Aim

- To analyse the SuperMarket sales dataset using Python to get detailed insight into the sales data.

Import required libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sb
```

Read the csv file

In [2]:
```
#filepath="D:/project/supermarket_sales - Sheet1.csv"
data=pd.read_csv('D:/project/supermarket_sales - Sheet1.csv')
```

Top 10 records

In [40]:
```
data.head(10)
```

Out[40]:

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax 5%	Total	
0	750-67-8428	A	Yangon	Member	Female	Health and beauty	74.69	7	26.1415	548.9715	
1	226-31-3081	C	Naypyitaw	Normal	Female	Electronic accessories	15.28	5	3.8200	80.2200	
2	631-41-3108	A	Yangon	Normal	Male	Home and lifestyle	46.33	7	16.2155	340.5255	
3	123-19-1176	A	Yangon	Member	Male	Health and beauty	58.22	8	23.2880	489.0480	1
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785	
5	699-14-3026	C	Naypyitaw	Normal	Male	Electronic accessories	85.39	7	29.8865	627.6165	3
6	355-53-5943	A	Yangon	Member	Female	Electronic accessories	68.84	6	20.6520	433.6920	2
7	315-22-5665	C	Naypyitaw	Normal	Female	Home and lifestyle	73.56	10	36.7800	772.3800	2
8	665-32-9167	A	Yangon	Member	Female	Health and beauty	36.26	2	3.6260	76.1460	1

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax 5%	Total	
9	692-92-5582	B	Mandalay	Member	Female	Food and beverages	54.84	3	8.2260	172.7460	2

Last 10 records

In [182…
```
data.tail(10)
```

Out[182…

	Invoice ID	Branch	City	Customer type	Gender	Product line	Unit price	Quantity	Tax 5%	Tota
990	886-18-2897	A	Yangon	Normal	Female	Food and beverages	56.56	5	14.1400	296.940
991	602-16-6955	B	Mandalay	Normal	Female	Sports and travel	76.60	10	38.3000	804.300
992	745-74-0715	A	Yangon	Normal	Male	Electronic accessories	58.03	2	5.8030	121.863
993	690-01-6631	B	Mandalay	Normal	Male	Fashion accessories	17.49	10	8.7450	183.645
994	652-49-6720	C	Naypyitaw	Member	Female	Electronic accessories	60.95	1	3.0475	63.997
995	233-67-5758	C	Naypyitaw	Normal	Male	Health and beauty	40.35	1	2.0175	42.367
996	303-96-2227	B	Mandalay	Normal	Female	Home and lifestyle	97.38	10	48.6900	1022.490
997	727-02-1313	A	Yangon	Member	Male	Food and beverages	31.84	1	1.5920	33.432
998	347-56-2442	A	Yangon	Normal	Male	Home and lifestyle	65.82	1	3.2910	69.111
999	849-09-3807	A	Yangon	Member	Female	Fashion accessories	88.34	7	30.9190	649.299

Columns present in the data

In [19]:
```
data.columns
```

Out[19]:
```
Index(['Invoice ID', 'Branch', 'City', 'Customer type', 'Gender',
       'Product line', 'Unit price', 'Quantity', 'Tax 5%', 'Total', 'Date',
```

```
       'Time', 'Payment', 'cogs', 'gross margin percentage', 'gross income',
       'Rating'],
      dtype='object')
```

Basic information about the dataset

In [20]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 17 columns):
 #   Column                   Non-Null Count  Dtype  
---  ------                   --------------  -----  
 0   Invoice ID               1000 non-null   object 
 1   Branch                   1000 non-null   object 
 2   City                     1000 non-null   object 
 3   Customer type            1000 non-null   object 
 4   Gender                   1000 non-null   object 
 5   Product line             1000 non-null   object 
 6   Unit price               1000 non-null   float64
 7   Quantity                 1000 non-null   int64  
 8   Tax 5%                   1000 non-null   float64
 9   Total                    1000 non-null   float64
 10  Date                     1000 non-null   object 
 11  Time                     1000 non-null   object 
 12  Payment                  1000 non-null   object 
 13  cogs                     1000 non-null   float64
 14  gross margin percentage  1000 non-null   float64
 15  gross income             1000 non-null   float64
 16  Rating                   1000 non-null   float64
dtypes: float64(7), int64(1), object(9)
memory usage: 132.9+ KB
```

Statistical information about the dataset

In [21]:
```
data.describe()
```

Out[21]:

	Unit price	Quantity	Tax 5%	Total	cogs	gross margin percentage	gross income
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.00000	1.000000e+03	1000.000000
mean	55.672130	5.510000	15.379369	322.966749	307.58738	4.761905e+00	15.379369
std	26.494628	2.923431	11.708825	245.885335	234.17651	6.220360e-14	11.708825
min	10.080000	1.000000	0.508500	10.678500	10.17000	4.761905e+00	0.508500
25%	32.875000	3.000000	5.924875	124.422375	118.49750	4.761905e+00	5.924875
50%	55.230000	5.000000	12.088000	253.848000	241.76000	4.761905e+00	12.088000
75%	77.935000	8.000000	22.445250	471.350250	448.90500	4.761905e+00	22.445250
max	99.960000	10.000000	49.650000	1042.650000	993.00000	4.761905e+00	49.650000

Check the number of Rows and Columns in the DataSet

In [22]:
```
data.shape
```

Out[22]:
```
(1000, 17)
```

Check for the Null Value count

In [23]:
```
data.isna().sum()
```

Out[23]:
```
Invoice ID                0
Branch                    0
City                      0
Customer type             0
Gender                    0
Product line              0
Unit price                0
Quantity                  0
Tax 5%                    0
Total                     0
Date                      0
Time                      0
Payment                   0
cogs                      0
gross margin percentage   0
gross income              0
Rating                    0
dtype: int64
```

---------Qualitative Data Analysis----------

Query - Date given in Dataset

In [24]:
```
data['Date'].min()
```

Out[24]:
```
'1/1/2019'
```

In [26]:
```
data['Date'].max()
```

Out[26]:
```
'3/9/2019'
```

Query - Number of Branches

In [27]:
```
data['Branch'].unique()
```

Out[27]:
```
array(['A', 'C', 'B'], dtype=object)
```

Query - Customer Type

In [28]:
```
data['Customer type'].unique()
```

Out[28]:
```
array(['Member', 'Normal'], dtype=object)
```

Query - Product categories

In [29]:
```
data['Product line'].unique()
```

Out[29]:
```
array(['Health and beauty', 'Electronic accessories',
       'Home and lifestyle', 'Sports and travel', 'Food and beverages',
       'Fashion accessories'], dtype=object)
```

Query - What are the Payment methods

In [30]:
```
data['Payment'].unique()
```

Out[30]:
```
array(['Ewallet', 'Cash', 'Credit card'], dtype=object)
```

Query - Cities mentioned

In [31]:
```
data['City'].unique()
```

Out[31]:
```
array(['Yangon', 'Naypyitaw', 'Mandalay'], dtype=object)
```

--------Quantitative Analysis----------

Query - Citywise sales

In [32]:
```
data.groupby('City')['Total'].sum()
```

Out[32]:
```
City
Mandalay     106197.6720
Naypyitaw    110568.7065
Yangon       106200.3705
Name: Total, dtype: float64
```

Query - Product wise sales

In [33]:
```
data.groupby('Product line')['Total'].sum()
```

Out[33]:
```
Product line
Electronic accessories    54337.5315
Fashion accessories       54305.8950
Food and beverages        56144.8440
Health and beauty         49193.7390
Home and lifestyle        53861.9130
Sports and travel         55122.8265
Name: Total, dtype: float64
```

Query - Number of products purchased by Branch

In [36]:
```
print(data.groupby('Branch')['Quantity'].sum())
```

```
Branch
A    1859
B    1820
C    1831
Name: Quantity, dtype: int64
```

Query - Average rating for Branches

In [37]:
```
data.groupby('Branch')['Rating'].mean()
```

Out[37]:
```
Branch
A    7.027059
B    6.818072
C    7.072866
Name: Rating, dtype: float64
```

Query - Purchases by different payment methods

In [39]:
```
data.groupby('Payment')['Quantity'].sum()
```

Out[39]:
```
Payment
Cash           1896
Credit card    1722
Ewallet        1892
Name: Quantity, dtype: int64
```

Statistical Analysis

Query - Average Rating Given by Customers

In [65]:
```
rating=data['Rating'].mean()
print("Average Rating given is {} out of 10".format(rating))
```

```
Average Rating given is 6.972700000000003 out of 10
```

Query - What is the total Cost of Goods Sold?

In [61]:
```
print('Total COGS is $ {} '.format(data['cogs'].sum()))
```

```
Total COGS is $ 307587.38
```

Query - Total Amount Collected as Tax

In [66]:
```
print("Total TAX AMOUNT Collected $ {}".format(data['Tax 5%'].sum()))
```

```
Total TAX AMOUNT Collected $ 15379.368999999999
```

Query - Average amount customers spend

In [70]:
```
print("Average Amount Customers Spend $ {}".format(data['Total'].mean()))
```

```
Average Amount Customers Spend $ 322.96674900000005
```

Query - Standard deviation on the Gross Margin Percentage

In [73]:
```
data['gross margin percentage'].std()
```

Out[73]:
```
6.22035989578277e-14
```

Query - Variance deviation on the Gross Margin Percentage

In [74]:
```
data['gross margin percentage'].var()
```

Out[74]:
```
3.869287723306264e-27
```

Query - Standard deviation on the Unit Price

In [78]:
```
data['Unit price'].std()
```

Out[78]:
```
26.494628347919768
```

Query - Standard Deviation on Rating

In [82]:
```
data['Rating'].std()
```

Out[82]:
```
1.718580294379123
```

Query - Average Gross Income by Branches

In [84]:
```
data.groupby('Branch')['gross income'].mean()
```

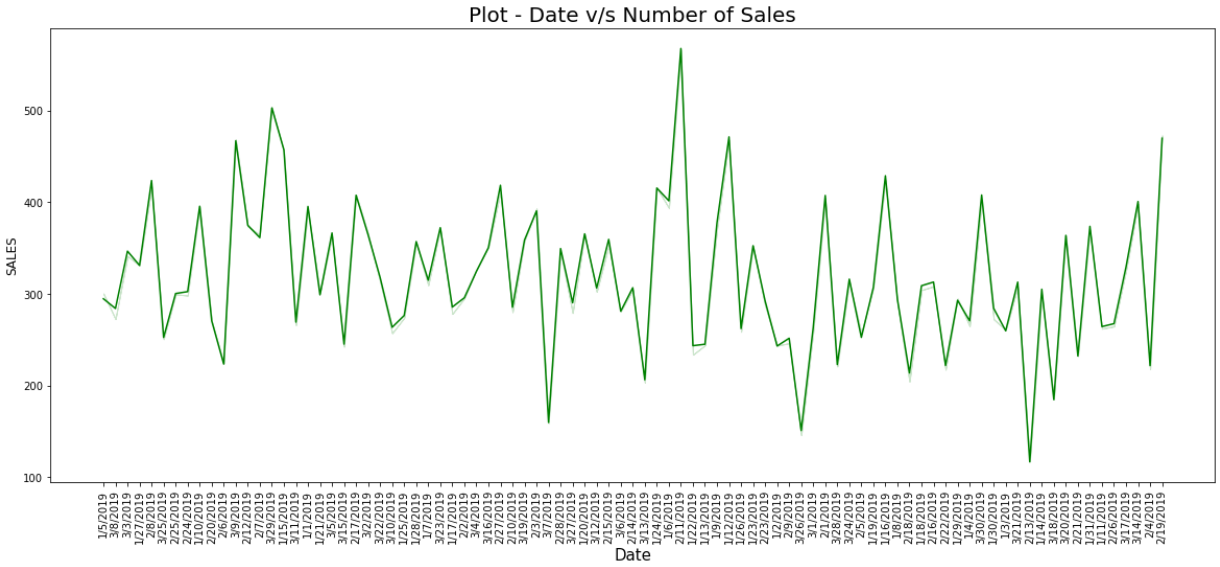
Out[84]:
```
Branch
A    14.874001
B    15.232024
C    16.052367
Name: gross income, dtype: float64
```

In [71]:
```
data['Quantity'].mode()
```

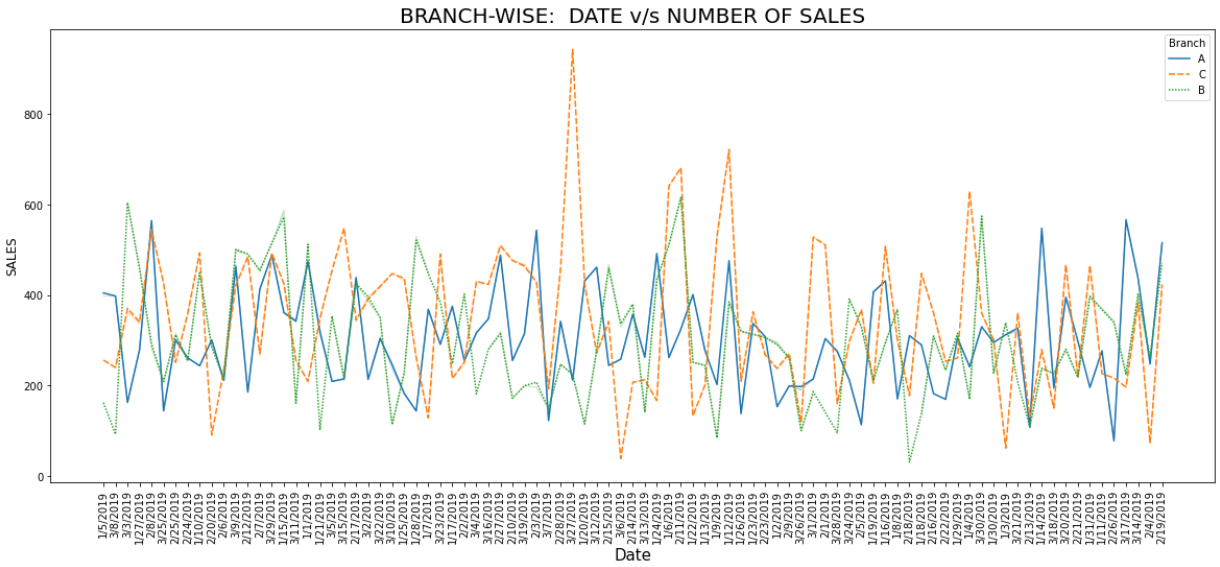
Out[71]:
```
0    10
dtype: int64
```

Data Visualisation

In [3]:
```
plt.figure(figsize=(20,8))
sb.lineplot(x='Date',y='Total',data=data,color='g',ci=False)
plt.xticks(rotation='vertical')
plt.title('Plot - Date v/s Number of Sales',size=20)
plt.xlabel('Date',size=15)
plt.ylabel('SALES',size=12)
plt.show()
```



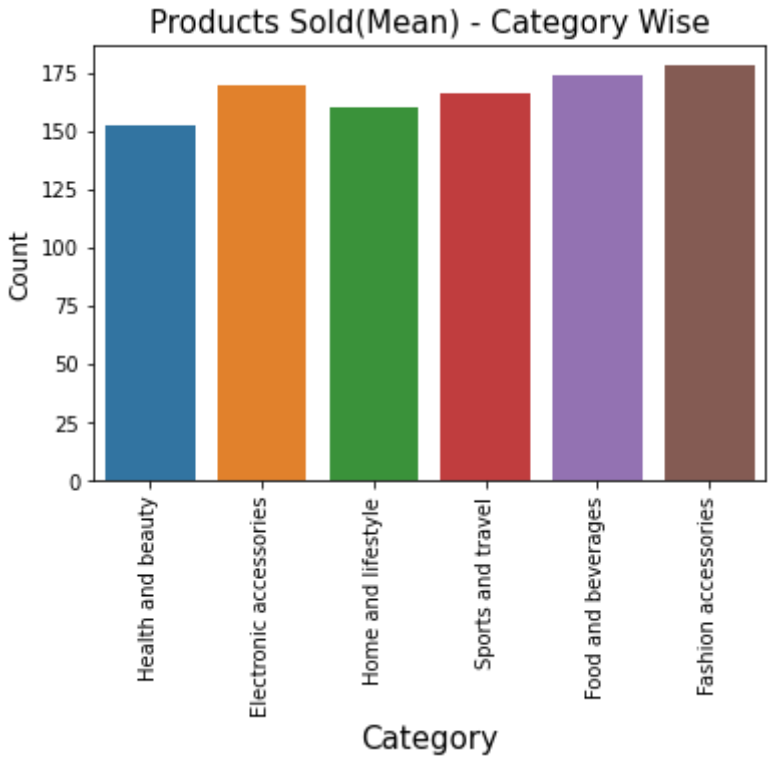
In [4]:
```
plt.figure(figsize=(20,8))
sb.lineplot(x='Date',y='Total',data=data,color='g',ci=True,hue='Branch',style='Branc
plt.xticks(rotation='vertical')
plt.title('BRANCH-WISE:  DATE v/s NUMBER OF SALES',size=20)
plt.xlabel('Date',size=15)
plt.ylabel('SALES',size=12)
plt.show()
```



In [22]:
```
sb.countplot('Product line',data=data)
plt.title('Products Sold(Mean) - Category Wise',size=15)
plt.xlabel('Category',size=15)
plt.ylabel('Count',size=12)
plt.xticks(rotation='vertical')
plt.show()
```

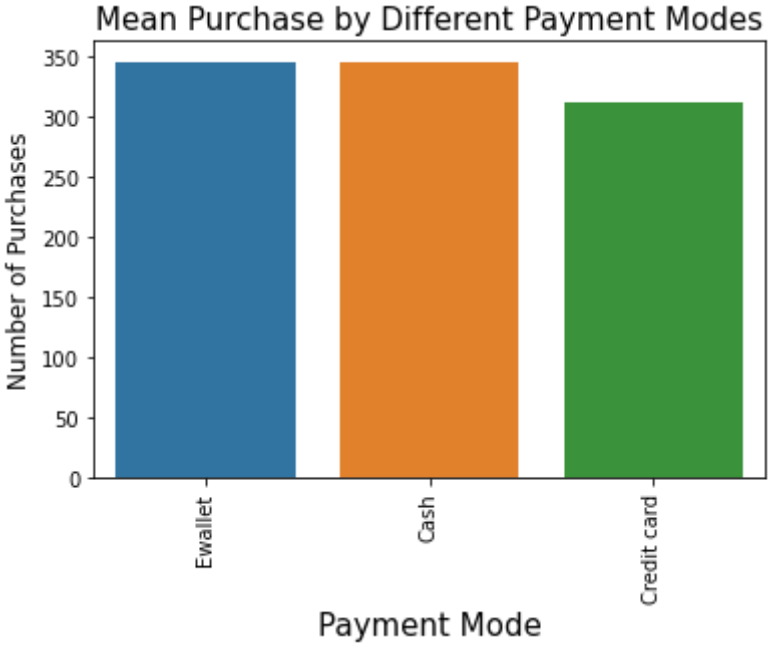
```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning:
```

```
Pass the following variable as a keyword arg: x. From version 0.12, the only valid p
ositional argument will be `data`, and passing other arguments without an explicit k
eyword will result in an error or misinterpretation.
  warnings.warn(
```



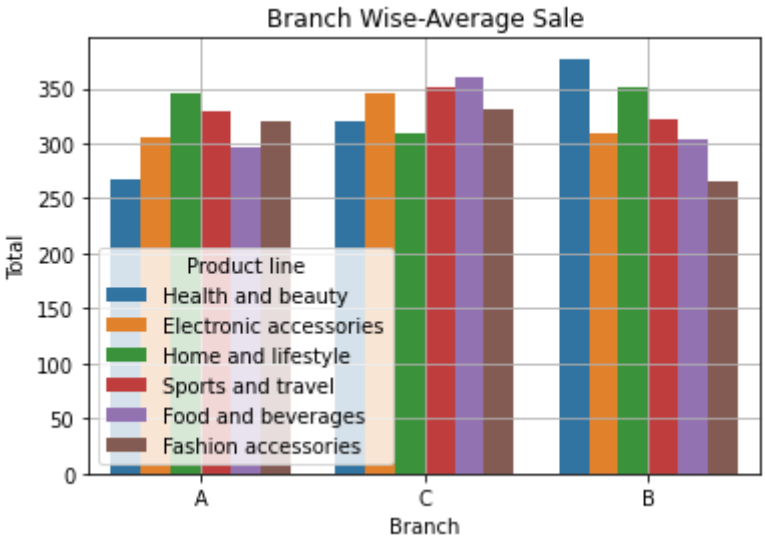
In [23]:
```
sb.countplot('Payment',data=data)
plt.title('Mean Purchase by Different Payment Modes',size=15)
plt.xlabel('Payment Mode',size=15)
plt.ylabel('Number of Purchases',size=12)
plt.xticks(rotation='vertical')
plt.show()
```

```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning:
Pass the following variable as a keyword arg: x. From version 0.12, the only valid p
ositional argument will be `data`, and passing other arguments without an explicit k
eyword will result in an error or misinterpretation.
  warnings.warn(
```



In [18]:
```
sb.barplot(x='Branch',y="Total",data=data,hue='Product line',ci=False)
plt.title('Branch Wise-Average Sale')
```

```
plt.grid()
plt.show()
```



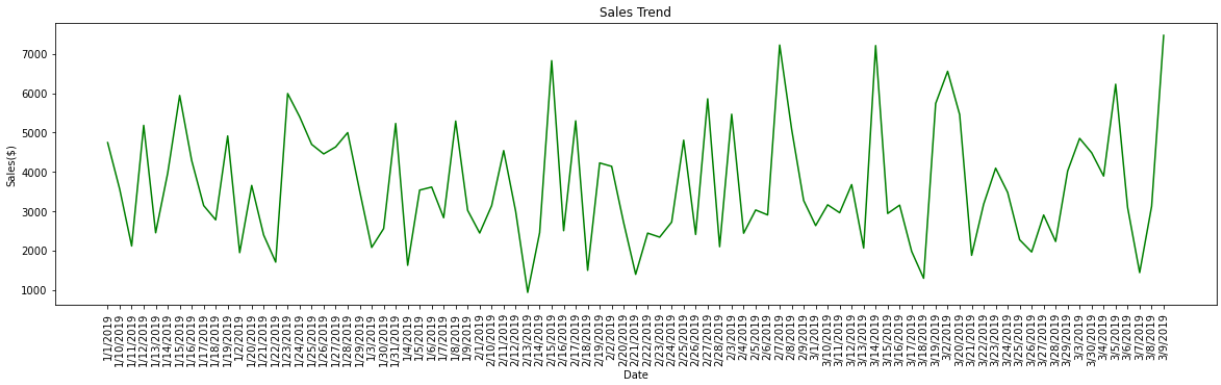
In [69]:
```
sales=data.groupby('Date')['Total'].sum().reset_index()
sales
```

Out[69]:

	Date	Total
0	1/1/2019	4745.1810
1	1/10/2019	3560.9490
2	1/11/2019	2114.9625
3	1/12/2019	5184.7635
4	1/13/2019	2451.2040
...	...	...
84	3/5/2019	6230.8785
85	3/6/2019	3092.5965
86	3/7/2019	1438.2585
87	3/8/2019	3125.3880
88	3/9/2019	7474.0470

89 rows × 2 columns

In [70]:
```
plt.figure(figsize=(20,5))
sb.lineplot(x='Date',y='Total',data=sales,color='g')
plt.title('Sales Trend')
plt.ylabel('Sales($)')
plt.xticks(rotation='vertical')
plt.show()
```

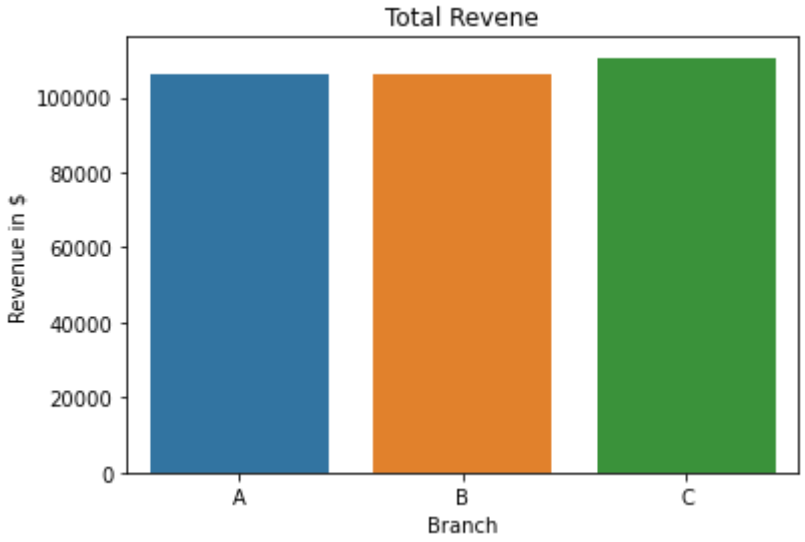


In [71]:
```
rev=data.groupby('Branch').sum().reset_index()
rev
```

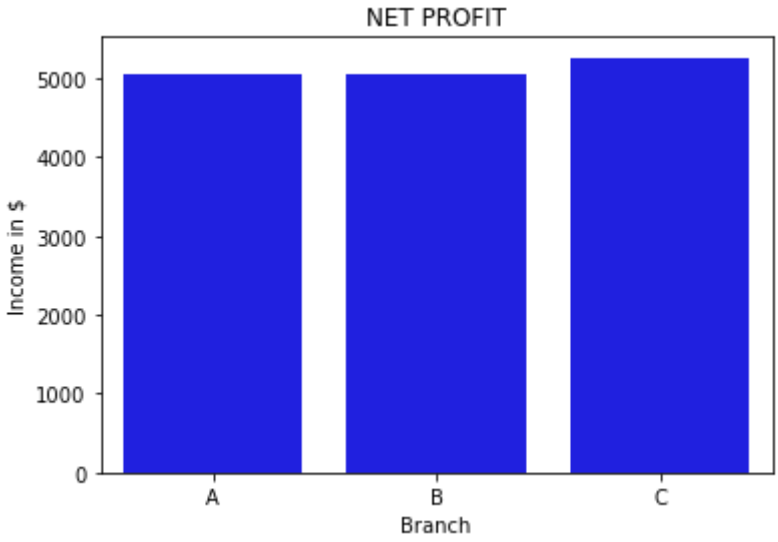
Out[71]:

	Branch	Unit price	Quantity	Tax 5%	Total	cogs	gross margin percentage	gross income	Rating
0	A	18625.49	1859	5057.1605	106200.3705	101143.21	1619.047619	5057.1605	2389.2
1	B	18478.88	1820	5057.0320	106197.6720	101140.64	1580.952381	5057.0320	2263.6
2	C	18567.76	1831	5265.1765	110568.7065	105303.53	1561.904762	5265.1765	2319.9

In [72]:
```
sb.barplot(x='Branch',y='Total',data=rev)
plt.ylabel("Revenue in $")
plt.title('Total Revene')
plt.show()
```

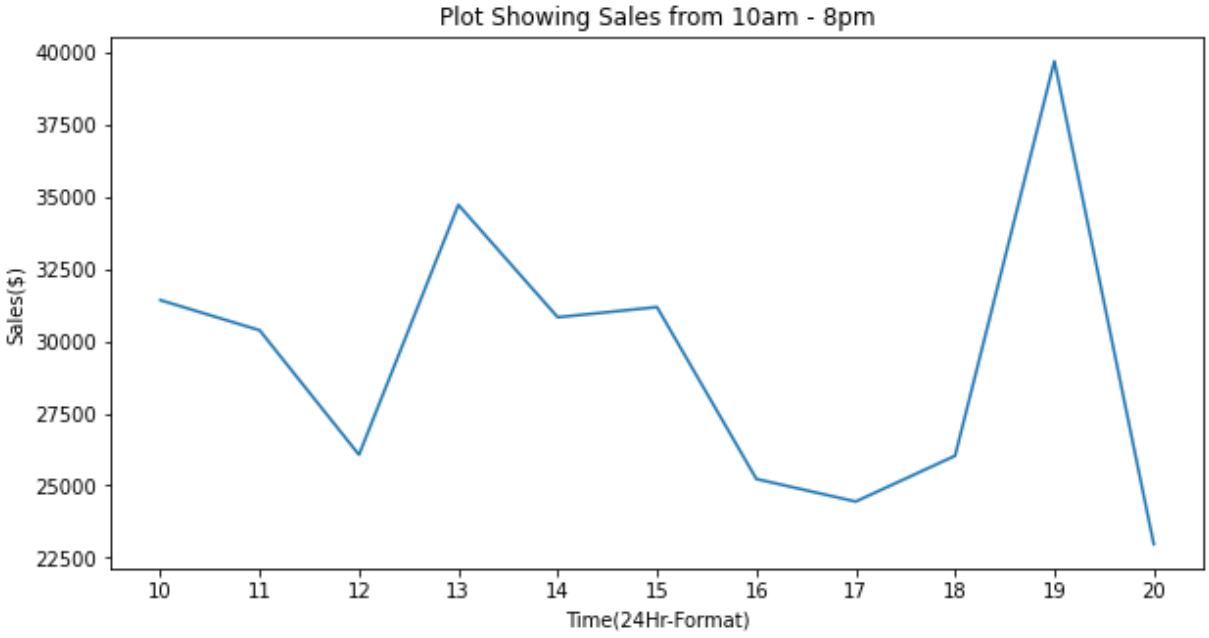


In [73]:
```
sb.barplot(x='Branch',y='gross income',data=rev,color='b')
plt.ylabel("Income in $")
plt.title('NET PROFIT')
plt.show()
```



In [74]:
```
data['hour']=data['Time'].apply(lambda x: x.split(':')[0])
hour=data.groupby('hour')['Total'].sum().reset_index().sort_values(by='hour')
```

In [75]:
```
plt.figure(figsize=(10,5))
sb.lineplot(x=hour['hour'],y=hour['Total'])
plt.title('Plot Showing Sales from 10am - 8pm')
plt.xlabel('Time(24Hr-Format)')
plt.ylabel('Sales($)')
plt.show()
```

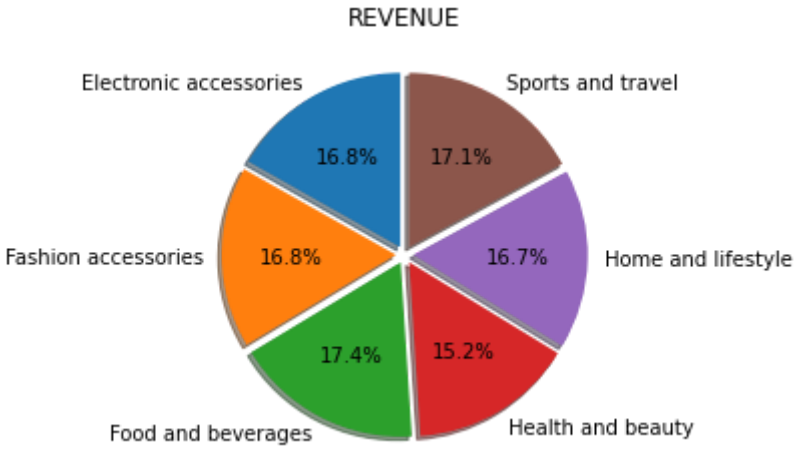


In [79]:
```
pie=data.groupby('Product line')['Total'].sum().reset_index()
```

In [82]:
```
slices=list(pie['Total'])
name=list(pie['Product line'])
print(slices, name)
```

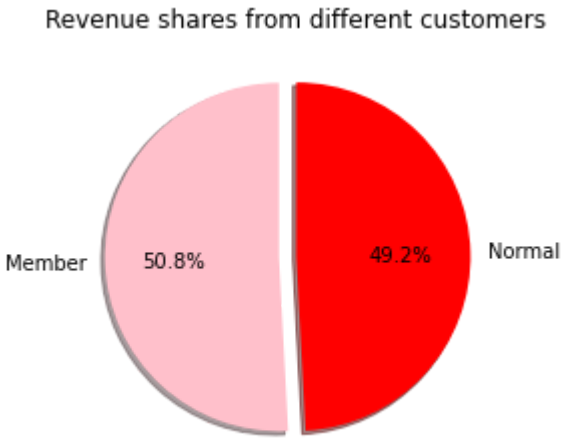
```
[54337.531500000005, 54305.895, 56144.844000000005, 49193.739000000016, 53861.913000
00001, 55122.826499999996] ['Electronic accessories', 'Fashion accessories', 'Food a
nd beverages', 'Health and beauty', 'Home and lifestyle', 'Sports and travel']
```

In [103…
```
plt.pie(slices,labels=name,shadow=True,startangle=90,explode=[0.05,0.05,0.05,0.05,0.
plt.title('REVENUE')
#plt.axis('auto')
plt.show()
```



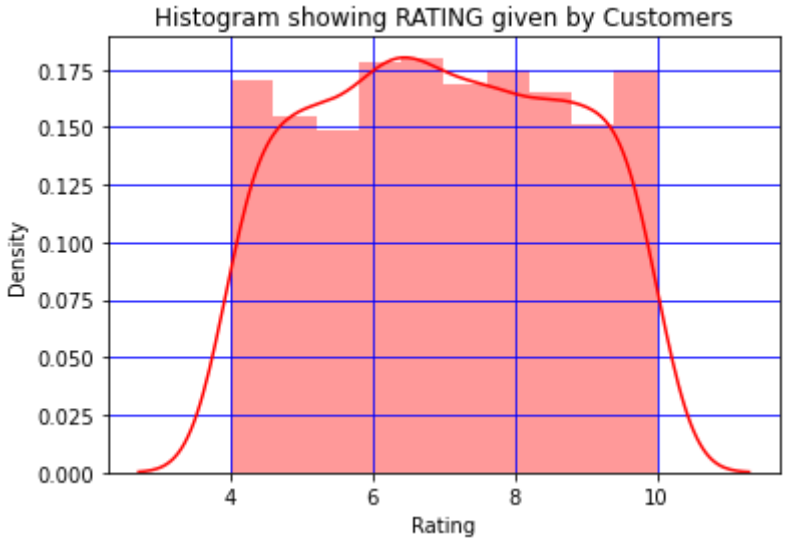
In [93]:
```
c_type=data.groupby('Customer type')['Total'].sum().reset_index()
slices1=list(c_type['Total'])
name1=list(c_type['Customer type'])
```

In [104…
```
plt.pie(slices1,labels=name1,shadow=True,colors=['pink','red'],explode=[0.1,0],start
plt.title('Revenue shares from different customers')
plt.show()
```

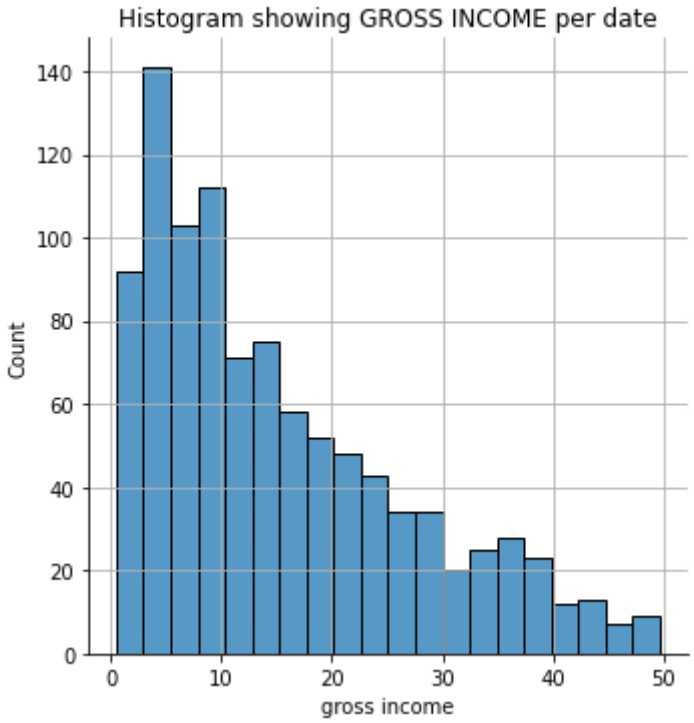


In [23]:
```
sb.distplot(data['Rating'],bins=10,color='r')
plt.title('Histogram showing RATING given by Customers')
plt.grid(color='b')
plt.show()
```

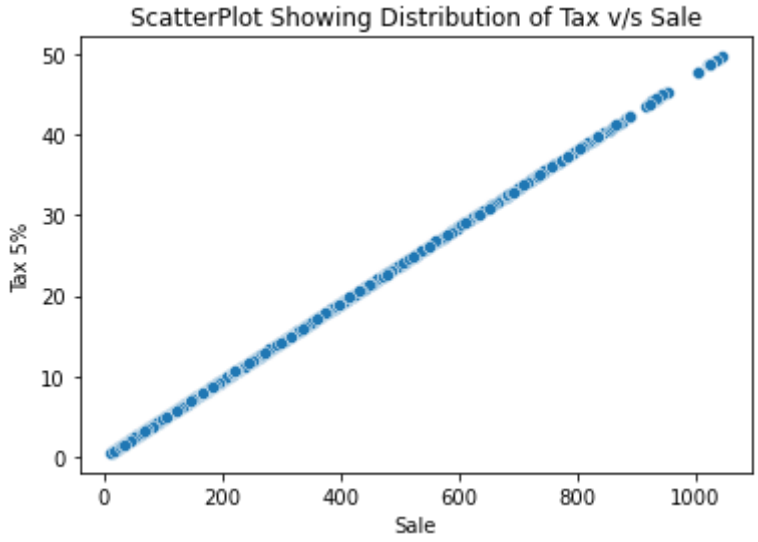
```
C:\ProgramData\Anaconda3\lib\site-packages\seaborn\distributions.py:2551: FutureWarn
ing: `distplot` is a deprecated function and will be removed in a future version. Pl
ease adapt your code to use either `displot` (a figure-level function with similar f
lexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```



In [181…
```
sb.displot(data['gross income'],bins=20)
plt.title('Histogram showing GROSS INCOME per date')
plt.grid()
plt.show()
```

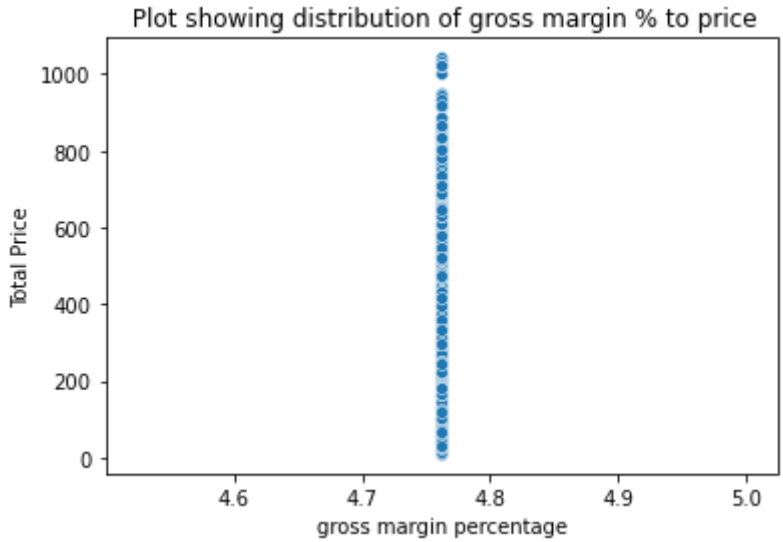


In [152…
```
sb.scatterplot(x='Total',y="Tax 5%",data=data)
plt.title('ScatterPlot Showing Distribution of Tax v/s Sale')
plt.xlabel('Sale')
plt.show()
```

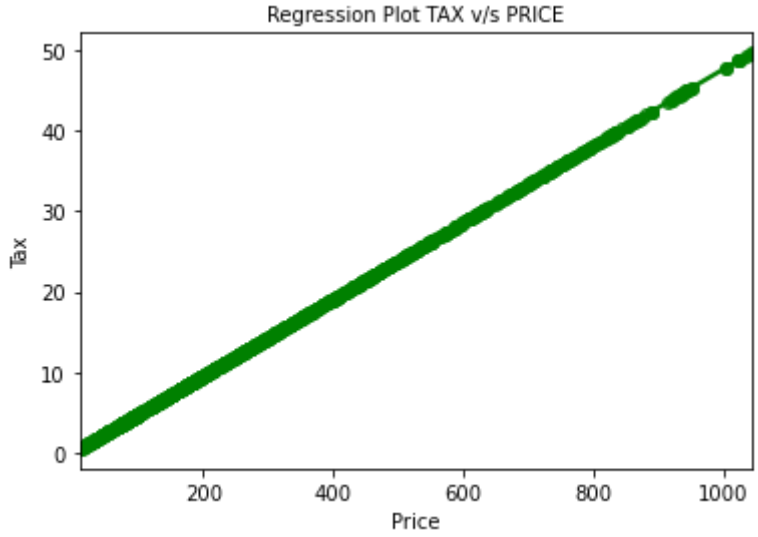


In [158…
```
sb.scatterplot(x='gross margin percentage', y='Total', data=data)
plt.title(' Plot showing distribution of gross margin % to price')
plt.ylabel('Total Price')
```

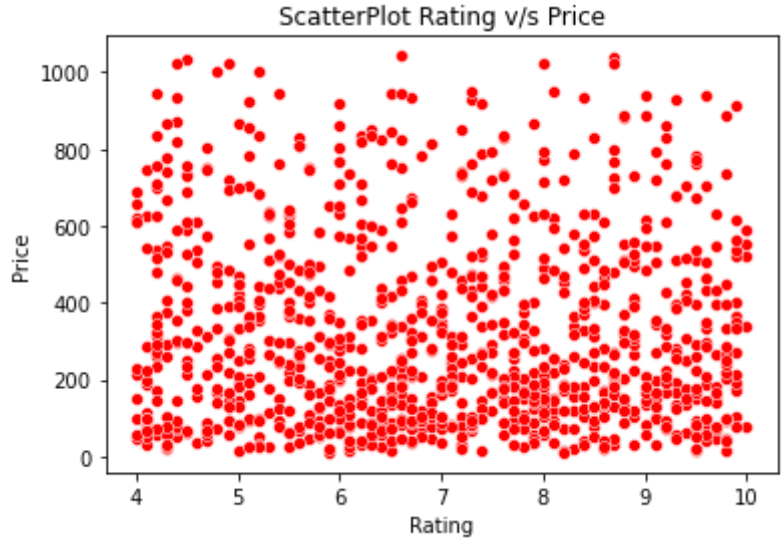
Out[158… Text(0, 0.5, 'Total Price')



In [178…
```
sb.regplot(y=data['Tax 5%'],x=data['Total'],color='g')
plt.title('Regression Plot TAX v/s PRICE',size=10)
plt.xlabel('Price')
plt.ylabel('Tax')
plt.show()
```



In [177…
```
sb.scatterplot(x='Rating',y='Total',data=data,color='r')
plt.title('ScatterPlot Rating v/s Price')
plt.ylabel('Price')
plt.show()
```



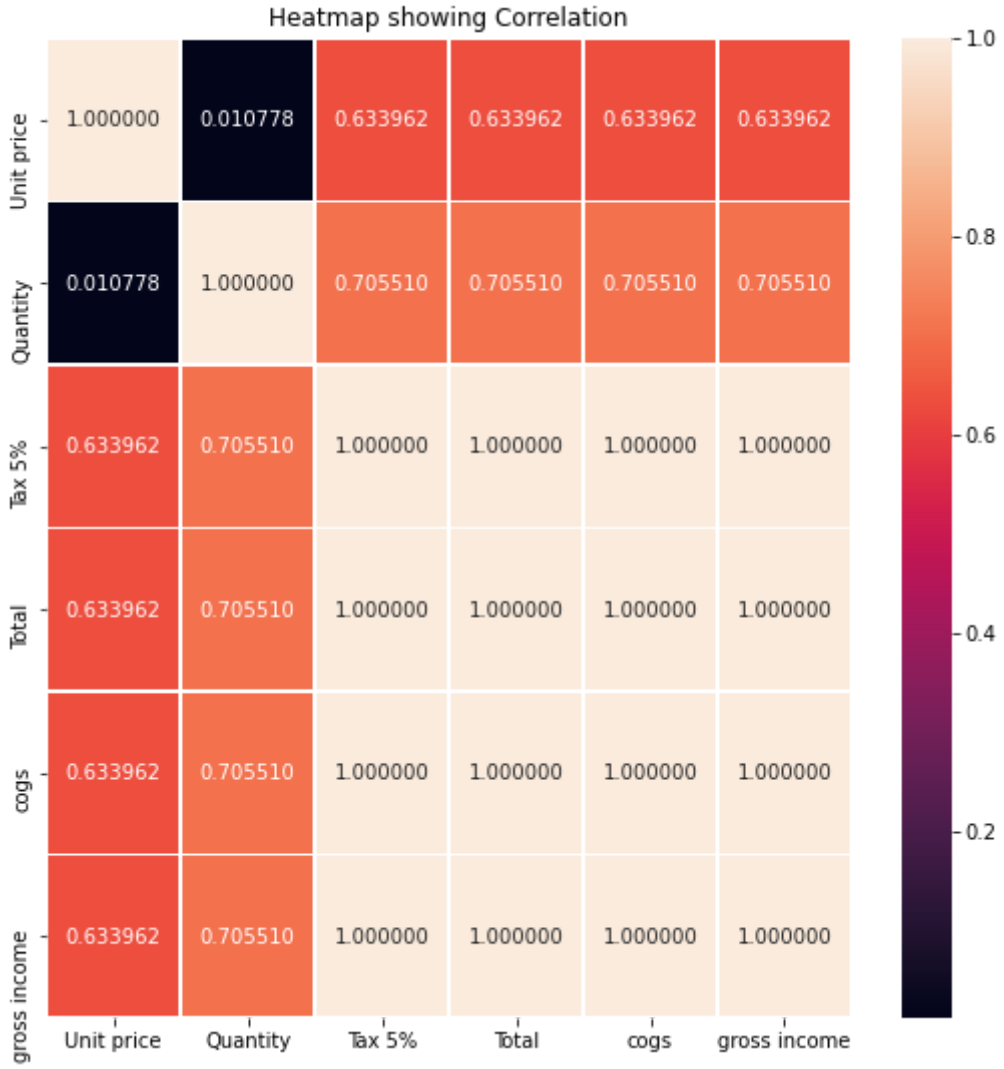
In [10]:
```
data1=data[['Unit price','Quantity','Tax 5%','Total','cogs','gross income']]
```

In [12]:
```
data1.head(2)
```

Out[12]:

	Unit price	Quantity	Tax 5%	Total	cogs	gross income
0	74.69	7	26.1415	548.9715	522.83	26.1415
1	15.28	5	3.8200	80.2200	76.40	3.8200

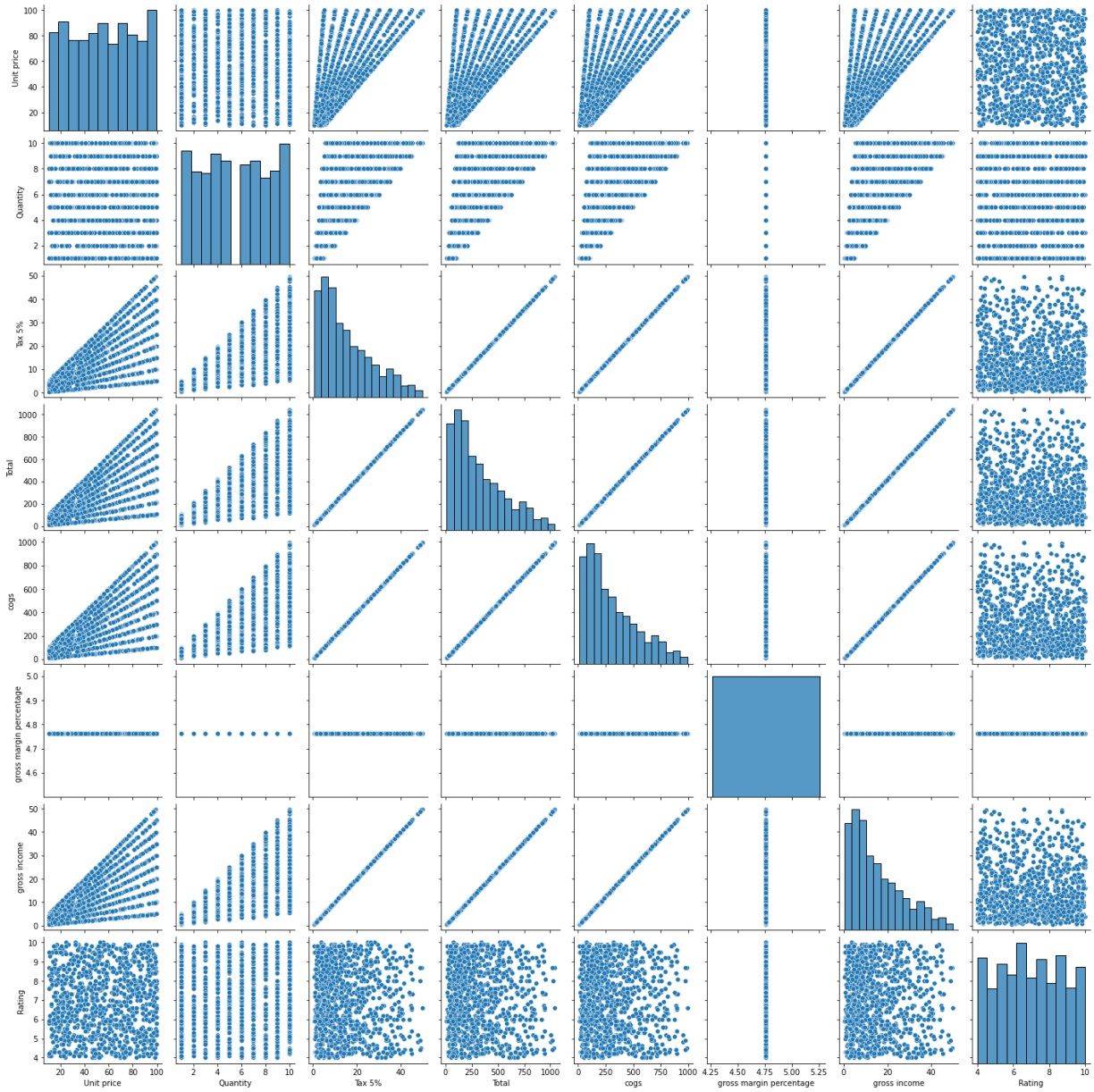
In [16]:
```
f, ax = plt.subplots(figsize=(9, 9))
sb.heatmap(data1.corr(),annot=True,fmt='f',linewidth=0.5,cmap='rocket')
plt.title('Heatmap showing Correlation')
plt.show()
```



In [ ]:

In [172…
```
sb.pairplot(data)
```

Out[172…
```
<seaborn.axisgrid.PairGrid at 0x2cb3df95370>
```



Conclusion

- This was the Analysis of SuperMarket Sales data using Python. I have used Python Libraries - Pandas, Numpy, Seaborn and Matplotlib to analyze the data. Based on the dataset qualitative, quantitative, statistical and visual analysis were performed to obtain a clear idea about the sales data.

In [ ]: