In [37]:
```
import pandas as pd
import os
import matplotlib.pyplot as plt
import re
import datetime as dt
import itertools
from itertools import combinations
import collections
from collections import Counter
```

In [2]:
```
os.listdir('Sales')
```

Out[2]:
```
['.ipynb_checkpoints',
 'Sales_April_2019.csv',
 'Sales_August_2019.csv',
 'Sales_December_2019.csv',
 'Sales_February_2019.csv',
 'Sales_January_2019.csv',
 'Sales_July_2019.csv',
 'Sales_June_2019.csv',
 'Sales_March_2019.csv',
 'Sales_May_2019.csv',
 'Sales_November_2019.csv',
 'Sales_October_2019.csv',
 'Sales_September_2019.csv']
```

In [3]:
```
df=pd.DataFrame()
```

In [4]:
```
files = os.listdir('Sales')
for x in files:

    file_path = os.path.join('Sales', x)

    if os.path.isfile(file_path):
        file = pd.read_csv(file_path)
        df = pd.concat([df, file])
```

In [5]:
```
df.head(40)
```

Out[5]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	176558	USB-C Charging Cable	2	11.95	04/19/19 08:46	917 1st St, Dallas, TX 75001
1	NaN	NaN	NaN	NaN	NaN	NaN
2	176559	Bose SoundSport Headphones	1	99.99	04/07/19 22:30	682 Chestnut St, Boston, MA 02215
3	176560	Google Phone	1	600	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
4	176560	Wired Headphones	1	11.99	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
5	176561	Wired Headphones	1	11.99	04/30/19 09:27	333 8th St, Los Angeles, CA 90001
6	176562	USB-C Charging Cable	1	11.95	04/29/19 13:03	381 Wilson St, San Francisco, CA 94016
7	176563	Bose SoundSport Headphones	1	99.99	04/02/19 07:46	668 Center St, Seattle, WA 98101

8	176564	USB-C Charging Cable	1	11.95	04/12/19 10:58	790 Ridge St, Atlanta, GA 30301
9	176565	Macbook Pro Laptop	1	1700	04/24/19 10:38	915 Willow St, San Francisco, CA 94016
10	176566	Wired Headphones	1	11.99	04/08/19 14:05	83 7th St, Boston, MA 02215
11	176567	Google Phone	1	600	04/18/19 17:18	444 7th St, Los Angeles, CA 90001
12	176568	Lightning Charging Cable	1	14.95	04/15/19 12:18	438 Elm St, Seattle, WA 98101
13	176569	27in 4K Gaming Monitor	1	389.99	04/16/19 19:23	657 Hill St, Dallas, TX 75001
14	176570	AA Batteries (4-pack)	1	3.84	04/22/19 15:09	186 12th St, Dallas, TX 75001
15	176571	Lightning Charging Cable	1	14.95	04/19/19 14:29	253 Johnson St, Atlanta, GA 30301
16	176572	Apple Airpods Headphones	1	150	04/04/19 20:30	149 Dogwood St, New York City, NY 10001
17	176573	USB-C Charging Cable	1	11.95	04/27/19 18:41	214 Chestnut St, San Francisco, CA 94016
18	176574	Google Phone	1	600	04/03/19 19:42	20 Hill St, Los Angeles, CA 90001
19	176574	USB-C Charging Cable	1	11.95	04/03/19 19:42	20 Hill St, Los Angeles, CA 90001
20	176575	AAA Batteries (4-pack)	1	2.99	04/27/19 00:30	433 Hill St, New York City, NY 10001
21	176576	Apple Airpods Headphones	1	150	04/28/19 11:42	771 Ridge St, Los Angeles, CA 90001
22	176577	Apple Airpods Headphones	1	150	04/04/19 19:25	260 Spruce St, Dallas, TX 75001
23	176578	Apple Airpods Headphones	1	150	04/09/19 23:35	513 Church St, Boston, MA 02215
24	176579	AA Batteries (4-pack)	1	3.84	04/11/19 10:23	886 Jefferson St, New York City, NY 10001
25	176580	USB-C Charging Cable	1	11.95	04/05/19 00:35	886 Willow St, Los Angeles, CA 90001
26	176581	iPhone	1	700	04/09/19 21:38	84 Jackson St, Boston, MA 02215
27	176582	Bose SoundSport Headphones	1	99.99	04/27/19 12:20	178 Lincoln St, Atlanta, GA 30301
28	176583	AAA Batteries (4-pack)	2	2.99	04/20/19 12:00	146 Jackson St, Portland, OR 97035
29	176584	Flatscreen TV	1	300	04/24/19 20:39	936 Church St, San Francisco, CA 94016
30	176585	Bose SoundSport Headphones	1	99.99	04/07/19 11:31	823 Highland St, Boston, MA 02215
31	176585	Bose SoundSport Headphones	1	99.99	04/07/19 11:31	823 Highland St, Boston, MA 02215

32	176586	AAA Batteries (4-pack)	2	2.99	04/10/19 17:00	365 Center St, San Francisco, CA 94016
33	176586	Google Phone	1	600	04/10/19 17:00	365 Center St, San Francisco, CA 94016
34	176587	27in FHD Monitor	1	149.99	04/29/19 19:38	557 5th St, Los Angeles, CA 90001
35	176588	20in Monitor	1	109.99	04/02/19 04:00	765 Cherry St, Seattle, WA 98101
36	176589	Lightning Charging Cable	1	14.95	04/04/19 12:23	846 Highland St, Atlanta, GA 30301
37	176590	Google Phone	1	600	04/11/19 11:46	873 6th St, New York City, NY 10001
38	176591	Apple Airpods Headphones	1	150	04/21/19 07:21	600 Maple St, Austin, TX 73301
39	176592	USB-C Charging Cable	1	11.95	04/27/19 13:04	352 4th St, Los Angeles, CA 90001

