CSE 231 **Fall 2022**

Computer Project #06

This assignment focuses on the design, implementation, and testing of a Python program that uses lists and tuples.

It is worth 50 points (5% of course grade) and must be completed no later than **11:59 PM on Sunday 10/23, 2022.**
Note that there will be zero penalties for assignments handed in on the following two days: October 24 & 25. No submissions will be accepted after October 25. If you submit your project by Sunday 10/23 at 11:59PM EST, you will get 2 extra credit points (note that you have to click on the submit to count as submitted).

Assignment Overview

In this assignment, you will practice with lists of lists and tuples and write a program to answer the questions described below.

Assignment Background

In this assignment, you will practice with character data from a video game called Genshin Impact. Genshin Impact has various playable characters that can be chosen. Each character has five attributes: its name, an element, a weapon type, a rarity ranking, and a possible region that they originate from.

The data is provided in a file:
1) `data.csv`: Each line has the five attributes of a character, comma-separated

```
Name , Rarity , Element , Weapon  ,  Region
```

You will create a list of tuples in a slightly different order:

```
(name, element, weapon, rarity, region)
```

Assignment Specifications

You will develop a Python program that has the following functions

`open_file () → file pointer fp:`

a. This function prompts the user to input a file name to open and keeps prompting until a valid name is entered. Return the file pointer.
b. Parameters: none
c. Returns: a file pointer
d. Display: prompts and error messages

`read_file (fp)` → `list of tuples:`

a. This function reads the comma-separated value (`csv`) file using file pointer fp. The file has one header line. Create a list of tuples. Each tuple represents a character and has the following format:

   `(name, element, weapon, rarity, region)`
   The type of each element in the tuple:
   `(string, string, string, int, string)`
   If there is no value for the region, use `None`.
   Return the list of tuples.
b. Parameter: file pointer
c. Returns: list of tuples
d. Displays: nothing

`def get_characters_by_criterion (list of tuples, criteria, value)` → `list`

a. Given a list of character tuples, retrieve the characters that match a certain `criteria`. If there is a problem with a `value` or `criteria` parameter, don't add the character to the return list—see note below
   The `criteria` parameter is an `int` that represents the index of a criteria in a character tuple. For example, if filtering by *weapon*, `criteria` should be 2; if filtering by *region*, `criteria` should be 4, etc (*Hint:* use provided constants for the parameter `criteria`*)*.

   Note:
   I. The input list of tuples can be empty. In that case, return an empty list.
   II. If the `criteria` is RARITY, `value` must be an `int.` If not, the character is not added to the return list. Remember, criteria is an INT.
   III. For other `criteria`, `value` must be a `string` and variations in case are accepted, e.g. `'Sword', 'SWORD', 'SwOrD'` and similar will match. If not, do not add the character to the return list.
   IV. If a character's criterion value is `None`, do not add the character to the return list.
b. parameter: list of tuples, int, int/string
c. Returns: list of tuples
d. Display: nothing

`def get_characters_by_criteria (master_list, element, weapon, rarity)→ list :`

This function takes as parameter the list of tuples returned by the read_file function (master_list), an element, a weapon, and a rarity and returns a list of tuples filtered using those 3 criterias. This function looks similar to the `get_characters_by_criterion` function; the difference is that this function calls `get_characters_by_criterion` *three* times, one for each of element, weapon and rarity specified to select characters based on all three criteria. The three calls effectively filter for each by passing the returned list of one function as an argument to the next call. Note that the parameters in this function for element, weapon, and rarity become the

`value` arguments for the three respective calls to `get_characters_by_criterion`---the `criteria` argument is determined by this parameter's name. (*Hint:* use provided constants for the parameter `criteria`).

a. Parameter: list of tuples, string, string, int
b. Returns: list of tuples
c. Display: nothing

`def get_region_list (master_list) → list:`

a. Given the master list of character tuples, retrieve all available regions into a list. No duplicate is allowed. If the region is None, do not include it in the list. Sort the list alphabetically (for consistent testing). Hint: to prevent duplicates check if a region is `not in` the list before adding it to the list.
b. Parameters: list of tuples
c. Returns: sorted list of strings
d. Display: nothing

`def sort_characters (list_of_tuples) → list:`

a. Given a list of character tuples, create a new list where character tuples have been sorted. The order of sorting is by decreasing rarity and alphabetically by name. Because sorting is stable, sort alphabetically on names, and then sort again by rarity. By default, sorting sorts on the first index—names in this case. To then sort by rarity at index 3 use `itemgetter` as described in the Notes below. Remember when sorting rarity to reverse the sorting so it is decreasing. Do not modify the original list.
b. Parameters: list of tuples
c. Return : sorted list of tuples
d. Display: nothing

`def display_characters (list_of_tuples) → none:`

a. Given a list of character tuples, display the characters along with their information, using the formats (HEADER and ROWS) provided as constants in `prog06.py`. If a region has the value `None`, display `'N/A'`.
If `list_of_tuples` is empty, print `'Nothing to print. '`

For example, if the input is the following:

```
list_of_tuples = [('Aloy', 'Cryo', 'Bow', 5, None), ('Eula',
'Cryo', 'Claymore', 5, 'Mondstadt')]
```

Below is what is displayed:

```
Character           Element   Weapon    Rarity    Region
Aloy                Cryo      Bow       5         N/A
Eula                Cryo      Claymore  5         Mondstadt
```

b. Parameters: list of tuples
c. Return: nothing
d. Display: character attributes

`def get_option () → int:`

a. Display a menu of options and prompt for input (`MENU` in the starter code). Note that the prompt is part of the `MENU`. Ask for the input in the function, this function does not take parameters. If the user enters a valid option (the input is an integer between 1 and 4), return the integer, otherwise print an error message (`INVALID_INPUT` in the starter code).
b. Parameters: nothing
c. Return: int
d. Display: menu and error message

`main():`

1. Call `open_file()` to open a CSV file for reading and get a file pointer for the input file.
2. Call `read_file()` to read the data and store it in a list of lists.
3. Call `get_option()` to prompt the user for input.
4. Loop until the user chooses 4.
5. Based on the input option
    a. If option is 1, call a function to get all available regions
        i. Display the message `"\nRegions:"`
        ii. Display all regions, separated by `", "` (comma and a space)(Hint: two possibilities: use the `join()` method or build a string with a comma tacked onto each region and at the end strip off the trailing comma before printing)
    b. If option is 2
        i. Prompt first for a *criteria* (use `CRITERIA_INPUT` in your prompt). if criteria is not an `int` between 1 and 4 (inclusive), print an error message (use INVALID_INPUT) and re-prompt for a criteria. Otherwise, prompt for a *value* (use `VALUE_INPUT` in your prompt).
        if `criteria` is RARITY, convert `value` to an `int.` If it is not an `int`, print an error message (use `INVALID_INPUT`) and re-prompt.
        ii. Call `get_characters_by_criterion` to filter characters by a certain *criteria* with a *value*.
        iii. Sort characters using `sort_characters`
        iv. Display characters using `display_characters`
    c. If option is 3
        i. Prompt in this order for *element*, *weapon*, *rarity;* (use `ELEMENT_INPUT`, `WEAPON_INPUT`, `RARITY_INPUT` respectively)
        for `RARITY` convert value to an `int`; print an error message (use `INVALID_INPUT`) and re-prompt if it is not an `int`.
        ii. Call `get_characters_by_criteria` to filter characters by above criteria.
        iii. Sort characters using `sort_characters`
        iv. Display characters using `display_characters`
    d. If option is 4
        i. Quit the program

Assignment Notes and Hints

1. The coding standard for CSE 231 is posted on the course website:

    http://www.cse.msu.edu/~cse231/General/coding.standard.html

Items 1-9 of the Coding Standard will be enforced for this project.

2. By default, `sorted` (or `sort`) will sort on the first item in a list or tuple. To sort on other indices use `itemgetter`. First, remember to include the following at the top of your program:

```
from operator import itemgetter
```

Then you use the `key` argument in `sorted` (or `sort`). The following sorts list L on index 3:

```
L = sorted(L, key=itemgetter(3))
```

3. The program will produce reasonable and readable output, with appropriate labels for all values displayed.

4. We provide a `proj06.py` program for you to start with.

5. If you "hard code" answers, you will receive a grade of zero for the whole project. An example of hard coding is to simply print the approximate value of e rather than calculating it and then printing the calculated average.

Assignment Deliverable

The deliverable for this assignment is the following file:

`proj06.py` – the source code for your Python program

Be sure to use the specified file name and to submit it for grading before the project deadline.

Test 1

```
Enter file name: data.csv

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 4
```

Test 2

```
Enter file name: data.csv

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 1

Regions:
Inazuma, Liyue, Mondstadt, Snezhnaya

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 4
```

Test 3

```
Enter file name: data.csv

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 2
Choose the following criteria
                1. Element
                2. Weapon
                3. Rarity
                4. Region
                Enter criteria number: 1
Enter value: time

Nothing to print.

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 2
Choose the following criteria
                1. Element
```

```
                2. Weapon
                3. Rarity
                4. Region
                Enter criteria number: 1
Enter value: cryo

Character           Element   Weapon    Rarity    Region
Aloy                Cryo      Bow       5         N/A
Eula                Cryo      Claymore  5         Mondstadt
Ganyu               Cryo      Bow       5         Liyue
Kamisato Ayaka      Cryo      Sword     5         Inazuma
Qiqi                Cryo      Sword     5         Liyue
Shenhe              Cryo      Polearm   5         Liyue
Chongyun            Cryo      Claymore  4         Liyue
Diona               Cryo      Bow       4         Mondstadt
Kaeya               Cryo      Sword     4         Mondstadt
Rosaria             Cryo      Polearm   4         Mondstadt

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 2
Choose the following criteria
                1. Element
                2. Weapon
                3. Rarity
                4. Region
                Enter criteria number: 1
Enter value: none

Character           Element   Weapon    Rarity    Region
Traveler            None      Sword     5         N/A

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 4
```

Test 4

```
Enter file name: data.csv

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
```

```
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 2
Choose the following criteria
                1. Element
                2. Weapon
                3. Rarity
                4. Region
                Enter criteria number: 2
Enter value: polearm

Character           Element   Weapon    Rarity    Region
Hu Tao              Pyro      Polearm   5         Liyue
Raiden Shogun       Electro   Polearm   5         Inazuma
Shenhe              Cryo      Polearm   5         Liyue
Xiao                Anemo     Polearm   5         Liyue
Zhongli             Geo       Polearm   5         Liyue
Rosaria             Cryo      Polearm   4         Mondstadt
Thoma               Pyro      Polearm   4         Inazuma
Xiangling           Pyro      Polearm   4         Liyue
Yun Jin             Geo       Polearm   4         Liyue

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 2
Choose the following criteria
                1. Element
                2. Weapon
                3. Rarity
                4. Region
                Enter criteria number: 3
Enter value: 5

Character           Element   Weapon    Rarity    Region
Albedo              Geo       Sword     5         Mondstadt
Aloy                Cryo      Bow       5         N/A
Arataki Itto        Geo       Claymore  5         Inazuma
Diluc               Pyro      Claymore  5         Mondstadt
Eula                Cryo      Claymore  5         Mondstadt
Ganyu               Cryo      Bow       5         Liyue
Hu Tao              Pyro      Polearm   5         Liyue
Jean                Anemo     Sword     5         Mondstadt
Kaedehara Kazuha    Anemo     Sword     5         Inazuma
Kamisato Ayaka      Cryo      Sword     5         Inazuma
Kamisato Ayato      Hydro     Sword     5         Inazuma
Keqing              Electro   Sword     5         Liyue
Klee                Pyro      Catalyst  5         Mondstadt
Mona                Hydro     Catalyst  5         Mondstadt
```

```
Qiqi                Cryo      Sword     5         Liyue
Raiden Shogun       Electro   Polearm   5         Inazuma
Sangonomiya Kokomi  Hydro     Catalyst  5         Inazuma
Shenhe              Cryo      Polearm   5         Liyue
Tartaglia           Hydro     Bow       5         Snezhnaya
Traveler            None      Sword     5         N/A
Venti               Anemo     Bow       5         Mondstadt
Xiao                Anemo     Polearm   5         Liyue
Yae Miko            Electro   Catalyst  5         Inazuma
Yoimiya             Pyro      Bow       5         Inazuma
Zhongli             Geo       Polearm   5         Liyue

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 2
Choose the following criteria
                1. Element
                2. Weapon
                3. Rarity
                4. Region
                Enter criteria number: 4
Enter value: liyue

Character           Element   Weapon    Rarity    Region
Ganyu               Cryo      Bow       5         Liyue
Hu Tao              Pyro      Polearm   5         Liyue
Keqing              Electro   Sword     5         Liyue
Qiqi                Cryo      Sword     5         Liyue
Shenhe              Cryo      Polearm   5         Liyue
Xiao                Anemo     Polearm   5         Liyue
Zhongli             Geo       Polearm   5         Liyue
Beidou              Electro   Claymore  4         Liyue
Chongyun            Cryo      Claymore  4         Liyue
Ningguang           Geo       Catalyst  4         Liyue
Xiangling           Pyro      Polearm   4         Liyue
Xingqiu             Hydro     Sword     4         Liyue
Xinyan              Pyro      Claymore  4         Liyue
Yanfei              Pyro      Catalyst  4         Liyue
Yun Jin             Geo       Polearm   4         Liyue

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 4
```

Test 5

```
Enter file name: directory.csv
Error opening file. Please try again.
Enter file name: data.csv

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 3
Enter element: dendro
Enter weapon: catalyst
Enter rarity: 5

Nothing to print.

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 3
Enter element: cryo
Enter weapon: bow
Enter rarity: 5

Character           Element   Weapon    Rarity    Region
Aloy                Cryo      Bow       5         N/A
Ganyu               Cryo      Bow       5         Liyue

Welcome to Genshin Impact Character Directory
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 3
Enter element: electro
Enter weapon: sword
Enter rarity: ssr
Invalid input
Enter rarity: 5

Character           Element   Weapon    Rarity    Region
Keqing              Electro   Sword     5         Liyue

Welcome to Genshin Impact Character Directory
```

```
        Choose one of below options:
        1. Get all available regions
        2. Filter characters by a certain criteria
        3. Filter characters by element, weapon, and rarity
        4. Quit the program
        Enter option: 4
```

Grading Rubric

```
Computer Project #06                                Scoring Summary
General Requirements:
  ( 4 pts) Coding Standard 1-9
     (descriptive comments, function headers, mnemonic identifiers,
     format, etc...)

Implementation:
 ( 3 pts)  open_file function (manual grading)

 ( 4 pts)  read_file function

 ( 4 pts)  get_characters_by_criterion function

 ( 4 pts)  get_characters_by_criteria function

( 4 pts)  get_region_list function

( 4 pts)  sort_characters function

( 4 pts)  display_characters function (manual grading)

( 3 pts)  get_option function (manual grading)

 ( 3 pts)  Test 1

( 3 pts)  Test 2

( 4 pts)  Test 3

( 3 pts)  Test 4

( 3 pts)  Test 5


Note: hard coding an answer earns zero points for the whole project
-10 points for not using main()
```