
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) (<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 derived from the Wikipedia entry on [All Time Olympic Games Medals](https://en.wikipedia.org/wiki/All-time_Olympic_Games_medal_table) (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
import numpy as np

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]!='No':
        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	T
Afghanistan	13	0	0	2	2	0	0	0	0	0
Algeria	12	5	2	8	15	3	0	0	0	0
Argentina	23	18	24	28	70	18	0	0	0	0
Armenia	5	1	2	9	12	6	0	0	0	0
Australasia	2	3	4	5	12	0	0	0	0	0

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]:

```
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]:

```
def answer_two():  
    return (df['Gold']-df['Gold.1']).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?

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

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

This function should return a single string value.

In [5]:

```
df2 = df.loc[:, ['Gold', 'Gold.1']]  
df3 = df2.loc[(df2 != 0).all(axis=1), :]  
df3
```

Out[5]:

	Gold	Gold.1
Australia	139	5
Austria	18	59
Belarus	12	6
Belgium	37	1
Bulgaria	51	1
Canada	59	62
China	201	12
Croatia	6	4
Czech Republic	14	7
Czechoslovakia	49	2
Estonia	9	4
Finland	101	42
France	202	31
Germany	174	78
United Team of Germany	28	8
East Germany	153	39
West Germany	56	11
Great Britain	236	10
Italy	198	37
Japan	130	10
Kazakhstan	16	1
South Korea	81	26
Netherlands	77	37
Norway	56	118
Poland	64	6
Russia	132	49
Soviet Union	395	78
Unified Team	45	9
Slovakia	7	2
Slovenia	4	2
Spain	37	1
Sweden	143	50
Switzerland	47	50
Ukraine	33	2

	Gold	Gold.1
United States	976	96
Uzbekistan	5	1

In [6]:

```

Golddif = df3['Gold']-df3['Gold.1']
Goldsum = df3['Gold']+df3['Gold.1']
Goldrat = Golddif / Goldsum
Goldrat

```

Out[6]:

```

Australia      0.930556
Austria        -0.532468
Belarus         0.333333
Belgium         0.947368
Bulgaria        0.961538
Canada         -0.024793
China           0.887324
Croatia         0.200000
Czech Republic  0.333333
Czechoslovakia  0.921569
Estonia         0.384615
Finland         0.412587
France          0.733906
Germany         0.380952
United Team of Germany  0.555556
East Germany    0.593750
West Germany    0.671642
Great Britain   0.918699
Italy           0.685106
Japan           0.857143
Kazakhstan      0.882353
South Korea     0.514019
Netherlands     0.350877
Norway          -0.356322
Poland          0.828571
Russia          0.458564
Soviet Union    0.670190
Unified Team    0.666667
Slovakia        0.555556
Slovenia        0.333333
Spain           0.947368
Sweden          0.481865
Switzerland     -0.030928
Ukraine         0.885714
United States   0.820896
Uzbekistan      0.666667
dtype: float64

```

In [7]:

```
def answer_three():  
    return Goldrat.argmax()  
answer_three()
```

Out[7]:

'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.

This function should return a Series named Points of length 146

In [8]:

```
df['Points'] = 3 * df['Gold.2'] + 2 * df['Silver.2'] + 1 * df['Bronze.2']
```


In [9]:

```
def answer_four():  
    return df['Points']  
answer_four()
```

Out[9]:

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	

ZmH0aDwE

10

Mixed team 38

Name: Points, 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/popest/data/counties/totals/2015/CO-EST2015-alldata.html) (<http://www.census.gov/popest/data/counties/totals/2015/CO-EST2015-alldata.html>). 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](http://www.census.gov/popest/data/counties/totals/2015/files/CO-EST2015-alldata.pdf) (<http://www.census.gov/popest/data/counties/totals/2015/files/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 [10]:

```
census_df = pd.read_csv('census.csv')  
census_df
```

Out[10]:

	SUMLEV	REGION	DIVISION	STATE	COUNTY	STNAME	CTYNAME	CENSUS
0	40	3	6	1	0	Alabama	Alabama	4779736
1	50	3	6	1	1	Alabama	Autauga County	54571
2	50	3	6	1	3	Alabama	Baldwin County	182265
3	50	3	6	1	5	Alabama	Barbour County	27457
4	50	3	6	1	7	Alabama	Bibb County	22915
5	50	3	6	1	9	Alabama	Blount County	57322
6	50	3	6	1	11	Alabama	Bullock County	10914
7	50	3	6	1	13	Alabama	Butler County	20947
8	50	3	6	1	15	Alabama	Calhoun County	118572
9	50	3	6	1	17	Alabama	Chambers County	34215
10	50	3	6	1	19	Alabama	Cherokee County	25989
11	50	3	6	1	21	Alabama	Chilton County	43643
12	50	3	6	1	23	Alabama	Choctaw County	13859
13	50	3	6	1	25	Alabama	Clarke County	25833
14	50	3	6	1	27	Alabama	Clay County	13932
15	50	3	6	1	29	Alabama	Cleburne County	14972
16	50	3	6	1	31	Alabama	Coffee County	49948
17	50	3	6	1	33	Alabama	Colbert County	54428
18	50	3	6	1	35	Alabama	Conecuh County	13228
19	50	3	6	1	37	Alabama	Coosa County	11539
20	50	3	6	1	39	Alabama	Covington	27705

20	50	3	6	1	39	Alabama	County	37765
	SUMLEV	REGION	DIVISION	STATE	COUNTY	STNAME	CTYNAME	CENSUS
21	50	3	6	1	41	Alabama	Crenshaw County	13906
22	50	3	6	1	43	Alabama	Cullman County	80406
23	50	3	6	1	45	Alabama	Dale County	50251
24	50	3	6	1	47	Alabama	Dallas County	43820
25	50	3	6	1	49	Alabama	DeKalb County	71109
26	50	3	6	1	51	Alabama	Elmore County	79303
27	50	3	6	1	53	Alabama	Escambia County	38319
28	50	3	6	1	55	Alabama	Etowah County	104430
29	50	3	6	1	57	Alabama	Fayette County	17241
...
3163	50	2	3	55	131	Wisconsin	Washington County	131887
3164	50	2	3	55	133	Wisconsin	Waukesha County	389891
3165	50	2	3	55	135	Wisconsin	Waupaca County	52410
3166	50	2	3	55	137	Wisconsin	Waushara County	24496
3167	50	2	3	55	139	Wisconsin	Winnebago County	166994
3168	50	2	3	55	141	Wisconsin	Wood County	74749
3169	40	4	8	56	0	Wyoming	Wyoming	563626
3170	50	4	8	56	1	Wyoming	Albany County	36299
3171	50	4	8	56	3	Wyoming	Big Horn County	11668
3172	50	4	8	56	5	Wyoming	Campbell County	46133
3173	50	4	8	56	7	Wyoming	Carbon County	15885

	SUMLEV	REGION	DIVISION	STATE	COUNTY	STNAME	CTYNAME	CENSUS
3174	50	4	8	56	9	Wyoming	Converse County	13833
3175	50	4	8	56	11	Wyoming	Crook County	7083
3176	50	4	8	56	13	Wyoming	Fremont County	40123
3177	50	4	8	56	15	Wyoming	Goshen County	13249
3178	50	4	8	56	17	Wyoming	Hot Springs County	4812
3179	50	4	8	56	19	Wyoming	Johnson County	8569
3180	50	4	8	56	21	Wyoming	Laramie County	91738
3181	50	4	8	56	23	Wyoming	Lincoln County	18106
3182	50	4	8	56	25	Wyoming	Natrona County	75450
3183	50	4	8	56	27	Wyoming	Niobrara County	2484
3184	50	4	8	56	29	Wyoming	Park County	28205
3185	50	4	8	56	31	Wyoming	Platte County	8667
3186	50	4	8	56	33	Wyoming	Sheridan County	29116
3187	50	4	8	56	35	Wyoming	Sublette County	10247
3188	50	4	8	56	37	Wyoming	Sweetwater County	43806
3189	50	4	8	56	39	Wyoming	Teton County	21294
3190	50	4	8	56	41	Wyoming	Uinta County	21118
3191	50	4	8	56	43	Wyoming	Washakie County	8533
3192	50	4	8	56	45	Wyoming	Weston County	7208

3193 rows × 100 columns

In [11]:

```
st_cnt=census_df[["STNAME", "COUNTY"]]  
st_cnt
```

Out[11]:

	STNAME	COUNTY
0	Alabama	0
1	Alabama	1
2	Alabama	3
3	Alabama	5
4	Alabama	7
5	Alabama	9
6	Alabama	11
7	Alabama	13
8	Alabama	15
9	Alabama	17
10	Alabama	19
11	Alabama	21
12	Alabama	23
13	Alabama	25
14	Alabama	27
15	Alabama	29
16	Alabama	31
17	Alabama	33
18	Alabama	35
19	Alabama	37
20	Alabama	39
21	Alabama	41
22	Alabama	43
23	Alabama	45
24	Alabama	47
25	Alabama	49
26	Alabama	51
27	Alabama	53
28	Alabama	55
29	Alabama	57
...
3163	Wisconsin	131
3164	Wisconsin	133
3165	Wisconsin	135

	STNAME	COUNTY
3166	Wisconsin	137
3167	Wisconsin	139
3168	Wisconsin	141
3169	Wyoming	0
3170	Wyoming	1
3171	Wyoming	3
3172	Wyoming	5
3173	Wyoming	7
3174	Wyoming	9
3175	Wyoming	11
3176	Wyoming	13
3177	Wyoming	15
3178	Wyoming	17
3179	Wyoming	19
3180	Wyoming	21
3181	Wyoming	23
3182	Wyoming	25
3183	Wyoming	27
3184	Wyoming	29
3185	Wyoming	31
3186	Wyoming	33
3187	Wyoming	35
3188	Wyoming	37
3189	Wyoming	39
3190	Wyoming	41
3191	Wyoming	43
3192	Wyoming	45

3193 rows × 2 columns

In [12]:

```
most_cntst = pd.value_counts(st_cnt['STNAME'].values, sort=True)
```

In [13]:

```
def answer_five():  
    return most_cntst.argmax()  
answer_five()
```

Out[13]:

'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 [14]:

```
st_10pop=census_df[["SUMLEV", "STNAME", "CTYNAME", "CENSUS2010POP"]]  
st_10pop
```

Out[14]:

	SUMLEV	STNAME	CTYNAME	CENSUS2010POP
0	40	Alabama	Alabama	4779736
1	50	Alabama	Autauga County	54571
2	50	Alabama	Baldwin County	182265
3	50	Alabama	Barbour County	27457
4	50	Alabama	Bibb County	22915
5	50	Alabama	Blount County	57322
6	50	Alabama	Bullock County	10914
7	50	Alabama	Butler County	20947
8	50	Alabama	Calhoun County	118572
9	50	Alabama	Chambers County	34215
10	50	Alabama	Cherokee County	25989
11	50	Alabama	Chilton County	43643
12	50	Alabama	Choctaw County	13859
13	50	Alabama	Clarke County	25833
14	50	Alabama	Clay County	13932
15	50	Alabama	Cleburne County	14972
16	50	Alabama	Coffee County	49948
17	50	Alabama	Colbert County	54428
18	50	Alabama	Conecuh County	13228
19	50	Alabama	Coosa County	11539
20	50	Alabama	Covington County	37765
21	50	Alabama	Crenshaw County	13906
22	50	Alabama	Cullman County	80406
23	50	Alabama	Dale County	50251
24	50	Alabama	Dallas County	43820
25	50	Alabama	DeKalb County	71109
26	50	Alabama	Elmore County	79303
27	50	Alabama	Escambia County	38319
28	50	Alabama	Etowah County	104430
29	50	Alabama	Fayette County	17241
...
3163	50	Wisconsin	Washington County	131887
3164	50	Wisconsin	Waukesha County	389891
3165	50	Wisconsin	Waupaca County	52410

	SUMLEV	STNAME	CTYNAME	CENSUS2010POP
3166	50	Wisconsin	Waushara County	24496
3167	50	Wisconsin	Winnebago County	166994
3168	50	Wisconsin	Wood County	74749
3169	40	Wyoming	Wyoming	563626
3170	50	Wyoming	Albany County	36299
3171	50	Wyoming	Big Horn County	11668
3172	50	Wyoming	Campbell County	46133
3173	50	Wyoming	Carbon County	15885
3174	50	Wyoming	Converse County	13833
3175	50	Wyoming	Crook County	7083
3176	50	Wyoming	Fremont County	40123
3177	50	Wyoming	Goshen County	13249
3178	50	Wyoming	Hot Springs County	4812
3179	50	Wyoming	Johnson County	8569
3180	50	Wyoming	Laramie County	91738
3181	50	Wyoming	Lincoln County	18106
3182	50	Wyoming	Natrona County	75450
3183	50	Wyoming	Niobrara County	2484
3184	50	Wyoming	Park County	28205
3185	50	Wyoming	Platte County	8667
3186	50	Wyoming	Sheridan County	29116
3187	50	Wyoming	Sublette County	10247
3188	50	Wyoming	Sweetwater County	43806
3189	50	Wyoming	Teton County	21294
3190	50	Wyoming	Uinta County	21118
3191	50	Wyoming	Washakie County	8533
3192	50	Wyoming	Weston County	7208

3193 rows × 4 columns

In [23]:

```
import csv
contry_dict = {}

with open('census.csv', 'r') as f:
    reader = csv.reader(f)
    next(reader)
    for row in reader:
        if row[5] != row[6]:
            if row[5] in contry_dict:
                contry_dict[row[5]].append(int(row[7]))
            else:
                contry_dict[row[5]] = [int(row[7])]

result = {}
for key in contry_dict.keys():
    result[key] = sum(sorted(contry_dict[key], reverse=True)[:3])
    print(key+str(result[key]))
```


Wyoming213321
Washington3439809
Louisiana1216552
North Dakota297947
Maine632728
Montana348199
Massachusetts3044796
Nevada2427950
Maryland2640226
Minnesota2059617
Missouri2033597
New York6321295
Florida5564635
Ohio3245910
Wisconsin1825699
West Virginia393551
Arizona5173150
Utah1852698
Vermont277721
Nebraska961357
Colorado1794424
California15924150
Oregon1641036
New Jersey2498943
Arkansas807152
South Dakota315244
Indiana1754727
Idaho719782
Mississippi593642
Connecticut2673320
North Carolina2309027
Kansas1220478
Hawaii1293120
New Hampshire842389
South Carolina1185938
Michigan3863924
Georgia2417795
Rhode Island919804
Kentucky1196619
Oklahoma1577791
Alaska478402
Alabama1406269
Texas8269632
Pennsylvania3549228
Illinois6815061
Virginia1921722
Tennessee1986551
Iowa807090
Delaware897934
New Mexico1015967

In [21]:

```
with open('census.csv', 'r') as f:
    reader = csv.reader(f)
    for row in reader:
        # New Yorkを試してみる
        if row[5] == 'Wyoming':
            print(row)
```

['040', '4', '8', '56', '000', 'Wyoming', 'Wyoming', '563626', '563767', '564516', '567768', '577080', '583131', '584304', '586107', '749', '3252', '9312', '6051', '1173', '1803', '1995', '7471', '7434', '7509', '7758', '7695', '1293', '4447', '4383', '4615', '4408', '4606', '702', '3024', '3051', '2894', '3350', '3089', '113', '380', '606', '553', '619', '661', '-94', '-216', '5516', '2603', '-2795', '-1885', '19', '164', '6122', '3156', '-2176', '-1224', '28', '64', '139', '1', '-1', '-62', '13855', '13942', '13984', '14164', '14265', '14147', '14143', '13.196335902', '12.986876861', '12.944197219', '13.290675712', '13.149227066', '7.8549197904', '7.6569116599', '7.9554494829', '7.5515981618', '7.870739424', '5.3414161112', '5.3299652006', '4.9887477364', '5.7390775504', '5.2784876424', '0.6712096965', '1.0586558216', '0.9532748784', '1.0604444787', '1.1295177506', '-0.381529722', '9.6362137157', '4.4871148438', '-4.78827515', '-3.221090711', '0.2896799743', '10.694869537', '5.4403897222', '-3.727830672', '-2.09157296']

['050', '4', '8', '56', '001', 'Wyoming', 'Albany County', '36299', '36299', '36428', '36908', '37396', '37647', '37918', '37956', '129', '480', '488', '251', '271', '38', '104', '413', '443', '410', '414', '428', '33', '189', '192', '188', '196', '174', '71', '224', '251', '222', '218', '254', '10', '111', '141', '160', '180', '180', '44', '136', '98', '-133', '-126', '-376', '54', '247', '239', '27', '54', '-196', '4', '9', '-2', '2', '-1', '-20', '2248', '2248', '2327', '2268', '2278', '2242', '2241', '11.263226792', '11.923987941', '10.927068481', '10.957453848', '11.281862034', '5.1543580233', '5.1679586563', '5.0104606692', '5.1875868458', '4.5865513878', '6.1088687684', '6.7560292851', '5.9166078115', '5.7698670019', '6.6953106466', '3.0271626486', '3.7952196382', '4.2642218461', '4.7641103686', '4.7447083322', '3.708956038', '2.6378122308', '-3.54463441', '-3.334877258', '-9.911168516', '6.7361186866', '6.4330318691', '0.7195874365', '1.4292331106', '-5.166460184']

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['050', '4', '8', '56', '033', 'Wyoming', 'Sheridan County', '29116', '29116', '29146', '29275', '29594', '29794', '30020', '30009', '30', '129', '319', '200', '226', '-11', '87', '343', '332', '306', '361', '338', '84', '298', '286', '292', '303', '318', '3', '45', '46', '14', '58', '20', '10', '34', '27', '29', '33', '33', '21', '28', '248', '135', '110', '-99', '31', '62', '275', '164', '143', '-66', '-4', '22', '-2', '22', '25', '35', '1009', '1009', '993', '987', '1018', '1022', '1023', '11.742352921', '11.279281116', '10.305112144', '12.070752667', '11.261223742', '10.201810993', '9.7164891539', '9.8336364249', '10.131407363', '10.594879142', '1.5405419284', '1.5627919618', '0.471475719', '1.9393453038', '0.6663446001', '1.1639650126', '0.9172909341', '0.9766282751', '1.1034206039', '1.0994685902', '0.9585594221', '8.4254870985', '4.5463730046', '3.6780686796', '-3.298405771', '2.1225244347', '9.3427780326', '5.5230012797', '4.7814892834', '-2.19893718']

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['050', '4', '8', '56', '039', 'Wyoming', 'Teton County', '21294', '21294', '21297', '2

```

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5', '196', '180', '186', '179', '2', '-8', '-13', '-13', '-11', '-10', '-45', '-373', '-103', '-
145', '-298', '-253', '-43', '-381', '-116', '-158', '-309', '-263', '3', '6', '-3', '11', '4',
'3', '270', '270', '245', '236', '254', '254', '254', '15.423430285', '14.84451445
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355385313', '8.5691842613', '8.8729874776', '8.5799880168', '-0.38082543
9', '-0.62051025', '-0.61888553', '-0.524746571', '-0.479328939', '-17.755986
1', '-4.916350445', '-6.902953988', '-14.21586166', '-12.12702217', '-18.1368
1154', '-5.536860695', '-7.521839518', '-14.74060823', '-12.60635111']
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'90', '95', '96', '90', '34', '79', '105', '77', '70', '79', '-8', '29', '-15', '18', '26', '11',
'1', '-3', '-3', '-2', '-2', '-2', '20', '-99', '-7', '-17', '-149', '14', '21', '-102', '-10', '-1
9', '-151', '12', '-1', '-3', '-1', '1', '-2', '-11', '140', '140', '140', '140', '140', '140',
'140', '12.695427295', '10.64333018', '11.251924671', '11.456530819', '10.8
14708003', '9.2864699659', '12.417218543', '9.1199810494', '8.353720389',
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302', '1.3217976448', '-0.352650758', '-0.354777673', '-0.236882625', '-0.238
677725', '-0.240326845', '-11.63747502', '-0.82781457', '-2.01350231', '-17.7
8149054', '1.6822879116', '-11.99012578', '-1.182592242', '-2.250384934', '-
18.02016827', '1.4419610671']
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4', '7065', '7160', '7185', '7234', '-27', '-67', '-49', '95', '25', '49', '26', '81', '74',
'93', '77', '79', '9', '71', '67', '77', '70', '77', '17', '10', '7', '16', '7', '2', '1', '-2', '0',
'0', '0', '0', '-41', '-84', '-57', '88', '11', '50', '-40', '-86', '-57', '88', '11', '50', '-4',
'9', '1', '-9', '7', '-3', '313', '313', '313', '313', '323', '318', '317', '11.332633788',
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1969', '9.4505959518', '10.826010545', '9.759498083', '10.680352313', '1.39
90905911', '0.9873756965', '2.2495606327', '0.9759498083', '0.277411748
4', '-0.279818118', '0', '0', '0', '0', '-11.75236097', '-8.040059243', '12.3725834
8', '1.533635413', '6.9352937097', '-12.03217908', '-8.040059243', '12.37258
348', '1.533635413', '6.9352937097']

```

In [26]:

```
aa = sorted(result.items(), key=lambda x: x[1], reverse=True)[:3]
print(aa)
```

```
[('California', 15924150), ('Texas', 8269632), ('Illinois', 6815061)]
```

In [28]:

```
type(aa)
```

Out[28]:

```
list
```

In [32]:

```
from collections import OrderedDict
```

In [38]:

```
q6 = list(OrderedDict(sorted(result.items(), key=lambda x: x[1], reverse=True)).keys())[:3]
```

In [39]:

```
def answer_six():  
    return q6  
answer_six()
```

Out[39]:

```
['California', 'Texas', 'Illinois']
```

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]:

```
df_q7=census_df[census_df['SUMLEV']==50]  
df_q7
```

Out[40]:

	SUMLEV	REGION	DIVISION	STATE	COUNTY	STNAME	CTYNAME	CENSUS
1	50	3	6	1	1	Alabama	Autauga County	54571
2	50	3	6	1	3	Alabama	Baldwin County	182265
3	50	3	6	1	5	Alabama	Barbour County	27457
4	50	3	6	1	7	Alabama	Bibb County	22915
5	50	3	6	1	9	Alabama	Blount County	57322
6	50	3	6	1	11	Alabama	Bullock County	10914
7	50	3	6	1	13	Alabama	Butler County	20947
8	50	3	6	1	15	Alabama	Calhoun County	118572
9	50	3	6	1	17	Alabama	Chambers County	34215
10	50	3	6	1	19	Alabama	Cherokee County	25989
11	50	3	6	1	21	Alabama	Chilton County	43643
12	50	3	6	1	23	Alabama	Choctaw County	13859
13	50	3	6	1	25	Alabama	Clarke County	25833
14	50	3	6	1	27	Alabama	Clay County	13932
15	50	3	6	1	29	Alabama	Cleburne County	14972
16	50	3	6	1	31	Alabama	Coffee County	49948
17	50	3	6	1	33	Alabama	Colbert County	54428
18	50	3	6	1	35	Alabama	Conecuh County	13228
19	50	3	6	1	37	Alabama	Coosa County	11539
20	50	3	6	1	39	Alabama	Covington County	37765

	SUMLEV	REGION	DIVISION	STATE	COUNTY	STNAME	CTYNAME	CENSUS
21	50	3	6	1	41	Alabama	Crenshaw County	13906
22	50	3	6	1	43	Alabama	Cullman County	80406
23	50	3	6	1	45	Alabama	Dale County	50251
24	50	3	6	1	47	Alabama	Dallas County	43820
25	50	3	6	1	49	Alabama	DeKalb County	71109
26	50	3	6	1	51	Alabama	Elmore County	79303
27	50	3	6	1	53	Alabama	Escambia County	38319
28	50	3	6	1	55	Alabama	Etowah County	104430
29	50	3	6	1	57	Alabama	Fayette County	17241
30	50	3	6	1	59	Alabama	Franklin County	31704
...
3162	50	2	3	55	129	Wisconsin	Washburn County	15911
3163	50	2	3	55	131	Wisconsin	Washington County	131887
3164	50	2	3	55	133	Wisconsin	Waukesha County	389891
3165	50	2	3	55	135	Wisconsin	Waupaca County	52410
3166	50	2	3	55	137	Wisconsin	Waushara County	24496
3167	50	2	3	55	139	Wisconsin	Winnebago County	166994
3168	50	2	3	55	141	Wisconsin	Wood County	74749
3170	50	4	8	56	1	Wyoming	Albany County	36299
3171	50	4	8	56	3	Wyoming	Big Horn County	11668
3172	50	4	8	56	5	Wyoming	Campbell	46133

	SUMLEV	REGION	DIVISION	STATE	COUNTY	STNAME	CTYNAME	CENSUS
3173	50	4	8	56	7	Wyoming	Carbon County	15885
3174	50	4	8	56	9	Wyoming	Converse County	13833
3175	50	4	8	56	11	Wyoming	Crook County	7083
3176	50	4	8	56	13	Wyoming	Fremont County	40123
3177	50	4	8	56	15	Wyoming	Goshen County	13249
3178	50	4	8	56	17	Wyoming	Hot Springs County	4812
3179	50	4	8	56	19	Wyoming	Johnson County	8569
3180	50	4	8	56	21	Wyoming	Laramie County	91738
3181	50	4	8	56	23	Wyoming	Lincoln County	18106
3182	50	4	8	56	25	Wyoming	Natrona County	75450
3183	50	4	8	56	27	Wyoming	Niobrara County	2484
3184	50	4	8	56	29	Wyoming	Park County	28205
3185	50	4	8	56	31	Wyoming	Platte County	8667
3186	50	4	8	56	33	Wyoming	Sheridan County	29116
3187	50	4	8	56	35	Wyoming	Sublette County	10247
3188	50	4	8	56	37	Wyoming	Sweetwater County	43806
3189	50	4	8	56	39	Wyoming	Teton County	21294
3190	50	4	8	56	41	Wyoming	Uinta County	21118
3191	50	4	8	56	43	Wyoming	Washakie County	8533
3192	50	4	8	56	45	Wyoming	Weston County	7208

3142 rows × 100 columns

In [41]:

```
def min_max(row):
    data = row[['POPESTIMATE2010',
                'POPESTIMATE2011',
                'POPESTIMATE2012',
                'POPESTIMATE2013',
                'POPESTIMATE2014',
                'POPESTIMATE2015']]
    return pd.Series({'min': np.min(data), 'max': np.max(data)})
```

In [42]:

```
df_q7_1=df_q7.apply(min_max, axis=1)  
df_q7_1
```

Out[42]:

	max	min
1	55347	54660
2	203709	183193
3	27341	26489
4	22861	22512
5	57776	57373
6	10887	10606
7	20944	20154
8	118437	115620
9	34153	33993
10	26084	25859
11	43943	43665
12	13841	13170
13	25767	24675
14	13880	13456
15	15072	14921
16	51211	50177
17	54514	54354
18	13208	12662
19	11758	10724
20	38060	37796
21	13963	13853
22	82005	80374
23	50358	49501
24	43803	41131
25	71387	70869
26	81468	79465
27	38309	37784
28	104442	103057
29	17231	16759
30	31734	31507
...
3162	15930	15552
3163	133674	131967
3164	396488	390076

	max	min
3165	52422	51945
3166	24581	24033
3167	169639	167059
3168	74807	73435
3170	37956	36428
3171	12022	11672
3172	49220	46244
3173	15856	15559
3174	14343	13728
3175	7444	7114
3176	41129	40222
3177	13666	13383
3178	4846	4741
3179	8636	8552
3180	97121	92271
3181	18722	17943
3182	82178	75472
3183	2548	2475
3184	29237	28259
3185	8812	8678
3186	30020	29146
3187	10418	9899
3188	45162	43593
3189	23125	21297
3190	21102	20822
3191	8545	8316
3192	7234	7065

3142 rows × 2 columns

In []:

In [43]:

```
df_q7_1['diff'] = df_q7_1['max'] - df_q7_1['min']  
df_q7_1
```

Out[43]:

	max	min	diff
1	55347	54660	687
2	203709	183193	20516
3	27341	26489	852
4	22861	22512	349
5	57776	57373	403
6	10887	10606	281
7	20944	20154	790
8	118437	115620	2817
9	34153	33993	160
10	26084	25859	225
11	43943	43665	278
12	13841	13170	671
13	25767	24675	1092
14	13880	13456	424
15	15072	14921	151
16	51211	50177	1034
17	54514	54354	160
18	13208	12662	546
19	11758	10724	1034
20	38060	37796	264
21	13963	13853	110
22	82005	80374	1631
23	50358	49501	857
24	43803	41131	2672
25	71387	70869	518
26	81468	79465	2003
27	38309	37784	525
28	104442	103057	1385
29	17231	16759	472
30	31734	31507	227
...
3162	15930	15552	378
3163	133674	131967	1707
3164	396488	390076	6412

	max	min	diff
3165	52422	51945	477
3166	24581	24033	548
3167	169639	167059	2580
3168	74807	73435	1372
3170	37956	36428	1528
3171	12022	11672	350
3172	49220	46244	2976
3173	15856	15559	297
3174	14343	13728	615
3175	7444	7114	330
3176	41129	40222	907
3177	13666	13383	283
3178	4846	4741	105
3179	8636	8552	84
3180	97121	92271	4850
3181	18722	17943	779
3182	82178	75472	6706
3183	2548	2475	73
3184	29237	28259	978
3185	8812	8678	134
3186	30020	29146	874
3187	10418	9899	519
3188	45162	43593	1569
3189	23125	21297	1828
3190	21102	20822	280
3191	8545	8316	229
3192	7234	7065	169

3142 rows × 3 columns

In [44]:

```
max(df_q7_1['diff'])
```

Out[44]:

429841

In [45]:

```
df_q7_1['diff'].idxmax()
```

Out[45]:

2667

In [46]:

```
df_q7_1.iloc[2623,:]
```

Out[46]:

```
max    4538028
min    4108187
diff    429841
Name: 2667, dtype: int64
```

In [47]:

```
def answer_seven():
    return df_q7.iloc[2623, 6]
answer_seven()
```

Out[47]:

'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 [48]:

```
df_q8=census_df[["REGION","STNAME", "CTYNAME", "POPESTIMATE2015", "POPESTIMATE2014"]]  
df_q8
```

Out[48]:

	REGION	STNAME	CTYNAME	POPESTIMATE2015	POPESTIMATE2014
0	3	Alabama	Alabama	4858979	4846411
1	3	Alabama	Autauga County	55347	55290
2	3	Alabama	Baldwin County	203709	199713
3	3	Alabama	Barbour County	26489	26815
4	3	Alabama	Bibb County	22583	22549
5	3	Alabama	Blount County	57673	57658
6	3	Alabama	Bullock County	10696	10829
7	3	Alabama	Butler County	20154	20276
8	3	Alabama	Calhoun County	115620	115993
9	3	Alabama	Chambers County	34123	34052
10	3	Alabama	Cherokee County	25859	25995
11	3	Alabama	Chilton County	43943	43921
12	3	Alabama	Choctaw County	13170	13289
13	3	Alabama	Clarke County	24675	24847
14	3	Alabama	Clay County	13555	13538
15	3	Alabama	Cleburne County	15018	15072
16	3	Alabama	Coffee County	51211	50831
17	3	Alabama	Colbert County	54354	54480
18	3	Alabama	Conecuh County	12672	12662
19	3	Alabama	Coosa County	10724	10807
20	3	Alabama	Covington County	37835	37888
21	3	Alabama	Crenshaw County	13963	13948
22	3	Alabama	Cullman County	82005	81221
23	3	Alabama	Dale County	49565	49501
24	3	Alabama	Dallas County	41131	41662
25	3	Alabama	DeKalb County	71130	71012
26	3	Alabama	Elmore County	81468	81022
27	3	Alabama	Escambia County	37789	37784
28	3	Alabama	Etowah County	103057	103452
29	3	Alabama	Fayette County	16759	16842

...
	REGION	STNAME	CTYNAME	POPESTIMATE2015	POPESTIMATE2014
3163	2	Wisconsin	Washington County	133674	133301
3164	2	Wisconsin	Waukesha County	396488	395335
3165	2	Wisconsin	Waupaca County	51945	52088
3166	2	Wisconsin	Waushara County	24033	24173
3167	2	Wisconsin	Winnebago County	169546	169639
3168	2	Wisconsin	Wood County	73435	73597
3169	4	Wyoming	Wyoming	586107	584304
3170	4	Wyoming	Albany County	37956	37918
3171	4	Wyoming	Big Horn County	12022	11919
3172	4	Wyoming	Campbell County	49220	48243
3173	4	Wyoming	Carbon County	15559	15856
3174	4	Wyoming	Converse County	14236	14172
3175	4	Wyoming	Crook County	7444	7264
3176	4	Wyoming	Fremont County	40315	40717
3177	4	Wyoming	Goshen County	13383	13509
3178	4	Wyoming	Hot Springs County	4741	4793
3179	4	Wyoming	Johnson County	8585	8552
3180	4	Wyoming	Laramie County	97121	96469
3181	4	Wyoming	Lincoln County	18722	18564
3182	4	Wyoming	Natrona County	82178	81603
3183	4	Wyoming	Niobrara County	2542	2530
3184	4	Wyoming	Park County	29228	29126
3185	4	Wyoming	Platte County	8812	8776
3186	4	Wyoming	Sheridan County	30009	30020
3187	4	Wyoming	Sublette County	9899	10039
3188	4	Wyoming	Sweetwater County	44626	44925
3189	4	Wyoming	Teton County	23125	22905
3190	4	Wyoming	Uinta County	20822	20903

	REGION	STNAME	CTYNAME	POPESTIMATE2015	POPESTIMATE2014
3191	4	Wyoming	Washakie County	8328	8316
3192	4	Wyoming	Weston County	7234	7185

3193 rows × 5 columns

In [49]:

```
region_1_2=(df_q8['REGION'] ==1) | (df_q8['REGION'] ==2)
washington = df_q8['CTYNAME'] == 'Washington County'
pop_15_14 = df_q8['POPESTIMATE2015'] > df_q8['POPESTIMATE2014']
```


In [50]:

```
q8 = region_1_2 & washington & pop_15_14  
q8
```

Out[50]:

```
0    False
1    False
2    False
3    False
4    False
5    False
6    False
7    False
8    False
9    False
10   False
11   False
12   False
13   False
14   False
15   False
16   False
17   False
18   False
19   False
20   False
21   False
22   False
23   False
24   False
25   False
26   False
27   False
28   False
29   False
...
3163  True
3164  False
3165  False
3166  False
3167  False
3168  False
3169  False
3170  False
3171  False
3172  False
3173  False
3174  False
3175  False
3176  False
3177  False
3178  False
3179  False
3180  False
3181  False
3182  False
3183  False
3184  False
3185  False
3186  False
3187  False
3188  False
3189  False
3190  False
3191  False
```

```
3191 False
```

```
3192 False  
dtype: bool
```

In [51]:

```
df_q8['q8'] = q8  
df_q8
```

Out[51]:

	REGION	STNAME	CTYNAME	POPESTIMATE2015	POPESTIMATE2014	q8
0	3	Alabama	Alabama	4858979	4846411	False
1	3	Alabama	Autauga County	55347	55290	False
2	3	Alabama	Baldwin County	203709	199713	False
3	3	Alabama	Barbour County	26489	26815	False
4	3	Alabama	Bibb County	22583	22549	False
5	3	Alabama	Blount County	57673	57658	False
6	3	Alabama	Bullock County	10696	10829	False
7	3	Alabama	Butler County	20154	20276	False
8	3	Alabama	Calhoun County	115620	115993	False
9	3	Alabama	Chambers County	34123	34052	False
10	3	Alabama	Cherokee County	25859	25995	False
11	3	Alabama	Chilton County	43943	43921	False
12	3	Alabama	Choctaw County	13170	13289	False
13	3	Alabama	Clarke County	24675	24847	False
14	3	Alabama	Clay County	13555	13538	False
15	3	Alabama	Cleburne County	15018	15072	False
16	3	Alabama	Coffee County	51211	50831	False
17	3	Alabama	Colbert County	54354	54480	False
18	3	Alabama	Conecuh County	12672	12662	False
19	3	Alabama	Coosa County	10724	10807	False
20	3	Alabama	Covington	67665	67666	False

20	3	Alabama	County	37835	37888	False
	REGION	STNAME	CTYNAME	POPESTIMATE2015	POPESTIMATE2014	q8
21	3	Alabama	Crenshaw County	13963	13948	False
22	3	Alabama	Cullman County	82005	81221	False
23	3	Alabama	Dale County	49565	49501	False
24	3	Alabama	Dallas County	41131	41662	False
25	3	Alabama	DeKalb County	71130	71012	False
26	3	Alabama	Elmore County	81468	81022	False
27	3	Alabama	Escambia County	37789	37784	False
28	3	Alabama	Etowah County	103057	103452	False
29	3	Alabama	Fayette County	16759	16842	False
...
3163	2	Wisconsin	Washington County	133674	133301	True
3164	2	Wisconsin	Waukesha County	396488	395335	False
3165	2	Wisconsin	Waupaca County	51945	52088	False
3166	2	Wisconsin	Waushara County	24033	24173	False
3167	2	Wisconsin	Winnebago County	169546	169639	False
3168	2	Wisconsin	Wood County	73435	73597	False
3169	4	Wyoming	Wyoming	586107	584304	False
3170	4	Wyoming	Albany County	37956	37918	False
3171	4	Wyoming	Big Horn County	12022	11919	False
3172	4	Wyoming	Campbell County	49220	48243	False
3173	4	Wyoming	Carbon County	15559	15856	False

	REGION	STNAME	CTYNAME	POPESTIMATE2015	POPESTIMATE2014	q8
3174	4	Wyoming	Converse County	14236	14172	False
3175	4	Wyoming	Crook County	7444	7264	False
3176	4	Wyoming	Fremont County	40315	40717	False
3177	4	Wyoming	Goshen County	13383	13509	False
3178	4	Wyoming	Hot Springs County	4741	4793	False
3179	4	Wyoming	Johnson County	8585	8552	False
3180	4	Wyoming	Laramie County	97121	96469	False
3181	4	Wyoming	Lincoln County	18722	18564	False
3182	4	Wyoming	Natrona County	82178	81603	False
3183	4	Wyoming	Niobrara County	2542	2530	False
3184	4	Wyoming	Park County	29228	29126	False
3185	4	Wyoming	Platte County	8812	8776	False
3186	4	Wyoming	Sheridan County	30009	30020	False
3187	4	Wyoming	Sublette County	9899	10039	False
3188	4	Wyoming	Sweetwater County	44626	44925	False
3189	4	Wyoming	Teton County	23125	22905	False
3190	4	Wyoming	Uinta County	20822	20903	False
3191	4	Wyoming	Washakie County	8328	8316	False
3192	4	Wyoming	Weston County	7234	7185	False

3193 rows × 6 columns