salesanalysisofelectronicdevices

April 10, 2024

1 Analysis of Electronic Sales

- Author = Aditya Kumar
- Libraries Used :- numpy,pandas,plotly,mapbox,json,matplotlib,seaborn

[1]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
import os
import re
```

[2]:
```
# changing Directory
os.chdir(r'./Data/')
```

[4]:
```
df = pd.read_csv("all_data.csv")
df.head()
```

[4]:
```
  Order ID                     Product Quantity Ordered Price Each  \
0   176558        USB-C Charging Cable                2      11.95
1      NaN                         NaN              NaN        NaN
2   176559  Bose SoundSport Headphones                1      99.99
3   176560                Google Phone                1        600
4   176560            Wired Headphones                1      11.99

       Order Date                      Purchase Address
0  04/19/19 08:46          917 1st St, Dallas, TX 75001
1             NaN                                   NaN
2  04/07/19 22:30     682 Chestnut St, Boston, MA 02215
3  04/12/19 14:38  669 Spruce St, Los Angeles, CA 90001
4  04/12/19 14:38  669 Spruce St, Los Angeles, CA 90001
```

[5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 615699 entries, 0 to 615698
Data columns (total 6 columns):
```

```
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   Order ID          613887 non-null  object
 1   Product           613887 non-null  object
 2   Quantity Ordered  613887 non-null  object
 3   Price Each        613887 non-null  object
 4   Order Date        613887 non-null  object
 5   Purchase Address  613887 non-null  object
dtypes: object(6)
memory usage: 28.2+ MB
```

[6]:
```
df.isna().sum()
```

[6]:
```
Order ID            1812
Product             1812
Quantity Ordered    1812
Price Each          1812
Order Date          1812
Purchase Address    1812
dtype: int64
```

1.1 Task1 Clean the Data

[7]:
```
# Seeing the Null values
na_df = df[df.isna().any(axis=1)]
na_df.head()
```

[7]:

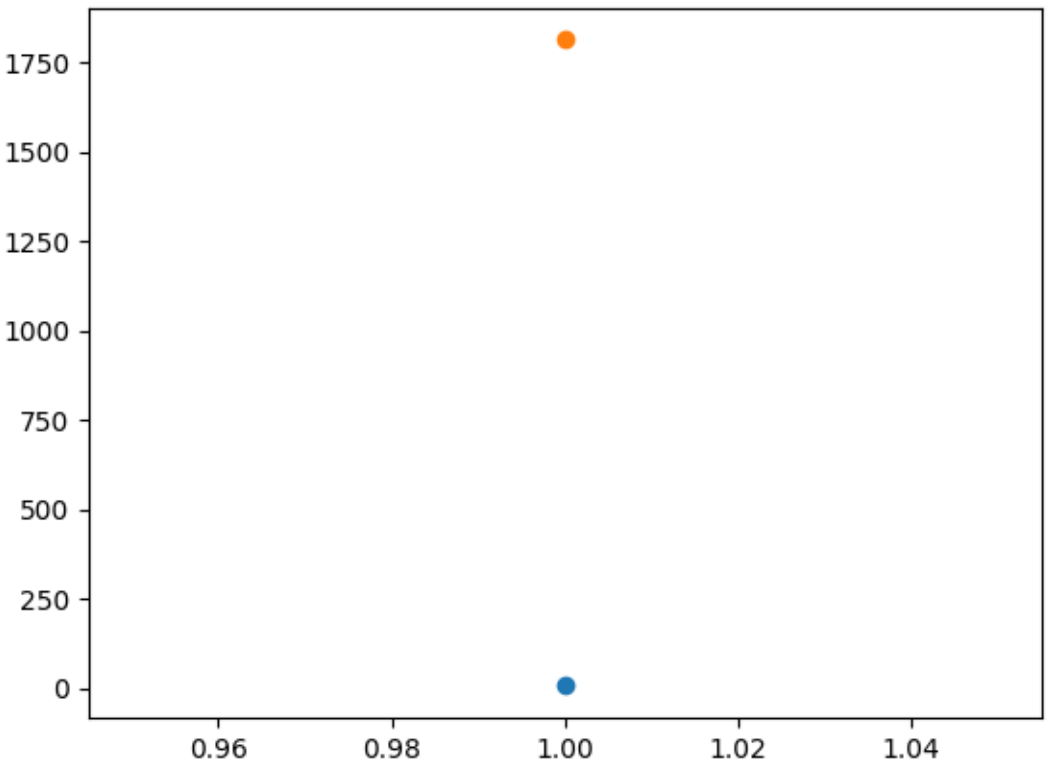
	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
1	NaN	NaN	NaN	NaN	NaN	NaN
356	NaN	NaN	NaN	NaN	NaN	NaN
735	NaN	NaN	NaN	NaN	NaN	NaN
1433	NaN	NaN	NaN	NaN	NaN	NaN
1553	NaN	NaN	NaN	NaN	NaN	NaN

[8]:
```
# All Null values
all_na = na_df.isna().any(axis=1).sum()
```

[9]:
```
# Any Null values
any_na = na_df.isna().all().sum()
```

[10]:
```
# Ploting the Total Null Values
plt.scatter(y=any_na,x = [1])
plt.scatter(y=all_na,x = [1])
```

[10]:
```
<matplotlib.collections.PathCollection at 0x185990443e0>
```



[11]:
```
# dropping the Null Values
df.dropna(how='all',inplace=True)
df.reset_index(drop=True,inplace=True)
df.head(3)
```

[11]:

	Order ID	Product	Quantity Ordered	Price Each	\
0	176558	USB-C Charging Cable	2	11.95	
1	176559	Bose SoundSport Headphones	1	99.99	
2	176560	Google Phone	1	600	

	Order Date	Purchase Address
0	04/19/19 08:46	917 1st St, Dallas, TX 75001
1	04/07/19 22:30	682 Chestnut St, Boston, MA 02215
2	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001

[12]:
```
# Drop all The Duplicate Rows
df.drop_duplicates(inplace =True)
df.reset_index()
```

[12]:

	index	Order ID	Product	Quantity Ordered	\
0	0	176558	USB-C Charging Cable	2	
1	1	176559	Bose SoundSport Headphones	1	

```
2            2   176560                Google Phone                1
3            3   176560            Wired Headphones                1
4            4   176561            Wired Headphones                1
…          …       …                          …               …
185682  241272   259353      AAA Batteries (4-pack)                3
185683  241273   259354                      iPhone                1
185684  241274   259355                      iPhone                1
185685  241275   259356      34in Ultrawide Monitor                1
185686  241276   259357        USB-C Charging Cable                1

       Price Each      Order Date                        Purchase Address
0           11.95  04/19/19 08:46             917 1st St, Dallas, TX 75001
1           99.99  04/07/19 22:30        682 Chestnut St, Boston, MA 02215
2             600  04/12/19 14:38     669 Spruce St, Los Angeles, CA 90001
3           11.99  04/12/19 14:38     669 Spruce St, Los Angeles, CA 90001
4           11.99  04/30/19 09:27        333 8th St, Los Angeles, CA 90001
…             …              …                                       …
185682       2.99  09/17/19 20:56   840 Highland St, Los Angeles, CA 90001
185683        700  09/01/19 16:00  216 Dogwood St, San Francisco, CA 94016
185684        700  09/23/19 07:39     220 12th St, San Francisco, CA 94016
185685     379.99  09/19/19 17:30   511 Forest St, San Francisco, CA 94016
185686      11.95  09/30/19 00:18   250 Meadow St, San Francisco, CA 94016

[185687 rows x 7 columns]
```

Dropping the Headings

- I obeserved that the dataset contained some titles in the data columns so i removed it

[13]:
```
import re
```

[14]:
```
def convert_Order(x):
    return bool(re.match(r'[a-zA-Z\s]+$', x))
```

[15]:
```
# condition on basis we are dropping
i = df['Order ID'].apply(convert_Order)
i[517:]
```

[15]:
```
518       False
519       False
520       False
521       False
522       False
          …
241272    False
241273    False
241274    False
```

```
241275    False
241276    False
Name: Order ID, Length: 185170, dtype: bool
```

[16]:
```
# dropping the Title Values
df.drop(index = df[i].index,inplace=True)
df.reset_index(drop = True,inplace=True)
df.head(3)
```

[16]:
```
  Order ID                    Product Quantity Ordered Price Each  \
0   176558        USB-C Charging Cable                2      11.95
1   176559  Bose SoundSport Headphones                1      99.99
2   176560                Google Phone                1        600

       Order Date                      Purchase Address
0  04/19/19 08:46          917 1st St, Dallas, TX 75001
1  04/07/19 22:30     682 Chestnut St, Boston, MA 02215
2  04/12/19 14:38  669 Spruce St, Los Angeles, CA 90001
```

1.2 Task 2 Adding Month Column

[17]:
```
df['Month'] = df['Order Date'].str[0:2]
df.head()
```

[17]:
```
  Order ID                    Product Quantity Ordered Price Each  \
0   176558        USB-C Charging Cable                2      11.95
1   176559  Bose SoundSport Headphones                1      99.99
2   176560                Google Phone                1        600
3   176560            Wired Headphones                1      11.99
4   176561            Wired Headphones                1      11.99

       Order Date                      Purchase Address Month
0  04/19/19 08:46          917 1st St, Dallas, TX 75001    04
1  04/07/19 22:30     682 Chestnut St, Boston, MA 02215    04
2  04/12/19 14:38  669 Spruce St, Los Angeles, CA 90001    04
3  04/12/19 14:38  669 Spruce St, Los Angeles, CA 90001    04
4  04/30/19 09:27     333 8th St, Los Angeles, CA 90001    04
```

1.3 Task 3 chnaging data types

[18]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 185686 entries, 0 to 185685
Data columns (total 7 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
```

```
 0   Order ID          185686 non-null  object
 1   Product           185686 non-null  object
 2   Quantity Ordered  185686 non-null  object
 3   Price Each        185686 non-null  object
 4   Order Date        185686 non-null  object
 5   Purchase Address  185686 non-null  object
 6   Month             185686 non-null  object
dtypes: object(7)
memory usage: 9.9+ MB
```

[19]:
```
# Converting dtype
df['Order Date'] =  pd.to_datetime(df['Order Date'])
df['Order ID'] = pd.to_numeric(df['Order ID'],downcast ='integer')
df['Quantity Ordered'] = df['Quantity Ordered'].astype('int16')
df['Price Each'] = df['Price Each'].astype('float32')
df['Month'] = df['Month'].astype(np.int16)
```

```
C:\Users\gamin\AppData\Local\Temp\ipykernel_11308\1495062626.py:2: UserWarning:
Could not infer format, so each element will be parsed individually, falling
back to `dateutil`. To ensure parsing is consistent and as-expected, please
specify a format.
  df['Order Date'] =  pd.to_datetime(df['Order Date'])
```

[20]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 185686 entries, 0 to 185685
Data columns (total 7 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   Order ID          185686 non-null  int32
 1   Product           185686 non-null  object
 2   Quantity Ordered  185686 non-null  int16
 3   Price Each        185686 non-null  float32
 4   Order Date        185686 non-null  datetime64[ns]
 5   Purchase Address  185686 non-null  object
 6   Month             185686 non-null  int16
dtypes: datetime64[ns](1), float32(1), int16(2), int32(1), object(2)
memory usage: 6.4+ MB
```

1.4 Task 4 Add a Sales Column

[21]:
```
sales = pd.Series(df['Price Each']*df['Quantity Ordered'],dtype='float64',
                  name = 'Sales')
sales = pd.DataFrame(sales)
sales
```

[21]:
```
              Sales
0         23.900000
1         99.989998
2        600.000000
3         11.990000
4         11.990000
…               …
185681     8.970000
185682   700.000000
185683   700.000000
185684   379.989990
185685    11.950000

[185686 rows x 1 columns]
```

[22]:
```
df = pd.concat([df,sales],axis=1)
df.head(2)
```

[22]:
```
   Order ID                     Product  Quantity Ordered  Price Each  \
0    176558        USB-C Charging Cable                 2   11.950000
1    176559  Bose SoundSport Headphones                 1   99.989998

            Order Date                   Purchase Address  Month      Sales
0 2019-04-19 08:46:00       917 1st St, Dallas, TX 75001      4  23.900000
1 2019-04-07 22:30:00  682 Chestnut St, Boston, MA 02215      4  99.989998
```

Reorder the Dataset

[23]:
```
df = df.iloc[:,[0,4,1,2,3,7,6,5]]
df.head(2)
```

[23]:
```
   Order ID          Order Date                     Product  Quantity Ordered  \
0    176558 2019-04-19 08:46:00        USB-C Charging Cable                 2
1    176559 2019-04-07 22:30:00  Bose SoundSport Headphones                 1

   Price Each      Sales  Month                   Purchase Address
0   11.950000  23.900000      4       917 1st St, Dallas, TX 75001
1   99.989998  99.989998      4  682 Chestnut St, Boston, MA 02215
```

1.4.1 Q1 which month has most sales and how much??

- Ans-> December has the most Sales probably Because of Christmas

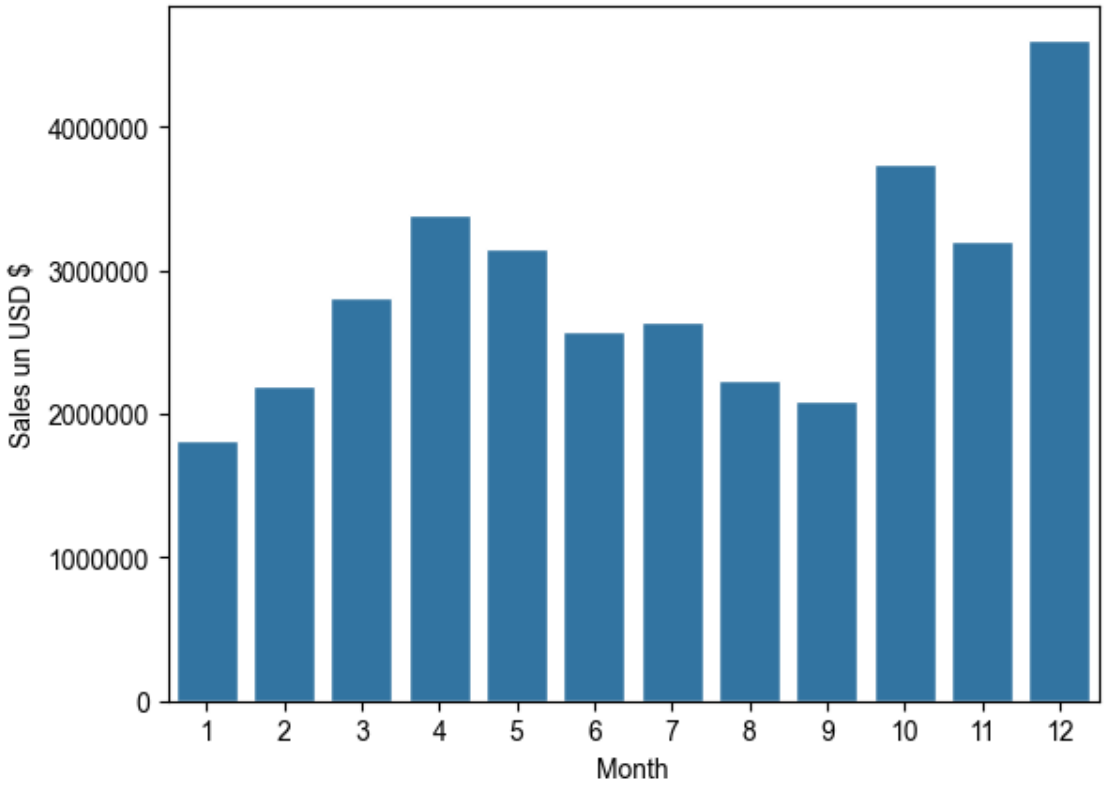
[24]:
```
df_temp = df[['Month','Quantity Ordered','Price Each','Sales']].
↪groupby(by=['Month']).sum()
df_temp
```

[24]:

Month	Quantity Ordered	Price Each	Sales
1	10893	1810924.750	1.821413e+06
2	13431	2186940.250	2.200078e+06
3	16979	2789084.750	2.804973e+06
4	20536	3366218.750	3.389218e+06
5	18653	3133134.500	3.150616e+06
6	15234	2560503.500	2.576280e+06
7	16054	2631225.000	2.646461e+06
8	13429	2226964.000	2.241083e+06
9	13091	2081897.625	2.094466e+06
10	22669	3713608.750	3.734778e+06
11	19769	3178872.500	3.197875e+06
12	28074	4583267.500	4.608296e+06

[25]:
```
# plotting the above

# Set the scientific Notation oFf
plt.ticklabel_format(style='plain', axis='both')

sns.set_theme(context = 'notebook',style = 'darkgrid')
sns.barplot(data= df_temp,x = 'Month',y='Sales')
plt.ylabel('Sales un USD $')
```

[25]:
```
Text(0, 0.5, 'Sales un USD $')
```



[26]:
```
# delete the temp
del df_temp
```

1.4.2 Q2 Which City has most no of sales

- San francisco Has the most No of Sales

[27]:
```
df['City'] = df['Purchase Address'].apply(lambda x : x.split(',')[1])
df.head(3)
```

[27]:

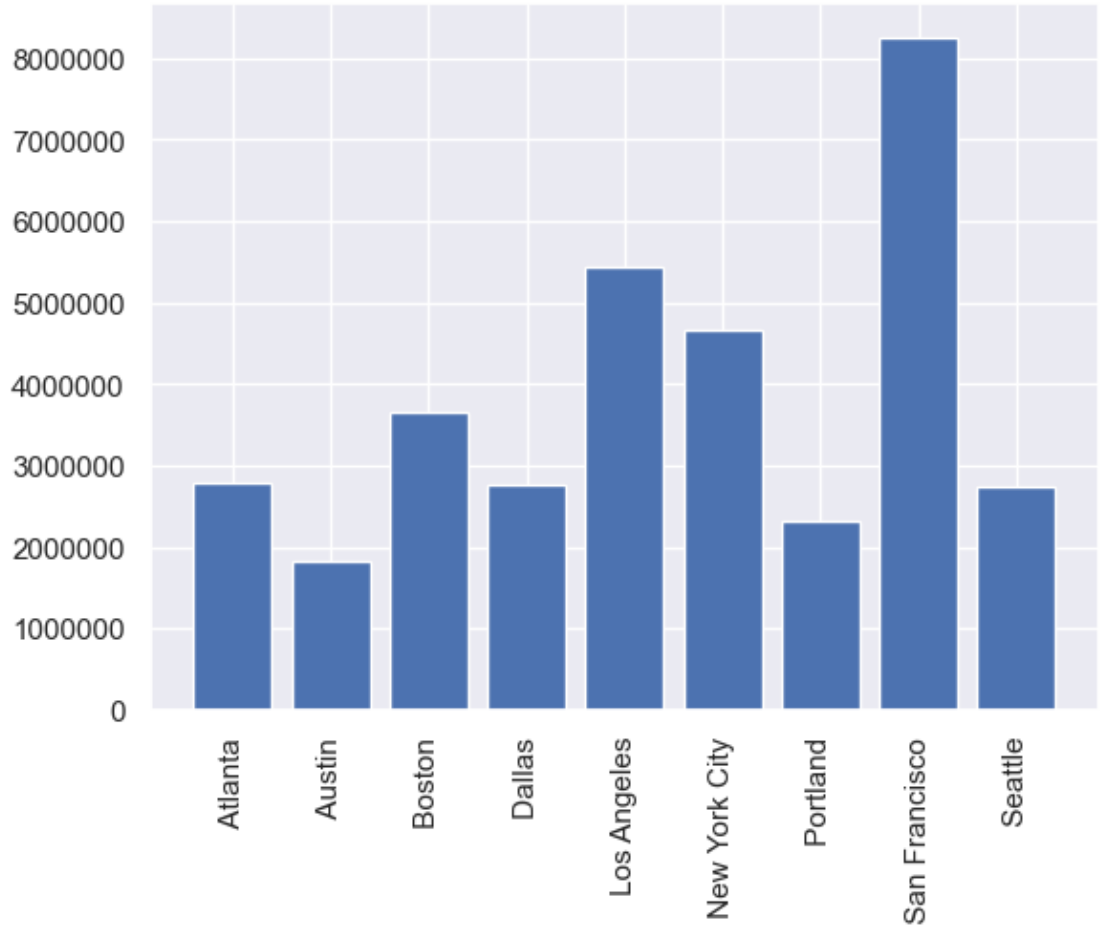
	Order ID	Order Date	Product	Quantity Ordered	Price Each	Sales	Month	Purchase Address	City
0	176558	2019-04-19 08:46:00	USB-C Charging Cable	2	11.950000	23.900000	4	917 1st St, Dallas, TX 75001	Dallas
1	176559	2019-04-07 22:30:00	Bose SoundSport Headphones	1	99.989998	99.989998	4	682 Chestnut St, Boston, MA 02215	
2	176560	2019-04-12 14:38:00	Google Phone	1	600.000000	600.000000	4	669 Spruce St, Los Angeles, CA 90001	

```
1         Boston
2    Los Angeles
```

[28]:
```
df_temp =df[['Month','City','Quantity Ordered','Price Each','Sales']].
↪groupby(by=['City']).sum()
```

[29]:
```
# plotting

# Set the scientific Notation oFf
plt.ticklabel_format(style='plain', axis='both')

plt.xticks(rotation = 'vertical')
plt.bar(x = df_temp.index, height = df_temp['Sales'])
```

[29]:
```
<BarContainer object of 9 artists>
```



[30]:
```
del df_temp
```

1.4.3 Q3 What time must we display the ad to maximise the sales??

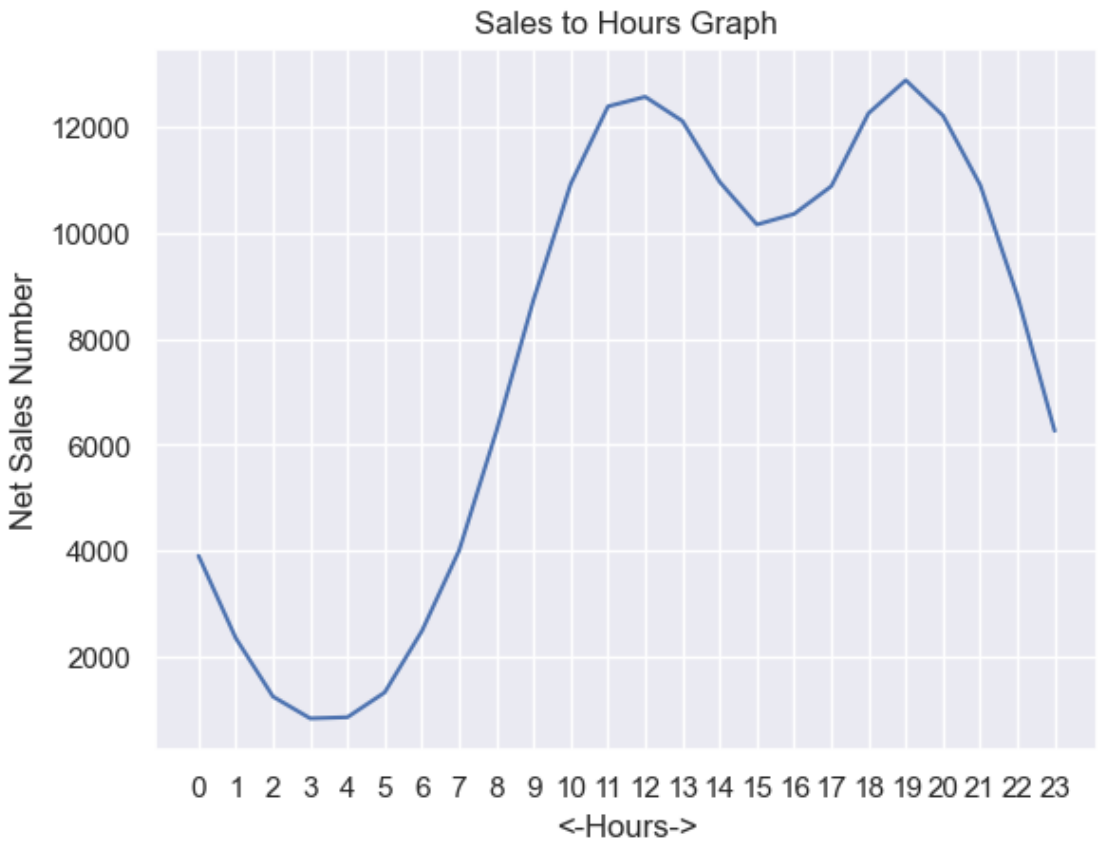
- We must display the ads one or two hpurs prior to 11 AM or 7 PM to maximize our sales

[31]:
```
df['Hour'] = df['Order Date'].dt.hour
df.head(2)
```

[31]:
```
   Order ID          Order Date                    Product  Quantity Ordered  \
0    176558 2019-04-19 08:46:00       USB-C Charging Cable                 2
1    176559 2019-04-07 22:30:00  Bose SoundSport Headphones                 1

   Price Each      Sales  Month                  Purchase Address     City  \
0   11.950000  23.900000      4      917 1st St, Dallas, TX 75001   Dallas
1   99.989998  99.989998      4  682 Chestnut St, Boston, MA 02215   Boston

   Hour
0     8
1    22
```

[32]:
```
# Plotting
ls_index = df[['Hour','Sales']].groupby('Hour').count().index
sales = df[['Hour','Sales']].groupby('Hour').count()['Sales']

# plotting the sales
plt.xlabel('<-Hours->')
plt.ylabel('Net Sales Number')
plt.title('Sales to Hours Graph')
plt.xticks(ls_index)
plt.grid(visible =True,which = 'both')
plt.plot(ls_index,sales)
```

[32]:
```
[<matplotlib.lines.Line2D at 0x1859f75eab0>]
```



1.5 Q4 Which Items were sold Toghether

- iPhone, Lightning Charging Cable were the items which were bought toghether the most

[33]:
```
# Get Duplcates
d2 =df.copy()
df = df[df['Order ID'].duplicated(keep = False)]
df.head()
```

[33]:

	Order ID	Order Date	Product	Quantity Ordered	Price Each	Sales	Month	Purchase Address
2	176560	2019-04-12 14:38:00	Google Phone	1	600.00	600.00	4	669 Spruce St, Los Angeles, CA 90001
3	176560	2019-04-12 14:38:00	Wired Headphones	1	11.99	11.99	4	669 Spruce St, Los Angeles, CA 90001
17	176574	2019-04-03 19:42:00	Google Phone	1	600.00	600.00	4	20 Hill St, Los Angeles, CA 90001
18	176574	2019-04-03 19:42:00	USB-C Charging Cable	1				
30	176586	2019-04-10 17:00:00	AAA Batteries (4-pack)	2				

```
18       11.95   11.95      4       20 Hill St, Los Angeles, CA 90001
30        2.99    5.98      4  365 Center St, San Francisco, CA 94016

              City  Hour
2      Los Angeles    14
3      Los Angeles    14
17     Los Angeles    19
18     Los Angeles    19
30   San Francisco    17
```

[34]:
```
df['Total Products'] = df.groupby('Order ID')['Product'].transform(lambda x:␣
 ↪','.join(list(x)) )
df = df[['Order ID','Total Products']].drop_duplicates()
df
```

