

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
```

▼ Extracted data from amazon_transactions with address as San Fransisco using Filter in excel and uploading

```
from google.colab import files
uploaded = files.upload()
dataset=pd.read_csv('orders.csv')
```

📁 Choose Files orders.csv

- **orders.csv**(application/vnd.ms-excel) - 4126412 bytes, last modified: 9/13/2020 - 100% done
Saving orders.csv to orders.csv

▼ dataset Information

```
dataset.info()
dataset.head(10)
```

📁

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 44732 entries, 0 to 44731
Data columns (total 6 columns):
#   Column                Non-Null Count  Dtype
---  ---
0   Order_ID              44732 non-null  int64
1   Product               44732 non-null  object
2   Quantity_Ordered      44732 non-null  int64
3   Price_Each            44732 non-null  float64
4   Order_Date            44732 non-null  object
5   Purchase_Address      44732 non-null  object
dtypes: float64(1), int64(2), object(3)
memory usage: 2.0+ MB
```

	Order_ID	Product	Quantity_Ordered	Price_Each	Order_Date	Purchase_Address
0	176562	USB-C Charging Cable	1	11.95	4/29/2019 13:03	381 Wilson St, San Francisco, CA 94016
1	176565	Macbook Pro Laptop	1	1700.00	4/24/2019 10:38	915 Willow St, San Francisco, CA 94016
2	176573	USB-C Charging Cable	1	11.95	4/27/2019 18:41	214 Chestnut St, San Francisco, CA 94016
3	176584	Flatscreen TV	1	300.00	4/24/2019 20:39	936 Church St, San Francisco, CA 94016
4	176586	AAA Batteries (4-pack)	2	2.99	4/10/2019 17:00	365 Center St, San Francisco, CA 94016

▼ cleaning dataset

```
dataset = dataset.dropna()
dataset.head(8)
```

```
dataset.dropna()
dataset.head(8)
```



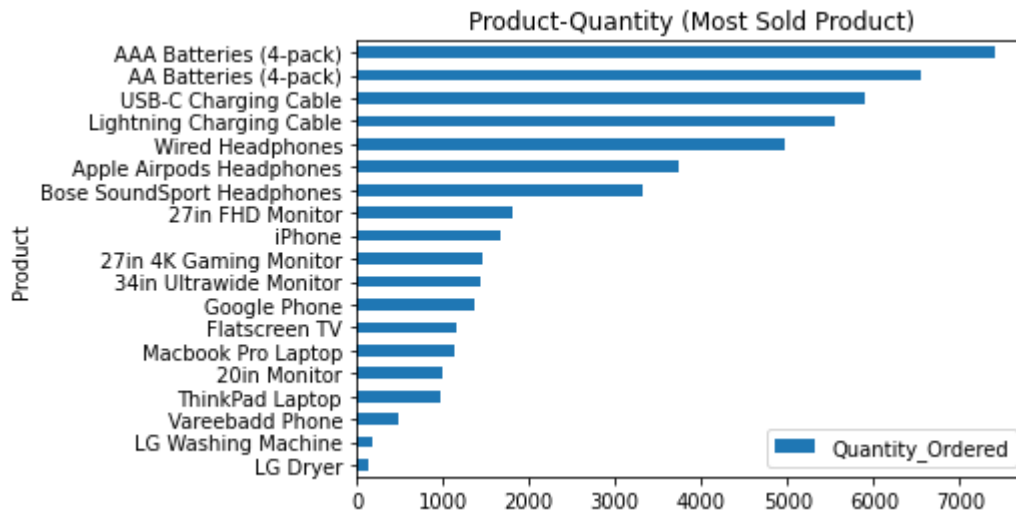
	Order_ID	Product	Quantity_Ordered	Price_Each	Order_Date	Purchase_Address
0	176562	USB-C Charging Cable	1	11.95	4/29/2019 13:03	381 Wilson St, San Francisco, CA 94016
1	176565	Macbook Pro Laptop	1	1700.00	4/24/2019 10:38	915 Willow St, San Francisco, CA 94016
2	176573	USB-C Charging Cable	1	11.95	4/27/2019 18:41	214 Chestnut St, San Francisco, CA 94016
3	176584	Flatscreen TV	1	300.00	4/24/2019 20:39	936 Church St, San Francisco, CA 94016

Visualizing most-lease purchased product and frequency of others

```
0    176594    wired Headphones    1    11.99    4/17/2019 23:04    63 Maple St, San Francisco, CA 94016
```

```
df=dataset.groupby(['Product'])[['Quantity_Ordered']].sum()
df.sort_values(by='Quantity_Ordered',inplace=True, ascending=True)
df.plot(kind="barh",title="Product-Quantity (Most Sold Product)")
```

☐ <matplotlib.axes._subplots.AxesSubplot at 0x7f7e41d59780>



Plotting Sales per Product (The number in sales is in order 10^5 for which graph

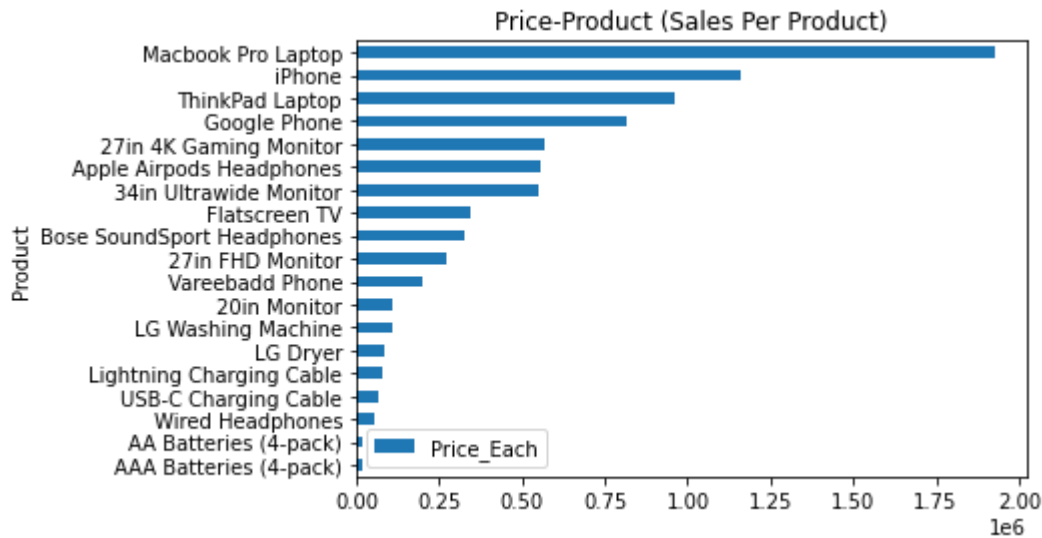
```
af=dataset.groupby(['Product'])[['Price_Each']].sum()
af.sort_values(by='Price_Each',inplace=True, ascending=True)

af.plot(kind="barh",title="Price-Product (Sales Per Product)")

af.head(5)
```



Product	Price_Each
AAA Batteries (4-pack)	14746.68
AA Batteries (4-pack)	18827.52
Wired Headphones	55058.08
USB-C Charging Cable	64147.60
Lightning Charging Cable	77351.30



▼ Taking only the IDs which have more than 1 occurrences

```
dfa=dataset
counts = dfa['Order_ID'].value_counts()
a=dfa[dfa['Order_ID'].isin(counts.index[counts > 1])]
a
```

	Order_ID	Product	Quantity_Ordered	Price_Each	Order_Date	Purchase_Address
4	176586	AAA Batteries (4-pack)	2	2.99	4/10/2019 17:00	365 Center St, San Francisco, CA 94016
5	176586	Google Phone	1	600.00	4/10/2019 17:00	365 Center St, San Francisco, CA 94016
67	176808	Google Phone	1	600.00	4/28/2019 18:03	933 Meadow St, San Francisco, CA 94016
68	176808	Wired Headphones	1	11.99	4/28/2019 18:03	933 Meadow St, San Francisco, CA 94016
108	176975	USB-C Charging Cable	1	11.95	4/23/2019 15:46	28 13th St, San Francisco, CA 94016
...
44657	259035	27in FHD Monitor	1	149.99	9/29/2019 13:52	327 Lake St, San Francisco, CA 94016
44708	259270	Google Phone	1	600.00	9/6/2019 15:27	940 10th St, San Francisco, CA 94016
44709	259270	USB-C Charging Cable	1	11.95	9/6/2019 15:27	940 10th St, San Francisco, CA 94016

```
a.info()
type(a)
```



```

<class 'pandas.core.frame.DataFrame'>
Int64Index: 3562 entries, 4 to 44726
Data columns (total 6 columns):
#   Column                Non-Null Count  Dtype
---  ---
0   Order_ID              3562 non-null   int64
1   Product               3562 non-null   object
2   Quantity_Ordered      3562 non-null   int64
3   Price_Each            3562 non-null   float64
4   Order_Date            3562 non-null   object
5   Purchase_Address      3562 non-null   object
dtypes: float64(1), int64(2), object(3)
memory usage: 191.8+ KB

```

▼ Sorting out the most frequent Product combinations based on 'Ordered_ID'

```

dfz=a.groupby('Order_ID').agg(lambda x: x.tolist())
dfz

```



Order_ID	Product	Quantity_Ordered	Price_Each	Order_Date	Purchase_Address
141450	[Google Phone, Bose SoundSport Headphones]	[1, 1]	[600.0, 99.99]	[1/12/2019 11:16, 1/12/2019 11:16]	[521 Park St, San Francisco, CA 94016, 521 Par...
141782	[27in FHD Monitor, Bose SoundSport Headphones]	[1, 1]	[149.99, 99.99]	[1/11/2019 21:13, 1/11/2019 21:13]	[353 4th St, San Francisco, CA 94016, 353 4th ...
141795	[iPhone, Wired Headphones]	[1, 1]	[700.0, 11.99]	[1/19/2019 20:31, 1/19/2019 20:31]	[383 Jefferson St, San Francisco, CA 94016, 38...
141843	[AA Batteries (4-pack), AAA Batteries (4-pack)]	[1, 1]	[3.84, 2.99]	[1/10/2019 9:59, 1/10/2019 9:59]	[400 9th St, San Francisco, CA 94016, 400 9th ...
141846	[USB-C Charging Cable, Wired	[1, 1]	[11.95,	[1/11/2019 17:24,	[731 Lake St, San Francisco,

dfz.info()

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1728 entries, 141450 to 319447
Data columns (total 5 columns):
#   Column          Non-Null Count  Dtype
---  -
0   Product          1728 non-null   object
1   Quantity_Ordered 1728 non-null   object
2   Price_Each        1728 non-null   object
3   Order_Date        1728 non-null   object
4   Purchase_Address  1728 non-null   object
dtypes: object(5)
memory usage: 81.0+ KB
```

141795	[iPhone, Wired Headphones]	[1, 1]	11.99]	12/29/2019 20:18]	San Francisco, CA 94016, 114 ...
--------	----------------------------	--------	--------	-------------------	----------------------------------

▼ Extracting out Product Column

```
dm=dfz['Product']
dm
```

```

↳ Order_ID
141450      [Google Phone, Bose SoundSport Headphones]
141782      [27in FHD Monitor, Bose SoundSport Headphones]
141795      [iPhone, Wired Headphones]
141843      [AA Batteries (4-pack), AAA Batteries (4-pack)]
141946      [USB-C Charging Cable, Wired Headphones]
...
318794      [Bose SoundSport Headphones, AA Batteries (4-p...
318902      [Google Phone, Wired Headphones]
319045      [Flatscreen TV, AAA Batteries (4-pack)]
319337      [Vareebadd Phone, USB-C Charging Cable]
319447      [Google Phone, Wired Headphones]
Name: Product, Length: 1728, dtype: object

```

▼ Total No. of Combinations of Products (after conversion to List)

```

Prod = dfz['Product'].tolist()
Prod
len(Prod)

```

```

↳ 1728

```

▼ unique Combinations

```

product = [list(x) for x in set(tuple(x) for x in Prod)]
len(product)

```

```

↳ 249

```


▼ Description Of Combinations

product



```

[['iPhone', 'USB-C Charging Cable'],
 ['20in Monitor', 'Lightning Charging Cable'],
 ['Flatscreen TV', 'iPhone'],
 ['Wired Headphones', 'Apple AirPods Headphones'],
 ['USB-C Charging Cable', 'AA Batteries (4-pack)'],
 ['Wired Headphones', 'Macbook Pro Laptop'],
 ['34in Ultrawide Monitor', 'Lightning Charging Cable'],
 ['34in Ultrawide Monitor', '20in Monitor'],
 ['LG Dryer', 'AA Batteries (4-pack)'],
 ['Flatscreen TV', 'AAA Batteries (4-pack)'],
 ['Apple AirPods Headphones', 'Flatscreen TV'],
 ['iPhone', 'Wired Headphones', 'Lightning Charging Cable'],
 ['Vareebadd Phone', '34in Ultrawide Monitor'],
 ['Bose SoundSport Headphones', 'Bose SoundSport Headphones'],
 ['Lightning Charging Cable', '27in 4K Gaming Monitor'],
 ['Bose SoundSport Headphones', 'Flatscreen TV'],
 ['Google Phone',
  'USB-C Charging Cable',
  'Wired Headphones',
  'USB-C Charging Cable'],
 ['Google Phone', 'iPhone'],
 ['27in 4K Gaming Monitor', 'AAA Batteries (4-pack)'],
 ['AA Batteries (4-pack)', 'Vareebadd Phone'],
 ['20in Monitor', '34in Ultrawide Monitor'],
 ['USB-C Charging Cable', 'Bose SoundSport Headphones'],
 ['Wired Headphones', 'AAA Batteries (4-pack)'],
 ['iPhone', '27in 4K Gaming Monitor'],
 ['Macbook Pro Laptop', 'USB-C Charging Cable'],
 ['iPhone', 'Apple AirPods Headphones'],
 ['Macbook Pro Laptop', 'Google Phone'],
 ['Vareebadd Phone', 'Bose SoundSport Headphones'],
 ['27in FHD Monitor', 'Bose SoundSport Headphones'],
 ['Lightning Charging Cable', 'ThinkPad Laptop'],
 ['Bose SoundSport Headphones', '34in Ultrawide Monitor'],
 ['Wired Headphones', 'Google Phone'],
 ['Google Phone', '27in 4K Gaming Monitor'],
 ['AAA Batteries (4-pack)', 'iPhone'],
 ['Wired Headphones', 'LG Washing Machine'],
 ['Lightning Charging Cable', 'Lightning Charging Cable'],
 ['27in 4K Gaming Monitor', 'USB-C Charging Cable'],
 ['20in Monitor', 'Macbook Pro Laptop'].

```

```

['27in 4K Gaming Monitor', 'Google Phone'],
['Lightning Charging Cable', 'USB-C Charging Cable'],
['AA Batteries (4-pack)', 'AA Batteries (4-pack)'],
['Vareebadd Phone', 'USB-C Charging Cable'],
['ThinkPad Laptop', 'Lightning Charging Cable'],
['USB-C Charging Cable', 'Wired Headphones'],
['27in FHD Monitor', 'USB-C Charging Cable'],
['Flatscreen TV', 'Google Phone'],
['Google Phone', '27in FHD Monitor'],
['Google Phone',
 'USB-C Charging Cable',
 'Wired Headphones',
 'Wired Headphones'],
['USB-C Charging Cable', 'USB-C Charging Cable'],
['USB-C Charging Cable', 'Lightning Charging Cable'],
['Bose SoundSport Headphones', 'Apple AirPods Headphones'],
['Apple AirPods Headphones', 'ThinkPad Laptop'],
['27in FHD Monitor', 'AA Batteries (4-pack)'],
['Macbook Pro Laptop', 'Apple AirPods Headphones'],
['Lightning Charging Cable', 'AAA Batteries (4-pack)'],
['34in Ultrawide Monitor', 'AA Batteries (4-pack)'],
['Apple AirPods Headphones', 'Apple AirPods Headphones'],
['AA Batteries (4-pack)', 'Flatscreen TV'],
['20in Monitor', 'Apple AirPods Headphones'],
['27in 4K Gaming Monitor', 'Flatscreen TV'],
['AAA Batteries (4-pack)', 'USB-C Charging Cable'],
['Bose SoundSport Headphones', '27in 4K Gaming Monitor'],
['Flatscreen TV', '27in FHD Monitor'],
['Google Phone', 'Google Phone'],
['Vareebadd Phone', 'USB-C Charging Cable', 'Bose SoundSport Headphones'],
['Google Phone', '34in Ultrawide Monitor'],
['27in 4K Gaming Monitor', 'Apple AirPods Headphones'],
['Wired Headphones', 'iPhone'],
['Wired Headphones', 'Flatscreen TV'],
['Apple AirPods Headphones', '27in 4K Gaming Monitor'],
['Apple AirPods Headphones', '27in FHD Monitor'],
['iPhone',
 'Lightning Charging Cable',
 'Apple AirPods Headphones',
 'Wired Headphones',
 'Google Phone'],

```

```

['USB-C Charging Cable', 'iPhone'],
['34in Ultrawide Monitor', 'Wired Headphones'],
['Google Phone', 'Bose SoundSport Headphones'],
['AAA Batteries (4-pack)', 'AA Batteries (4-pack)'],
['Bose SoundSport Headphones', 'Google Phone'],
['Apple AirPods Headphones', 'Google Phone'],
['Google Phone', 'USB-C Charging Cable', 'Apple AirPods Headphones'],
['Vareebadd Phone', 'Wired Headphones'],
['Google Phone', 'USB-C Charging Cable', 'Bose SoundSport Headphones'],
['Apple AirPods Headphones', 'Vareebadd Phone'],
['iPhone', 'iPhone'],
['AAA Batteries (4-pack)', '34in Ultrawide Monitor'],
['USB-C Charging Cable', 'Macbook Pro Laptop'],
['AAA Batteries (4-pack)', 'AAA Batteries (4-pack)'],
['ThinkPad Laptop', 'Bose SoundSport Headphones'],
['27in FHD Monitor', 'Macbook Pro Laptop'],
['iPhone', 'AAA Batteries (4-pack)'],
['Lightning Charging Cable', 'Apple AirPods Headphones'],
['Apple AirPods Headphones', 'AAA Batteries (4-pack)'],
['Bose SoundSport Headphones', '27in FHD Monitor'],
['34in Ultrawide Monitor', 'Bose SoundSport Headphones'],
['Wired Headphones', '20in Monitor'],
['Apple AirPods Headphones', '34in Ultrawide Monitor'],
['Bose SoundSport Headphones', 'AAA Batteries (4-pack)'],
['27in 4K Gaming Monitor', 'Lightning Charging Cable'],
['AA Batteries (4-pack)', 'Wired Headphones'],
['27in FHD Monitor', 'Lightning Charging Cable'],
['AA Batteries (4-pack)', '20in Monitor'],
['27in 4K Gaming Monitor', 'iPhone'],
['Bose SoundSport Headphones', 'Macbook Pro Laptop'],
['AA Batteries (4-pack)', 'iPhone'],
['34in Ultrawide Monitor', 'AAA Batteries (4-pack)'],
['Lightning Charging Cable', 'Flatscreen TV'],
['AA Batteries (4-pack)', 'ThinkPad Laptop'],
['Lightning Charging Cable', 'Wired Headphones'],
['27in 4K Gaming Monitor', '34in Ultrawide Monitor'],
['USB-C Charging Cable', 'Google Phone'],
['Macbook Pro Laptop', 'iPhone'],
['USB-C Charging Cable', 'Flatscreen TV'],
['Wired Headphones', 'Lightning Charging Cable'],
['Vareebadd Phone',

```

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

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

```
[
    'Google Phone', 'Wired Headphones'],
    ['Bose SoundSport Headphones', 'AA Batteries (4-pack)'],
    ['AA Batteries (4-pack)', '27in 4K Gaming Monitor'],
    ['34in Ultrawide Monitor', 'Google Phone'],
    ['27in FHD Monitor', '20in Monitor'],
    ['AAA Batteries (4-pack)', 'Vareebadd Phone'],
    ['USB-C Charging Cable', '27in FHD Monitor'],
    ['Google Phone', 'USB-C Charging Cable', 'AA Batteries (4-pack)'],
    ['Macbook Pro Laptop', '27in FHD Monitor'],
    ['iPhone', 'Lightning Charging Cable', 'Wired Headphones'],
    ['AAA Batteries (4-pack)', 'Bose SoundSport Headphones'],
    ['Google Phone', 'AA Batteries (4-pack)'],
    ['Lightning Charging Cable', 'Macbook Pro Laptop'],
    ['Wired Headphones', '27in FHD Monitor'],
    ['ThinkPad Laptop', 'AAA Batteries (4-pack)'],
    ['Google Phone', 'Bose SoundSport Headphones', '27in FHD Monitor'],
    ['Wired Headphones', 'Vareebadd Phone'],
    ['Lightning Charging Cable', 'LG Washing Machine'],
    ['AA Batteries (4-pack)', 'Apple AirPods Headphones'],
    ['34in Ultrawide Monitor', '34in Ultrawide Monitor'],
    ['20in Monitor', 'Wired Headphones'],
    ['iPhone', '34in Ultrawide Monitor'],
    ['USB-C Charging Cable', 'Vareebadd Phone'],
    ['iPhone', 'Macbook Pro Laptop'],
    ['AAA Batteries (4-pack)', 'Google Phone'],
    ['Macbook Pro Laptop', '34in Ultrawide Monitor'],
    ['Bose SoundSport Headphones', 'iPhone'],
    ['20in Monitor', 'AAA Batteries (4-pack)'],
```

▼ Converting Prod List to Dictionary and Sorting in Descending order

```
['34in Ultrawide Monitor', 'Apple AirPods Headphones'],
```

```
Output = {}
```

```
for lis in Prod:
```

```
    Output.setdefault(tuple(lis), list()).append(1)
```

```
for a, b in Output.items():
```

```
    Output[a] = sum(b)
```

```
Output = {k: v for k, v in sorted(Output.items(), key=lambda item: item[1], reverse=True)}
```

```
Total Number Of Combination: 249
{('iPhone', 'Lightning Charging Cable'): 213, ('Google Phone', 'USB-C Charging Cable'): 211, ('iPhone', 'Wired Headpho
```

```
[('Xiaomi Mi Note Pro', 'Wired Headphones'),  
('Huawei P30 Pro', 'Wired Headphones'), ('Huawei P30 Pro', 'Wireless Earbuds')]
```

```
uin = input("Enter Product:")

ke=uin
for i in Output.keys():
    if uin in str(i):
        res = [val for key, val in Output.items() if ke in key]
        #print(res)
```



```
    recm=max(res)
    #print(recm)
    for item in Output:
        if Output[item]==recm:
            recm=item

print("Recommended Items:",recm)

☞ Enter Product:Google Phone
Recommended Items: ('Google Phone', 'USB-C Charging Cable')
```

▼ Hence, we conclude the most suitable list of items for certain Products.**bold text**

