In [1]:
```
#Libraries we will use
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [2]:
```
#reading the file
sales_file = pd.read_csv('.\Downloads\super_market_sales.csv')
sales_file.head()
```

Out[2]:

	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
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785

In [ ]:
```
#Explanation of the columns
"""
Invoice id = identification number bill of sale invoice
generated by computer

Branch = Supercenter Branch has 3 branches identified by
A, B and C).

City = City: Location of supercenters

Customer type = Type of customers, registered by Socios
for customers with a credit card
member and Normal for without membership card.

Gender = Client gender type

Product line = General groups Item categorization: Electronic
accessories, Fashion accessories, Food and beverages, Health
and beauty, Home and lifestyle, Sports and travel

Unit Price = Price of each product in $

Quantity = Number of products purchased by the client

Tax = 5% tax rate for purchase of the client

Total = Total price taxes included
```

```
Date = Date of purchase (Record available from January to March)

Time = Purchase time (10am to 9pm)

Payment = payment used by the client for the purchase
(3 methods are available: cash, credit card and electronic wallet)

COGS: cost of goods sold

Gross margin percentage = Gross margin percentage

Gross income = Gross income

Rating = stratification rating of the customer in their overall
shopping experience (in a scale from 1 to 10)

"""
```

In [3]:
```
# We are seeing the number of rows and columns
sales_file.shape
```

Out[3]:
```
(1000, 17)
```

In [4]:
```
#checking for duplicate values
sales_file.duplicated().any()
```

Out[4]:
```
False
```

In [5]:
```
#With ".info()" we have a description of each column, the name,
#the number of rows (not counting null values)
#and the data type of each column
sales_file.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
```

In [6]:
```
#here we are going to convert the data type of the "Date"
#and "Time" columns to date and time, we will use "pd.to_datetime" for that
sales_file['Date'] = pd.to_datetime(sales_file['Date'])
sales_file['Time'] = pd.to_datetime(sales_file['Time'])
```

In [7]:
```
#we can check here that the data type conversion of "Date" and "Time" was successfu
sales_file.dtypes
```

Out[7]:
```
Invoice ID                       object
Branch                           object
City                             object
Customer type                    object
Gender                           object
Product line                     object
Unit price                      float64
Quantity                          int64
Tax 5%                          float64
Total                           float64
Date                     datetime64[ns]
Time                     datetime64[ns]
Payment                          object
cogs                            float64
gross margin percentage         float64
gross income                    float64
Rating                          float64
dtype: object
```

In [8]:
```
#we are creating new columns "day", "month", "year" and "hour"
sales_file['day'] = (sales_file['Date']).dt.day_name()
sales_file['month'] = (sales_file['Date']).dt.month
sales_file['year'] = (sales_file['Date']).dt.year
sales_file['hour'] = (sales_file['Time']).dt.hour
```

In [9]:
```
sales_file.head()
```

Out[9]:

	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
4	373-73-7910	A	Yangon	Normal	Male	Sports and travel	86.31	7	30.2085	634.3785

5 rows × 21 columns

In [10]:
```
#we can see here what values the 'month' column has
sales_file['month'].unique()
```

Out[10]:
```
array([1, 3, 2], dtype=int64)
```

In [11]:
```
#We are changing the values of each month value by its name
sales_file['month'].replace({1:'January', 2:'February', 3:'March'}, inplace=True)
sales_file['month'].unique()
```

Out[11]:
```
array(['January', 'March', 'February'], dtype=object)
```

In [12]:
```
#a quick statistical overview of numeric columns
sales_file.describe()
```

Out[12]:

	Unit price	Quantity	Tax 5%	Total	cogs	gross margin percentage	gros incom
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.00000	1.000000e+03	1000.00000
mean	55.672130	5.510000	15.379369	322.966749	307.58738	4.761905e+00	15.37936
std	26.494628	2.923431	11.708825	245.885335	234.17651	6.131498e-14	11.70882
min	10.080000	1.000000	0.508500	10.678500	10.17000	4.761905e+00	0.50850
25%	32.875000	3.000000	5.924875	124.422375	118.49750	4.761905e+00	5.92487
50%	55.230000	5.000000	12.088000	253.848000	241.76000	4.761905e+00	12.08800
75%	77.935000	8.000000	22.445250	471.350250	448.90500	4.761905e+00	22.44525
max	99.960000	10.000000	49.650000	1042.650000	993.00000	4.761905e+00	49.65000

In [13]:
```
# we are seeing the number of null values in each column}
sales_file.isnull().sum()
```

Out[13]:
```
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
day                        0
month                      0
year                       0
hour                       0
dtype: int64
```

In [14]:
```
#checking the number of non-repeating values in each column
sales_file.nunique()
```

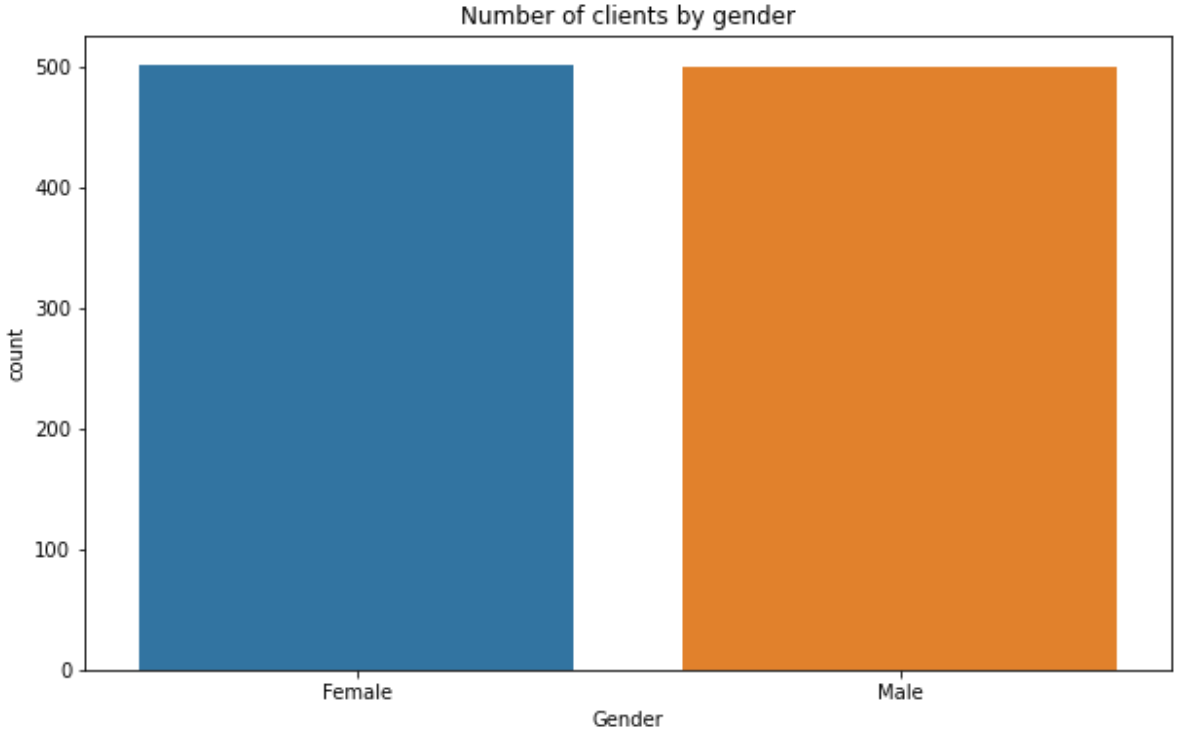
Out[14]:
```
Invoice ID                 1000
Branch                        3
City                          3
Customer type                 2
Gender                        2
Product line                  6
Unit price                  943
Quantity                     10
Tax 5%                      990
Total                       990
Date                         89
Time                        506
Payment                       3
cogs                        990
gross margin percentage       1
gross income                990
Rating                       61
day                           7
month                         3
year                          1
hour                         11
dtype: int64
```

In [15]:
```
#number of clients of each gender
sales_file['Gender'].value_counts()
```

Out[15]:
```
Female    501
Male      499
Name: Gender, dtype: int64
```

In [16]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='Gender', data=sales_file).set_title("Number of clients by gender")
```

Out[16]:
```
Text(0.5, 1.0, 'Number of clients by gender')
```

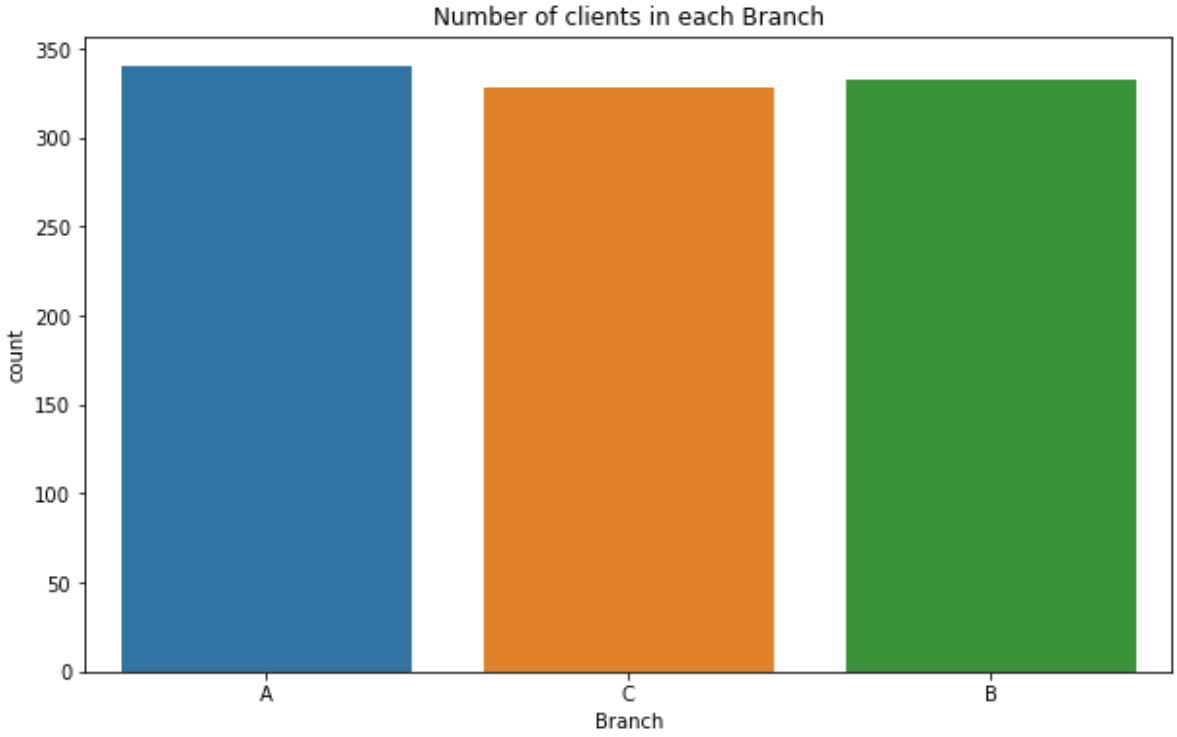


In [17]:
```
#checking the number of customers in each branch
sales_file['Branch'].value_counts()
```

Out[17]:
```
A    340
B    332
C    328
Name: Branch, dtype: int64
```

In [18]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='Branch', data= sales_file).set_title("Number of clients in each Br
```

Out[18]:
```
Text(0.5, 1.0, 'Number of clients in each Branch')
```

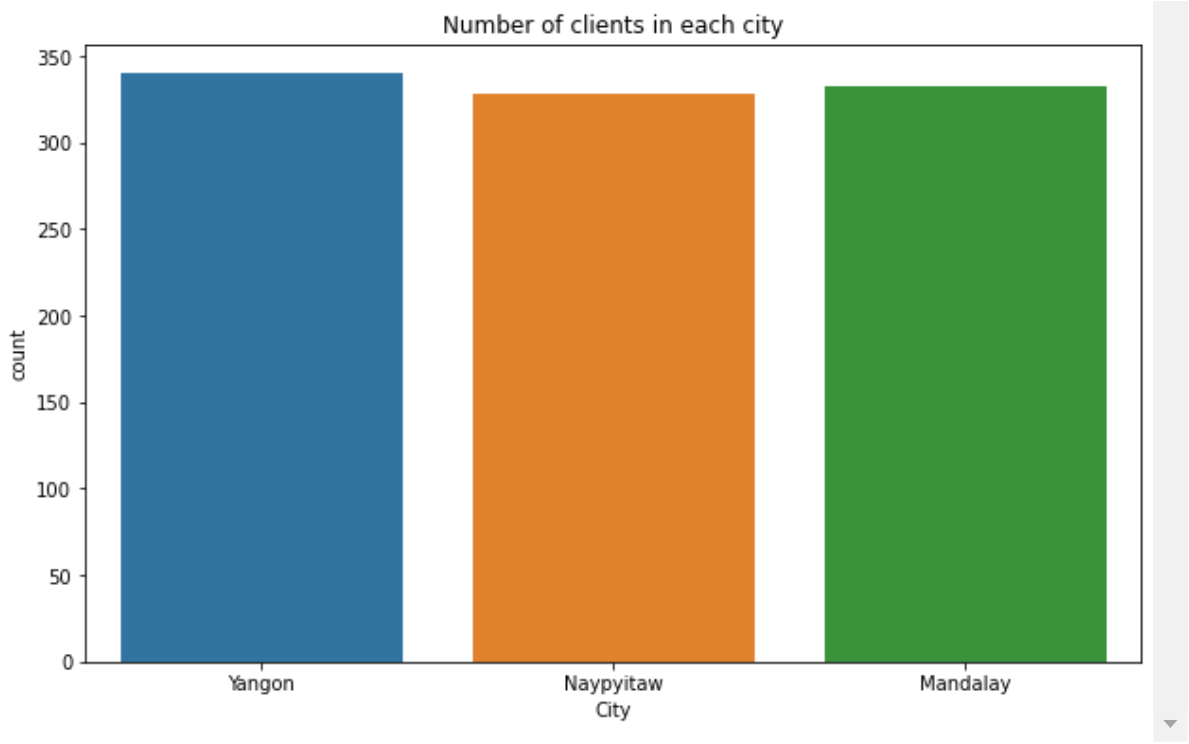


In [19]:
```
#checking the number of customers in each City
sales_file['City'].value_counts()
```

Out[19]:
```
Yangon       340
Mandalay     332
Naypyitaw    328
Name: City, dtype: int64
```

In [20]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='City', data=sales_file).set_title('Number of clients in each city
```

Out[20]:
```
Text(0.5, 1.0, 'Number of clients in each city')
```

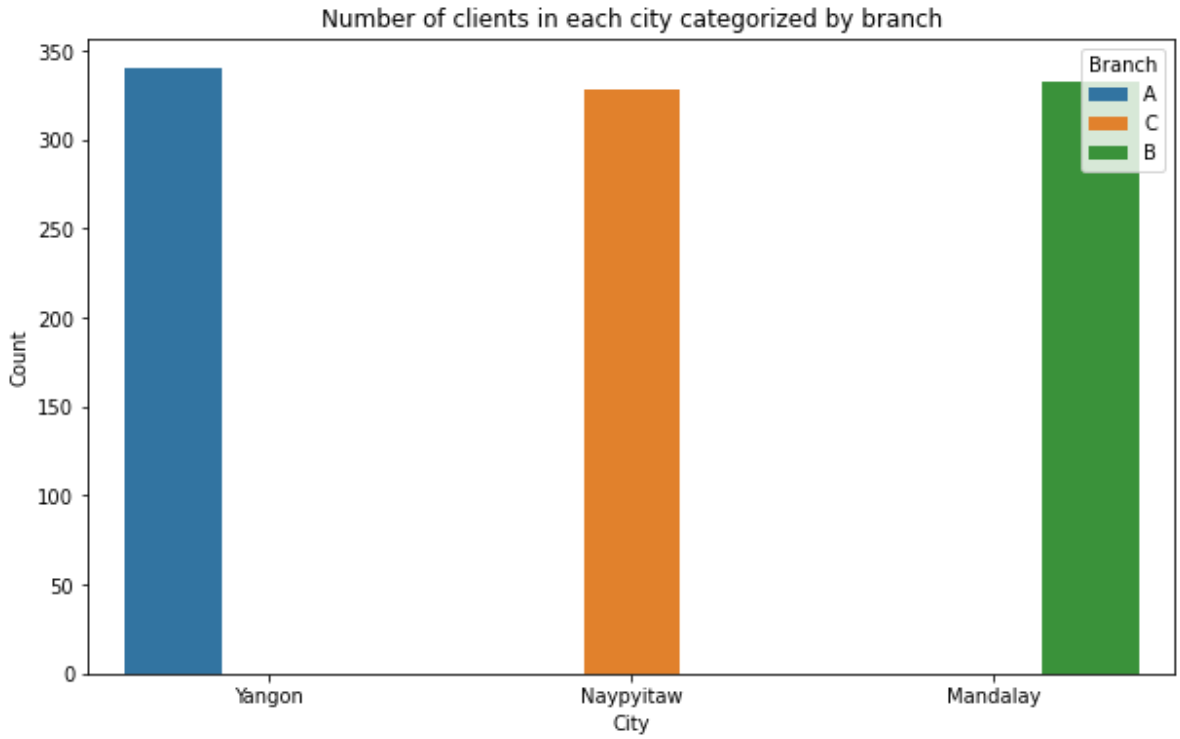


In [21]:
```
#Number of clients in each city categorized by branch
sales_file.groupby(['City', 'Branch']).agg(amount=('Invoice ID', 'count'))
```

Out[21]:

		amount
City	**Branch**	
Mandalay	**B**	332
Naypyitaw	**C**	328
Yangon	**A**	340

In [22]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='City', hue='Branch', data=sales_file).set_title('Number of clients
plt.xlabel('City')
plt.ylabel('Count')
plt.show()
```

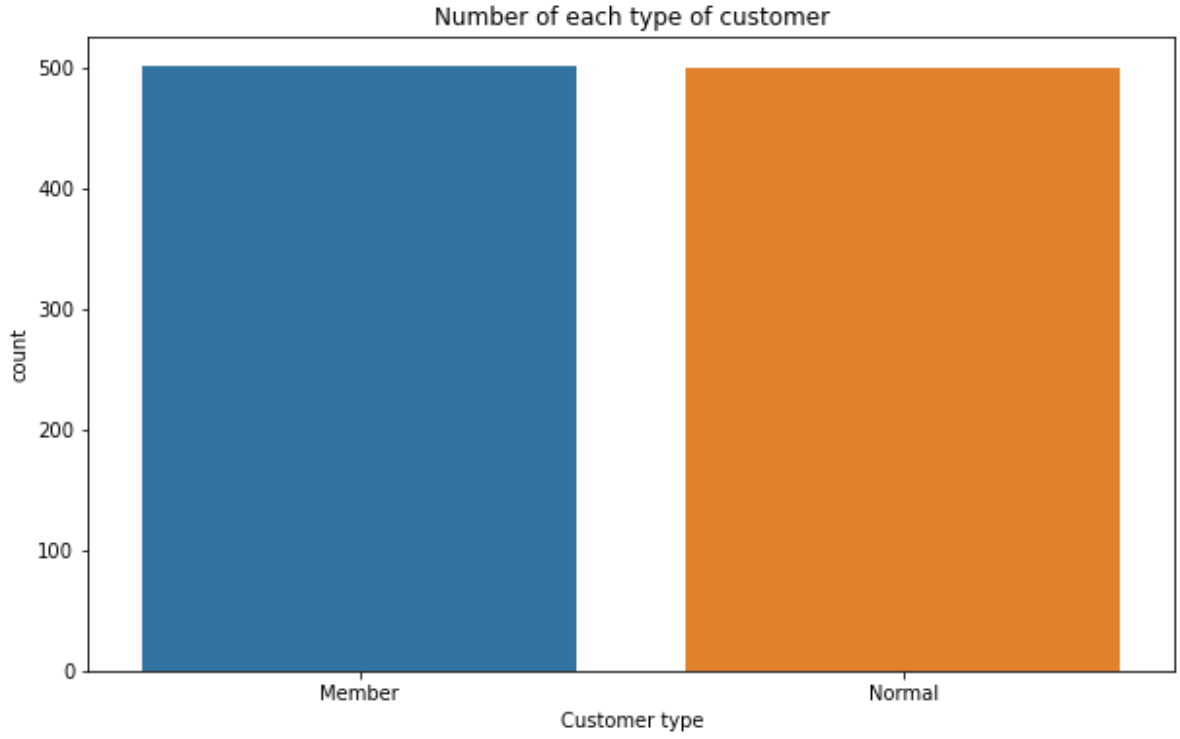


In [23]:
```
#Consultation of the quantity of each type of client
sales_file['Customer type'].value_counts()
```

Out[23]:
```
Member    501
Normal    499
Name: Customer type, dtype: int64
```

In [24]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='Customer type', data=sales_file).set_title('Number of each type o
```

Out[24]:
```
Text(0.5, 1.0, 'Number of each type of customer')
```



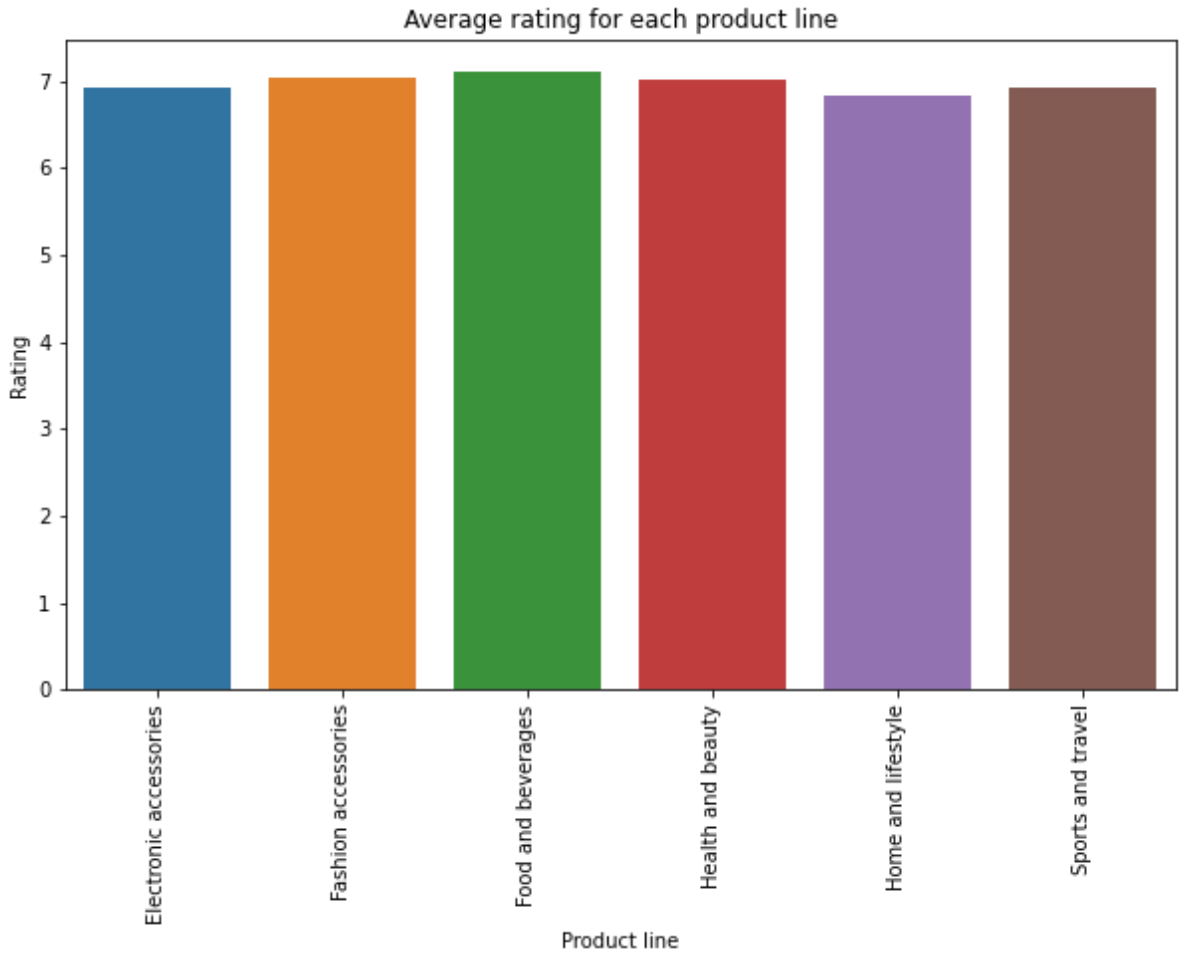
In [25]:
```
#Average rating of each product line
sales_rating_avg = pd.DataFrame(sales_file.groupby('Product line')['Rating'].mean(
sales_rating_avg
```

Out[25]:

Product line	Rating
Electronic accessories	6.924706
Fashion accessories	7.029213
Food and beverages	7.113218
Health and beauty	7.003289
Home and lifestyle	6.837500
Sports and travel	6.916265

In [26]:
```
sales_rating_avg = sales_rating_avg.reset_index()
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.barplot(x='Product line', y='Rating', data=sales_rating_avg).set_title('Averag
```

Out[26]:
```
Text(0.5, 1.0, 'Average rating for each product line')
```

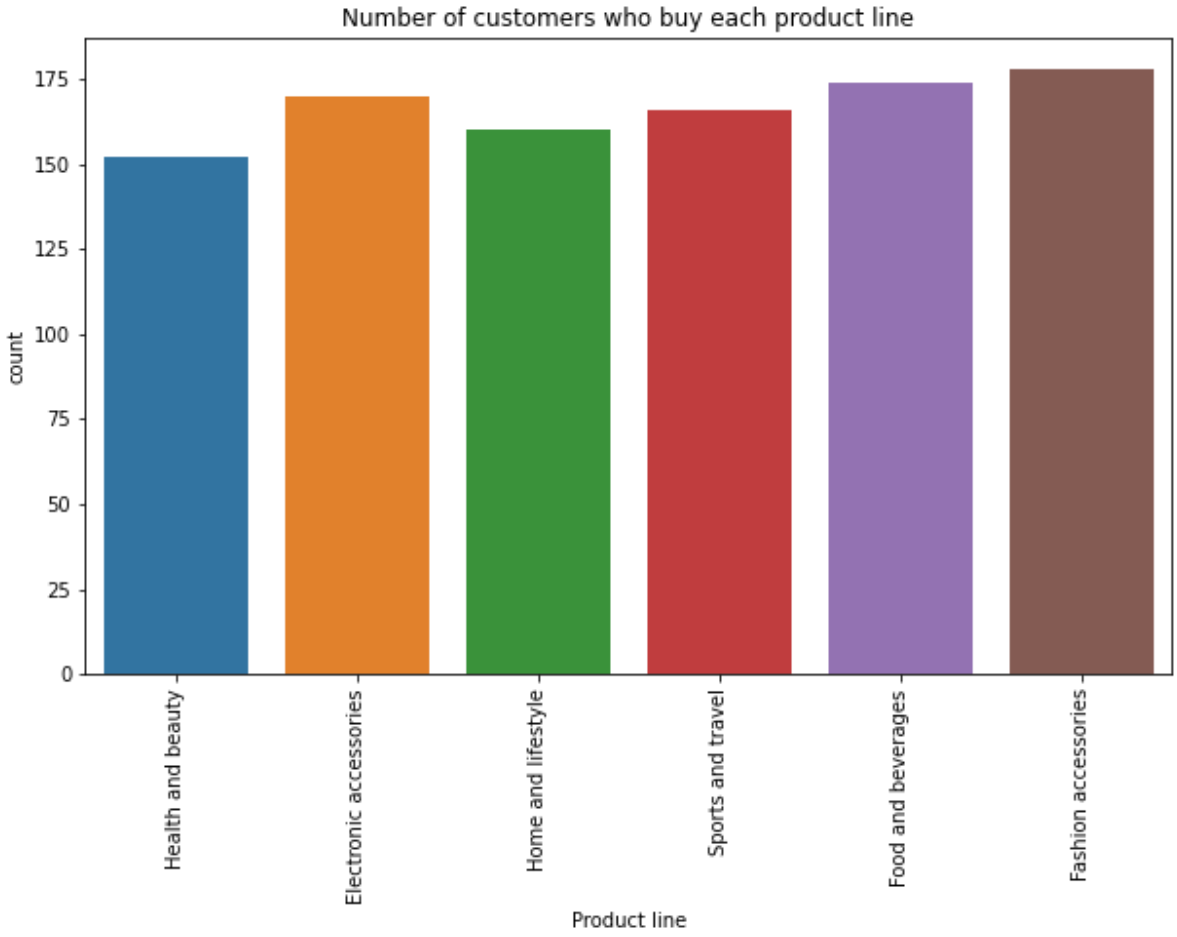


In [27]:
```
#Number of customers who buy each product line
sales_file['Product line'].value_counts()
```

Out[27]:
```
Fashion accessories       178
Food and beverages        174
Electronic accessories    170
Sports and travel         166
Home and lifestyle        160
Health and beauty         152
Name: Product line, dtype: int64
```

In [28]:
```
plt.figure(figsize=(10, 6))
#We use xtics(rotation=90) to rotate the name of the categories 90 degrees so they
plt.xticks(rotation=90)
sns.countplot(x='Product line', data=sales_file).set_title('Number of customers who
```

Out[28]:
```
Text(0.5, 1.0, 'Number of customers who buy each product line')
```

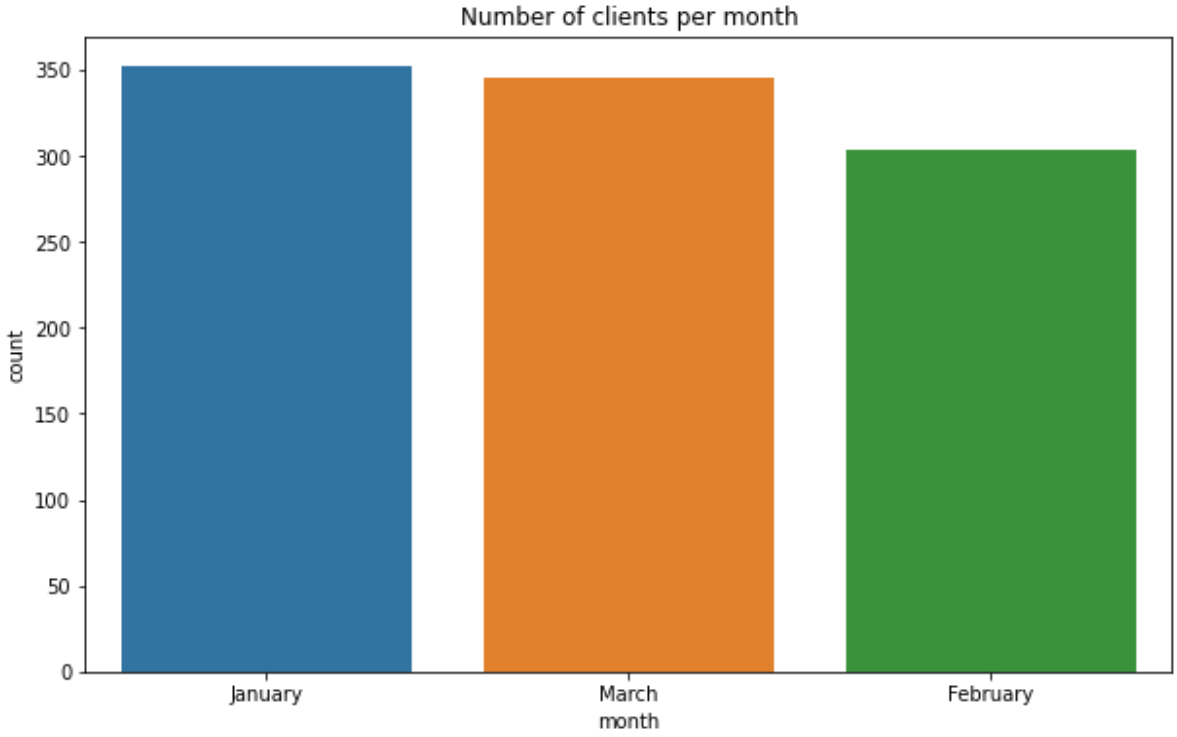


In [29]:
```
#Number of clients per month
sales_file['month'].value_counts()
```

Out[29]:
```
January     352
March       345
February    303
Name: month, dtype: int64
```

In [30]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='month', data=sales_file).set_title('Number of clients per month')
```

Out[30]:
```
Text(0.5, 1.0, 'Number of clients per month')
```

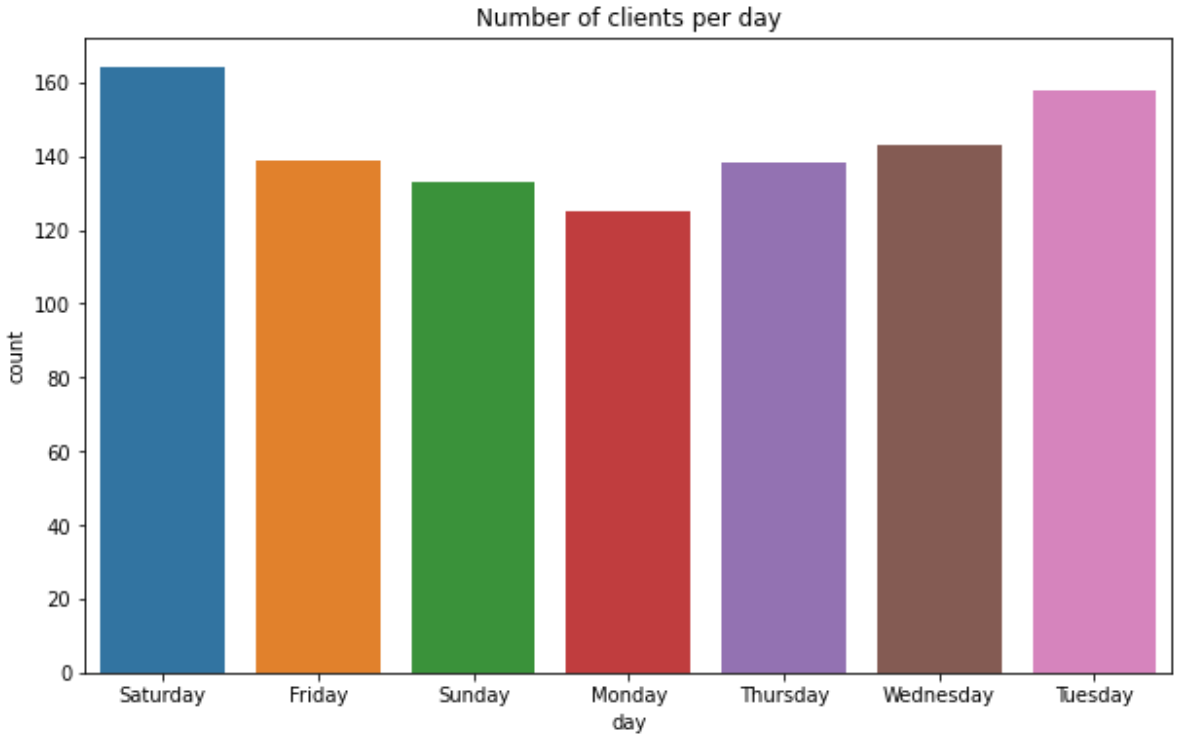


In [31]:
```
#Number of clients per day
sales_file['day'].value_counts()
```

Out[31]:
```
Saturday     164
Tuesday      158
Wednesday    143
Friday       139
Thursday     138
Sunday       133
Monday       125
Name: day, dtype: int64
```

In [32]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='day', data=sales_file).set_title('Number of clients per day')
```

Out[32]:
```
Text(0.5, 1.0, 'Number of clients per day')
```

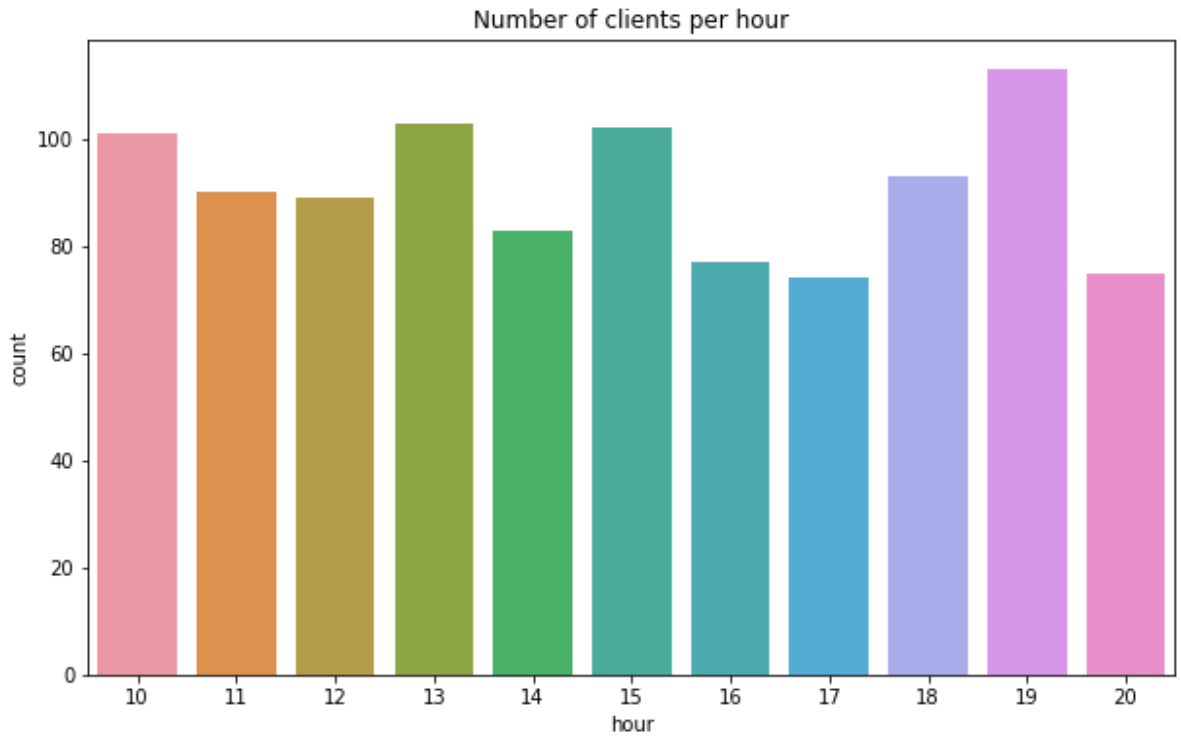


In [33]:
```
#Number of clients per hour
sales_file['hour'].value_counts()
```

Out[33]:
```
19    113
13    103
15    102
10    101
18     93
11     90
12     89
14     83
16     77
20     75
17     74
Name: hour, dtype: int64
```

In [34]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='hour', data=sales_file).set_title('Number of clients per hour')
```

Out[34]:
```
Text(0.5, 1.0, 'Number of clients per hour')
```



In [ ]:
```
#Summary
"""
Times are rounded (10:00 a.m. - 10:59 a.m.) = 10 a.m.,
(11:0 a.m. - 11:59 a.m.) = 11 a.m., ...
1. The number of clients of each gender is very balanced
2. "A" branch is located in "Yangon", "B" is
in "Mandalay" and the "C" is in "Naypyitaw"
3. Of all the branches, the one with the most customers in
this period of 3 months was the "A", but they all have an amount
very similar
4. The number of clients who are members and those who are
not fairly balanced
5. The product line that stood out the most was accessories
fashion, followed by food and drinks, and third the
electronic accessories
6. The product line that stood out the least was health And beauty
7. On average, the product line that is most accepted had was
the food and drinks, followed by accessories of
fashion, very equal with health and beauty products
```

```
8. The least accepted product line in product was home and lifestyle
9. The month with the most clients was: January
10. The month with the fewest clients was: February
11. The days that most customers went shopping were: saturday
and tuesday
12. The days that fewer customers went shopping were: monday
and sunday
13. The hours that most customers went shopping were (Top 3):
7:00 p.m., 1:00 p.m., 3:00 p.m. (very even with 10 o'clock)
14. The hours that most customers went shopping were (Top 3):
5:00 p.m., 8:00 p.m., 4:00 p.m.
"""
```

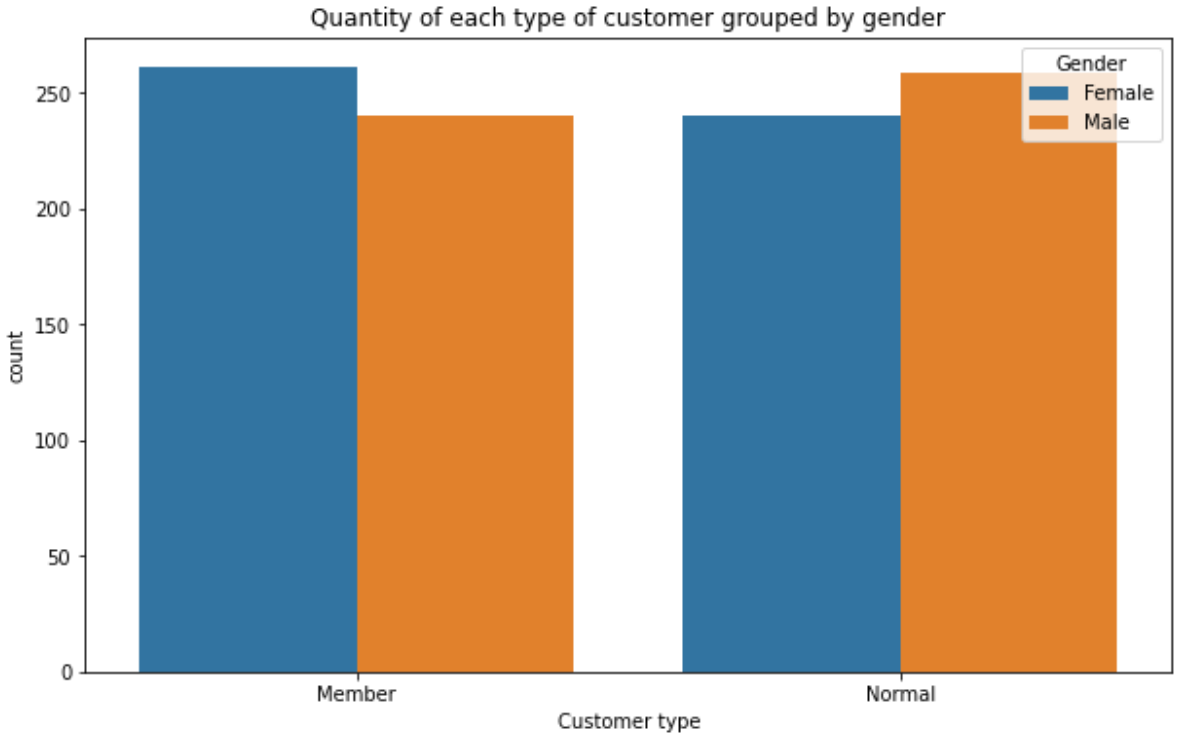
In [35]:
```
#Consult the amount of each type of customer grouped by gender
sales_file.groupby(['Customer type', 'Gender']).agg(amount=('Invoice ID', 'count'))
```

Out[35]:

		amount
Customer type	**Gender**	
Member	**Female**	261
	Male	240
Normal	**Female**	240
	Male	259

In [36]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='Customer type', hue='Gender', data=sales_file).set_title('Quantity
```

Out[36]:
```
Text(0.5, 1.0, 'Quantity of each type of customer grouped by gender')
```



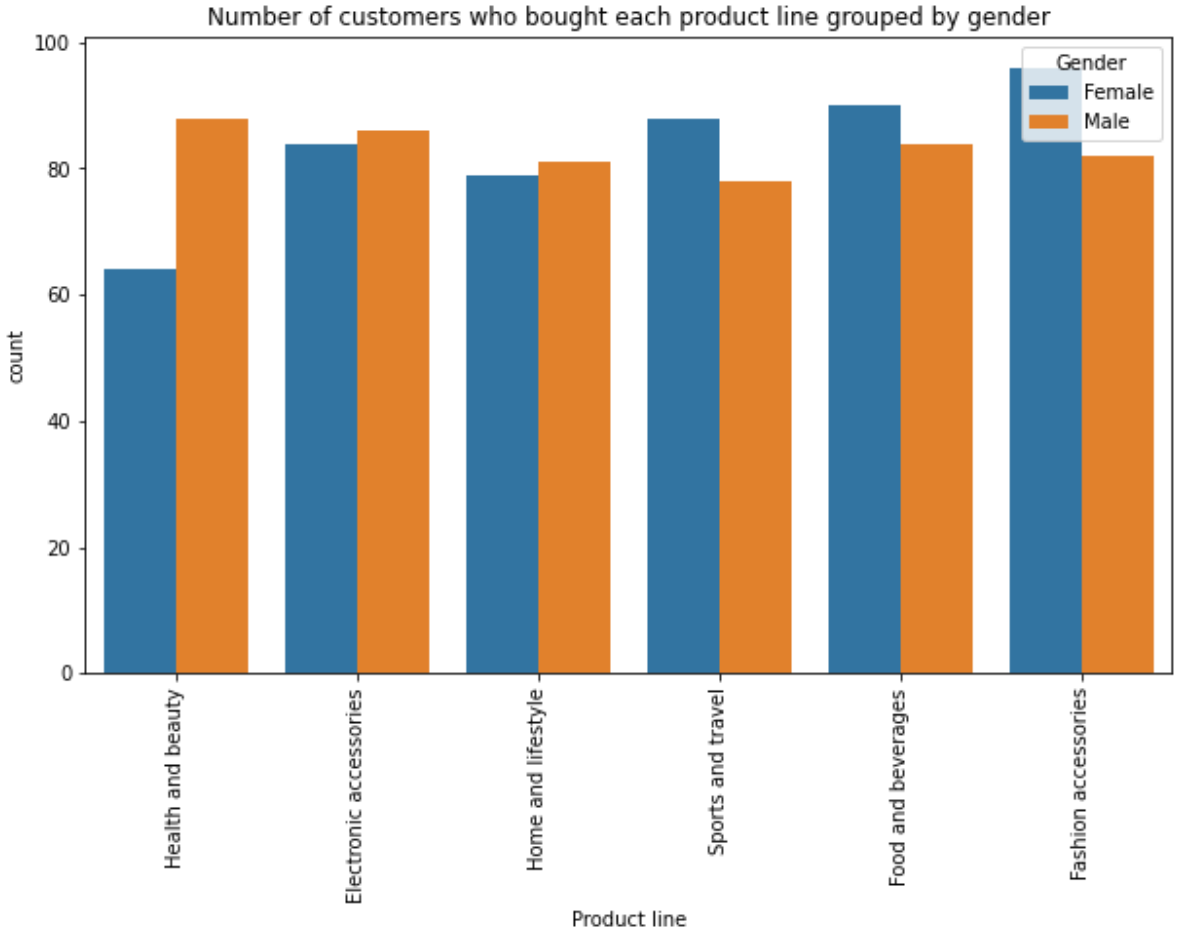
In [37]:
```
#Number of customers who bought each line of products grouped by gender
sales_file.groupby(['Product line', 'Gender']).agg(amount=('Invoice ID', 'count'))
```

Out[37]:

		amount
Product line	**Gender**	
Electronic accessories	**Female**	84
	Male	86
Fashion accessories	**Female**	96
	Male	82
Food and beverages	**Female**	90
	Male	84
Health and beauty	**Female**	64
	Male	88
Home and lifestyle	**Female**	79
	Male	81
Sports and travel	**Female**	88
	Male	78

In [38]:
```
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.countplot(x='Product line', hue='Gender', data=sales_file).set_title('Number o
```

Out[38]:
```
Text(0.5, 1.0, 'Number of customers who bought each product line grouped by gende
r')
```



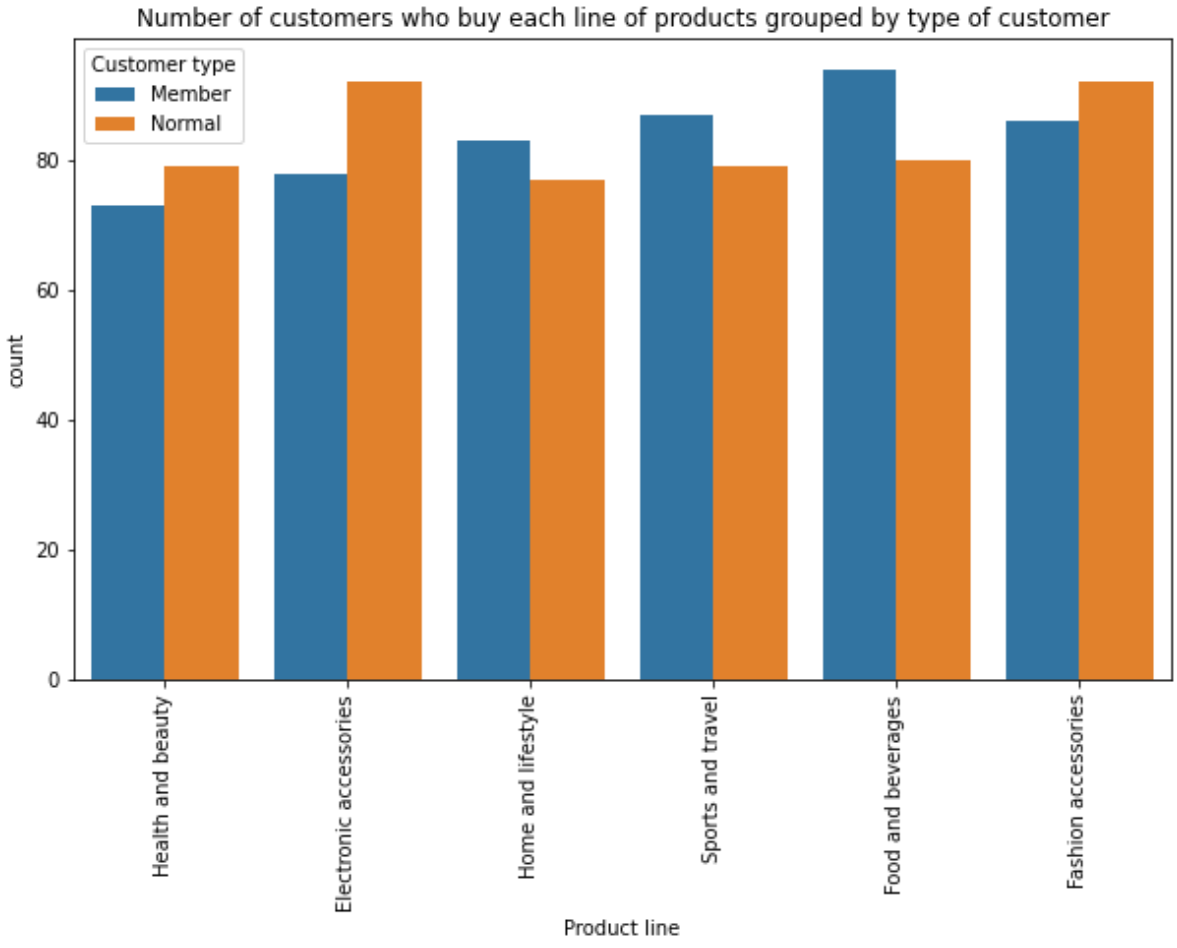
In [39]:
```
#Number of customers who buy each line of products grouped by type of Customer
sales_file.groupby(['Product line', 'Customer type']).agg(amount=('Invoice ID', 'c
```

Out[39]:

Product line	Customer type	amount
Electronic accessories	Member	78
	Normal	92
Fashion accessories	Member	86
	Normal	92
Food and beverages	Member	94
	Normal	80
Health and beauty	Member	73
	Normal	79
Home and lifestyle	Member	83
	Normal	77
Sports and travel	Member	87
	Normal	79

In [40]:
```
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.countplot(x='Product line', hue='Customer type', data=sales_file).set_title('Nu
```

Out[40]:
```
Text(0.5, 1.0, 'Number of customers who buy each line of products grouped by type
of customer')
```



In [41]:
```
#Number of customers of each gender per month
```

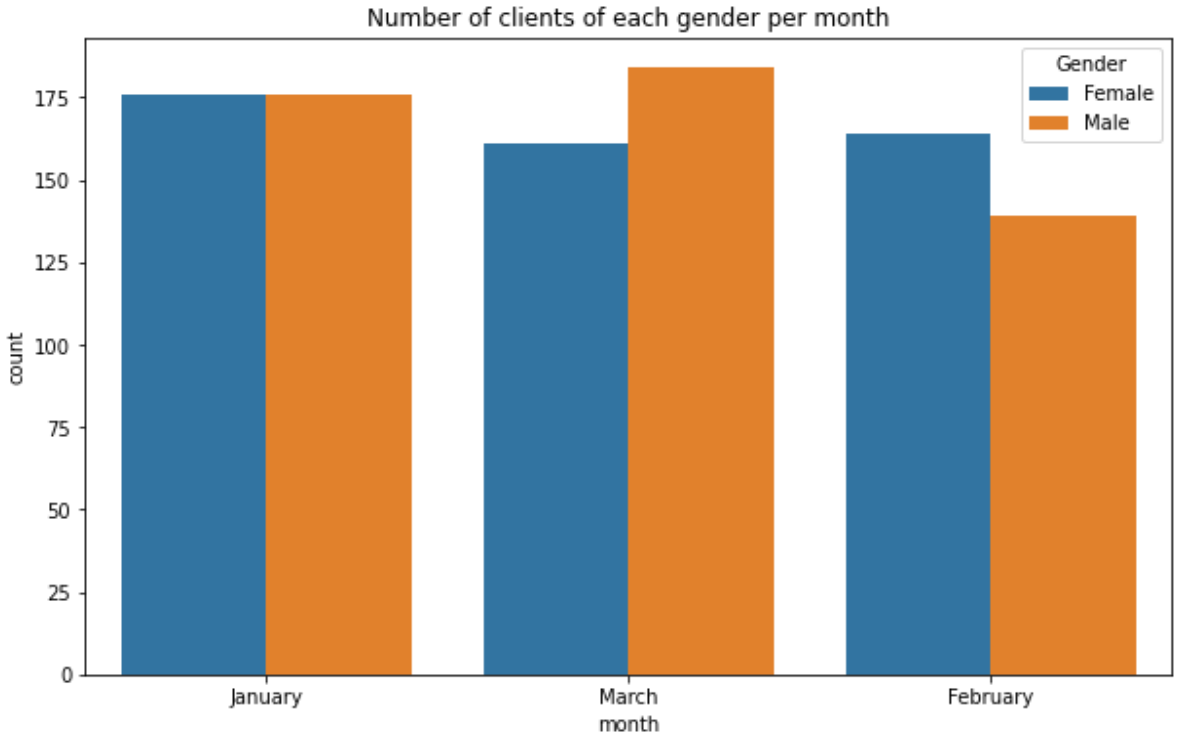
```
sales_file.groupby(['month', 'Gender']).agg(amount=('Invoice ID', 'count'))
```

Out[41]:

		amount
month	**Gender**	
February	**Female**	164
	Male	139
January	**Female**	176
	Male	176
March	**Female**	161
	Male	184

In [42]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='month',hue='Gender', data=sales_file).set_title('Number of clients
```

Out[42]:
```
Text(0.5, 1.0, 'Number of clients of each gender per month')
```



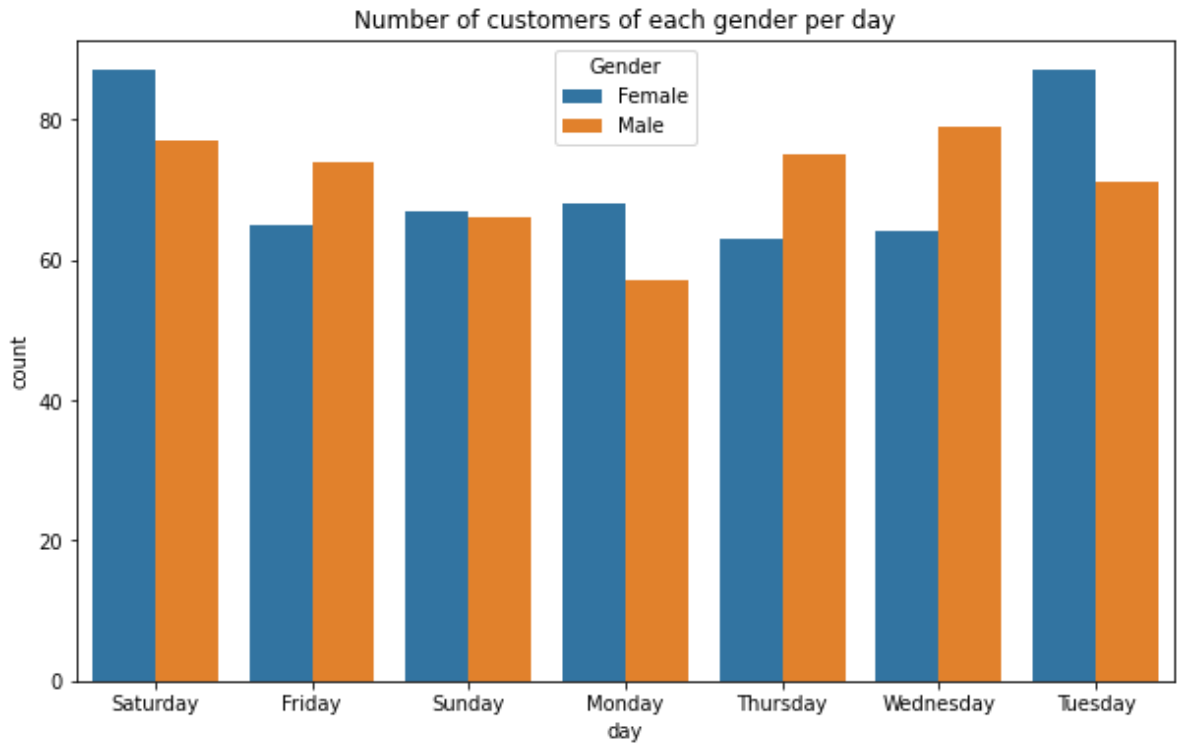
In [43]:
```
#Number of customers of each gender per day
sales_file.groupby(['day', 'Gender']).agg(amount=('Invoice ID', 'count'))
```

Out[43]:

day	Gender	amount
Friday	Female	65
	Male	74
Monday	Female	68
	Male	57
Saturday	Female	87
	Male	77
Sunday	Female	67
	Male	66
Thursday	Female	63
	Male	75
Tuesday	Female	87
	Male	71
Wednesday	Female	64
	Male	79

In [44]:
```
plt.figure(figsize=(10,6))
sns.countplot(x='day',hue='Gender', data=sales_file).set_title('Number of customers
```

Out[44]:
```
Text(0.5, 1.0, 'Number of customers of each gender per day')
```



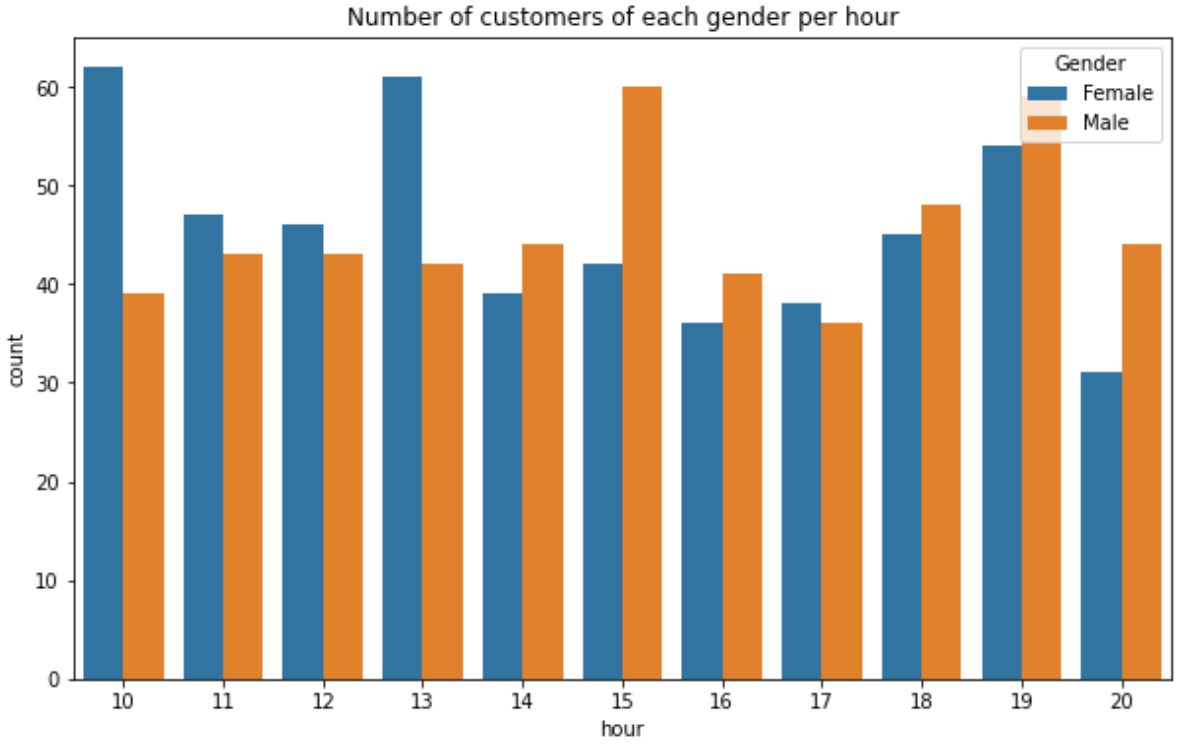
In [45]:
```
#Number of customers of each gender per hour
sales_file.groupby(['hour', 'Gender']).agg(amount=('Invoice ID', 'count'))
```

Out[45]:

hour	Gender	amount
10	Female	62
	Male	39
11	Female	47
	Male	43
12	Female	46
	Male	43
13	Female	61
	Male	42
14	Female	39
	Male	44
15	Female	42
	Male	60
16	Female	36
	Male	41
17	Female	38
	Male	36
18	Female	45
	Male	48
19	Female	54
	Male	59
20	Female	31
	Male	44

In [46]:
```
plt.figure(figsize=(10,6))
sns.countplot(x='hour',hue='Gender', data=sales_file).set_title('Number of customer
```

Out[46]:
```
Text(0.5, 1.0, 'Number of customers of each gender per hour')
```



In [ ]:
```
#Summary
"""
1. Women are considerably more likely to choose to be members
than men
2. Women chose significantly more fashion products, as well
as sports and travel
3. Men preferred much more than women for health and beauty
products
4. Customers without membership compared to those with yes
they are, they choose much more (greater than 10 units)
electronic accessories
5. There is a big difference in the food industry and drinks
in the members (being greater than 10 units) in
comparison to those who are not
6. Women shopped more in the month of January, on the contrary,
men did it in March
7. Women shopped less in the month of March
and men in february
8. Women went shopping more on Saturdays and Tuesday
(the same amount) and men on Wednesday (very even with Saturdays)
9. Women shopped less on Wednesday (very even with Thursdays)
and men on Mondays
10. Women went shopping more at 10 o'clock (very around 1:00 p.m.)
and men at 3:00 p.m. (quite equal to 7:00 p.m.)
11. Women went shopping less at 8pm and men men at 5 pm
"""
```

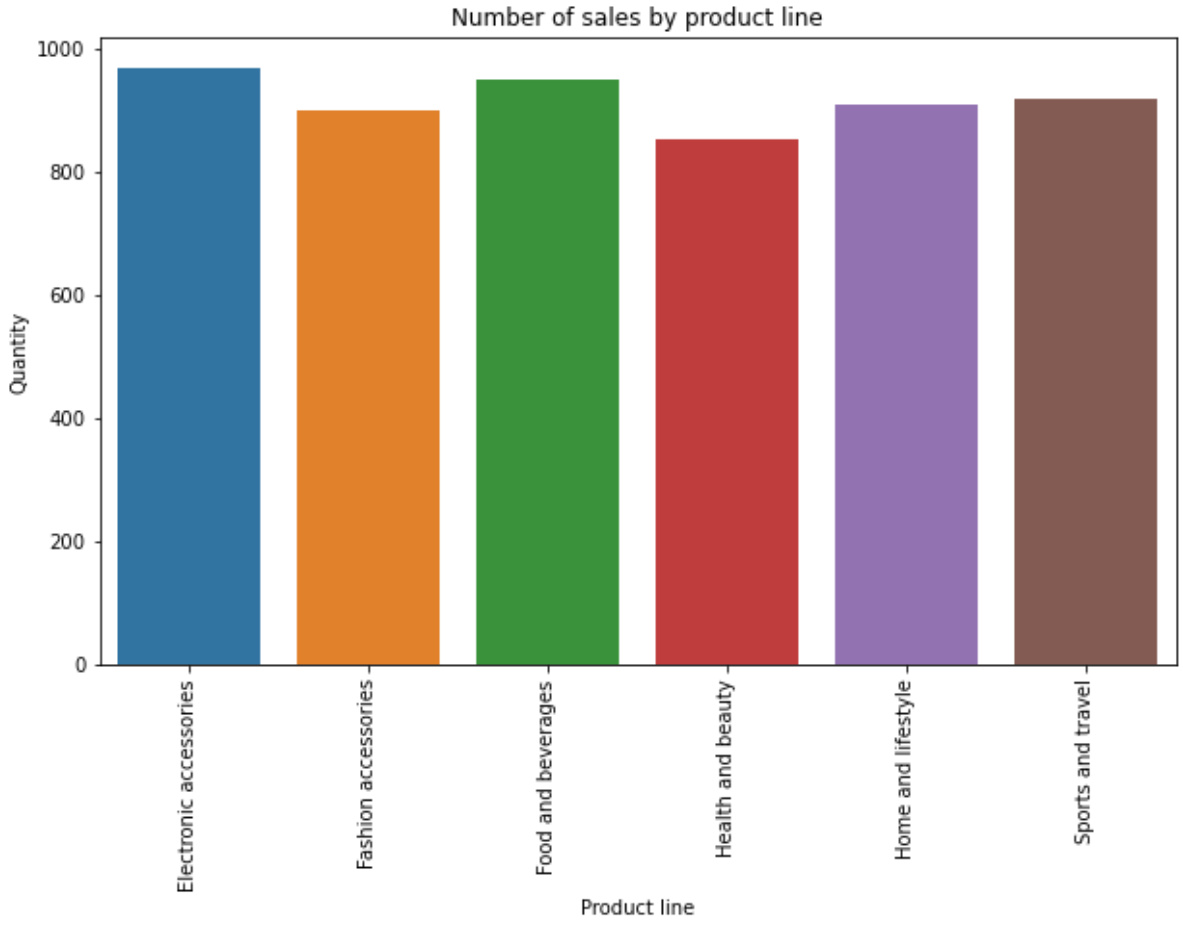
In [48]:
```
#Number of sales by product line
sales_file_2= pd.DataFrame(sales_file.groupby('Product line')['Quantity'].sum())
sales_file_2
```

Out[48]:

Product line	Quantity
Electronic accessories	971
Fashion accessories	902
Food and beverages	952
Health and beauty	854
Home and lifestyle	911
Sports and travel	920

In [49]:
```
#We need to reset the index of the new dataset to avoid errors when trying to graph
sales_file_2 = sales_file_2.reset_index()
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.barplot(x='Product line', y='Quantity', data=sales_file_2).set_title('Number of
```

Out[49]:
```
Text(0.5, 1.0, 'Number of sales by product line')
```

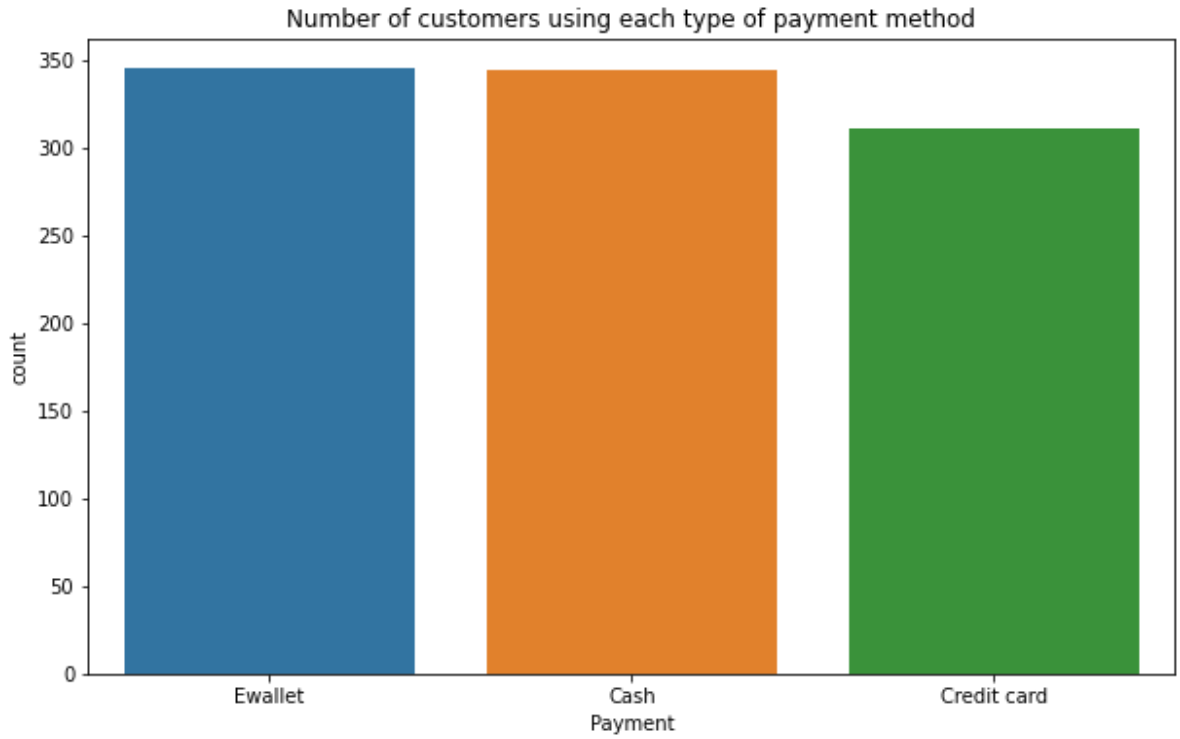


In [50]:
```
#Number of customers using each type of payment method
sales_file['Payment'].value_counts()
```

Out[50]:
```
Ewallet        345
Cash           344
Credit card    311
Name: Payment, dtype: int64
```

In [51]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='Payment', data=sales_file).set_title('Number of customers using ea
```