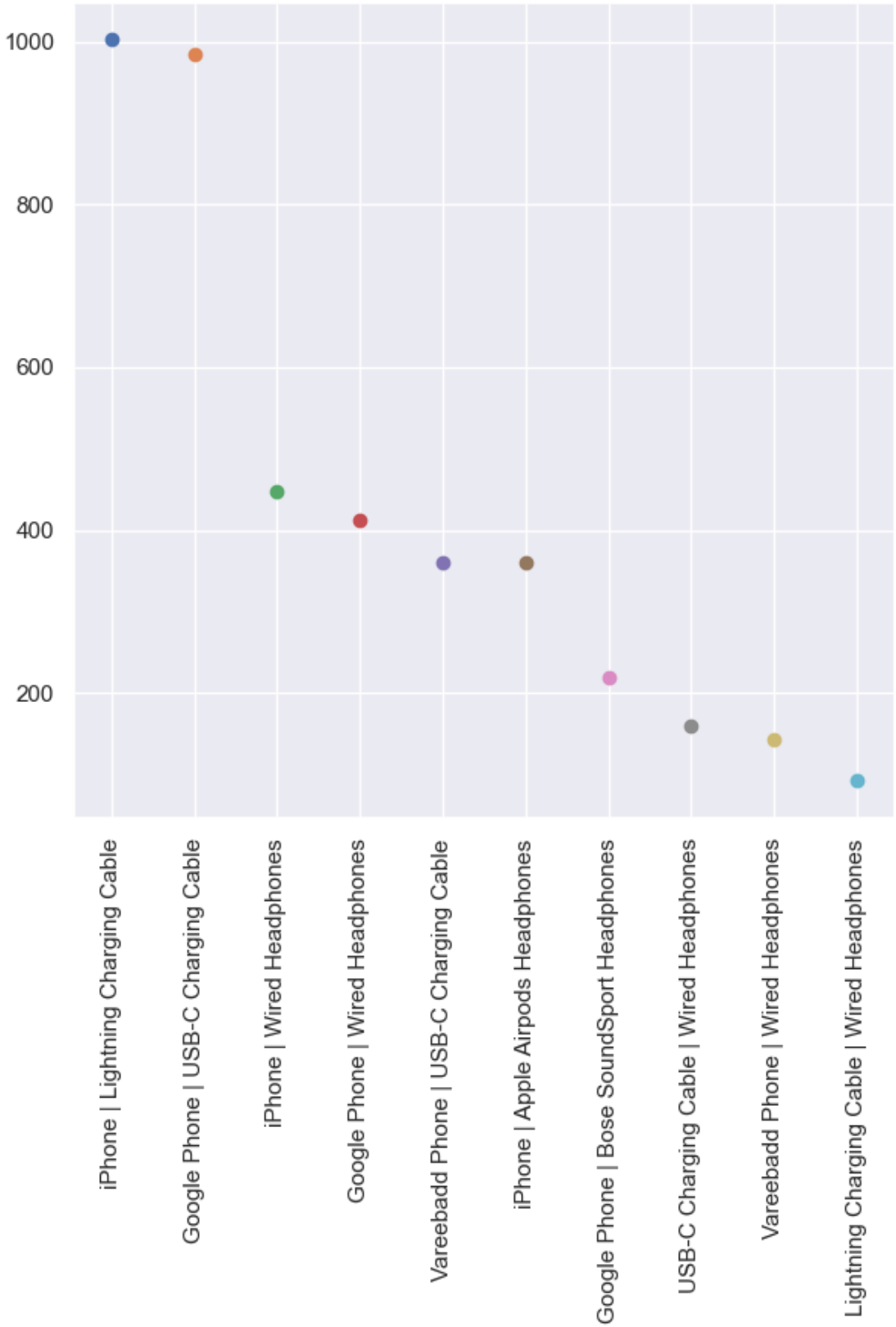
[34]:
```
        Order ID                                  Total Products
2         176560                  Google Phone,Wired Headphones
17        176574              Google Phone,USB-C Charging Cable
30        176586            AAA Batteries (4-pack),Google Phone
117       176672  Lightning Charging Cable,USB-C Charging Cable
127       176681       Apple Airpods Headphones,ThinkPad Laptop
…          …                                               …
185600    259277                         iPhone,Wired Headphones
185621    259297                 iPhone,Lightning Charging Cable
185628    259303   34in Ultrawide Monitor,AA Batteries (4-pack)
185640    259314        Wired Headphones,AAA Batteries (4-pack)
185677    259350              Google Phone,USB-C Charging Cable

[6879 rows x 2 columns]
```

[35]:
```
# Counting the Combinations
from itertools import combinations
from collections import Counter

count = Counter()

for row in df['Total Products']:
    row_list = row.split(',')
    count.update(Counter(combinations(row_list, 2)))

for key,value in count.most_common(10):
    print(key, value)
```

```
('iPhone', 'Lightning Charging Cable') 1002
('Google Phone', 'USB-C Charging Cable') 985
('iPhone', 'Wired Headphones') 447
('Google Phone', 'Wired Headphones') 413
```

```
('Vareebadd Phone', 'USB-C Charging Cable') 361
('iPhone', 'Apple Airpods Headphones') 360
('Google Phone', 'Bose SoundSport Headphones') 220
('USB-C Charging Cable', 'Wired Headphones') 159
('Vareebadd Phone', 'Wired Headphones') 143
('Lightning Charging Cable', 'Wired Headphones') 92
```

[36]:
```
# plotting
plt.figure(figsize=(7,7))

for key,value in count.most_common(10):
    plt.xticks(rotation = 'vertical')
    plt.grid(visible =True,which = 'both')
    plt.scatter(x = str(key[0] + ' | ' + key[1]),y = value)
```


1000
800
600
400
200
iPhone | Lightning Charging Cable
Google Phone | USB-C Charging Cable
iPhone | Wired Headphones
Google Phone | Wired Headphones
Vareebadd Phone | USB-C Charging Cable
iPhone | Apple Airpods Headphones
Google Phone | Bose SoundSport Headphones
USB-C Charging Cable | Wired Headphones
Vareebadd Phone | Wired Headphones
Lightning Charging Cable | Wired Headphones

1.5.1 Q5 Which Product Sold the most

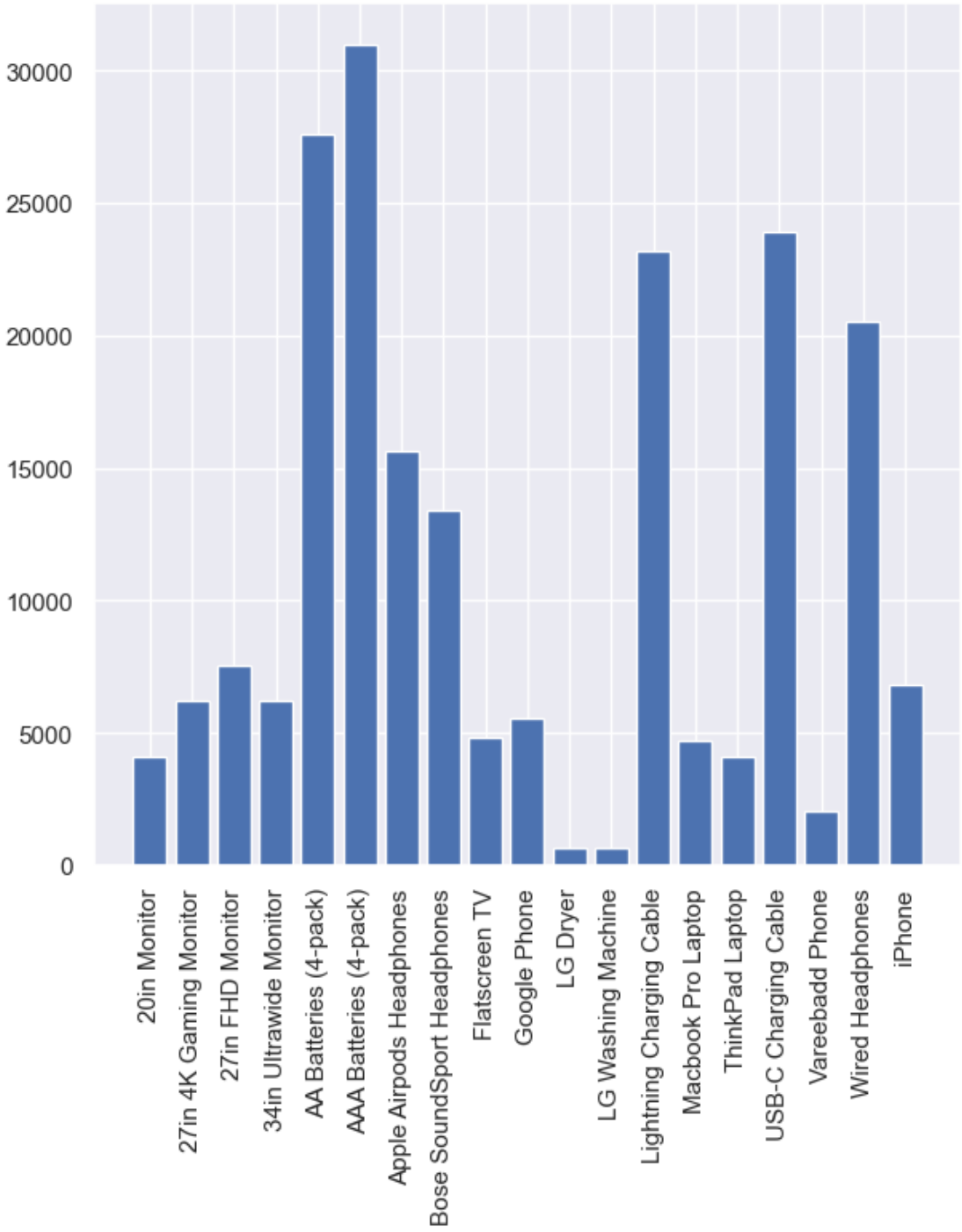
[37]:
```
dpr = d2[['Product','Quantity Ordered']].groupby(by = 'Product').sum()
dpr
```

[37]:

Product	Quantity Ordered
20in Monitor	4126
27in 4K Gaming Monitor	6239
27in FHD Monitor	7541
34in Ultrawide Monitor	6192
AA Batteries (4-pack)	27615
AAA Batteries (4-pack)	30986
Apple Airpods Headphones	15637
Bose SoundSport Headphones	13430
Flatscreen TV	4813
Google Phone	5529
LG Dryer	646
LG Washing Machine	666
Lightning Charging Cable	23169
Macbook Pro Laptop	4725
ThinkPad Laptop	4128
USB-C Charging Cable	23931
Vareebadd Phone	2068
Wired Headphones	20524
iPhone	6847

[38]:
```
# plotting

plt.figure(figsize=(7,7))
plt.xticks(rotation = 'vertical')
plt.grid(visible =True,which = 'both')
plt.bar(x = dpr.index,height=dpr['Quantity Ordered'])
```

[38]:
```
<BarContainer object of 19 artists>
```



1.5.2 Q6 Which Product Brought the most Money

[39]:
```
d2.head()
```

[39]:

	Order ID	Order Date	Product	Quantity Ordered	\
0	176558	2019-04-19 08:46:00	USB-C Charging Cable	2	
1	176559	2019-04-07 22:30:00	Bose SoundSport Headphones	1	
2	176560	2019-04-12 14:38:00	Google Phone	1	
3	176560	2019-04-12 14:38:00	Wired Headphones	1	
4	176561	2019-04-30 09:27:00	Wired Headphones	1	

	Price Each	Sales	Month	Purchase Address	\
0	11.950000	23.900000	4	917 1st St, Dallas, TX 75001	
1	99.989998	99.989998	4	682 Chestnut St, Boston, MA 02215	
2	600.000000	600.000000	4	669 Spruce St, Los Angeles, CA 90001	
3	11.990000	11.990000	4	669 Spruce St, Los Angeles, CA 90001	
4	11.990000	11.990000	4	333 8th St, Los Angeles, CA 90001	

	City	Hour
0	Dallas	8
1	Boston	22
2	Los Angeles	14
3	Los Angeles	14
4	Los Angeles	9

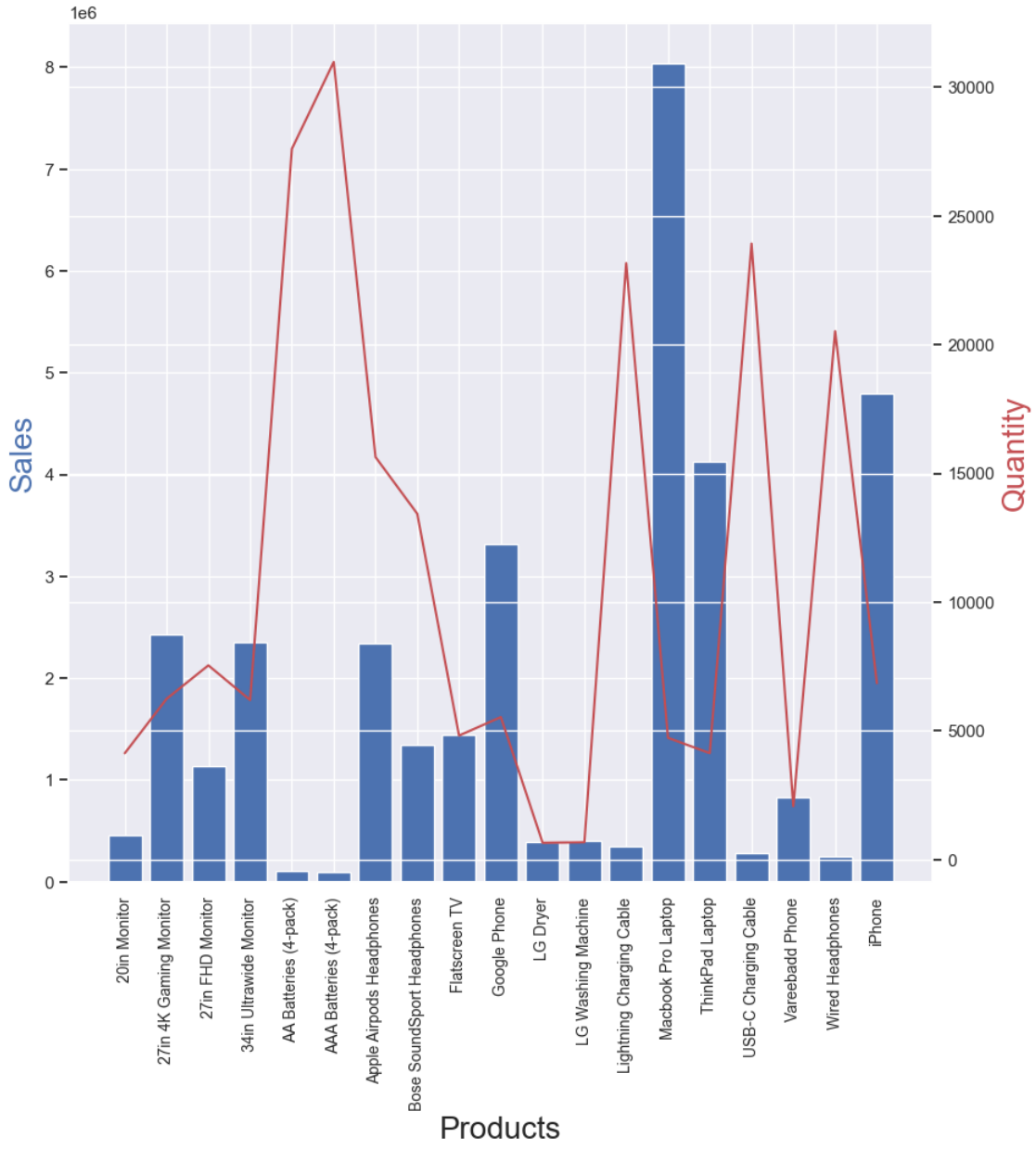
[40]:
```
dmon = d2[['Product','Sales','Quantity Ordered']].groupby('Product').sum()
dmon
```

[40]:

Product	Sales	Quantity Ordered
20in Monitor	4.538187e+05	4126
27in 4K Gaming Monitor	2.433148e+06	6239
27in FHD Monitor	1.131075e+06	7541
34in Ultrawide Monitor	2.352898e+06	6192
AA Batteries (4-pack)	1.060416e+05	27615
AAA Batteries (4-pack)	9.264814e+04	30986
Apple Airpods Headphones	2.345550e+06	15637
Bose SoundSport Headphones	1.342866e+06	13430
Flatscreen TV	1.443900e+06	4813
Google Phone	3.317400e+06	5529
LG Dryer	3.876000e+05	646
LG Washing Machine	3.996000e+05	666
Lightning Charging Cable	3.463765e+05	23169
Macbook Pro Laptop	8.032500e+06	4725
ThinkPad Laptop	4.127959e+06	4128
USB-C Charging Cable	2.859754e+05	23931
Vareebadd Phone	8.272000e+05	2068
Wired Headphones	2.460828e+05	20524
iPhone	4.792900e+06	6847

[41]:
```
# plotting
fig, ax1 = plt.subplots()

# change the height
fig.set_figheight(10)
fig.set_figwidth(10)

ax2 = ax1.twinx()
ax1.bar(x =dmon.index,height = dmon['Sales'],color = 'b')
ax2.plot(dmon.index,dmon['Quantity Ordered'],color = 'r')

ax1.set_xlabel('Products',fontsize =20)
ax1.set_ylabel('Sales', color='b',fontsize =20)
ax2.set_ylabel('Quantity', color='r',fontsize =20)

ax1.set_xticklabels(dmon.index,rotation = 'vertical',size=10)

#plt.bar(x =dmon.index,height = dmon['Sales'])
fig.show()
```

```
C:\Users\gamin\AppData\Local\Temp\ipykernel_11308\3863813624.py:16: UserWarning:
set_ticklabels() should only be used with a fixed number of ticks, i.e. after
set_ticks() or using a FixedLocator.
  ax1.set_xticklabels(dmon.index,rotation = 'vertical',size=10)
C:\Users\gamin\AppData\Local\Temp\ipykernel_11308\3863813624.py:19: UserWarning:
FigureCanvasAgg is non-interactive, and thus cannot be shown
  fig.show()
```



[42]:
```
# Most bought Scatter plot

dmon2 = d2[['Product','Sales','City']]
dmon2['City'] = dmon2['City'].astype('category')
dmon2
```

```
C:\Users\gamin\AppData\Local\Temp\ipykernel_11308\1833799112.py:4:
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/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  dmon2['City'] = dmon2['City'].astype('category')
```

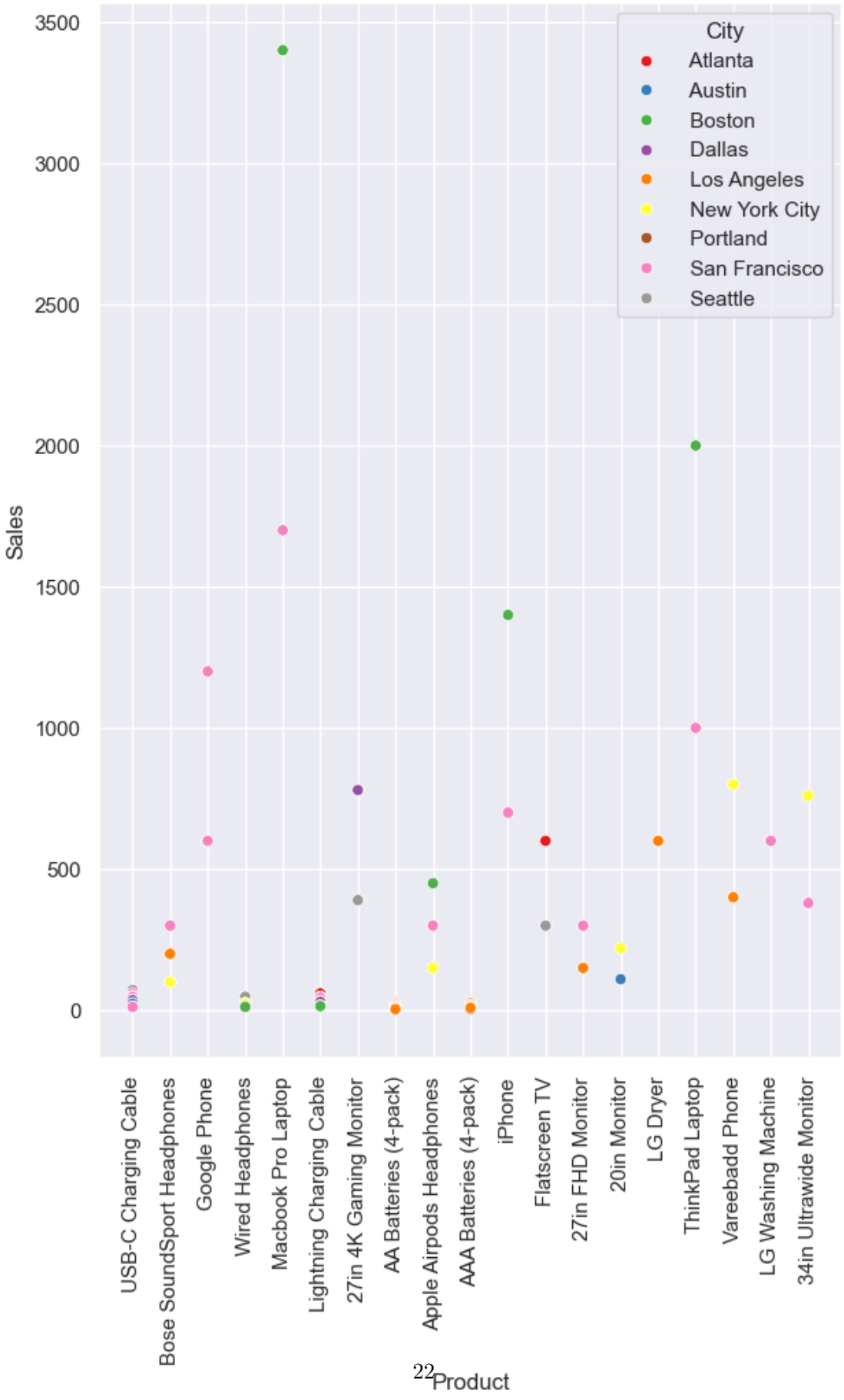
[42]:

	Product	Sales	City
0	USB-C Charging Cable	23.900000	Dallas
1	Bose SoundSport Headphones	99.989998	Boston
2	Google Phone	600.000000	Los Angeles
3	Wired Headphones	11.990000	Los Angeles
4	Wired Headphones	11.990000	Los Angeles
…	…	…	…
185681	AAA Batteries (4-pack)	8.970000	Los Angeles
185682	iPhone	700.000000	San Francisco
185683	iPhone	700.000000	San Francisco
185684	34in Ultrawide Monitor	379.989990	San Francisco
185685	USB-C Charging Cable	11.950000	San Francisco

[185686 rows x 3 columns]

[43]:
```
# plotting

plt.figure(figsize=(7,10))
# Set the scientific Notation oFf
plt.ticklabel_format(style='plain', axis='both')

plt.xticks(rotation = 'vertical')
plt.grid(visible =True,which = 'both')
sns.scatterplot(data =dmon2,x = 'Product', y = 'Sales',hue␣
 ↪='City',palette='Set1')
```

[43]:
```
<Axes: xlabel='Product', ylabel='Sales'>
```


City
Atlanta
Austin
Boston
Dallas
Los Angeles
New York City
Portland
San Francisco
Seattle
Sales
3500
3000
2500
2000
1500
1000
500
0
USB-C Charging Cable
Bose SoundSport Headphones
Google Phone
Wired Headphones
Macbook Pro Laptop
Lightning Charging Cable
27in 4K Gaming Monitor
AA Batteries (4-pack)
Apple Airpods Headphones
AAA Batteries (4-pack)
iPhone
Flatscreen TV
27in FHD Monitor
20in Monitor
LG Dryer
ThinkPad Laptop
Vareebadd Phone
LG Washing Machine
34in Ultrawide Monitor
Product

2 Task 4 Geoplotting

[44]:
```
import json
import plotly.express as px
```

[45]:
```
# city state map
city_state_map = {
    'Dallas': 'Texas',
    'Boston': 'Massachusetts',
    'Los Angeles': 'California',
    'San Francisco': 'California',
    'Seattle': 'Washington',
    'Atlanta': 'Georgia',
    'New York City': 'New York',
    'Portland': 'Oregon',
    'Austin': 'Texas'
}
```

[46]:
```
d2['State'] = d2['City'].apply(lambda city : city_state_map[city.strip()])
```

[47]:
```
d2.head()
```

[47]:

	Order ID	Order Date	Product	Quantity Ordered	Price Each	Sales	Month	Purchase Address	City	Hour	State
0	176558	2019-04-19 08:46:00	USB-C Charging Cable	2	11.950000	23.900000	4	917 1st St, Dallas, TX 75001	Dallas	8	Texas
1	176559	2019-04-07 22:30:00	Bose SoundSport Headphones	1	99.989998	99.989998	4	682 Chestnut St, Boston, MA 02215	Boston	22	Massachusetts
2	176560	2019-04-12 14:38:00	Google Phone	1	600.000000	600.000000	4	669 Spruce St, Los Angeles, CA 90001	Los Angeles	14	California
3	176560	2019-04-12 14:38:00	Wired Headphones	1	11.990000	11.990000	4	669 Spruce St, Los Angeles, CA 90001	Los Angeles	14	California
4	176561	2019-04-30 09:27:00	Wired Headphones	1	11.990000	11.990000	4	333 8th St, Los Angeles, CA 90001	Los Angeles	9	California

[48]:
```
us_states = json.load(open('Us_sates.json','r'))
us_states['features'][10].keys()
```

[48]:
```
dict_keys(['type', 'properties', 'geometry'])
```

[49]:
```
state_id_map = {}
for feature in us_states['features']:
    feature['id']  = feature['properties']['STATE']
    state_id_map[feature['properties']['NAME']] = feature['id']
```

[50]:
```
us_states['features'][0]['properties']
```

[50]:
```
{'GEO_ID': '0400000US23',
 'STATE': '23',
 'NAME': 'Maine',
 'LSAD': '',
 'CENSUSAREA': 30842.923}
```

[51]:
```
# map state to code
d2['State Code'] = d2['State'].apply(lambda state : state_id_map[state])
d2.head(2)
```

[51]:
```
   Order ID          Order Date                    Product  Quantity Ordered  \
0    176558 2019-04-19 08:46:00        USB-C Charging Cable                 2
1    176559 2019-04-07 22:30:00  Bose SoundSport Headphones                 1

   Price Each      Sales  Month                  Purchase Address     City  \
0   11.950000  23.900000      4       917 1st St, Dallas, TX 75001   Dallas
1   99.989998  99.989998      4  682 Chestnut St, Boston, MA 02215   Boston

   Hour          State State Code
0     8          Texas         48
1    22  Massachusetts         25
```

[52]:
```
# Taking log for better vs
d2['Sales Log'] =  np.log10(d2['Sales'])
d2.head(2)
```

[52]:
```
   Order ID          Order Date                    Product  Quantity Ordered  \
0    176558 2019-04-19 08:46:00        USB-C Charging Cable                 2
1    176559 2019-04-07 22:30:00  Bose SoundSport Headphones                 1

   Price Each      Sales  Month                  Purchase Address     City  \
0   11.950000  23.900000      4       917 1st St, Dallas, TX 75001   Dallas
1   99.989998  99.989998      4  682 Chestnut St, Boston, MA 02215   Boston

   Hour          State State Code  Sales Log
```

```
0     8          Texas          48   1.378398
1    22  Massachusetts          25   1.999957
```

[53]:
```
fig =px.choropleth(d2,locations='State Code',geojson = us_states,color='Sales Log',scope ='usa'
                   ,hover_name='State',hover_data=['Sales'])

# Customize the color scale labels to disable scientific notation
fig.update_layout(coloraxis_colorbar=dict(
    tickformat='.0f',  # Specify format for color scale labels (no decimal places)
    title='Sales'
))

# focus on location
fig.update_geos(fitbounds = 'locations',visible = True)

fig.show()
```

[54]:
```
fig2 =px.choropleth_mapbox(d2,locations='State Code',geojson =us_states,color='Sales Log'
                           
,hover_name='State',hover_data=['Sales'],mapbox_style="carto-positron"
                            ,center={'lat':42.184155,'ldn': -71.206245},zoom=3,opacity = 0.5)

fig2.show()
```

3 THE END