*You are currently looking at **version 1.2** of this notebook. To download notebooks and datafiles, as well as get help on Jupyter notebooks in the Coursera platform, visit the Jupyter Notebook FAQ (https://www.coursera.org/learn/python-data-analysis/resources/0dhYG) course resource.*

# Assignment 2 - Pandas Introduction

All questions are weighted the same in this assignment.

## Part 1

The following code loads the olympics dataset (olympics.csv), which was derrived from the Wikipedia entry on All Time Olympic Games Medals (https://en.wikipedia.org/wiki/All-time_Olympic_Games_medal_table), and does some basic data cleaning.

The columns are organized as # of Summer games, Summer medals, # of Winter games, Winter medals, total # number of games, total # of medals. Use this dataset to answer the questions below.

In [1]:
```
import pandas as pd

df = pd.read_csv('olympics.csv', index_col=0, skiprows=1)

for col in df.columns:
    if col[:2]=='01':
        df.rename(columns={col:'Gold'+col[4:]}, inplace=True)
    if col[:2]=='02':
        df.rename(columns={col:'Silver'+col[4:]}, inplace=True)
    if col[:2]=='03':
        df.rename(columns={col:'Bronze'+col[4:]}, inplace=True)
    if col[:1]=='№':
        df.rename(columns={col:'#'+col[1:]}, inplace=True)

names_ids = df.index.str.split('\s\(') # split the index by '('

df.index = names_ids.str[0] # the [0] element is the country name (new index)
df['ID'] = names_ids.str[1].str[:3] # the [1] element is the abbreviation or ID (take first 3 characters from that)

df = df.drop('Totals')
df.head()
```

Out[1]:

| | # Summer | Gold | Silver | Bronze | Total | # Winter | Gold.1 | Silver.1 | Bronze.1 | Total.1 | # Games | Gold.2 | Silver.2 | Bronze.2 | Combined total | ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Afghanistan** | 13 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 2 | 2 | AFG |
| **Algeria** | 12 | 5 | 2 | 8 | 15 | 3 | 0 | 0 | 0 | 0 | 15 | 5 | 2 | 8 | 15 | ALG |
| **Argentina** | 23 | 18 | 24 | 28 | 70 | 18 | 0 | 0 | 0 | 0 | 41 | 18 | 24 | 28 | 70 | ARG |
| **Armenia** | 5 | 1 | 2 | 9 | 12 | 6 | 0 | 0 | 0 | 0 | 11 | 1 | 2 | 9 | 12 | ARM |
| **Australasia** | 2 | 3 | 4 | 5 | 12 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 4 | 5 | 12 | ANZ |

## Question 0 (Example)

What is the first country in df?

*This function should return a Series.*

In [2]:
```
# You should write your whole answer within the function provided. The autograder will call
# this function and compare the return value against the correct solution value
def answer_zero():
    # This function returns the row for Afghanistan, which is a Series object. The assignment
    # question description will tell you the general format the autograder is expecting
    return df.iloc[0]

# You can examine what your function returns by calling it in the cell. If you have questions
# about the assignment formats, check out the discussion forums for any FAQs
answer_zero()
```

Out[2]:
```
# Summer           13
Gold                0
Silver              0
Bronze              2
Total               2
# Winter            0
Gold.1              0
Silver.1            0
Bronze.1            0
Total.1             0
# Games            13
Gold.2              0
Silver.2            0
Bronze.2            2
Combined total      2
ID                AFG
Name: Afghanistan, dtype: object
```

## Question 1

Which country has won the most gold medals in summer games?

*This function should return a single string value.*

In [3]:
```python
def answer_one():
    return df['Gold'].argmax()
answer_one()
```

Out[3]:
```
'United States'
```

## Question 2

Which country had the biggest difference between their summer and winter gold medal counts?

*This function should return a single string value.*

In [4]:
```python
def answer_two():
    return (df['Gold']-df['Gold.1']).abs().argmax()
answer_two()
```

Out[4]:
```
'United States'
```

## Question 3

Which country has the biggest difference between their summer gold medal counts and winter gold medal counts relative to their total gold medal count?

$$\frac{Summer\ Gold - Winter\ Gold}{Total\ Gold}$$

Only include countries that have won at least 1 gold in both summer and winter.

*This function should return a single string value.*

In [5]:
```python
def answer_three():
    x=df[(df['Gold']>0) & (df['Gold.1']>0)]
    return ((x['Gold']-x['Gold.1']).abs()/(x['Gold']+x['Gold.1']+x['Gold.2'])).argmax()
answer_three()
```

Out[5]:
```
'Bulgaria'
```

## Question 4

Write a function that creates a Series called "Points" which is a weighted value where each gold medal (`Gold.2`) counts for 3 points, silver medals (`Silver.2`) for 2 points, and bronze medals (`Bronze.2`) for 1 point. The function should return only the column (a Series object) which you created, with the country names as indices.

*This function should return a Series named `Points` of length 146*

In [6]:
```
def answer_four():
    Points= df['Gold.2']*3 + df['Silver.2']*2 + df['Bronze.2']
    return Points
answer_four()
```

Out[6]:
```
Afghanistan                            2
Algeria                               27
Argentina                            130
Armenia                               16
Australasia                           22
Australia                            923
Austria                              569
Azerbaijan                            43
Bahamas                               24
Bahrain                                1
Barbados                               1
Belarus                              154
Belgium                              276
Bermuda                                1
Bohemia                                5
Botswana                               2
Brazil                               184
British West Indies                    2
Bulgaria                             411
Burundi                                3
Cameroon                              12
Canada                               846
Chile                                 24
China                               1120
Colombia                              29
Costa Rica                             7
Ivory Coast                            2
Croatia                               67
Cuba                                 420
Cyprus                                 2
                                    ...
Spain                                268
Sri Lanka                              4
Sudan                                  2
Suriname                               4
Sweden                              1217
```

```
Switzerland                         630
Syria                                 6
Chinese Taipei                       32
Tajikistan                            4
Tanzania                              4
Thailand                             44
Togo                                  1
Tonga                                 2
Trinidad and Tobago                  27
Tunisia                              19
Turkey                              191
Uganda                               14
Ukraine                             220
United Arab Emirates                  3
United States                      5684
Uruguay                              16
Uzbekistan                           38
Venezuela                            18
Vietnam                               4
Virgin Islands                        2
Yugoslavia                          171
Independent Olympic Participants      4
Zambia                                3
Zimbabwe                             18
Mixed team                           38
dtype: int64
```

## Part 2

For the next set of questions, we will be using census data from the United States Census Bureau (http://www.census.gov). Counties are political and geographic subdivisions of states in the United States. This dataset contains population data for counties and states in the US from 2010 to 2015. See this document (https://www2.census.gov/programs-surveys/popest/technical-documentation/file-layouts/2010-2015/co-est2015-alldata.pdf) for a description of the variable names.

The census dataset (census.csv) should be loaded as census_df. Answer questions using this as appropriate.

### Question 5

Which state has the most counties in it? (hint: consider the sumlevel key carefully! You'll need this for future questions too...)

