Homework 06

⚠️ Before you start ⚠️

Duplicate this Jupyter Notebook in your `week-07` folder (right-click -> Duplicate) and then add your last name to the beginning of it (ie. `blevins-hw-06.ipynb` - otherwise you risk having all your work overwritten when you try to sync your GitHub repository with your instructor's repository.

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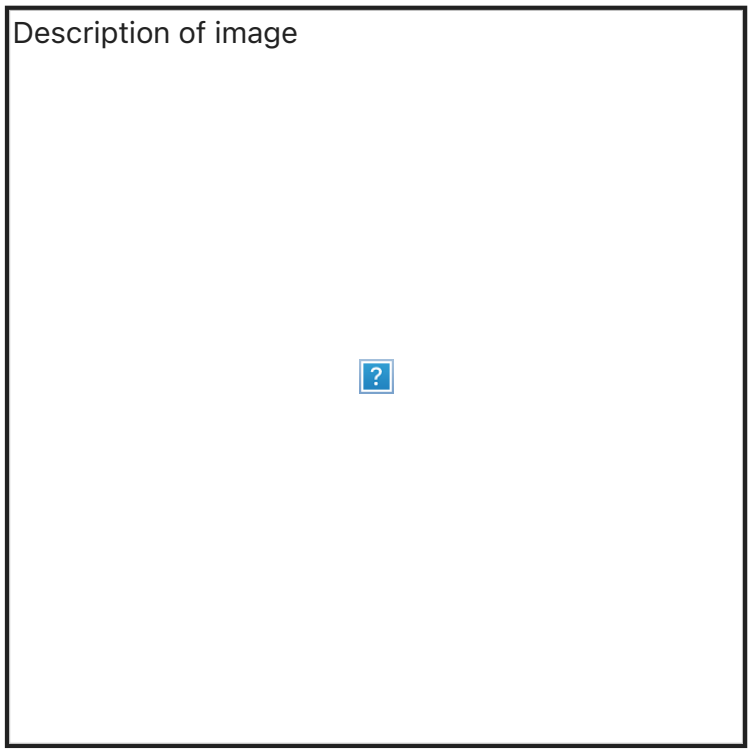
Overview

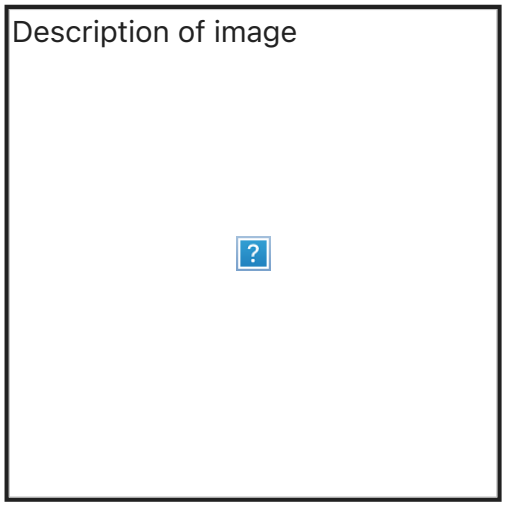
This homework assignment will help you learn how to use the Pandas library to explore tabular data by applying some of the concepts and lessons from Melanie Walsh, Pandas I to a new dataset.

This week we're going to use a spreadsheet of historical data transcribed by CU Denver history major Ryan Hanlon as part of his final project for the course Introduction to Digital Studies in Spring 2021. The data consists of a passenger list from a steamship that arrived in Boston on April 9, 1884 carrying several hundred immigrants.



The Steamship Grecian

The nine-page passenger list from the *Steamship Grecian* was submitted to authorities at the Port of Boston. This document was later scanned by the Church of Latter Day Saints and made available through its FamilySearch online archive.



Passenger list from the Steamship Grecian

Ryan then transcribed the data in Spring 2021 into a spreadsheet formatted as a CSV (comma separated value) file contained in this folder: `boston-passenger-list-1884.csv`.

For this homework, you will be following many of Melanie Walsh's steps in Pandas I and

then adapting them to fit this new dataset.

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1. Import the Pandas library (use the alias `pd`) and read in the CSV file, storing the contents of the file as a dataframe named `passengers_df`. Add a second line of code to display the contents of the dataframe (truncated).

In [10]:
```
#Your Code Here

import pandas as pd

passengers_df = pd.read_csv("boston-passenger-list-1884.csv")
passengers_df
```

Out[10]:

	first_name	last_name	date	age	native_country	destination_city	destination_
0	Jno	McNab	09 Apr 1884	21	Scotland	Suelpla	Ca
1	Thos	Campbell	09 Apr 1884	24	Scotland	Suelpla	Ca
2	Jas	Mitchell	09 Apr 1884	23	Scotland	Detroit	
3	Don	Cumming	09 Apr 1884	24	Scotland	Detroit	
4	Jno	McKinlay	09 Apr 1884	24	Scotland	Winnipeg	Ca
...	...	...	...	...	...	...	
510	Mich	Mulkern	09 Apr 1884	15	Ireland	Boston	
511	Math	Griffins	09 Apr 1884	2	Ireland	Pittsburg	
512	T	McDermott	09 Apr 1884	35	United States	Boston	
513	Wm	Hewitt	09 Apr 1884	25	United States	Boston	
514	F	Doherty	09 Apr 1884	27	United States	Boston	

515 rows × 9 columns

2. Display the **first 6 rows** of the dataframe.

In [12]:
```
#Your Code Here

passengers_df.head(6)
```

Out[12]:

	first_name	last_name	date	age	native_country	destination_city	destination_sta
0	Jno	McNab	09 Apr 1884	21	Scotland	Suelpla	Cana
1	Thos	Campbell	09 Apr 1884	24	Scotland	Suelpla	Cana
2	Jas	Mitchell	09 Apr 1884	23	Scotland	Detroit	
3	Don	Cumming	09 Apr 1884	24	Scotland	Detroit	
4	Jno	McKinlay	09 Apr 1884	24	Scotland	Winnipeg	Cana
5	John	Wilson	09 Apr 1884	28	Scotland	Boston	

3. Show a **random sample of 10 rows** from your dataframe.

In [14]:
```
#Your Code Here

passengers_df.sample(10)
```

Out[14]:

	first_name	last_name	date	age	native_country	destination_city	destination_
50	Annie	Morrison	09 Apr 1884	27	Scotland	Boston	
252	Mary	Nolan	09 Apr 1884	36	Ireland	Painesville	
403	John	Crawford	09 Apr 1884	21	Ireland	Boston	
377	Mary	Mulkern	09 Apr 1884	7	Ireland	Pittsburg	
404	John	Leaky	09 Apr 1884	25	Ireland	Boston	
405	Austin	McGovern	09 Apr 1884	20	Ireland	Boston	
221	Bgt	Coyne	09 Apr 1884	24	Ireland	Brooklyn	
156	Celia	Heally	09 Apr 1884	14	Ireland	Philadelphia	
262	Mary	Reilly	09 Apr 1884	12	Ireland	Chicago	
239	Julia	Cafferty	09 Apr 1884	13	Ireland	Chicago	

4. What are **two historical questions** about this list of passengers that you might be able to answer using Pandas?

Your answer here.

1. Where are the majority of these immigrants coming from, and what is their final destination? (spatial Data)
2. What is the average age of these immigrants (numerical data), as well as how many

families have made the trip (querying for similar last names)

Analyzing the Data

5. Calculate "summary statistics" for the passenger data.

In [19]:
```
#Your Code Here

passengers_df.describe(include='all')
```

Out[19]:

	first_name	last_name	date	age	native_country	destination_city	de
count	512	515	515	515.000000	515	515	
unique	102	170	1	NaN	3	56	
top	Mary	Doherty	09 Apr 1884	NaN	Ireland	Boston	
freq	59	12	515	NaN	461	107	
mean	NaN	NaN	NaN	21.440777	NaN	NaN	
std	NaN	NaN	NaN	13.115392	NaN	NaN	
min	NaN	NaN	NaN	0.000000	NaN	NaN	
25%	NaN	NaN	NaN	11.000000	NaN	NaN	
50%	NaN	NaN	NaN	20.000000	NaN	NaN	
75%	NaN	NaN	NaN	28.000000	NaN	NaN	
max	NaN	NaN	NaN	64.000000	NaN	NaN	

6. Looking at the summary statistics, answer the following questions:

Your answers here:

What is the most frequently occuring last name?

- Doherty

How often does the most frequently occuring last name appear?

- Doherty appears 12 times. (freq row)

How many different *kinds* of occupations are listed in the data?

- There are 9 unique types of occupations listed in the dataset.

How old is the oldest passenger?

- The oldest passenger was 64 years old.

7. Write code to answer: what was the **median** age of the passengers?

In [23]:
```
#Your Code Here

median_age = passengers_df['age'].median()
median_age
```

Out[23]:
```
20.0
```

8. What were the **ten most frequent cities** that passengers were traveling to and how many of them were going to each of these cities?

In [25]:
```
#Your Code Here

city_count = passengers_df["destination_city"].value_counts()
top_ten_cities = city_count.head(10)
top_ten_cities
```

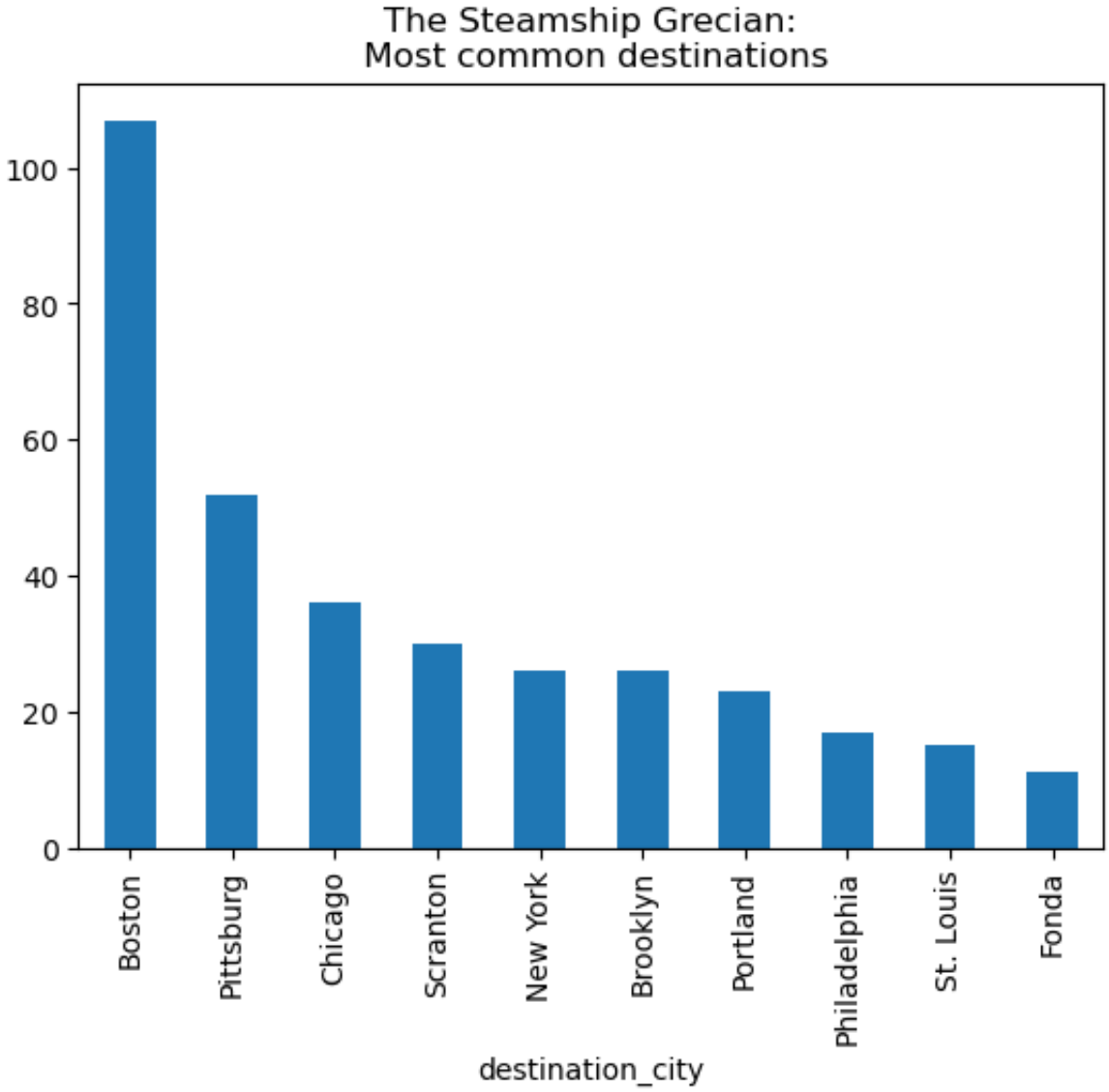
Out[25]:
```
destination_city
Boston          107
Pittsburg        52
Chicago          36
Scranton         30
New York         26
Brooklyn         26
Portland         23
Philadelphia     17
St. Louis        15
Fonda            11
Name: count, dtype: int64
```

9. Follow Walsh's example and adapt her code to make a bar chart of the **top ten most frequent destination cities** based on **how many passengers** were going to each of them.

