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

df=pd.read_csv(r"B:\DATA ANALYST PROJECTS\POWERBI + PYTHON + SQL\
WALMART SALES ANALYSIS\Sales.csv.csv")

df.shape
```

```
(1000, 17)
```

```
df.head(1000)
```

```
      Invoice_ID Branch       City Customer_type  Gender  \
0    750-67-8428      A     Yangon        Member  Female
1    226-31-3081      C  Naypyitaw        Normal  Female
2    631-41-3108      A     Yangon        Normal    Male
3    123-19-1176      A     Yangon        Member    Male
4    373-73-7910      A     Yangon        Normal    Male
..           ...    ...        ...           ...     ...
995  233-67-5758      C  Naypyitaw        Normal    Male
996  303-96-2227      B   Mandalay        Normal  Female
997  727-02-1313      A     Yangon        Member    Male
998  347-56-2442      A     Yangon        Normal    Male
999  849-09-3807      A     Yangon        Member  Female

               Sub_category  Unit_price  Quantity  Tax_5_per
Total  \
0         Health and beauty       74.69         7    26.1415
548.9715
1    Electronic accessories       15.28         5     3.8200
80.2200
2        Home and lifestyle       46.33         7    16.2155
340.5255
3         Health and beauty       58.22         8    23.2880
489.0480
4         Sports and travel       86.31         7    30.2085
634.3785
..                      ...         ...       ...        ...          ..
.
995       Health and beauty       40.35         1     2.0175
42.3675
996      Home and lifestyle       97.38        10    48.6900
1022.4900
997      Food and beverages       31.84         1     1.5920
33.4320
998      Home and lifestyle       65.82         1     3.2910
69.1110
999     Fashion accessories       88.34         7    30.9190
```

```
649.2990

     full_Date           full_Time      Payment    cogs  \
0   2019-01-05 2024-04-10 13:08:00      Ewallet  522.83
1   2019-03-08 2024-04-10 10:29:00         Cash   76.40
2   2019-03-03 2024-04-10 13:23:00  Credit card  324.31
3   2019-01-27 2024-04-10 20:33:00      Ewallet  465.76
4   2019-02-08 2024-04-10 10:37:00      Ewallet  604.17
..         ...                 ...          ...     ...
995 2019-01-29 2024-04-10 13:46:00      Ewallet   40.35
996 2019-03-02 2024-04-10 17:16:00      Ewallet  973.80
997 2019-02-09 2024-04-10 13:22:00         Cash   31.84
998 2019-02-22 2024-04-10 15:33:00         Cash   65.82
999 2019-02-18 2024-04-10 13:28:00         Cash  618.38

     gross_margin_percentage  gross_income  Rating time_of_day
Day_Name  \
0                   4.761905       26.1415     9.1   Afternoon
Saturday
1                   4.761905        3.8200     9.6     Morning
Friday
2                   4.761905       16.2155     7.4   Afternoon
Sunday
3                   4.761905       23.2880     8.4     Evening
Sunday
4                   4.761905       30.2085     5.3     Morning
Friday
..                       ...           ...     ...         ...       .
..
995                 4.761905        2.0175     6.2   Afternoon
Tuesday
996                 4.761905       48.6900     4.4     Evening
Saturday
997                 4.761905        1.5920     7.7   Afternoon
Saturday
998                 4.761905        3.2910     4.1   Afternoon
Friday
999                 4.761905       30.9190     6.6   Afternoon
Monday

    Month_Name
0      January
1        March
2        March
3      January
4     February
..         ...
995    January
996      March
997   February
```

```
998    February
999    February

[1000 rows x 20 columns]
```

#FEATURE ENGINEERING

1.Add a new column named `time_of_day` to give insight of sales in the Morning,Afternoon and Evening. This will help answer the question on which part of the day most sales are made

```
df['full_Time'] = pd.to_datetime(df['full_Time'])
df['hour'] = df['full_Time'].dt.hour
def categorize_hour(hour):
    if 0 <= hour < 12:
        return 'Morning'
    elif 12 <= hour < 16:
        return 'Afternoon'
    else:
        return 'Evening'

df['time_of_day'] = df['hour'].apply(categorize_hour)
df.drop('hour', axis=1, inplace=True)
```

2.Add a new column named `day_name` that contains the extracted days of the week on which the giventransaction took place (Mon, Tue, Wed, Thur, Fri). This will help answer the question on which week of the dayeach branch is busiest.

```
df['full_Date'] = pd.to_datetime(df['full_Date'])
df['Day_Name'] = df['full_Date'].dt.day_name()
```

3.Add a new column named `month_name` that contains the extracted months of the year on which the giventransaction took place (Jan, Feb, Mar). Help determine which month of the year has the most sales and profit.

```
df['full_Date'] = pd.to_datetime(df['full_Date'])
df['Month_Name'] = df['full_Date'].dt.strftime('%B')
```

#DATA CLEANING

```
df.shape
```

```
(1000, 20)
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 20 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   Sub_category             1000 non-null   object
 6   Unit_price               1000 non-null   float64
 7   Quantity                 1000 non-null   int64
 8   Tax_5_per                1000 non-null   float64
 9   Total                    1000 non-null   float64
 10  full_Date                1000 non-null   datetime64[ns]
 11  full_Time                1000 non-null   datetime64[ns]
 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
 17  time_of_day              1000 non-null   object
 18  Day_Name                 1000 non-null   object
 19  Month_Name               1000 non-null   object
dtypes: datetime64[ns](2), float64(7), int64(1), object(10)
memory usage: 156.4+ KB
```

```
pd.isnull(df).sum()
```

```
Invoice_ID                 0
Branch                     0
City                       0
Customer_type              0
Gender                     0
Sub_category               0
Unit_price                 0
Quantity                   0
Tax_5_per                  0
Total                      0
full_Date                  0
full_Time                  0
Payment                    0
cogs                       0
gross_margin_percentage    0
gross_income               0
Rating                     0
time_of_day                0
Day_Name                   0
Month_Name                 0
dtype: int64
```

```
df.drop('gross_margin_percentage',axis=1,inplace=True)
df.shape
```

```
(1000, 19)
```

```
df.describe()
```

```
         Unit_price     Quantity    Tax_5_per        Total        cogs  \
count  1000.000000  1000.000000  1000.000000  1000.000000  1000.00000

mean     55.672130     5.510000    15.379369   322.966749   307.58738

std      26.494628     2.923431    11.708825   245.885335   234.17651

min      10.080000     1.000000     0.508500    10.678500    10.17000

25%      32.875000     3.000000     5.924875   124.422375   118.49750

50%      55.230000     5.000000    12.088000   253.848000   241.76000

75%      77.935000     8.000000    22.445250   471.350250   448.90500

max      99.960000    10.000000    49.650000  1042.650000   993.00000


       gross_income      Rating
count   1000.000000  1000.00000
mean      15.379369     6.97270
std       11.708825     1.71858
min        0.508500     4.00000
25%        5.924875     5.50000
50%       12.088000     7.00000
75%       22.445250     8.50000
max       49.650000    10.00000
```

```
df.columns
```

```
Index(['Invoice_ID', 'Branch', 'City', 'Customer_type', 'Gender',
       'Sub_category', 'Unit_price', 'Quantity', 'Tax_5_per', 'Total',
       'full_Date', 'full_Time', 'Payment', 'cogs',
'gross_margin_percentage',
       'gross_income', 'Rating', 'time_of_day', 'Day_Name',
'Month_Name'],
      dtype='object')
```

BUSINESS QUESTION TO ANSWER

A-GENERIC QUESTIONS-

1) Find The Total Sum Of Revenue..?

```
total_revenue=df['Total'].sum().round(2)
total_revenue

322966.75
```

2) How many unique product lines does the data have?

```
unique_productlines=df['Sub_category'].nunique()
unique_productlines

6
```

3) How many unique cities does the data have?

```
unique_cities=df['City'].nunique()
unique_cities

3
```

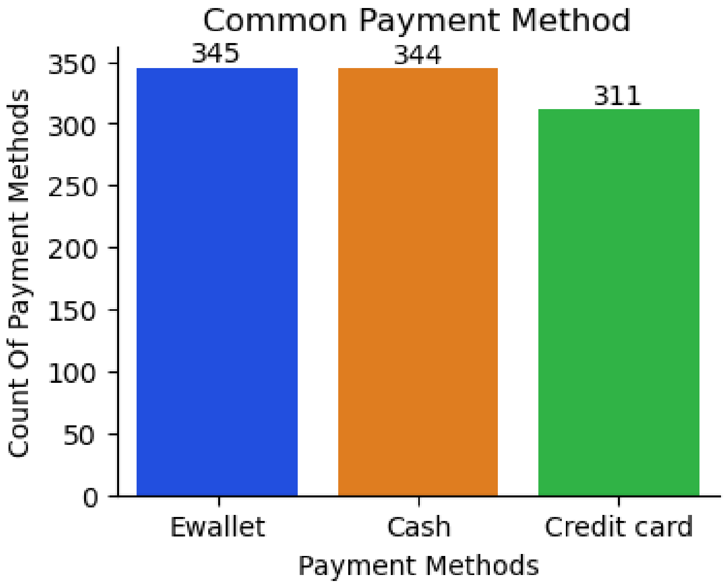
4) Find The Total Branches Available In This data.

```
total_Branches=df['Branch'].nunique()
total_Branches

3
```

B-PRODUCT QUESTIONS

1) What is the most common payment method?

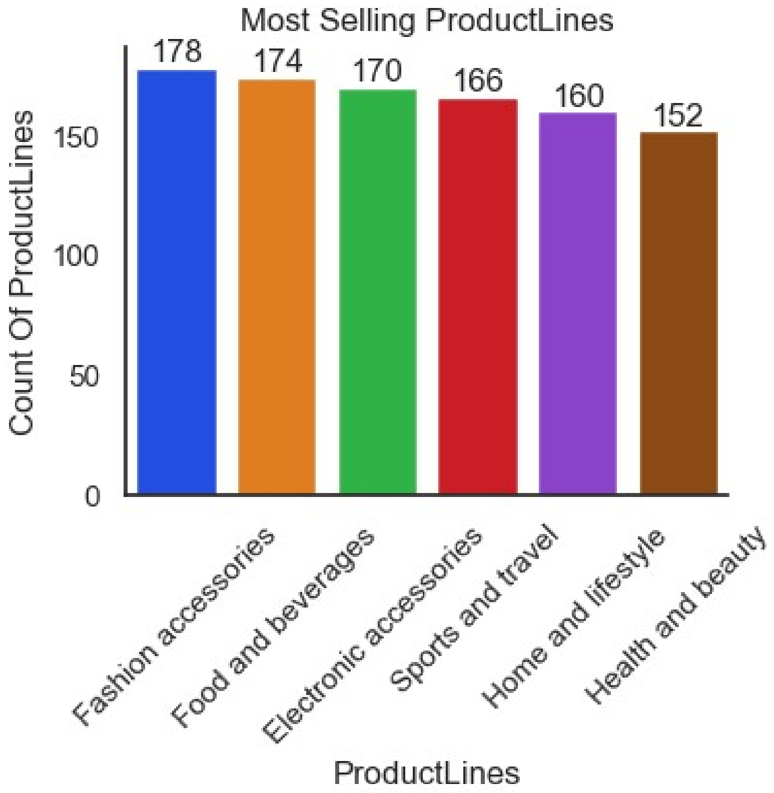
```
common_pay_method = df['Payment'].value_counts()
plt.figure(figsize=(4, 3))
pay_met=sns.barplot(x=common_pay_method.index,y=common_pay_method.valu
es,palette='bright')
pay_met.bar_label(pay_met.containers[0])
sns.despine()

plt.title('Common Payment Method')
plt.xlabel('Payment Methods')
plt.ylabel('Count Of Payment Methods')
plt.show()
```



MOST OF THE CUSTOMER CAN PAY THEIR PAYMENT THROUGH THE EWALLET FOLLOWED BY CASH ,IF YOU WANT CUSTOMER CAN PAY THROUGH CREDIT CARD TRY TO ADD SOME OFFERS FOR CREDIT CARD

2) What is the most selling product line?

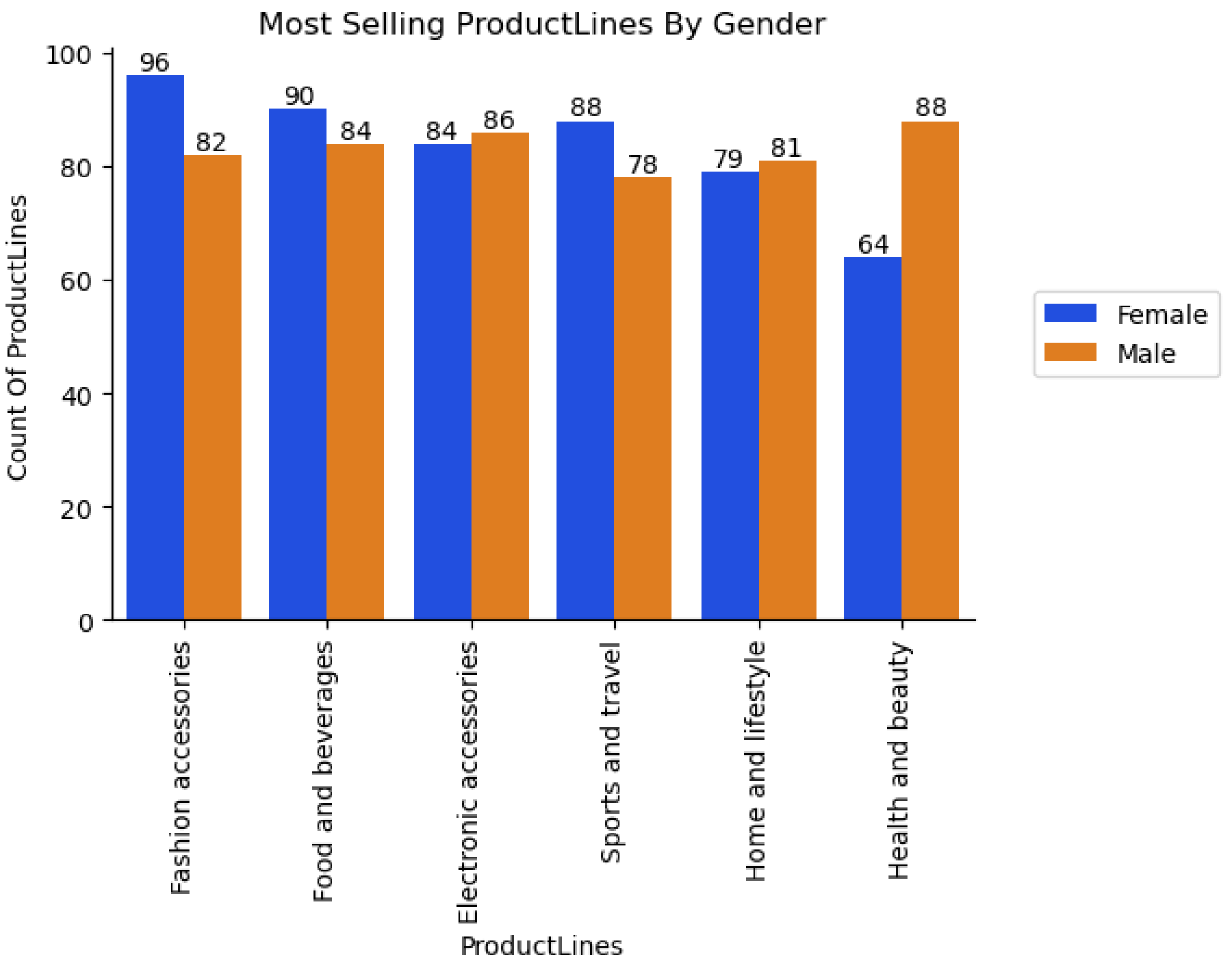
```
most_selling_productline = df['Sub_category'].value_counts()
plt.figure(figsize=(4, 3))
pay_met=sns.barplot(x=most_selling_productline.index,y=most_selling_pr
oductline.values,palette='bright')
pay_met.bar_label(pay_met.containers[0])
sns.despine()

plt.title('Most Selling ProductLines')
plt.xlabel('ProductLines')
plt.xticks(rotation=45)
plt.ylabel('Count Of ProductLines')
plt.show()
```



FASHION ACCESSORIES IS THE MOST SELLING PRODUCT LINE FOLLOWED BY FOOD & BEVERAGES WHILE HEALTH & BEAUTY IS THE LOWEST SELLING PRODUCT LINES

3) What is the most common product line by gender?

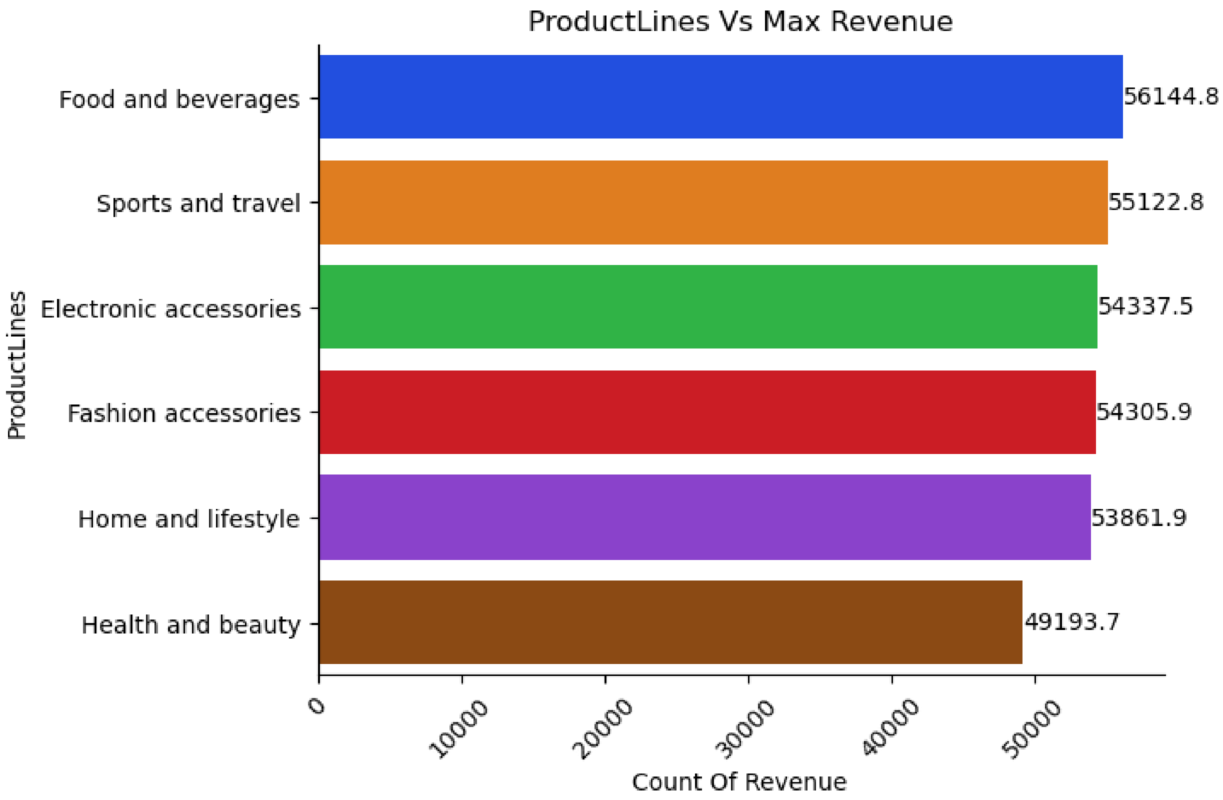
```
plt.figure(figsize=(6, 4))
cnt = sns.countplot(x='Sub_category', data=df, hue='Gender',
palette='bright', order=df['Sub_category'].value_counts().index)
cnt.bar_label(cnt.containers[0])
cnt.bar_label(cnt.containers[1])
sns.despine()

plt.title('Most Selling ProductLines By Gender')
plt.xlabel('ProductLines')
plt.xticks(rotation=90)
plt.ylabel('Count Of ProductLines')
plt.legend(loc='center right', bbox_to_anchor=(1.3, 0.5))
plt.show()
```



FASHION & ACCESSORIES IS THE MOST HIGHEST COMMON PRODUCT LINE & HEALTH & BEAUTY IS THE LOWEST COMMON PRODUCT LINE

4) What product line had the largest revenue?

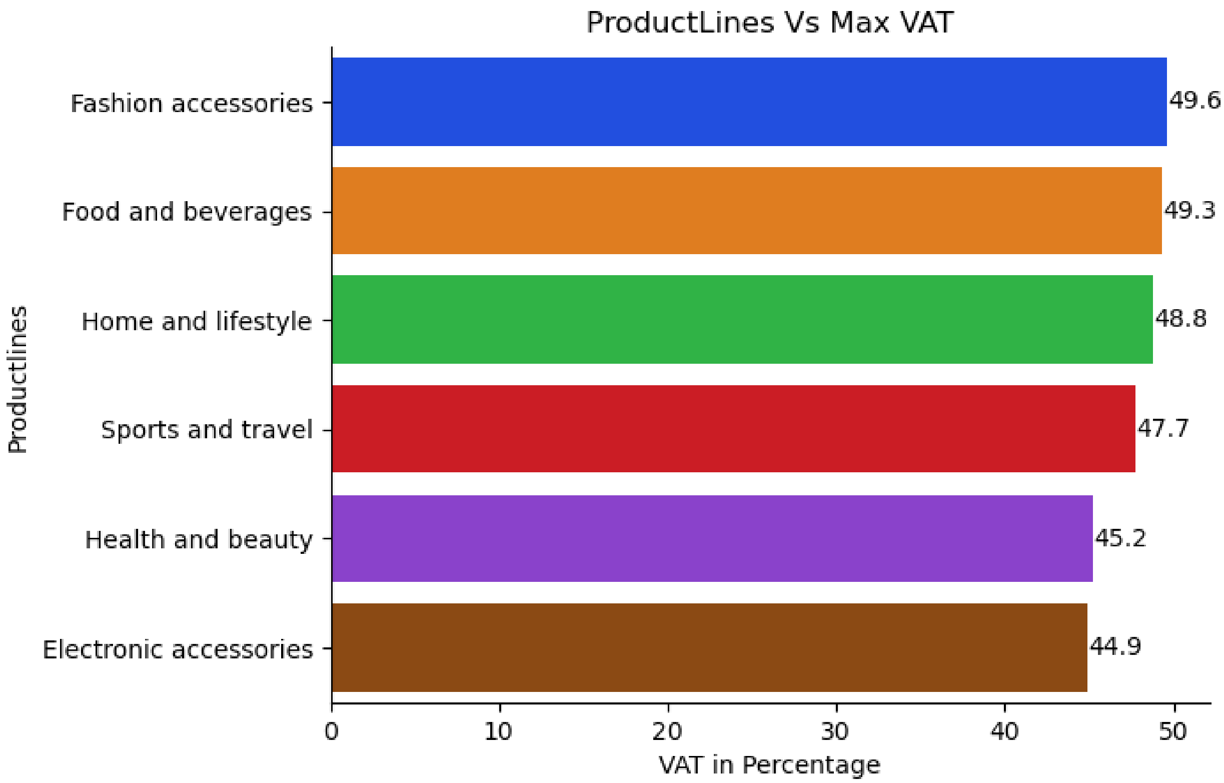
```
productline_revenue = df.groupby(['Sub_category'],as_index=False)
['Total'].sum().sort_values(by='Total',ascending=False)
cnt=sns.barplot(x='Total',y='Sub_category',data=productline_revenue,pa
lette='bright')
cnt.bar_label(cnt.containers[0])
sns.despine()

plt.title('ProductLines Vs Max Revenue')
plt.xlabel('Count Of Revenue')
plt.xticks(rotation=45)
plt.ylabel('ProductLines')
plt.show()
```



FOOD & BEVERAGE PRODUCT LINE HAS THE LARGEST REVENUE & HEALTH,BEAUTY PRODUCTLINE IS THE LOWEST REVENUE

5) What product line had the largest VAT?

```
productline_VAT = df.groupby(['Sub_category'],as_index=False)
['Tax_5_per'].max().round(1).sort_values(by='Tax_5_per',ascending=False)
xyz = sns.barplot(y='Sub_category',
x='Tax_5_per',data=productline_VAT,palette='bright')
xyz.bar_label(xyz.containers[0])

sns.despine()
plt.title('ProductLines Vs Max VAT')
plt.xlabel('VAT in Percentage')
plt.ylabel('Productlines')
plt.show()
```

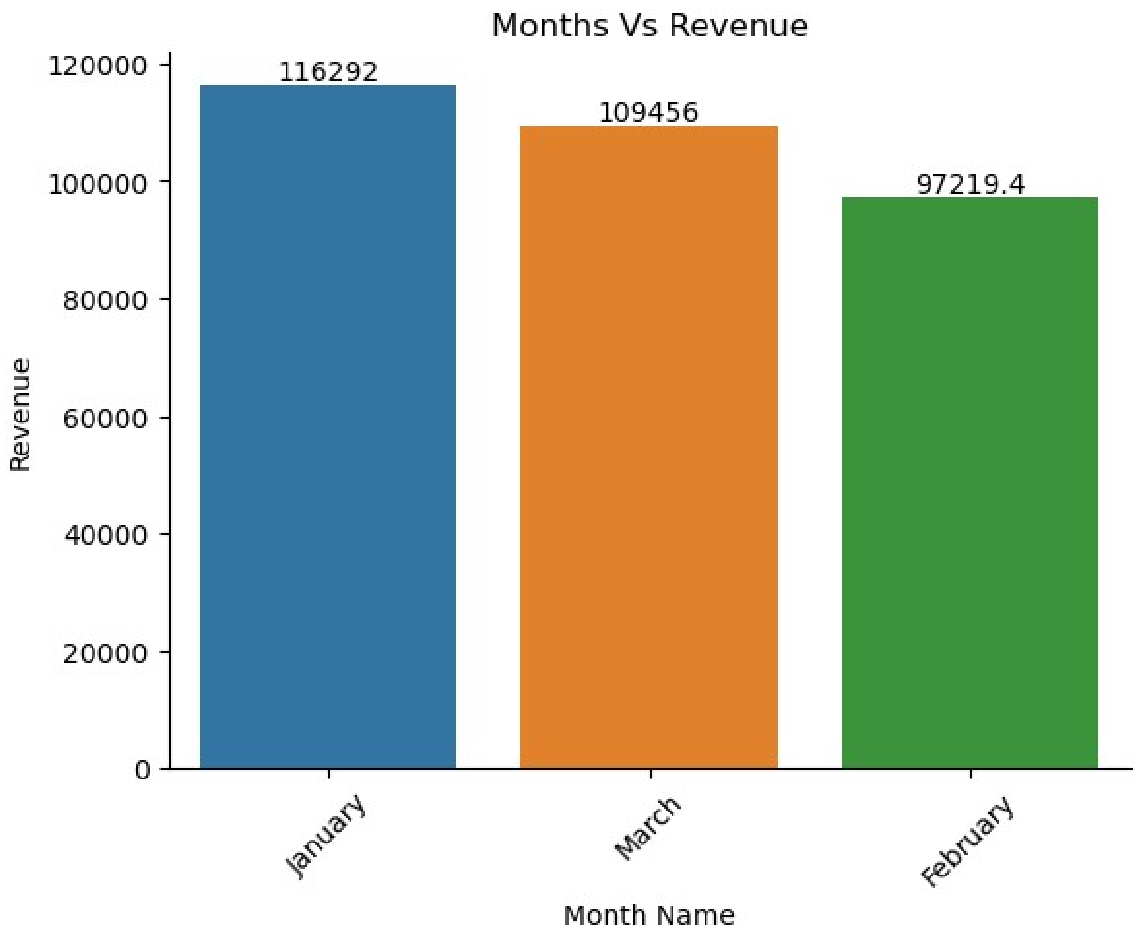


LARGEST VAT ON PRODUCT LINE - FASHION ACCESSORIES (49.6)

LOWEST VAT ON PRODUCT LINE -ELECTRONIC ACCESSORIES (44.9)

6) What is the total revenue by month?

```
revenue_by_month=df.groupby(['Month_Name'],as_index=False)
['Total'].sum().round(1).sort_values(by='Total',ascending=False)
xyz=sns.barplot(x='Month_Name',y='Total',data=revenue_by_month)
xyz.bar_label(xyz.containers[0])
sns.despine()
plt.title('Months Vs Revenue')
plt.xlabel('Month Name')
plt.xticks(rotation=45)
plt.ylabel('Revenue')
plt.show()
```

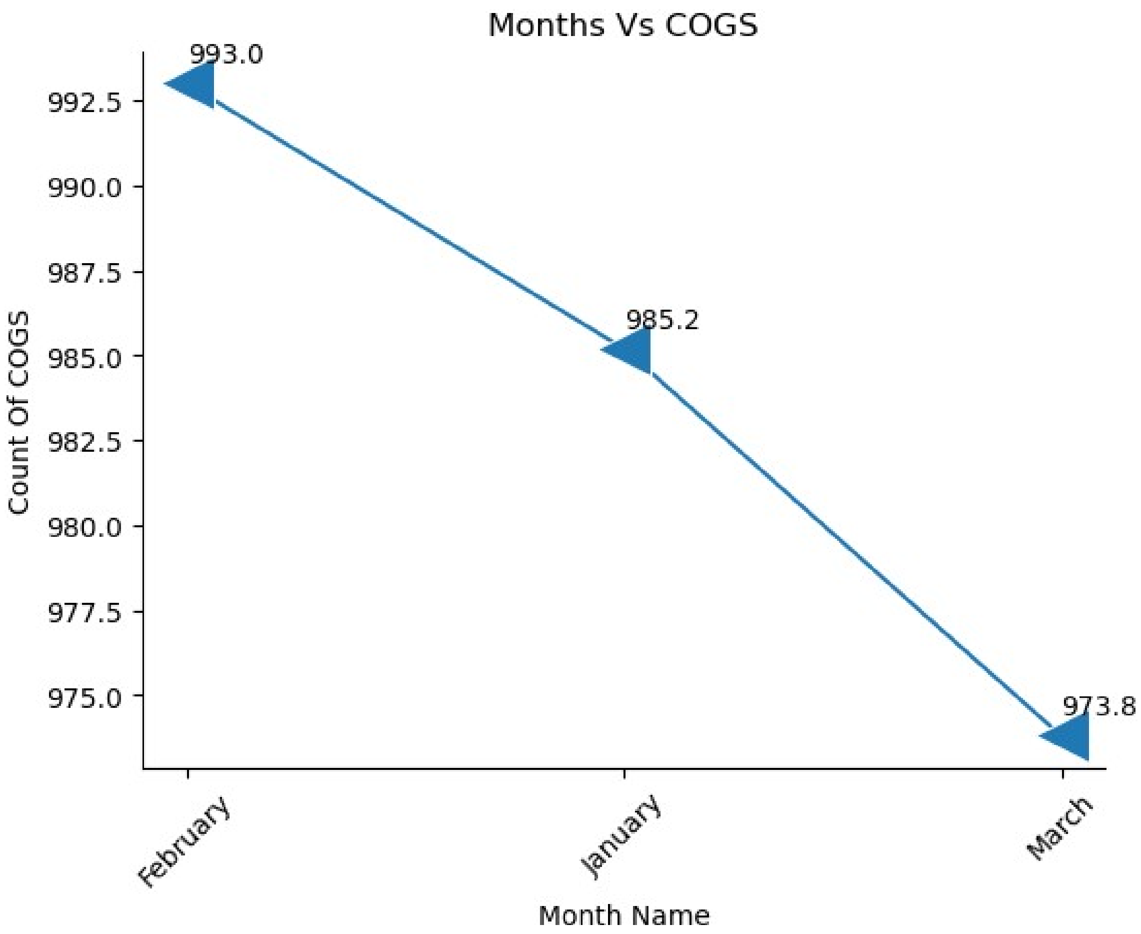


MAX REVENUE MONTH - JANUARY (116292)

MIN REVENUE MONTH - FEBRUARY (97219.4)

7) What month had the largest COGS?

```
month_with_cogs=df.groupby(['Month_Name'],as_index=False)
['cogs'].max().round(2).sort_values(by='cogs',ascending=False)
sns.lineplot(x='Month_Name',y='cogs',data=month_with_cogs, marker='<',
markersize=20)
for x, y in zip(month_with_cogs['Month_Name'],
month_with_cogs['cogs']):
    y_rounded = round(y, 2)
    plt.annotate(f'{y_rounded}', (x, y), textcoords="offset points",
xytext=(0,8), ha='left')

sns.despine()
plt.title('Months Vs COGS')
plt.xlabel('Month Name')
plt.xticks(rotation=45)
plt.ylabel('Count Of COGS')
plt.show()
```

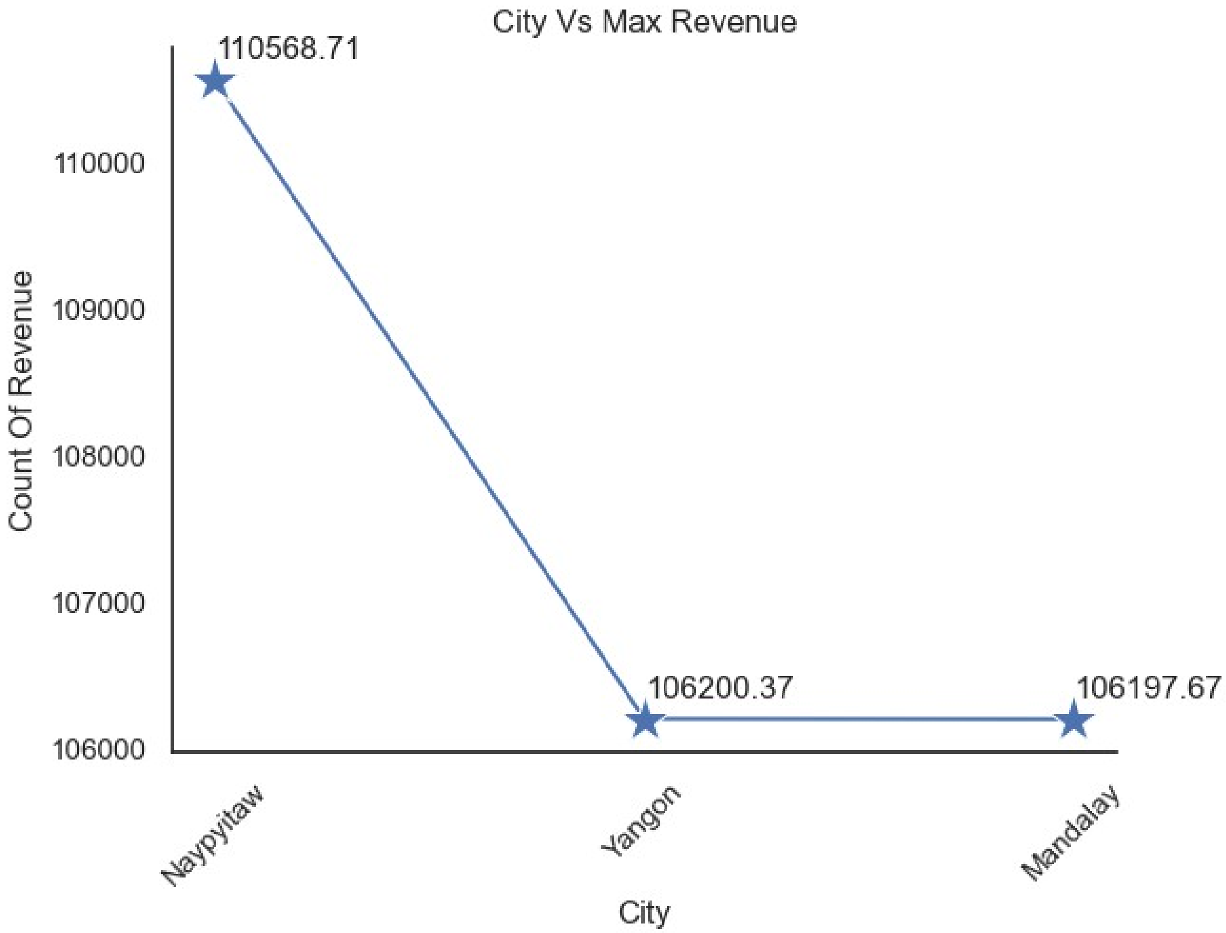


MAX COGS MONTH - FEBRUARY (993.0)

MIN COGS MONTH - MARCH (973.8)

8) What is the city with the largest revenue?

```
City_With_Largest_Revenue = df.groupby('City')
['Total'].sum().round(2).sort_values(ascending=False)
sns.lineplot(x=City_With_Largest_Revenue.index,
y=City_With_Largest_Revenue.values, marker='*', markersize=20)

for x, y in zip(City_With_Largest_Revenue.index,
City_With_Largest_Revenue.values):
    y_rounded = round(y, 2)
    plt.annotate(f'{y_rounded}', (x, y), textcoords="offset points",
xytext=(0,8), ha='left')

sns.despine()
plt.title('City Vs Max Revenue')
plt.xlabel('City')
plt.xticks(rotation=45)
plt.ylabel('Count Of Revenue')
plt.show()
```



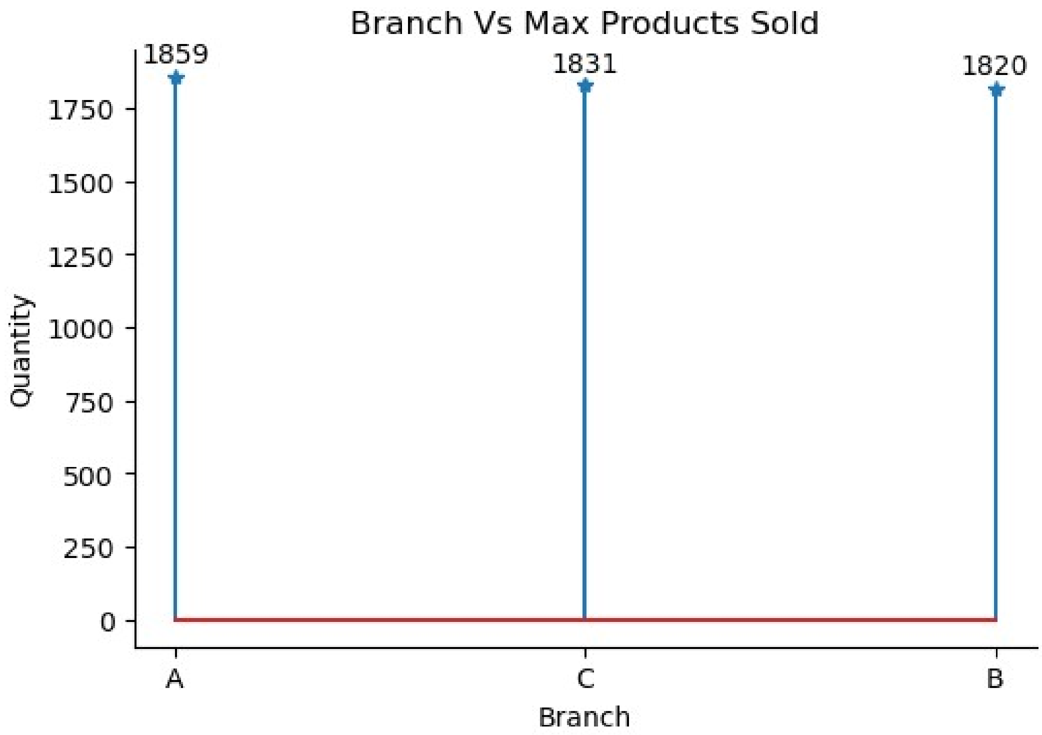
MAX REVENUE CITY - NAYPYITAW (110568.71)

MIN REVENUE CITY- MANDALAY (106197.67)

9) Which branch sold more products than average product sold?

```
plt.figure(figsize=(6, 4))
branch_with_max_product = df.groupby('Branch')
['Quantity'].sum().round(2).sort_values(ascending=False)

stem = plt.stem(branch_with_max_product.index,
branch_with_max_product.values,markerfmt='*')
for i in range(len(branch_with_max_product)):
    plt.annotate(branch_with_max_product.values[i],
(branch_with_max_product.index[i], branch_with_max_product.values[i]),
textcoords="offset points", xytext=(0,5), ha='center')

sns.despine()
```

```
plt.title('Branch Vs Max Products Sold')
plt.xlabel('Branch')
plt.ylabel('Quantity')
plt.show()
```



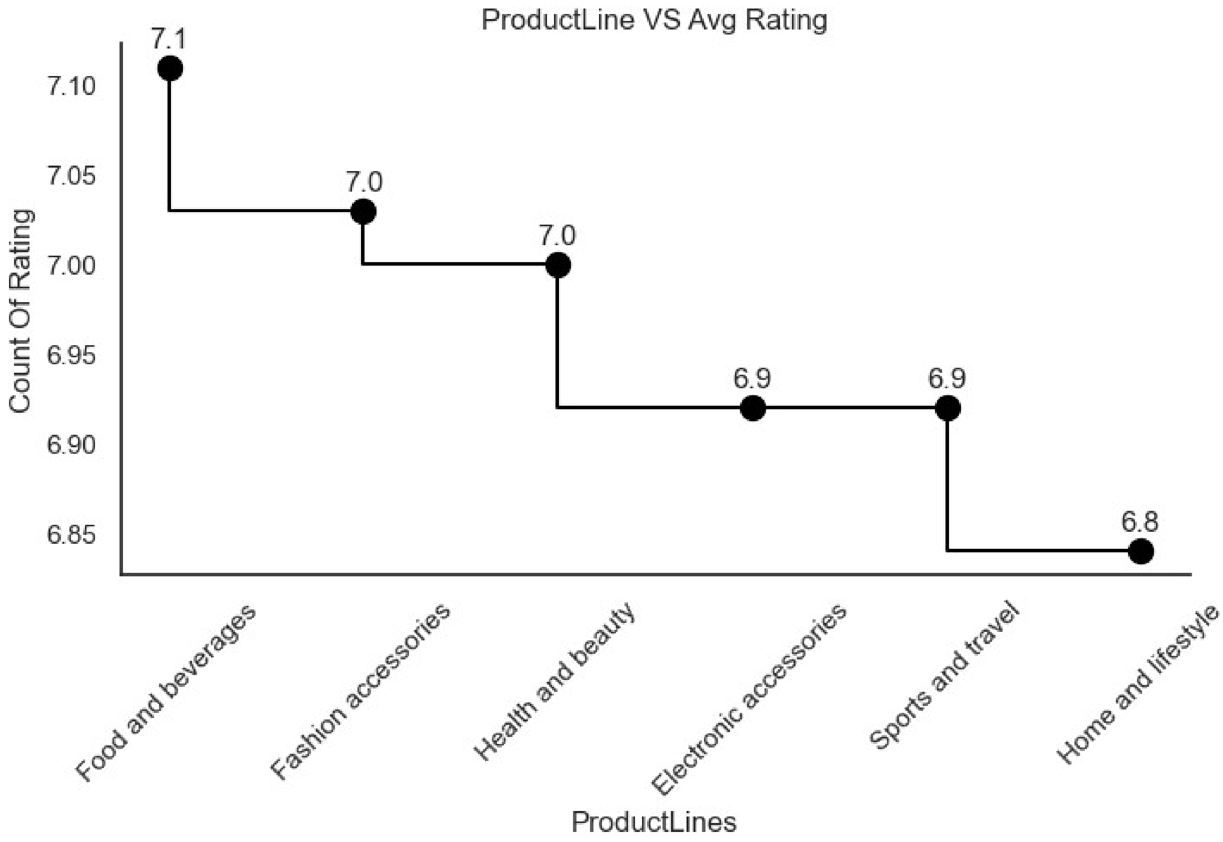
BRANCH WITH MAX PRODUCT SOLD - A (1859)

BRANCH WITH LOW PRODUCT SOLD - B(1820)

10) What is the average rating of each product line?

```
Avg_productline_Rating = df.groupby('Sub_category')
['Rating'].mean().round(2).sort_values(ascending=False)
plt.figure(figsize=(8,4))
sns.set(style='white')
plt.step(x=Avg_productline_Rating.index,
y=Avg_productline_Rating.values, color='Black', marker='o',
markerfacecolor='black', markersize=10)

for x, y in zip(Avg_productline_Rating.index,
Avg_productline_Rating.values):
    y_rounded = round(y, 1)
    plt.annotate(f'{y_rounded}', (x, y), textcoords="offset points",
xytext=(0,8), ha='center')

sns.despine()
title_pos = plt.title('ProductLine VS Avg Rating')
```

```
title_pos.set_position([0.5,0.0])
plt.ylabel('Count Of Rating')
plt.xlabel('ProductLines')
plt.xticks(rotation=45)
plt.show()
```



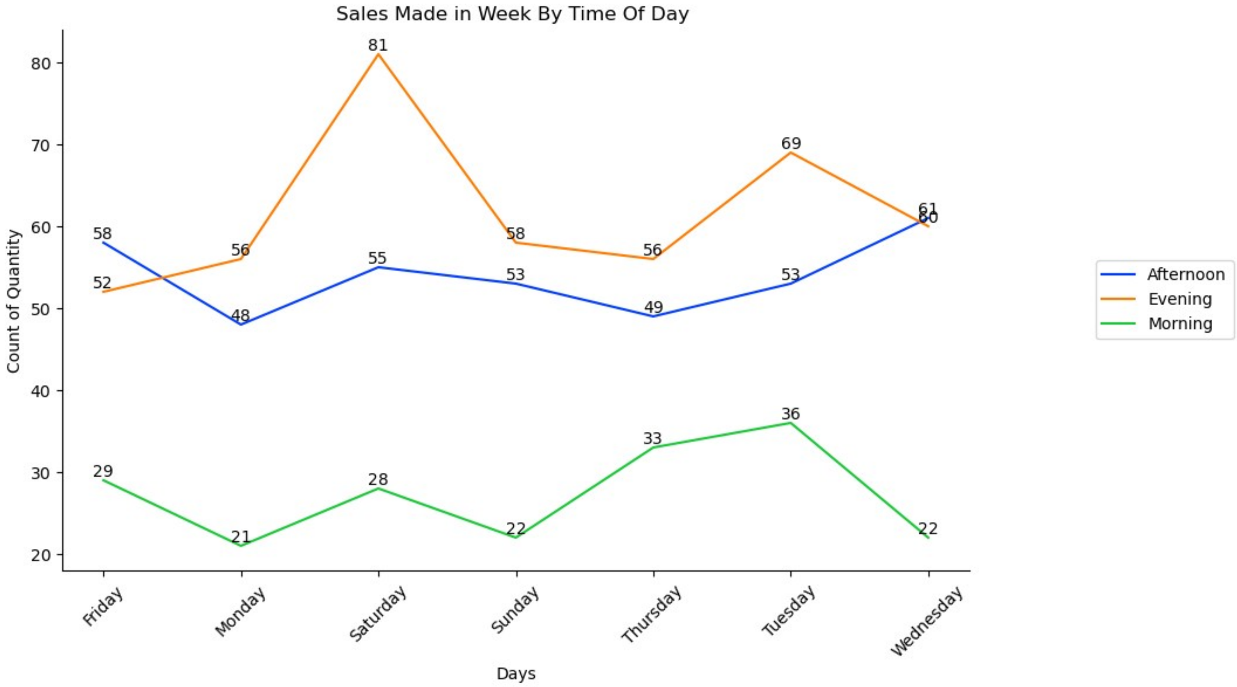
MAX RATING PRODUCTLINES CATEGORY - FOOD & BEVERAGES- 7.1

LOW RATING PRODUCTLINES CATEGORY - HOME & LIFESTYLE- 6.8

C-Sales Question

1. Number of sales made in each time of the day per weekday

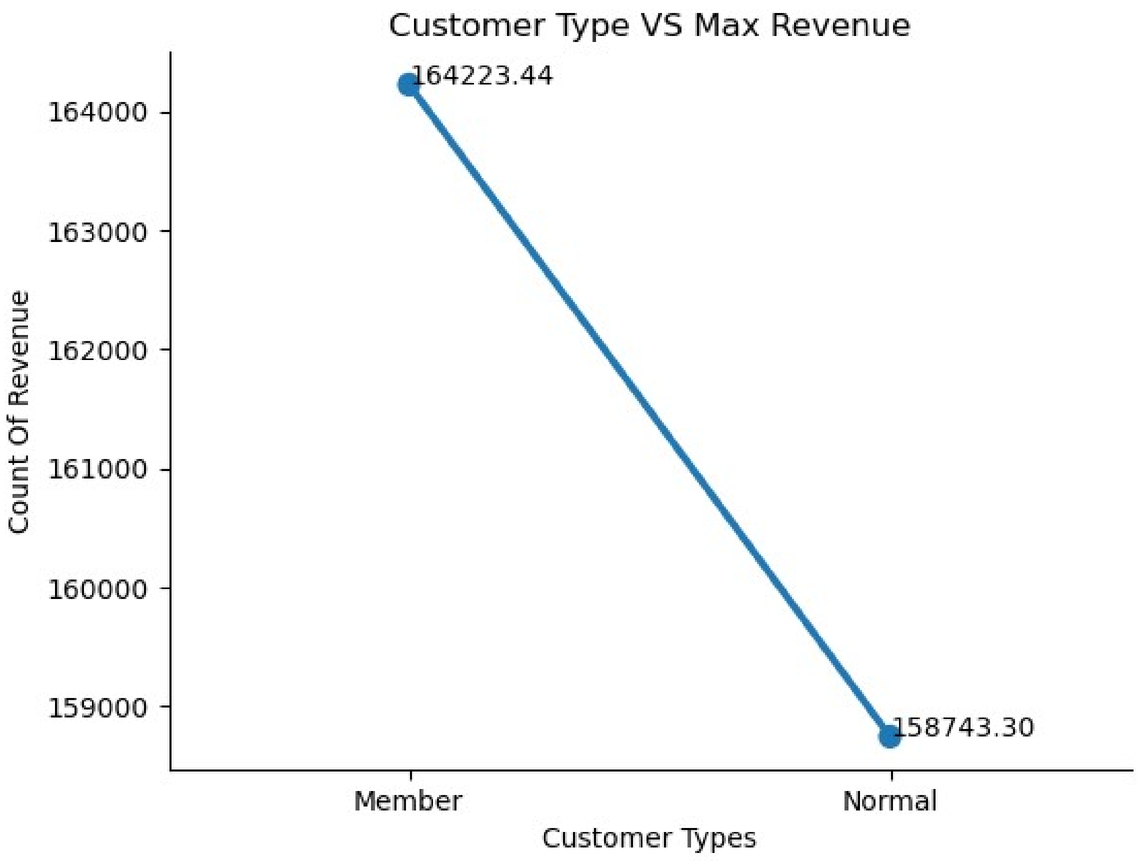
```
plt.figure(figsize=(10, 6))
no_of_sales_made = df.groupby(['Day_Name',
'time_of_day']).size().reset_index(name='Quantity')
cnt = sns.lineplot(x='Day_Name', y='Quantity', data=no_of_sales_made,
hue='time_of_day', palette='bright')
for line in cnt.lines:
    x, y = line.get_data()
    for i in range(len(x)):
        plt.text(x[i], y[i], f'{y[i]:.0f}', color='black',
ha='center', va='bottom')

sns.despine()
plt.title('Sales Made in Week By Time Of Day ')
plt.xlabel('Days')
plt.xticks(rotation=45)
plt.ylabel('Count of Quantity')
plt.legend(loc='center right', bbox_to_anchor=(1.3, 0.5))
plt.show()
```



SATURDAY IS THE HIGHEST DAY OF AN WEEK WHERE 164 SALES WAS MADE INCLUDING MORNING,AFTERNOON,EVENING & MONDAY IS THE LOWEST DAY OF AN WEEK WHERE ONLY 125 SALES WAS MADE

1. Which of the customer types brings the most revenue?

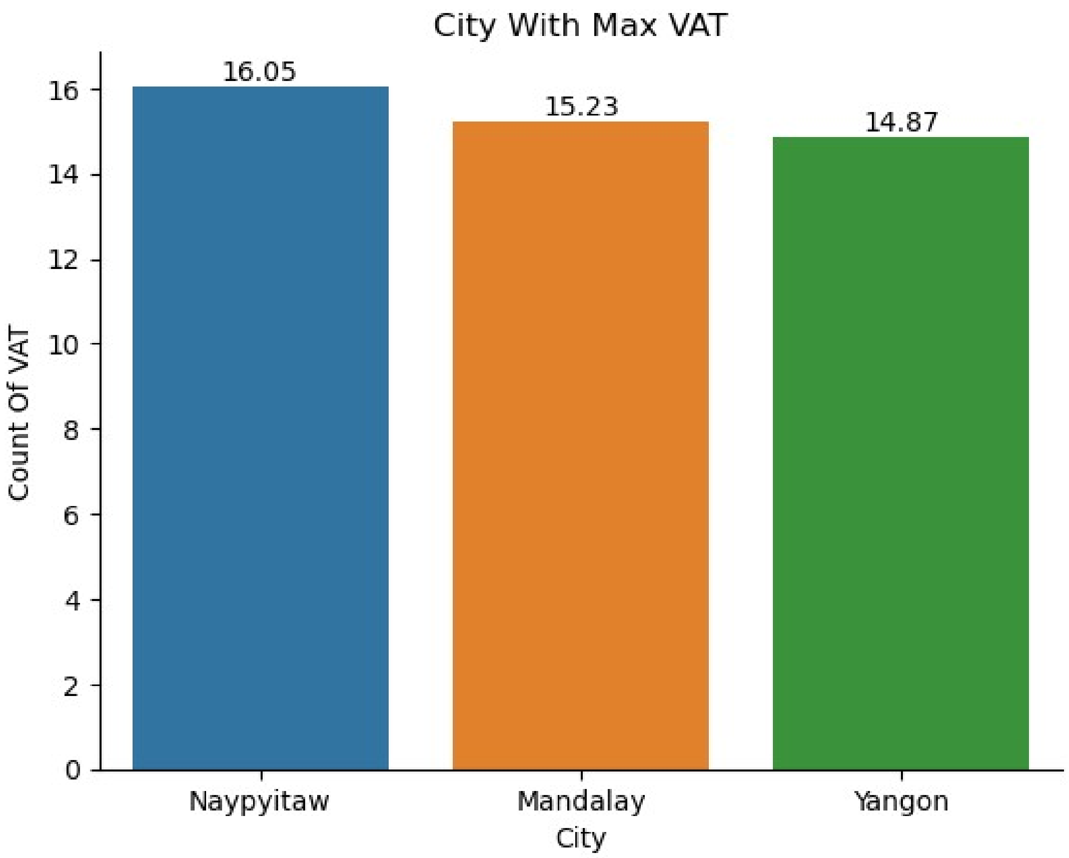
```
customer_max_revenue = df.groupby(['Customer_type'],as_index=False)
['Total'].sum().sort_values(by='Total',ascending=False)
sns.pointplot(x='Customer_type',y='Total',data=customer_max_revenue)
for index, row in customer_max_revenue.iterrows():
    plt.text(row.name, row['Total'], f'{row["Total"]:.2f}',
color='black', ha="left")
sns.despine()
plt.title('Customer Type VS Max Revenue')
plt.ylabel('Count Of Revenue')
plt.xlabel('Customer Types')
plt.show()
```



MEMBER CUSTOMER TYPE PRODUCE THE MOST REVENUE WHICH IS 164223.44

1. Which city has the largest tax percent/ VAT (**Value Added Tax**)?

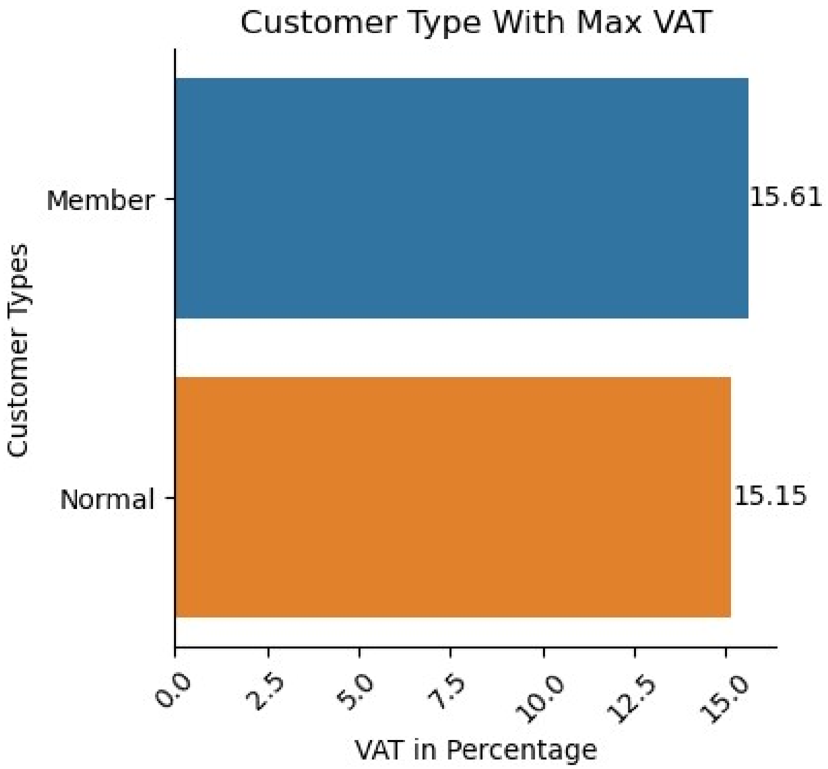
```
city_max_tax=df.groupby(['City'],as_index=False)['Tax_5_per'].mean().round(2).sort_values(by='Tax_5_per',ascending=False)
cnt=sns.barplot(data=city_max_tax,x='City',y='Tax_5_per')
cnt.bar_label(cnt.containers[0])

sns.despine()
plt.title('City With Max VAT')
plt.ylabel('Count Of VAT')
plt.xlabel('City')
plt.show()
```



THE NAYPYITAW IS THE HIGHEST TAX PAYING CITY WHICH AVERAGE TAX NEAR BY 16.05 & THE YANGON IS THE LOWEST CITY WHICH PAYS AVG 14.87% OF TAX

1. Which customer type pays the most in VAT?

```
plt.figure(figsize=(4, 4))
customer_with_max_VAT=df.groupby(['Customer_type'],as_index=False)
['Tax_5_per'].mean().round(2).sort_values(by='Tax_5_per',
ascending=False)
cnt =
sns.barplot(y='Customer_type',x='Tax_5_per',data=customer_with_max_VAT
)
cnt.bar_label(cnt.containers[0])

sns.despine()
plt.title('Customer Type With Max VAT')
plt.xlabel('VAT in Percentage')
plt.xticks(rotation=45)
plt.ylabel('Customer Types')
plt.show()
```



MEMBER CUSTOMER TYPE CAN PAYS THE MOST VAT WHICH NEAR BY OF AVG 15.61%

D-CUSTOMER QUESTIONS

1. How many unique customer types does the data have?

```
unique_customer=df['Customer_type'].nunique()
unique_customer

2
```

1. How many unique payment methods does the data have?

```
unique_pay_method=df['Payment'].nunique()
unique_pay_method

3
```

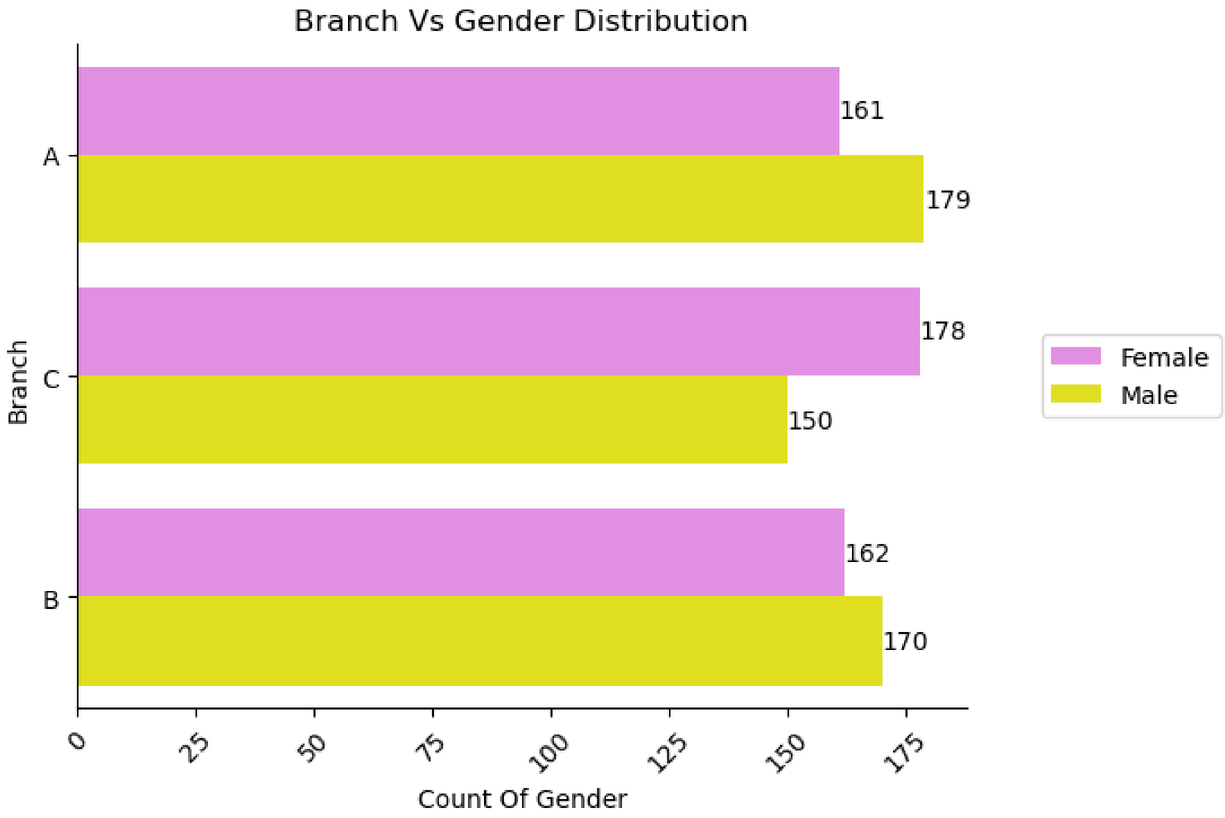
1. Which customer type buys the most?

```
customer_with_buys_most=df.groupby('Customer_type')
['Quantity'].count().sort_values(ascending=False)
customer_with_buys_most

Customer_type
Member    501
```

```
Normal     499
Name: Quantity, dtype: int64
```

1. What is the gender distribution per branch?

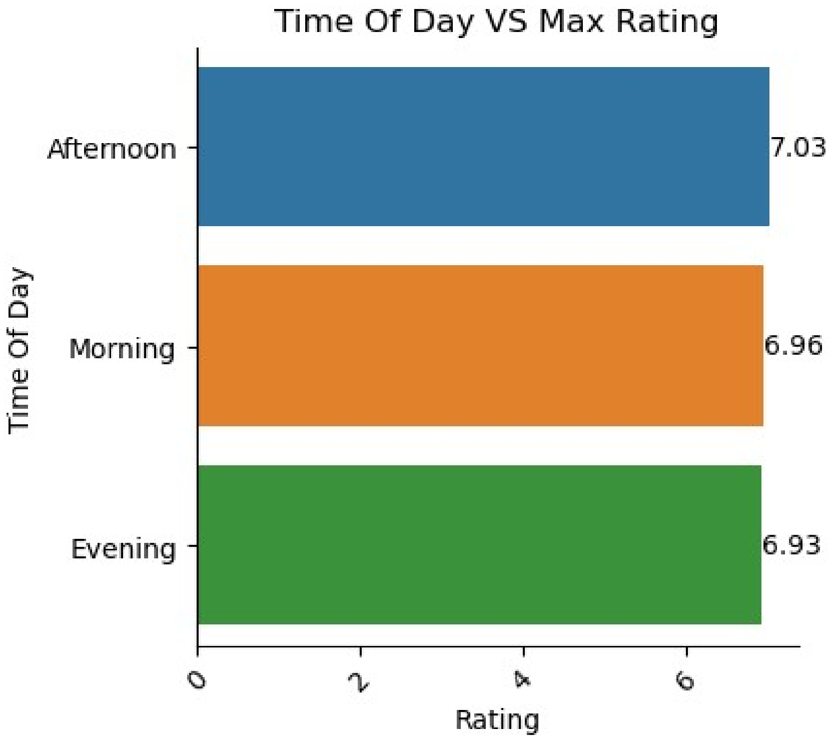
```
cnt=sns.countplot(y='Branch',data=df,hue='Gender',palette={'Male':
'yellow', 'Female': 'violet'})
cnt.bar_label(cnt.containers[0])
cnt.bar_label(cnt.containers[1])

sns.despine()
plt.title('Branch Vs Gender Distribution')
plt.xlabel('Count Of Gender')
plt.xticks(rotation=45)
plt.ylabel('Branch')
plt.legend(loc='center right',bbox_to_anchor=(1.3,0.5))
plt.show()
```



1. Which time of the day do customers give most ratings?

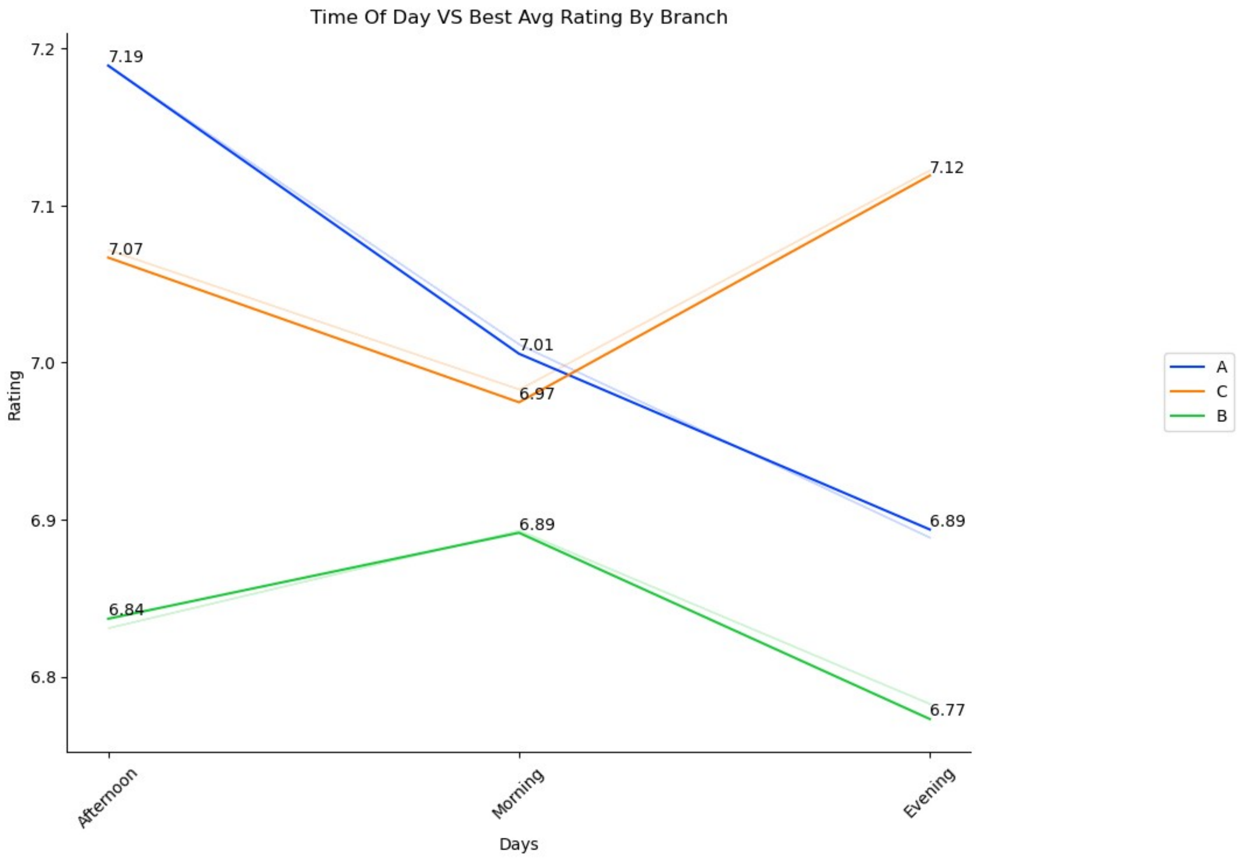
```
plt.figure(figsize=(4, 4))
customer_with_most_rating=df.groupby(['time_of_day'],as_index=False)
['Rating'].mean().round(2).sort_values(by='Rating', ascending=False)
cnt =
sns.barplot(y='time_of_day',x='Rating',data=customer_with_most_rating)
```

```
cnt.bar_label(cnt.containers[0])

sns.despine()
plt.title('Time Of Day VS Max Rating')
plt.xlabel('Rating')
plt.xticks(rotation=45)
plt.ylabel('Time Of Day')
plt.show()
```



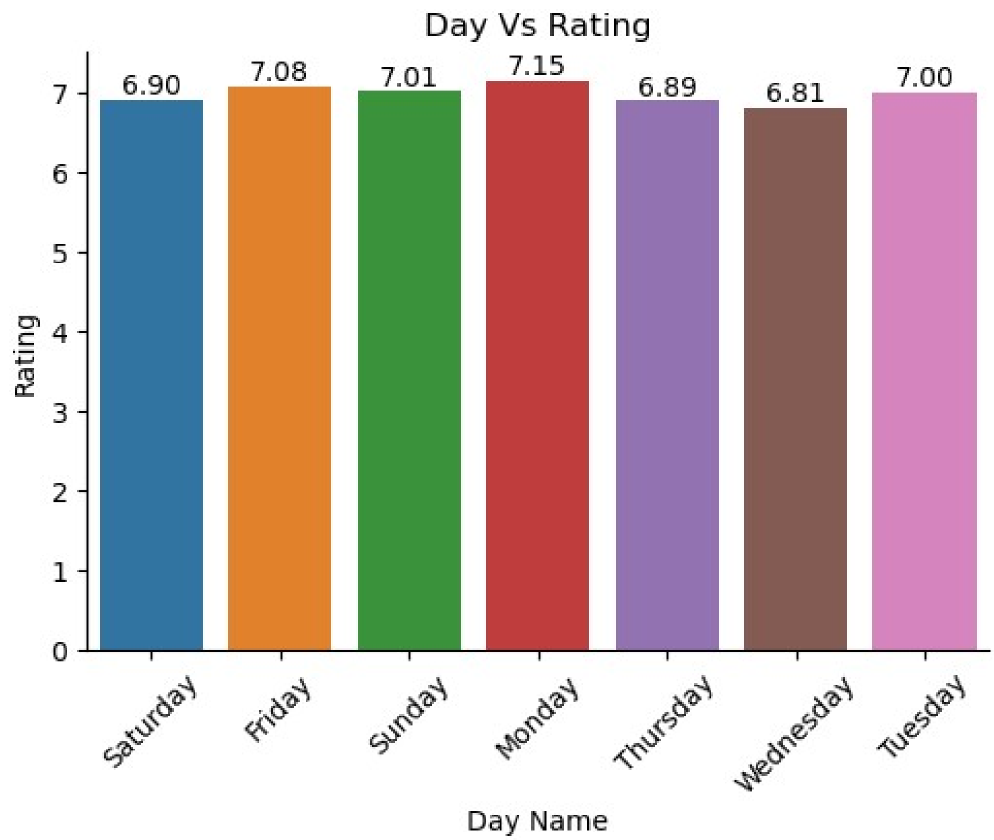
1. Which time of the day do customers give most ratings per branch?

```
plt.figure(figsize=(10, 8))
cnt=sns.lineplot(x='time_of_day',y='Rating',data=df,hue='Branch',palet
te='bright',errorbar=('ci',0))
for line in cnt.lines:
    x, y = line.get_data()
    for i in range(len(x)):
        plt.text(x[i], y[i], f'{y[i]:.2f}', color='black', ha='left',
va='bottom')
sns.despine()
plt.title('Time Of Day VS Best Avg Rating By Branch')
plt.xlabel('Days')
plt.xticks(rotation=45)
plt.ylabel('Rating')
plt.legend(loc='center right', bbox_to_anchor=(1.3, 0.5))
plt.show()
```



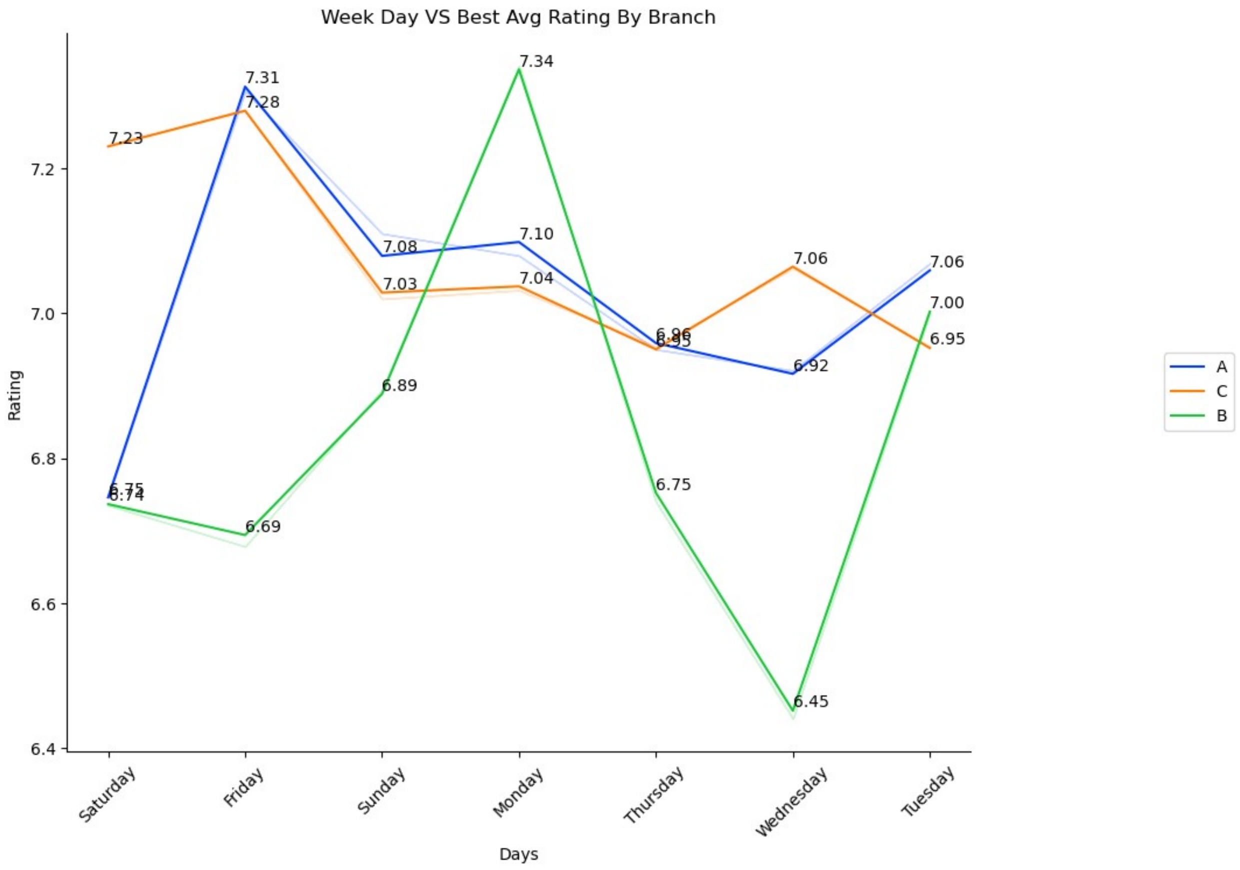
1. Which day of the week has the best avg ratings?

```
plt.figure(figsize=(6, 4))
cnt = sns.barplot(x='Day_Name', y='Rating', data=df,
errorbar=('ci',0))
for container in cnt.containers:
    cnt.bar_label(container, fmt='%.2f')

sns.despine()
plt.title('Day Vs Rating')
plt.xlabel('Day Name')
plt.ylabel('Rating')
plt.xticks(rotation=45)
plt.show()
```



1. Which day of the week has the best average ratings per branch?

```
plt.figure(figsize=(10, 8))
cnt=sns.lineplot(x='Day_Name',y='Rating',data=df,hue='Branch',palette=
'bright',errorbar=('ci',0))
for line in cnt.lines:
    x, y = line.get_data()
    for i in range(len(x)):
        plt.text(x[i], y[i], f'{y[i]:.2f}', color='black', ha='left',
va='bottom')
sns.despine()
plt.title('Week Day VS Best Avg Rating By Branch')
plt.xlabel('Days')
plt.xticks(rotation=45)
plt.ylabel('Rating')
plt.legend(loc='center right', bbox_to_anchor=(1.3, 0.5))
plt.show()
```



CONCLUSION

our analysis has provided a deep understanding of Walmart's and strategic initiatives. As Walmart continues to evolve in the dynamic retail landscape,leveraging data-driven insights and customer-centric strategies will be pivotal for sustaining its growth and market leadership.