

Assignment 2

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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](#) course resource.

1 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 derived from the Wikipedia entry on [All Time Olympic Games Medals](#), 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)
```

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

```
df.head()
```

```

Out[1]:
# Summer  Gold  Silver  Bronze  Total  # Winter  Gold.1  \
Afghanistan      13     0     0       2       2         0     0
Algeria           12     5     2       8      15         3     0
Argentina         23    18    24      28      70        18     0
Armenia            5     1     2       9      12         6     0
Australasia       2     3     4       5      12         0     0

Silver.1  Bronze.1  Total.1  # Games  Gold.2  Silver.2  Bronze.2  \
Afghanistan      0         0         0       13         0         0         2
Algeria           0         0         0       15         5         2         8
Argentina         0         0         0       41        18        24        28
Armenia            0         0         0       11         1         2         9
Australasia       0         0         0        2         3         4         5

Combined total  ID
Afghanistan         2  AFG
Algeria             15  ALG
Argentina           70  ARG
Armenia             12  ARM
Australasia         12  ANZ

```

1.0.1 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

```

1.0.2 Question 1

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

This function should return a single string value.

```

In [3]: def answer_one():
        return df[df['Gold'] == max(df['Gold'])].index[0]
        answer_one()

```

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

1.0.3 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]: def answer_two():
        return df[(df['Gold'] - df['Gold.1']).abs() == (df['Gold'] - df['Gold.1']).abs().max()].index[0]
        answer_two()

```

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

1.0.4 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?

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

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

This function should return a single string value.

```

In [12]: def answer_three():
        A = df[(df['Gold'] > 0) & (df['Gold.1'] > 0)]
        B = abs((A['Gold'] - A['Gold.1']) / (A['Gold'] + A['Gold.1']))
        B.sort(ascending = False)

        #abs((A['Gold'] - A['Gold.1']) / (A['Gold'] + A['Gold.1']))
        return B.index[0]
        answer_three()

```

```
Out[12]: 'Bulgaria'
```

1.0.5 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

1.1 Part 2

For the next set of questions, we will be using census data from the [United States Census Bureau](#). 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](#) for a description of the variable names.

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

1.1.1 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.head()
```

```
Out[7]:
```

	SUMLEV	REGION	DIVISION	STATE	COUNTY	STNAME	CTYNAME	\
0	40	3	6	1	0	Alabama	Alabama	
1	50	3	6	1	1	Alabama	Autauga County	

2	50	3	6	1	3	Alabama	Baldwin County
3	50	3	6	1	5	Alabama	Barbour County
4	50	3	6	1	7	Alabama	Bibb County

	CENSUS2010POP	ESTIMATESBASE2010	POPESTIMATE2010	...	\
0	4779736	4780127	4785161	...	
1	54571	54571	54660	...	
2	182265	182265	183193	...	
3	27457	27457	27341	...	
4	22915	22919	22861	...	

	RDOMESTICMIG2011	RDOMESTICMIG2012	RDOMESTICMIG2013	RDOMESTICMIG2014	\
0	0.002295	-0.193196	0.381066	0.582002	
1	7.242091	-2.915927	-3.012349	2.265971	
2	14.832960	17.647293	21.845705	19.243287	
3	-4.728132	-2.500690	-7.056824	-3.904217	
4	-5.527043	-5.068871	-6.201001	-0.177537	

	RDOMESTICMIG2015	RNETMIG2011	RNETMIG2012	RNETMIG2013	RNETMIG2014	\
0	-0.467369	1.030015	0.826644	1.383282	1.724718	
1	-2.530799	7.606016	-2.626146	-2.722002	2.592270	
2	17.197872	15.844176	18.559627	22.727626	20.317142	
3	-10.543299	-4.874741	-2.758113	-7.167664	-3.978583	
4	0.177258	-5.088389	-4.363636	-5.403729	0.754533	

	RNETMIG2015
0	0.712594
1	-2.187333
2	18.293499
3	-10.543299
4	1.107861

[5 rows x 100 columns]

```
In [8]: def answer_five():
        A = census_df[['STNAME', 'COUNTY']]
        B = A.groupby('STNAME').count()

        return B[(B['COUNTY'] == B['COUNTY'].max())].index[0]
answer_five()
```

Out[8]: 'Texas'

1.1.2 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 [33]: def answer_six():
```

```
    A = census_df[['STNAME', 'CENSUS2010POP', 'SUMLEV']]
    A = A[A['SUMLEV']==50]
    #B = A.groupby(['STNAME']).get_group('{STATE}'.format(STATE= C[i])).sort('CENSUS2010POP')
    C = A['STNAME'].unique()
    List = []
    for i in range(len(C)):
        List.append(A.groupby(['STNAME']).get_group('{STATE}'.format(STATE= C[i])).sort('CENSUS2010POP'))
    Frames = []
    for j in range(len(List)):
        Frames.append(List[j])
    E = pd.concat(Frames)
    F = E.groupby('STNAME').sum().sort('CENSUS2010POP',ascending= False)[0:3]
    R = F.index
    X = [R[0],R[1],R[2]]

    return X
answer_six()
```

```
Out[33]: ['California', 'Texas', 'Illinois']
```

1.1.3 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 [40]: def answer_seven():
```

```
    A = census_df[['STNAME', 'CTYNAME', 'SUMLEV', 'POPESTIMATE2010', 'POPESTIMATE2011', 'POPESTIMATE2012', 'POPESTIMATE2013', 'POPESTIMATE2014', 'POPESTIMATE2015']]
    Changes = []
    for i in range(len(A)):
        Changes.append((A.iloc[i].values[3:].max()) - (A.iloc[i].values[3:].min()))
    A['CHANGES'] = Changes
    B = A[A['SUMLEV']==50]
    B.head()
    C = B.sort('CHANGES',ascending = False)
    C['CTYNAME'].values[0]

    #Changes
    #(A.iloc[0].values[2:].max()) - (A.iloc[0].values[2:].min())
    return C['CTYNAME'].values[0]
answer_seven()
```

```
Out[40]: 'Harris County'
```

1.1.4 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 [11]: def answer_eight():
    List = []
    A = census_df[census_df['REGION']<3]
    for i in range(len(A)):
        if(A['CTYNAME'].iloc[i].startswith('Washington')) == True:
            List.append(A[i:i+1])
    Frames = []
    for j in range(len(List)):
        Frames.append(List[j])
    B = pd.concat(Frames)
    C = B[B['POPESTIMATE2015'] > B['POPESTIMATE2014']]
    D= C[['STNAME', 'CTYNAME']].sort_index(ascending=True)
    #A['CTYNAME'].iloc[0].startswith('Washington')
    return D
answer_eight()
```

```
Out[11]:
```

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

```
In [ ]:
```