In [6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 186850 entries, 0 to 11685
Data columns (total 6 columns):
 #   Column            Non-Null Count   Dtype 
---  ------            --------------   ----- 
 0   Order ID          186305 non-null  object
 1   Product           186305 non-null  object
 2   Quantity Ordered  186305 non-null  object
 3   Price Each        186305 non-null  object
 4   Order Date        186305 non-null  object
 5   Purchase Address  186305 non-null  object
dtypes: object(6)
memory usage: 10.0+ MB
```

In [7]:
```
#lets count null content
df.isnull().value_counts()
```

Out[7]:
```
Order ID  Product  Quantity Ordered  Price Each  Order Date  Purchase Address
False     False    False             False       False       False             186305
True      True     True              True        True        True                 545
Name: count, dtype: int64
```

In [8]:
```
df['Order ID'].isnull().value_counts()
```

Out[8]:
```
Order ID
False    186305
True        545
Name: count, dtype: int64
```

In [9]:
```
df=df[df['Order ID'].notnull()]
df
```

Out[9]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	176558	USB-C Charging Cable	2	11.95	04/19/19 08:46	917 1st St, Dallas, TX 75001
2	176559	Bose SoundSport Headphones	1	99.99	04/07/19 22:30	682 Chestnut St, Boston, MA 02215
3	176560	Google Phone	1	600	04/12/19	669 Spruce St, Los Angeles, CA

					14:38	90001
4	176560	Wired Headphones	1	11.99	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
5	176561	Wired Headphones	1	11.99	04/30/19 09:27	333 8th St, Los Angeles, CA 90001
...	...	...	...	...	...	...
11681	259353	AAA Batteries (4-pack)	3	2.99	09/17/19 20:56	840 Highland St, Los Angeles, CA 90001
11682	259354	iPhone	1	700	09/01/19 16:00	216 Dogwood St, San Francisco, CA 94016
11683	259355	iPhone	1	700	09/23/19 07:39	220 12th St, San Francisco, CA 94016
11684	259356	34in Ultrawide Monitor	1	379.99	09/19/19 17:30	511 Forest St, San Francisco, CA 94016
11685	259357	USB-C Charging Cable	1	11.95	09/30/19 00:18	250 Meadow St, San Francisco, CA 94016

186305 rows × 6 columns

In [10]:
```
df.isnull().value_counts()
```

Out[10]:
```
Order ID  Product  Quantity Ordered  Price Each  Order Date  Purchase Address
False     False    False             False       False       False             186305
Name: count, dtype: int64
```

In [11]:
```
df.head()
```

Out[11]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	176558	USB-C Charging Cable	2	11.95	04/19/19 08:46	917 1st St, Dallas, TX 75001
2	176559	Bose SoundSport Headphones	1	99.99	04/07/19 22:30	682 Chestnut St, Boston, MA 02215
3	176560	Google Phone	1	600	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
4	176560	Wired Headphones	1	11.99	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
5	176561	Wired Headphones	1	11.99	04/30/19 09:27	333 8th St, Los Angeles, CA 90001

In [12]:
```
df.iloc[514:,:]
#position 519 has object type
```

Out[12]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
516	177052	USB-C Charging Cable	2	11.95	04/02/19 09:30	532 Walnut St, San Francisco, CA 94016
517	177053	Wired Headphones	1	11.99	04/24/19 20:45	5 Adams St, Boston, MA 02215
518	177054	Apple Airpods Headphones	1	150	04/09/19 19:18	800 Jackson St, Atlanta, GA 30301

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
519	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
520	177055	Lightning Charging Cable	1	14.95	04/09/19 12:37	59 Forest St, Atlanta, GA 30301
...	...	...	...	...	...	...
11681	259353	AAA Batteries (4-pack)	3	2.99	09/17/19 20:56	840 Highland St, Los Angeles, CA 90001
11682	259354	iPhone	1	700	09/01/19 16:00	216 Dogwood St, San Francisco, CA 94016
11683	259355	iPhone	1	700	09/23/19 07:39	220 12th St, San Francisco, CA 94016
11684	259356	34in Ultrawide Monitor	1	379.99	09/19/19 17:30	511 Forest St, San Francisco, CA 94016
11685	259357	USB-C Charging Cable	1	11.95	09/30/19 00:18	250 Meadow St, San Francisco, CA 94016

185791 rows × 6 columns

In [13]:
```
df['Quantity Ordered'] = pd.to_numeric(df['Quantity Ordered'], errors='coerce')
df = df[pd.notna(df['Quantity Ordered'])]
df
```

Out[13]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	176558	USB-C Charging Cable	2.0	11.95	04/19/19 08:46	917 1st St, Dallas, TX 75001
2	176559	Bose SoundSport Headphones	1.0	99.99	04/07/19 22:30	682 Chestnut St, Boston, MA 02215
3	176560	Google Phone	1.0	600	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
4	176560	Wired Headphones	1.0	11.99	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
5	176561	Wired Headphones	1.0	11.99	04/30/19 09:27	333 8th St, Los Angeles, CA 90001
...	...	...	...	...	...	...
11681	259353	AAA Batteries (4-pack)	3.0	2.99	09/17/19 20:56	840 Highland St, Los Angeles, CA 90001
11682	259354	iPhone	1.0	700	09/01/19 16:00	216 Dogwood St, San Francisco, CA 94016
11683	259355	iPhone	1.0	700	09/23/19 07:39	220 12th St, San Francisco, CA 94016
11684	259356	34in Ultrawide Monitor	1.0	379.99	09/19/19 17:30	511 Forest St, San Francisco, CA 94016
11685	259357	USB-C Charging Cable	1.0	11.95	09/30/19 00:18	250 Meadow St, San Francisco, CA 94016

185950 rows × 6 columns

In [14]:
```
df['Quantity Ordered']=df['Quantity Ordered'].astype('int64')
```

```
df['Price Each']=df['Price Each'].astype('float')
df
```

```
C:\Users\Ledwin Torres\AppData\Local\Temp\ipykernel_7532\110518105.py:1: SettingWithCopy
Warning:
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
  df['Quantity Ordered']=df['Quantity Ordered'].astype('int64')
C:\Users\Ledwin Torres\AppData\Local\Temp\ipykernel_7532\110518105.py:2: SettingWithCopy
Warning:
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
  df['Price Each']=df['Price Each'].astype('float')
```

Out[14]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	176558	USB-C Charging Cable	2	11.95	04/19/19 08:46	917 1st St, Dallas, TX 75001
2	176559	Bose SoundSport Headphones	1	99.99	04/07/19 22:30	682 Chestnut St, Boston, MA 02215
3	176560	Google Phone	1	600.00	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
4	176560	Wired Headphones	1	11.99	04/12/19 14:38	669 Spruce St, Los Angeles, CA 90001
5	176561	Wired Headphones	1	11.99	04/30/19 09:27	333 8th St, Los Angeles, CA 90001
...	...	...	...	...	...	...
11681	259353	AAA Batteries (4-pack)	3	2.99	09/17/19 20:56	840 Highland St, Los Angeles, CA 90001
11682	259354	iPhone	1	700.00	09/01/19 16:00	216 Dogwood St, San Francisco, CA 94016
11683	259355	iPhone	1	700.00	09/23/19 07:39	220 12th St, San Francisco, CA 94016
11684	259356	34in Ultrawide Monitor	1	379.99	09/19/19 17:30	511 Forest St, San Francisco, CA 94016
11685	259357	USB-C Charging Cable	1	11.95	09/30/19 00:18	250 Meadow St, San Francisco, CA 94016

185950 rows × 6 columns

In [15]:

```
df['Order Date']=pd.to_datetime(df['Order Date'])
df
```

```
C:\Users\Ledwin Torres\AppData\Local\Temp\ipykernel_7532\879419774.py:1: UserWarning: Co
uld not infer format, so each element will be parsed individually, falling back to `date
util`. To ensure parsing is consistent and as-expected, please specify a format.
  df['Order Date']=pd.to_datetime(df['Order Date'])
C:\Users\Ledwin Torres\AppData\Local\Temp\ipykernel_7532\879419774.py:1: SettingWithCopy
Warning:
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
  df['Order Date']=pd.to_datetime(df['Order Date'])
```

Out[15]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	176558	USB-C Charging Cable	2	11.95	2019-04-19 08:46:00	917 1st St, Dallas, TX 75001
2	176559	Bose SoundSport Headphones	1	99.99	2019-04-07 22:30:00	682 Chestnut St, Boston, MA 02215
3	176560	Google Phone	1	600.00	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001
4	176560	Wired Headphones	1	11.99	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001
5	176561	Wired Headphones	1	11.99	2019-04-30 09:27:00	333 8th St, Los Angeles, CA 90001
...	...	...	...	...	...	...
11681	259353	AAA Batteries (4-pack)	3	2.99	2019-09-17 20:56:00	840 Highland St, Los Angeles, CA 90001
11682	259354	iPhone	1	700.00	2019-09-01 16:00:00	216 Dogwood St, San Francisco, CA 94016
11683	259355	iPhone	1	700.00	2019-09-23 07:39:00	220 12th St, San Francisco, CA 94016
11684	259356	34in Ultrawide Monitor	1	379.99	2019-09-19 17:30:00	511 Forest St, San Francisco, CA 94016
11685	259357	USB-C Charging Cable	1	11.95	2019-09-30 00:18:00	250 Meadow St, San Francisco, CA 94016

185950 rows × 6 columns

In [16]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 185950 entries, 0 to 11685
Data columns (total 6 columns):
 #   Column            Non-Null Count   Dtype 
---  ------            --------------   ----- 
 0   Order ID          185950 non-null  object
 1   Product           185950 non-null  object
 2   Quantity Ordered  185950 non-null  int64 
 3   Price Each        185950 non-null  float64
 4   Order Date        185950 non-null  datetime64[ns]
 5   Purchase Address  185950 non-null  object
dtypes: datetime64[ns](1), float64(1), int64(1), object(3)
memory usage: 9.9+ MB
```

QUESTION 1 WHAT WAS THE MONTH WITH HIGHER SALE?

In [17]:
```
df['Month']=df['Order Date'].dt.month
df.head()
```

```
C:\Users\Ledwin Torres\AppData\Local\Temp\ipykernel_7532\1625564236.py:1: 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
  df['Month']=df['Order Date'].dt.month
```

Out[17]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address	Month
0	176558	USB-C Charging Cable	2	11.95	2019-04-19 08:46:00	917 1st St, Dallas, TX 75001	4
2	176559	Bose SoundSport Headphones	1	99.99	2019-04-07 22:30:00	682 Chestnut St, Boston, MA 02215	4
3	176560	Google Phone	1	600.00	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4
4	176560	Wired Headphones	1	11.99	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4
5	176561	Wired Headphones	1	11.99	2019-04-30 09:27:00	333 8th St, Los Angeles, CA 90001	4

In [18]:

```
df['Monthly Sales']=df['Quantity Ordered']*df['Price Each']
df
```

```
C:\Users\Ledwin Torres\AppData\Local\Temp\ipykernel_7532\910162204.py:1: 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
  df['Monthly Sales']=df['Quantity Ordered']*df['Price Each']
```

Out[18]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address	Month	Monthly Sales
0	176558	USB-C Charging Cable	2	11.95	2019-04-19 08:46:00	917 1st St, Dallas, TX 75001	4	23.90
2	176559	Bose SoundSport Headphones	1	99.99	2019-04-07 22:30:00	682 Chestnut St, Boston, MA 02215	4	99.99
3	176560	Google Phone	1	600.00	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	600.00
4	176560	Wired Headphones	1	11.99	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	11.99
5	176561	Wired Headphones	1	11.99	2019-04-30 09:27:00	333 8th St, Los Angeles, CA 90001	4	11.99
...	...	...	...	...	...	...	...	...
11681	259353	AAA Batteries (4-pack)	3	2.99	2019-09-17 20:56:00	840 Highland St, Los Angeles, CA 90001	9	8.97
11682	259354	iPhone	1	700.00	2019-09-01 16:00:00	216 Dogwood St, San Francisco, CA 94016	9	700.00
11683	259355	iPhone	1	700.00	2019-09-23 07:39:00	220 12th St, San Francisco, CA 94016	9	700.00
11684	259356	34in Ultrawide Monitor	1	379.99	2019-09-19 17:30:00	511 Forest St, San Francisco, CA 94016	9	379.99
11685	259357	USB-C Charging	1	11.95	2019-09-30	250 Meadow St, San	9	11.95

	Cable	00:18:00	Francisco, CA 94016

185950 rows × 8 columns

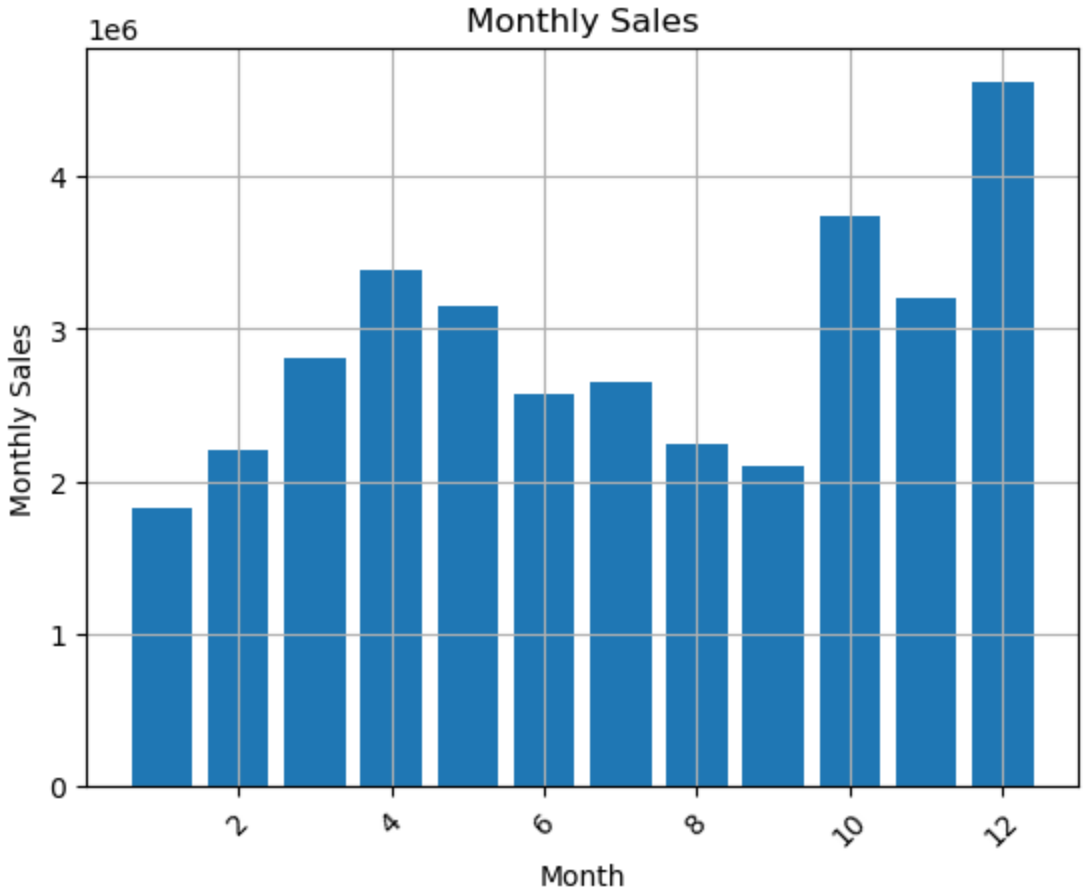
In [19]:
```
df_month = df.groupby('Month')[['Quantity Ordered', 'Price Each', 'Monthly Sales']].sum(
df_month
```

Out[19]:

Month	Quantity Ordered	Price Each	Monthly Sales
1	10903	1811768.38	1822256.73
2	13449	2188884.72	2202022.42
3	17005	2791207.83	2807100.38
4	20558	3367671.02	3390670.24
5	18667	3135125.13	3152606.75
6	15253	2562025.61	2577802.26
7	16072	2632539.56	2647775.76
8	13448	2230345.42	2244467.88
9	13109	2084992.09	2097560.13
10	22703	3715554.83	3736726.88
11	19798	3180600.68	3199603.20
12	28114	4588415.41	4613443.34

In [20]:
```
df_month.reset_index(inplace=True, drop=False)
```

In [21]:
```
plt.bar(df_month['Month'], df_month['Monthly Sales'])
plt.title('Monthly Sales')
plt.xlabel('Month')
plt.ylabel('Monthly Sales')
plt.xticks(rotation=45)
plt.grid(True)
```



In [22]:
```
df_date=df.groupby('Order Date').sum()
df_date
```

Out[22]:

Order Date	Order ID	Product	Quantity Ordered	Price Each	Purchase Address	Month	Monthly Sales
2019-01-01 03:07:00	147268	Wired Headphones	1	11.99	9 Lake St, New York City, NY 10001	1	11.99
2019-01-01 03:40:00	148041	USB-C Charging Cable	1	11.95	760 Church St, San Francisco, CA 94016	1	11.95
2019-01-01 04:56:00	149343	Apple Airpods Headphones	1	150.00	735 5th St, New York City, NY 10001	1	150.00
2019-01-01 05:53:00	149964	AAA Batteries (4-pack)	1	2.99	75 Jackson St, Dallas, TX 75001	1	2.99
2019-01-01 06:03:00	149350	USB-C Charging Cable	2	11.95	943 2nd St, Atlanta, GA 30301	1	23.90
...	...	...	...	...	...	...	...
2020-01-01 04:06:00	308185	27in FHD Monitor	1	149.99	202 Maple St, San Francisco, CA 94016	1	149.99
2020-01-01 04:13:00	304165	AAA Batteries (4-pack)	1	2.99	825 Adams St, Portland, OR 97035	1	2.99

2020-01-01 04:21:00	299125	USB-C Charging Cable	1	11.95	754 Hickory St, New York City, NY 10001	1	11.95
2020-01-01 04:54:00	305840	Bose SoundSport Headphones	1	99.99	784 River St, San Francisco, CA 94016	1	99.99
2020-01-01 05:13:00	300519300519	Bose SoundSport HeadphonesLightning Charging C...	2	114.94	657 Spruce St, New York City, NY 10001657 Spru...	2	114.94

142395 rows × 7 columns

In [ ]:

WHAT IS THE CITY WITH HIGHEST SALES?

In [23]:
```
df.head()
```

Out[23]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address	Month	Monthly Sales
0	176558	USB-C Charging Cable	2	11.95	2019-04-19 08:46:00	917 1st St, Dallas, TX 75001	4	23.90
2	176559	Bose SoundSport Headphones	1	99.99	2019-04-07 22:30:00	682 Chestnut St, Boston, MA 02215	4	99.99
3	176560	Google Phone	1	600.00	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	600.00
4	176560	Wired Headphones	1	11.99	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	11.99
5	176561	Wired Headphones	1	11.99	2019-04-30 09:27:00	333 8th St, Los Angeles, CA 90001	4	11.99

In [24]:
```
x=df.iloc[3,5]
x.split(',')[1]
```

Out[24]:
```
' Los Angeles'
```

In [25]:
```
df['City']=df['Purchase Address'].apply(lambda x:x.split(',')[1])
df
```

```
C:\Users\Ledwin Torres\AppData\Local\Temp\ipykernel_7532\2654651659.py:1: 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
  df['City']=df['Purchase Address'].apply(lambda x:x.split(',')[1])
```

Out[25]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address	Month	Monthly Sales	City
0	176558	USB-C Charging Cable	2	11.95	2019-04-19 08:46:00	917 1st St, Dallas, TX 75001	4	23.90	Dallas
2	176559	Bose	1	99.99	2019-04-	682 Chestnut St,	4	99.99	Boston

		SoundSport Headphones			07 22:30:00	Boston, MA 02215			
3	176560	Google Phone	1	600.00	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	600.00	Los Angeles
4	176560	Wired Headphones	1	11.99	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	11.99	Los Angeles
5	176561	Wired Headphones	1	11.99	2019-04-30 09:27:00	333 8th St, Los Angeles, CA 90001	4	11.99	Los Angeles
...	...	...	...	...	...	...	...	...	...
11681	259353	AAA Batteries (4-pack)	3	2.99	2019-09-17 20:56:00	840 Highland St, Los Angeles, CA 90001	9	8.97	Los Angeles
11682	259354	iPhone	1	700.00	2019-09-01 16:00:00	216 Dogwood St, San Francisco, CA 94016	9	700.00	San Francisco
11683	259355	iPhone	1	700.00	2019-09-23 07:39:00	220 12th St, San Francisco, CA 94016	9	700.00	San Francisco
11684	259356	34in Ultrawide Monitor	1	379.99	2019-09-19 17:30:00	511 Forest St, San Francisco, CA 94016	9	379.99	San Francisco
11685	259357	USB-C Charging Cable	1	11.95	2019-09-30 00:18:00	250 Meadow St, San Francisco, CA 94016	9	11.95	San Francisco

185950 rows × 9 columns

In [26]:
```
#GRAPHIC FOR HIGHEST CITY SALES
```

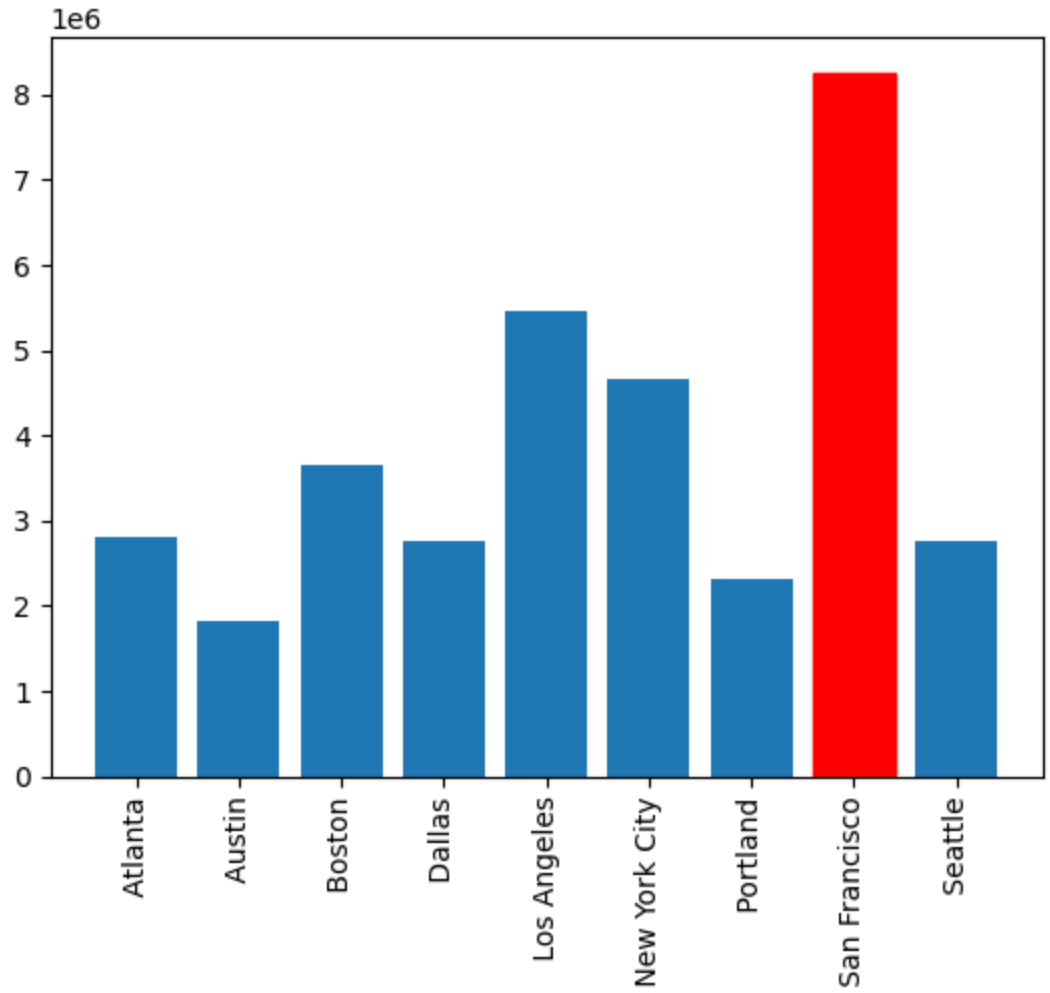
In [27]:
```
df_city=df.groupby("City")['Monthly Sales'].sum()
df_city=df_city.reset_index()
df_city
```

Out[27]:

	City	Monthly Sales
0	Atlanta	2795498.58
1	Austin	1819581.75
2	Boston	3661642.01
3	Dallas	2767975.40
4	Los Angeles	5452570.80
5	New York City	4664317.43
6	Portland	2320490.61
7	San Francisco	8262203.91
8	Seattle	2747755.48

In [28]:
```
bars=plt.bar(df_city['City'],df_city['Monthly Sales'])
plt.xticks(rotation=90)
```

```
bars[7].set_color('r')
plt.show()
```



At what time are most products sold?

In [29]:
```
df.head()
```

Out[29]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address	Month	Monthly Sales	City
0	176558	USB-C Charging Cable	2	11.95	2019-04-19 08:46:00	917 1st St, Dallas, TX 75001	4	23.90	Dallas
2	176559	Bose SoundSport Headphones	1	99.99	2019-04-07 22:30:00	682 Chestnut St, Boston, MA 02215	4	99.99	Boston
3	176560	Google Phone	1	600.00	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	600.00	Los Angeles
4	176560	Wired Headphones	1	11.99	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	11.99	Los Angeles
5	176561	Wired Headphones	1	11.99	2019-04-30 09:27:00	333 8th St, Los Angeles, CA 90001	4	11.99	Los Angeles

In [30]:
```
df['Hour']=df['Order Date'].apply(lambda x: x.hour)
df.head()
```

```
C:\Users\Ledwin Torres\AppData\Local\Temp\ipykernel_7532\325569060.py:1: SettingWithCopy
Warning:
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
  df['Hour']=df['Order Date'].apply(lambda x: x.hour)
```

Out[30]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address	Month	Monthly Sales	City	Hour
0	176558	USB-C Charging Cable	2	11.95	2019-04-19 08:46:00	917 1st St, Dallas, TX 75001	4	23.90	Dallas	8
2	176559	Bose SoundSport Headphones	1	99.99	2019-04-07 22:30:00	682 Chestnut St, Boston, MA 02215	4	99.99	Boston	22
3	176560	Google Phone	1	600.00	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	600.00	Los Angeles	14
4	176560	Wired Headphones	1	11.99	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	11.99	Los Angeles	14
5	176561	Wired Headphones	1	11.99	2019-04-30 09:27:00	333 8th St, Los Angeles, CA 90001	4	11.99	Los Angeles	9

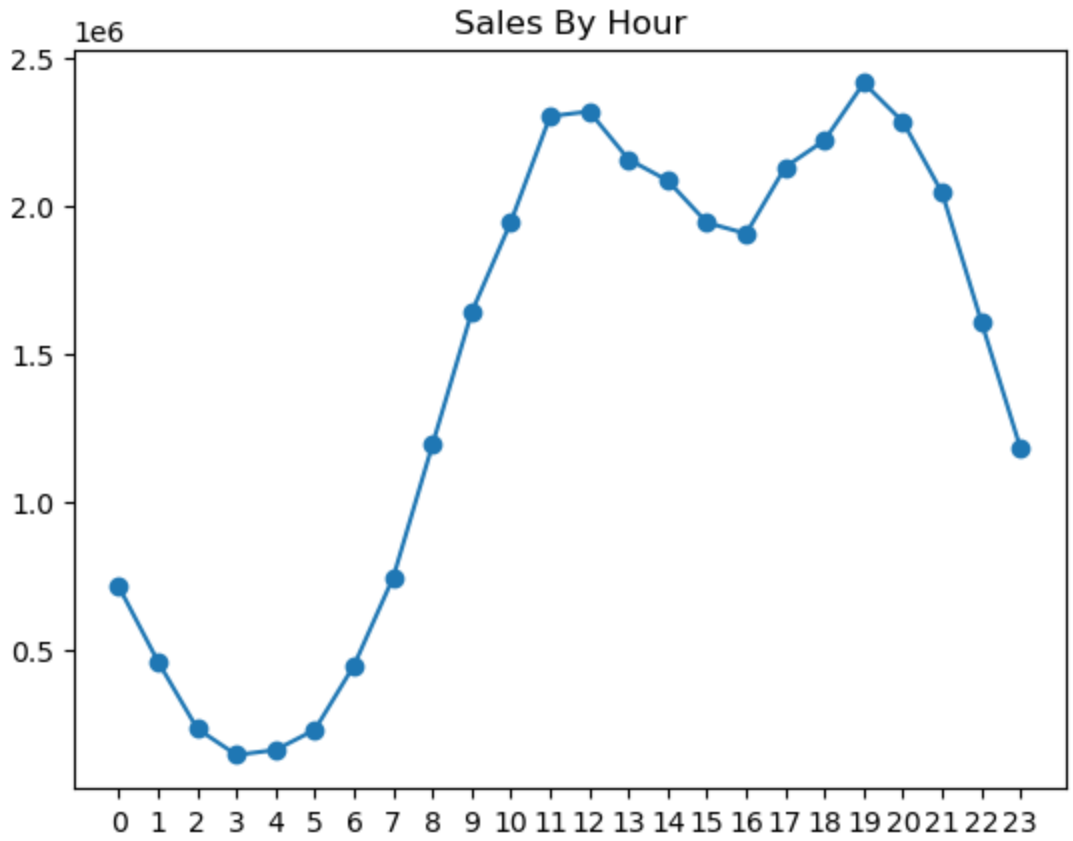
In [31]:
```
df_hour=df.groupby('Hour')['Monthly Sales'].sum()
df_hour=df_hour.reset_index()
df_hour
```

Out[31]:

	Hour	Monthly Sales
0	0	713721.27
1	1	460866.88
2	2	234851.44
3	3	145757.89
4	4	162661.01
5	5	230679.82
6	6	448113.00
7	7	744854.12
8	8	1192348.97
9	9	1639030.58
10	10	1944286.77
11	11	2300610.24
12	12	2316821.34
13	13	2155389.80
14	14	2083672.73
15	15	1941549.60
16	16	1904601.31
17	17	2129361.61
18	18	2219348.30

19	19	2412938.54
20	20	2281716.24
21	21	2042000.86
22	22	1607549.21
23	23	1179304.44

In [32]:
```
plt.plot(df_hour['Monthly Sales'],marker='o')
plt.xticks(df_hour['Hour'])
plt.title('Sales By Hour')
plt.show()
```



Which products are most commonly bundled in sales?

In [34]:
```
df=df[df['Order ID'].duplicated(keep=False)]
df['Grouped']=df.groupby(['Order ID'])['Product'].transform(lambda x: ','.join(x))
df
```

Out[34]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address	Month	Monthly Sales	City	Hour	Gro
3	176560	Google Phone	1	600.00	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	600.00	Los Angeles	14	Go Phone,V Headph
4	176560	Wired Headphones	1	11.99	2019-04-12 14:38:00	669 Spruce St, Los Angeles, CA 90001	4	11.99	Los Angeles	14	Go Phone,V Headph
18	176574	Google	1	600.00	2019-	20 Hill St,	4	600.00	Los	19	Go

		Phone			04-03 19:42:00	Los Angeles, CA 90001			Angeles		Phone,U Charging (
19	176574	USB-C Charging Cable	1	11.95	2019-04-03 19:42:00	20 Hill St, Los Angeles, CA 90001	4	11.95	Los Angeles	19	Go Phone,U Charging (
30	176585	Bose SoundSport Headphones	1	99.99	2019-04-07 11:31:00	823 Highland St, Boston, MA 02215	4	99.99	Boston	11	Bose Sound Headphones SoundSport
...	...	...	...	...	...	...	...	...	...	...	
11628	259303	AA Batteries (4-pack)	1	3.84	2019-09-20 20:18:00	106 7th St, Atlanta, GA 30301	9	3.84	Atlanta	20	34in Ultra Monit Batteries (4-
11639	259314	Wired Headphones	1	11.99	2019-09-16 00:25:00	241 Highland St, Atlanta, GA 30301	9	11.99	Atlanta	0	V Headphones Batteries (4-
11640	259314	AAA Batteries (4-pack)	2	2.99	2019-09-16 00:25:00	241 Highland St, Atlanta, GA 30301	9	5.98	Atlanta	0	V Headphones Batteries (4-
11677	259350	Google Phone	1	600.00	2019-09-30 13:49:00	519 Maple St, San Francisco, CA 94016	9	600.00	San Francisco	13	Go Phone,U Charging (
11678	259350	USB-C Charging Cable	1	11.95	2019-09-30 13:49:00	519 Maple St, San Francisco, CA 94016	9	11.95	San Francisco	13	Go Phone,U Charging (

14649 rows × 11 columns

LETS EXTRACT AND COMBINE THE PRODUCTS

In [39]:
```
count=Counter()

for r in df['Grouped']:
    rows=r.split(',')
    count.update(Counter(combinations(rows,2)))
```

In [40]:
```
count
```

Out[40]:
```
Counter({('iPhone', 'Lightning Charging Cable'): 2140,
         ('Google Phone', 'USB-C Charging Cable'): 2116,
         ('iPhone', 'Wired Headphones'): 987,
         ('Google Phone', 'Wired Headphones'): 949,
         ('iPhone', 'Apple Airpods Headphones'): 799,
         ('Vareebadd Phone', 'USB-C Charging Cable'): 773,
         ('Google Phone', 'Bose SoundSport Headphones'): 503,
```

```
('USB-C Charging Cable', 'Wired Headphones'): 452,
('Vareebadd Phone', 'Wired Headphones'): 327,
('Lightning Charging Cable', 'Wired Headphones'): 253,
('Lightning Charging Cable', 'Apple Airpods Headphones'): 214,
('USB-C Charging Cable', 'Bose SoundSport Headphones'): 211,
('Vareebadd Phone', 'Bose SoundSport Headphones'): 182,
('Apple Airpods Headphones', 'Wired Headphones'): 170,
('Bose SoundSport Headphones', 'Wired Headphones'): 140,
('Lightning Charging Cable', 'USB-C Charging Cable'): 120,
('Lightning Charging Cable', 'AA Batteries (4-pack)'): 114,
('Lightning Charging Cable', 'Lightning Charging Cable'): 111,
('AA Batteries (4-pack)', 'Lightning Charging Cable'): 102,
('AAA Batteries (4-pack)', 'USB-C Charging Cable'): 100,
('Apple Airpods Headphones', 'AAA Batteries (4-pack)'): 99,
('USB-C Charging Cable', 'USB-C Charging Cable'): 99,
('AA Batteries (4-pack)', 'AAA Batteries (4-pack)'): 96,
('AAA Batteries (4-pack)', 'AAA Batteries (4-pack)'): 96,
('Wired Headphones', 'USB-C Charging Cable'): 95,
('USB-C Charging Cable', 'AAA Batteries (4-pack)'): 93,
('AA Batteries (4-pack)', 'Wired Headphones'): 88,
('AAA Batteries (4-pack)', 'Lightning Charging Cable'): 88,
('AAA Batteries (4-pack)', 'Wired Headphones'): 86,
('Wired Headphones', 'AAA Batteries (4-pack)'): 86,
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('Wired Headphones', 'AA Batteries (4-pack)'): 83,
('AA Batteries (4-pack)', 'Apple Airpods Headphones'): 82,
('USB-C Charging Cable', 'AA Batteries (4-pack)'): 80,
('AAA Batteries (4-pack)', 'AA Batteries (4-pack)'): 78,
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('Wired Headphones', 'Lightning Charging Cable'): 75,
('Bose SoundSport Headphones', 'AAA Batteries (4-pack)'): 74,
('AA Batteries (4-pack)', 'USB-C Charging Cable'): 74,
('Lightning Charging Cable', 'AAA Batteries (4-pack)'): 73,
('Wired Headphones', 'Wired Headphones'): 72,
('USB-C Charging Cable', 'Apple Airpods Headphones'): 72,
('Apple Airpods Headphones', 'Lightning Charging Cable'): 70,
('AA Batteries (4-pack)', 'AA Batteries (4-pack)'): 70,
('Bose SoundSport Headphones', 'Lightning Charging Cable'): 67,
('AAA Batteries (4-pack)', 'Apple Airpods Headphones'): 66,
('Wired Headphones', 'Apple Airpods Headphones'): 65,
('USB-C Charging Cable', '27in FHD Monitor'): 65,
('Apple Airpods Headphones', 'Bose SoundSport Headphones'): 65,
('Apple Airpods Headphones', 'USB-C Charging Cable'): 58,
('Apple Airpods Headphones', 'AA Batteries (4-pack)'): 58,
('AA Batteries (4-pack)', 'Bose SoundSport Headphones'): 56,
('Bose SoundSport Headphones', 'Bose SoundSport Headphones'): 54,
('Bose SoundSport Headphones', 'AA Batteries (4-pack)'): 54,
('Bose SoundSport Headphones', 'USB-C Charging Cable'): 50,
('Apple Airpods Headphones', 'Apple Airpods Headphones'): 48,
('AAA Batteries (4-pack)', '27in FHD Monitor'): 44,
('27in FHD Monitor', 'AAA Batteries (4-pack)'): 42,
('Wired Headphones', 'Bose SoundSport Headphones'): 42,
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('Wired Headphones', '34in Ultrawide Monitor'): 34,
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```

```
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('Google Phone', 'Lightning Charging Cable'): 26,
('AAA Batteries (4-pack)', '34in Ultrawide Monitor'): 26,
('Apple Airpods Headphones', 'iPhone'): 26,
('Wired Headphones', '27in FHD Monitor'): 26,
('Google Phone', 'AAA Batteries (4-pack)'): 25,
('Lightning Charging Cable', 'Flatscreen TV'): 25,
('Apple Airpods Headphones', '27in 4K Gaming Monitor'): 24,
('Apple Airpods Headphones', '27in FHD Monitor'): 24,
('27in FHD Monitor', 'Bose SoundSport Headphones'): 24,
('27in FHD Monitor', 'USB-C Charging Cable'): 24,
('Bose SoundSport Headphones', '34in Ultrawide Monitor'): 24,
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```

```
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('20in Monitor', '20in Monitor'): 6,
('ThinkPad Laptop', 'iPhone'): 6,
('34in Ultrawide Monitor', 'Flatscreen TV'): 6,
('Macbook Pro Laptop', 'Macbook Pro Laptop'): 6,
('34in Ultrawide Monitor', 'ThinkPad Laptop'): 6,
('Macbook Pro Laptop', 'iPhone'): 6,
('Wired Headphones', 'LG Washing Machine'): 6,
('Macbook Pro Laptop', '27in FHD Monitor'): 6,
('Flatscreen TV', 'Bose SoundSport Headphones'): 6,
('AA Batteries (4-pack)', 'Vareebadd Phone'): 6,
('27in FHD Monitor', '20in Monitor'): 6,
('27in 4K Gaming Monitor', 'iPhone'): 6,
('Google Phone', 'Google Phone'): 6,
('Flatscreen TV', 'Google Phone'): 6,
('27in 4K Gaming Monitor', 'Flatscreen TV'): 6,
('Apple Airpods Headphones', 'LG Dryer'): 6,
('20in Monitor', 'AAA Batteries (4-pack)'): 6,
('iPhone', 'Macbook Pro Laptop'): 6,
('iPhone', 'iPhone'): 5,
('Vareebadd Phone', '27in 4K Gaming Monitor'): 5,
('34in Ultrawide Monitor', 'Google Phone'): 4,
('Macbook Pro Laptop', '20in Monitor'): 4,
('Lightning Charging Cable', 'LG Dryer'): 4,
('Flatscreen TV', '27in 4K Gaming Monitor'): 4,
('ThinkPad Laptop', 'Macbook Pro Laptop'): 4,
('Macbook Pro Laptop', 'LG Washing Machine'): 4,
('20in Monitor', '27in FHD Monitor'): 4,
('ThinkPad Laptop', 'ThinkPad Laptop'): 4,
('Bose SoundSport Headphones', 'Vareebadd Phone'): 4,
('Vareebadd Phone', 'ThinkPad Laptop'): 4,
('20in Monitor', 'ThinkPad Laptop'): 4,
('27in FHD Monitor', 'LG Dryer'): 4,
('27in 4K Gaming Monitor', '20in Monitor'): 4,
('LG Washing Machine', 'Lightning Charging Cable'): 4,
('LG Washing Machine', 'Bose SoundSport Headphones'): 4,
('AA Batteries (4-pack)', 'LG Dryer'): 4,
('Vareebadd Phone', 'AAA Batteries (4-pack)'): 4,
('iPhone', '20in Monitor'): 4,
('20in Monitor', 'Google Phone'): 4,
('Flatscreen TV', 'ThinkPad Laptop'): 4,
('ThinkPad Laptop', '27in FHD Monitor'): 4,
('27in FHD Monitor', 'Flatscreen TV'): 4,
('Google Phone', '20in Monitor'): 4,
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('Google Phone', 'Vareebadd Phone'): 3,
('27in 4K Gaming Monitor', 'Vareebadd Phone'): 2,
('27in FHD Monitor', 'iPhone'): 2,
('Vareebadd Phone', 'Lightning Charging Cable'): 2,
('20in Monitor', 'iPhone'): 2,
('LG Dryer', 'Vareebadd Phone'): 2,
('Macbook Pro Laptop', 'Flatscreen TV'): 2,
('ThinkPad Laptop', 'Vareebadd Phone'): 2,
('Google Phone', 'Flatscreen TV'): 2,
('LG Washing Machine', 'Google Phone'): 2,
('LG Washing Machine', 'Wired Headphones'): 2,
('LG Dryer', 'Flatscreen TV'): 2,
('27in FHD Monitor', 'LG Washing Machine'): 2,
('LG Dryer', '27in FHD Monitor'): 2,
('20in Monitor', '34in Ultrawide Monitor'): 2,
('34in Ultrawide Monitor', '20in Monitor'): 2,
('34in Ultrawide Monitor', 'LG Washing Machine'): 2,
('Google Phone', '27in 4K Gaming Monitor'): 2,
('LG Washing Machine', 'iPhone'): 2,
('LG Dryer', 'Wired Headphones'): 2,
('27in FHD Monitor', 'Vareebadd Phone'): 2,
('LG Washing Machine', '27in 4K Gaming Monitor'): 2,
('LG Washing Machine', 'Apple Airpods Headphones'): 2,
('27in 4K Gaming Monitor', 'LG Dryer'): 2,
('20in Monitor', 'LG Washing Machine'): 2,
('LG Dryer', 'Google Phone'): 2,
('Vareebadd Phone', '27in FHD Monitor'): 2,
('ThinkPad Laptop', '27in 4K Gaming Monitor'): 2,
('20in Monitor', 'Flatscreen TV'): 2,
('USB-C Charging Cable', 'LG Dryer'): 2,
('LG Washing Machine', '20in Monitor'): 2,
('Flatscreen TV', '20in Monitor'): 2,
('27in FHD Monitor', 'Google Phone'): 2,
('iPhone', '27in FHD Monitor'): 2,
('LG Dryer', 'AAA Batteries (4-pack)'): 2,
('ThinkPad Laptop', '34in Ultrawide Monitor'): 2,
('iPhone', 'LG Washing Machine'): 2,
('AAA Batteries (4-pack)', 'LG Dryer'): 2,
('LG Dryer', '27in 4K Gaming Monitor'): 2,
('LG Dryer', 'Lightning Charging Cable'): 2,
('ThinkPad Laptop', 'LG Dryer'): 2,
('LG Washing Machine', 'AA Batteries (4-pack)'): 2})
```

In [41]:
```
commons=count.most_common(10)
commons
```

Out[41]:
```
[(('iPhone', 'Lightning Charging Cable'), 2140),
 (('Google Phone', 'USB-C Charging Cable'), 2116),
 (('iPhone', 'Wired Headphones'), 987),
 (('Google Phone', 'Wired Headphones'), 949),
 (('iPhone', 'Apple Airpods Headphones'), 799),
 (('Vareebadd Phone', 'USB-C Charging Cable'), 773),
 (('Google Phone', 'Bose SoundSport Headphones'), 503),
 (('USB-C Charging Cable', 'Wired Headphones'), 452),
 (('Vareebadd Phone', 'Wired Headphones'), 327),
 (('Lightning Charging Cable', 'Wired Headphones'), 253)]
```

In [ ]:

In [ ]: