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```
In [ ]: import numpy as np
import pandas as pd
```

```
In [9]: all_data=pd.read_csv("all_data.csv")
```

```
In [10]: all_data.head()
```

Out[10]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	176558	USB-C Charging Cable	2	11.95	04/19/19 8:46	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

Clean up the data!

Drop rows of NAN

```
In [11]: nan_df = all_data[all_data.isna().any(axis=1)]
display(nan_df.head())

all_data = all_data.dropna(how='all')
all_data.head()
```

	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

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 8:46	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 9:27	333 8th St, Los Angeles, CA 90001

Get rid of text in order date column

```
In [12]: all_data = all_data[all_data['Order Date'].str[0:2]!='On']
```

Make columns correct type

```
In [13]: all_data['Quantity Ordered'] = pd.to_numeric(all_data['Quantity Ordered'])
all_data['Price Each'] = pd.to_numeric(all_data['Price Each'])
```

Augment data with additional columns

```
In [14]: all_data['Month'] = all_data['Order Date'].str[0:2]
all_data['Month'] = all_data['Month'].astype('int32')
all_data.head()
```

Out[14]:

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

Add month column (alternative method)

```
In [15]: all_data['Month'] = all_data['Order Date'].str[0:2]
all_data['Month'] = all_data['Month'].astype('int32')
all_data.head()
```

Out[15]:

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

Add city column

```
In [16]: def get_city(address):
          return address.split(",")[1].strip(" ")

def get_state(address):
    return address.split(",")[2].split(" ")[1]

all_data['City'] = all_data['Purchase Address'].apply(lambda x: f"{get_city(x)} ({get_state(x)})")
all_data.head()
```

Out[16]:

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

Data Exploration!

Question 1: What was the best month for sales? How much was earned that month?

```
In [17]: all_data['Sales'] = all_data['Quantity Ordered'].astype('int') * all_data['Price Each'].astype('float')
```

```
In [19]: all_data.groupby(['Month']).sum()
```

Out[19]:

	Quantity Ordered	Price Each	Sales
Month			
4	17739	2899439.68	2918954.40
5	26	8851.62	8855.46

Question 2: What city sold the most product?

```
In [20]: city_max=all_data.groupby(['City']).sum()
print(max(city_max))
```

Sales

Question 4: What products are most often sold together?

```
In [21]: df = all_data[all_data['Order ID'].duplicated(keep=False)]

# Referenced: https://stackoverflow.com/questions/27298178/concatenate-strings-from-several-rows-using
df['Grouped'] = df.groupby('Order ID')['Product'].transform(lambda x: ','.join(x))
df2 = df[['Order ID', 'Grouped']].drop_duplicates()
print(df['Grouped'])

3          Google Phone,Wired Headphones
4          Google Phone,Wired Headphones
18         Google Phone,USB-C Charging Cable
19         Google Phone,USB-C Charging Cable
30    Bose SoundSport Headphones,Bose SoundSport Hea...
...
15787    USB-C Charging Cable,Wired Headphones
15818    Vareebadd Phone,Lightning Charging Cable
15819    Vareebadd Phone,Lightning Charging Cable
15874    Google Phone,Bose SoundSport Headphones
15875    Google Phone,Bose SoundSport Headphones
Name: Grouped, Length: 1269, dtype: object

<ipython-input-21-9a93a24e3a06>: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/indexin
g.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexi
ng.html#returning-a-view-versus-a-copy)
df['Grouped'] = df.groupby('Order ID')['Product'].transform(lambda x: ','.join(x))
```

```
In [22]: from itertools import combinations
from collections import Counter

count = Counter()

for row in df2['Grouped']:
    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') 94
('Google Phone', 'USB-C Charging Cable') 92
('Google Phone', 'Wired Headphones') 34
('iPhone', 'Wired Headphones') 33
('Vareebadd Phone', 'USB-C Charging Cable') 32
('iPhone', 'Apple AirPods Headphones') 29
('Google Phone', 'Bose SoundSport Headphones') 20
('Vareebadd Phone', 'Wired Headphones') 15
('USB-C Charging Cable', 'Wired Headphones') 11
('AA Batteries (4-pack)', 'Apple AirPods Headphones') 7
```

What product sold the most? Why do you think it sold the most?

```
In [23]: product_group = all_data.groupby('Product')
quantity_ordered = product_group.sum()['Quantity Ordered']
```

```
In [24]: print(quantity_ordered)
```

```
Product
20in Monitor           345
27in 4K Gaming Monitor 491
27in FHD Monitor       633
34in Ultrawide Monitor 563
AA Batteries (4-pack)  2446
AAA Batteries (4-pack) 2559
Apple AirPods Headphones 1303
Bose SoundSport Headphones 1110
Flatscreen TV          398
Google Phone           497
LG Dryer                69
LG Washing Machine      56
Lightning Charging Cable 2027
Macbook Pro Laptop      400
ThinkPad Laptop         329
USB-C Charging Cable    1938
Vareebadd Phone         185
Wired Headphones        1823
iPhone                  593
Name: Quantity Ordered, dtype: int64
```

```
In [25]: prices = all_data.groupby('Product').mean()['Price Each']
```

```
In [28]: print(prices)
```

```
Product
20in Monitor           109.99
27in 4K Gaming Monitor 389.99
27in FHD Monitor       149.99
34in Ultrawide Monitor 379.99
AA Batteries (4-pack)    3.84
AAA Batteries (4-pack)   2.99
Apple AirPods Headphones 150.00
Bose SoundSport Headphones 99.99
Flatscreen TV           300.00
Google Phone            600.00
LG Dryer                600.00
LG Washing Machine       600.00
Lightning Charging Cable  14.95
Macbook Pro Laptop      1700.00
ThinkPad Laptop         999.99
USB-C Charging Cable     11.95
Vareebadd Phone         400.00
Wired Headphones        11.99
iPhone                  700.00
Name: Price Each, dtype: float64
```