Python Programming Section 1832 & 1833

Deadline Dec 7, 2020 by 11:59 PM PST

Programming Assignment 5 (100 Points): US Election Data Analysis.
President Candidate vs House Member Winners (draft as of November 25, 2020)

Assignment Description:
Assignment 5 will require that you write a number of Python functions to read data from files and to create and return a dictionary as shown in the Python skeleton code. The files are available to download in the Canvas assignment 5 entry and are named,**house.tab** and **president.tab**. The files contain data for the US Presidential elections and House of Representative elections from 1976-2016. Refer to the references on the last page of this handout for the data source.

Description of the Data Files:
The files are stored as tab separated values. Use a tab character delimiter to parse each line of the file into a list of fields using Python's **split()** method. Note that the default delimiter is a space. The **president.tab** data file contains the votes for each presidential candidate per state for election years 1976-2016. The **house.tab** contains the votes for each House of Representative candidate per district per state per election year from 1976-2018.

Description of Functions to Implement:
The function **def process_president_data(ifs):** has one formal parameter, *ifs* which is the **president.tab** file stream object. Use the *year*, *state*, *candidate*, *party*, *candidatevotes* and *totalvotes* fields from the **president.tab** file to create and return a dictionary structured as follows:

```
key = (election_year, ‘‘statename’’)
value = [winners_name,winners_party_affiliation, winners_vote,total_votes]
president_dictionary[key] = value
```

For example, in 2016 the **president_dictionary** entry for California is:

```
>>>president_dictionary = process_president_data(ifs)
>>>president_dictionary[(2016,'California')]
['"Clinton, Hillary"', 'democrat', 8753788, 14181595]
```

The function **def process_house_data(ifs)::** has one formal parameter, *ifs* which is the **house.tab** file stream object. Use the *year*, *state*, *candidate*, *party*,*district* and *candidatevotes* fields from the **president.tab** file to create and return a dictionary structured as follows:

```
key = (election_year, ‘‘statename’’)
value = {district:[winners_name,winners_party_affiliation, winners_vote,total_votes]}
house_dictionary[key] = value
```

For example, in 2016 the **house_dictionary** entry for Idaho is:

```
>>>house_dictionary = process_house_data(ifs)
>>>house_dictionary[(2016,'Idaho')]
{1: ['Ra_l R. Labrador', 'republican', 242252],
 2: ['Michael K. Simpson', 'republican', 205292]}
```

Note that the value for the *house_dictionary* is a dictionary where each *key* is the district number.

The function **def state_breakdown(house_dictionary):** has one formal parameter, the *house_dictionary* that is created in the **process_house_data** function. The **state_breakdown** function will create and return a dictionary. The dictionary will contain the count of winning candidates from each party for each election year per state. The structure of the returned dictionary is as follows:

```
key = (election_year, ‘‘statename’’)
value = {party_affiliation: count_of_party_winners_per_state}
house_wins_by_party[key] = value
```

For example, in 2016 the **house_wins_by_party** dictionary entry for California is:

```
>>>house_wins_by_party = state_breakdown(house_dictionary)
>>>house_wins_by_party[2016,'California']
{'republican': 14, 'democrat': 39}
```

Note that the value for the *house_wins_by_party* dictionary is a dictionary where each *key* is the party affiliation.

The function,**def compute_electoral_votes(house_dictionary):**has one formal parameter, the *house_dictionary* that is created in the **process_house_data** function. The function will create and return a dictionary of the electoral votes in each state. The total number of districts per state in the *house_dictionary* plus the number of senators per state result in the number of electors per state. For example, California has 53 districts (i.e. representatives) and 2 senators and 55 electoral votes (i.e. $53 + 2$). Each state has 2 senators so we can add 2 to the the total number of districts per state to compute the number of electors per state. The function is given in whole below:

```
def compute_electoral_votes(house_dict):
    electoral_votes = {}
    for key in house_dict:
            electoral_votes[key] = len(house_dict[key])+2 #add two senators per state
    return electoral_votes
```

For example, in 2016 the **electoral_votes** dictionary entry for California is:

```
>>>electoral_votes = compute_electoral_votes(house_dictionary)
>>>electoral_votes[2016,'California']
55
```

The function **def presidential_winner(president_dictionary,electoral_votes):** has two formal parameters, the *presidential_dictionary* and the *electoral_votes*. The **presidential_winner** function will create and return a dictionary. The dictionary will contain the count of electoral votes and winning party affiliation name. The structure of the returned dictionary is as follows:

```
key = election_year
value = {party_affiliation_of_winner:count_of_electors}
electoral_votes_of_winner[key] = value
```

For example, the **electoral_votes_of_winner** dictionary value for 1984 is:

```
>>> electoral_votes_of_winner[1984]
['republican', 525]
>>>
```

Note that due to the data assumptions and adjustments described below, the electoral values may differ slightly than official counts found online.

Data Adjustments/Assumptions:
For the purpose of this assignment you can ignore the District of Columbia or add 3 to the electors awarded to winning democrat candidates. Reason, the District of Columbia (e.g. Washington D.C.) does not have any senators or representatives but does allow citizens to vote. To ensure Electoral College representation, the District of Columbia receives 3 electoral votes equal to the state with the least electors. Since 1964, the 3 electors have always been awarded to Democrats. Since they do not have

representatives, the District of Columbia is not in the **house.tab** file but is in the **president.tab** file. This discrepancy can cause a key error in the house_dictionary.

For the purpose of this assignment ignore any proportional elector voting and award all the electors to the winning candidate for each state. Some states, like Nebraska, do not award all the electors to the winning candidate but proportionally allocate the electors based on criteria like the popular vote.

Example output of the data analysis:

```
Enter an election year to construct a summary of the presidential election results: 2000

Year  Candidate         Candidate Party     State         Majority of Representatives Elected
*********************************************************************************************
2000   Bush, George W.     republican       Arkansas              democrat
2000   Gore, Al            democrat         Delaware              republican
2000   Gore, Al            democrat         Iowa                  republican
2000   Gore, Al            democrat         Maryland              republican
2000   Bush, George W.     republican       Mississippi           democrat
2000   Bush, George W.     republican       Nevada                democrat
2000   Gore, Al            democrat         New Mexico            republican
2000   Bush, George W.     republican       North Dakota          democrat
2000   Gore, Al            democrat         Pennsylvania          republican
2000   Bush, George W.     republican       Texas                 democrat
2000   Gore, Al            democrat         Vermont               independent
2000   Bush, George W.     republican       West Virginia         democrat

Notes:
--In 2000 a republican won the election with 271 electoral votes.
--The table above displays the states a president won but the majority of representatives
  who won were of the opposing party.

Enter an election year to construct a summary of the presidential election results: 2012

Year  Candidate         Candidate Party     State         Majority of Representatives Elected
*********************************************************************************************
2012   Romney, Mitt        republican       Arizona               democrat
2012   Obama, Barack H.    democrat         Colorado              republican
2012   Obama, Barack H.    democrat         Florida               republican
2012   Obama, Barack H.    democrat         Michigan              republican
2012   Obama, Barack H.    democrat         Ohio                  republican
2012   Obama, Barack H.    democrat         Pennsylvania          republican
2012   Obama, Barack H.    democrat         Virginia              republican
2012   Obama, Barack H.    democrat         Wisconsin             republican

Notes:
--In 2012 a democrat won the election with 332 electoral votes.
--The table above displays the states a president won but the majority of representatives
  who won were of the opposing party.

Enter an election year to construct a summary of the presidential election results: 2008

Year  Candidate         Candidate Party     State         Majority of Representatives Elected
*********************************************************************************************
2008   McCain, John        republican       Arizona               democrat
2008   McCain, John        republican       Arkansas              democrat
2008   Obama, Barack H.    democrat         Delaware              republican
2008   Obama, Barack H.    democrat         Florida               republican
```

```
2008   McCain, John        republican       Idaho                democrat
2008   McCain, John        republican       Mississippi          democrat
2008   McCain, John        republican       North Dakota         democrat
2008   McCain, John        republican       South Dakota         democrat
2008   McCain, John        republican       Tennessee            democrat
2008   McCain, John        republican       West Virginia        democrat

Notes:
--In 2008 a democrat won the election with 364 electoral votes.
--The table above displays the states a president won but the majority of representatives
  who won were of the opposing party.

Enter an election year to construct a summary of the presidential election
results: quit >>>
```

Code Skeleton:
A sample sketch/skeleton code of the program can be downloaded from Canvas. The Python file contains function prototypes and implementation details. Although you are encouraged to create your own program design.

Where to do the assignment
You can do this assignment on your own computer, or from the SMC Virtual labs via Citrix. In either case, ensure the code runs on Windows and in IDLE. Submit one **.py** file named **A05.py**. Do not use any other name or else points will be deducted.

Submitting the Assignment
Include your name, your student id, the assignment number, the submission date, and a program description in comments at the top of your files. Submit the assignment on Canvas (`https://online.smc.edu`) by **uploading your .py file** to the Assignment 5 entry as an attachment. Do not cut-and-paste your script into a text window. Do not hand in a screenshot of your program's output. Do not hand in a text file containing the output of your program. Do not save and turn in the interpreter session (e.g. the one with $>>>$).

Saving your work
Save your work often on a flash-drive or to the cloud (e.g., GoogleDrive, Microsoft OneDrive, Canvas, etc.). Always save a personal copy of your files (e.g. .py, etc.). Do not store files on the lab computers.

Do your own work
Do not distribute this handout. Do not upload to chegg, coursehero, or any other online platform. Do not pay someone to write the code and submit their code as your solution. You are expected to do your own work. Turning in code that is not your own work will result in a referral to Student Judicial Affairs.

References:

- Python dictionaries: https://docs.python.org/datastructures.html
- Python File IO: https://docs.python.org/inputoutput.html
- Gaddis 4th Ed. Chapters 6 & 9
- US Election Data Source: data: https://electionlab.mit.edu/data
- Electoral College Data: https://www.archives.gov/electoral-college/allocation