*This function should return a single string value.*

In [7]:
```
census_df = pd.read_csv('census.csv')
census_df
```

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3164** | 50 | 2 | 3 | 55 | 133 | Wisconsin | Waukesha County | 389891 | 389938 | 390076 | ... |
| **3165** | 50 | 2 | 3 | 55 | 135 | Wisconsin | Waupaca County | 52410 | 52410 | 52422 | ... |
| **3166** | 50 | 2 | 3 | 55 | 137 | Wisconsin | Waushara County | 24496 | 24496 | 24506 | ... |
| **3167** | 50 | 2 | 3 | 55 | 139 | Wisconsin | Winnebago County | 166994 | 166994 | 167059 | ... |
| **3168** | 50 | 2 | 3 | 55 | 141 | Wisconsin | Wood County | 74749 | 74749 | 74807 | ... |
| **3169** | 40 | 4 | 8 | 56 | 0 | Wyoming | Wyoming | 563626 | 563767 | 564516 | ... |
| **3170** | 50 | 4 | 8 | 56 | 1 | Wyoming | Albany County | 36299 | 36299 | 36428 | ... |
| **3171** | 50 | 4 | 8 | 56 | 3 | Wyoming | Big Horn County | 11668 | 11668 | 11672 | ... |
| | | | | | | | Campbell | | | | |

In [8]:
```
def answer_five():
    temp=census_df.copy()
#     temp=temp.reset_index()
#     temp=temp.set_index('STNAME')
    p=census_df.groupby(census_df['STNAME']).count().COUNTY.argmax()
    return p

answer_five()
```

Out[8]:
```
'Texas'
```

## Question 6

**Only looking at the three most populous counties for each state**, what are the three most populous states (in order of highest population to lowest population)? Use `CENSUS2010POP`.

*This function should return a list of string values.*

```
In [16]: def answer_six():
             temp=census_df.copy()
             z=temp.groupby(['STNAME'])
             s=pd.Series({'Population':'None'})
             p=pd.DataFrame(columns=['Population'])
             for i,j in z:
                 p.loc[i]=(j.sort_values(by='CENSUS2010POP',ascending=False)[1:4]['CENSUS2010POP'].sum())
             x=p.sort_values(by='Population',ascending=False)[1:4]
             return list(x.index)

         answer_six()
```

```
Out[16]: ['Texas', 'Illinois', 'New York']
```

## Question 7

Which county has had the largest absolute change in population within the period 2010-2015? (Hint: population values are stored in columns POPESTIMATE2010 through POPESTIMATE2015, you need to consider all six columns.)

e.g. If County Population in the 5 year period is 100, 120, 80, 105, 100, 130, then its largest change in the period would be |130-80| = 50.

*This function should return a single string value.*

In [51]:
```
def answer_seven():
    pre=census_df.copy()
    pre=pre[['STNAME','CTYNAME','POPESTIMATE2015','POPESTIMATE2014','POPESTIMATE2013','POPESTIMATE2012','POPESTIMATE2011'
    pre=pre[pre['STNAME']!=pre['CTYNAME']]
    pre1=pre[['POPESTIMATE2015','POPESTIMATE2014','POPESTIMATE2013','POPESTIMATE2012','POPESTIMATE2011','POPESTIMATE2010'
    t=pre1.min(axis=1)
    t1=pre1.max(axis=1)
    t2=(t-t1).abs()
    t2=t2.argmax()









    return pre.loc[t2]['CTYNAME']
answer_seven()
```

Out[51]:
```
'Harris County'
```

## Question 8

In this datafile, the United States is broken up into four regions using the "REGION" column.

Create a query that finds the counties that belong to regions 1 or 2, whose name starts with 'Washington', and whose POPESTIMATE2015 was greater than their POPESTIMATE 2014.

*This function should return a 5x2 DataFrame with the columns = ['STNAME', 'CTYNAME'] and the same index ID as the census_df (sorted ascending by index).*

In [58]:
```
def answer_eight():


    return census_df[((census_df['REGION']==1) | (census_df['REGION']==2)) & (census_df['CTYNAME'].str.startswith('Washin


answer_eight()
```

Out[58]:

| | STNAME | CTYNAME |
|---|---|---|
| **896** | Iowa | Washington County |
| **1419** | Minnesota | Washington County |
| **2345** | Pennsylvania | Washington County |
| **2355** | Rhode Island | Washington County |
| **3163** | Wisconsin | Washington County |

In [ ]: