Import the necessary libraries

In [ ]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from mlxtend.frequent_patterns import apriori
from mlxtend.frequent_patterns import association_rules
```

Importing the data

In [ ]:
```
df = pd.read_csv("/home/owekitiibwa/Desktop/dataAnalysis/Pandas-Data-Scie
df.head()
```

Out[ ]:

	Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address
0	194095	Wired Headphones	1	11.99	05/16/19 17:14	669 2nd St, New York City, NY 10001
1	194096	AA Batteries (4-pack)	1	3.84	05/19/19 14:43	844 Walnut St, Dallas, TX 75001
2	194097	27in FHD Monitor	1	149.99	05/24/19 11:36	164 Madison St, New York City, NY 10001
3	194098	Wired Headphones	1	11.99	05/02/19 20:40	622 Meadow St, Dallas, TX 75001
4	194099	AAA Batteries (4-pack)	2	2.99	05/11/19 22:55	17 Church St, Seattle, WA 98101

Data Cleaning

Count missing values for each column and sort in descending order

In [ ]:
```
missing_values = df.isnull().sum().sort_values(ascending=False)
missing_values
```

Out[ ]:
```
Order ID            1090
Product             1090
Quantity Ordered    1090
Price Each          1090
Order Date          1090
Purchase Address    1090
dtype: int64
```

Deleting missing values from the dataset

In [ ]:
```
df = df.dropna()
missing_values = df.isnull().sum().sort_values(ascending=False)
missing_values
```

Out[ ]:
```
Order ID            0
Product             0
Quantity Ordered    0
Price Each          0
Order Date          0
Purchase Address    0
dtype: int64
```

Checking for duplicates and delete them

In [ ]:
```
# Use the `duplicated` method to check for duplicate rows
duplicates = df[df.duplicated()]
df = df.drop_duplicates()
#Checking whether duplicates have been removed
duplicates = df[df.duplicated()]
duplicates
```

Out[ ]:

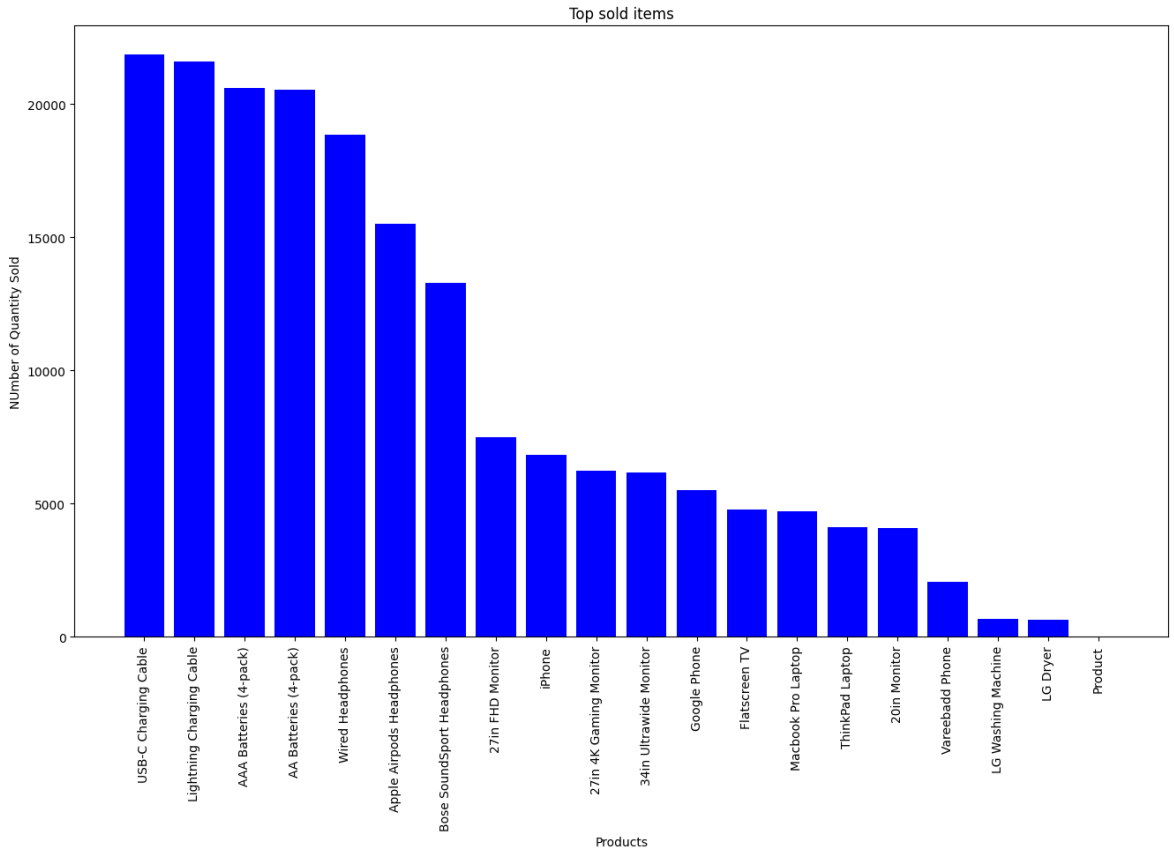
Order ID	Product	Quantity Ordered	Price Each	Order Date	Purchase Address

Plotting the item distribution

In [ ]:
```
Itemdistro = df.groupby(by= "Product").size().reset_index(name= 'Frequenc
bars = Itemdistro['Product']
height = Itemdistro['Frequency']
x_pos = np.arange(len(bars))

plt.figure(figsize=(16,9))
plt.bar(x_pos,height,color="blue")
plt.title("Top sold items")
plt.xlabel("Products")
plt.ylabel("NUmber of Quantity Sold")
plt.xticks(x_pos, bars, rotation=90)

plt.show()
```

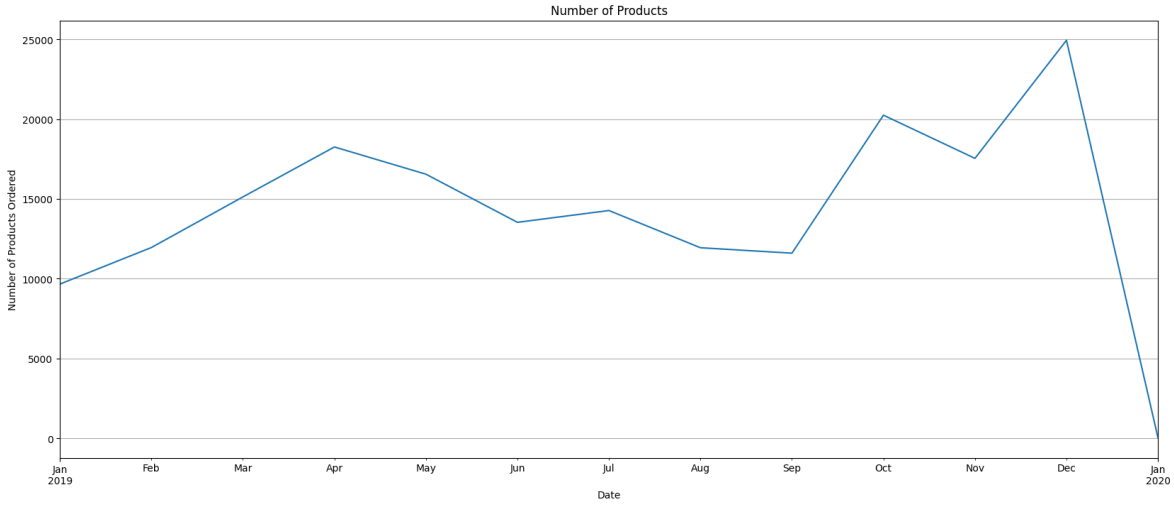


Lets us create a chart showing trends the products ordered

In [ ]:
```
df['Order Date'] = pd.to_datetime(df['Order Date'], errors='coerce')
df_date = df.set_index(df["Order Date"])
df_date.resample('M')["Product"].count().plot(figsize = (20,8),grid= True
```

```
/tmp/ipykernel_258289/1884926306.py:1: UserWarning: Could not infer forma
t, so each element will be parsed individually, falling back to `dateutil
`. To ensure parsing is consistent and as-expected, please specify a forma
t.
  df['Order Date'] = pd.to_datetime(df['Order Date'], errors='coerce')
```

Out[ ]:
```
[Text(0.5, 0, 'Date'), Text(0, 0.5, 'Number of Products Ordered')]
```



Now, let's pivot this table to convert the items into columns and the transaction into rows:

In [ ]:
```
df2 = pd.crosstab(df['Order ID'], df['Product'])
df2.head()
```

Out[ ]:

Product / Order ID	20in Monitor	27in 4K Gaming Monitor	27in FHD Monitor	34in Ultrawide Monitor	AA Batteries (4-pack)	AAA Batteries (4-pack)	Apple Airpods Headphones	S H
141275	0	0	0	0	0	0	0	
141290	0	0	0	0	1	0	1	
141365	0	0	0	0	0	0	0	
141384	0	0	0	0	0	0	0	
141450	0	0	0	0	0	0	0	

Now lets encode the data for the Apriori Algorithm

In [ ]:
```
def encode(item_freq):
    res = 0
    if item_freq > 0:
        res = 1
    return res

basket_input = df2.applymap(encode)
```

```
/tmp/ipykernel_258289/230850535.py:7: FutureWarning: DataFrame.applymap ha
s been deprecated. Use DataFrame.map instead.
  basket_input = df2.applymap(encode)
```

Build the Apriori Algorithm for Market Basket Analysis

In [ ]:
```
from mlxtend.frequent_patterns import apriori
from mlxtend.frequent_patterns import association_rules
frequent_itemsets = apriori(basket_input, min_support=0.001, use_colnames

rules = association_rules(frequent_itemsets, metric="lift")

rules.sort_values(["support", "confidence","lift"],axis = 0, ascending =
```

```
/home/owekitiibwa/.local/lib/python3.10/site-packages/mlxtend/frequent_pat
terns/fpcommon.py:110: DeprecationWarning: DataFrames with non-bool types
result in worse computationalperformance and their support might be discon
tinued in the future.Please use a DataFrame with bool type
  warnings.warn(
```

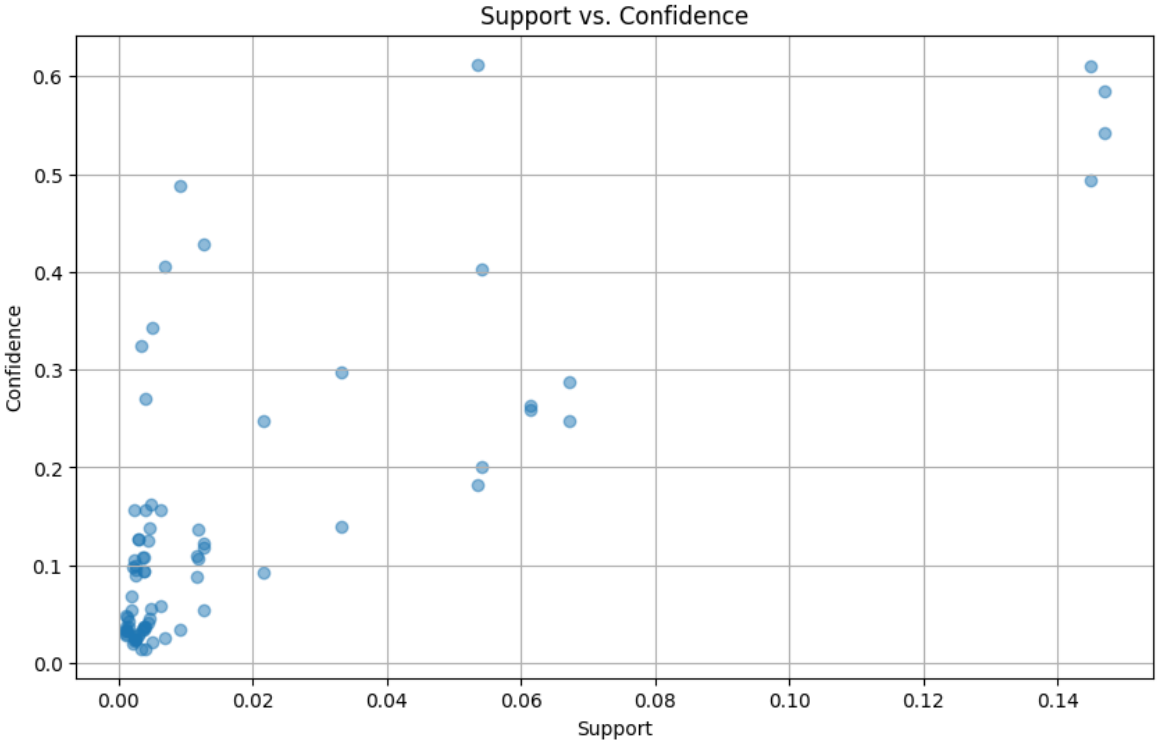
Out[ ]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	li
57	(Lightning Charging Cable)	(iPhone)	0.251199	0.270970	0.146969	0.585069	2.1591
56	(iPhone)	(Lightning Charging Cable)	0.270970	0.251199	0.146969	0.542382	2.1591
53	(Google Phone)	(USB-C Charging Cable)	0.237389	0.293793	0.144934	0.610533	2.0781
52	(USB-C Charging Cable)	(Google Phone)	0.293793	0.237389	0.144934	0.493320	2.0781
62	(Wired Headphones)	(iPhone)	0.233610	0.270970	0.067161	0.287492	1.0609
63	(iPhone)	(Wired Headphones)	0.270970	0.233610	0.067161	0.247854	1.0609
54	(Wired Headphones)	(Google Phone)	0.233610	0.237389	0.061346	0.262601	1.1062
55	(Google Phone)	(Wired Headphones)	0.237389	0.233610	0.061346	0.258420	1.1062
47	(Apple Airpods Headphones)	(iPhone)	0.134613	0.270970	0.054223	0.402808	1.4865
46	(iPhone)	(Apple Airpods Headphones)	0.270970	0.134613	0.054223	0.200107	1.4865

Support vs. Confidence Scatter Plot

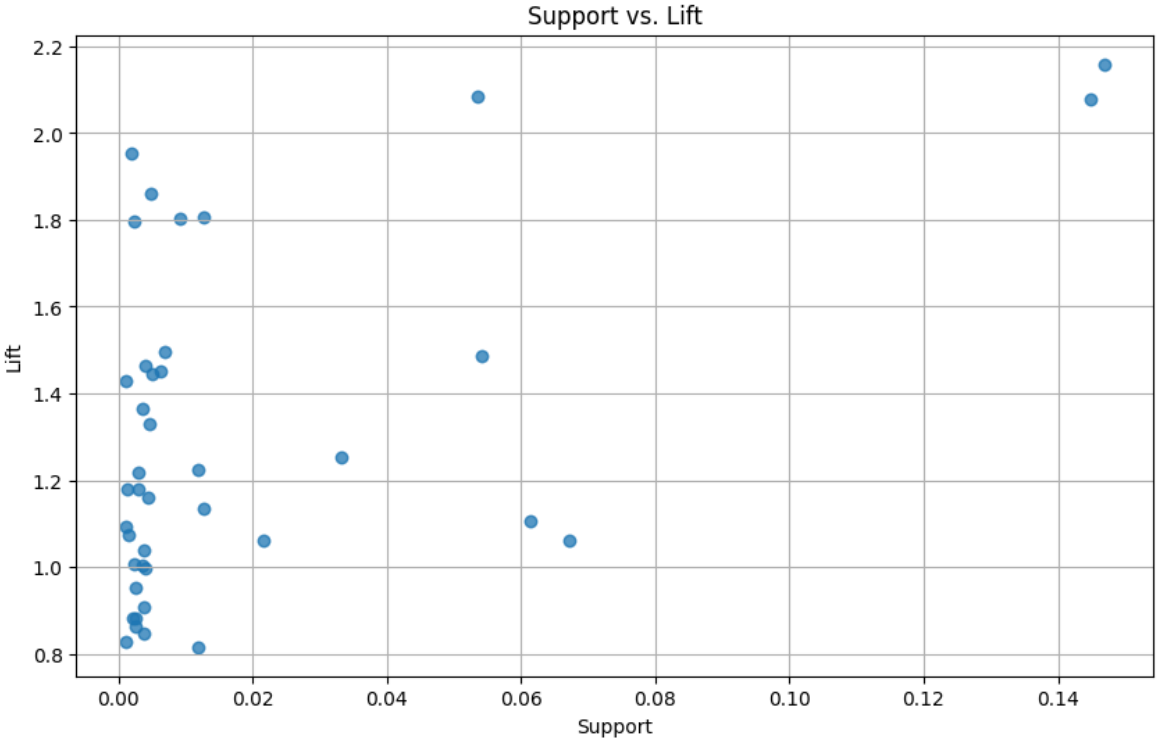
In [ ]:

```
plt.figure(figsize=(10, 6))
plt.scatter(rules['support'], rules['confidence'], alpha=0.5)
plt.xlabel('Support')
plt.ylabel('Confidence')
plt.title('Support vs. Confidence')
plt.grid()
plt.show()
```



Support vs Lift Scatter Plot

In [ ]:
```
plt.figure(figsize=(10, 6))
plt.scatter(rules['support'], rules['lift'], alpha=0.5)
plt.xlabel('Support')
plt.ylabel('Lift')
plt.title('Support vs. Lift')
plt.grid()
plt.show()
```



Confidence vs. Lift Scatter Plot

In [ ]:
```
plt.figure(figsize=(10, 6))
plt.scatter(rules['confidence'], rules['lift'], alpha=0.5)
plt.xlabel('Confidence')
plt.ylabel('Lift')
plt.title('Confidence vs. Lift')
plt.grid()
plt.show()
```