined below.

Tasks

TASK 1

Implement a class **Country** that holds the information about a single country; name the file **country.py**.

Instance Variables

- 1) name: The name of the country (string)
- 2) population: The population in the country (integer)
- 3) area: The area of the country (integer)
- 4) continent: The name of the continent to which the country belongs (string)

Methods

- 1) Constructor, **`__init__(self, name, pop, area, continent)`**
- 2) Getter Methods: **`getName`, `getPopulation`, `getArea`, `getContinent`**
- 3) Setter Methods: **`setPopulation`, `setArea`, `setContinent`**
- 4) **`def __repr__(self)`**: generates a string representation for class objects.

Example of output from **`__repr__`**

Name (pop: population value, size: area value) in Continent

e.g., Nigeria (pop: 11723456, size: 324935) in Africa

Test all your classes and methods before moving to the next section. Feel free to create other helper methods if necessary.

TASK 2

Implement a class called **CountryCatalogue**; name the file **catalogue.py**.

This class will use a file to build the data structures to hold the information about countries. The file **data.txt** contains information about a number of countries. An example of the data file is:

```
Country|Continent|Population|Area
Brazil|South America|193,364,000|8,511,965
Canada|North America|34,207,000|9,976,140
China|Asia|1,339,190,000|9,596,960
Colombia||48,654,392|1,090,909
Egypt|Africa|93,383,574|
```

Notice that:

- There is a header line: "Country|Continent|Population|Area". This is really for information purpose for the data file; it is a reminder of the format of the data in the file.
- The file consists of "records" for each country – one per line with the information as described in the header line.
- The different "fields" of each "record" are separated by vertical bars, "|".
- A field (except for country name) may be missing (see Colombia and Egypt) but the record should still have the three vertical bars.

The class **CountryCatalogue** should have the following instance variable:

1. **countryCat**: This is a collection of countries, i.e., each member is an object of the class **Country**. The collection could be a set, dictionary or list. **It is important that the collection store objects of type Country.**

You may add other instance variables as you see fit.

Methods

- 1) Constructor, **__init__(self, countryFile)**

The constructor method will take a single parameter (besides "self") that is the name of the file that contains the information about each country. The constructor will use the data in the file to construct the data structure **countryCat**. Sample data files has been provided: **data.txt** and **data2.txt**. [**Note: Both files have headers and these files are meant for you to test your program; they may NOT be the same used to evaluate your solution.**]

- 2) Setter Methods: **setPopulationOfCountry**, **setAreaOfCountry**, **setContinentOfCountry**
- 3) **findCountry(self, country)**

Given a country object (that is, an object of the **Country** class), this methods checks to see if that country object is in **countryCat**. If it is, it just returns the country object, but if it is not, it returns the null object **NONE**.

- 4) **addCountry(self, countryName, pop, area, cont)**

Given the name, population, area and continent of a country, this method adds a new country to **countryCat**; it should only be added if the country does not exist in **countryCat**. The method should return **True** if the operation is successful (country successfully added), or **False** if it is not, e.g. the country they entered already exists.

5) **printCountryCatalogue(self)**

This method prints a list of the countries and their information to the screen; it should make use of the **repr** method of the **Country** class.

6) **saveCountryCatalogue(self,fname)**

This method will enable all the country information in the catalogue to be saved to a file. The method takes as a parameter the name of the file. All the countries should be sorted alphabetically by name (A – Z) prior to saving. If the operation is successful, the method should return the number of items written, otherwise it should return a value of -1. The file should appear in the exact same format as the original file, namely:

```
Country|Continent|Population|Area
Brazil|South America|193,364,000|8,511,965
Canada|North America|34,207,000|9,976,140
China|Asia|1,339,190,000|9,596,960
Egypt||93,384,001|1,000,000
Indonesia||260,581,345|
```

Notice that:

- There should be no spaces between the fields and vertical bars.
- If a field has no value, then nothing should be printed, e.g. see Egypt and Indonesia with no continent value and Indonesia with no area given.

You may add other methods as you see fit.

Test all your classes and methods before moving to the next section. Feel free to create other helper methods if necessary.

TASK 3

Implement a Python module, called **processUpdates.py**, that has a function **processUpdates(cntryFileName,updateFileName)**. This function takes two parameters: the first parameter will be the name of a file containing country data (e.g. **data.txt**). The second file will contain the name of a file containing **updates**. Each record in the update file specifies updates for a single country. The format of a record is as follows:

```
Country;update1;update2;update3
```

Where an “update” is of the form “L=value” and L can be **P**, for population, **A** for area and **C** for continent. Updates are separated by semicolons and a line can have 0, 1, 2 or 3 updates; any updates beyond 3 are simply ignored.

An example of an update file is:

```
Brazil;P=193,364,111;A=8,511,966
Indonesia;P=260,581,345
Japan;P=127,380,555;A=377,800
Sweden;P=9,995,345;A=450,295;C=Europe
```

```
Italy; P=59,801,999
Canada;C=North America
Egypt;A=1,000,000 ; P=93,384,001
```

Notice that:

- The updates can be in different orders, e.g. the updates for Egypt are area first, then population.
- If a country is specified and that country is **NOT** already in the catalogue ***then that country and its attributes (at least the ones specified; not all have to be specified) should be added to the catalogue.***
- There can be spaces around the semicolons; spaces in other places may cause errors and should be handled as exceptions (see below).

The function **processUpdates** gets two files as parameters. The first parameter is the name of the file with the country data and the second parameter is the name of file with the update data.

The country file should be processed first. The function **processUpdates** should ensure that it exists. If it does exist, it should then proceed to process the data file using the class **CountryCatalogue**. If the country file does not exist, then **processUpdates** should give the user the option to quit or not (prompts for “Y” (yes) or “N” (no)). If the user does not wish to quite (responds with “N”), then the function should prompt the user for the name of a new file. If the user wishes to quit (responds with a “Y” or anything other than a “N”, then the method should exit and return **False**. The method should continue to prompt for file names until a valid file is found or the user quits.

If the user chooses to quit, i.e. no country file is processed, then the function **processUpdates** should NOT try to process the updates file, write to the file “**output.txt**” the message “**Update Unsuccessful\n**” – just the single line. It should then exit (i.e.,) and return **False**.

If the function **processUpdates** has successfully processed the country file, then it should proceed to process the file of updates. It should prompt the user in a similar manner to how the country file was input, i.e., using a loop to continuously prompt the user until a file was found that existed or until the user quits.

If the user quits without an update file being selected, then the function **processUpdates** should write to the file “**output.txt**” the message “**Update Unsuccessful\n**” – just the single line. It should then exit (i.e.,) and return **False**.

If an update file is found, then the function **processUpdates** should process the updates, i.e., update the information about the countries and then output the new updated list of countries in alphabetical order to the file “**output.txt**”. The output should use the method **saveCountryCatalogue(self,fname)** from the class **CountryCatalogue** (see Task 2). It should then exit and return **True**.

In processing the updates from the update file, the lines may have extra spaces, forgotten semicolons, etc. Some of these MAY cause exceptions when processing the line – you program should be design to catch any of these as exception. , e.g. bad values, incorrect format, etc.

The **main.py** file is provided as the interface to your program. It has been designed to prompt for the names of a country file and a file of updates and then call the function **processUpdates**; **make sure that you use these names of functions and methods as described above**. You may use the **main.py** to test your program in other ways. Two additional data sets of countries have been provided, **data2.txt** and **data3.txt**, as well as two different files of updates, **upd2.txt** and **upd3.txt**. You may use these to test your program. **NOTE: while main.py will test some aspects of your program it does not do a complete and thorough testing – this is left up to you. The TA will use a program similar to, but different than, main.py to grade your assignment - it will include other tests.**

The following may be helpful in sorting data structures

<http://pythoncentral.io/how-to-sort-a-list-tuple-or-object-with-sorted-in-python/>

<http://pythoncentral.io/how-to-sort-python-dictionaries-by-key-or-value/>

Non-functional Specifications:

1. Include brief comments in your code identifying yourself, describing the program, and describing key portions of the code.
2. Assignments are to be done individually and must be your own work. Software may be used to detect cheating.
3. Use Python coding conventions and good programming techniques, for example:
 - i. Meaningful variable names
 - ii. Conventions for naming variables and constants
 - iii. Readability: indentation, white space, consistency

Submit the files in which your classes and functions are defined:

- **country.py** containing the class **Country**;
- **catalogue.py** containing the class **CountryCatalogue**;
- **processUpdates.py** contain the function **processUpdates**.

Make sure you attach your python file to your assignment; DO NOT put the code inline in the textbox.

What You Will Be Marked On:

1. Functional specifications:
 - Does the program behave according to specifications? Are classes, methods and functions named as per the instructions?
 - Are the order of parameters in the methods and functions defined as per the instructions?
 - Does it run when tested with a program similar to the main program provided?
 - Are your classes created properly?
 - Are you using appropriate data structures?
 - Is the output according to specifications?
2. Non-functional specifications: as described above
3. Assignment submission: via OWL assignment submission