In [27]:
```
#Your Code Here
```

```
passengers_df['destination_city'].value_counts()[:10].plot(kind='bar', title
```

Out[27]:
```
<Axes: title={'center': 'The Steamship Grecian:\n Most common destination
s'}, xlabel='destination_city'>
```



10. Where were passengers coming from? Print out **the most frequent countries** they were immigrating from and how many passengers were coming from each country. Hint: use `value_counts()` and index.

In [29]:
```
#Your Code Here

passengers_df['native_country'].value_counts()[:10]
```

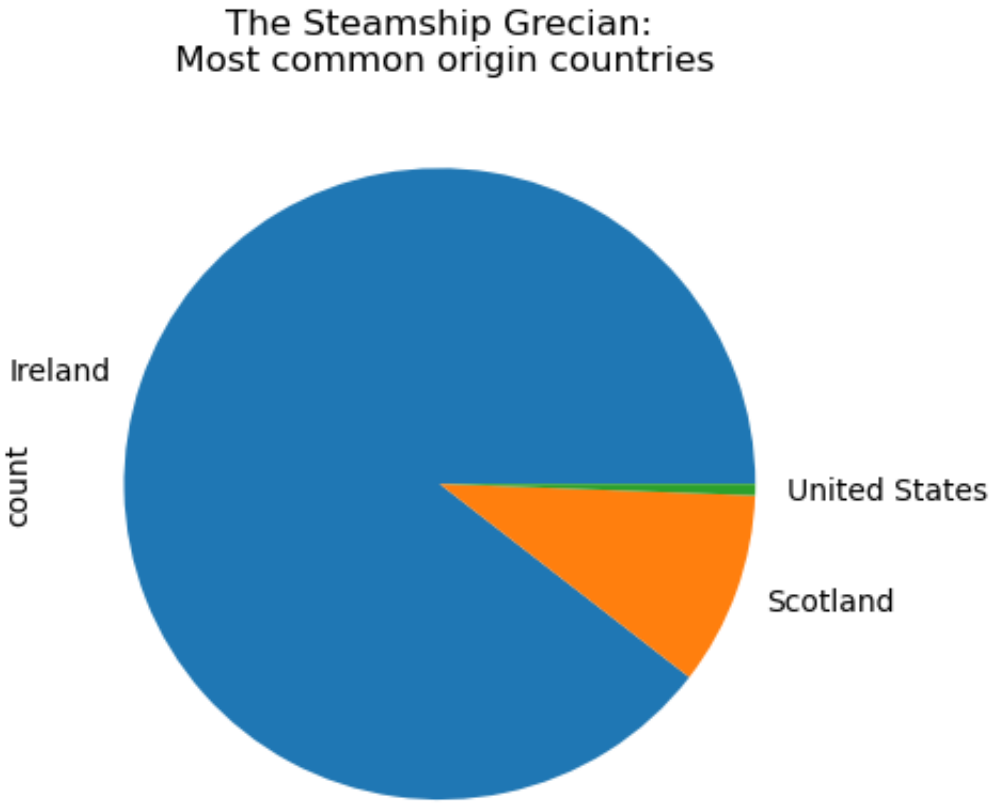
Out[29]:
```
native_country
Ireland          461
Scotland          51
United States      3
Name: count, dtype: int64
```

11. Make a pie chart showing **how many passengers were coming from each country**. Adapt Walsh's example.

In [31]:
```
#Your Code Here

passengers_df['native_country'].value_counts()[:3].plot(kind='pie', title='T
```

Out[31]:
```
<Axes: title={'center': 'The Steamship Grecian:\n Most common origin countr
ies'}, ylabel='count'>
```



12. Create a new variable called `children_filter` and assign it a True/False statement to that variable that specifies passengers who were **children**. Then use this new `children_filter` to create a new dataframe called `children_df` that **only contains passengers who were children**. Display a sample of **five random rows** from this new dataframe. Hint: look under the `occupation` column in your

dataframe. Hint: Walsh example.

In [33]:
```
#Your Code Here

children_filter = passengers_df['occupation'] == 'Child'

children_df = passengers_df[children_filter]

children_df.sample(5)
```

Out[33]:

	first_name	last_name	date	age	native_country	destination_city	destination_
163	Pat	Lofus	09 Apr 1884	7	Ireland	Oneida	
362	Mich	Reanny	09 Apr 1884	11	Ireland	Scranton	
511	Math	Griffins	09 Apr 1884	2	Ireland	Pittsburg	
199	Pat	Marrin	09 Apr 1884	2	Ireland	Danbury	
355	Kate	Brennan	09 Apr 1884	3	Ireland	New York	

13. Create a **new CSV file** named `passenger-list-children.csv` that only contains records for passengers who were children. Hint: you'll be printing the contents of `children_df` to a CSV file using `to_csv()` method. Walsh example. To check to make sure you successfully created the file, add a line of code that reads in the newly created CSV file using `pd.read_csv()`.

In [35]:
```
#Your Code Here

children_df.to_csv("passenger-list-children.csv", encoding='utf-8', index=Fa

children_df_check = pd.read_csv("passenger-list-children.csv")
children_df_check
```

Out[35]:

	first_name	last_name	date	age	native_country	destination_city	destination_
0	Alex	McBride	09 Apr 1884	12	Scotland	Chicago	
1	Cath	McBride	09 Apr 1884	11	Scotland	Chicago	
2	Wm	McBride	09 Apr 1884	9	Scotland	Chicago	
3	Agnes	McBride	09 Apr 1884	7	Scotland	Chicago	
4	Maggie	McBride	09 Apr 1884	4	Scotland	Chicago	
...	...	...	...	...	...	...	
127	Ellen	Deran	09 Apr 1884	8	Ireland	Pittsburg	
128	Pat	Kyne	09 Apr 1884	9	Ireland	Portland	
129	John	Kyne	09 Apr 1884	3	Ireland	Portland	
130	Mich	Kyne	09 Apr 1884	0	Ireland	Portland	
131	Math	Griffins	09 Apr 1884	2	Ireland	Pittsburg	

132 rows × 9 columns

Bonus Questions

What was the cut-off age for classifying a passenger as a child? Ie. What was **the oldest a passenger could be to still be considered a child**? Write code that prints out the answer to this question.

In [38]:
```
#Your Code Here

max(children_df['age'])
```

Out[38]: 12

Age Comparison: Calculate and write print() statements that show:

- The average age of passengers from **Ireland**
- The average age of passengers from **Scotland**.
- The difference in years between these average

In [40]:
```
#Your Code Here

irish_filter = passengers_df['native_country'] == 'Ireland'
irish_pass_df = passengers_df[irish_filter]

scot_filter = passengers_df['native_country'] == 'Scotland'
scot_pass_df = passengers_df[scot_filter]

irish_mean = irish_pass_df['age'].mean()
scot_mean = scot_pass_df['age'].mean()

print(f'The Irish mean was {irish_mean} years of age!')
print(f'The Scottish mean was {scot_mean} years of age!')

diff_in_mean = scot_mean - irish_mean

print(f'The difference between them is {diff_in_mean} years!')
```

```
The Irish mean was 20.98698481561822 years of age!
The Scottish mean was 25.098039215686274 years of age!
The difference between them is 4.111054400068053 years!
```

Save a Filtered Dataset: Create a new CSV file that contains data for: only adult passengers (**age 18 and over**) who were heading to **Boston**.

In [42]:
```
#Your Code Here

adult_filter = passengers_df['age'] >= 18
adults_df = passengers_df[adult_filter]

boston_filter = adults_df['destination_city'] == 'Boston'
boston_adults_df = adults_df[boston_filter]

boston_adults_df.to_csv("adult_passengers_heading_to_boston.csv", encoding='
```

```
boston_df_check = pd.read_csv("adult_passengers_heading_to_boston.csv")
boston_df_check
```

Out[42]:

	first_name	last_name	date	age	native_country	destination_city	destination_s
0	John	Wilson	09 Apr 1884	28	Scotland	Boston	
1	Rob	Watson	09 Apr 1884	20	Scotland	Boston	
2	Thos.B	Watson	09 Apr 1884	23	Scotland	Boston	
3	NaN	Roberts	09 Apr 1884	40	Scotland	Boston	
4	Robt	Chalmers	09 Apr 1884	23	Scotland	Boston	
...	...	...	...	...	...	...	
91	Bgt	Adley	09 Apr 1884	20	Ireland	Boston	
92	Ned	Flaherty	09 Apr 1884	22	Ireland	Boston	
93	T	McDermott	09 Apr 1884	35	United States	Boston	
94	Wm	Hewitt	09 Apr 1884	25	United States	Boston	
95	F	Doherty	09 Apr 1884	27	United States	Boston	

96 rows × 9 columns

In [ ]: