Final Project Submission

Please fill out:

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- Student pace: part time
- Scheduled project review date/time:
- Instructor name: Claude Fried
- Blog post URL:

In [1]:
```
# Your code here - remember to use markdown cells for comments as well!
```

This is not the final product yet. I'm using this notebook to begin evaluating the available data.

In [2]:
```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import numpy as np
import shutil
import sqlite3
import seaborn as sns
import matplotlib.patches as mpatches
```

In [3]:
```
pd.set_option("display.max_columns", None)

#A command I was using earlier that I may use again.
#pd.set_option("display.max_rows", None, "display.max_columns", None)
```

In [4]:
```
ls zippedData
```

```
 Volume in drive C is OS
 Volume Serial Number is 4EE7-277F

 Directory of C:\Users\g_osb\dsc-phase-1-project-v2-4\zippedData

05/19/2022  01:15 PM    <DIR>          .
05/20/2022  09:32 AM    <DIR>          ..
05/08/2022  11:01 PM            53,544 bom.movie_gross.csv.gz
05/08/2022  11:01 PM        67,149,708 im.db.zip
05/08/2022  11:01 PM           107,563 movie_data_erd.jpeg
05/08/2022  11:01 PM           498,202 rt.movie_info.tsv.gz
05/08/2022  11:01 PM         3,402,194 rt.reviews.tsv.gz
05/08/2022  11:01 PM           827,840 tmdb.movies.csv.gz
05/08/2022  11:01 PM           153,218 tn.movie_budgets.csv.gz
               7 File(s)     72,192,269 bytes
               2 Dir(s)  414,838,538,240 bytes free
```

In [5]:

```
bom = pd.read_csv('C:/Users/g_osb/dsc-phase-1-project-v2-4/zippedData/bom.movie_g
rt_info = pd.read_csv('C:/Users/g_osb/dsc-phase-1-project-v2-4/zippedData/rt.movi
rt_reviews = pd.read_csv('C:/Users/g_osb/dsc-phase-1-project-v2-4/zippedData/rt.r
tmdb = pd.read_csv('C:/Users/g_osb/dsc-phase-1-project-v2-4/zippedData/tmdb.movie
tn = pd.read_csv('C:/Users/g_osb/dsc-phase-1-project-v2-4/zippedData/tn.movie_bud
```

Unzipping the SQL data and previewing all the tables.

In [6]:

```
#unzip the zip file
#C:/Users/g_osb/dsc-phase-1-project-v2-4
shutil.unpack_archive("C:/Users/g_osb/dsc-phase-1-project-v2-4/zippedData/im.db.z
```

In [7]:

```
#The SQL file is named im.db. Connecting it to Python
conn = sqlite3.connect('im.db')
cur = conn.cursor()
```

The next cell ses up printing the table names.

In [8]:

```
%%script sqlite3 im.db --out tables
.tables
.quit
```

In [9]:

```
#Now listing the tables
print(tables)
```

```
directors      movie_akas     movie_ratings  principals
known_for      movie_basics   persons        writers
```

In [10]:

```
#Putting each table into a dataframe
imdb_directors = pd.read_sql("""
SELECT *
FROM directors
;
""",conn)

#I checked each table for fully duplicated rows, then deleted the duplicates.
#If a table had no duplicates, I deleted the check.
imdb_directors.drop(imdb_directors[imdb_directors.duplicated()].index, inplace=Tr
imdb_directors
```

Out[10]:

```
          movie_id   person_id
      0  tt0285252   nm0899854
      1  tt0462036   nm1940585
      2  tt0835418   nm0151540
      4  tt0878654   nm0089502
      5  tt0878654   nm2291498
    ...        ...         ...
 291169  tt8999974  nm10122357
 291170  tt9001390   nm6711477
 291171  tt9001494  nm10123242
 291172  tt9001494  nm10123248
 291173  tt9004986   nm4993825

163535 rows × 2 columns
```

In [11]:

```
imdb_movie_akas = pd.read_sql("""
SELECT *
FROM movie_akas
;
""",conn)
imdb_movie_akas
```

Out[11]:

	movie_id	ordering	title	region	language	types	attributes	is_original_title
0	tt0369610	10	Джурасик свят	BG	bg	None	None	0.0
1	tt0369610	11	Jurashikku warudo	JP	None	imdbDisplay	None	0.0
2	tt0369610	12	Jurassic World: O Mundo dos Dinossauros	BR	None	imdbDisplay	None	0.0
3	tt0369610	13	O Mundo dos Dinossauros	BR	None	None	short title	0.0
4	tt0369610	14	Jurassic World	FR	None	imdbDisplay	None	0.0
...	...	...	...	...	...	...	...	...
331698	tt9827784	2	Sayonara kuchibiru	None	None	original	None	1.0
331699	tt9827784	3	Farewell Song	XWW	en	imdbDisplay	None	0.0
331700	tt9880178	1	La atención	None	None	original	None	1.0
331701	tt9880178	2	La atención	ES	None	None	None	0.0
331702	tt9880178	3	The Attention	XWW	en	imdbDisplay	None	0.0

331703 rows × 8 columns

```
In [12]: imdb_movie_ratings = pd.read_sql("""
         SELECT *
         FROM movie_ratings
         ;
         """,conn)
         imdb_movie_ratings
```

```
Out[12]:
              movie_id  averagerating  numvotes
          0  tt10356526            8.3        31
          1  tt10384606            8.9       559
          2   tt1042974            6.4        20
          3   tt1043726            4.2     50352
          4   tt1060240            6.5        21
        ...         ...            ...       ...
      73851   tt9805820            8.1        25
      73852   tt9844256            7.5        24
      73853   tt9851050            4.7        14
      73854   tt9886934            7.0         5
      73855   tt9894098            6.3       128

     73856 rows × 3 columns
```

In [13]:
```
imdb_principals = pd.read_sql("""
SELECT *
FROM principals
;
""",conn)
imdb_principals
```

Out[13]:

	movie_id	ordering	person_id	category	job	characters
0	tt0111414	1	nm0246005	actor	None	["The Man"]
1	tt0111414	2	nm0398271	director	None	None
2	tt0111414	3	nm3739909	producer	producer	None
3	tt0323808	10	nm0059247	editor	None	None
4	tt0323808	1	nm3579312	actress	None	["Beth Boothby"]
...	...	...	...	...	...	...
1028181	tt9692684	1	nm0186469	actor	None	["Ebenezer Scrooge"]
1028182	tt9692684	2	nm4929530	self	None	["Herself","Regan"]
1028183	tt9692684	3	nm10441594	director	None	None
1028184	tt9692684	4	nm6009913	writer	writer	None
1028185	tt9692684	5	nm10441595	producer	producer	None

1028186 rows × 6 columns

In [14]:
```
imdb_known_for = pd.read_sql("""
SELECT *
FROM known_for
;
""",conn)
imdb_known_for
```

Out[14]:

	person_id	movie_id
0	nm0061671	tt0837562
1	nm0061671	tt2398241
2	nm0061671	tt0844471
3	nm0061671	tt0118553
4	nm0061865	tt0896534
...	...	...
1638255	nm9990690	tt9090932
1638256	nm9990690	tt8737130
1638257	nm9991320	tt8734436
1638258	nm9991320	tt9615610
1638259	nm9993380	tt8743182

1638260 rows × 2 columns

In [15]:
```
imdb_movie_basics = pd.read_sql("""
SELECT *
FROM movie_basics
;
""",conn)
imdb_movie_basics
```

Out[15]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy
...	...	...	...	...	...	...
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Comedy
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	None
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Documentary

146144 rows × 6 columns

In [16]:

```
imdb_persons = pd.read_sql("""
SELECT *
FROM persons
;
""",conn)
imdb_persons
```

Out[16]:

	person_id	primary_name	birth_year	death_year	primary_pro
0	nm0061671	Mary Ellen Bauder	NaN	NaN	miscellaneous,production_manager,p
1	nm0061865	Joseph Bauer	NaN	NaN	composer,music_department,sound_dep
2	nm0062070	Bruce Baum	NaN	NaN	miscellaneous,act
3	nm0062195	Axel Baumann	NaN	NaN	camera_department,cinematographer,art_dep
4	nm0062798	Pete Baxter	NaN	NaN	production_designer,art_department,set_d
...	...	...	...	...	
606643	nm9990381	Susan Grobes	NaN	NaN	
606644	nm9990690	Joo Yeon So	NaN	NaN	
606645	nm9991320	Madeline Smith	NaN	NaN	
606646	nm9991786	Michelle Modigliani	NaN	NaN	p
606647	nm9993380	Pegasus Envoyé	NaN	NaN	director,act

606648 rows × 5 columns

In [17]:

```
imdb_writers = pd.read_sql("""
SELECT *
FROM writers
;
""",conn)
imdb_writers.drop(imdb_writers[imdb_writers.duplicated()].index, inplace=True)
imdb_writers
```

Out[17]:

	movie_id	person_id
0	tt0285252	nm0899854
1	tt0438973	nm0175726
2	tt0438973	nm1802864
3	tt0462036	nm1940585
4	tt0835418	nm0310087
...	...	...
255868	tt8999892	nm10122246
255869	tt8999974	nm10122357
255870	tt9001390	nm6711477
255871	tt9004986	nm4993825
255872	tt9010172	nm8352242

178352 rows × 2 columns

In [18]:
```
#Looking for a friend of mine's Uncle, Sanford Gibbons
pd.read_sql("""
SELECT *
FROM persons
WHERE primary_name LIKE '%Gibbons%';
""",conn)
```

Out[18]:

	person_id	primary_name	birth_year	death_year	primary_profession
0	nm0316584	Patrick D. Gibbons	NaN	NaN	assistant_director,producer,miscellaneous
1	nm0316554	Greg Gibbons	NaN	NaN	animation_department,visual_effects,art_director
2	nm0316596	Sanford Gibbons	1933.0	2018.0	actor
3	nm1733301	Dave Gibbons	1949.0	NaN	writer,art_department,producer
4	nm0316531	Billy Gibbons	1949.0	NaN	soundtrack,actor,composer
5	nm2524514	Matt Gibbons	NaN	NaN	actor,writer,director
6	nm1644817	Tyler Gibbons	NaN	NaN	composer,sound_department,soundtrack
7	nm3453179	Pete Gibbons	NaN	NaN	producer
8	nm1668151	Neil Gibbons	NaN	NaN	writer,producer,director
9	nm2971362	Tony Gibbons	1983.0	NaN	actor
10	nm1668152	Rob Gibbons	NaN	NaN	writer,producer,director
11	nm1766037	Michael Gibbons	NaN	NaN	None
12	nm3202120	Lauren Gibbons	NaN	NaN	actress
13	nm4752963	Sally Fitzgibbons	NaN	NaN	None
14	nm3501059	Marlon Gibbons	NaN	NaN	composer,soundtrack
15	nm4613842	Richard Fitzgibbons	NaN	NaN	None
16	nm4548984	Darryn Gibbons	NaN	NaN	actor,writer,director
17	nm3106632	Derek Gibbons	NaN	NaN	actor,producer,director
18	nm4313499	Anthony Gibbons	NaN	NaN	cinematographer
19	nm5854730	Anthony Gibbons	NaN	NaN	actor
20	nm3180477	Michael Gibbons	NaN	NaN	actor
21	nm5785553	Tom Gibbons	NaN	NaN	cinematographer
22	nm4425737	Brendan Gibbons	NaN	NaN	director,writer,producer
23	nm5258424	Maurine Gibbons	NaN	NaN	miscellaneous,actress,writer

	person_id	primary_name	birth_year	death_year	primary_profession
24	nm4882012	Akil Gibbons	NaN	NaN	producer,miscellaneous,camera_department
25	nm5903645	Kendyl Gibbons	NaN	NaN	None
26	nm5532424	Brendon Gibbons	NaN	NaN	None
27	nm4958141	Philip Gibbons	NaN	NaN	writer,director,producer
28	nm5964883	Matthew Gibbons	NaN	NaN	sound_department,camera_department,editor
29	nm6367107	John Carroll-Gibbons	NaN	NaN	editor,visual_effects,editorial_department
30	nm9242691	Mark Gibbons	NaN	NaN	actor

In [19]:

```
#Here's my friend's Uncle's final film. Again, left for fun.
pd.read_sql("""
SELECT *
FROM principals
JOIN movie_basics
    USING(movie_id)
WHERE person_id LIKE 'nm0316596';
""",conn)
```

Out[19]:

	movie_id	ordering	person_id	category	job	characters	primary_title	original_title	start_ye
0	tt5607782	4	nm0316596	actor	None	["Father James Burk"]	The Covenant	The Covenant	20

In [20]:

```
#After reviewing the data, I found a strange mistake in Box Office Mojo's
#date for a 2012 movie titled Upside Down. It's date is listed 2013. This
#caused the data to be inconsistent with other databases. I could just delete
#it, but, after finding the error, it's just as easy to correct it.

bom.at[1298,'year'] = 2012
bom.iloc[1298]['year']
```

Out[20]:

```
2012
```

In [21]:
```
#Merging bom and imdb
movies_analyzed = pd.merge(bom,imdb_movie_basics, how='inner',left_on='title', ri
movies_analyzed
```

Out[21]:

	title	studio	domestic_gross	foreign_gross	year	movie_id	primary_title	original_title
0	Toy Story 3	BV	415000000.0	652000000	2010	tt0435761	Toy Story 3	Toy Story 3
1	Inception	WB	292600000.0	535700000	2010	tt1375666	Inception	Inception
2	Shrek Forever After	P/DW	238700000.0	513900000	2010	tt0892791	Shrek Forever After	Shrek Forever After
3	The Twilight Saga: Eclipse	Sum.	300500000.0	398000000	2010	tt1325004	The Twilight Saga: Eclipse	The Twilight Saga: Eclipse
4	Iron Man 2	Par.	312400000.0	311500000	2010	tt1228705	Iron Man 2	Iron Man 2
...	...	...	...	...	...	...	...	...
2771	The Escape	IFC	14000.0	NaN	2018	tt6069126	The Escape	The Escape
2772	Souvenir	Strand	11400.0	NaN	2018	tt2387692	Souvenir	Souvenir
2773	Souvenir	Strand	11400.0	NaN	2018	tt2389092	Souvenir	Souvenir
2774	Souvenir	Strand	11400.0	NaN	2018	tt3478898	Souvenir	Souvenir
2775	An Actor Prepares	Grav.	1700.0	NaN	2018	tt5718046	An Actor Prepares	An Actor Prepares

2776 rows × 11 columns

In [22]:

```
#Dropping mistakes based on inconsistent years released data.
movies_to_drop = movies_analyzed[movies_analyzed['title'].duplicated()]
movies_to_drop.drop(movies_to_drop[(movies_to_drop['year'] == movies_to_drop['sta
movies_analyzed.drop(movies_to_drop.index, inplace=True)
movies_analyzed.drop(movies_analyzed[(movies_analyzed['year'] != movies_analyzed[
bom_and_imdb = movies_analyzed.reset_index()
bom_and_imdb
```

```
C:\Users\g_osb\anaconda3\envs\learn-env\lib\site-packages\pandas\core\frame.py:
4163: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pyd
ata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-c
opy)
  return super().drop(
```

Out[22]:

	index	title	studio	domestic_gross	foreign_gross	year	movie_id	primary_title	o
0	0	Toy Story 3	BV	415000000.0	652000000	2010	tt0435761	Toy Story 3	
1	1	Inception	WB	292600000.0	535700000	2010	tt1375666	Inception	
2	2	Shrek Forever After	P/DW	238700000.0	513900000	2010	tt0892791	Shrek Forever After	F
3	3	The Twilight Saga: Eclipse	Sum.	300500000.0	398000000	2010	tt1325004	The Twilight Saga: Eclipse	
4	4	Iron Man 2	Par.	312400000.0	311500000	2010	tt1228705	Iron Man 2	
...	...	...	...	...	...	...	...	...	
1662	2756	The House That Jack Built	IFC	88000.0	NaN	2018	tt4003440	The House That Jack Built	
1663	2761	Helicopter Eela	Eros	72000.0	NaN	2018	tt8427036	Helicopter Eela	
1664	2765	Oolong Courtyard	CL	37700.0	NaN	2018	tt8549902	Oolong Courtyard: KungFu School	
1665	2768	The Workshop	Strand	22100.0	NaN	2018	tt7405478	The Workshop	
1666	2775	An Actor Prepares	Grav.	1700.0	NaN	2018	tt5718046	An Actor Prepares	

1667 rows × 12 columns

In [23]:
```
#Editing tmdb so we can merge it with the other data easily
tmdb.rename(columns = {'Unnamed: 0':'tmdb_index','original_title':'tmdb_original_

#Fixing yet another error in Upside Down
tmdb.at[7969,'tmdb_release_date'] = '2012-08-31'

#Converting to release dates to release years in integers in a new column
tmdb['tmdb_year'] = tmdb['tmdb_release_date'].map(lambda x : x[0:4])
tmdb['tmdb_year'] = tmdb['tmdb_year'].astype(int)
```

In [24]:
```
#Merging the newly culled dataframe with the tmdb dataframe
movies_analyzed = pd.merge(bom_and_imdb,tmdb, how='inner',left_on='title', right_
movies_analyzed
```

Out[24]:

	index	title	studio	domestic_gross	foreign_gross	year	movie_id	primary_title	origi
0	0	Toy Story 3	BV	415000000.0	652000000	2010	tt0435761	Toy Story 3	Toy
1	1	Inception	WB	292600000.0	535700000	2010	tt1375666	Inception	I
2	2	Shrek Forever After	P/DW	238700000.0	513900000	2010	tt0892791	Shrek Forever After	Fore
3	3	The Twilight Saga: Eclipse	Sum.	300500000.0	398000000	2010	tt1325004	The Twilight Saga: Eclipse	The
4	4	Iron Man 2	Par.	312400000.0	311500000	2010	tt1228705	Iron Man 2	Irc
...	...	...	...	...	...	...	...	...	
1770	2739	The Guardians	MBox	177000.0	NaN	2018	tt8150132	The Guardians	G
1771	2742	Museo	Vita.	149000.0	NaN	2018	tt4958448	Museo	
1772	2756	The House That Jack Built	IFC	88000.0	NaN	2018	tt4003440	The House That Jack Built	Th T
1773	2756	The House That Jack Built	IFC	88000.0	NaN	2018	tt4003440	The House That Jack Built	Th T
1774	2775	An Actor Prepares	Grav.	1700.0	NaN	2018	tt5718046	An Actor Prepares	F

1775 rows × 23 columns

In [25]:

```
#Dropping mistakes based on inconsistent years released data.
movies_to_drop = movies_analyzed[movies_analyzed['title'].duplicated()]
movies_to_drop.drop(movies_to_drop[(movies_to_drop['year'] == movies_to_drop['tmd
movies_analyzed.drop(movies_to_drop.index, inplace=True)
movies_analyzed.drop(movies_analyzed[(movies_analyzed['year'] != movies_analyzed[
bom_imdb_and_tmdb = movies_analyzed.reset_index()
bom_imdb_and_tmdb
```

```
C:\Users\g_osb\anaconda3\envs\learn-env\lib\site-packages\pandas\core\frame.py:
4163: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pyd
ata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-c
opy)
  return super().drop(
```

Out[25]:

	level_0	index	title	studio	domestic_gross	foreign_gross	year	movie_id	primary
0	0	0	Toy Story 3	BV	415000000.0	652000000	2010	tt0435761	Toy S
1	1	1	Inception	WB	292600000.0	535700000	2010	tt1375666	Ince
2	2	2	Shrek Forever After	P/DW	238700000.0	513900000	2010	tt0892791	Forever
3	3	3	The Twilight Saga: Eclipse	Sum.	300500000.0	398000000	2010	tt1325004	The Tv E
4	4	4	Iron Man 2	Par.	312400000.0	311500000	2010	tt1228705	Iron I
...	...	...	...	...	...	...	...	...	
1631	1767	2731	Time Freak	Grindstone	10000.0	256000	2018	tt6769280	Time
1632	1768	2732	What They Had	BST	260000.0	NaN	2018	tt6662736	What
1633	1771	2742	Museo	Vita.	149000.0	NaN	2018	tt4958448	M
1634	1773	2756	The House That Jack Built	IFC	88000.0	NaN	2018	tt4003440	The H Tha
1635	1774	2775	An Actor Prepares	Grav.	1700.0	NaN	2018	tt5718046	An Pre

1636 rows × 24 columns

In [26]:

```
#Editing tn so we can merge it with the other data easily

tn.rename(columns = {'id':'tn_id','movie':'tn_title','domestic_gross':'tn_domesti
#Fixing yet another error in Upside Down
tn.at[1203,'tn_release_date'] = 'Aug 31 2012'

#Converting date to integer year in new column
tn['tn_year'] = tn['tn_release_date'].map(lambda x : x[-4:])
tn['tn_year'] = tn['tn_year'].astype(int)
```

In [27]:

```
#Merging the newly culled dataframe with the newly formatted dataframe tn
movies_analyzed = pd.merge(bom_imdb_and_tmdb,tn, how='inner',left_on='title', rig
movies_analyzed
```

Out[27]:

	level_0	index	title	studio	domestic_gross	foreign_gross	year	movie_id	primar
0	0	0	Toy Story 3	BV	415000000.0	652000000	2010	tt0435761	Toy S
1	1	1	Inception	WB	292600000.0	535700000	2010	tt1375666	Inc
2	2	2	Shrek Forever After	P/DW	238700000.0	513900000	2010	tt0892791	Foreve
3	3	3	The Twilight Saga: Eclipse	Sum.	300500000.0	398000000	2010	tt1325004	The T E
4	4	4	Iron Man 2	Par.	312400000.0	311500000	2010	tt1228705	Iron
...	...	...	...	...	...	...	...	...	
1157	1741	2682	Suspiria	Amazon	2500000.0	5400000	2018	tt1034415	S
1158	1743	2686	The Hurricane Heist	ENTMP	6100000.0	NaN	2018	tt5360952	Hur
1159	1745	2688	Destroyer	Annapurna	1500000.0	4000000	2018	tt7137380	Des
1160	1749	2694	Gotti	VE	4300000.0	NaN	2018	tt1801552	
1161	1759	2710	Mandy	RLJ	1200000.0	NaN	2018	tt6998518	I

1162 rows × 31 columns

In [28]:

```
#Dropping mistakes based on inconsistent years released data.
movies_to_drop = movies_analyzed[movies_analyzed['title'].duplicated()]
movies_to_drop.drop(movies_to_drop[(movies_to_drop['year'] == movies_to_drop['tn_
movies_analyzed.drop(movies_to_drop.index, inplace=True)
movies_analyzed.drop(movies_analyzed[(movies_analyzed['year'] != movies_analyzed
```

```
C:\Users\g_osb\anaconda3\envs\learn-env\lib\site-packages\pandas\core\frame.py:
4163: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pyd
ata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-c
opy)
  return super().drop(
```

In [29]:

```
#There are duplicate rows I need to drop. These are rows with the same film
#title and same release year. To do this, I need to create a dataframe with
#just these values, and preserve the index numbers from the dataframe created
#which is called bom_imdb_tmdb_and_tn

pd.set_option("display.max_rows", None, "display.max_columns", None)

duplicated_titles = movies_analyzed[movies_analyzed['movie_id'].duplicated(keep=F
duplicated_titles = duplicated_titles.iloc[:,1:].reset_index()
duplicated_titles['duped_title'] = duplicated_titles['movie_id'].duplicated()
duplicated_titles['duped_year'] = duplicated_titles['year'].duplicated().astype(b
duplicated_titles['drop'] = False

#I couldn't figure out how to do this using a lambda function.
for x in range(len(duplicated_titles)):
    if (duplicated_titles['duped_title'][x] == True and duplicated_titles['duped_
        duplicated_titles['drop'][x] = True


duplicated_titles
```

```
<ipython-input-29-f3b11eaa361f>:17: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy (https://panda
s.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ver
sus-a-copy)
  duplicated_titles['drop'][x] = True
```

In [30]:

```
#Resetting the max rows

pd.set_option("display.max_rows", 60, "display.max_columns", None)
```

In [31]:

```
#Dropping the duplicated titles
duplicated_titles.drop(duplicated_titles[duplicated_titles['drop'] == False].inde
movies_analyzed.drop(duplicated_titles['level_0'], inplace=True)

#Checking to see if duplicated titles are gone.
movies_analyzed['title'].duplicated().sum()
```

Out[31]:

```
23
```

In [32]:

```
#Funny enough, there are twenty three pairs, or 46 films, that have the same
#title, were released the same year, but yet have different runtimes and
#different entries on IMDB. These need to be removed selectively. First, I'll
#look at the 46 films.
test = movies_analyzed[movies_analyzed['title'].duplicated(keep=False)].sort_valu
test
```

Out[32]:

	title	studio	year	movie_id	runtime_minutes	genres
207	Abduction	LGF	2011	tt1600195	106.0	Action,Mystery,Thriller
208	Abduction	LGF	2011	tt2447982	84.0	Horror,Thriller
614	Addicted	LGF	2014	tt3435418	97.0	Documentary,Music
613	Addicted	LGF	2014	tt2205401	106.0	Drama,Thriller
607	Big Eyes	Wein.	2014	tt4317898	NaN	Documentary
606	Big Eyes	Wein.	2014	tt1126590	106.0	Biography,Crime,Drama
53	Burlesque	SGem	2010	tt1126591	119.0	Drama,Music,Musical
54	Burlesque	SGem	2010	tt1586713	NaN	Drama
962	Coco	BV	2017	tt2380307	105.0	Adventure,Animation,Comedy
963	Coco	BV	2017	tt7002100	98.0	Horror
111	Cyrus	FoxS	2010	tt1327709	87.0	Crime,Horror,Mystery
112	Cyrus	FoxS	2010	tt1336617	91.0	Comedy,Drama,Romance
942	Denial	BST	2016	tt4645330	109.0	Biography,Drama
943	Denial	BST	2016	tt5897002	93.0	Documentary
737	Legend	Uni.	2015	tt3381068	94.0	Horror
739	Legend	Uni.	2015	tt3569230	132.0	Biography,Crime,Drama
848	Lights Out	WB (NL)	2016	tt5328340	90.0	Documentary
847	Lights Out	WB (NL)	2016	tt4786282	81.0	Drama,Horror,Mystery
686	Sisters	Uni.	2015	tt1850457	118.0	Comedy
687	Sisters	Uni.	2015	tt4793074	53.0	Biography,Documentary,Music
698	Spotlight	ORF	2015	tt7785302	99.0	Drama
696	Spotlight	ORF	2015	tt1895587	129.0	Crime,Drama
1055	Stronger	RAtt.	2017	tt3881784	119.0	Biography,Drama
1056	Stronger	RAtt.	2017	tt5738152	125.0	Drama
187	The Artist	Wein.	2011	tt1825978	100.0	Thriller
186	The Artist	Wein.	2011	tt1655442	100.0	Comedy,Drama,Romance
41	The Bounty Hunter	Sony	2010	tt1038919	110.0	Action,Comedy,Romance
42	The Bounty Hunter	Sony	2010	tt1472211	NaN	None
898	The Forest	Focus	2016	tt3387542	93.0	Horror,Mystery,Thriller
901	The Forest	Focus	2016	tt4982356	109.0	Drama,Fantasy,Horror

	title	studio	year	movie_id	runtime_minutes	genres
729	The Night Before	Sony	2015	tt6353886	86.0	Documentary
726	The Night Before	Sony	2015	tt3530002	101.0	Adventure,Comedy,Fantasy
138	The Tempest	Mira.	2010	tt1683003	131.0	Drama
137	The Tempest	Mira.	2010	tt1274300	110.0	Comedy,Drama,Fantasy
695	The Visit	Uni.	2015	tt3833746	83.0	Documentary
693	The Visit	Uni.	2015	tt3567288	94.0	Horror,Mystery,Thriller
721	The Walk	TriS	2015	tt3488710	123.0	Adventure,Biography,Drama
720	The Walk	TriS	2015	tt2159988	89.0	Crime,Thriller
1065	The Wall	RAtt.	2017	tt7578246	NaN	Documentary
1064	The Wall	RAtt.	2017	tt6845582	5.0	Documentary
1063	The Wall	RAtt.	2017	tt4218696	88.0	Action,Drama,Thriller
1114	Truth or Dare	Uni.	2018	tt6869948	92.0	Comedy,Drama,Romance
1113	Truth or Dare	Uni.	2018	tt6772950	100.0	Horror,Thriller
510	Upside Down	MNE	2012	tt1374992	109.0	Drama,Fantasy,Romance
511	Upside Down	MNE	2012	tt2105043	81.0	Drama

In [33]:

```
#Now, I'll check which ones to pick and which to drop. I'll choose which one
#to keep by searching for a Google search and matching up the film that comes
#up with the runtime listed in IMDB.

imposter_films = ['tt2447982', 'tt3435418', 'tt4317898', 'tt1586713',
                  'tt7002100', 'tt1327709', 'tt5897002', 'tt3381068',
                  'tt5328340', 'tt4793074', 'tt7785302', 'tt5738152',
                  'tt1825978', 'tt1472211', 'tt4982356', 'tt6353886',
                  'tt1683003', 'tt3833746', 'tt2159988', 'tt7578246',
                  'tt6845582', 'tt6869948', 'tt2105043']
to_drop = test[test['movie_id'].isin(imposter_films)].index
test.drop(to_drop, inplace=True)
test.sort_values('title')
```

Out[33]:

	title	studio	year	movie_id	runtime_minutes	genres
207	Abduction	LGF	2011	tt1600195	106.0	Action,Mystery,Thriller
613	Addicted	LGF	2014	tt2205401	106.0	Drama,Thriller
606	Big Eyes	Wein.	2014	tt1126590	106.0	Biography,Crime,Drama
53	Burlesque	SGem	2010	tt1126591	119.0	Drama,Music,Musical
962	Coco	BV	2017	tt2380307	105.0	Adventure,Animation,Comedy
112	Cyrus	FoxS	2010	tt1336617	91.0	Comedy,Drama,Romance
942	Denial	BST	2016	tt4645330	109.0	Biography,Drama
739	Legend	Uni.	2015	tt3569230	132.0	Biography,Crime,Drama
847	Lights Out	WB (NL)	2016	tt4786282	81.0	Drama,Horror,Mystery
686	Sisters	Uni.	2015	tt1850457	118.0	Comedy
696	Spotlight	ORF	2015	tt1895587	129.0	Crime,Drama
1055	Stronger	RAtt.	2017	tt3881784	119.0	Biography,Drama
186	The Artist	Wein.	2011	tt1655442	100.0	Comedy,Drama,Romance
41	The Bounty Hunter	Sony	2010	tt1038919	110.0	Action,Comedy,Romance
898	The Forest	Focus	2016	tt3387542	93.0	Horror,Mystery,Thriller
726	The Night Before	Sony	2015	tt3530002	101.0	Adventure,Comedy,Fantasy
137	The Tempest	Mira.	2010	tt1274300	110.0	Comedy,Drama,Fantasy
693	The Visit	Uni.	2015	tt3567288	94.0	Horror,Mystery,Thriller
721	The Walk	TriS	2015	tt3488710	123.0	Adventure,Biography,Drama
1063	The Wall	RAtt.	2017	tt4218696	88.0	Action,Drama,Thriller
1113	Truth or Dare	Uni.	2018	tt6772950	100.0	Horror,Thriller
510	Upside Down	MNE	2012	tt1374992	109.0	Drama,Fantasy,Romance

In [34]:

```
#Those look good. So now we'll do drop the same films from movies_analyzed
movies_analyzed.drop(to_drop, inplace=True)
```

In [35]:

```
#Creating a new dataframe to mark where we are here.
bom_imdb_tmdb_and_tn = movies_analyzed.iloc[:,1:].reset_index()
bom_imdb_tmdb_and_tn
```

Out[35]:

	level_0	index	title	studio	domestic_gross	foreign_gross	year	movie_id	primar
0	0	0	Toy Story 3	BV	415000000.0	652000000	2010	tt0435761	Toy S
1	1	1	Inception	WB	292600000.0	535700000	2010	tt1375666	Inc
2	2	2	Shrek Forever After	P/DW	238700000.0	513900000	2010	tt0892791	Foreve
3	3	3	The Twilight Saga: Eclipse	Sum.	300500000.0	398000000	2010	tt1325004	The T E
4	4	4	Iron Man 2	Par.	312400000.0	311500000	2010	tt1228705	Iron
...	...	...	...	...	...	...	...	...	
1003	1157	2682	Suspiria	Amazon	2500000.0	5400000	2018	tt1034415	S
1004	1158	2686	The Hurricane Heist	ENTMP	6100000.0	NaN	2018	tt5360952	Hur
1005	1159	2688	Destroyer	Annapurna	1500000.0	4000000	2018	tt7137380	Des
1006	1160	2694	Gotti	VE	4300000.0	NaN	2018	tt1801552	
1007	1161	2710	Mandy	RLJ	1200000.0	NaN	2018	tt6998518	I

1008 rows × 31 columns

In [36]:

```
#Convert tn money data to integers
dataset = bom_imdb_tmdb_and_tn
dataset['tn_worldwide_gross'] = dataset['tn_worldwide_gross'].str.replace(',', '
dataset['tn_worldwide_gross'] = dataset['tn_worldwide_gross'].str.replace('$', '
dataset['tn_domestic_gross'] = dataset['tn_domestic_gross'].str.replace(',', '')
dataset['tn_domestic_gross'] = dataset['tn_domestic_gross'].str.replace('$', '').
dataset['production_budget'] = dataset['production_budget'].str.replace(',', '')
dataset['production_budget'] = dataset['production_budget'].str.replace('$', '').
dataset[['tn_worldwide_gross', 'tn_domestic_gross', 'production_budget']]
#bom_imdb_tmdb_and_tn['domestic_gross'].value_counts()
```

Out[36]:

```
      tn_worldwide_gross  tn_domestic_gross  production_budget
   0          1068879522          415004880          200000000
   1           835524642          292576195          160000000
   2           756244673          238736787          165000000
   3           706102828          300531751           68000000
   4           621156389          312433331          170000000
 ...                 ...                ...                ...
1003             7034615            2483472           20000000
1004            30963684            6115824           40000000
1005             3681096            1533324            9000000
1006             6089100            4286367           10000000
1007             1427656            1214525            6000000
```

In [37]:

```
#Reformatting a few numbers in the foreign_gross column
dataset['foreign_gross'] = dataset['foreign_gross'].str.replace(',', '')

#Replacing missing values from imdb domestic_gross and foreign gross with data fr
dataset['domestic_gross'] = dataset['domestic_gross'].fillna(dataset['tn_domestic
dataset['domestic_gross'] = dataset['domestic_gross'].round(decimals=0).astype(in
dataset['foreign_gross'] = dataset['foreign_gross'].fillna(dataset['tn_worldwide_
dataset['foreign_gross'] = dataset['foreign_gross'].round(decimals=0).astype(int)

dataset.isna().sum()
```

Out[37]:

```
level_0                0
index                  0
title                  0
studio                 0
domestic_gross         0
foreign_gross          0
year                   0
movie_id               0
primary_title          0
original_title         0
start_year             0
runtime_minutes        0
genres                 0
tmdb_index             0
genre_ids              0
tmdb_id                0
original_language      0
tmdb_original_title    0
popularity             0
tmdb_release_date      0
tmdb_title             0
vote_average           0
vote_count             0
tmdb_year              0
tn_id                  0
tn_release_date        0
tn_title               0
production_budget      0
tn_domestic_gross      0
tn_worldwide_gross     0
tn_year                0
dtype: int64
```

In [38]:

```
#Converting runtime_minutes to an integer because every number in the column
#is a whole number
dataset['runtime_minutes'] = dataset['runtime_minutes'].astype(int)
```

In [39]:

```
#I need to split out the imdb genre list into separate columns.
dataset['imdb_genre_lst'] = dataset['genres'].str.split(',')
dataset['imdb_genre_1'] = dataset['imdb_genre_lst'].apply(lambda x : x[0])
dataset['imdb_genre_2'] = dataset['imdb_genre_lst'].apply(lambda x : x[1] if len(
dataset['imdb_genre_3'] = dataset['imdb_genre_lst'].apply(lambda x : x[2] if len(
dataset[['imdb_genre_1','imdb_genre_2','imdb_genre_3','imdb_genre_lst']]
```

Out[39]:

	imdb_genre_1	imdb_genre_2	imdb_genre_3	imdb_genre_lst
0	Adventure	Animation	Comedy	[Adventure, Animation, Comedy]
1	Action	Adventure	Sci-Fi	[Action, Adventure, Sci-Fi]
2	Adventure	Animation	Comedy	[Adventure, Animation, Comedy]
3	Adventure	Drama	Fantasy	[Adventure, Drama, Fantasy]
4	Action	Adventure	Sci-Fi	[Action, Adventure, Sci-Fi]
...	...	...	...	...
1003	Fantasy	Horror	Mystery	[Fantasy, Horror, Mystery]
1004	Action	Adventure	Crime	[Action, Adventure, Crime]
1005	Action	Crime	Drama	[Action, Crime, Drama]
1006	Biography	Crime	Drama	[Biography, Crime, Drama]
1007	Action	Fantasy	Horror	[Action, Fantasy, Horror]

1008 rows × 4 columns

In [40]:

```
#I will analyze what the best month to release a movie is for the
#highest revenue. I will isolate this info from the TN data.
dataset['tn_release_month'] = dataset['tn_release_date'].str[0:3]
dataset[['tn_release_date','tn_release_month']]
```

Out[40]:

	tn_release_date	tn_release_month
0	Jun 18, 2010	Jun
1	Jul 16, 2010	Jul
2	May 21, 2010	May
3	Jun 30, 2010	Jun
4	May 7, 2010	May
...	...	...
1003	Oct 26, 2018	Oct
1004	Mar 9, 2018	Mar
1005	Dec 25, 2018	Dec
1006	Jun 15, 2018	Jun
1007	Sep 14, 2018	Sep

1008 rows × 2 columns

In [41]:

```
dataset['tn_num_month'] = dataset['tn_release_month'].map(lambda x :
                                                          1 if x == 'Jan' else
                                                          2 if x == 'Feb' else
                                                          3 if x == 'Mar' else
                                                          4 if x == 'Apr' else
                                                          5 if x == 'May' else
                                                          6 if x == 'Jun' else
                                                          7 if x == 'Jul' else
                                                          8 if x == 'Aug' else
                                                          9 if x == 'Sep' else
                                                          10 if x == 'Oct' else
                                                          11 if x == 'Nov' else
                                                          12 if x == 'Dec' else
                                                          'error')
```

In [42]:

```
#Checking the consistent data of tn_release_month and tn_num_month
dataset['tn_release_month'].value_counts()
```

Out[42]:

```
Nov    120
Oct    104
Dec    103
Sep     96
Jul     95
Jun     88
Aug     87
Mar     78
May     67
Feb     61
Apr     55
Jan     54
Name: tn_release_month, dtype: int64
```

In [43]:

```
#and now my numerical conversion
dataset['tn_num_month'].value_counts()
```

Out[43]:

```
11    120
10    104
12    103
9      96
7      95
6      88
8      87
3      78
5      67
2      61
4      55
1      54
Name: tn_num_month, dtype: int64
```

The numbers are consistent.

In [44]:

```
#Now I need to compare the imdb box office totals to the tn totals.
#First, the imdb data separated domestic and foreign totals, while the
#tn data combined foreign and doestic for worldwide gross. So, I'll
#make a column of tn foreign gross.
dataset['tn_foreign_gross'] = dataset['tn_worldwide_gross'] - dataset['tn_domesti

#Now, I'll see how the totals of domestic and foreign compare
comparison = dataset.copy()
comparison['bom_minus_tn_foreign'] = comparison['foreign_gross'] - comparison['tr
comparison['bom_minus_tn_domestic'] = comparison['domestic_gross'] - comparison['
```

In [45]:

```
#I want to see all the data in the imdb minus tn columns. So I'm setting the
#rows to max.

#printing the column sorted from lowest to highest.
comparison.sort_values('bom_minus_tn_foreign').head(5)
```

Out[45]:

	level_0	index	title	studio	domestic_gross	foreign_gross	year	movie_id	primary_titl
921	1074	2535	Avengers: Infinity War	BV	678800000	1370	2018	tt4154756	Avengers Infinity Wa
836	953	2246	The Fate of the Furious	Uni.	226000000	1010	2017	tt4630562	The Fate c the Furiou
605	636	1507	Jurassic World	Uni.	652300000	1019	2015	tt0369610	Jurassi Worl
42	45	62	Dear John	SGem	80000000	35000000	2010	tt0989757	Dear Joh
280	293	587	Wreck-It Ralph	BV	189400000	281800000	2012	tt1772341	Wreck- Ralp

In [46]:

```
#I was planning on some further analysis to see which of the two revenue
#columns were the most accurate, but I think I found what I'm looking for in
#the table above. According to BOM, Avengers Infinity War, Jurassic World,
#and Fate of the Furious, some of the most profitable film franchises of all
#time, made barely over $1000 at the foreign box office. That is not right,
#so we will rely on the TN numbers.

#I looked for ways to decode the tmdb genre_id categories, but I could not
#find a simple way to do it. Since IMDB gives up to three genres per film,
#we'll just use those definitions for any genre comparisons. It's important
#to note that the genres listed for imdb are in alphabetical order, not
#order of significance.

#In light of this, I'm removing the column genre_ids.

dataset = dataset[[
                    #bom
                    'title', 'studio','year',
                    #imdb
                    'movie_id', 'runtime_minutes','imdb_genre_1',
                    'imdb_genre_2', 'imdb_genre_3',
                    #tmdb
                    'tmdb_index', 'tmdb_id','original_language','popularity',
                    'tmdb_release_date','vote_average','vote_count',
                    #tn
                    'tn_release_month', 'tn_num_month', 'production_budget',
                    'tn_domestic_gross', 'tn_foreign_gross',
                    'tn_worldwide_gross']]

#Now let's check the top 30 highest grossing movies worldwide in our data.
dataset.sort_values('tn_worldwide_gross', ascending = 0).head(30)
```

Out[46]:

	title	studio	year	movie_id	runtime_minutes	imdb_genre_1	imdb_genre_2	imd
921	Avengers: Infinity War	BV	2018	tt4154756	149	Action	Adventure	
605	Jurassic World	Uni.	2015	tt0369610	124	Action	Adventure	
606	Avengers: Age of Ultron	BV	2015	tt2395427	141	Action	Adventure	
922	Black Panther	BV	2018	tt1825683	134	Action	Adventure	
923	Jurassic World: Fallen Kingdom	Uni.	2018	tt4881806	128	Action	Adventure	
386	Frozen	BV	2013	tt2294629	102	Adventure	Animation	
924	Incredibles 2	BV	2018	tt3606756	118	Action	Adventure	
836	The Fate of the Furious	Uni.	2017	tt4630562	136	Action	Crime	
607	Minions	Uni.	2015	tt2293640	91	Adventure	Animation	
925	Aquaman	WB	2018	tt1477834	143	Action	Adventure	

	title	studio	year	movie_id	runtime_minutes	imdb_genre_1	imdb_genre_2	imd
719	Captain America: Civil War	BV	2016	tt3498820	147	Action	Adventure	
134	Transformers: Dark of the Moon	P/DW	2011	tt1399103	154	Action	Adventure	
270	Skyfall	Sony	2012	tt1074638	143	Action	Adventure	
497	Transformers: Age of Extinction	Par.	2014	tt2109248	165	Action	Adventure	
271	The Dark Knight Rises	WB	2012	tt1345836	164	Action	Thriller	
0	Toy Story 3	BV	2010	tt0435761	103	Adventure	Animation	
135	Pirates of the Caribbean: On Stranger Tides	BV	2011	tt1298650	136	Action	Adventure	
837	Despicable Me 3	Uni.	2017	tt3469046	89	Adventure	Animation	
720	Finding Dory	BV	2016	tt2277860	97	Adventure	Animation	
721	Zootopia	BV	2016	tt2948356	108	Adventure	Animation	
272	The Hobbit: An Unexpected Journey	WB (NL)	2012	tt0903624	169	Adventure	Family	
387	Despicable Me 2	Uni.	2013	tt1690953	98	Adventure	Animation	
838	Jumanji: Welcome to the Jungle	Sony	2017	tt2283362	119	Action	Adventure	
388	The Hobbit: The Desolation of Smaug	WB (NL)	2013	tt1170358	161	Adventure	Fantasy	
498	The Hobbit: The Battle of the Five Armies	WB (NL)	2014	tt2310332	144	Adventure	Fantasy	
926	Bohemian Rhapsody	Fox	2018	tt1727824	134	Biography	Drama	
722	The Secret Life of Pets	Uni.	2016	tt2709768	87	Adventure	Animation	
839	Spider-Man: Homecoming	Sony	2017	tt2250912	133	Action	Adventure	
273	Ice Age: Continental Drift	Fox	2012	tt1667889	88	Adventure	Animation	
608	Spectre	Sony	2015	tt2379713	148	Action	Adventure	

Notes from meeting with Calude:

Dependent Variable

You can recommend and change independent variable. If you recommend a genre of a movie, that would be independent. You cannot recommend a gross of a movie, as in some many millions of dollars.

Scope: Select three independent variables, and one dependent variable.

Revenue because of the reasons I explained to Claude.

Wink and nod about bad idea.

Genres, personel, Month of release

Visualizations: Two purposes for data visualization

1. For yourself only, raw dirty quick.
2. Telling a story. Sharing a point. Show three things:

How Genre, Personel, Release month impacts gross of movie (neatly, cleanly clearly)

Jupyter Notebook w/ analysis in the notebook Slide Show

Finish Deliverable: Presentation, Notebook, Post on github

In [47]:
```
#There's still a long road ahead. In our dataset, we only have genre and
#release month information. We don't have anything about personell. I want to
#analyze what affects five roles have on revenue production: writers, directors
#actors, actresses and producers.

#There's a lot of personel info in the IMDB data, but we're going to stick to
#the personel in the pricipals table. This has the big names in the five roles
#I mentioned earlier. First, we have to make that table make sense. First I'll
#preview the table down here.

imdb_principals
```

Out[47]:

	movie_id	ordering	person_id	category	job	characters
0	tt0111414	1	nm0246005	actor	None	["The Man"]
1	tt0111414	2	nm0398271	director	None	None
2	tt0111414	3	nm3739909	producer	producer	None
3	tt0323808	10	nm0059247	editor	None	None
4	tt0323808	1	nm3579312	actress	None	["Beth Boothby"]
...	...	...	...	...	...	...
1028181	tt9692684	1	nm0186469	actor	None	["Ebenezer Scrooge"]
1028182	tt9692684	2	nm4929530	self	None	["Herself","Regan"]
1028183	tt9692684	3	nm10441594	director	None	None
1028184	tt9692684	4	nm6009913	writer	writer	None
1028185	tt9692684	5	nm10441595	producer	producer	None

1028186 rows × 6 columns

In [48]:
```
#First, we'll call the dataset to include only the films from our dataset.
#Then, we'll run the value_counts method on the results to make sure we have
#the same number of movies in our dataset.
imdb_principals_dataset = imdb_principals[imdb_principals['movie_id'].isin(datase
imdb_principals_dataset['movie_id'].value_counts()
```

Out[48]:
```
tt4846340    10
tt0498381    10
tt1555064    10
tt0892769    10
tt4669986    10
             ..
tt3707106     9
tt2229499     9
tt1508675     8
tt0873886     8
tt7535780     3
Name: movie_id, Length: 1008, dtype: int64
```

In [49]:

```
#We now have the right number of films and the big names attached to them, but
#I don't want all the names. I just want the names of people from those five
#categories (writer, director, actor, actress, producer) First, I'll see what val
#are available in the category column.

imdb_principals_dataset['category'].value_counts()
```

Out[49]:

```
actor                  2525
writer                 2027
producer               2005
actress                1484
director               1083
composer                472
cinematographer         277
editor                  130
production_designer      38
self                     15
archive_footage           1
archive_sound             1
Name: category, dtype: int64
```

In [50]:

```
#I am only interested in writer, director, actor, actress and producer
#So let's get rid of the rest.

categories = ['writer', 'director', 'actor', 'actress', 'producer']

imdb_principals_dataset = imdb_principals_dataset[imdb_principals_dataset['catego
imdb_principals_dataset['category'].value_counts()
```

Out[50]:

```
actor       2525
writer      2027
producer    2005
actress     1484
director    1083
Name: category, dtype: int64
```

In [51]:

```
#Now, I'm curious if each movie has at least one of each category.
#I want to keep actors and actresses separate for a later analysis, but for
#this one analysis, I'm curious if each movie is represnted equally in this
#data.

movies_that_include_writer_director_producer_actorsneutral = []

#First, the first three categories
categories_no_actors = ['writer', 'director', 'producer']

for x in categories_no_actors:
    movies_that_include_writer_director_producer_actorsneutral.append(
        len(imdb_principals_dataset[imdb_principals_dataset['category']
        .isin([x])]['movie_id'].value_counts()))

#now actors and actresses combined
movies_that_include_writer_director_producer_actorsneutral.append(
    len(imdb_principals_dataset[imdb_principals_dataset['category']
    .isin(['actor','actress'])]['movie_id'].value_counts()))

movies_that_include_writer_director_producer_actorsneutral
```

Out[51]:

```
[864, 980, 895, 1005]
```

In [52]:

```
#There are movies in this database with no actors listed. Oh my.
#Since I now understand that there may be some gaps in the principals
#table, I want to fill them in with whatever I can. First, the directors and
#writers tables. First, let's see which movies don't have writers.

writer = imdb_principals_dataset[imdb_principals_dataset['category'].isin(['write
no_writer = imdb_principals_dataset[~imdb_principals_dataset['movie_id'].isin(wri
no_writer_list = no_writer['movie_id'].unique()
print('There are ' + str(len(no_writer_list)) + ' films missing a writer.')
print(no_writer_list)
```

```
There are 144 films missing a writer.
['tt0475290' 'tt1403241' 'tt1605783' 'tt1666186' 'tt2083355' 'tt1675192'
 'tt1527186' 'tt1602613' 'tt2215719' 'tt2235108' 'tt1336617' 'tt1650062'
 'tt2184339' 'tt1441326' 'tt0873886' 'tt1213663' 'tt1508675' 'tt1229340'
 'tt1243974' 'tt1549572' 'tt1645080' 'tt1719071' 'tt1764183' 'tt0466893'
 'tt1470827' 'tt1623288' 'tt1702443' 'tt1126591' 'tt1065073' 'tt1535108'
 'tt1535612' 'tt1540133' 'tt1617661' 'tt1020558' 'tt1092026' 'tt0878835'
 'tt1433822' 'tt1421051' 'tt1555064' 'tt2076220' 'tt1869716' 'tt1313092'
 'tt1220634' 'tt1602620' 'tt1615147' 'tt1931533' 'tt1235170' 'tt1182350'
 'tt2170593' 'tt1560747' 'tt1684628' 'tt1853728' 'tt1859650' 'tt1307068'
 'tt2194499' 'tt0872230' 'tt1570989' 'tt1763303' 'tt1316616' 'tt1800246'
 'tt2042568' 'tt2388637' 'tt2334873' 'tt1478964' 'tt1971352' 'tt2229499'
 'tt2401878' 'tt1637688' 'tt1855199' 'tt0938283' 'tt1920849' 'tt1840417'
 'tt1375666' 'tt1710396' 'tt1772288' 'tt1431181' 'tt1655442' 'tt1781827'
 'tt2309260' 'tt1195478' 'tt1333125' 'tt1171222' 'tt2103254' 'tt0478304'
 'tt1878870' 'tt1276104' 'tt1659337' 'tt1855325' 'tt2872718' 'tt3470600'
 'tt3312830' 'tt2334649' 'tt2387433' 'tt3099498' 'tt2690138' 'tt2937898'
 'tt2473794' 'tt3707106' 'tt3850214' 'tt3152624' 'tt2975578' 'tt3783958'
 'tt3606756' 'tt2361509' 'tt2994190' 'tt3760922' 'tt2390361' 'tt2609912'
 'tt2784678' 'tt2884206' 'tt2582802' 'tt2321549' 'tt3460252' 'tt3721936'
 'tt2649554' 'tt3567288' 'tt2872732' 'tt4034228' 'tt4094724' 'tt4925292'
 'tt6000478' 'tt3890160' 'tt5027774' 'tt5052448' 'tt4034354' 'tt5834262'
 'tt5013056' 'tt6265828' 'tt6288250' 'tt5726086' 'tt6791096' 'tt4651520'
 'tt4649416' 'tt5619332' 'tt5758778' 'tt5721088' 'tt4669986' 'tt4761916'
 'tt4624424' 'tt5719700' 'tt7784604' 'tt6499752' 'tt6359956' 'tt6266538']
```

In [53]:

```
#Let's do the same for directors:
director = imdb_principals_dataset[imdb_principals_dataset['category'].isin(['dir
no_director = imdb_principals_dataset[~imdb_principals_dataset['movie_id'].isin(d
no_director_list = no_director['movie_id'].unique()
print('There are ' + str(len(no_director_list)) + ' films missing a director.')
print(no_director_list)
```

```
There are 28 films missing a director.
['tt1205537' 'tt1258972' 'tt1562568' 'tt1320253' 'tt1637725' 'tt1321860'
 'tt1235170' 'tt1583420' 'tt2177771' 'tt0840361' 'tt1024648' 'tt1859650'
 'tt1570989' 'tt0359950' 'tt2398231' 'tt2229499' 'tt1124035' 'tt1608290'
 'tt1630036' 'tt3707106' 'tt3521126' 'tt2784678' 'tt2637276' 'tt2671706'
 'tt2870708' 'tt6644200' 'tt5619332' 'tt7959026']
```

In [54]:
```
#Now, let's see if any of these are listed in the writers and directors tables.
#Writers first
additional_writers = imdb_writers[imdb_writers['movie_id'].isin(no_writer_list)]
additional_writers['movie_id'].value_counts()
```

Out[54]:
```
tt1333125    20
tt6359956     2
tt1666186     2
tt0475290     2
tt2042568     2
             ..
tt1540133     1
tt1710396     1
tt0938283     1
tt3760922     1
tt6499752     1
Name: movie_id, Length: 142, dtype: int64
```

In [55]:
```
#Now for directors
additional_directors = imdb_directors[imdb_directors['movie_id'].isin(no_director
additional_directors['movie_id'].value_counts()
```

Out[55]:
```
tt1258972    1
tt1320253    1
tt2177771    1
tt1637725    1
tt2229499    1
tt2784678    1
tt0359950    1
tt1583420    1
tt7959026    1
tt6644200    1
tt1859650    1
tt1124035    1
tt1205537    1
tt2671706    1
tt2637276    1
tt3521126    1
tt3707106    1
tt1630036    1
tt1235170    1
tt2870708    1
tt1570989    1
tt2398231    1
tt5619332    1
tt1608290    1
tt0840361    1
tt1024648    1
tt1321860    1
tt1562568    1
Name: movie_id, dtype: int64
```

In [56]:
```
#145 movies to assign writers and 31 movies to assign directors into our
#dataset. Not bad.

#To add them, I first need add the category column to these two columns
additional_writers['category'] = 'writer'
additional_directors['category'] = 'director'

#Now, I need to add both to the dataset
imdb_principals_dataset = imdb_principals_dataset.append(additional_writers)
imdb_principals_dataset = imdb_principals_dataset.append(additional_directors)
imdb_principals_dataset
```

```
<ipython-input-56-4d4554b71d7d>:5: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pyd
ata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-c
opy)
  additional_writers['category'] = 'writer'
<ipython-input-56-4d4554b71d7d>:6: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/sta
ble/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pyd
ata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-c
opy)
  additional_directors['category'] = 'director'
```

Out[56]:

	movie_id	ordering	person_id	category	job	characters
37	tt0475290	1.0	nm0000982	actor	None	["Eddie Mannix"]
38	tt0475290	2.0	nm0000123	actor	None	["Baird Whitlock"]
39	tt0475290	3.0	nm2403277	actor	None	["Hobie Doyle"]
40	tt0475290	4.0	nm0000146	actor	None	["Laurence Laurentz"]
41	tt0475290	5.0	nm0001053	director	None	None
...	...	...	...	...	...	...
231826	tt1235170	NaN	nm0432380	director	NaN	NaN
252452	tt1320253	NaN	nm0000230	director	NaN	NaN
271231	tt7959026	NaN	nm0000142	director	NaN	NaN
281388	tt0359950	NaN	nm0001774	director	NaN	NaN
282970	tt2398231	NaN	nm0000169	director	NaN	NaN

9333 rows × 6 columns

In [57]:
```
#Now we'll rerun this cell to see if anything has changed

movies_that_include_writer_director_producer_actorsneutral = []

#First, the first three categories
categories_no_actors = ['writer', 'director', 'producer']

for x in categories_no_actors:
    movies_that_include_writer_director_producer_actorsneutral.append(
        len(imdb_principals_dataset[imdb_principals_dataset['category']
        .isin([x])]['movie_id'].value_counts()))

#now actors and actresses combined
movies_that_include_writer_director_producer_actorsneutral.append(
    len(imdb_principals_dataset[imdb_principals_dataset['category']
    .isin(['actor','actress'])]['movie_id'].value_counts()))

movies_that_include_writer_director_producer_actorsneutral
```

Out[57]:
```
[1006, 1008, 895, 1005]
```

In [58]:
```
#Well, we still are missing over a hundred producers and a few actors, but
#we sure filled in a lot of writers and directors.
#So, I could complete this data by looking up the writers for two movies, the
# and the actors/actresses for three.

#I want a data of films for to compare with dataframes missing films.
films_in_dataset = imdb_principals_dataset[~imdb_principals_dataset['movie_id'].d

#Now, I'll create a dataframe of just the movie_id with no writer, director or
#actor.
films_with_writers = imdb_principals_dataset[imdb_principals_dataset['category'].
films_with_writers = films_with_writers[~films_with_writers.duplicated()]
no_writer = films_in_dataset[~films_in_dataset.isin(films_with_writers.tolist())]

films_with_actor = imdb_principals_dataset[imdb_principals_dataset['category'].is
films_with_actor = films_with_actor[~films_with_actor.duplicated()]
no_actor = films_in_dataset[~films_in_dataset.isin(films_with_actor.tolist())]
```

In [59]:
```
#Now I'll print three dataframes that give us the movie titles and other info
#for the movie_ids we just extracted.

#first no writer
dataset[dataset['movie_id'].isin(no_writer.tolist())]
```

Out[59]:

	title	studio	year	movie_id	runtime_minutes	imdb_genre_1	imdb_genre_2	imdb_genre_3
186	Justin Bieber: Never Say Never	Par.	2011	tt1702443	105	Documentary	Music	None
353	Katy Perry: Part of Me	Par.	2012	tt2215719	93	Documentary	Music	None

In [60]:
```
#Second no actors
dataset[dataset['movie_id'].isin(no_actor.tolist())]
```

Out[60]:

	title	studio	year	movie_id	runtime_minutes	imdb_genre_1	imdb_genre_2	imdb_genre_3
111	Inside Job	SPC	2010	tt1645089	109	Crime	Documentary	None
186	Justin Bieber: Never Say Never	Par.	2011	tt1702443	105	Documentary	Music	None
353	Katy Perry: Part of Me	Par.	2012	tt2215719	93	Documentary	Music	None

In [61]:

```
#Interesting. The two films without writers are concert films, so they
#certainly don't need writers. They do, however, have stars. So let's just
#add both Katy Perry and Justin Bieber as an actor/actress.

#Inside Job has an A-list hollywood actor for as a narrator, so let's add him
#as an actor too.

insert_df = pd.DataFrame(columns = ['movie_id', 'person_id','category'])

movie_id_name_job = [['tt1645089', 'Matt Damon', 'actor'],
                     ['tt1702443', 'Justin Bieber', 'actor'],
                     ['tt2215719', 'Katy Perry','actress']]

#Lookup the person's imdb person_id and add it to the list
for lookup in movie_id_name_job:
    lookup.append(imdb_persons[imdb_persons['primary_name'].isin([lookup[1]])]['p

for insert in movie_id_name_job:
    insert_df = insert_df.append({'movie_id' : insert[0],
                                  'person_id' : insert[3],
                                  'category' : insert[2]},
                                 ignore_index=True)

imdb_principals_dataset = imdb_principals_dataset.append(insert_df)

#We'll rerun these lines of code as a check that it worked
films_with_actor = imdb_principals_dataset[imdb_principals_dataset['category'].is
films_with_actor = films_with_actor[~films_with_actor.duplicated()]
no_actor = films_in_dataset[~films_in_dataset.isin(films_with_actor.tolist())]
dataset[dataset['movie_id'].isin(no_actor.tolist())]
```

Out[61]:

title	studio	year	movie_id	runtime_minutes	imdb_genre_1	imdb_genre_2	imdb_genre_3	tmdb

In [62]:

```
#I don't want to look up all that data for producer, but there are some people
#listed as producers in job category. The only problem is that if someone is
#labeled as a producer and an actor, writer or director, then I would have to
#give them two roles for the movie. I guess that wouldn't be the end of the
#world though.

producer = imdb_principals_dataset[imdb_principals_dataset['category'].isin(['pro
no_producer = imdb_principals_dataset[~imdb_principals_dataset['movie_id'].isin(p
no_producer_list = no_producer['movie_id'].unique()
print('There are ' + str(len(no_producer_list)) + ' films missing a producer.')
print(no_producer_list)
```

```
There are 113 films missing a producer.
['tt1228705' 'tt2015381' 'tt2096673' 'tt1772341' 'tt1872181' 'tt0974015'
 'tt1961175' 'tt0892791' 'tt1402488' 'tt0948470' 'tt1075747' 'tt1999890'
 'tt0451279' 'tt1508675' 'tt2247476' 'tt1152822' 'tt1843866' 'tt2267968'
 'tt2279373' 'tt1302067' 'tt1985966' 'tt0881320' 'tt1365519' 'tt1487931'
 'tt2006295' 'tt0808510' 'tt0816711' 'tt1436562' 'tt1628841' 'tt1469304'
 'tt1572315' 'tt1860357' 'tt0478970' 'tt1319716' 'tt1790886' 'tt2243537'
 'tt1809398' 'tt2025690' 'tt2096672' 'tt1449283' 'tt1602620' 'tt1279935'
 'tt2294449' 'tt0800369' 'tt0892769' 'tt1196141' 'tt1198101' 'tt0963966'
 'tt1298650' 'tt1591479' 'tt1679335' 'tt0471042' 'tt0472181' 'tt2177771'
 'tt1587310' 'tt0787474' 'tt0864835' 'tt1397280' 'tt1911658' 'tt2176013'
 'tt1790809' 'tt1596346' 'tt2245084' 'tt2250912' 'tt1877832' 'tt1477834'
 'tt2017020' 'tt1621039' 'tt0837562' 'tt1277953' 'tt1711525' 'tt1981115'
 'tt2234155' 'tt2379713' 'tt1333125' 'tt2296777' 'tt0448694' 'tt1630036'
 'tt2283362' 'tt0790736' 'tt0848537' 'tt1979388' 'tt3501632' 'tt2828996'
 'tt2975590' 'tt3606752' 'tt3707106' 'tt2316204' 'tt3300542' 'tt2473510'
 'tt3385516' 'tt3832914' 'tt3498820' 'tt2910274' 'tt2948356' 'tt4154756'
 'tt2660888' 'tt3522806' 'tt3411444' 'tt3731562' 'tt2692250' 'tt2357291'
 'tt3521164' 'tt4849438' 'tt3416828' 'tt4667094' 'tt3922818' 'tt4981636'
 'tt4871980' 'tt5095030' 'tt6182908' 'tt6306064' 'tt7535780']
```

In [63]:

```
#These mysterious producers could also be listed as something other than a
#writer, director, actor or actress, so we'll isolate those first.

#Create new dateframe retreiving all data on the movies in
#imdb_principals_dataset
additional_producers = imdb_principals[imdb_principals['movie_id'].isin(imdb_prin

#Take out the rows we've already got
additional_producers = additional_producers[~additional_producers.index.isin(imdb

#See if anyone is listed a producer in what's left.
additional_producers['job'].value_counts()
```

Out[63]:

```
director of photography            182
film editor                          3
composer                             3
co-composer                          2
director of photography: camera      1
director of photography: lighting    1
Name: job, dtype: int64
```

In [64]:

```
#Well, this didn't work. Now we need to look for producers in
#imdb_principals_dataset to see if there is anyone listed as a producer for
#the film in the job column but not in the category column.

missing_producers = imdb_principals_dataset.copy()
missing_producers_cat = missing_producers[missing_producers['category'].isin(['pr

missing_producers_cat['job'].value_counts()
```

Out[64]:

```
producer              2002
executive producer       2
line producer            1
Name: job, dtype: int64
```

In [65]:

```
#It is with a heavy heart that I conclude that there are no missing producers
#in this dataset. We'll either need to drop all films without a producer from
#the dataset, or we'll need to drop them only when doing the personell
#analysis. I will go for the later since there's nothing else wrong with the
#nearly 900 films data.

#That leaves us with the dataset we had before attempting to fill in producers.
imdb_principals_dataset
```

Out[65]:

	movie_id	ordering	person_id	category	job	characters
37	tt0475290	1.0	nm0000982	actor	None	["Eddie Mannix"]
38	tt0475290	2.0	nm0000123	actor	None	["Baird Whitlock"]
39	tt0475290	3.0	nm2403277	actor	None	["Hobie Doyle"]
40	tt0475290	4.0	nm0000146	actor	None	["Laurence Laurentz"]
41	tt0475290	5.0	nm0001053	director	None	None
...	...	...	...	...	...	...
281388	tt0359950	NaN	nm0001774	director	NaN	NaN
282970	tt2398231	NaN	nm0000169	director	NaN	NaN
0	tt1645089	NaN	nm0000354	actor	NaN	NaN
1	tt1702443	NaN	nm3595501	actor	NaN	NaN
2	tt2215719	NaN	nm2953537	actress	NaN	NaN

9336 rows × 6 columns

In [66]:

```
#First, easy, let's add the names
imdb_principals_dataset = pd.merge(imdb_principals_dataset,imdb_persons[['person_
imdb_principals_dataset
```

Out[66]:

	movie_id	ordering	person_id	category	job	characters	primary_name	death_year
0	tt0475290	1.0	nm0000982	actor	None	["Eddie Mannix"]	Josh Brolin	NaN
1	tt1075747	1.0	nm0000982	actor	None	["Jonah Hex"]	Josh Brolin	NaN
2	tt1182350	3.0	nm0000982	actor	None	["Roy"]	Josh Brolin	NaN
3	tt1403865	4.0	nm0000982	actor	None	["Tom Chaney"]	Josh Brolin	NaN
4	tt3397884	2.0	nm0000982	actor	None	["Matt Graver"]	Josh Brolin	NaN
...	...	...	...	...	...	...	...	...
9331	tt1333125	NaN	nm0765563	writer	NaN	NaN	Olle Sarri	NaN
9332	tt1333125	NaN	nm1856892	writer	NaN	NaN	Jacob Fleisher	NaN
9333	tt1333125	NaN	nm0698119	writer	NaN	NaN	Greg Pritikin	NaN
9334	tt1333125	NaN	nm2695453	writer	NaN	NaN	Steve Baker	NaN
9335	tt1702443	NaN	nm3595501	actor	NaN	NaN	Justin Bieber	NaN

9336 rows × 8 columns

In [67]:

```
#Let's see how what the maximum personel are for each movie per category
writers = imdb_principals_dataset[imdb_principals_dataset['category'].isin(['writ
directors = imdb_principals_dataset[imdb_principals_dataset['category'].isin(['di
producers = imdb_principals_dataset[imdb_principals_dataset['category'].isin(['pr
actors = imdb_principals_dataset[imdb_principals_dataset['category'].isin(['actor
actresses = imdb_principals_dataset[imdb_principals_dataset['category'].isin(['ac
actorsneutral = imdb_principals_dataset[imdb_principals_dataset['category'].isin(

#These dataframes will be used later, so I want to reset the index and sort them.
writers.sort_values('movie_id',inplace=True)
writers.reset_index(inplace=True)
directors.sort_values('movie_id',inplace=True)
directors.reset_index(inplace=True)
producers.sort_values('movie_id',inplace=True)
producers.reset_index(inplace=True)
actors.sort_values('movie_id',inplace=True)
actors.reset_index(inplace=True)
actresses.sort_values('movie_id',inplace=True)
actresses.reset_index(inplace=True)
actorsneutral.sort_values('movie_id',inplace=True)
actorsneutral.reset_index(inplace=True)

max_writers = writers.groupby(['movie_id','category']).size()
max_writers.value_counts()
```

```
<ipython-input-67-64ddceac8b64>:10: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy (https://panda
s.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ver
sus-a-copy)
  writers.sort_values('movie_id',inplace=True)
<ipython-input-67-64ddceac8b64>:12: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy (https://panda
s.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ver
sus-a-copy)
  directors.sort_values('movie_id',inplace=True)
<ipython-input-67-64ddceac8b64>:14: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy (https://panda
s.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ver
sus-a-copy)
  producers.sort_values('movie_id',inplace=True)
<ipython-input-67-64ddceac8b64>:16: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy (https://panda
s.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ver
sus-a-copy)
```

```
  actors.sort_values('movie_id',inplace=True)
<ipython-input-67-64ddceac8b64>:18: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  actresses.sort_values('movie_id',inplace=True)
<ipython-input-67-64ddceac8b64>:20: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  actorsneutral.sort_values('movie_id',inplace=True)
```

Out[67]:

```
1     384
2     290
3     165
4     101
5      65
20      1
dtype: int64
```

In [68]:

```
imdb_principals_dataset
```

Out[68]:

	movie_id	ordering	person_id	category	job	characters	primary_name	death_year
0	tt0475290	1.0	nm0000982	actor	None	["Eddie Mannix"]	Josh Brolin	NaN
1	tt1075747	1.0	nm0000982	actor	None	["Jonah Hex"]	Josh Brolin	NaN
2	tt1182350	3.0	nm0000982	actor	None	["Roy"]	Josh Brolin	NaN
3	tt1403865	4.0	nm0000982	actor	None	["Tom Chaney"]	Josh Brolin	NaN
4	tt3397884	2.0	nm0000982	actor	None	["Matt Graver"]	Josh Brolin	NaN
...	...	...	...	...	...	...	...	...
9331	tt1333125	NaN	nm0765563	writer	NaN	NaN	Olle Sarri	NaN
9332	tt1333125	NaN	nm1856892	writer	NaN	NaN	Jacob Fleisher	NaN
9333	tt1333125	NaN	nm0698119	writer	NaN	NaN	Greg Pritikin	NaN
9334	tt1333125	NaN	nm2695453	writer	NaN	NaN	Steve Baker	NaN
9335	tt1702443	NaN	nm3595501	actor	NaN	NaN	Justin Bieber	NaN

9336 rows × 8 columns

In [69]:

```
#Max writers is twenty, for a single movie.
max_directors = directors.groupby(['movie_id','category']).size()
max_directors.value_counts()
```

Out[69]:

```
1    920
2     79
3      6
6      1
5      1
4      1
dtype: int64
```

In [70]:

```
#Max directors is six, for a single movie
max_producers = producers.groupby(['movie_id','category']).size()
max_producers.value_counts()
```

Out[70]:

```
2    322
1    238
3    233
4     86
5     16
dtype: int64
```

In [71]:

```
#Max producers is five, for sixteen movies
max_actors = actors.groupby(['movie_id','category']).size()
max_actors.value_counts()
```

Out[71]:

```
3    421
2    361
4    114
1     86
dtype: int64
```

In [72]:

```
#Max actors is four.
max_actresses = actresses.groupby(['movie_id','category']).size()
max_actresses.value_counts()
```

Out[72]:

```
1    422
2    361
3     83
4     23
dtype: int64
```

```
In [73]: #Max actresses is four
         #Now to work on transposing this dataframe so all the info for each film is in
         #a single row.
         #First, I need to create the columns the data will go in.

         temp = pd.DataFrame(columns = [ 'movie_id',
             'writer01_id', 'writer01_name', 'writer01_ord', 'writer01_job', 'writer01_cha
             'writer02_id', 'writer02_name', 'writer02_ord', 'writer02_job', 'writer02_cha
             'writer03_id', 'writer03_name', 'writer03_ord', 'writer03_job', 'writer03_cha
             'writer04_id', 'writer04_name', 'writer04_ord', 'writer04_job', 'writer04_cha
             'writer05_id', 'writer05_name', 'writer05_ord', 'writer05_job', 'writer05_cha
             'writer06_id', 'writer06_name', 'writer06_ord', 'writer06_job', 'writer06_cha
             'writer07_id', 'writer07_name', 'writer07_ord', 'writer07_job', 'writer07_cha
             'writer08_id', 'writer08_name', 'writer08_ord', 'writer08_job', 'writer08_cha
             'writer09_id', 'writer09_name', 'writer09_ord', 'writer09_job', 'writer09_cha
             'writer10_id', 'writer10_name', 'writer10_ord', 'writer10_job', 'writer10_cha
             'writer11_id', 'writer11_name', 'writer11_ord', 'writer11_job', 'writer11_cha
             'writer12_id', 'writer12_name', 'writer12_ord', 'writer12_job', 'writer12_cha
             'writer13_id', 'writer13_name', 'writer13_ord', 'writer13_job', 'writer13_cha
             'writer14_id', 'writer14_name', 'writer14_ord', 'writer14_job', 'writer14_cha
             'writer15_id', 'writer15_name', 'writer15_ord', 'writer15_job', 'writer15_cha
             'writer16_id', 'writer16_name', 'writer16_ord', 'writer16_job', 'writer16_cha
             'writer17_id', 'writer17_name', 'writer17_ord', 'writer17_job', 'writer17_cha
             'writer18_id', 'writer18_name', 'writer18_ord', 'writer18_job', 'writer18_cha
             'writer19_id', 'writer19_name', 'writer19_ord', 'writer19_job', 'writer19_cha
             'writer20_id', 'writer20_name', 'writer20_ord', 'writer20_job', 'writer20_cha
             'director01_id', 'director01_name', 'director01_ord', 'director01_job', 'dire
             'director02_id', 'director02_name', 'director02_ord', 'director02_job', 'dire
             'director03_id', 'director03_name', 'director03_ord', 'director03_job', 'dire
             'director04_id', 'director04_name', 'director04_ord', 'director04_job', 'dire
             'director05_id', 'director05_name', 'director05_ord', 'director05_job', 'dire
             'director06_id', 'director06_name', 'director06_ord', 'director06_job', 'dire
             'producer01_id', 'producer01_name', 'producer01_ord', 'producer01_job', 'prod
             'producer02_id', 'producer02_name', 'producer02_ord', 'producer02_job', 'prod
             'producer03_id', 'producer03_name', 'producer03_ord', 'producer03_job', 'prod
             'producer04_id', 'producer04_name', 'producer04_ord', 'producer04_job', 'prod
             'producer05_id', 'producer05_name', 'producer05_ord', 'producer05_job', 'prod
             'actor01_id', 'actor01_name', 'actor01_ord', 'actor01_job', 'actor01_char',
             'actor02_id', 'actor02_name', 'actor02_ord', 'actor02_job', 'actor02_char',
             'actor03_id', 'actor03_name', 'actor03_ord', 'actor03_job', 'actor03_char',
             'actor04_id', 'actor04_name', 'actor04_ord', 'actor04_job', 'actor04_char',
             'actress01_id', 'actress01_name', 'actress01_ord', 'actress01_job', 'actress0
             'actress02_id', 'actress02_name', 'actress02_ord', 'actress02_job', 'actress0
             'actress03_id', 'actress03_name', 'actress03_ord', 'actress03_job', 'actress0
             'actress04_id', 'actress04_name', 'actress04_ord', 'actress04_job', 'actress0
             ])

         people_in_film = pd.merge(films_in_dataset, temp, how='left', left_on='movie_id',

         people_in_film.iloc[:,1:].reset_index(inplace=True)
         people_in_film
```

Out[73]:

	movie_id	writer01_id	writer01_name	writer01_ord	writer01_job	writer01_char	writer02_id
0	tt0475290	NaN	NaN	NaN	NaN	NaN	NaN

	movie_id	writer01_id	writer01_name	writer01_ord	writer01_job	writer01_char	writer02_id
1	tt1124037	NaN	NaN	NaN	NaN	NaN	NaN
2	tt1216492	NaN	NaN	NaN	NaN	NaN	NaN
3	tt1226229	NaN	NaN	NaN	NaN	NaN	NaN
4	tt1389139	NaN	NaN	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...	...
1003	tt7401588	NaN	NaN	NaN	NaN	NaN	NaN
1004	tt7388562	NaN	NaN	NaN	NaN	NaN	NaN
1005	tt7040874	NaN	NaN	NaN	NaN	NaN	NaN
1006	tt7153766	NaN	NaN	NaN	NaN	NaN	NaN
1007	tt6266538	NaN	NaN	NaN	NaN	NaN	NaN

1008 rows × 196 columns

In [74]:

```python
#Now to fill the columns in with data. I'll need to do this with each of the
#five categories, so I'll write a function to do this.

def transpose(df, nm):
    movies_complete = []
    for i in range(len(df)):
        mov = df['movie_id'][i]
        pid = df['person_id'][i]
        name = df['primary_name'][i]
        od = df['ordering'][i]
        job = df['job'][i]
        char = df['characters'][i]
        movies_complete.append(mov)
        num = movies_complete.count(mov)
        idx = list(people_in_film[people_in_film['movie_id'].isin([mov])].index)
        idx = idx[0]
        if num < 10:
            cp = nm + '0'+str(num)+'_'
        else:
            cp = nm + ''+str(num)+'_'
        people_in_film.at[idx, cp+'id'] = pid
        people_in_film.at[idx, cp+'name'] = name
        people_in_film.at[idx, cp+'ord'] = od
        people_in_film.at[idx, cp+'job'] = job
        people_in_film.at[idx, cp+'char'] = char

#Now I'll run the function for each category
transpose(writers,'writer')
transpose(directors,'director')
transpose(producers,'producer')
transpose(actors,'actor')
transpose(actresses,'actress')
people_in_film
```

Out[74]:

	movie_id	writer01_id	writer01_name	writer01_ord	writer01_job	writer01_char	writer02_i
0	tt0475290	nm0001054	Joel Coen	NaN	NaN	NaN	nm000105
1	tt1124037	nm0366989	Leonard Hartman	6	story	None	Na
2	tt1216492	nm0253323	Harry Elfont	7	written by	None	nm043822
3	tt1226229	nm0781981	Jason Segel	6	characters	None	Na
4	tt1389139	nm3357261	Jack Olsen	6	screenplay	None	Na
...	...	...	...	...	...	...	.
1003	tt7401588	nm1898234	John Morris	6	None	None	Na
1004	tt7388562	nm3885256	Terence Berden	6	None	None	Na

	movie_id	writer01_id	writer01_name	writer01_ord	writer01_job	writer01_char	writer02_i
1005	tt7040874	nm9079127	Darcey Bell	6	based upon the novel by	None	nm078936
1006	tt7153766	nm0007079	James Greer	7	written by	None	nm007708
1007	tt6266538	nm0570912	Adam McKay	NaN	NaN	NaN	Na

1008 rows × 196 columns

In [75]:

```
#Now I'll add this to the dataset
dataset_no_personnel = dataset.copy()
dataset = pd.merge(dataset_no_personnel, people_in_film,how='inner',left_on='movi
```

In [76]:

```
#Now, since our dependent variable is worldwixe box office revenue,
#I'll add a new column, revenue_rank, and sort the data.

dataset.sort_values('tn_worldwide_gross',ascending=False,inplace=True)
dataset.reset_index(inplace=True)
dataset = dataset.iloc[:,1:]
dataset['revenue_rank'] = dataset.index + 1
cols = ['revenue_rank'] + list(dataset.columns[0:-1])
dataset = dataset[cols]
dataset.head(30)
```

Out[76]:

	revenue_rank	title	studio	year	movie_id	runtime_minutes	imdb_genre_1	imdb_ger
0	1	Avengers: Infinity War	BV	2018	tt4154756	149	Action	Adve
1	2	Jurassic World	Uni.	2015	tt0369610	124	Action	Adve
2	3	Avengers: Age of Ultron	BV	2015	tt2395427	141	Action	Adve
3	4	Black Panther	BV	2018	tt1825683	134	Action	Adve
4	5	Jurassic World: Fallen Kingdom	Uni.	2018	tt4881806	128	Action	Adve
5	6	Frozen	BV	2013	tt2294629	102	Adventure	Anim
6	7	Incredibles 2	BV	2018	tt3606756	118	Action	Adve
7	8	The Fate of the Furious	Uni.	2017	tt4630562	136	Action	(
8	9	Minions	Uni.	2015	tt2293640	91	Adventure	Anim
9	10	Aquaman	WB	2018	tt1477834	143	Action	Adve
10	11	Captain America: Civil War	BV	2016	tt3498820	147	Action	Adve
11	12	Transformers: Dark of the Moon	P/DW	2011	tt1399103	154	Action	Adve
12	13	Skyfall	Sony	2012	tt1074638	143	Action	Adve
13	14	Transformers: Age of Extinction	Par.	2014	tt2109248	165	Action	Adve

	revenue_rank	title	studio	year	movie_id	runtime_minutes	imdb_genre_1	imdb_ger
14	15	The Dark Knight Rises	WB	2012	tt1345836	164	Action	T
15	16	Toy Story 3	BV	2010	tt0435761	103	Adventure	Anim
16	17	Pirates of the Caribbean: On Stranger Tides	BV	2011	tt1298650	136	Action	Adve
17	18	Despicable Me 3	Uni.	2017	tt3469046	89	Adventure	Anim
18	19	Finding Dory	BV	2016	tt2277860	97	Adventure	Anim
19	20	Zootopia	BV	2016	tt2948356	108	Adventure	Anim
20	21	The Hobbit: An Unexpected Journey	WB (NL)	2012	tt0903624	169	Adventure	F
21	22	Despicable Me 2	Uni.	2013	tt1690953	98	Adventure	Anim
22	23	Jumanji: Welcome to the Jungle	Sony	2017	tt2283362	119	Action	Adve
23	24	The Hobbit: The Desolation of Smaug	WB (NL)	2013	tt1170358	161	Adventure	Fa
24	25	The Hobbit: The Battle of the Five Armies	WB (NL)	2014	tt2310332	144	Adventure	Fa
25	26	Bohemian Rhapsody	Fox	2018	tt1727824	134	Biography	D
26	27	The Secret Life of Pets	Uni.	2016	tt2709768	87	Adventure	Anim
27	28	Spider-Man: Homecoming	Sony	2017	tt2250912	133	Action	Adve
28	29	Ice Age: Continental Drift	Fox	2012	tt1667889	88	Adventure	Anim
29	30	Spectre	Sony	2015	tt2379713	148	Action	Adve

In [77]:

```
#Now, we finally move on to the real work: Answering our 3 business questions:

#1. What genres of film produce the highest box office revenue?
#2. What is the best month to release a film in to generate the most revenue?
#3. What writers, directors, producers, actors and actresses have the highest
#   revenue earning potential?

#Before we begin, we should note that the genres columns 1, 2, and 3 are not
#a ordered by alphabetical order per film. Also, each film can have one, two
#or three genres.

#First, Genre. Let's generate a list of all the various genres available in
#our dataset.

def genre_counts(df):

    genre_col1_count = df['imdb_genre_1'].value_counts()
    genre_col2_count = df['imdb_genre_2'].value_counts()
    genre_col3_count = df['imdb_genre_3'].value_counts()

    temp = genre_col1_count.append(genre_col2_count.append(genre_col3_count))
    genre_count = {}

    for i in range(len(temp)):
        key = temp.index[i]
        value = temp[i]
        if key not in genre_count:
            genre_count[key] = value
        else:
            genre_count[key] = int(genre_count[key] + value)

    genre_count_df = pd.DataFrame.from_dict(genre_count,orient = 'index')
    genre_count_df.rename(columns = {0:'count'},inplace=True)
    genre_count_df.sort_values('count', ascending=False,inplace=True)
    return genre_count_df
dataset_genre_counts = genre_counts(dataset)
dataset_genre_counts
```

Out[77]:

```
           count
    Drama    494
   Comedy    378
   Action    319
Adventure    271
 Thriller    176
    Crime    156
  Romance    140
Biography    103
   Horror    103
   Sci-Fi     94
```

	count
Fantasy	88
Animation	82
Mystery	80
Family	66
Music	29
History	29
Sport	20
Documentary	7
War	7
Western	6
Musical	3

In [78]:

```
#So Drama, Comedy, Action and Adventure are four most numerous genres in
#our dataset.

#There are many factors that make a successful movie. We all know that bad
#movies of all genres exist. There are superhero films that are among the best
#selling films ever made, Avengers Endgame, and superero films that are so
#poorly executed the public is barely aware of them, The Specials. Therefore,
#it would be foolish to take an average of all the films in each genre and
#declaring the highest average as the most successful genre. For this analysis,
#It would be far more telling to select a list of the best performing films
#in our dataset and analyzing what genres are represented in those films are.
#To do this, let's set a threshold. If we set it to $490m, we get exactly
#100 films, making percentages effortless to calculate

revenue_threshold = 490000000
cols = ['revenue_rank', 'title', 'studio', 'year', 'runtime_minutes',
        'imdb_genre_1', 'imdb_genre_2', 'imdb_genre_3', 'tn_worldwide_gross']
half_billion = dataset[dataset['tn_worldwide_gross'].map(lambda x :
                                    True if x>=revenue_threshold else False)]
half_billion[cols]
```

Out[78]:

	revenue_rank	title	studio	year	runtime_minutes	imdb_genre_1	imdb_genre_2	imdb_ge
0	1	Avengers: Infinity War	BV	2018	149	Action	Adventure	
1	2	Jurassic World	Uni.	2015	124	Action	Adventure	
2	3	Avengers: Age of Ultron	BV	2015	141	Action	Adventure	
3	4	Black Panther	BV	2018	134	Action	Adventure	
4	5	Jurassic World: Fallen Kingdom	Uni.	2018	128	Action	Adventure	
...	...	...	...	...	...	...	...	
95	96	The Boss Baby	Fox	2017	97	Adventure	Animation	C
96	97	Dunkirk	WB	2017	106	Action	Drama	I
97	98	Wreck-It Ralph	BV	2012	101	Adventure	Animation	C
98	99	How to Train Your Dragon	P/DW	2010	98	Action	Adventure	Ani
99	100	Rio 2	Fox	2014	101	Adventure	Animation	C

100 rows × 9 columns

In [79]:

```
#Only 96 films now. Let's see what genres are represented
half_billion_counts = genre_counts(half_billion)
half_billion_counts
```

Out[79]:

	count
Adventure	86
Action	61
Comedy	34
Animation	33
Sci-Fi	27
Fantasy	17
Drama	10
Thriller	8
Family	5
Horror	3
Biography	3
Crime	3
Romance	1
Mystery	1
Music	1
History	1

In [80]:

```
#I'm curious how many genres are represented in each of these films.
half_billion[['imdb_genre_1', 'imdb_genre_2', 'imdb_genre_3']].isna().sum()
```

Out[80]:

```
imdb_genre_1    0
imdb_genre_2    0
imdb_genre_3    6
dtype: int64
```

In [81]:

```
#I'm really curious to see what the popular combinations are.
genres = half_billion_counts.index

dual_genre = pd.DataFrame()
dual_genre[cols] = half_billion[cols]
newcols = []

for i in range(len(genres)-1):
    left = genres[i]
    for n in range(len(genres) - i-1):
        right = genres[n+i+1]
        add = left + "/" + right
        newcols.append(add)
        dual_genre[add] = False
        for row in range(len(dual_genre)):
            c = dual_genre.columns.get_loc(add)
            one = dual_genre['imdb_genre_1'][row]
            two = dual_genre['imdb_genre_2'][row]
            three = dual_genre['imdb_genre_3'][row]
            if  one == left or two == left or three == left:
                if one == right or two == right or three == right:
                    dual_genre.at[row,add] = True

dual_genre = dual_genre[cols + newcols]
dft = pd.DataFrame(dual_genre[newcols].sum())
dft.sort_values(0,ascending = False,inplace=True)
dft.rename(columns={0:'count'},inplace=True)
dft = dft[dft['count'].map(lambda x :True if x>0 else False)]
dft
```

Out[81]:

	count
Adventure/Action	55
Adventure/Animation	31
Adventure/Comedy	30
Adventure/Sci-Fi	25
Comedy/Animation	25
Action/Sci-Fi	24
Adventure/Fantasy	16
Action/Fantasy	10
Action/Animation	8
Action/Comedy	7
Adventure/Drama	5

From this, we can see that the most numerous combinations are Adventure/Action, Adventure/Animation, Adventure/Comedy, Adventure/Sci-Fi, Comedy/Animation, Action/Sci-Fi and Adventure/Fantasy.

It's important that we define what these genres mean to IMDB, which is where we get the genre information. In order of popularity:

Adventure: Should contain numerous consecutive and inter-related scenes of characters participating in hazardous or exciting experiences for a specific goal. Often include searches or expeditions for lost continents and exotic locales, characters embarking in treasure hunt or heroic journeys, travels, and quests for the unknown. Not to be confused with Action, and should only sometimes be supplied with it. Subjective. Examples: The Goonies (1985) |The Lord of The Rings: The Fellowship of the Ring (2001) | Life of Pi (2012)

Action: Should contain numerous scenes where action is spectacular and usually destructive. Often includes non-stop motion, high energy physical stunts, chases, battles, and destructive crises (floods, explosions, natural disasters, fires, etc.) Note: if a movie contains just one action scene (even if prolonged, i.e. airplane-accident) it does not qualify. Subjective. Examples: Die Hard (1988) |The Avengers (2012) | Wonder Woman (2019)

Comedy: Virtually all scenes should contain characters participating in humorous or comedic experiences. The comedy can be exclusively for the viewer, at the expense of the characters in the title, or be shared with them. Please submit qualifying keywords to better describe the humor (i.e. spoof, parody, irony, slapstick, satire, black-comedy etc). If the title does not conform to the 'virtually all scenes' guideline then please do not add the comedy genre; instead, submit the same keyword variations described above to signify the comedic elements of the title. Subjective. Examples: Some Like it Hot (1959) |When Harry Met Sally... (1989) | Bridesmaids (2011)

Animation: Over 75% of the title's running time should have scenes that are wholly, or part-animated. Any form of animation is acceptable, e.g., hand-drawn, computer-generated, stop-motion, etc. Puppetry does not count as animation, unless a form of animation such as stop-motion is also applied. Incidental animated sequences should be indicated with the keywords part-animated or animated-sequence instead. Although the overwhelming majority of video games are a form of animation it's okay to forgo this genre when adding them as this is implied by the title type. Objective. Examples: Spirited Away (2001) |The Lion King (1994) | "The Simpsons" (1987)

Sci-Fi: Numerous scenes, and/or the entire background for the setting of the narrative, should be based on speculative scientific discoveries or developments, environmental changes, space travel, or life on other planets. Subjective. Examples: Star Wars (1977) |The Matrix (1999) | Alien (1979)

Fantasy: Should contain numerous consecutive scenes of characters portrayed to effect a magical and/or mystical narrative throughout the title. Usually has elements of magic, supernatural events, mythology, folklore, or exotic fantasy worlds.Note: not to be confused with Sci-Fi which is not usually based in magic or mysticism. Subjective. Examples: "Game of Thrones" (2011) |Harry Potter and The Sorcerer's Stone (2001) | "Stranger Things" (2016)

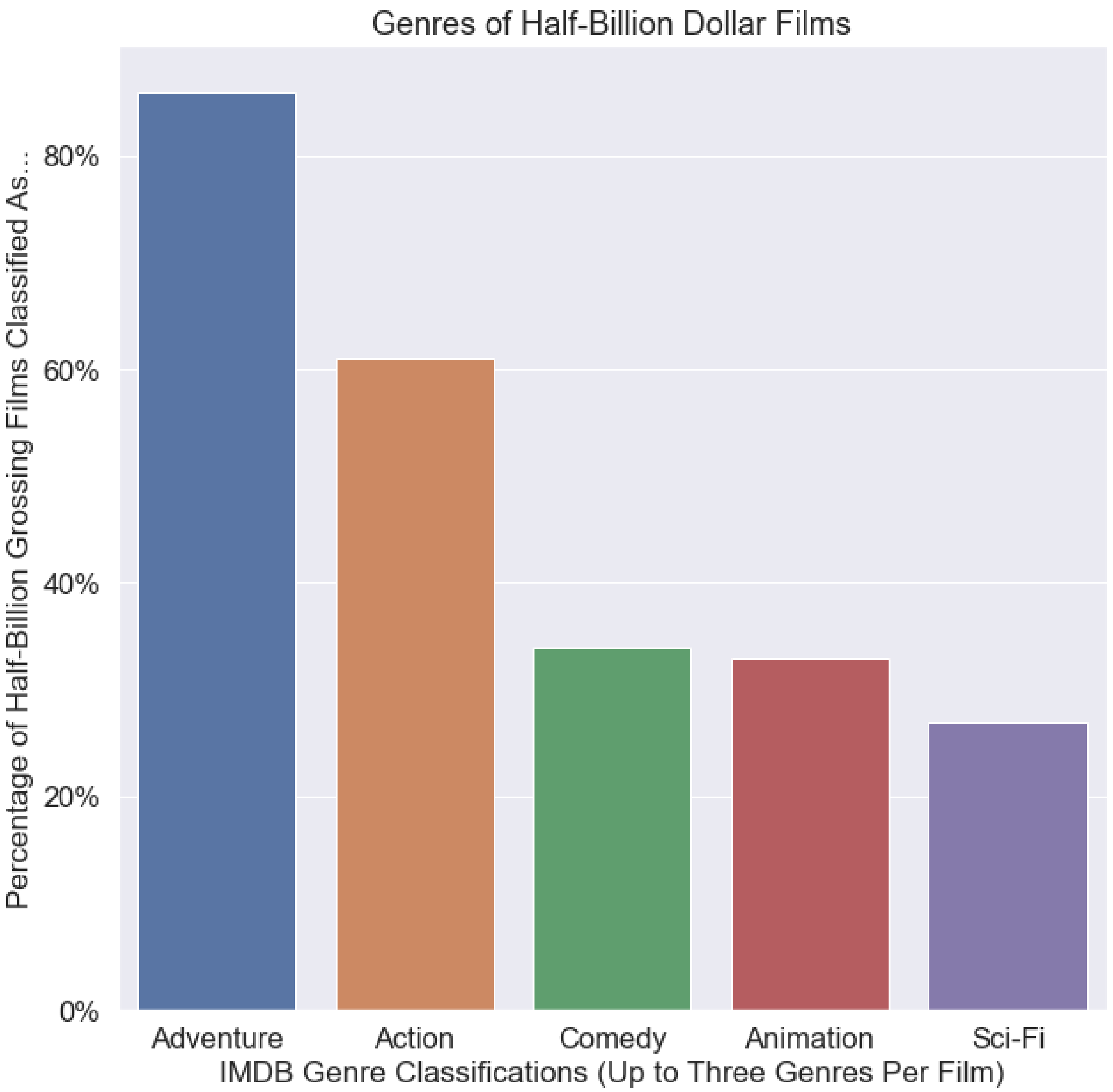
```
In [82]: half_billion_counts = half_billion_counts.reset_index()
```

Graphic #1

In [83]:

```
half_billion_counts_percent = half_billion_counts.copy()
genres, percent = half_billion_counts_percent.columns

half_billion_counts_percent[percent] = half_billion_counts_percent[percent]/len(

plt.figure(figsize=(10, 10))
sns.set(font_scale = 1.5)

xlabel = 'IMDB Genre Classifications (Up to Three Genres Per Film)'
ylabel = 'Percentage of Half-Billion Grossing Films Classified As...'
graphic_title = 'Genres of Half-Billion Dollar Films'
#half_billion_counts_percent.rename(columns = {oldxlabel:xlabel,oldylabel:ylabel
q1_ax = sns.barplot(y=percent,x=genres, data=half_billion_counts_percent.head())

#Fortmatting
q1_ax.set_xlabel(xlabel, fontsize = 17)
q1_ax.set_ylabel(ylabel, fontsize = 17)
q1_ax.set(title=graphic_title)
current_values = q1_ax.get_yticks()
# using format string '{:.0f}' here but you can choose others
q1_ax.set_yticklabels(['{:,.0%}'.format(x) for x in current_values]);
```

```
<ipython-input-83-0ba8c9e2af58>:21: UserWarning: FixedFormatter should only be
used together with FixedLocator
  q1_ax.set_yticklabels(['{:,.0%}'.format(x) for x in current_values]);
```



On to question 2: 2. What is the best month to release a film in to generate the most revenue?

This question requires far less analysis. I'd like to look at it in two different ways. The first will be a histogram to see what months the half-billion grossing movies were released in. The second is a simple average of worldwide gross of all the films in the dataset binned by month.

Graphic #2

In [84]:

```
def release_month_count(df,div,sig):
    rt = df.groupby('tn_release_month')['tn_num_month','tn_domestic_gross','tn_fo
    
    #I need these values for the next chart.
    rt['count'] = df.groupby('tn_release_month')['title'].count()
    rt['count_percent'] = (rt['count']/len(df)).round(decimals=sig+2)
    #Lets reduce the significant digits to make the graph more readable.
    #We'll go with millions of dollars.
    
    cols = ['tn_domestic_gross','tn_foreign_gross','tn_worldwide_gross']
    
    rt[cols[0:3]] = ((rt[cols[0:3]]/div).round()).astype(int)
    rt.sort_values('tn_num_month',inplace=True)
    rt.reset_index(inplace=True)
    rt.drop(columns='tn_num_month',inplace=True)
    return rt
binned_by_month = release_month_count(dataset,1000000,1).iloc[:,0:4]
binned_by_month
```

```
<ipython-input-84-ac2877dd6f3a>:2: FutureWarning: Indexing with multiple keys
(implicitly converted to a tuple of keys) will be deprecated, use a list instea
d.
  rt = df.groupby('tn_release_month')['tn_num_month','tn_domestic_gross','tn_fo
reign_gross','tn_worldwide_gross'].mean()
```

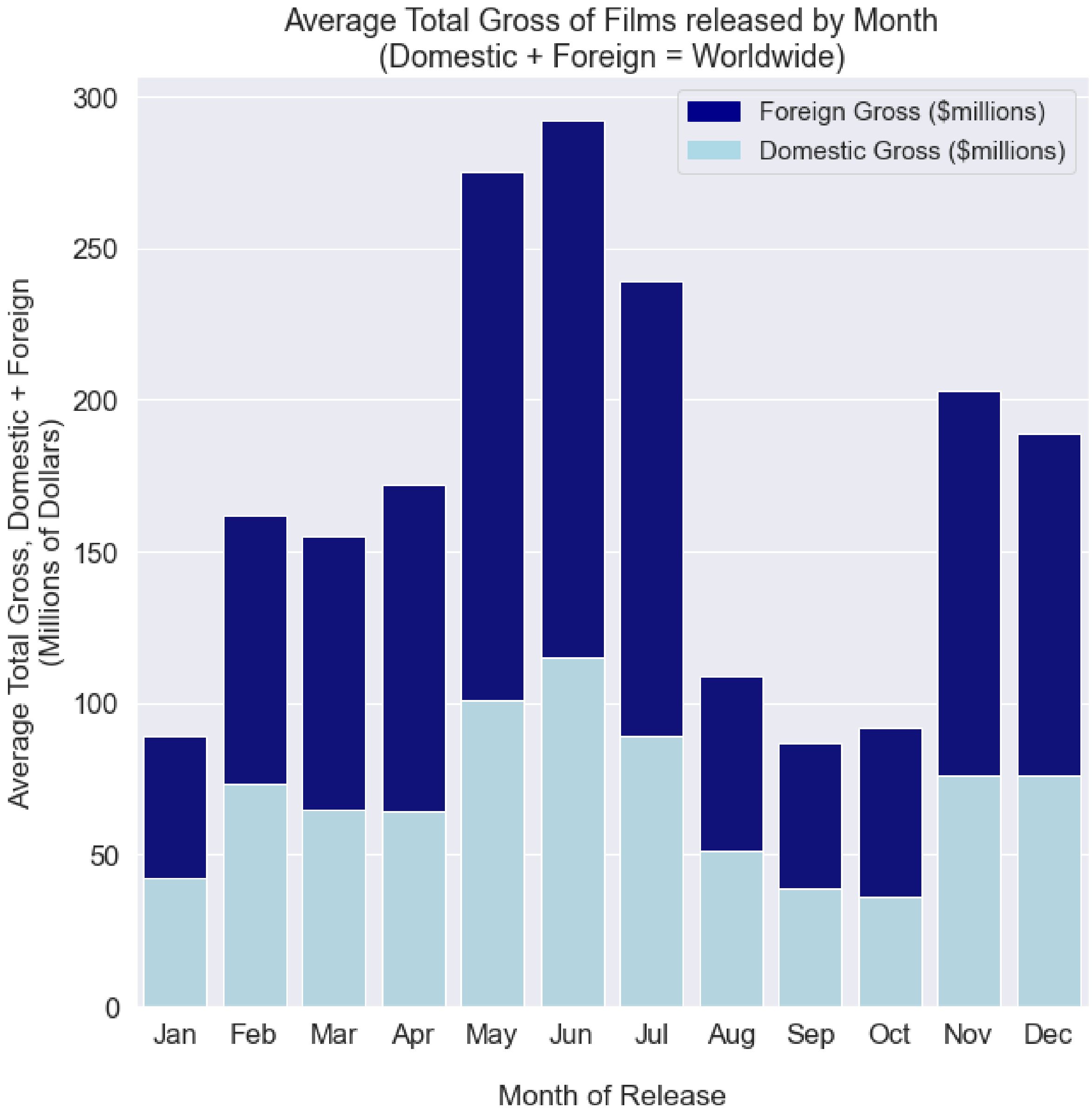
Out[84]:

	tn_release_month	tn_domestic_gross	tn_foreign_gross	tn_worldwide_gross
0	Jan	42	47	89
1	Feb	73	89	162
2	Mar	65	89	155
3	Apr	64	108	172
4	May	101	174	275
5	Jun	115	177	292
6	Jul	89	150	239
7	Aug	51	58	109
8	Sep	39	48	87
9	Oct	36	57	92
10	Nov	76	127	203
11	Dec	76	113	189

This shows that the biggest money makers of the year are released in the summer months of May, June and July.

In [85]:

```
#Now for the graphic

mon, dom, fgn, wor = binned_by_month.columns

title = "Average Total Gross of Films released by Month\n(Domestic + Foreign = Wo
xlabel = '\nMonth of Release'
ylabel = 'Average Total Gross, Domestic + Foreign\n(Millions of Dollars)'

# set the figure size
plt.figure(figsize=(10, 10))

# top bar -> sum all values(smoker=No and smoker=Yes) to find y position of the b
total = binned_by_month[[mon,wor]]

# bar chart 1 -> top bars (group of worldwide total)
q2_ax1 = sns.barplot(x=mon,  y=wor, data=total, color='darkblue')

# bottom bar ->  take only domestic values from the data
domestic = binned_by_month[[mon,dom,wor]]

# bar chart 2 -> bottom bars (group of domestic)
q2_ax2 = sns.barplot(x=mon, y=dom, data=domestic, estimator=sum, ci=None,  color=

# add legend
top_bar = mpatches.Patch(color='darkblue', label='Foreign Gross ($millions)')
bottom_bar = mpatches.Patch(color='lightblue', label='Domestic Gross ($millions)'
plt.legend(handles=[top_bar, bottom_bar], fontsize = 15)
q2_ax1.set_xlabel(xlabel, fontsize = 17)
q2_ax1.set_ylabel(ylabel, fontsize = 17)
q2_ax1.set(title=title)

# show the graph
plt.show()
```


Average Total Gross of Films released by Month
(Domestic + Foreign = Worldwide)
Foreign Gross ($millions)
Domestic Gross ($millions)
Average Total Gross, Domestic + Foreign
(Millions of Dollars)
300
250
200
150
100
50
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month of Release

Graphic #3

In [86]:

```
#Now we're going to to show how many of our Half a billion films were released
#for each month of the year.
#Even though we've used all bar charts so far, this data should also be a
#bar chart because it fits the data.

binned_by_month_half_billion = release_month_count(half_billion,1000000,0)[['tn_r
binned_by_month_half_billion
```

```
<ipython-input-84-ac2877dd6f3a>:2: FutureWarning: Indexing with multiple keys
(implicitly converted to a tuple of keys) will be deprecated, use a list instea
d.
  rt = df.groupby('tn_release_month')['tn_num_month','tn_domestic_gross','tn_fo
reign_gross','tn_worldwide_gross'].mean()
```

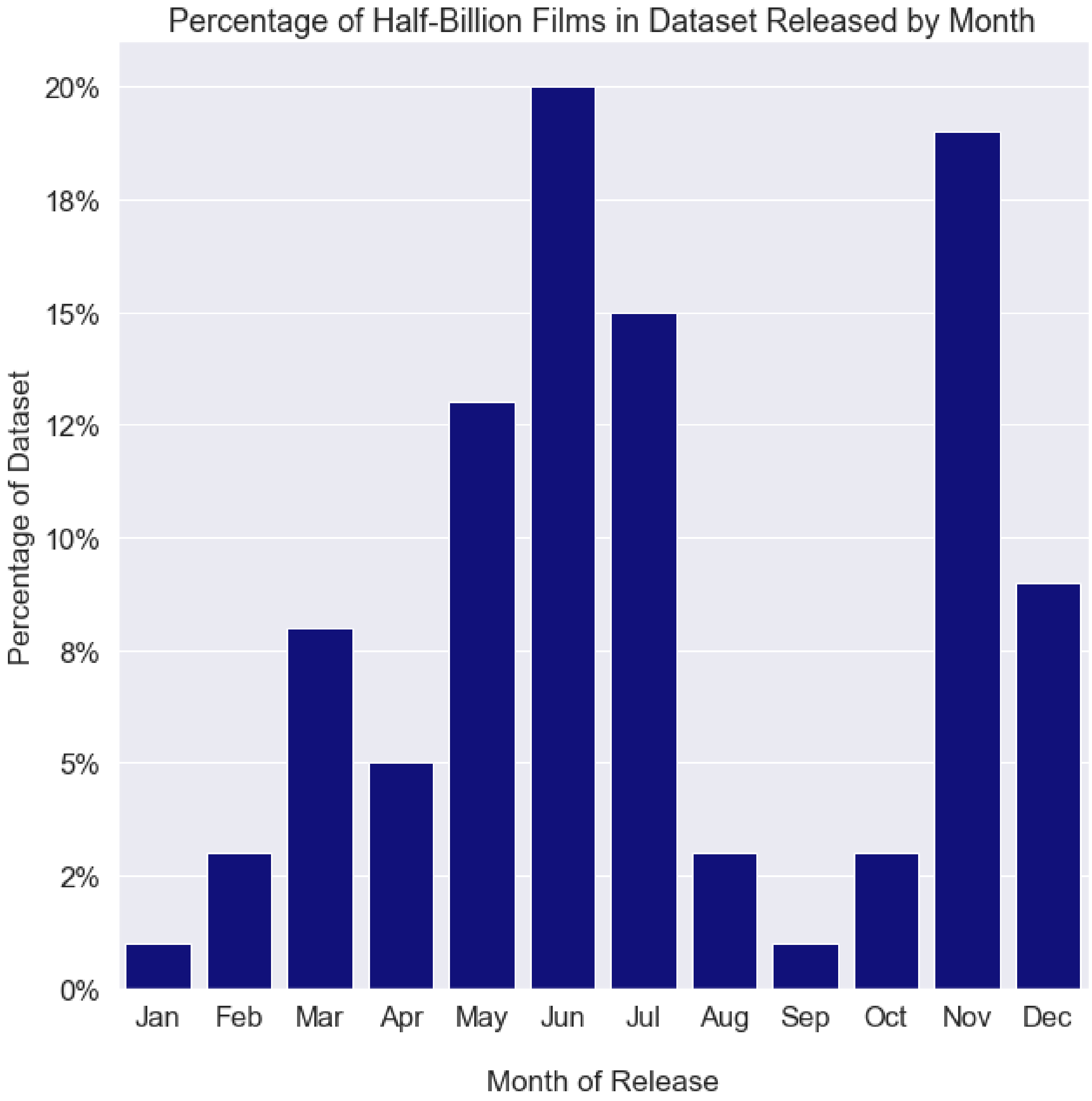
Out[86]:

	tn_release_month	count_percent
0	Jan	0.01
1	Feb	0.03
2	Mar	0.08
3	Apr	0.05
4	May	0.13
5	Jun	0.20
6	Jul	0.15
7	Aug	0.03
8	Sep	0.01
9	Oct	0.03
10	Nov	0.19
11	Dec	0.09

In [87]:

```
mon, per = binned_by_month_half_billion.columns

title = "Percentage of Half-Billion Films in Dataset Released by Month"
xlabel = '\nMonth of Release'
ylabel = 'Percentage of Dataset'

# set the figure size
plt.figure(figsize=(10, 10))

# bar chart 1 -> top bars (group of worldwide total)
q2_ax2 = sns.barplot(x=mon,  y=per, data=binned_by_month_half_billion, color='dar

q2_ax2.set_xlabel(xlabel, fontsize = 17)
q2_ax2.set_ylabel(ylabel, fontsize = 17)
q2_ax2.set(title=title)
current_values = q2_ax2.get_yticks()
# using format string '{:.0f}' here but you can choose others
q2_ax2.set_yticklabels(['{:,.0%}'.format(x) for x in current_values]);

# show the graph
plt.show();
```

```
<ipython-input-87-2954234a437f>:18: UserWarning: FixedFormatter should only be
used together with FixedLocator
  q2_ax2.set_yticklabels(['{:,.0%}'.format(x) for x in current_values]);
```



Question #3

3. What writers, directors, producers, actors and actresses have the highest revenue earning potential?

To answer this question, once again, we need to answer it two ways. The first is which category is most consistent, writer, director, producer or actor. Then, once we do that, we can list the top ten mone making talent in each category.

In [88]:

```
#The writers job has a lot of bad information in it. It contains people who
#get credit for creating characters that are featured in the mega popular
#superhero films, but the character creaters didn't write the movie at all.
#Unfortunatley, there's no way to isolate the screenwriters, so instead we'll
#just take people who have at least three films on their resume. Hopefully this
#won't be a problem with the other jobs.

#So, we'll add a column then to use the count to filter the data. We may as
#well do this for all of them.

def counting_films(df):
    new = df.groupby('person_id')['movie_id','primary_name'].count()
    new.rename(columns = {'movie_id' :'film_count'}, inplace=True)
    df = pd.merge(df,new['film_count'], how='inner',left_on='person_id', right_or
    return df

writers = counting_films(writers)
directors = counting_films(directors)
producers = counting_films(producers)
actors = counting_films(actors)
actresses = counting_films(actresses)
actorsneutral = counting_films(actorsneutral)
```

```
<ipython-input-88-fd1aff0fe6e2>:12: FutureWarning: Indexing with multiple keys
(implicitly converted to a tuple of keys) will be deprecated, use a list instea
d.
  new = df.groupby('person_id')['movie_id','primary_name'].count()
```

In [89]:

```
#Earlier, I grouped together all the different categories in their own
#dataframe. Now we just need to add the film grossing information to that data.

def add_movie_stats(org,cls,div):
    new = pd.merge(org,dataset[cls+['movie_id']], how='inner',left_on='movie_id',
    new[cls] = (new[cls]/div).round(0)
    return new

cols = ['tn_worldwide_gross']
divisor = 1000000
writers = add_movie_stats(writers,cols,divisor)
directors = add_movie_stats(directors,cols,divisor)
producers = add_movie_stats(producers,cols,divisor)
actors  = add_movie_stats(actors,cols,divisor)
actresses = add_movie_stats(actresses,cols,divisor)
actorsneutral = add_movie_stats(actorsneutral,cols,divisor)
```

In [90]:

```
#We can't hire dead people, so let's get rid of them
writers_alive = writers[writers['death_year'].isna()]
directors_alive = directors[directors['death_year'].isna()]
producers_alive = producers[producers['death_year'].isna()]
actors_alive = actors[actors['death_year'].isna()]
actresses_alive = actresses[actresses['death_year'].isna()]
actorsneutral_alive = actorsneutral[actorsneutral['death_year'].isna()]
```

In [91]:

```
#Now I need to see how the top creatives averages differ.
def top(df,floor,num,label):
    new = df[df['film_count'].map(lambda x : True if x>=floor else False)]
    tops = new.groupby('primary_name')[['tn_worldwide_gross']].mean().sort_values
    tops['tn_worldwide_gross'] = tops['tn_worldwide_gross'].round(0).astype(int)
    last = pd.merge(tops,df[['primary_name','film_count']], how='left',left_on='p
    last.rename(columns={'primary_name':label+"'s name",'tn_worldwide_gross' : la
    last = last[~last.duplicated()].reset_index(drop=True)
    return last.reset_index()

the_floor = 3
the_top = 50

writers_top = top(writers_alive,the_floor,the_top,'Writer')
directors_top = top(directors_alive,the_floor,the_top,'Director')
producers_top = top(producers_alive,the_floor,the_top,'Producer')
actors_top = top(actors_alive,the_floor,the_top,'Actor')
actresses_top = top(actresses_alive,the_floor,the_top,'Actress')
actorsneutral_top = top(actorsneutral_alive,the_floor,the_top,'(Gender Inclusive)
```

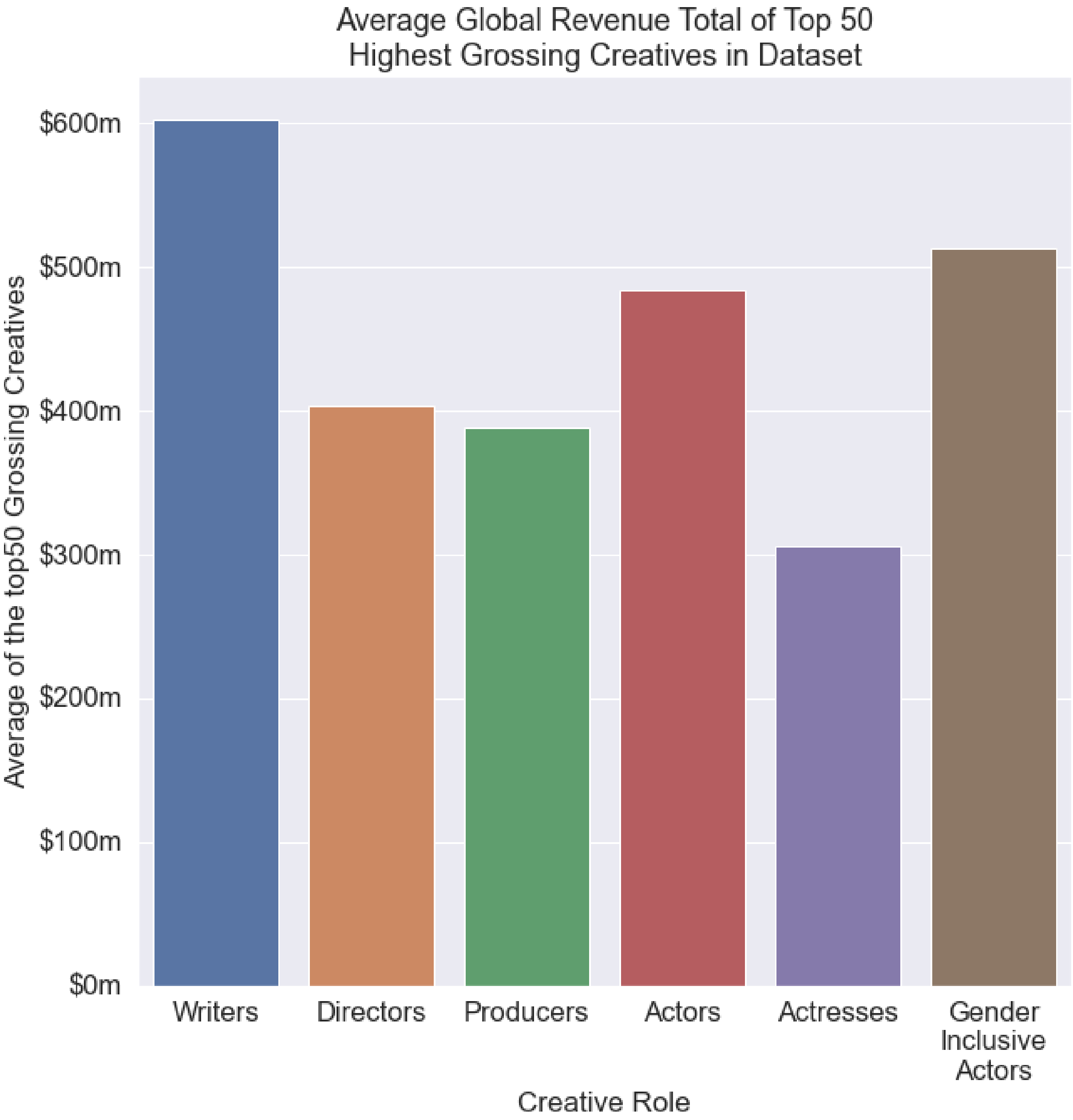
In [92]:
```
#Putting all the averages together
def merging(df1,df2):
    tem = pd.merge(df1,df2,how='inner',left_on='index',right_on='index')
    return tem

temp1 = merging(writers_top,directors_top)
temp2 = merging(producers_top,actors_top)
temp3 = merging(actresses_top,actorsneutral_top)
temp4 = merging(temp1,temp2)
all_creatives = merging(temp4,temp3)
des_rows = ["Writer's Gross","Director's Gross","Producer's Gross","Actor's Gross
all_creatives_average = pd.DataFrame(all_creatives[des_rows].mean().round(0).asty
all_creatives_average.reset_index(inplace=True)
all_creatives_average.rename(columns={'index':'Creative Jobs',0:"Top "+str(the_to
all_creatives_average
```

Out[92]:
```
                     Creative Jobs   Top 50 Average gross ($MM)
0                   Writer's Gross                          603
1                 Director's Gross                          403
2                 Producer's Gross                          388
3                    Actor's Gross                          484
4                  Actress's Gross                          306
5  (Gender Inclusive) Actor's Gross                         513
```

In [93]:

```
#Now for the graphic
job, grs = all_creatives_average.columns
abb_rows = ['Writers','Directors','Producers','Actors','Actresses','Gender\nInclu
creatives_gross_graphic = all_creatives_average.copy()
row_change = {}
for i in range(len(des_rows)):
    row_change[des_rows[i]]=abb_rows[i]
creatives_gross_graphic['Creative Jobs'] = creatives_gross_graphic['Creative Jobs

plt.figure(figsize=(10, 10))
sns.set(font_scale = 1.5)

xlabel = "Creative Role"
ylabel = "Average of the top" +str(the_top)+" Grossing Creatives"
title = "Average Global Revenue Total of Top " +str(the_top)+"\nHighest Grossing
#half_billion_counts_percent.rename(columns = {oldxlabel:xlabel,oldylabel:ylabel}
q3_ax = sns.barplot(y=grs,x=job, data=creatives_gross_graphic)

#Fortmatting
q3_ax.set_xlabel(xlabel, fontsize = 17)
q3_ax.set_ylabel(ylabel, fontsize = 17)
q3_ax.set(title=title)
current_values = q3_ax.get_yticks()
current_values[:]=current_values[:]
#using format string '{:.0f}' here but you can choose others
q3_ax.set_yticklabels(['${:.0f}m'.format(x) for x in current_values]);
```

```
<ipython-input-93-9d2398498ceb>:26: UserWarning: FixedFormatter should only be
used together with FixedLocator
  q3_ax.set_yticklabels(['${:.0f}m'.format(x) for x in current_values]);
```


Average Global Revenue Total of Top 50
Highest Grossing Creatives in Dataset
Average of the top50 Grossing Creatives
$600m
$500m
$400m
$300m
$200m
$100m
$0m
Writers
Directors
Producers
Actors
Actresses
Gender Inclusive Actors
Creative Role

In [94]:

```
#According to the data, writers and actors have the largest impact on a films
#total gross. So we'd reccomend hiring some big names in those two categories.
#Despite the data, we highly reccomend pay equality between actors and
#actresses. We cannot make popular movies without actresses. We should pay them
#well. Also, if it gets out that your film studio does not have pay equality
#between men and women, the public will not be happy.

#Anyway, with this in mind, lets find the top ten highest grossing creatives
#in the categories of Writers, Actors and Actresses.

all_creatives.rename(columns = {'index':'Rank'},inplace=True)
all_creatives['Rank'] = all_creatives['Rank'] +1
top_ten = all_creatives[["Rank","Writer's name","Actor's name","Actress's name"]]
top_ten
```

Out[94]:

	Rank	Writer's name	Actor's name	Actress's name
0	1	Guillermo del Toro	Richard Armitage	Sandra Bullock
1	2	Christopher Markus	Ian McKellen	Bryce Dallas Howard
2	3	Stephen McFeely	Robert Downey Jr.	Evangeline Lilly
3	4	Derek Connolly	Chris Evans	Scarlett Johansson
4	5	David S. Goyer	Chris Pratt	Eloise Mumford
5	6	Chris McKenna	Chris Hemsworth	Anne Hathaway
6	7	Erik Sommers	Benjamin Bratt	Holly Hunter
7	8	Philippa Boyens	Andy Serkis	Judi Dench
8	9	Fran Walsh	Mark Ruffalo	Angelina Jolie
9	10	Suzanne Collins	Martin Freeman	Emily Mortimer

And that's a wrap. I've got everything I need to create my slides now.