Out[51]:
```
Text(0.5, 1.0, 'Number of customers using each type of payment method')
```

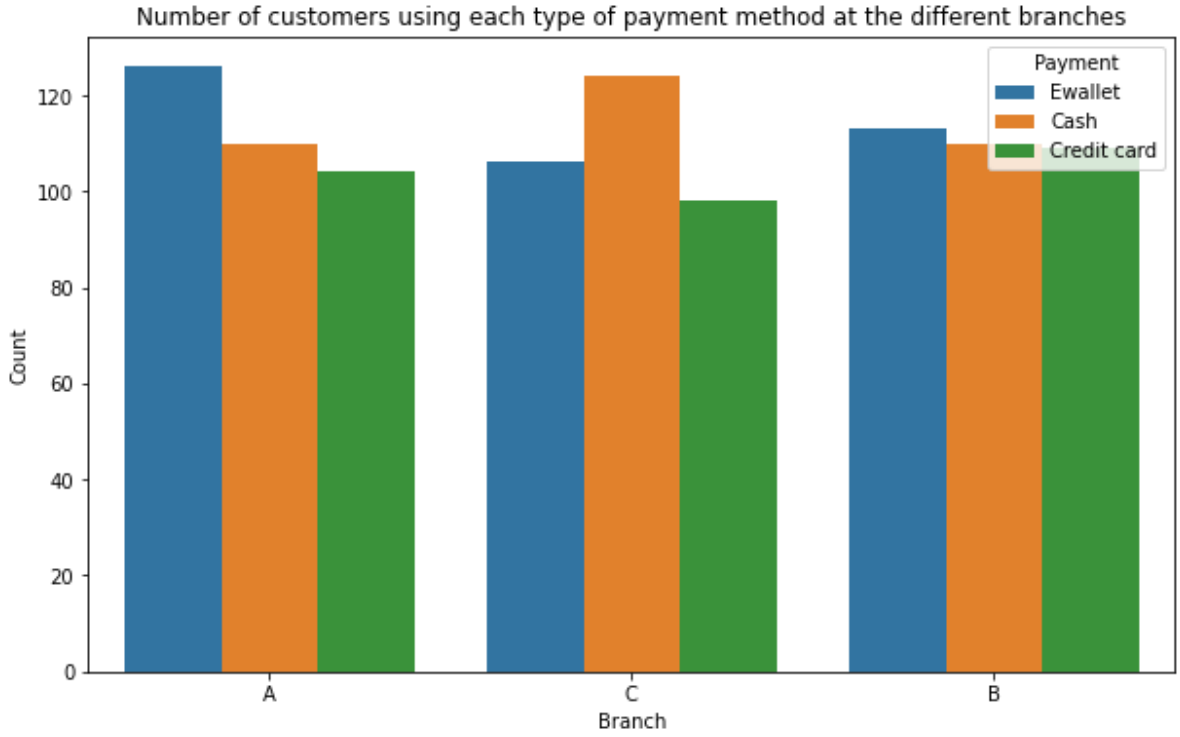


In [52]:
```
#Number of customers who use each type of payment method in the different branches
sales_file.groupby(['Branch', 'Payment']).agg(amount=('Invoice ID', 'count'))
```

Out[52]:

		amount
Branch	**Payment**	
A	**Cash**	110
	Credit card	104
	Ewallet	126
B	**Cash**	110
	Credit card	109
	Ewallet	113
C	**Cash**	124
	Credit card	98
	Ewallet	106

In [53]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='Branch', hue='Payment', data=sales_file).set_title('Number of cust
plt.xlabel('Branch')
plt.ylabel('Count')
plt.show()
```

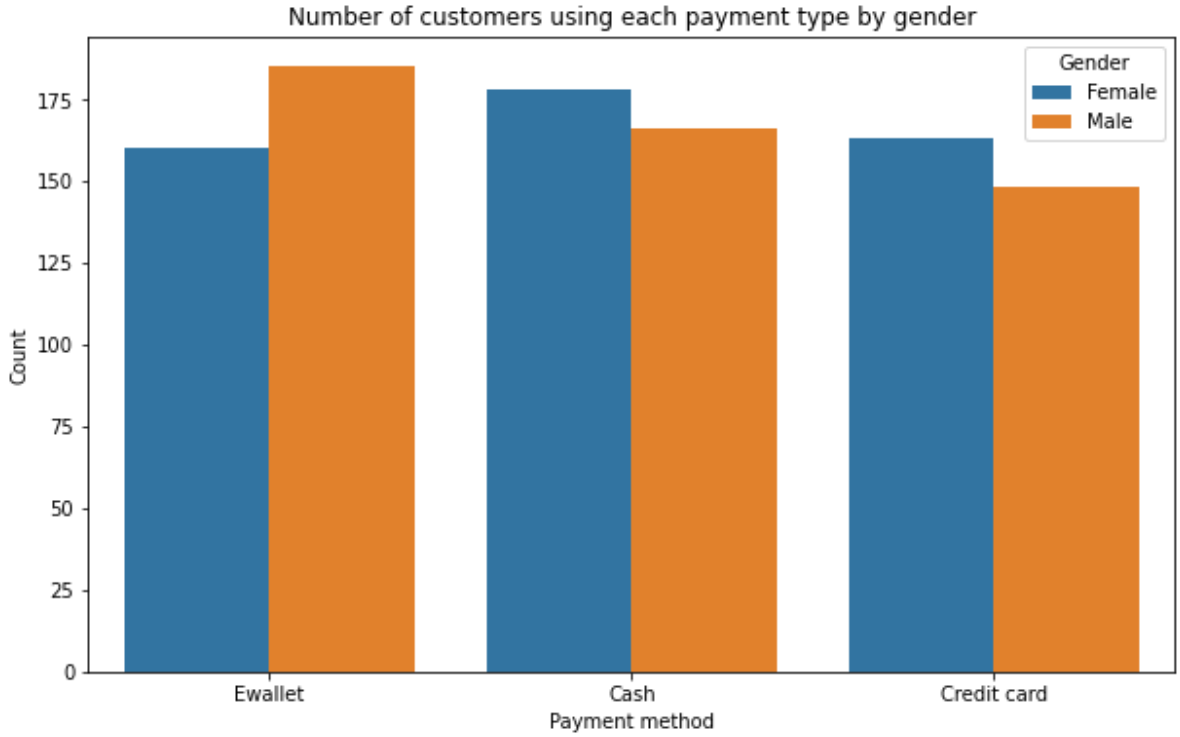


In [54]:
```
#Number of customers using each payment type by gender
sales_file.groupby([ 'Gender', 'Payment']).agg(amount=('Invoice ID', 'count'))
```

Out[54]:

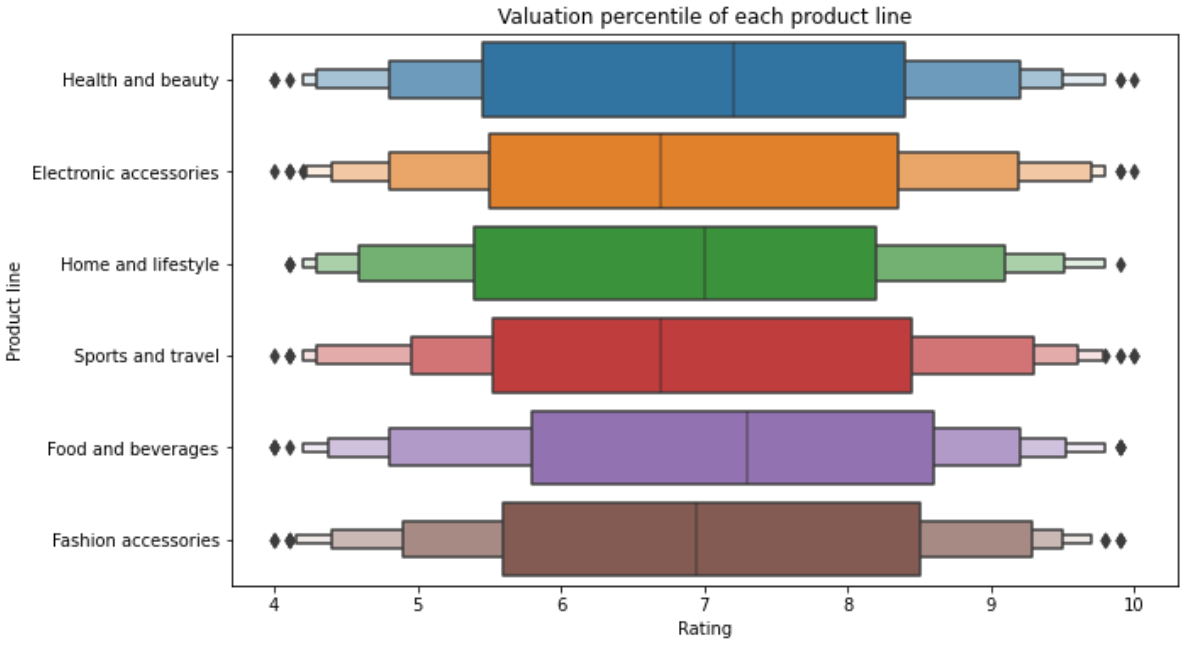
		amount
Gender	**Payment**	
Female	**Cash**	178
	Credit card	163
	Ewallet	160
Male	**Cash**	166
	Credit card	148
	Ewallet	185

In [55]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='Payment', hue='Gender', data=sales_file).set_title('Number of cust
plt.xlabel('Payment method')
plt.ylabel('Count')
plt.show()
```



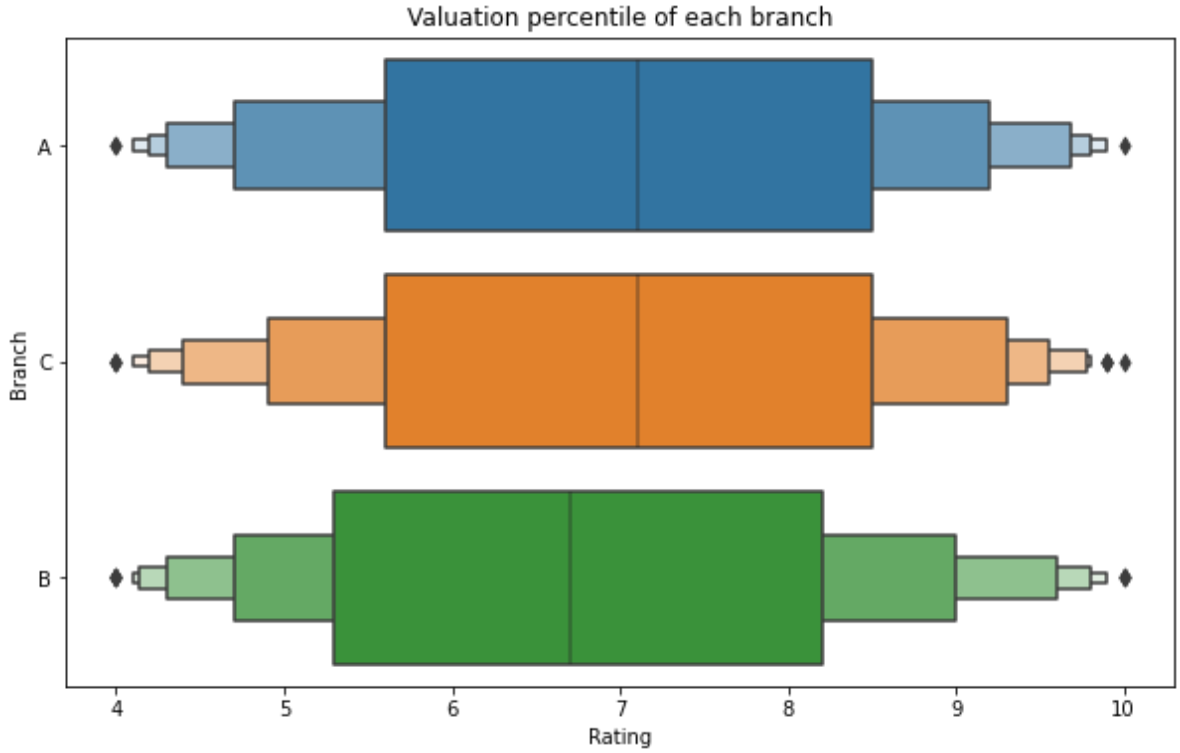
In [56]:
```
plt.figure(figsize=(10, 6))
sns.boxenplot(x='Rating', y='Product line', data=sales_file).set_title('Valuation p
```

Out[56]:
```
Text(0.5, 1.0, 'Valuation percentile of each product line')
```



In [57]:
```
plt.figure(figsize=(10, 6))
sns.boxenplot(x='Rating', y='Branch', data=sales_file).set_title('Valuation percent
```

Out[57]:
```
Text(0.5, 1.0, 'Valuation percentile of each branch')
```



In [ ]:
```
#Summary
"""
1. Even though more customers bought accessories from beauty,
more electronic accessories were sold and meals
2. Electronic wallets are preferred by the customers, closely
matched with cash, unlike with the credit cards
3. The electronic wallet is preferred in the branch "A" and "B",
instead cash is preferred in "C"
4. Women prefer to pay more in cash and less with electronic
wallets
5. men prefer to use electronic wallets and less Credit cards
6. Analyzing the percentiles, the products that have the best
rating are food and drinks, followed by health and beauty
7. The products in branch "C" have better evaluation, slightly
lower is branch "A"
"""
```

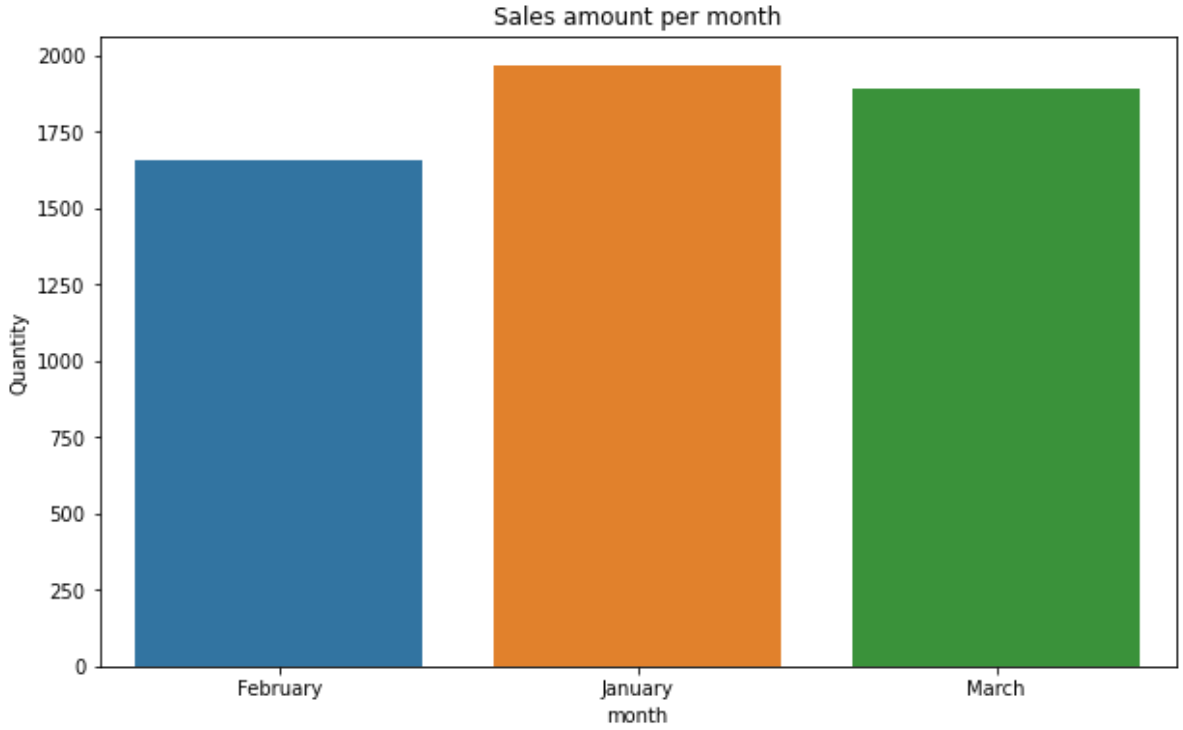
In [58]:
```
#Amount of sales per month
sales_file_3 = pd.DataFrame(sales_file.groupby('month')['Quantity'].sum())
sales_file_3= sales_file_3.reset_index()
sales_file_3
```

Out[58]:

	month	Quantity
0	February	1654
1	January	1965
2	March	1891

In [59]:
```
plt.figure(figsize=(10, 6))
sns.barplot(x='month', y='Quantity',data=sales_file_3).set_title('Sales amount per
```

Out[59]:
```
Text(0.5, 1.0, 'Sales amount per month')
```



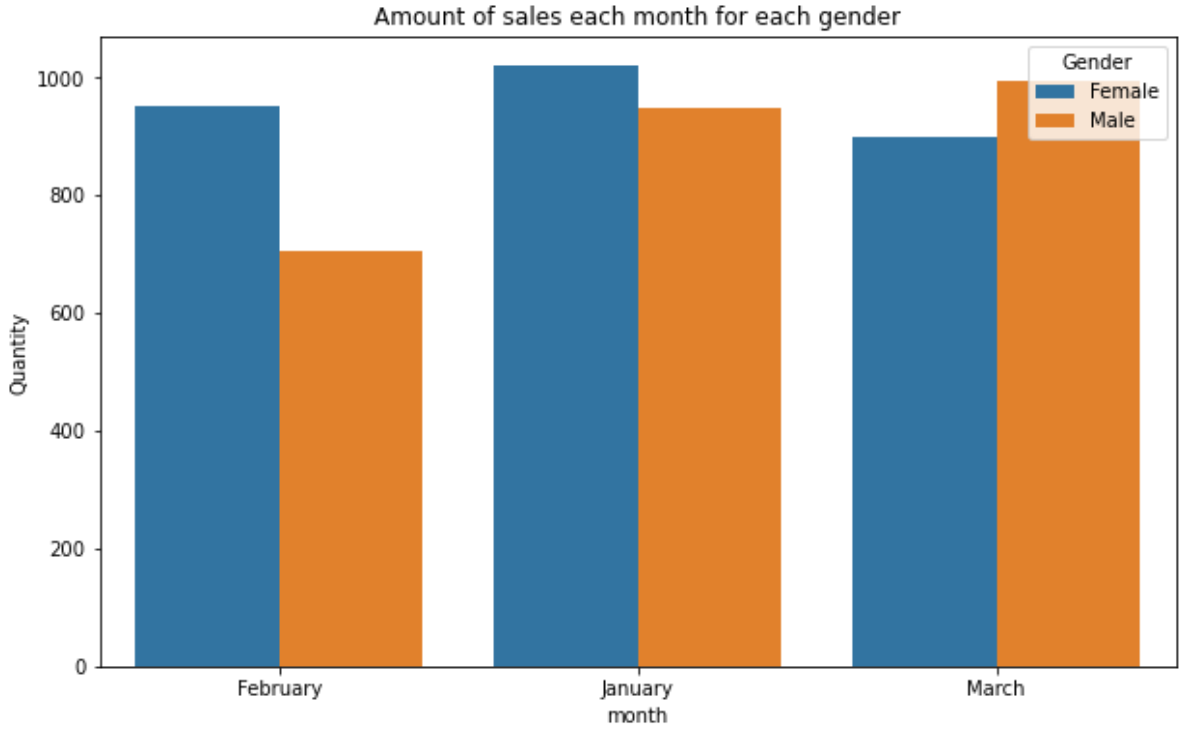
In [60]:
```
#Amount of sales for each month for each gender
sales_file_4 = pd.DataFrame(sales_file.groupby(['month', 'Gender'])['Quantity'].sur
sales_file_4
```

Out[60]:

		Quantity
month	**Gender**	
February	**Female**	951
	Male	703
January	**Female**	1019
	Male	946
March	**Female**	899
	Male	992

In [61]:
```
sales_file_4 = sales_file_4.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x=sales_file_4['month'], y=sales_file_4['Quantity'], hue=sales_file_4[
```

Out[61]:
```
Text(0.5, 1.0, 'Amount of sales each month for each gender')
```



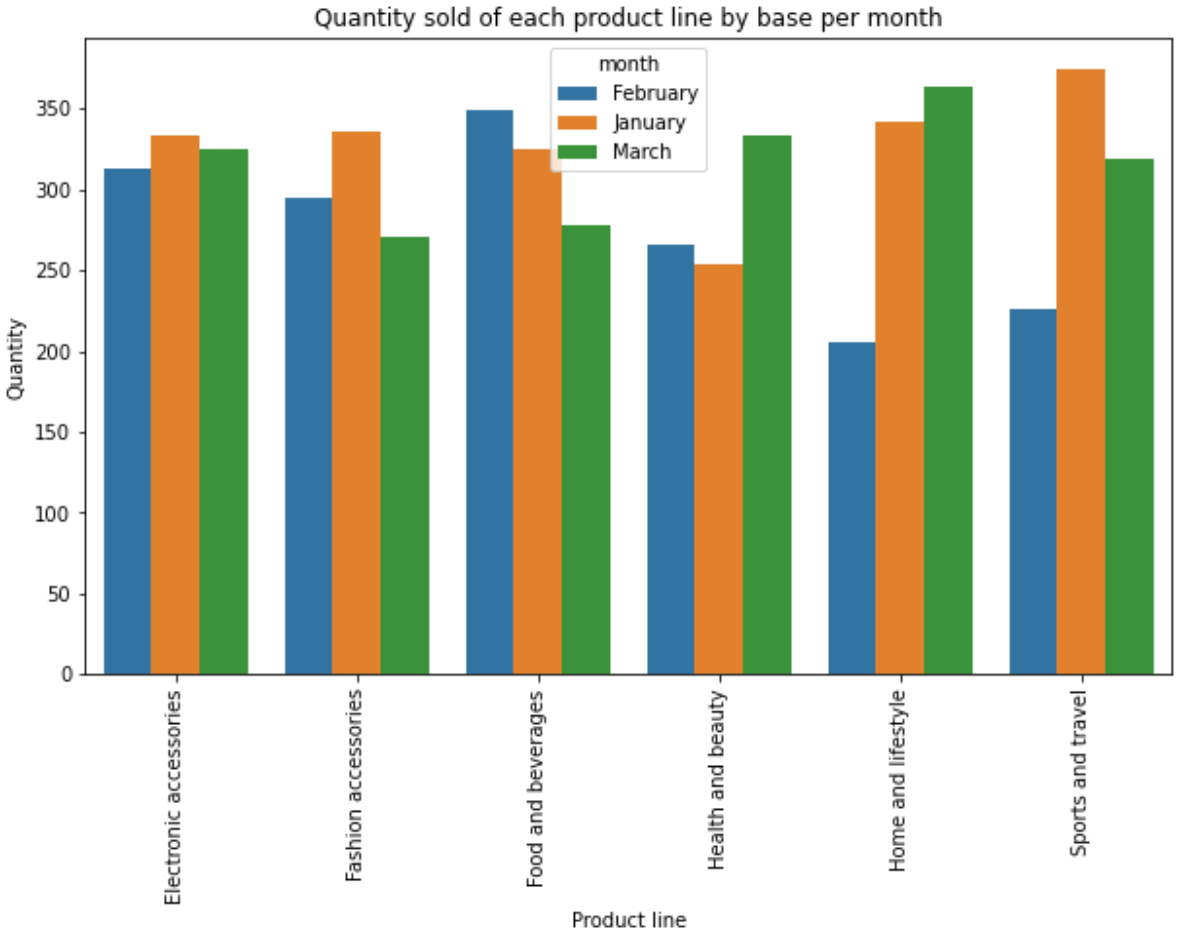
In [62]:
```
#Quantity sold of each product line by base per month
sales_file_5 = pd.DataFrame(sales_file.groupby(['Product line', 'month'])['Quantity
sales_file_5
```

Out[62]:

		Quantity
Product line	**month**	
Electronic accessories	**February**	313
	January	333
	March	325
Fashion accessories	**February**	295
	January	336
	March	271
Food and beverages	**February**	349
	January	325
	March	278
Health and beauty	**February**	266
	January	254
	March	334
Home and lifestyle	**February**	205
	January	342
	March	364
Sports and travel	**February**	226
	January	375
	March	319

In [63]:
```
sales_file_5 = sales_file_5.reset_index()
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.barplot(x='Product line', y='Quantity', hue='month', data=sales_file_5).set_ti
```

Out[63]:
```
Text(0.5, 1.0, 'Quantity sold of each product line by base per month')
```



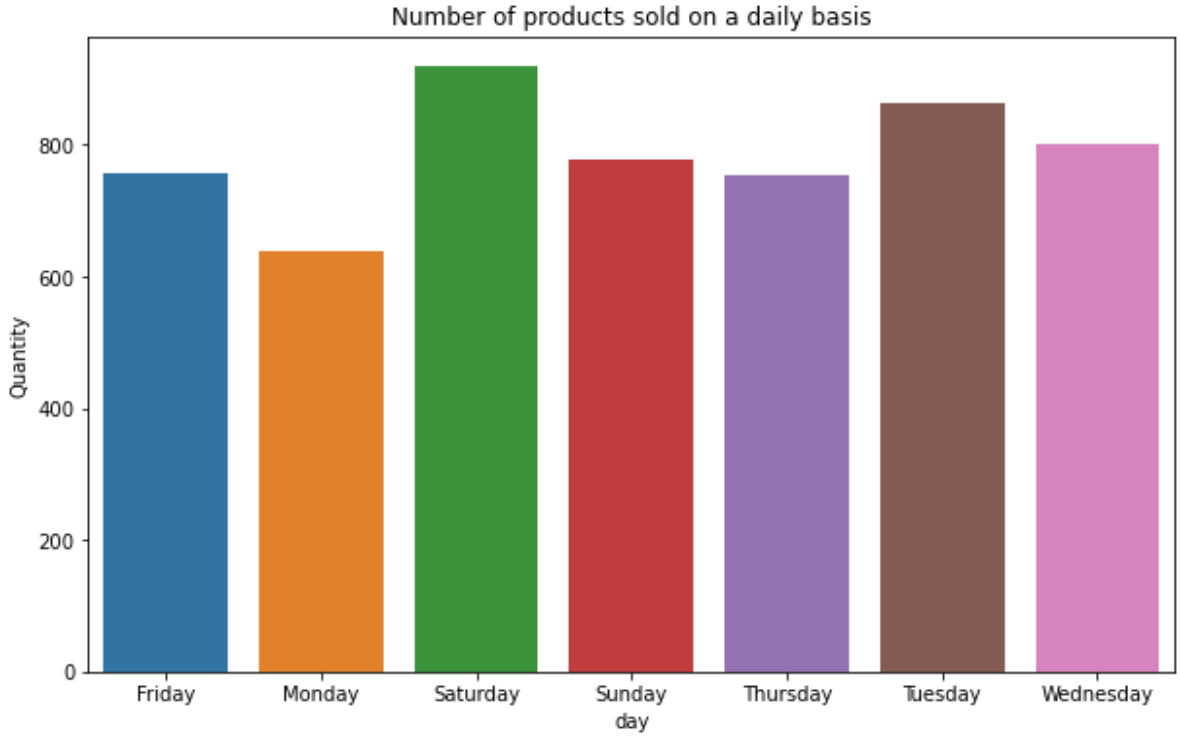
In [64]:
```
#Number of products sold on a daily basis
sales_file_6 = pd.DataFrame(sales_file.groupby('day')['Quantity'].sum())
sales_file_6
```

Out[64]:

day	Quantity
Friday	758
Monday	638
Saturday	919
Sunday	778
Thursday	755
Tuesday	862
Wednesday	800

In [65]:
```
sales_file_6 = sales_file_6.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x='day', y='Quantity', data=sales_file_6).set_title('Number of product
```

Out[65]:
```
Text(0.5, 1.0, 'Number of products sold on a daily basis')
```



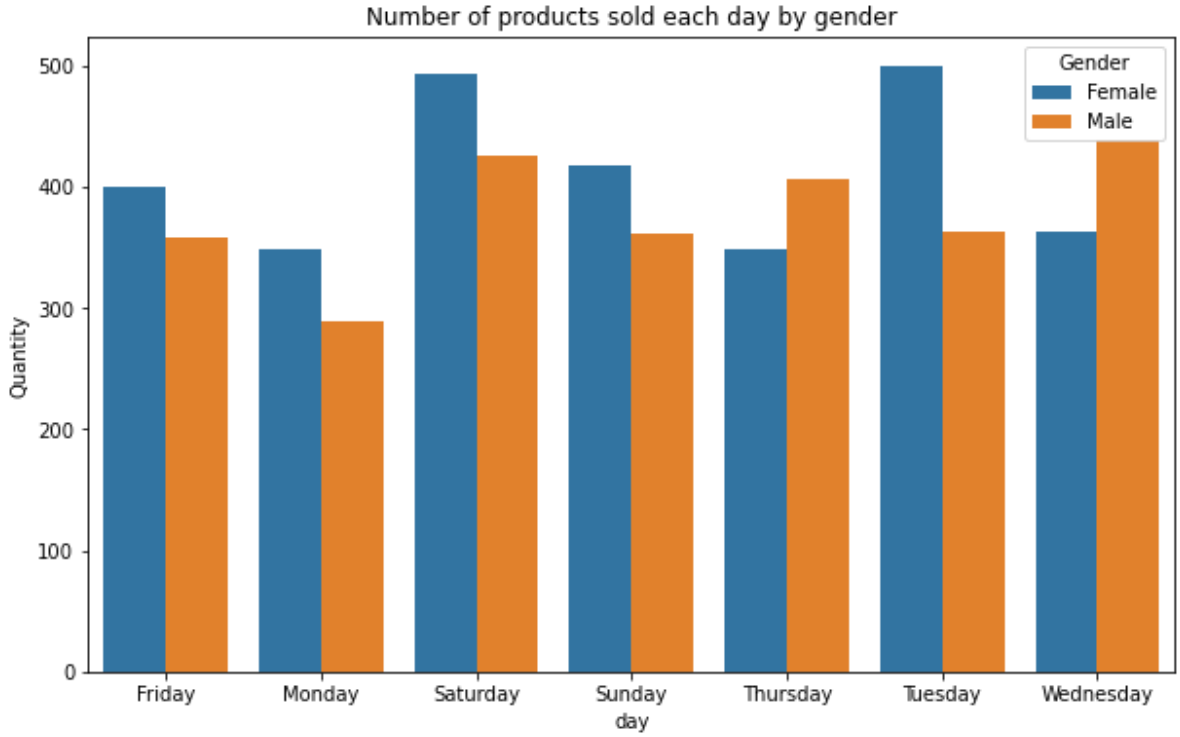
In [66]:
```
#Number of products sold each day by gender
sales_file_7 = pd.DataFrame(sales_file.groupby(['day', 'Gender'])['Quantity'].sum(
sales_file_7
```

Out[66]:

		Quantity
day	**Gender**	
Friday	**Female**	400
	Male	358
Monday	**Female**	349
	Male	289
Saturday	**Female**	493
	Male	426
Sunday	**Female**	417
	Male	361
Thursday	**Female**	349
	Male	406
Tuesday	**Female**	499
	Male	363
Wednesday	**Female**	362
	Male	438

In [67]:
```
sales_file_7 = sales_file_7.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x=sales_file_7['day'], y=sales_file_7['Quantity'], hue=sales_file_7['G
```

Out[67]:
```
Text(0.5, 1.0, 'Number of products sold each day by gender')
```



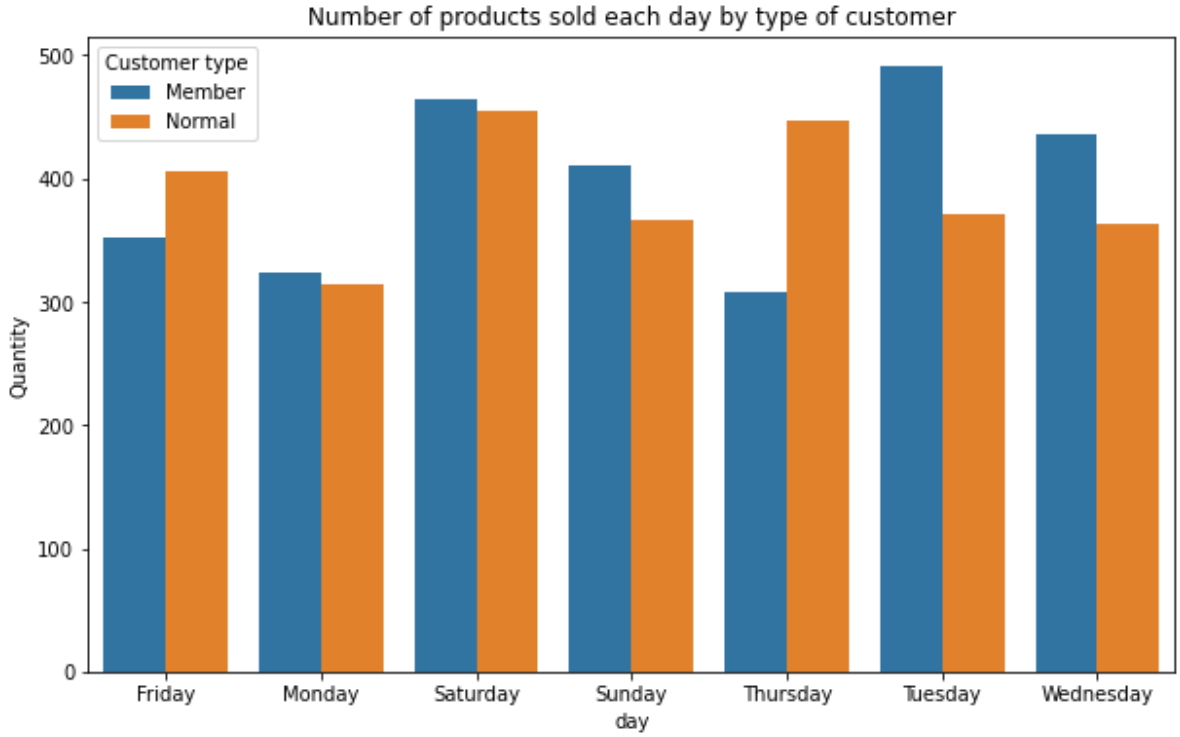
In [68]:
```
#Number of products sold each day by type of customer
sales_file_8 = pd.DataFrame(sales_file.groupby(['day', 'Customer type'])['Quantity
sales_file_8
```

Out[68]:

		Quantity
day	**Customer type**	
Friday	**Member**	352
	Normal	406
Monday	**Member**	323
	Normal	315
Saturday	**Member**	464
	Normal	455
Sunday	**Member**	411
	Normal	367
Thursday	**Member**	308
	Normal	447
Tuesday	**Member**	491
	Normal	371
Wednesday	**Member**	436
	Normal	364

In [69]:
```
sales_file_8 = sales_file_8.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x='day', y='Quantity', hue='Customer type', data=sales_file_8).set_titl
```

Out[69]:
```
Text(0.5, 1.0, 'Number of products sold each day by type of customer')
```



In [70]:
```
#Number of products sold each day by type of customer and gender
sales_file_8_1 = pd.DataFrame(sales_file.groupby(['day', 'Customer type','Gender']
sales_file_8_1
```

Out[70]:

			Quantity
day	**Customer type**	**Gender**	
Friday	**Member**	**Female**	234
		Male	118
	Normal	**Female**	166
		Male	240
Monday	**Member**	**Female**	191
		Male	132
	Normal	**Female**	158
		Male	157
Saturday	**Member**	**Female**	233
		Male	231
	Normal	**Female**	260
		Male	195
Sunday	**Member**	**Female**	212
		Male	199
	Normal	**Female**	205
		Male	162
Thursday	**Member**	**Female**	129
		Male	179
	Normal	**Female**	220
		Male	227
Tuesday	**Member**	**Female**	317
		Male	174
	Normal	**Female**	182
		Male	189
Wednesday	**Member**	**Female**	176
		Male	260
	Normal	**Female**	186
		Male	178

In [ ]:
```
#Summary
"""
1. More units were sold in the month of January and
fewer in February.
2. Women bought more units in the months: January
and February
3. Men bought more units in the month of March
4.In January the product lines that sold the most were
(Top 3): Sports and travel, home and lifestyle,
fashion accessories.
```

```
5.In February the product lines that sold the most were
(Top 3): Food and drink, electronic accessories,
fashion accessories.
6.In March the product lines that sold the most were
(Top 3): Home and lifestyle, health and beauty,
electronic accessories.
7.The days that sold the most units were Saturdays,
followed by Tuesdays.
8.The days that fewer units were sold were Mondays.
9. Women bought more units than men days: Sunday, Monday,
Tuesday, Friday and Saturday.
10. Men bought more units than women days: Wednesday and
Thursday
11.Membership users bought more units per day over which
are not: Sunday, Monday, Tuesday, Wednesday and Saturday
12.Users without membership bought more units per day over
which the days are: Thursday and Friday.
13.Las Tuesdays, by women who are members was the group that
bought the most units (classified by days of the week,
membership and gender)
14. On Sundays women who are members buy more, very similar
to what they are.
15. On Mondays women who are members buy more, the same happens
on Tuesdays and with a wide difference.
16. On Wednesdays the men who are members are the what they buy
the most
17.On Thursdays the men who are members are the ones who more
units of products they buy, very even with the women
18.On Fridays the men who are members are the ones who more
units buy, very even with women who do not they are.
19.On Saturdays the women who are not members are the What
more units do they buy?
"""
```

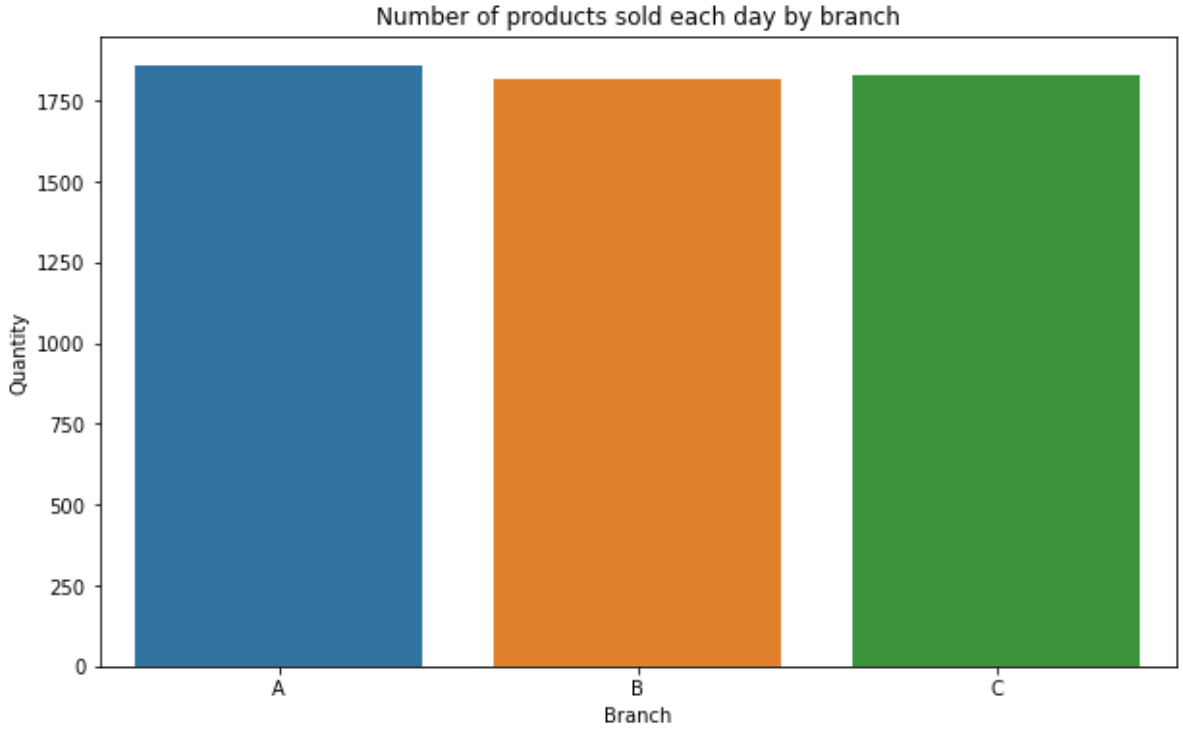
In [71]:
```
#Number of products sold each day by branch
sales_file_9 = pd.DataFrame(sales_file.groupby('Branch')['Quantity'].sum())
sales_file_9
```

Out[71]:

Branch	Quantity
A	1859
B	1820
C	1831

In [72]:
```
sales_file_9 = sales_file_9.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x='Branch', y='Quantity', data=sales_file_9).set_title('Number of produ
```

Out[72]:
```
Text(0.5, 1.0, 'Number of products sold each day by branch')
```



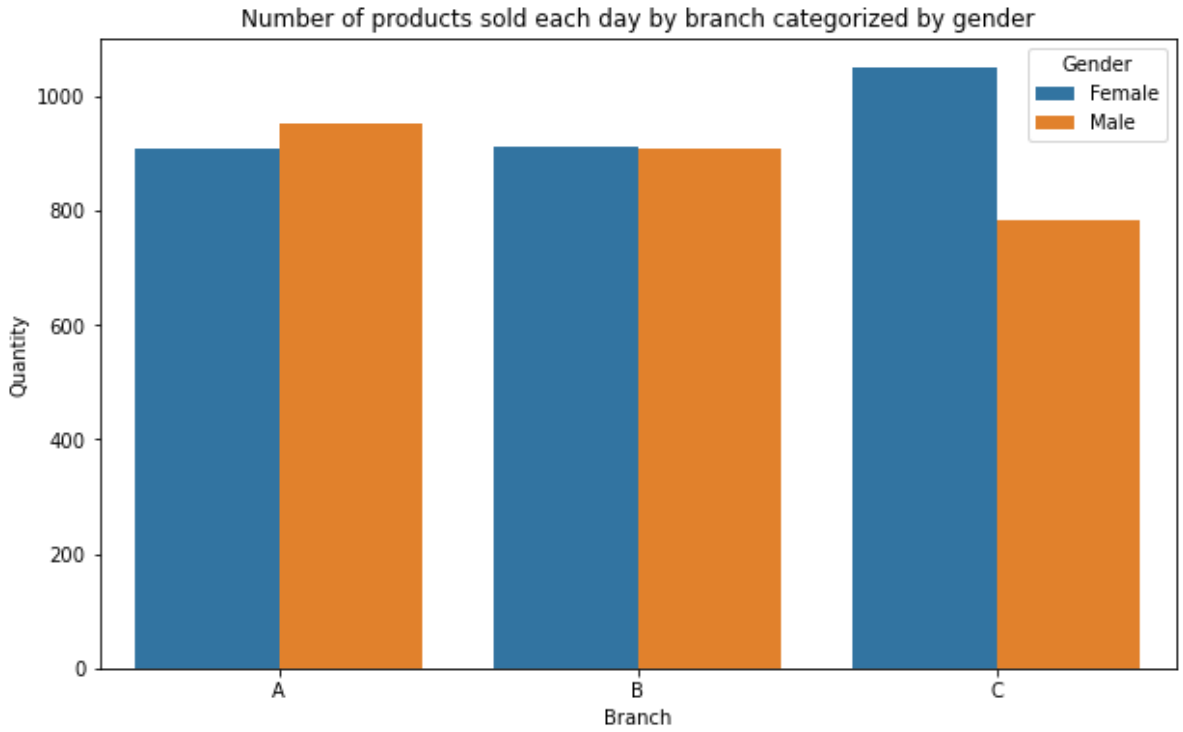
In [73]:
```
#Number of products sold each day by branch categorized by gender
sales_file_10 = pd.DataFrame(sales_file.groupby(['Branch', 'Gender'])['Quantity'].
sales_file_10
```

Out[73]:

		Quantity
Branch	**Gender**	
A	**Female**	909
	Male	950
B	**Female**	911
	Male	909
C	**Female**	1049
	Male	782

In [74]:
```
sales_file_10 = sales_file_10.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x='Branch', y='Quantity', hue='Gender', data=sales_file_10).set_title(
```

Out[74]:
```
Text(0.5, 1.0, 'Number of products sold each day by branch categorized by gender')
```



In [75]:
```
#Number of products sold each day by branch categorized by gender and type of custo
sales_file_10_1 = pd.DataFrame(sales_file.groupby(['Branch', 'Customer type','Gende
sales_file_10_1
```

Out[75]:

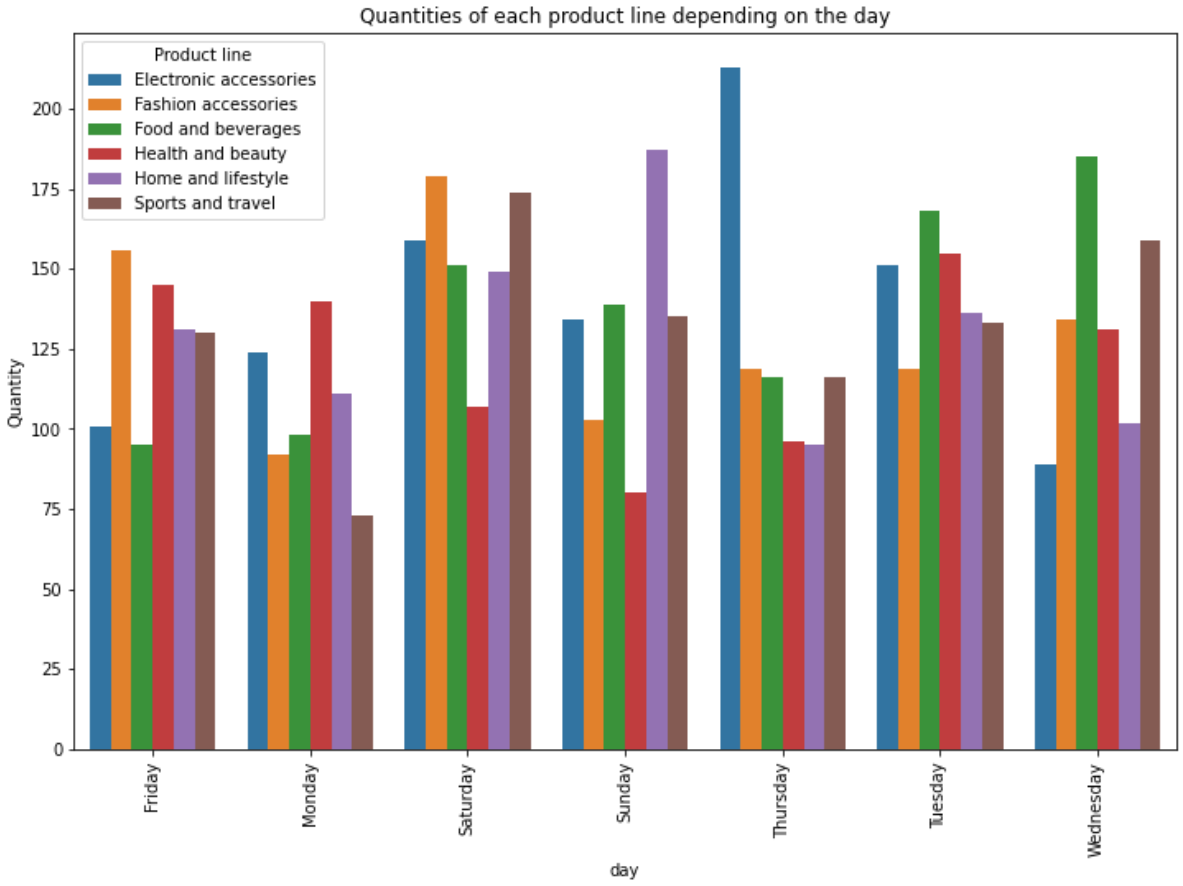
			Quantity
Branch	**Customer type**	**Gender**	
A	**Member**	**Female**	465
		Male	499
	Normal	**Female**	444
		Male	451
B	**Member**	**Female**	479
		Male	445
	Normal	**Female**	432
		Male	464
C	**Member**	**Female**	548
		Male	349
	Normal	**Female**	501
		Male	433

In [76]:
```
#Quantities of each product line depending on the day
sales_file_11 = pd.DataFrame(sales_file.groupby(['day', 'Product line'])['Quantity
sales_file_11.head()
```

Out[76]:

day	Product line	Quantity
Friday	Electronic accessories	101
	Fashion accessories	156
	Food and beverages	95
	Health and beauty	145
	Home and lifestyle	131

In [77]:
```
sales_file_11=sales_file_11.reset_index()
plt.figure(figsize=(12,8))
plt.xticks(rotation=90)
sns.barplot(x='day', y='Quantity', hue='Product line', data=sales_file_11).set_titl
plt.show()
```



In [ ]:
```
#Summary
"""
1. The branch that sold the most units was "A" (all very similar)
2. Men bought more units in the branch "A"
3. Women bought more units in the "B" branches (closely matched)
and in the "C" (with wide difference)
4. In branch "A" men who are members were those who bought the
most units.
5. In branches "B" and "C" the women who are members were the
ones who bought the most.
6. On Mondays more units were sold than product lines (Top 3):
Health and beauty, accessories electronics, home and lifestyle
7. On Tuesdays, more units were sold than product lines (Top 3):
Food and beverage, health and beauty, electronic accessories
8. On Wednesdays, more units of product lines (Top 3): Food and
beverage, sport and travel, fashion accessories
```

```
9. On Thursdays, more units were sold than Product Lines (Top 3):
Electronic Accessories (by wide difference), fashion accessories,
food and drink (closely matched with sports and travel)
10. On Fridays, more units of Product Lines (Top 3): Fashion
Accessories, health and beauty, home and lifestyle (much the
same with with sports and travel)
11. On Saturdays, more units were sold than product lines (Top 3):
Fashion accessories, sports and travel, electronic accessories
12. On Sundays, more units of Product lines (Top 3):
Home and lifestyle, food and drink, sports and travel (closely
matched with electronic accessories)
"""
```

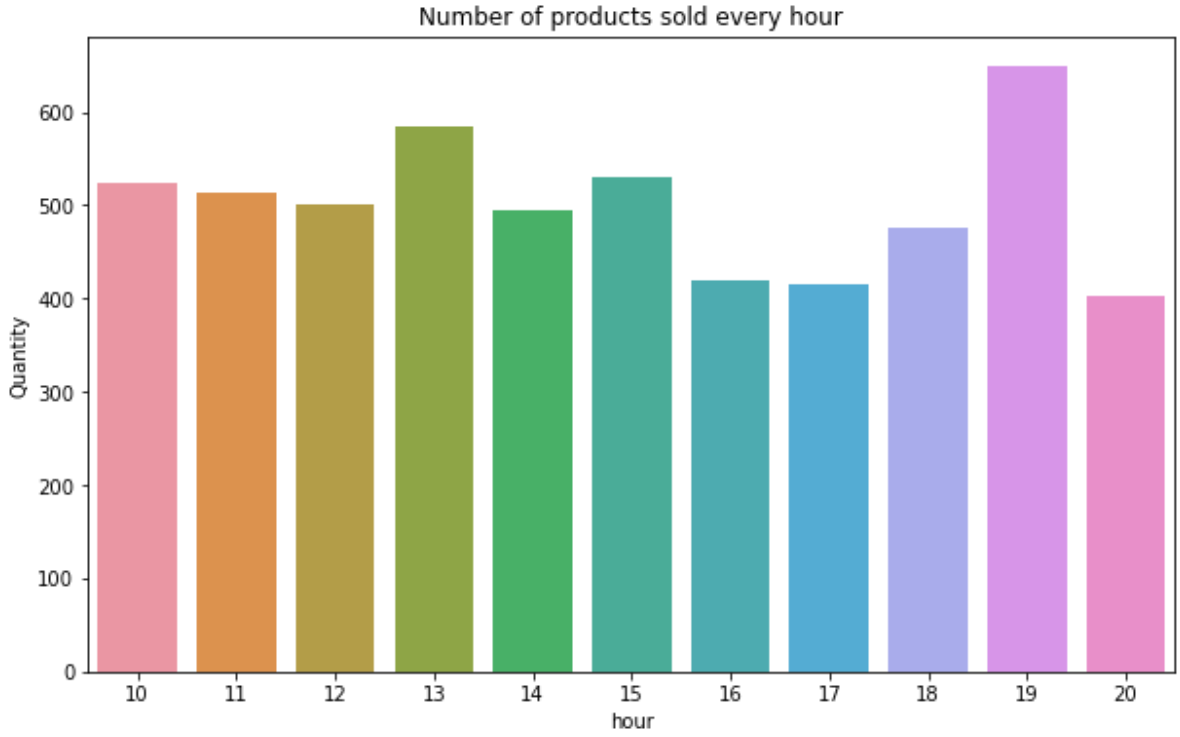
In [78]:
```
#Number of products sold every hour
sales_file_12 = pd.DataFrame(sales_file.groupby('hour')['Quantity'].sum())
sales_file_12
```

Out[78]:

hour	Quantity
10	525
11	513
12	501
13	585
14	495
15	530
16	420
17	415
18	475
19	649
20	402

In [79]:
```
sales_file_12=sales_file_12.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x='hour', y='Quantity', data=sales_file_12).set_title('Number of produ
```

Out[79]:
```
Text(0.5, 1.0, 'Number of products sold every hour')
```



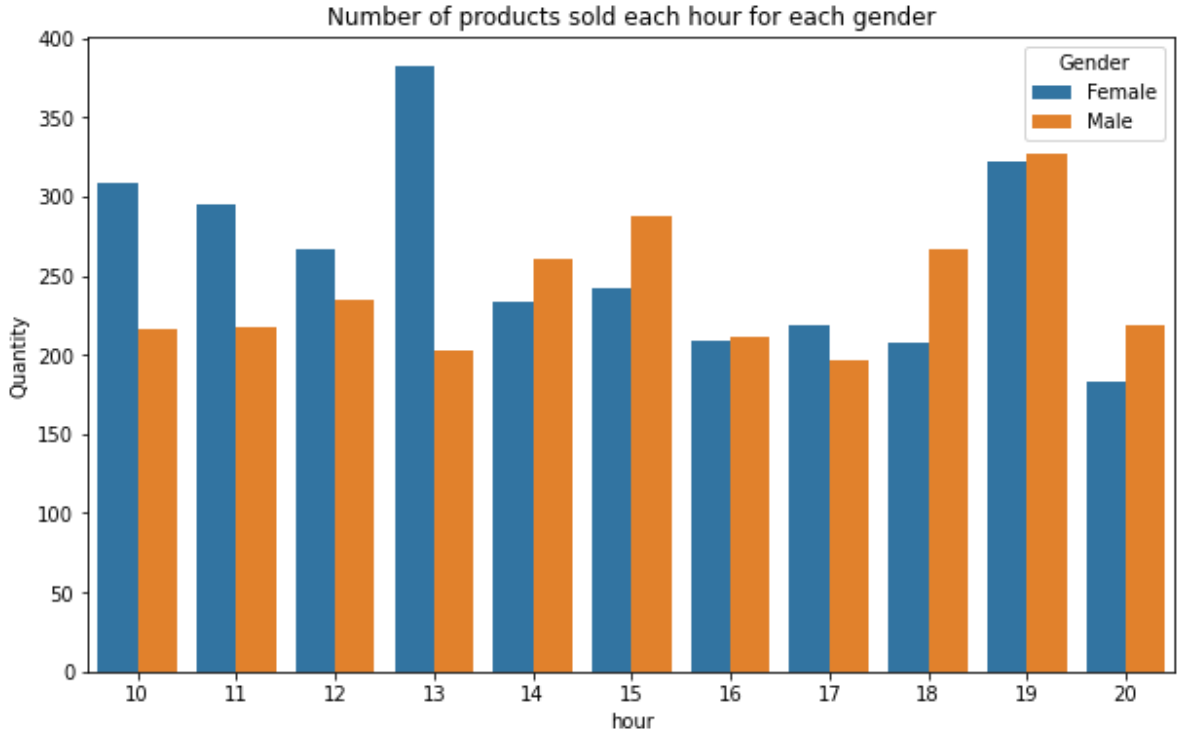
In [80]:
```
#Number of products sold per hour for each gender
sales_file_13 = pd.DataFrame(sales_file.groupby(['hour', 'Gender'])['Quantity'].sur
sales_file_13
```

Out[80]:

		Quantity
hour	**Gender**	
10	**Female**	309
	Male	216
11	**Female**	295
	Male	218
12	**Female**	266
	Male	235
13	**Female**	382
	Male	203
14	**Female**	234
	Male	261
15	**Female**	242
	Male	288
16	**Female**	209
	Male	211
17	**Female**	219
	Male	196
18	**Female**	208
	Male	267
19	**Female**	322
	Male	327
20	**Female**	183
	Male	219

In [81]:
```
sales_file_13=sales_file_13.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x='hour', y='Quantity', hue='Gender',data=sales_file_13).set_title('Nu
```

Out[81]:
```
Text(0.5, 1.0, 'Number of products sold each hour for each gender')
```



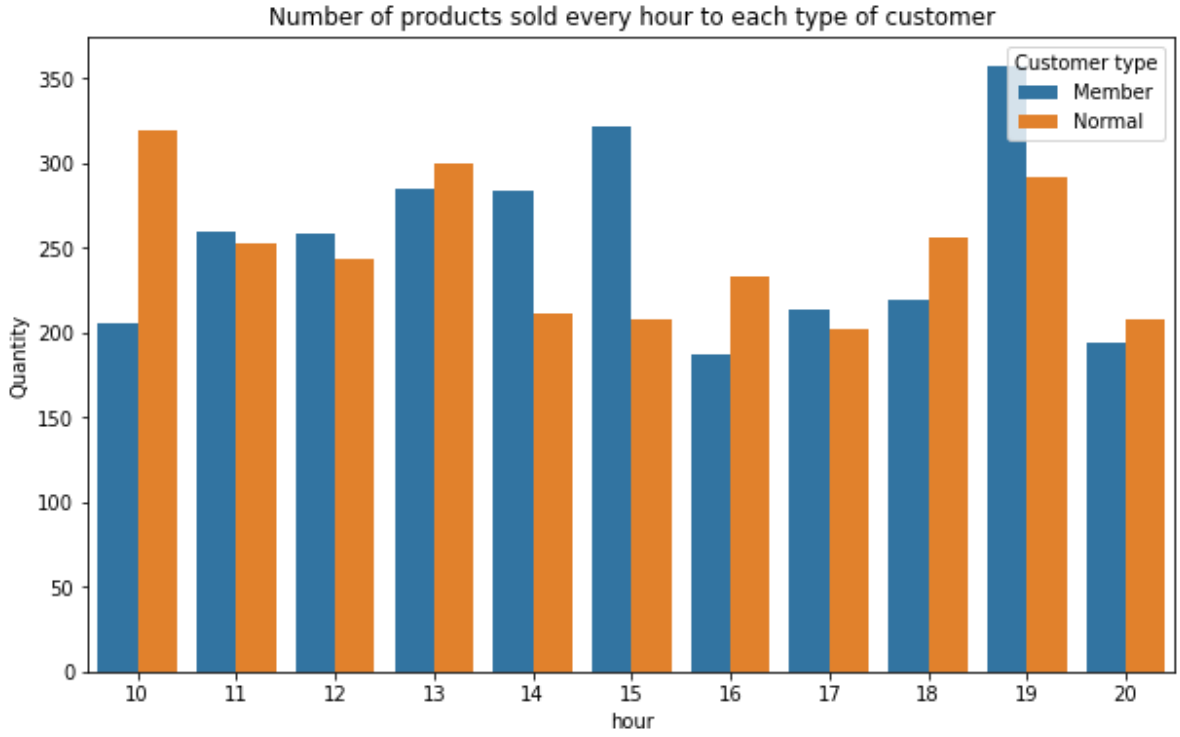
In [82]:
```
#Number of products sold per hour to each type of customer'
sales_file_14 = pd.DataFrame(sales_file.groupby(['hour', 'Customer type'])['Quanti
sales_file_14
```

Out[82]:

		Quantity
hour	**Customer type**	
10	**Member**	206
	Normal	319
11	**Member**	260
	Normal	253
12	**Member**	258
	Normal	243
13	**Member**	285
	Normal	300
14	**Member**	284
	Normal	211
15	**Member**	322
	Normal	208
16	**Member**	187
	Normal	233
17	**Member**	213
	Normal	202
18	**Member**	219
	Normal	256
19	**Member**	357
	Normal	292
20	**Member**	194
	Normal	208

In [83]:
```
sales_file_14=sales_file_14.reset_index()
plt.figure(figsize=(10, 6))
sns.barplot(x='hour', y='Quantity', hue='Customer type',data=sales_file_14).set_ti
```

Out[83]:
```
Text(0.5, 1.0, 'Number of products sold every hour to each type of customer')
```



In [84]:
```
#Number of products sold per hour per branch
sales_file_15 = pd.DataFrame(sales_file.groupby(['hour', 'Branch'])['Quantity'].sum
sales_file_15
```

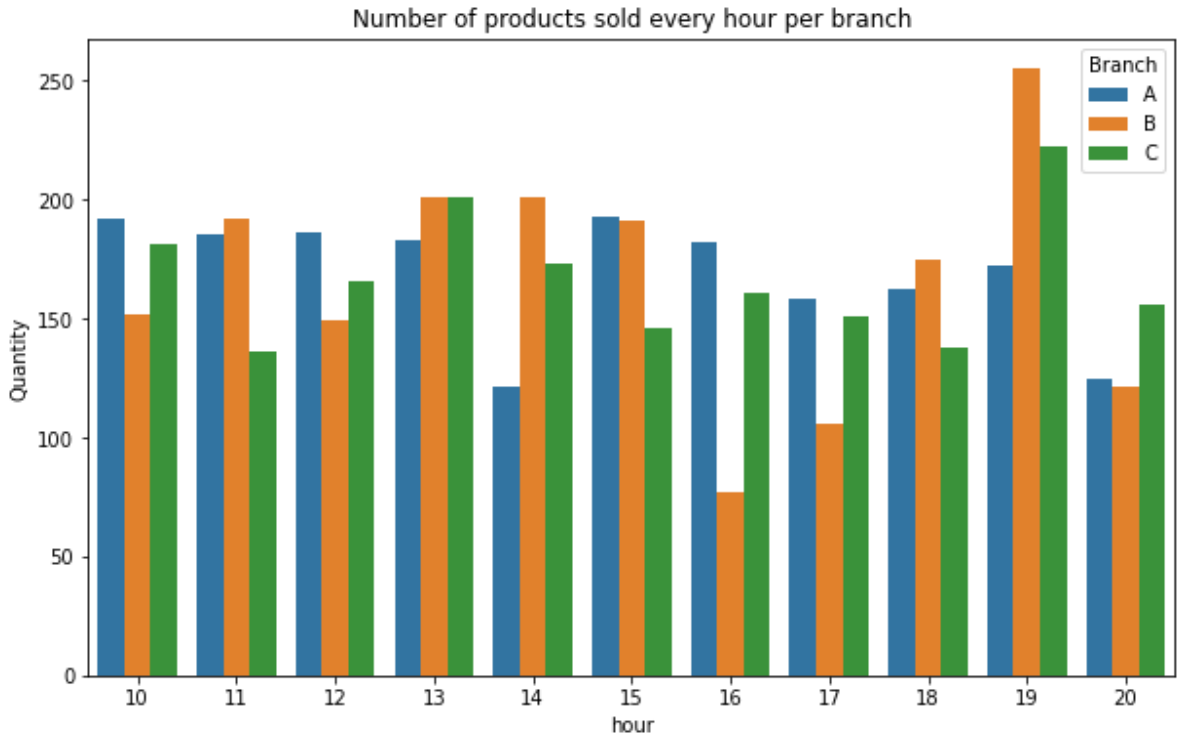
Out[84]:

hour	Branch	Quantity
10	A	192
	B	152
	C	181
11	A	185
	B	192
	C	136
12	A	186
	B	149
	C	166
13	A	183
	B	201
	C	201
14	A	121
	B	201
	C	173
15	A	193
	B	191
	C	146
16	A	182
	B	77
	C	161
17	A	158
	B	106
	C	151
18	A	162
	B	175
	C	138
19	A	172
	B	255
	C	222
20	A	125
	B	121
	C	156

In [85]:
```
sales_file_15=sales_file_15.reset_index()
plt.figure(figsize=(10, 6))
```

```
sns.barplot(x='hour', y='Quantity', hue='Branch',data=sales_file_15).set_title('Nur
```

Out[85]:
```
Text(0.5, 1.0, 'Number of products sold every hour per branch')
```



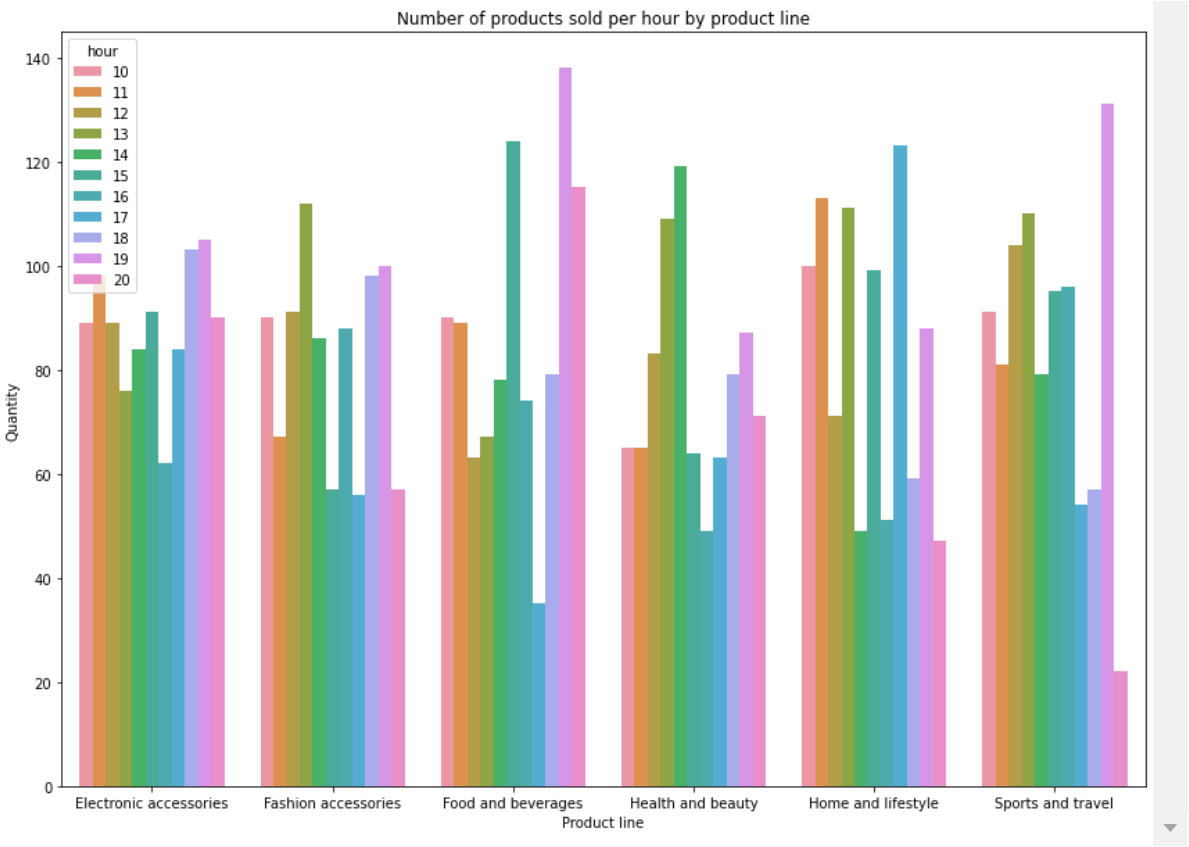
In [86]:
```
#Number of products sold per hour by product line
sales_file_16 = pd.DataFrame(sales_file.groupby(['Product line', 'hour'])['Quantity
sales_file_16.head()
```

Out[86]:

		Quantity
Product line	**hour**	
Electronic accessories	**10**	89
	11	98
	12	89
	13	76
	14	84

In [87]:
```
sales_file_16=sales_file_16.reset_index()
plt.figure(figsize=(14, 10))
sns.barplot(x='Product line', y='Quantity', hue='hour',data=sales_file_16).set_titl
```

Out[87]:
```
Text(0.5, 1.0, 'Number of products sold per hour by product line')
```



In [ ]:
```
#Summary
"""
Times are rounded (10am - 10:59am) = 10am, (11am - 11:59am) = 11am, ...
1. Schedules that more units are sold are (Top 3): 7:00 p.m.,
1:00 p.m., 3:00 p.m. (very similar to 10:00 a.m.)
2. Hours when fewer units are sold are (Top 3): 8:00 p.m.,
5:00 p.m., 4:00 p.m.
3. Hours in which women buy more units (Top 3): 1 p.m., 7 p.m.,
10 a.m. (same as 11 a.m.)
4. Hours in which women have fewer units buy (Top 3): 8:00 p.m.,
6:00 p.m., 4:00 p.m.
5. Hours in which men drive the most buy (Top 3:): 7:00 p.m.,
3:00 p.m., 6:00 p.m. (very even with 2:00 p.m.)
6. Hours in which men less units buy (Top 3:): 5pm, 1pm, 4pm
7. Hours in which the members have the most units buy (Top 3:):
7:00 p.m., 3:00 p.m., 1:00 p.m.
8. Hours in which the members less units buy (Top 3:): 4:00 p.m.,
8:00 p.m., 10:00 a.m.
9. Hours when normal customers most units buy (Top 3:): 10am, 1pm,
7pm
10. Hours when normal customers less units buy (Top 3:): 5:00 p.m.,
8:00 p.m., even with 3 pm
11. Hours when branch customers "A" more units buy (Top 3:):
3:00 p.m., 10:00 a.m., 12 noon (very even with 11 o'clock)
12. Hours when branch customers "A" fewer units buy (Top 3:):
2:00 p.m., 8:00 p.m., 5:00 p.m.
13. Hours when branch customers "B" more units buy (Top 3:):
7:00 p.m., 2:00 p.m., tied with 1:00 p.m.
14. Hours when branch customers "B" fewer units buy (Top 3:):
4:00 p.m., 5:00 p.m., 8:00 p.m.
15. Hours when branch customers "C" more units buy (Top 3:):
7:00 p.m., 1:00 p.m., 10:00 a.m.
16. Hours when branch customers "C" fewer units buy (Top 3:):
11am, 6:00 p.m., 3:00 p.m.
17. Hours when more accessories are sold Electronic (Top 3):
7:00 p.m., 6:00 p.m., 11:00 a.m.
18. Times when fewer accessories are sold Electronic (Top 3):
```

```
4:00 p.m., 1:00 p.m., 5:00 p.m. (very even with 2:00 p.m.)
19. Hours in which more accessories are sold Fashion (Top 3):
1:00 p.m., 7:00 p.m., 6:00 p.m.
20. Times when fewer accessories are sold Fashion (Top 3):
5:00 p.m., 8:00 p.m., 3:00 p.m.
21. Hours in which more food is sold and drink (Top 3):
7:00 p.m., 3:00 p.m., 8:00 p.m.
22. Times when less food is sold and Drink (Top 3):
5:00 p.m., 12:00 p.m., 1:00 p.m.
23. Hours in which more products are sold health and beauty
(Top 3): 2:00 p.m., 1:00 p.m., 7:00 p.m.
24. Times when fewer products are sold health and beauty
(Top 3): 4:00 p.m., 5:00 p.m., 3:00 p.m.
25. Hours in which more products are sold home and lifestyle
(Top 3): 5:00 p.m., 11:00 a.m., 1:00 p.m.
26. Hours when fewer products are sold home and lifestyle
(Top 3): 8pm, 2pm, 4pm
27. Hours in which more products are sold sports and travel
(Top 3): 7:00 p.m., 1:00 p.m., 12:00 p.m.
28. Times when fewer products are sold sports and travel
(Top 3): 8:00 p.m., 5:00 p.m., 6:00 p.m.
"""
```

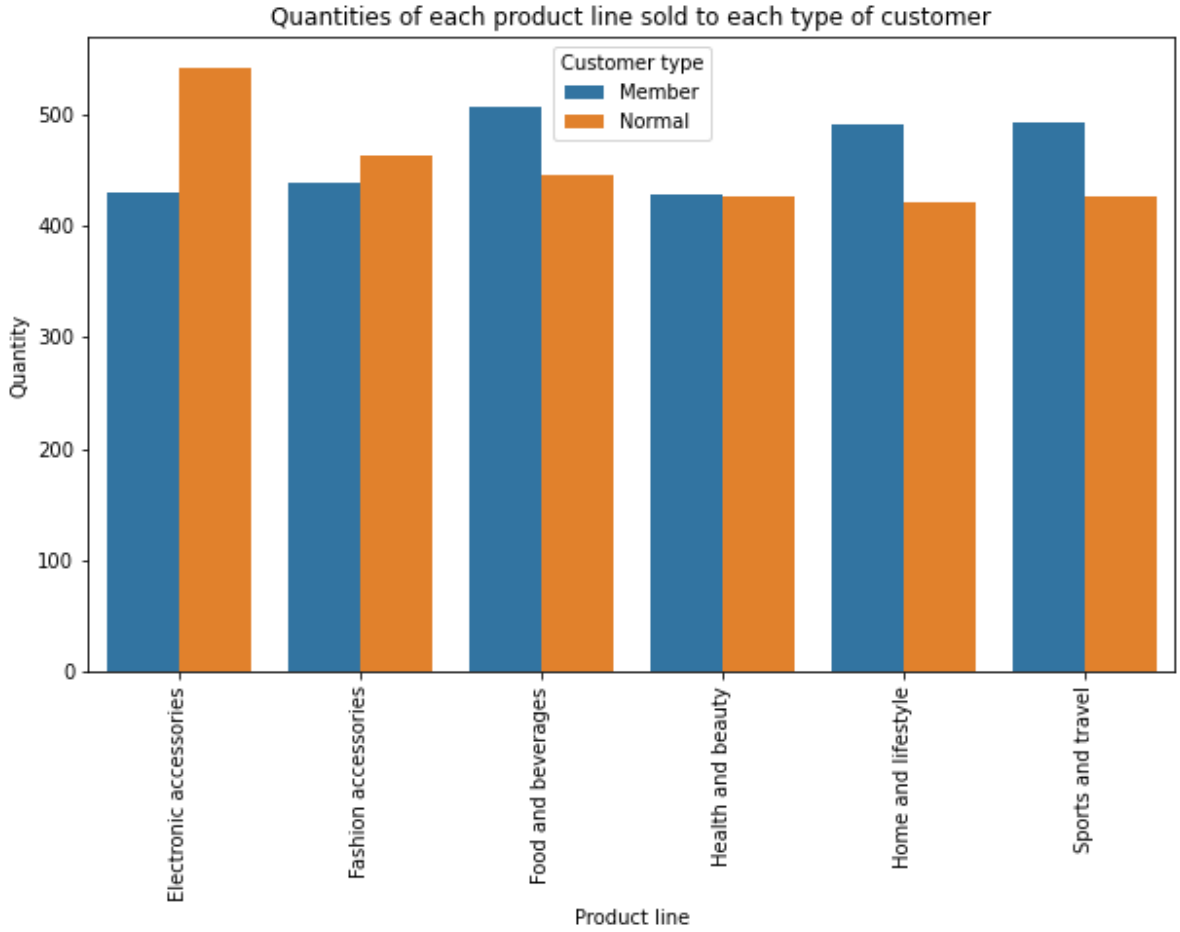
In [88]:
```
# Quantities of each product line sold to each type of customer
sales_file_17 = pd.DataFrame(sales_file.groupby(['Customer type', 'Product line'])
sales_file_17
```

Out[88]:

		Quantity
Customer type	**Product line**	
Member	**Electronic accessories**	429
	Fashion accessories	439
	Food and beverages	506
	Health and beauty	428
	Home and lifestyle	490
	Sports and travel	493
Normal	**Electronic accessories**	542
	Fashion accessories	463
	Food and beverages	446
	Health and beauty	426
	Home and lifestyle	421
	Sports and travel	427

In [89]:
```
sales_file_17 = sales_file_17.reset_index()
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.barplot(x='Product line', y='Quantity', hue='Customer type', data=sales_file_1
```

Out[89]:
```
Text(0.5, 1.0, 'Quantities of each product line sold to each type of customer')
```



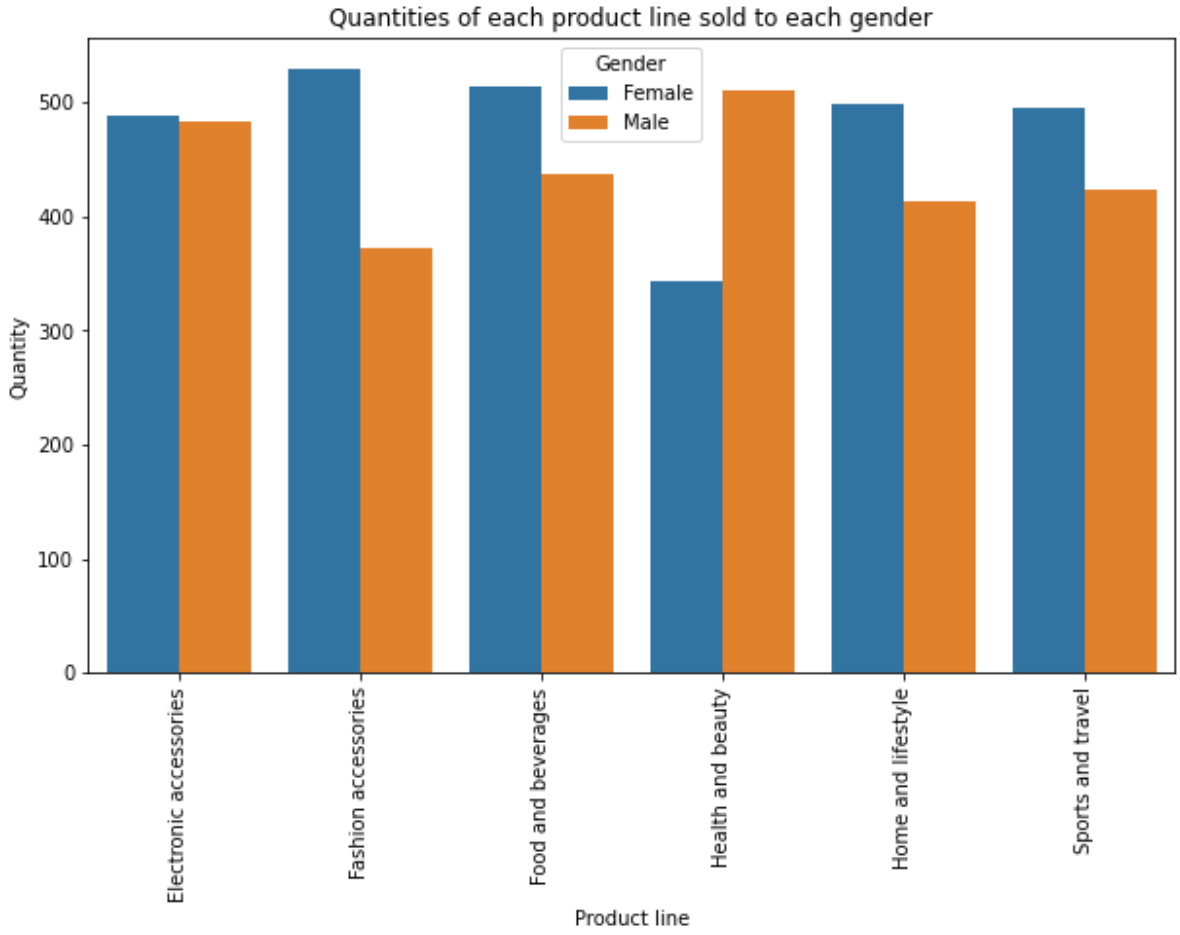
In [90]:
```
# Quantities of each product line sold to each gender
sales_file_18 = pd.DataFrame(sales_file.groupby(['Gender', 'Product line'])['Quant
sales_file_18
```

Out[90]:

		Quantity
Gender	**Product line**	
Female	**Electronic accessories**	488
	Fashion accessories	530
	Food and beverages	514
	Health and beauty	343
	Home and lifestyle	498
	Sports and travel	496
Male	**Electronic accessories**	483
	Fashion accessories	372
	Food and beverages	438
	Health and beauty	511
	Home and lifestyle	413
	Sports and travel	424

In [91]:
```
sales_file_18 = sales_file_18.reset_index()
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.barplot(x='Product line', y='Quantity', hue='Gender', data=sales_file_18).set_
```

Out[91]:
```
Text(0.5, 1.0, 'Quantities of each product line sold to each gender')
```



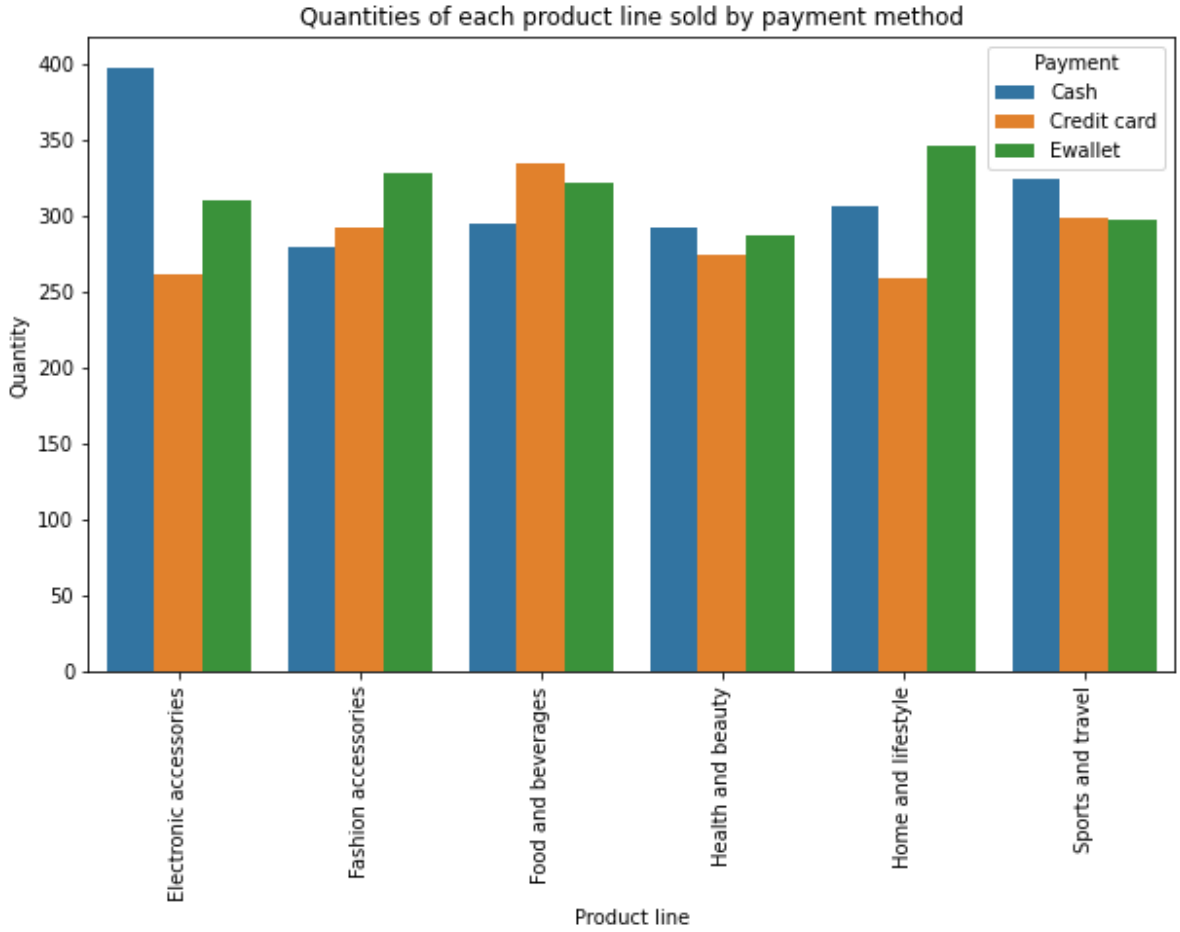
In [92]:
```
#Quantities of each product line sold by payment method
sales_file_19 = pd.DataFrame(sales_file.groupby(['Payment', 'Product line'])['Quan
sales_file_19
```

Out[92]:

Payment	Product line	Quantity
Cash	Electronic accessories	398
	Fashion accessories	280
	Food and beverages	295
	Health and beauty	293
	Home and lifestyle	306
	Sports and travel	324
Credit card	Electronic accessories	262
	Fashion accessories	293
	Food and beverages	335
	Health and beauty	274
	Home and lifestyle	259
	Sports and travel	299
Ewallet	Electronic accessories	311
	Fashion accessories	329
	Food and beverages	322
	Health and beauty	287
	Home and lifestyle	346
	Sports and travel	297

In [93]:
```
sales_file_19 = sales_file_19.reset_index()
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.barplot(x='Product line', y='Quantity', hue='Payment', data=sales_file_19).set_
```

Out[93]:
```
Text(0.5, 1.0, 'Quantities of each product line sold by payment method')
```



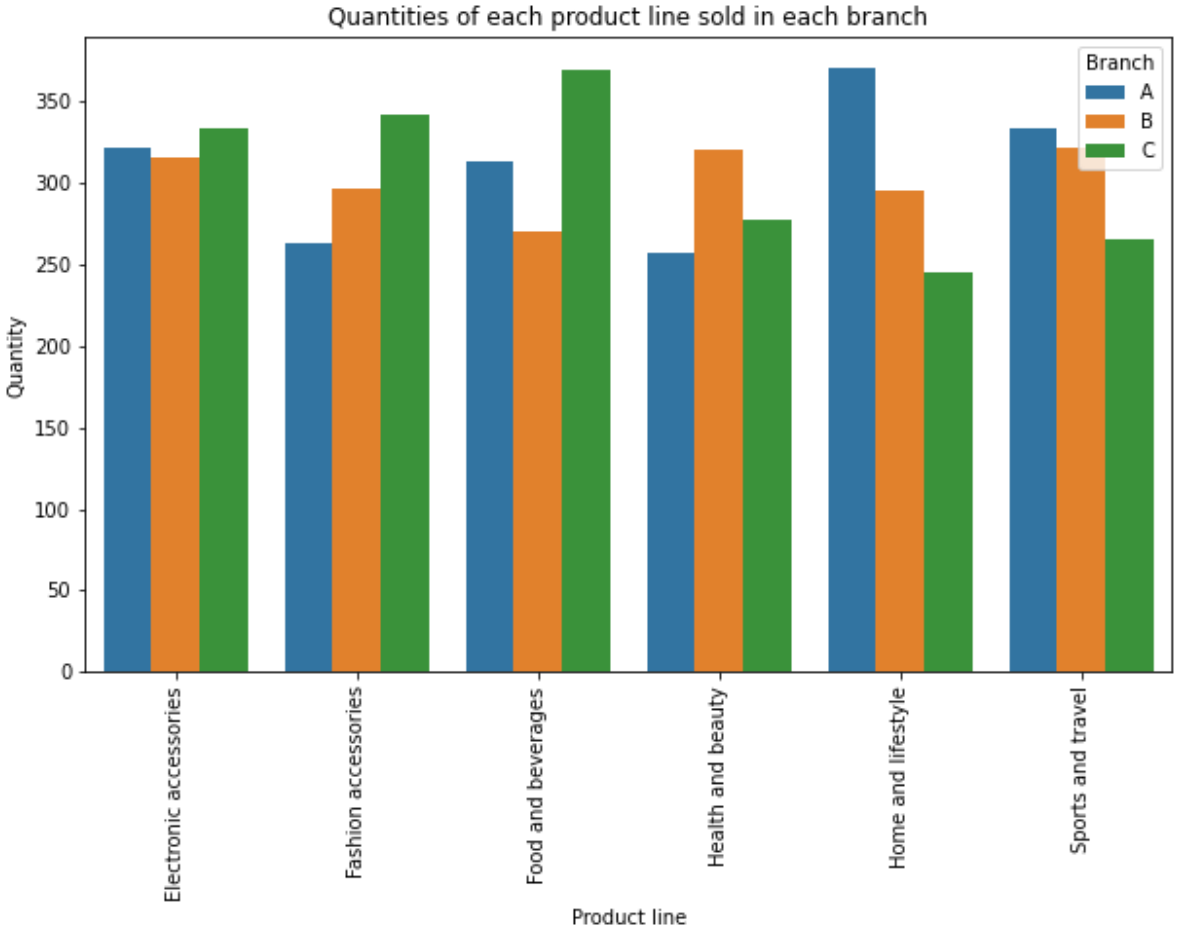
In [94]:
```
#Quantities of each product line sold in each branch
sales_file_20 = pd.DataFrame(sales_file.groupby(['Branch', 'Product line'])['Quant
sales_file_20
```

Out[94]:

		Quantity
Branch	**Product line**	
A	**Electronic accessories**	322
	Fashion accessories	263
	Food and beverages	313
	Health and beauty	257
	Home and lifestyle	371
	Sports and travel	333
B	**Electronic accessories**	316
	Fashion accessories	297
	Food and beverages	270
	Health and beauty	320
	Home and lifestyle	295
	Sports and travel	322
C	**Electronic accessories**	333
	Fashion accessories	342
	Food and beverages	369
	Health and beauty	277
	Home and lifestyle	245
	Sports and travel	265

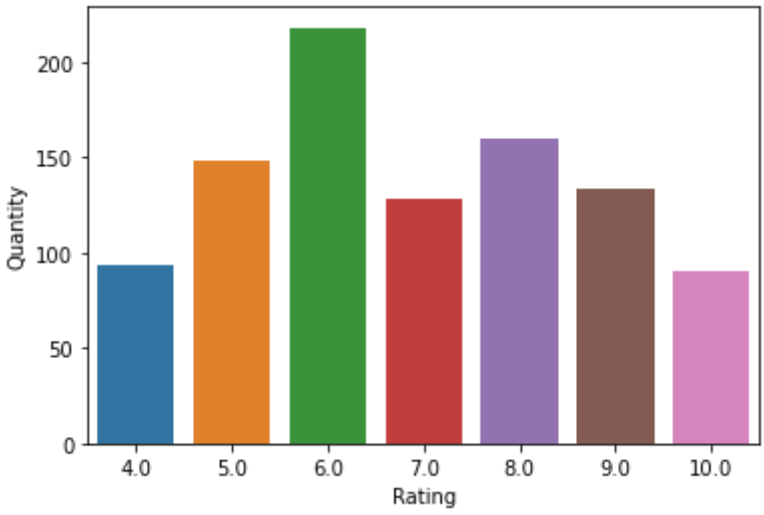
In [95]:
```
sales_file_20 = sales_file_20.reset_index()
plt.figure(figsize=(10, 6))
plt.xticks(rotation=90)
sns.barplot(x='Product line', y='Quantity', hue='Branch', data=sales_file_20).set_
```

Out[95]:
```
Text(0.5, 1.0, 'Quantities of each product line sold in each branch')
```

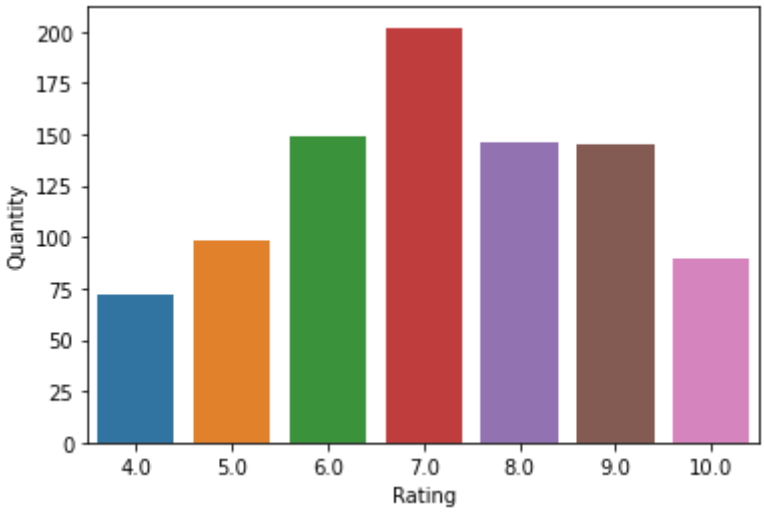


In [96]:
```
#Quantity sold based on valuation (rounded)
product_lines = ['Electronic accessories', 'Fashion accessories', 'Sports and trave
sales_rating = sales_file.round()
for line in product_lines:
    sales_line_3 = sales_rating[sales_rating['Product line']==line]
    sales_amount_rating_product_line = pd.DataFrame(sales_line_3.groupby('Rating')
    sales_amount_rating_product_line = sales_amount_rating_product_line.reset_inde
    print(f'Quantity sold based on the valuation of the product line: {line}')
    plt.figure(figsize=(6,4))
    sns.barplot(x = 'Rating', y = 'Quantity',data = sales_amount_rating_product_li
    plt.show()
```

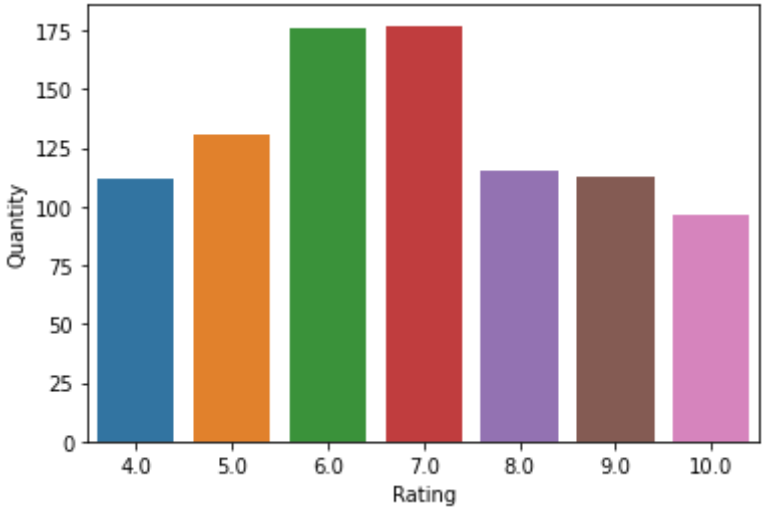
```
Quantity sold based on the valuation of the product line: Electronic accessories
```



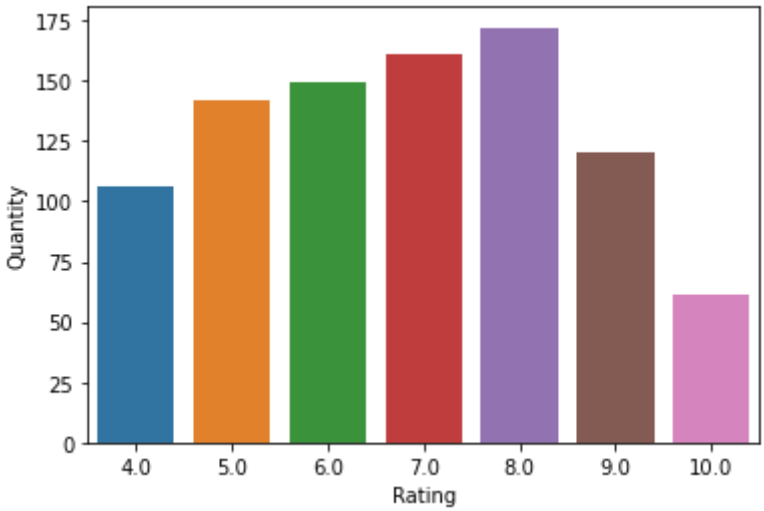

```
Quantity sold based on the valuation of the product line: Fashion accessories
```



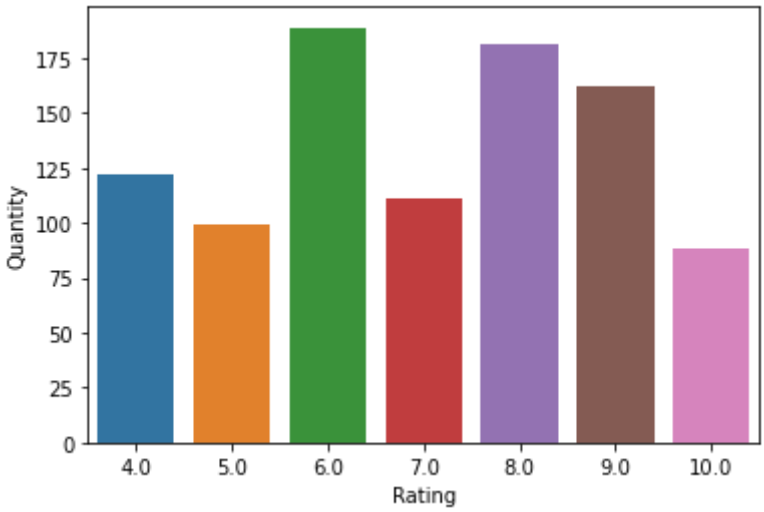
Quantity sold based on the valuation of the product line: Sports and travel



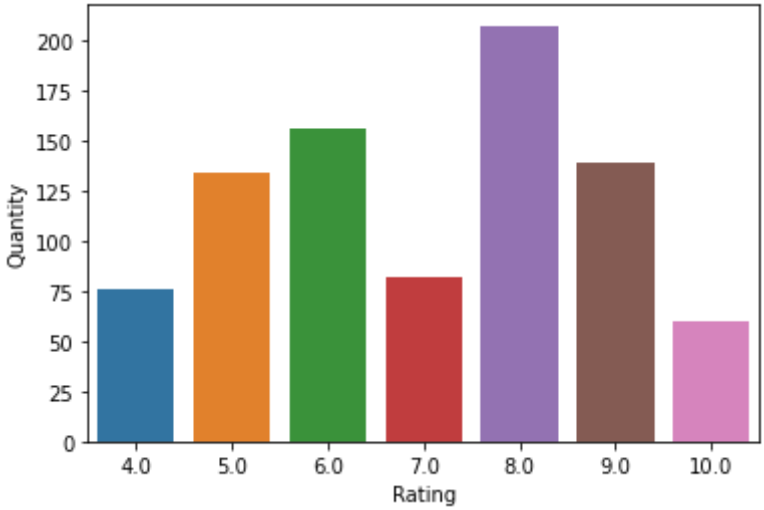
Quantity sold based on the valuation of the product line: Home and lifestyle



Quantity sold based on the valuation of the product line: Food and beverages



Quantity sold based on the valuation of the product line: Health and beauty



In [ ]:
```
#Summary
"""
1. Product lines that most members units buy (Top 3):
food and beverages, sports and travel, home and lifestyle
2. Product lines than normal customers most units buy
(Top 3): electronic accesories (by wide difference), fashion
accessories, food and beverages
3. Product lines that men most units buy (Top 3): health
and beauty, electronic accessories, food and beverages
4. Product lines that women most units buy (Top 3): fashion
accesories, food and beverages, home and lifestyle
5. Product lines that are most purchased with electronic
wallet (Top 3): home and lifestyle, fashion accessories, food
and beverages
6. Product lines that are most purchased with banknotes
(Top 3): electronic accesories (by wide difference), sports
and travel, home and lifestyle
7. Product lines that are most purchased with credit cards
(Top 3): food and beverages, sports and travel, fashion
accessories
8. Product lines that are most purchased in the branch "A"
(Top 3): home and lifestyle, sports and travel,  electronic
accessories
9. Product lines that are most purchased in the branch "B"
(Top 3): sports and travel, health and beauty, electronic
accessories
10. Lines of products that are most purchased in the branch
"C" (Top 3): food and beverages, fashion accessories,
electronic accessories
```

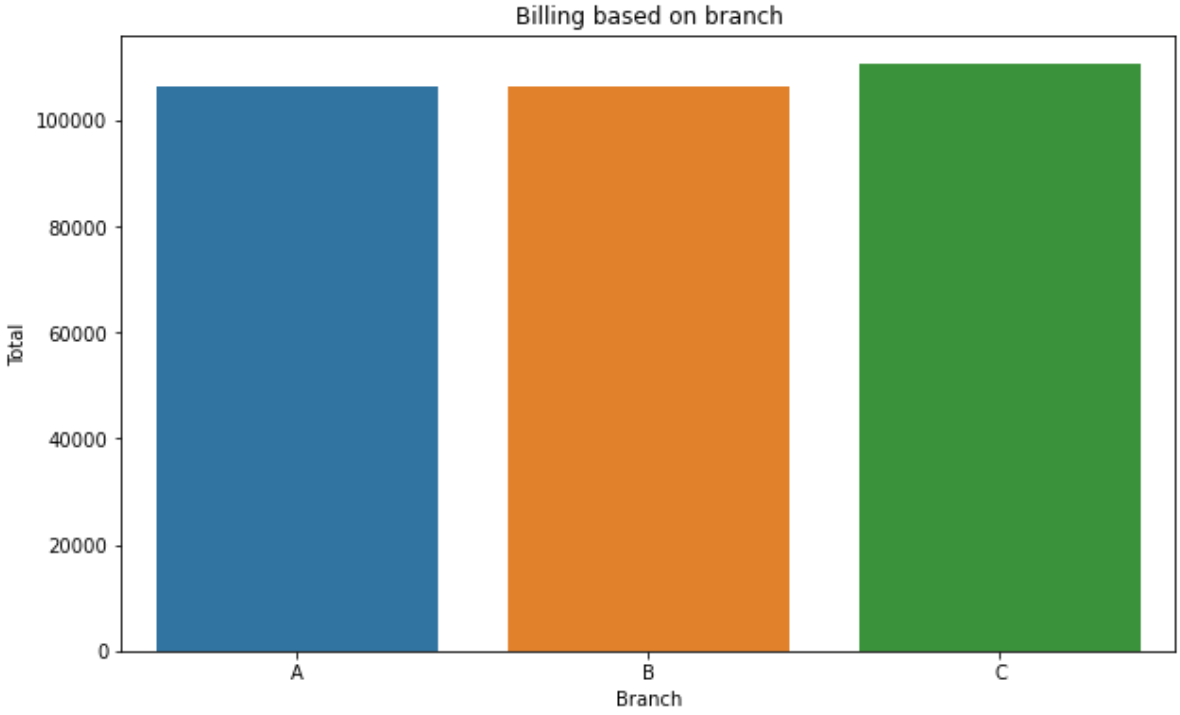
```
11. Considering the assessment given by the customers
about electronic accessories, those who reached their highest
points of quantities sold were those with 6 and 8
valuation
12. Considering the valuation they gave customers about
accessories electronics, which reached their highest
points low quantities sold were those that
they have 10 and 4 valuation
13. Considering the assessment given by the customers
about fashion accessories, those who reached their highest
points of quantities sold were those with 7 and 6 valuation
14. Considering the assessment given by the customers about
fashion accessories, those who reached their lowest points
of c quantities sold were those with 4 and 10 rating
15. Considering the assessment given by the customers about
sport products and journey, those who reached their highest
points of quantities sold high were the who have 7 and 6
valuation
16. Considering the assessment given by the customers
about sport products and journey, those who reached their
lowest points of quantities sold were low who have 10 and
9 valuation
17. Considering the assessment given by the customers about
household products and lifestyle, those who reached their
points highest in quantities sold were the who have 8 and 7
valuation
18. Considering the assessment given by the customers about
household products and lifestyle, those who reached their
points lowest in quantities sold were the who have 10 and
4 valuation
19. Considering the assessment given by the customers about
food and drink, that reached their highest points of amounts
sold were those with 6 and 8 of assessment
20. Considering the assessment given by the customers about
food and drink, that reached their lowest points of amounts
sold were those with 10 and 5 of assessment
21. Considering the assessment given by the customers about
health products and beauty, those who reached their highest
points of quantities sold were those that they have 8 and 6
valuation
22. Considering the assessment given by the customers about
health products and beauty, those who reached their lowest
points of quantities sold were those that they have 10 and 4
valuation
"""
```

In [97]:
```
#Billing based on branch
sales_file_branch = pd.DataFrame(sales_file.groupby('Branch')['Total'].sum())
sales_file_branch = sales_file_branch.reset_index()
sales_file_branch
```

Out[97]:

	Branch	Total
0	A	106200.3705
1	B	106197.6720
2	C	110568.7065

In [98]:
```
plt.figure(figsize=(10, 6))
sns.barplot(x='Branch', y='Total', data=sales_file_branch).set_title('Billing base
plt.show()
```



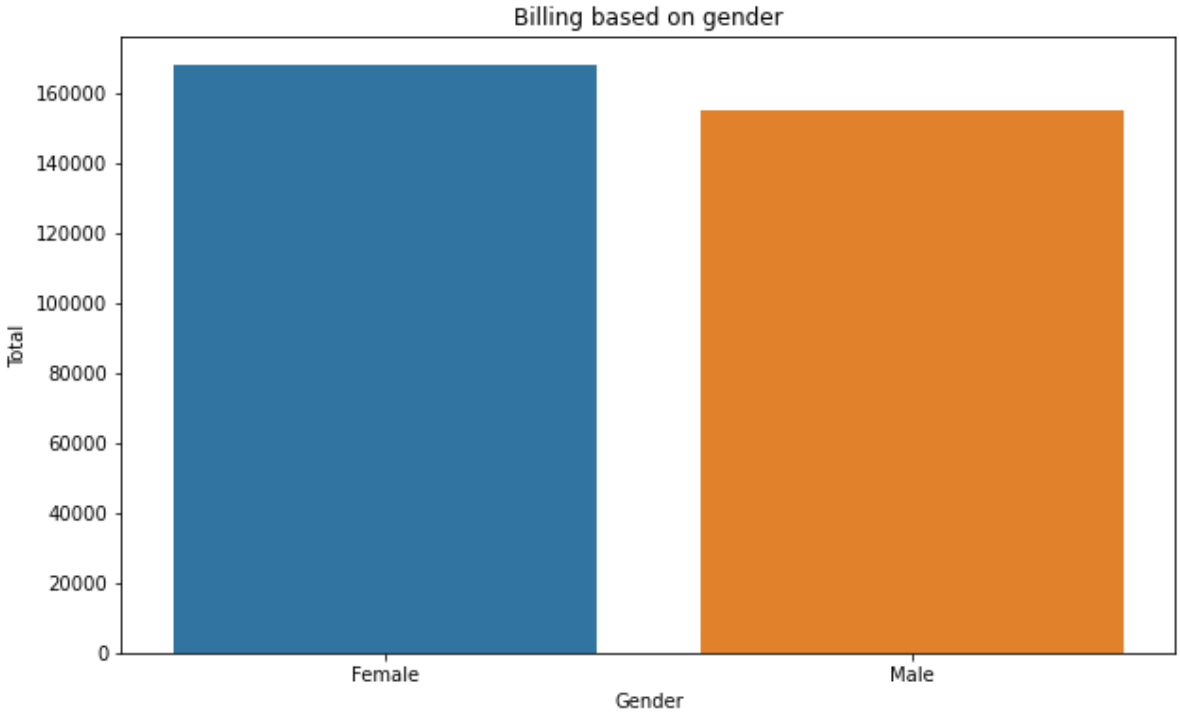
In [99]:
```
#Billing based on gender
sales_file_gender = pd.DataFrame(sales_file.groupby('Gender')['Total'].sum())
sales_file_gender = sales_file_gender.reset_index()
sales_file_gender
```

Out[99]:

	Gender	Total
0	Female	167882.925
1	Male	155083.824

In [100…
```
plt.figure(figsize=(10, 6))
sns.barplot(x='Gender', y='Total', data=sales_file_gender).set_title('Billing base
```

Out[100]:
```
Text(0.5, 1.0, 'Billing based on gender')
```



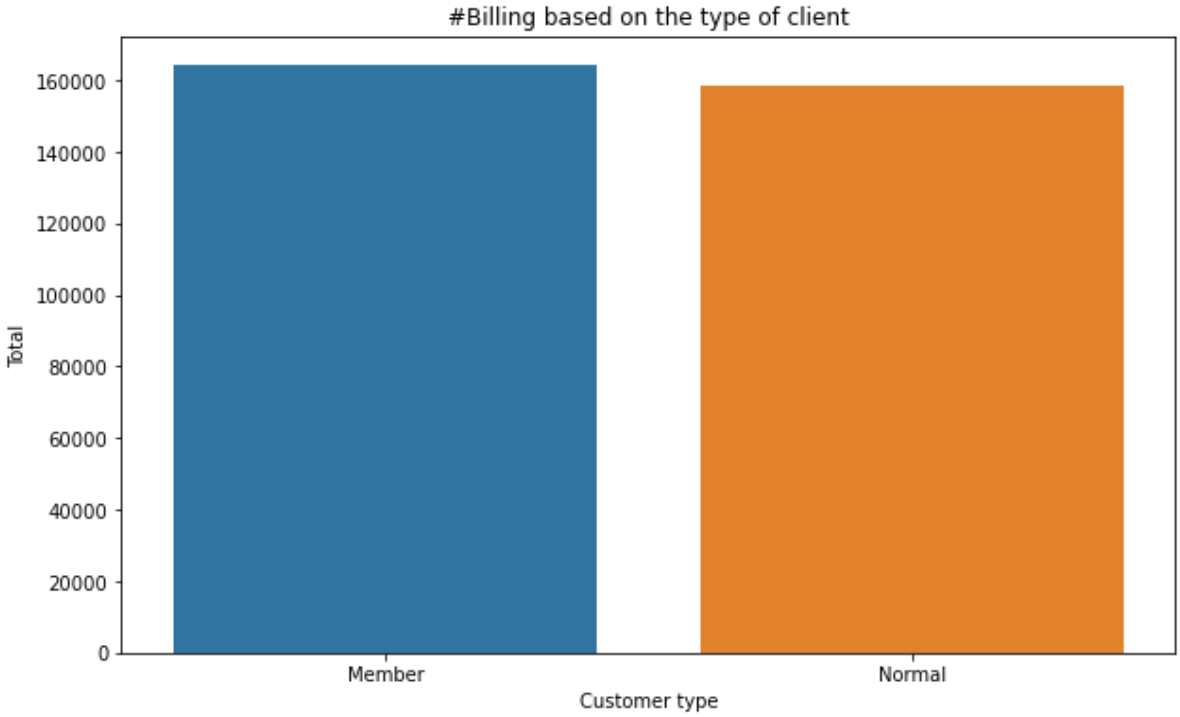
In [101…
```
#Billing based on the type of client
sales_file_customer_type = pd.DataFrame(sales_file.groupby('Customer type')['Total
sales_file_customer_type = sales_file_customer_type.reset_index()
sales_file_customer_type
```

Out[101]:

	Customer type	Total
0	Member	164223.444
1	Normal	158743.305

In [102…
```
plt.figure(figsize=(10, 6))
sns.barplot(x='Customer type', y='Total', data=sales_file_customer_type).set_title
```

Out[102]:
```
Text(0.5, 1.0, '#Billing based on the type of client')
```



In [103…
```
#To determine on which dates each day of the week
days = ['Sunday', 'Monday', 'Tuesday', 'Wednesday', 'Thursday', 'Friday', 'Saturday
for day in days:
    if day == 'Sunday':
        sales_d = sales_file[sales_file['day']==day]
        sales_d = pd.DataFrame(sales_d.groupby('Date')['Total'].sum())
        sales_d = sales_d.reset_index()
        sunday_dates = sales_d
    elif day == 'Monday':
        sales_d = sales_file[sales_file['day']==day]
        sales_d = pd.DataFrame(sales_d.groupby('Date')['Total'].sum())
        sales_d = sales_d.reset_index()
        monday_dates = sales_d
    elif day == 'Tuesday':
        sales_d = sales_file[sales_file['day']==day]
        sales_d = pd.DataFrame(sales_d.groupby('Date')['Total'].sum())
        sales_d = sales_d.reset_index()
        tuesday_dates = sales_d
    elif day == 'Wednesday':
        sales_d = sales_file[sales_file['day']==day]
        sales_d = pd.DataFrame(sales_d.groupby('Date')['Total'].sum())
        sales_d = sales_d.reset_index()
        wednesday_dates = sales_d
    elif day == 'Thursday':
```

```
        sales_d = sales_file[sales_file['day']==day]
        sales_d = pd.DataFrame(sales_d.groupby('Date')['Total'].sum())
        sales_d = sales_d.reset_index()
        thursday_dates = sales_d
    elif day == 'Friday':
        sales_d = sales_file[sales_file['day']==day]
        sales_d = pd.DataFrame(sales_d.groupby('Date')['Total'].sum())
        sales_d = sales_d.reset_index()
        friday_dates = sales_d
    else:
        sales_d = sales_file[sales_file['day']==day]
        sales_d = pd.DataFrame(sales_d.groupby('Date')['Total'].sum())
        sales_d = sales_d.reset_index()
        saturday_dates = sales_d
```

In [104…

```
print('Dates that were Sunday and billing for those dates:')
sunday_dates
```

```
Dates that were Sunday and billing for those dates:
```

Out[104]:

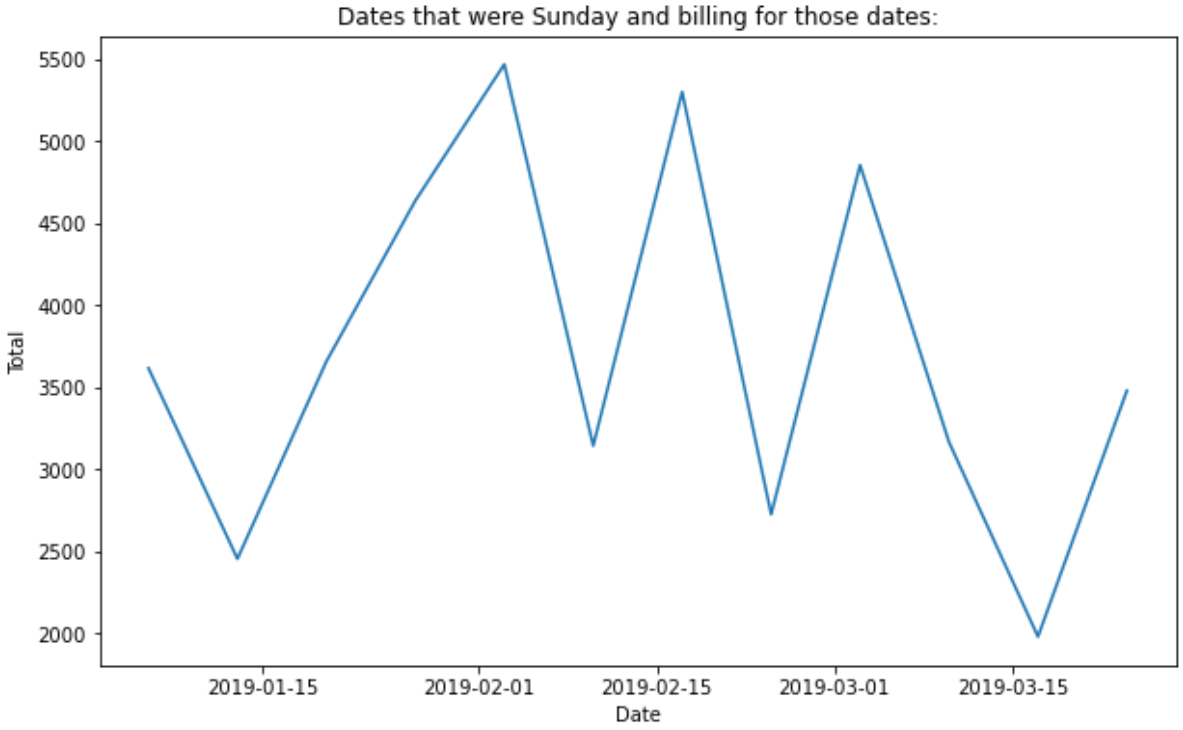
	Date	Total
0	2019-01-06	3614.2050
1	2019-01-13	2451.2040
2	2019-01-20	3655.4490
3	2019-01-27	4635.8970
4	2019-02-03	5467.9275
5	2019-02-10	3141.0225
6	2019-02-17	5299.5705
7	2019-02-24	2722.4610
8	2019-03-03	4853.1735
9	2019-03-10	3163.2300
10	2019-03-17	1976.2890
11	2019-03-24	3477.4635

In [105…

```
plt.figure(figsize=(10,6))
sns.lineplot(x = 'Date', y = 'Total', data = sunday_dates).set_title('Dates that we
```

Out[105]:

```
Text(0.5, 1.0, 'Dates that were Sunday and billing for those dates:')
```



In [106…
```
print('Dates that were Monday and billing for those dates:')
monday_dates
```

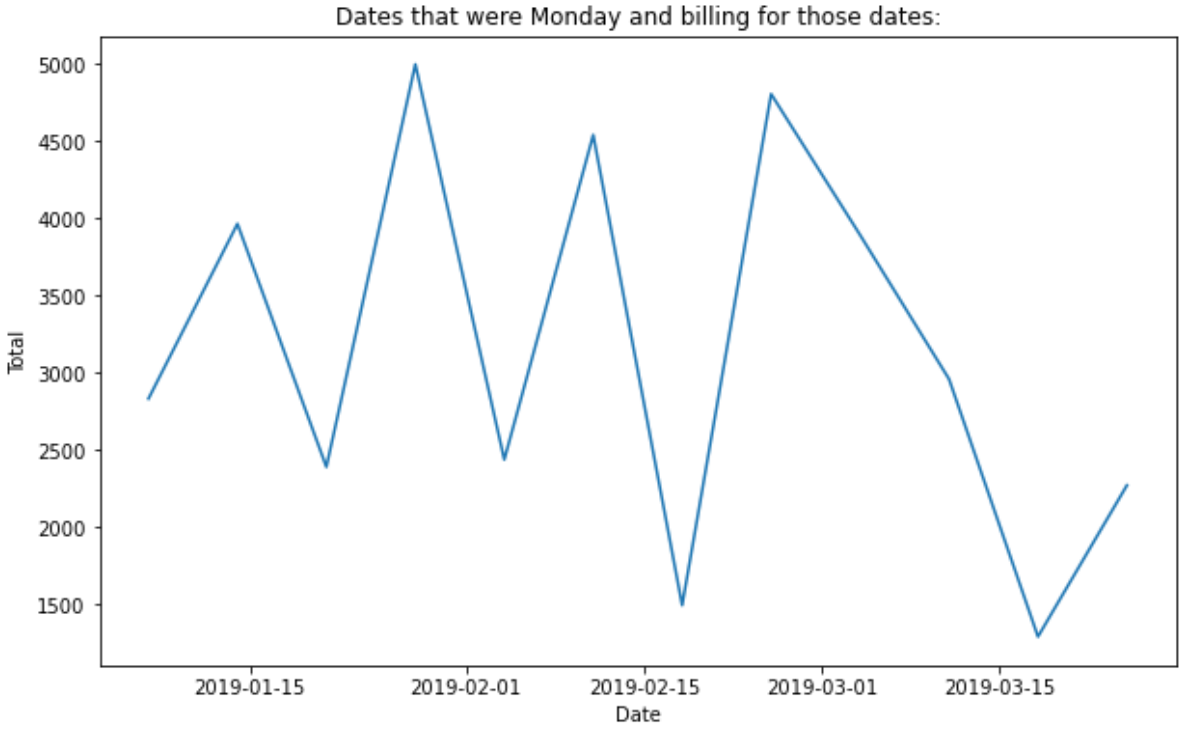
```
Dates that were Monday and billing for those dates:
```

Out[106]:

	Date	Total
0	2019-01-07	2834.2440
1	2019-01-14	3966.6165
2	2019-01-21	2392.0995
3	2019-01-28	4999.7115
4	2019-02-04	2439.4965
5	2019-02-11	4542.1530
6	2019-02-18	1496.0295
7	2019-02-25	4807.2360
8	2019-03-04	3894.4395
9	2019-03-11	2961.2520
10	2019-03-18	1292.8335
11	2019-03-25	2272.9665

In [107…
```
plt.figure(figsize=(10,6))
sns.lineplot(x = 'Date', y = 'Total', data = monday_dates).set_title('Dates that w
```

Out[107]:
```
Text(0.5, 1.0, 'Dates that were Monday and billing for those dates:')
```



In [108…
```
print('Dates that were Tuesday and billing for those dates:')
tuesday_dates
```

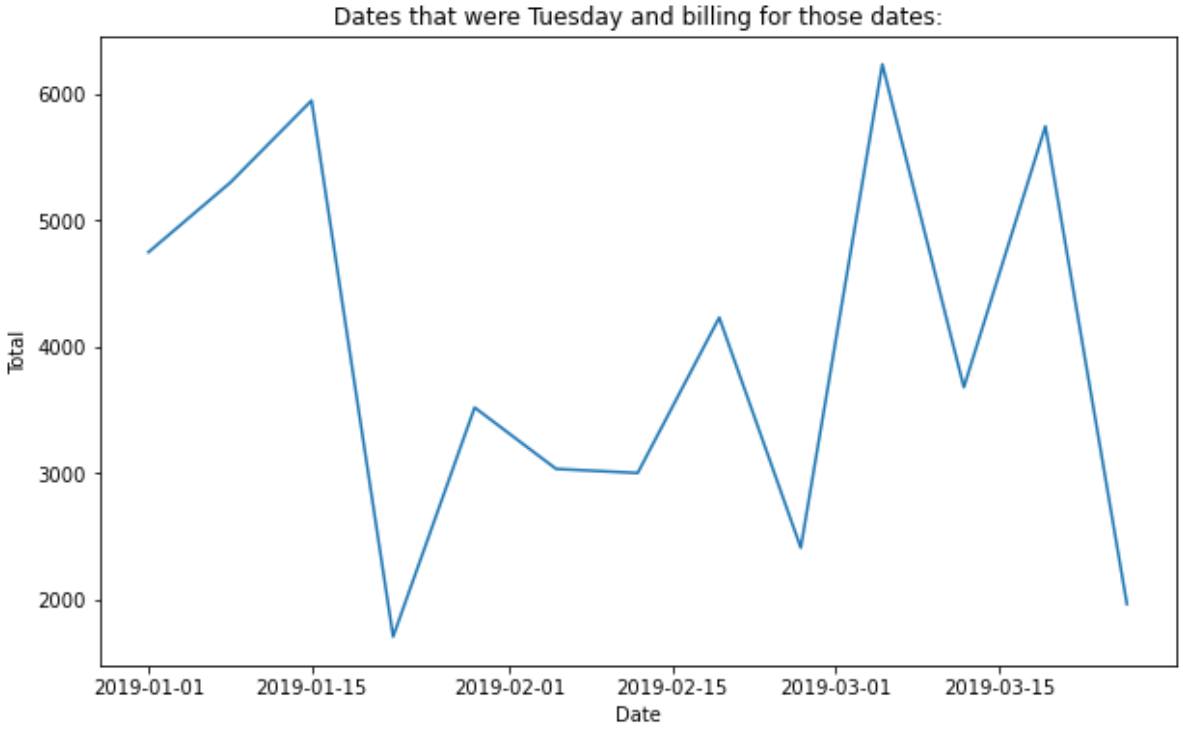
```
Dates that were Tuesday and billing for those dates:
```

Out[108]:

	Date	Total
0	2019-01-01	4745.1810
1	2019-01-08	5293.7325
2	2019-01-15	5944.2600
3	2019-01-22	1704.7695
4	2019-01-29	3516.5655
5	2019-02-05	3031.1295
6	2019-02-12	2998.9890
7	2019-02-19	4228.1190
8	2019-02-26	2408.1645
9	2019-03-05	6230.8785
10	2019-03-12	3677.5515
11	2019-03-19	5740.3920
12	2019-03-26	1962.5130

In [109…
```
plt.figure(figsize=(10,6))
sns.lineplot(x = 'Date', y = 'Total', data = tuesday_dates).set_title('Dates that w
```

Out[109]:
```
Text(0.5, 1.0, 'Dates that were Tuesday and billing for those dates:')
```



In [110…
```
print('Dates that were Wednesdays and billing for those dates:')
wednesday_dates
```

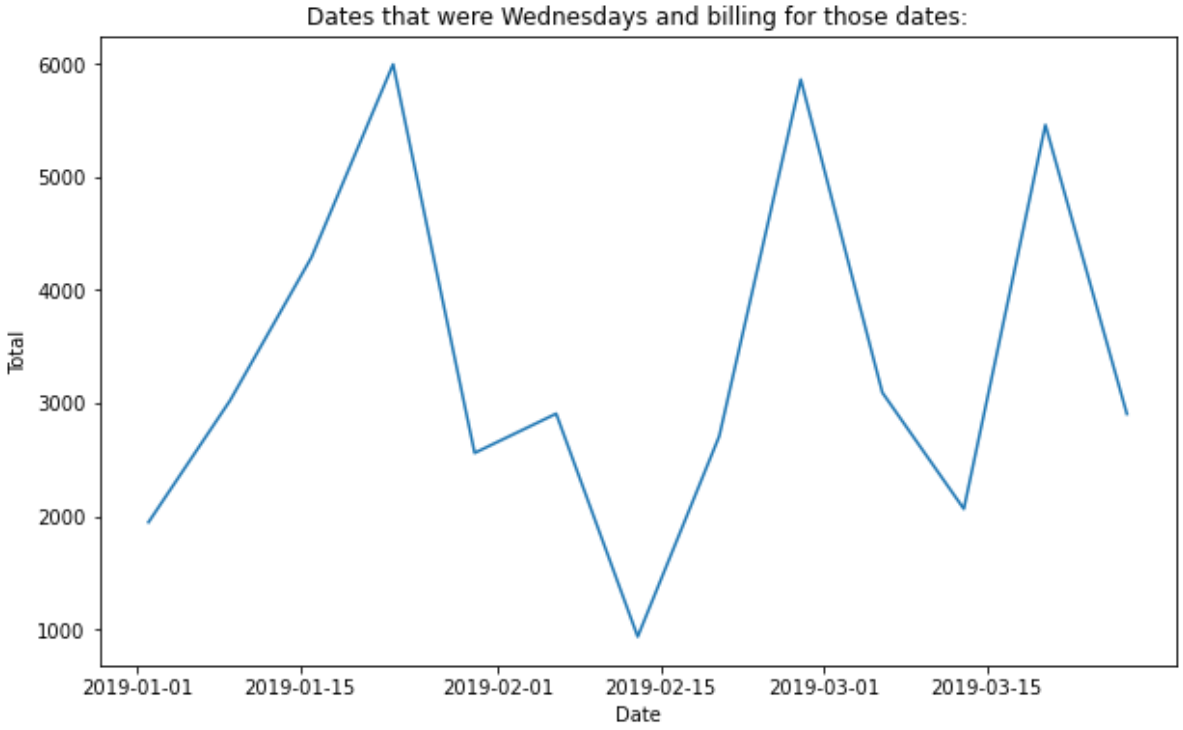
```
Dates that were Wednesdays and billing for those dates:
```

Out[110]:

	Date	Total
0	2019-01-02	1945.5030
1	2019-01-09	3021.3435
2	2019-01-16	4289.0820
3	2019-01-23	5994.1875
4	2019-01-30	2558.2620
5	2019-02-06	2905.4235
6	2019-02-13	934.2375
7	2019-02-20	2706.4170
8	2019-02-27	5859.4515
9	2019-03-06	3092.5965
10	2019-03-13	2063.6070
11	2019-03-20	5458.2045
12	2019-03-27	2902.8195

In [112…
```
plt.figure(figsize=(10,6))
sns.lineplot(x = 'Date', y = 'Total', data = wednesday_dates).set_title('Dates tha
```

Out[112]:
```
Text(0.5, 1.0, 'Dates that were Wednesdays and billing for those dates:')
```



In [113…
```
print('Dates that were Thursday and billing for those dates:')
thursday_dates
```

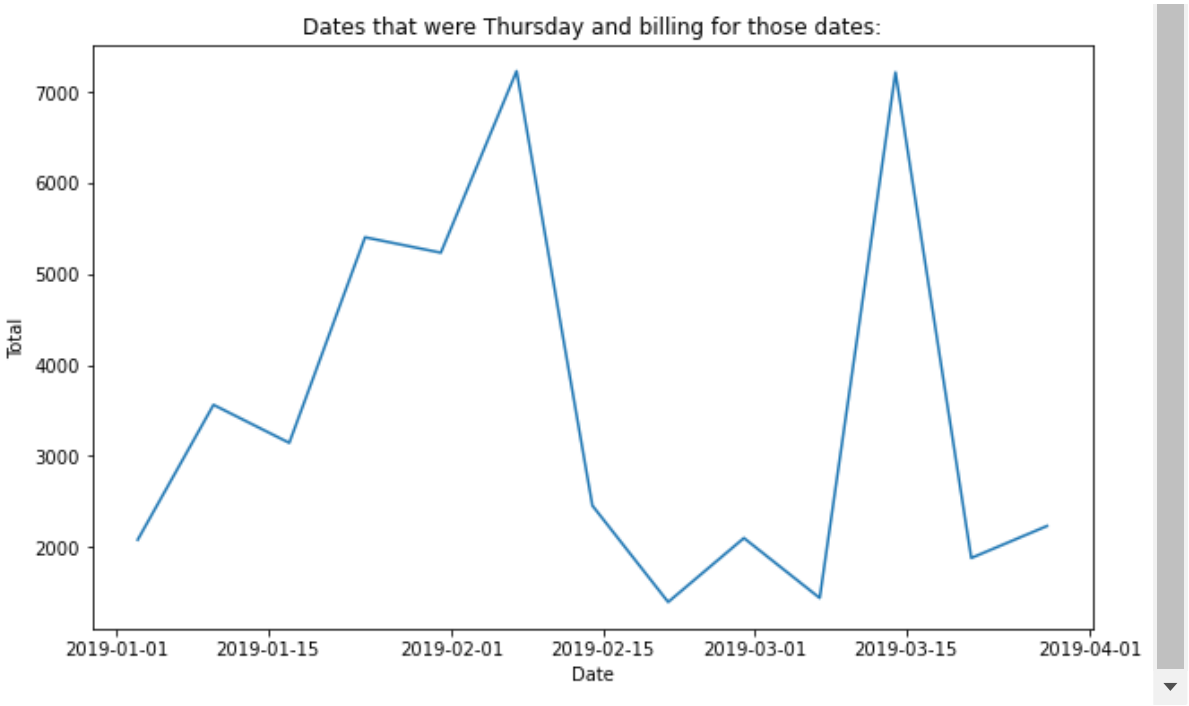
```
Dates that were Thursday and billing for those dates:
```

Out[113]:

	Date	Total
0	2019-01-03	2078.1285
1	2019-01-10	3560.9490
2	2019-01-17	3142.7550
3	2019-01-24	5402.0505
4	2019-01-31	5232.4965
5	2019-02-07	7228.2105
6	2019-02-14	2454.0915
7	2019-02-21	1393.7385
8	2019-02-28	2097.0180
9	2019-03-07	1438.2585
10	2019-03-14	7214.6340
11	2019-03-21	1877.5155
12	2019-03-28	2229.4020

In [114…
```
plt.figure(figsize=(10,6))
sns.lineplot(x = 'Date', y = 'Total', data = thursday_dates).set_title('Dates that
```

Out[114]:
```
Text(0.5, 1.0, 'Dates that were Thursday and billing for those dates:')
```



In [115…
```
print('Dates that were Friday and billing for those dates:')
friday_dates
```

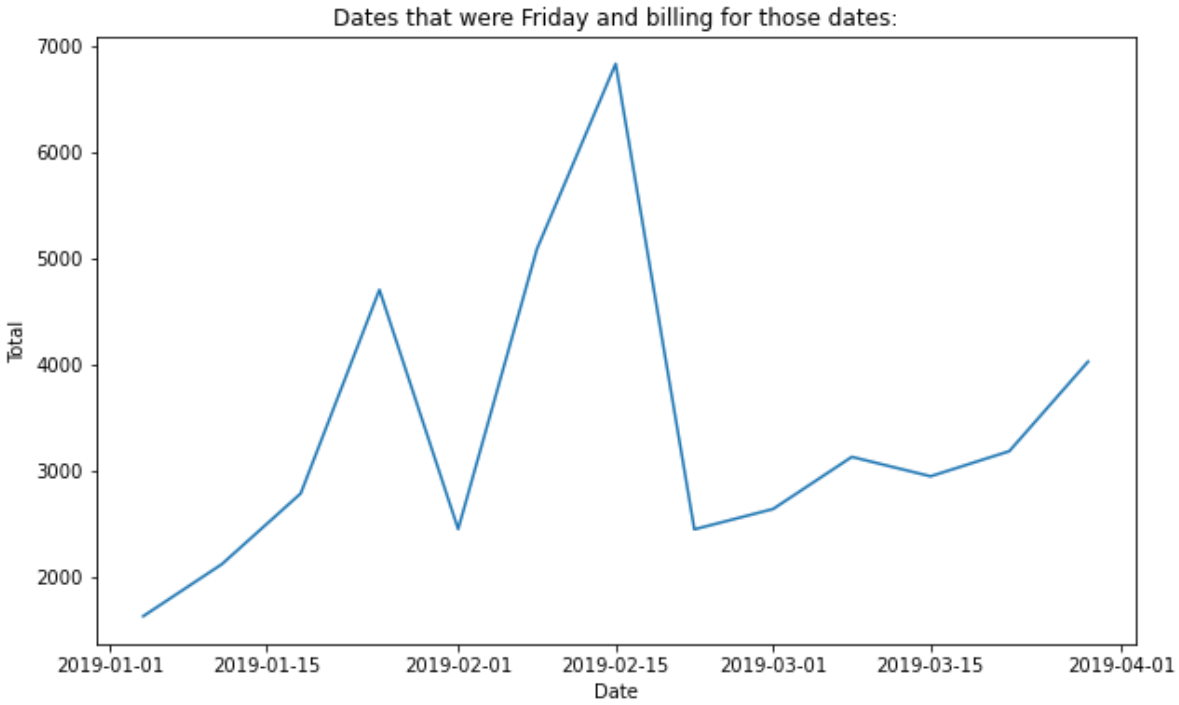
```
Dates that were Friday and billing for those dates:
```

Out[115]:

	Date	Total
0	2019-01-04	1623.6885
1	2019-01-11	2114.9625
2	2019-01-18	2780.4735
3	2019-01-25	4700.3670
4	2019-02-01	2444.5365
5	2019-02-08	5084.6565
6	2019-02-15	6830.7855
7	2019-02-22	2442.3105
8	2019-03-01	2634.3660
9	2019-03-08	3125.3880
10	2019-03-15	2942.4150
11	2019-03-22	3179.1480
12	2019-03-29	4023.2430

In [116…
```
plt.figure(figsize=(10,6))
sns.lineplot(x = 'Date', y = 'Total', data = friday_dates).set_title('Dates that w
```

Out[116]:
```
Text(0.5, 1.0, 'Dates that were Friday and billing for those dates:')
```



In [117…
```
print('Dates that were Saturday and billing for those dates:')
saturday_dates
```

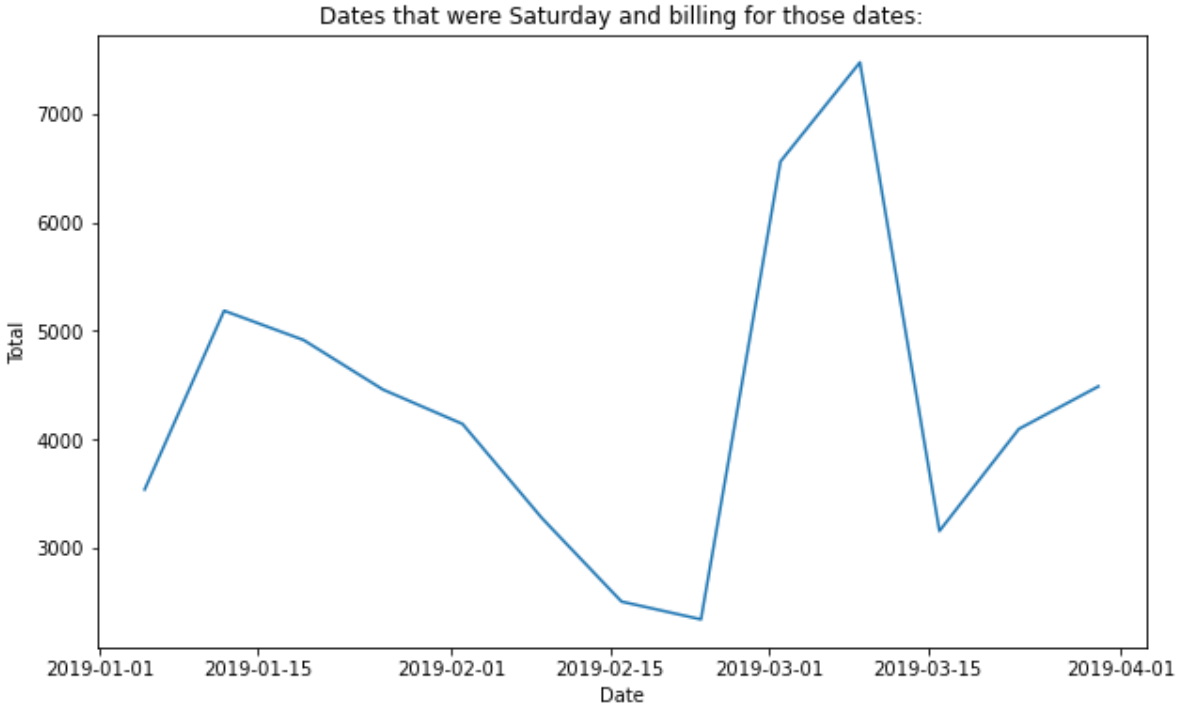
```
Dates that were Saturday and billing for those dates:
```

Out[117]:

	Date	Total
0	2019-01-05	3536.6835
1	2019-01-12	5184.7635
2	2019-01-19	4914.7245
3	2019-01-26	4457.5125
4	2019-02-02	4140.9480
5	2019-02-09	3271.8945
6	2019-02-16	2503.7670
7	2019-02-23	2339.5890
8	2019-03-02	6560.3055
9	2019-03-09	7474.0470
10	2019-03-16	3154.4730
11	2019-03-23	4095.0420
12	2019-03-30	4487.0595

In [118…
```
plt.figure(figsize=(10,6))
sns.lineplot(x = 'Date', y = 'Total', data = saturday_dates).set_title('Dates that
```

Out[118]:
```
Text(0.5, 1.0, 'Dates that were Saturday and billing for those dates:')
```



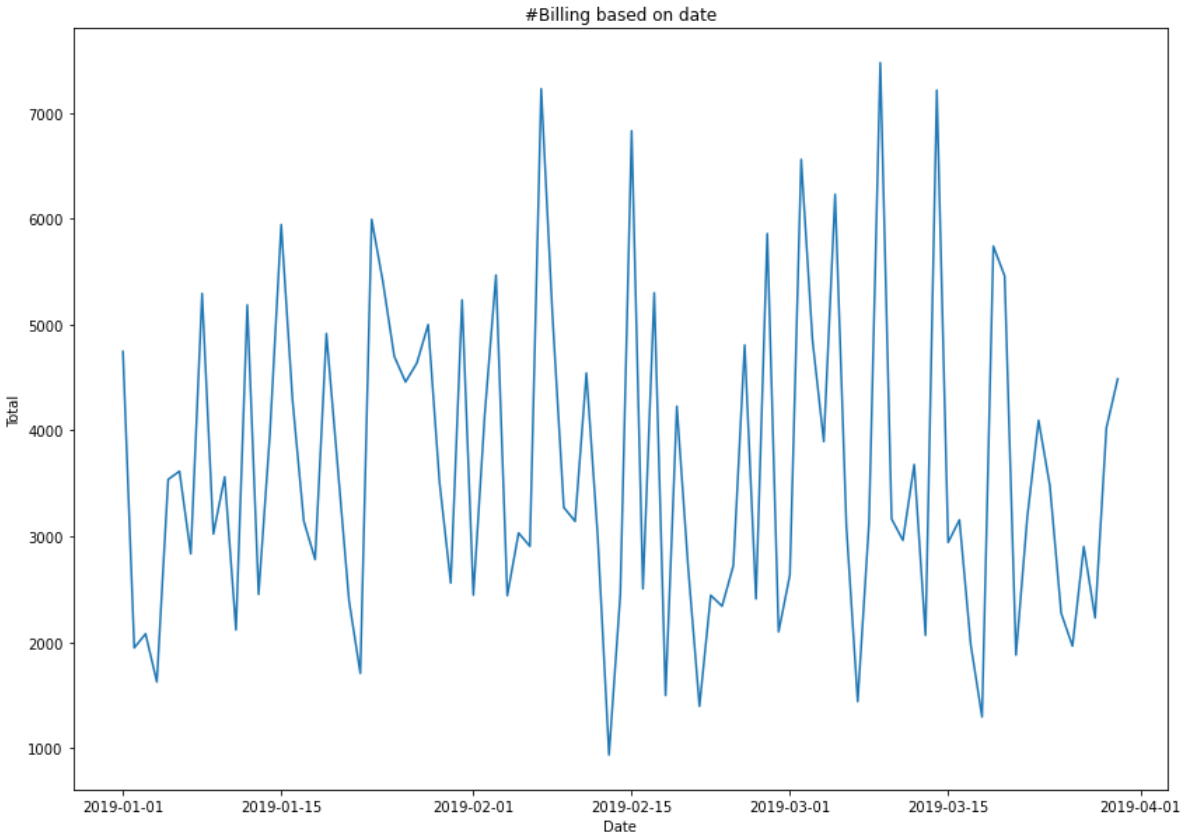
In [119…
```
#Billing based on date
sales_file_date = pd.DataFrame(sales_file.groupby('Date')['Total'].sum())
sales_file_date = sales_file_date.reset_index()
sales_file_date.head()
```

Out[119]:

	Date	Total
0	2019-01-01	4745.1810
1	2019-01-02	1945.5030
2	2019-01-03	2078.1285
3	2019-01-04	1623.6885
4	2019-01-05	3536.6835

In [120…
```
plt.figure(figsize=(14,10))
sns.lineplot(x = 'Date', y = 'Total', data = sales_file_date).set_title('#Billing
```

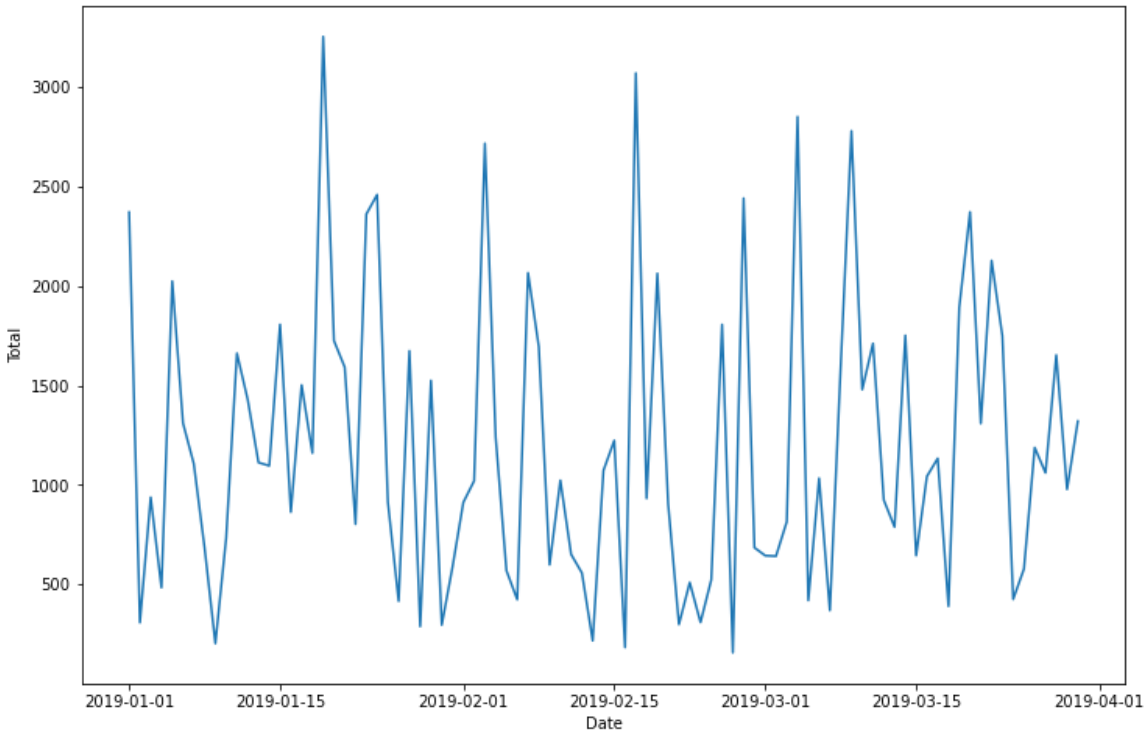
Out[120]:
```
Text(0.5, 1.0, '#Billing based on date')
```



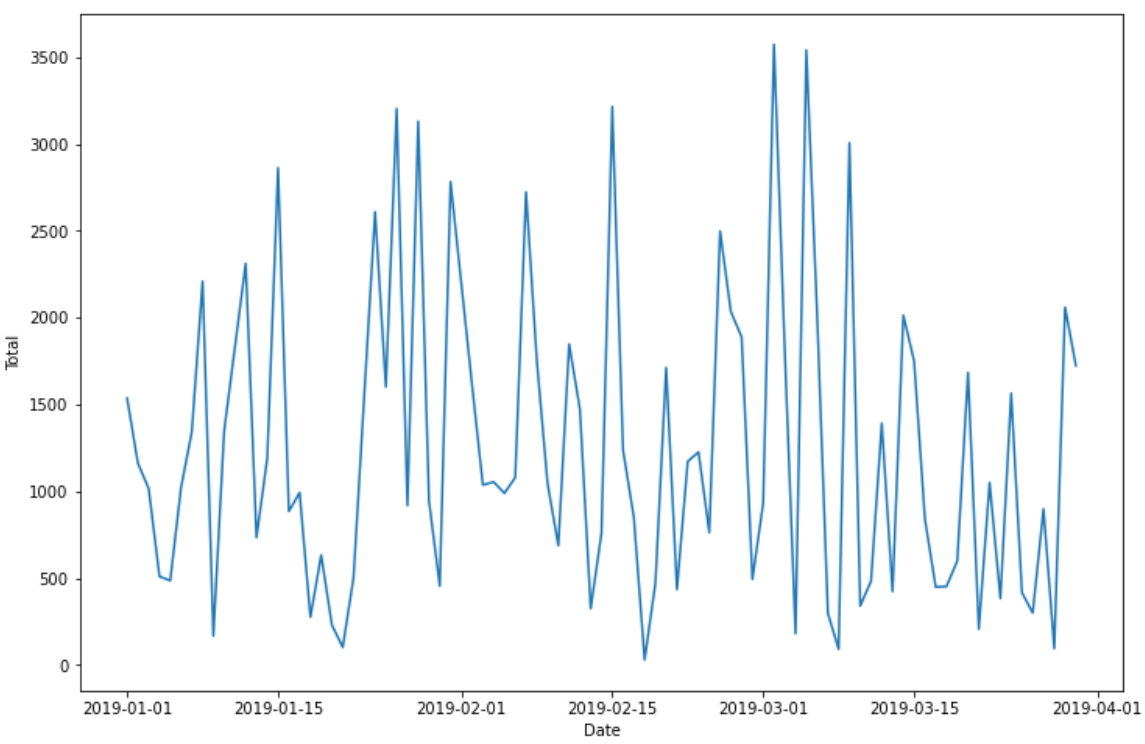
In [121…

```
#Billing based on the date (of each branch)
Branch = ['A', 'B', 'C']
for branch in Branch:
    sales_branch = sales_file[sales_file['Branch']==branch]
    sales_file_date_branch = pd.DataFrame(sales_branch.groupby(['Branch', 'Date'])
    sales_file_date_branch = sales_file_date_branch.reset_index()
    print(f'Billing of {branch} based on the date ')
    plt.figure(figsize=(12,8))
    sns.lineplot(x = 'Date', y = 'Total',data = sales_file_date_branch)
    plt.show()
```

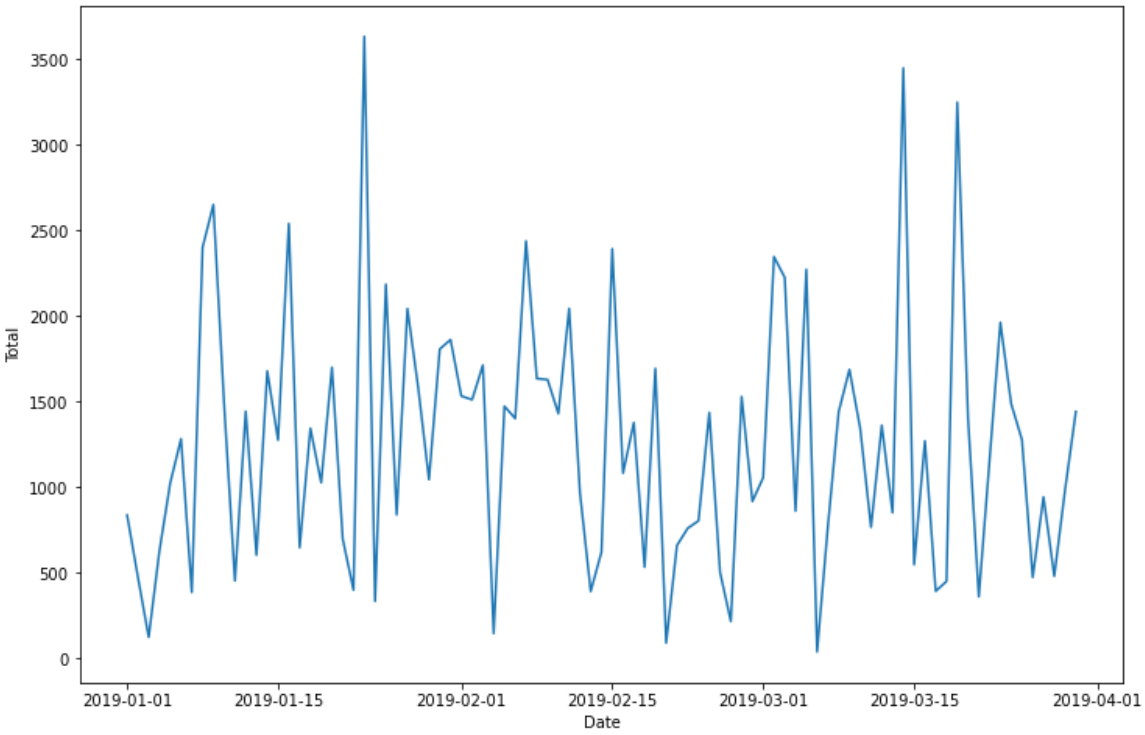
```
Billing of A based on the date
```




```
Billing of B based on the date
```



Billing of C based on the date



In [122…

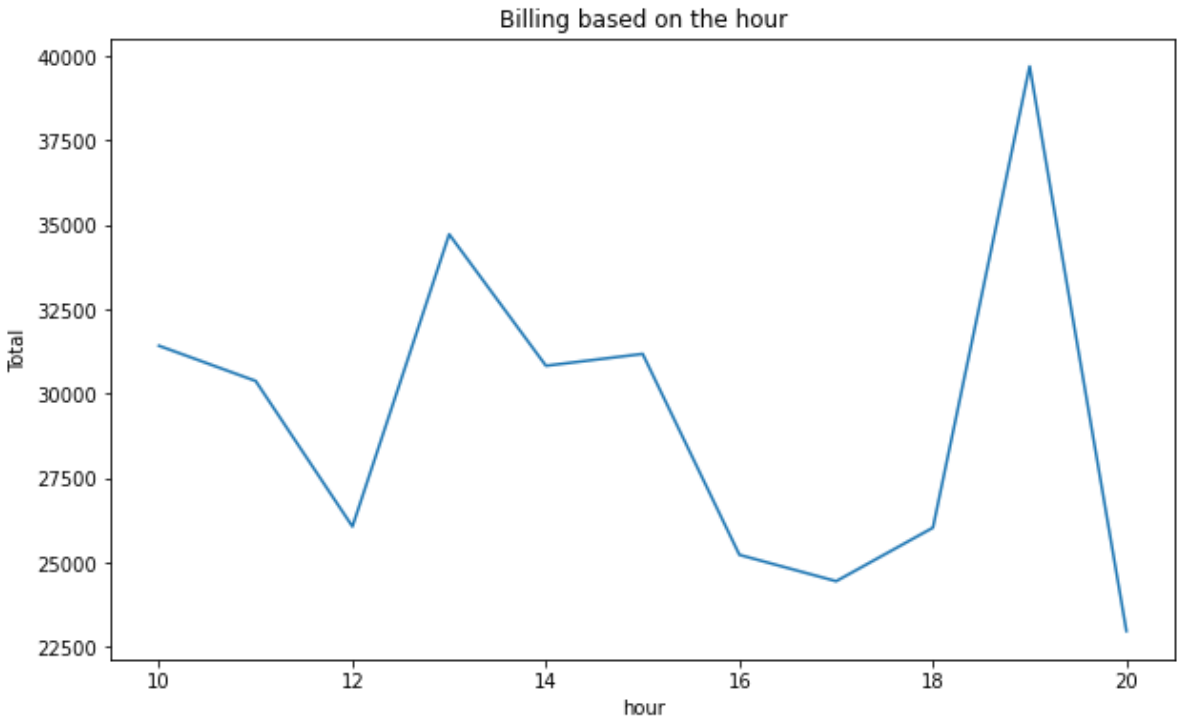
```
#Billing based on the hour
sales_file_hour = pd.DataFrame(sales_file.groupby('hour')['Total'].sum())
sales_file_hour = sales_file_hour.reset_index()
sales_file_hour
```

Out[122]:

	hour	Total
0	10	31421.4810
1	11	30377.3295
2	12	26065.8825
3	13	34723.2270
4	14	30828.3990
5	15	31179.5085
6	16	25226.3235
7	17	24445.2180
8	18	26030.3400
9	19	39699.5130
10	20	22969.5270

In [123…
```
plt.figure(figsize=(10,6))
sns.lineplot(x = 'hour', y = 'Total', data = sales_file_hour).set_title('Billing ba
```

Out[123]:
```
Text(0.5, 1.0, 'Billing based on the hour')
```



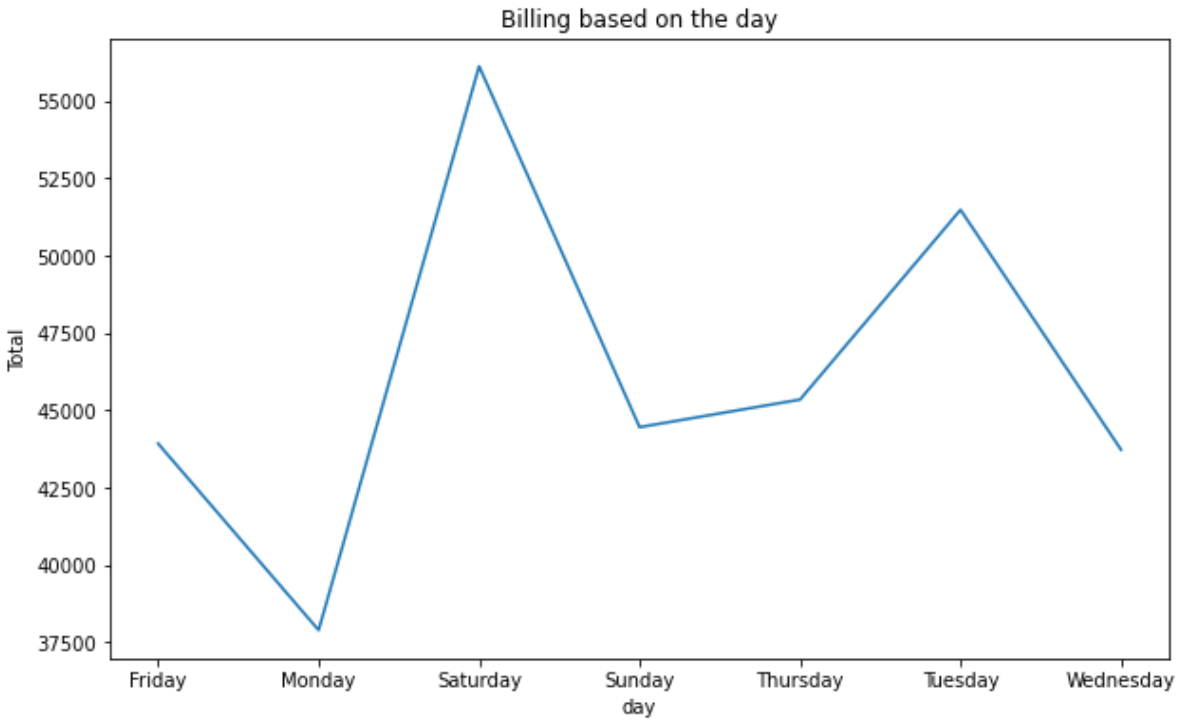
In [124…
```
#Billing based on the day
sales_file_day = pd.DataFrame(sales_file.groupby('day')['Total'].sum())
sales_file_day
```

Out[124]:

day	Total
Friday	43926.3405
Monday	37899.0780
Saturday	56120.8095
Sunday	44457.8925
Thursday	45349.2480
Tuesday	51482.2455
Wednesday	43731.1350

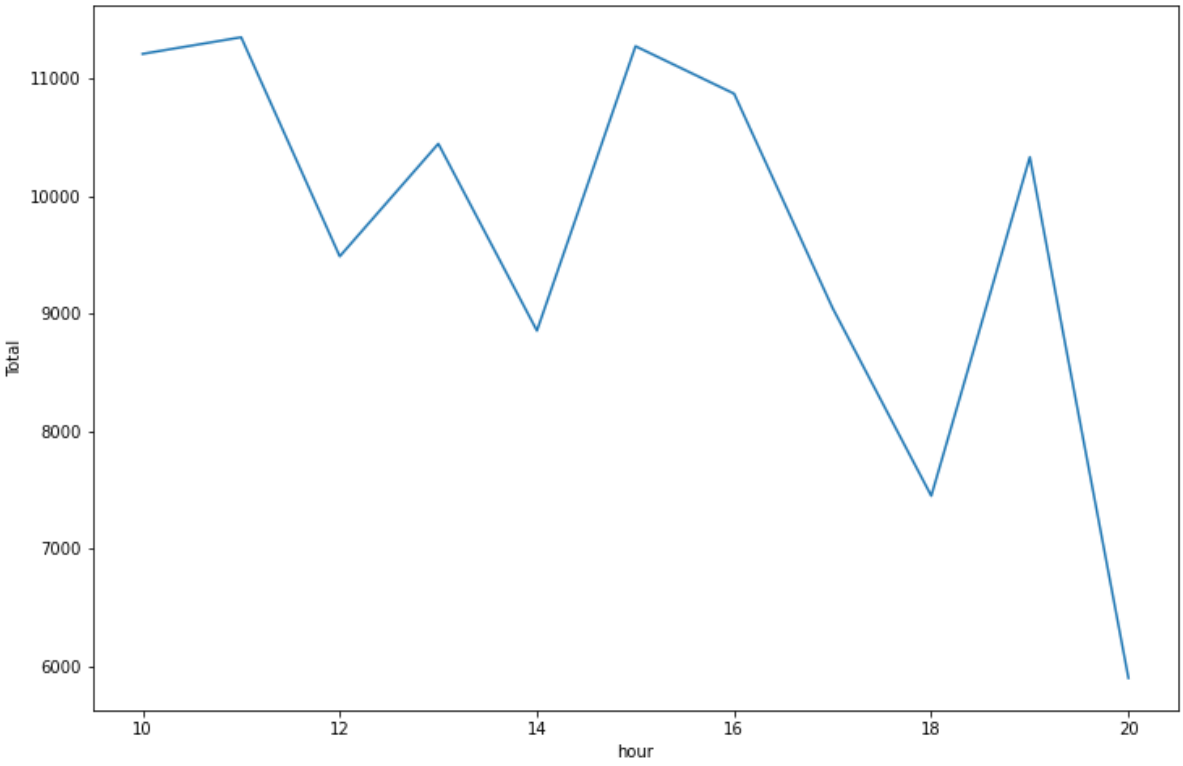
In [125…
```
sales_file_day = sales_file_day.reset_index()
plt.figure(figsize=(10,6))
sns.lineplot(x = 'day', y = 'Total', data = sales_file_day).set_title('Billing base
```

Out[125]:
```
Text(0.5, 1.0, 'Billing based on the day')
```

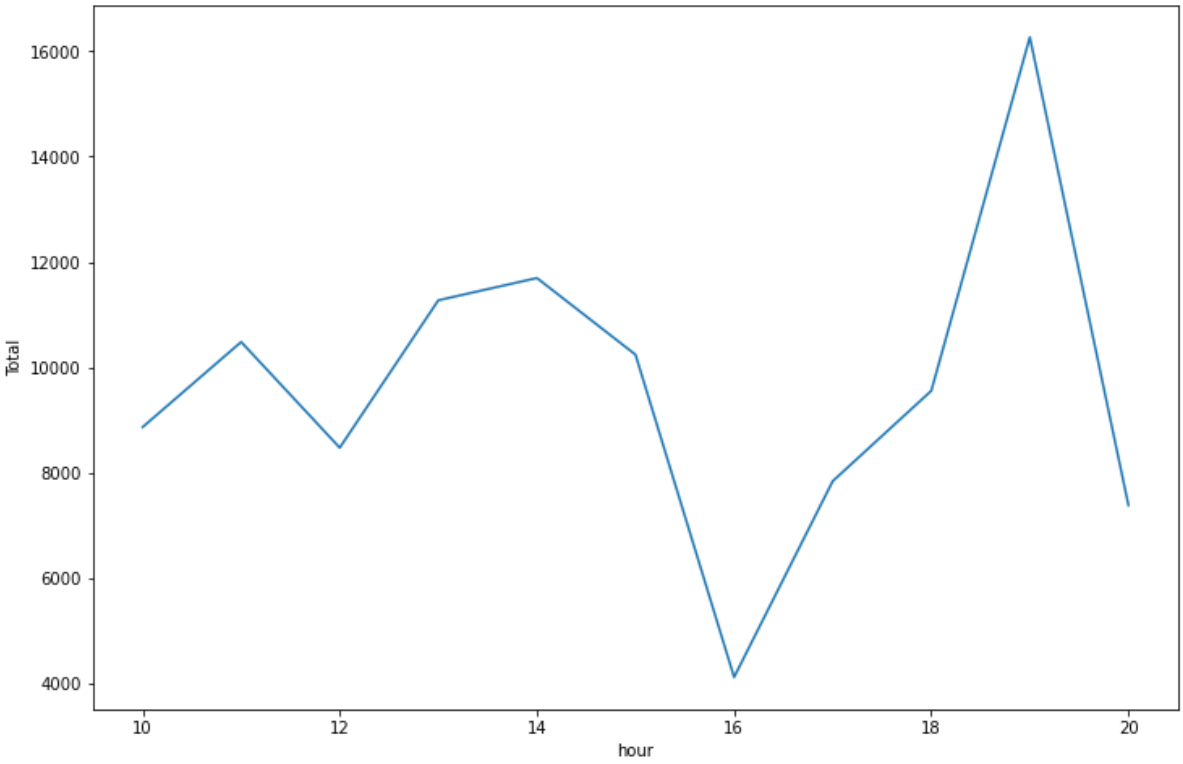


In [126…
```
#Billing based on the hour (for each branch)
for branch in Branch:
    sales_branch = sales_file[sales_file['Branch']==branch]
    sales_billing_hour_branch = pd.DataFrame(sales_branch.groupby(['Branch', 'hour
    sales_billing_hour_branch = sales_billing_hour_branch.reset_index()
    print(f'Billing of branch {branch} per hour')
    plt.figure(figsize=(12,8))
    sns.lineplot(x = 'hour', y = 'Total',data = sales_billing_hour_branch)
    plt.show()
```

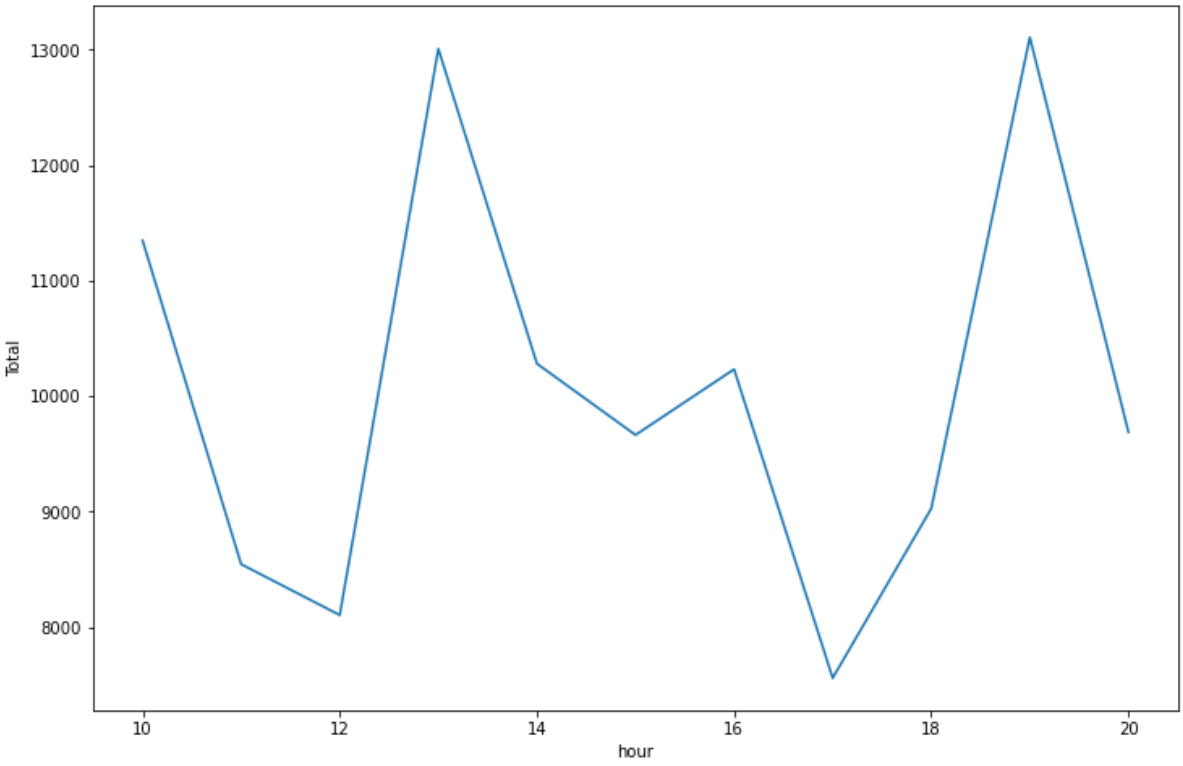
```
Billing of branch A per hour
```



Billing of branch B per hour



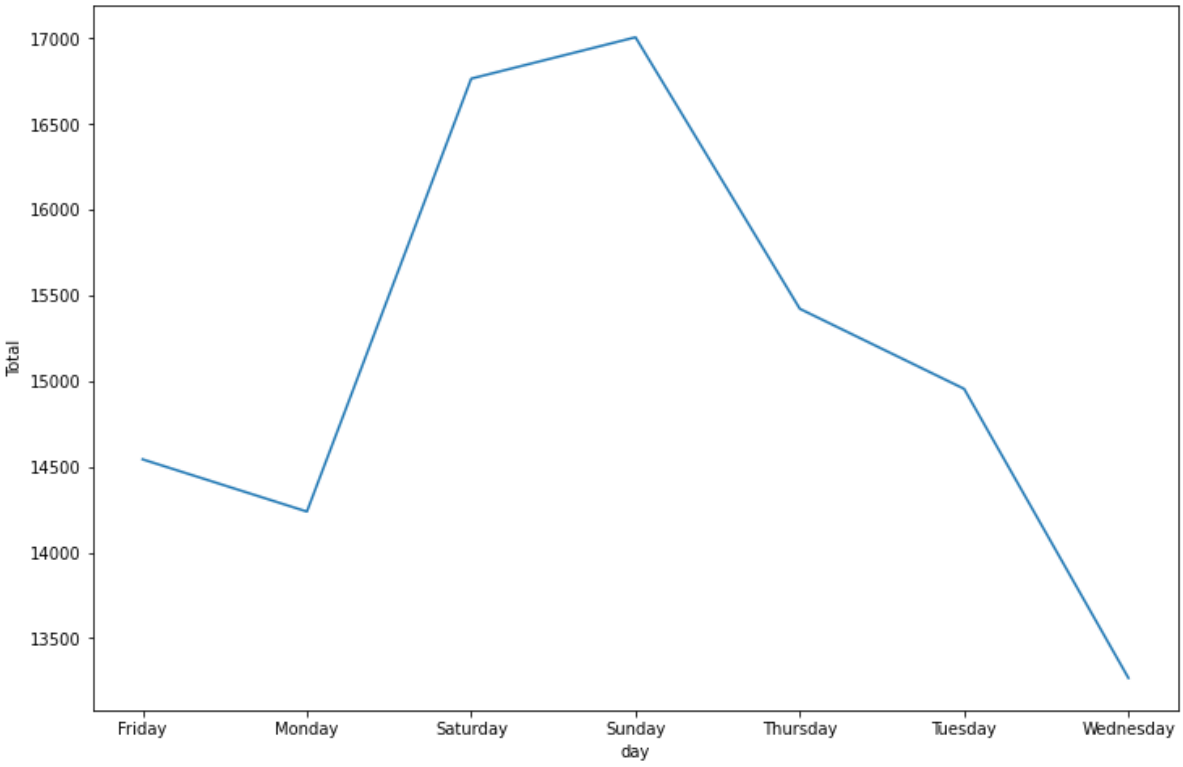
Billing of branch C per hour



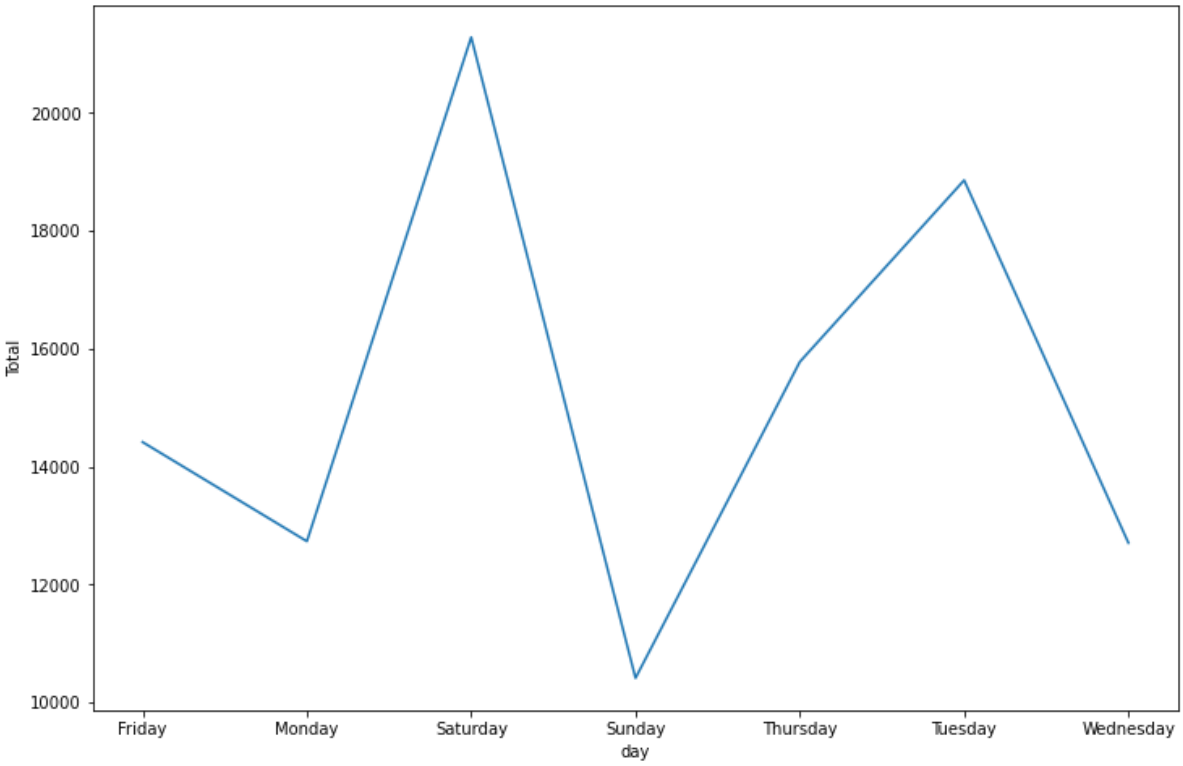
In [127…

```
#Billing based on the day (of each branch)
for branch in Branch:
    sales_branch = sales_file[sales_file['Branch']==branch]
    sales_billing_day_branch = pd.DataFrame(sales_branch.groupby('day')['Total'].su
    sales_billing_day_branch = sales_billing_day_branch.reset_index()
    print(f'Billing of branch {branch} per branch')
    plt.figure(figsize=(12,8))
    sns.lineplot(x ='day', y = 'Total',data = sales_billing_day_branch)
    plt.show()
```

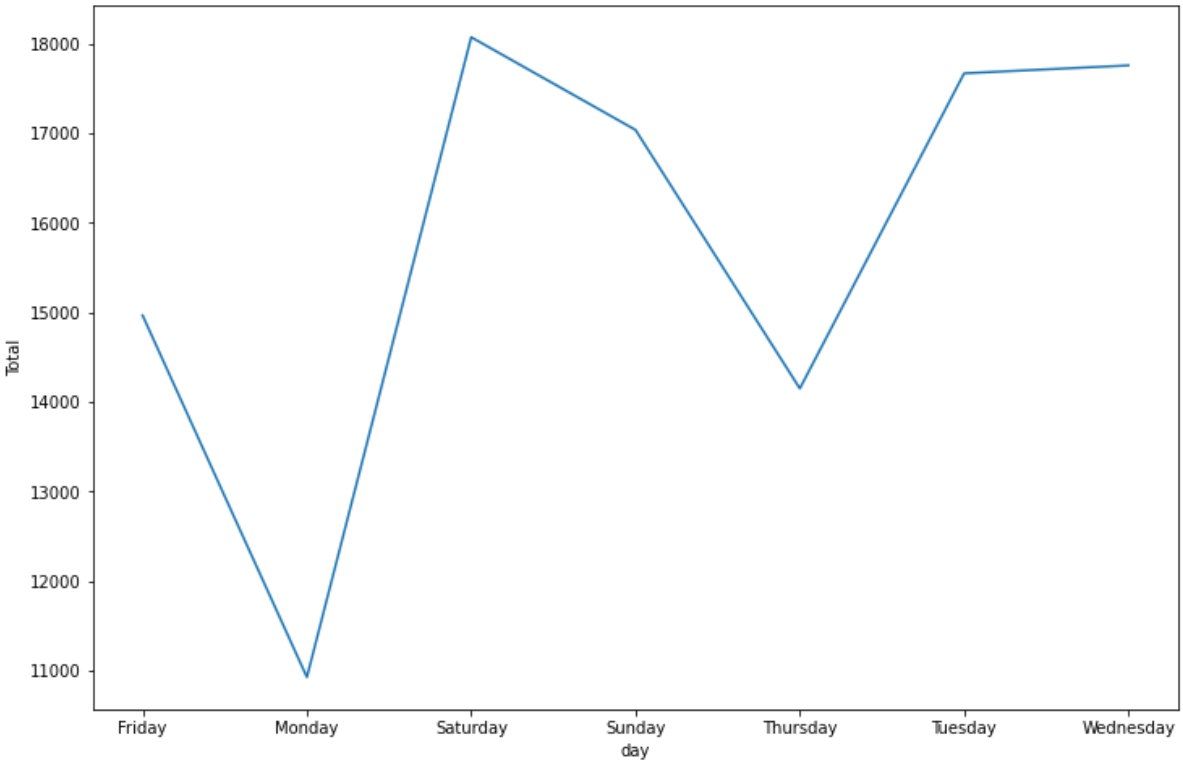
```
Billing of branch A per branch
```




```
Billing of branch B per branch
```



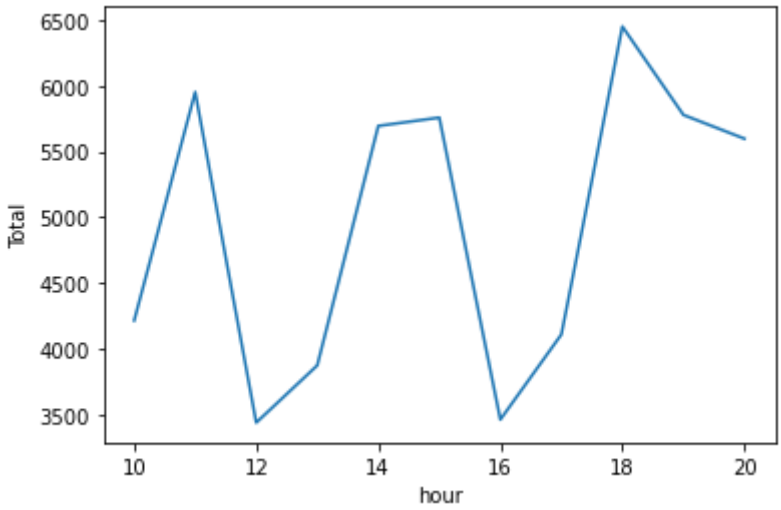
Billing of branch C per branch



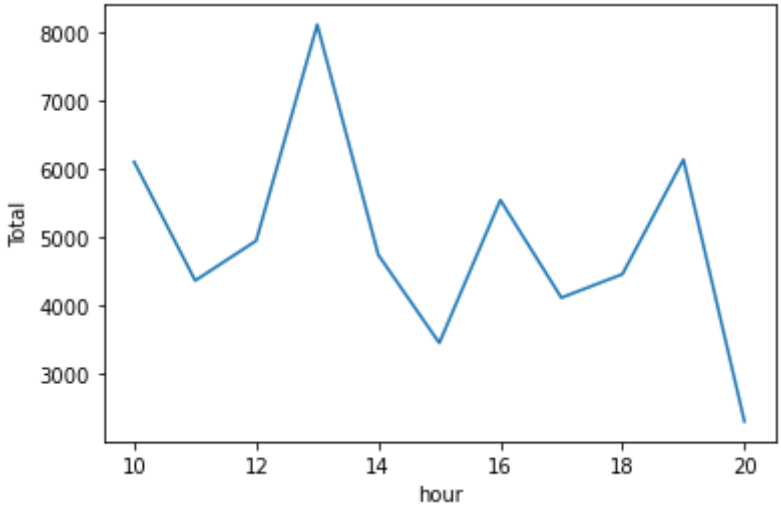
In [128…

```
#Billing obtained from each product line based on time
for line in product_lines:
    sales_line_2 = sales_file[sales_file['Product line']==line]
    sales_billing_hour_line = pd.DataFrame(sales_line_2.groupby(['Product line', '
    sales_billing_hour_line = sales_billing_hour_line.reset_index()
    print(f'Billing of {line} per hour')
    plt.figure(figsize=(6,4))
    sns.lineplot(x = 'hour', y = 'Total',data = sales_billing_hour_line)
    plt.show()
```

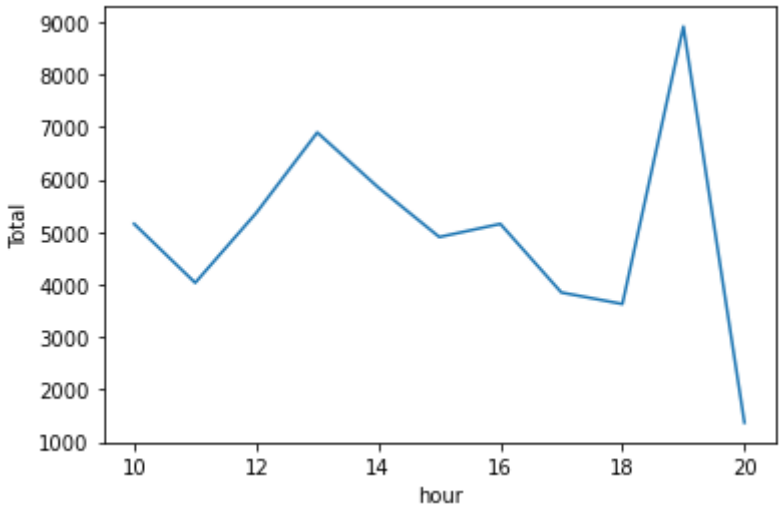
Billing of Electronic accessories per hour



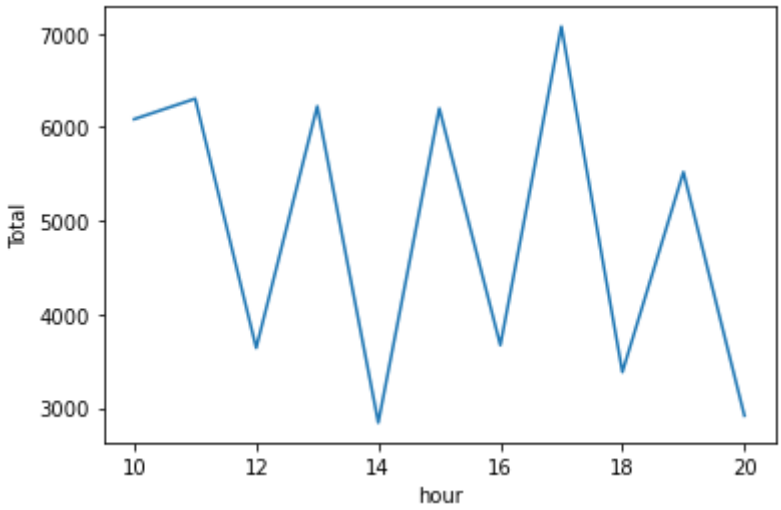
Billing of Fashion accessories per hour



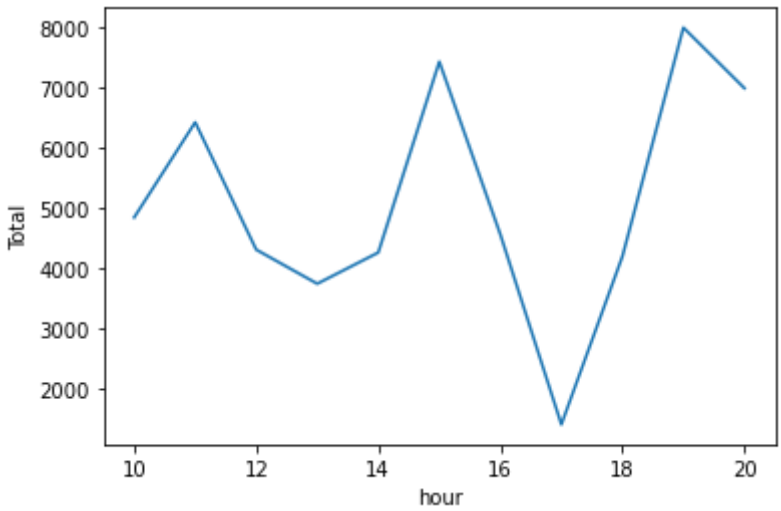
Billing of Sports and travel per hour



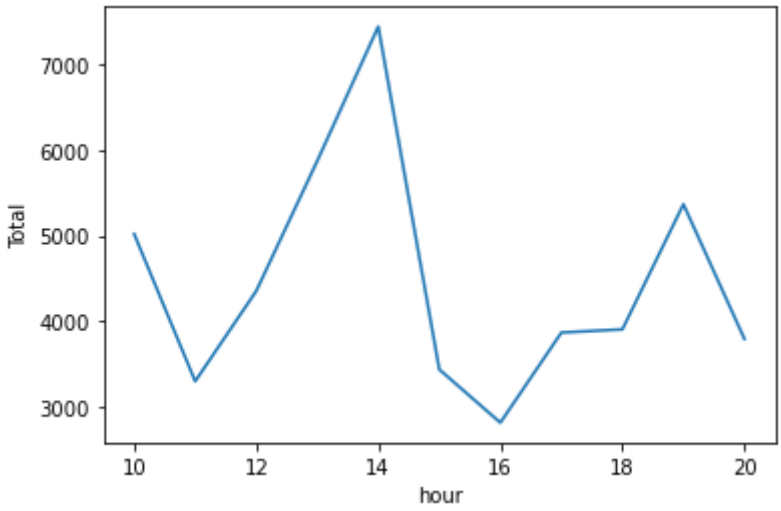
Billing of Home and lifestyle per hour



Billing of Food and beverages per hour



Billing of Health and beauty per hour



In [129…

```
#Billing based on the product line
sales_product_line_total = pd.DataFrame(sales_file.groupby('Product line')['Total'
sales_product_line_total = sales_product_line_total.reset_index()
sales_product_line_total
```

Out[129]:

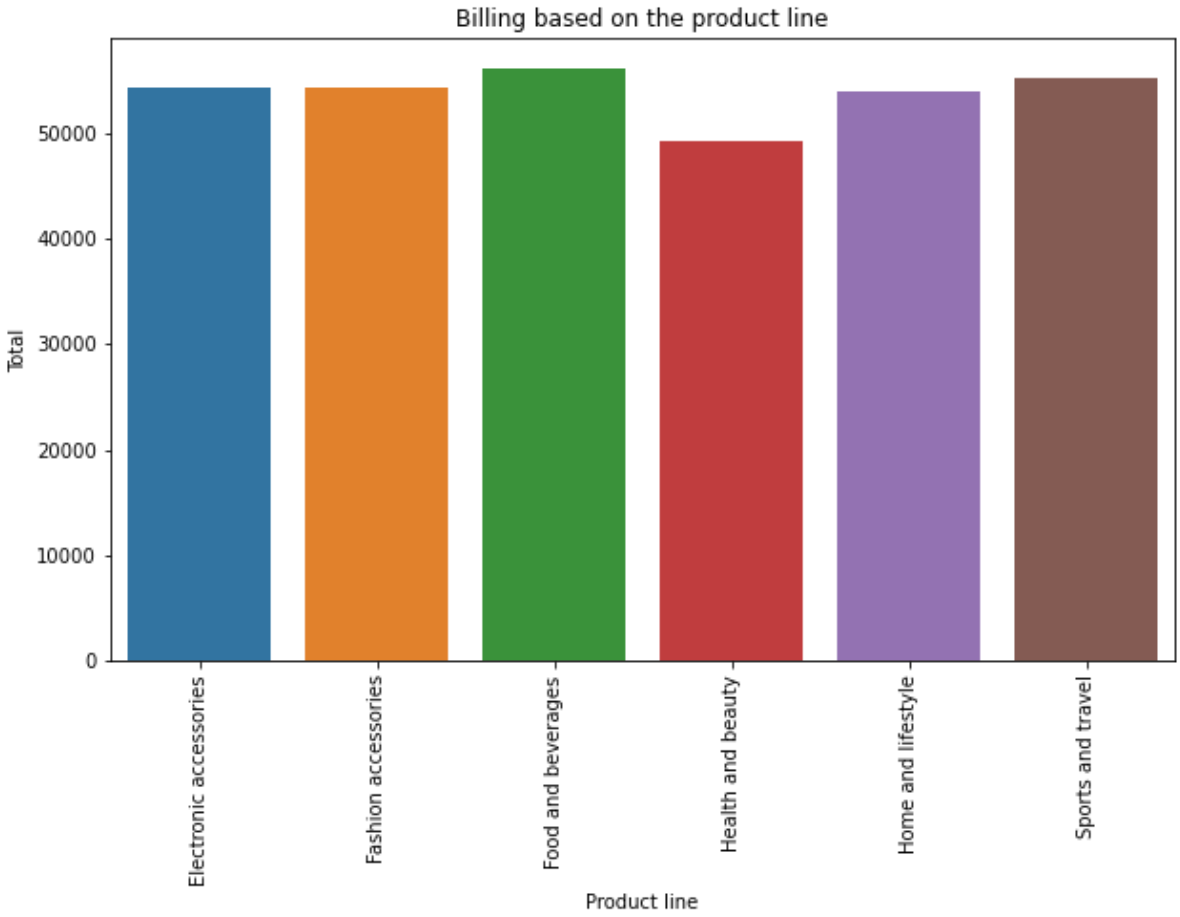
	Product line	Total
0	Electronic accessories	54337.5315
1	Fashion accessories	54305.8950
2	Food and beverages	56144.8440
3	Health and beauty	49193.7390
4	Home and lifestyle	53861.9130
5	Sports and travel	55122.8265

In [130…

```
plt.figure(figsize=(10,6))
plt.xticks(rotation=90)
sns.barplot(x = 'Product line', y = 'Total', data = sales_product_line_total).set_
```

Out[130]:

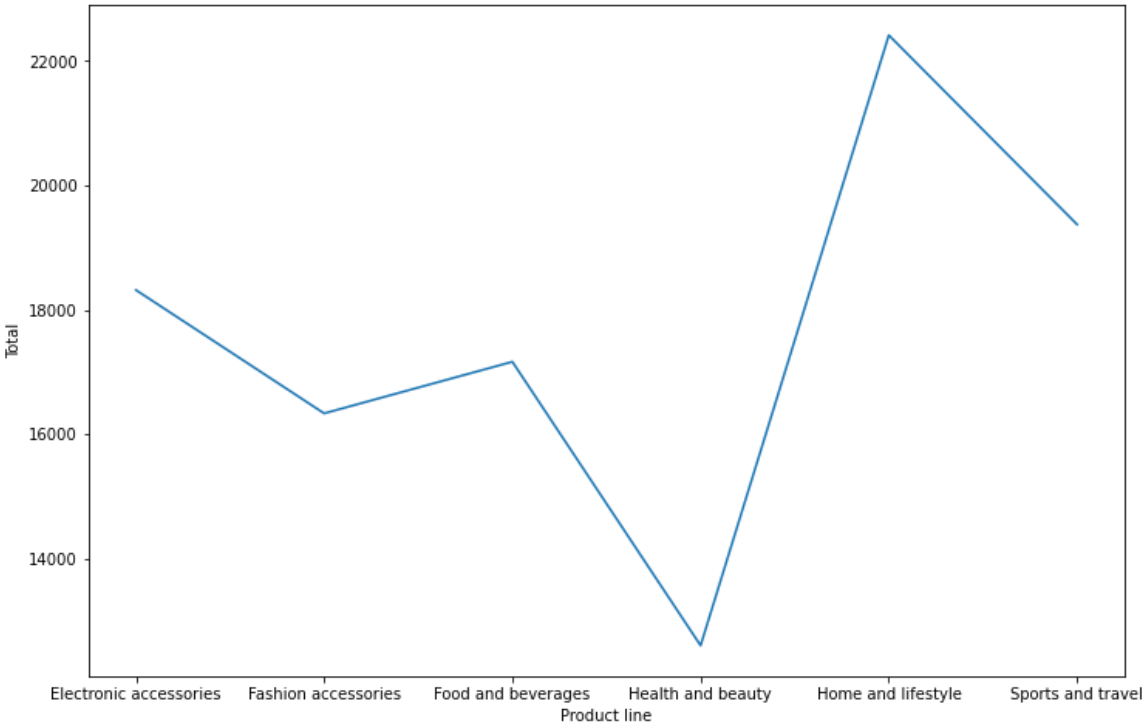
```
Text(0.5, 1.0, 'Billing based on the product line')
```



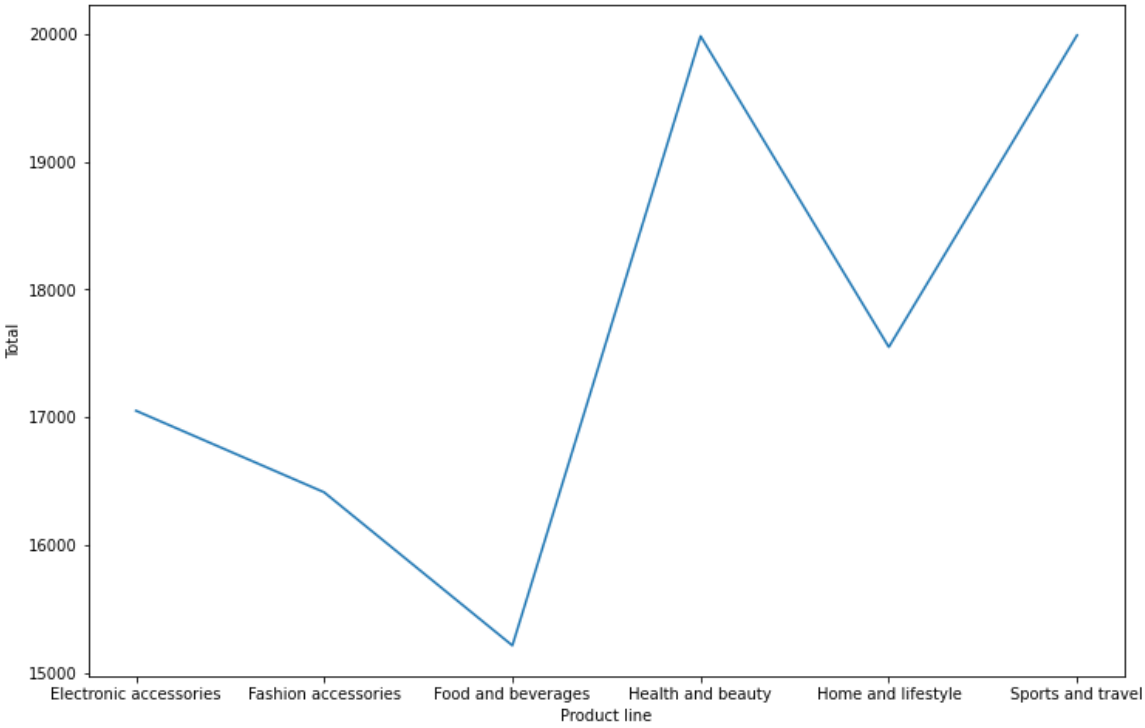
In [131…

```
#Billing based on the type of product (classified by branches)
for branch in Branch:
    sales_branch = sales_file[sales_file['Branch']==branch]
    sales_billing_product_line_branch = pd.DataFrame(sales_branch.groupby('Product
    sales_billing_product_line_branch = sales_billing_product_line_branch.reset_in
    print(f'Billing of each product lines based on branch {branch}')
    plt.figure(figsize=(12,8))
    sns.lineplot(x ='Product line', y = 'Total',data = sales_billing_product_line_
    plt.show()
```

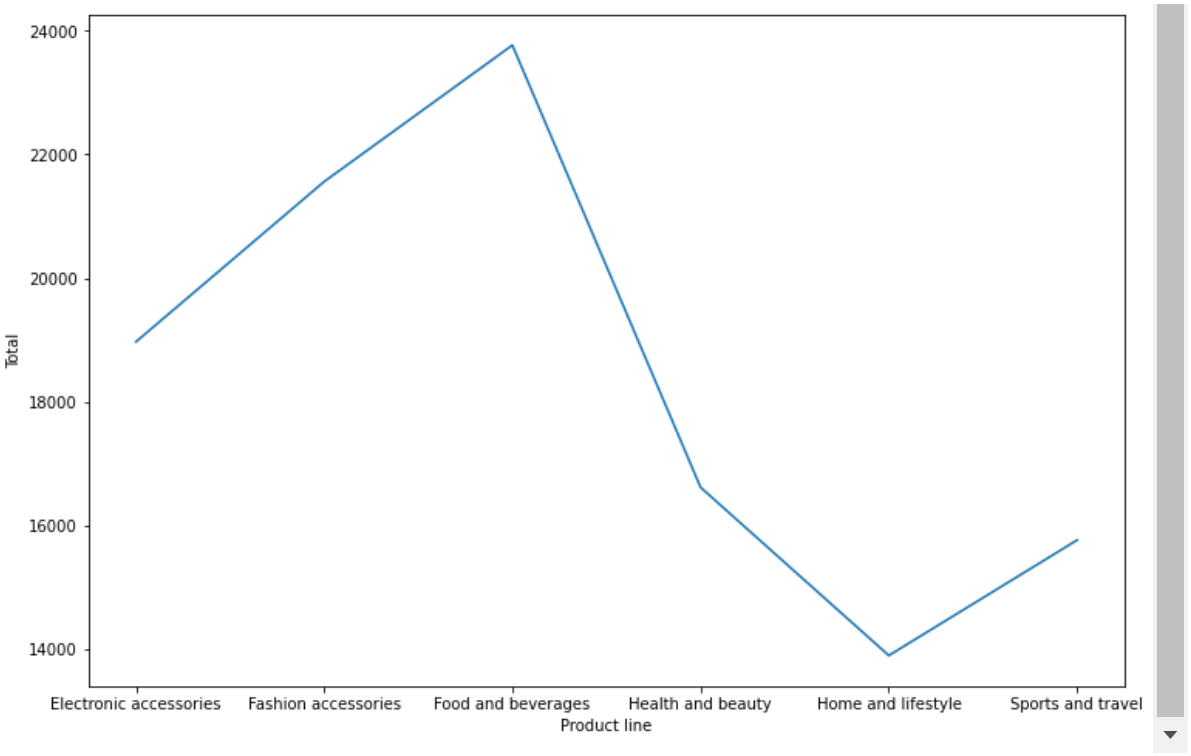
```
Billing of each product lines based on branch A
```



Billing of each product lines based on branch B



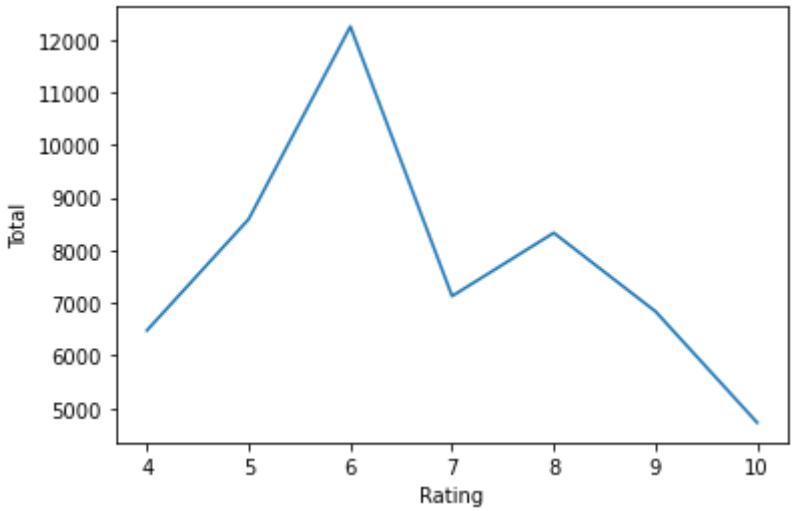
Billing of each product lines based on branch C



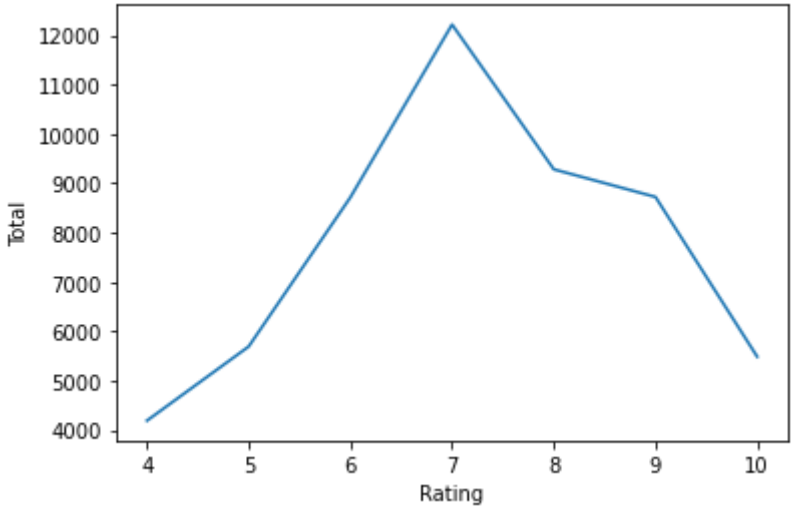
In [132…

```
#Billing based on the valuation of each product line
for line in product_lines:
    sales_line_3 = sales_rating[sales_rating['Product line']==line]
    sales_billing_rating_product_line = pd.DataFrame(sales_line_3.groupby('Rating'
    sales_billing_rating_product_line = sales_billing_rating_product_line.reset_in
    print(f'Billing of {line} based on rating')
    plt.figure(figsize=(6,4))
    sns.lineplot(x = 'Rating', y = 'Total',data = sales_billing_rating_product_lin
    plt.show()
```

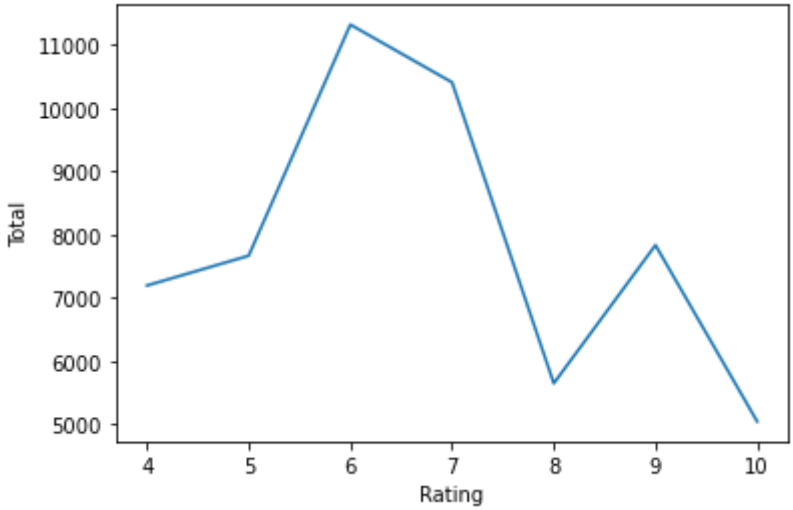
```
Billing of Electronic accessories based on rating
```



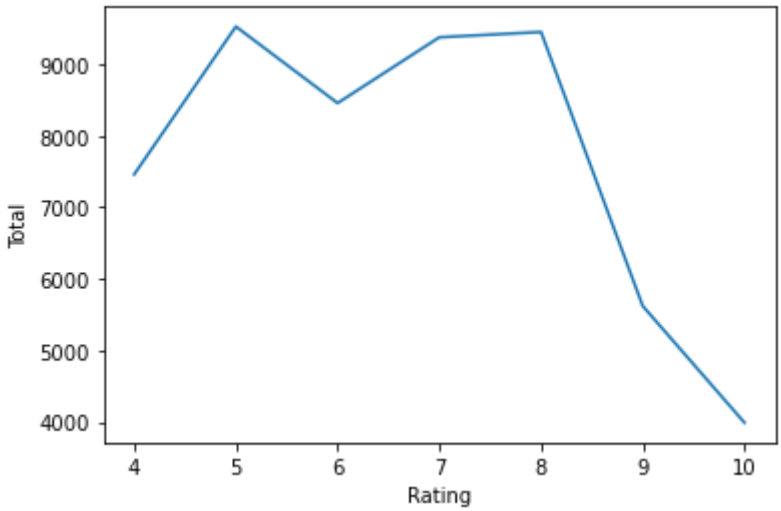

```
Billing of Fashion accessories based on rating
```



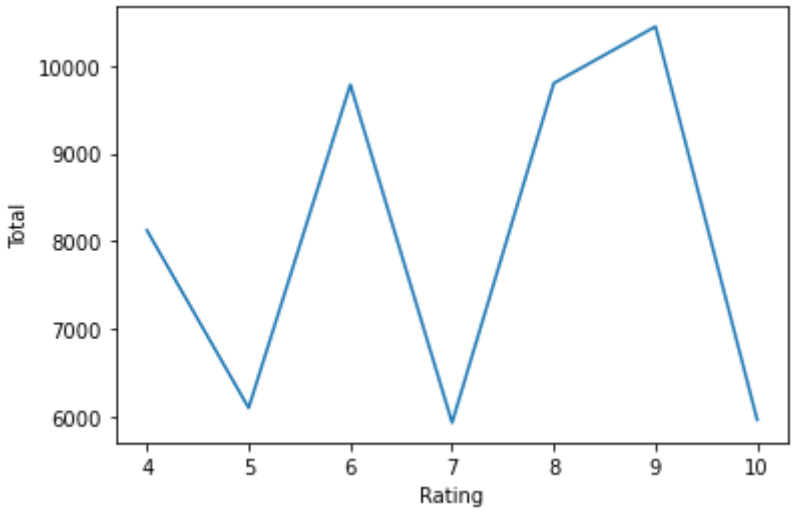
Billing of Sports and travel based on rating



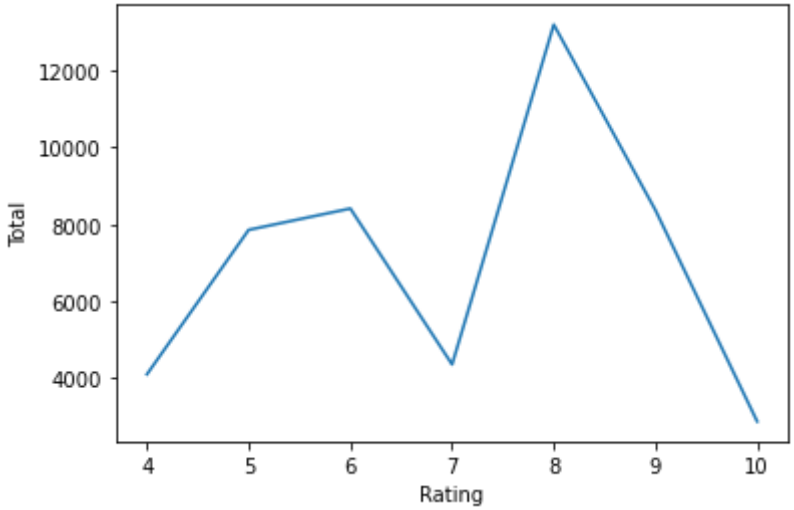
Billing of Home and lifestyle based on rating



Billing of Food and beverages based on rating



Billing of Health and beauty based on rating

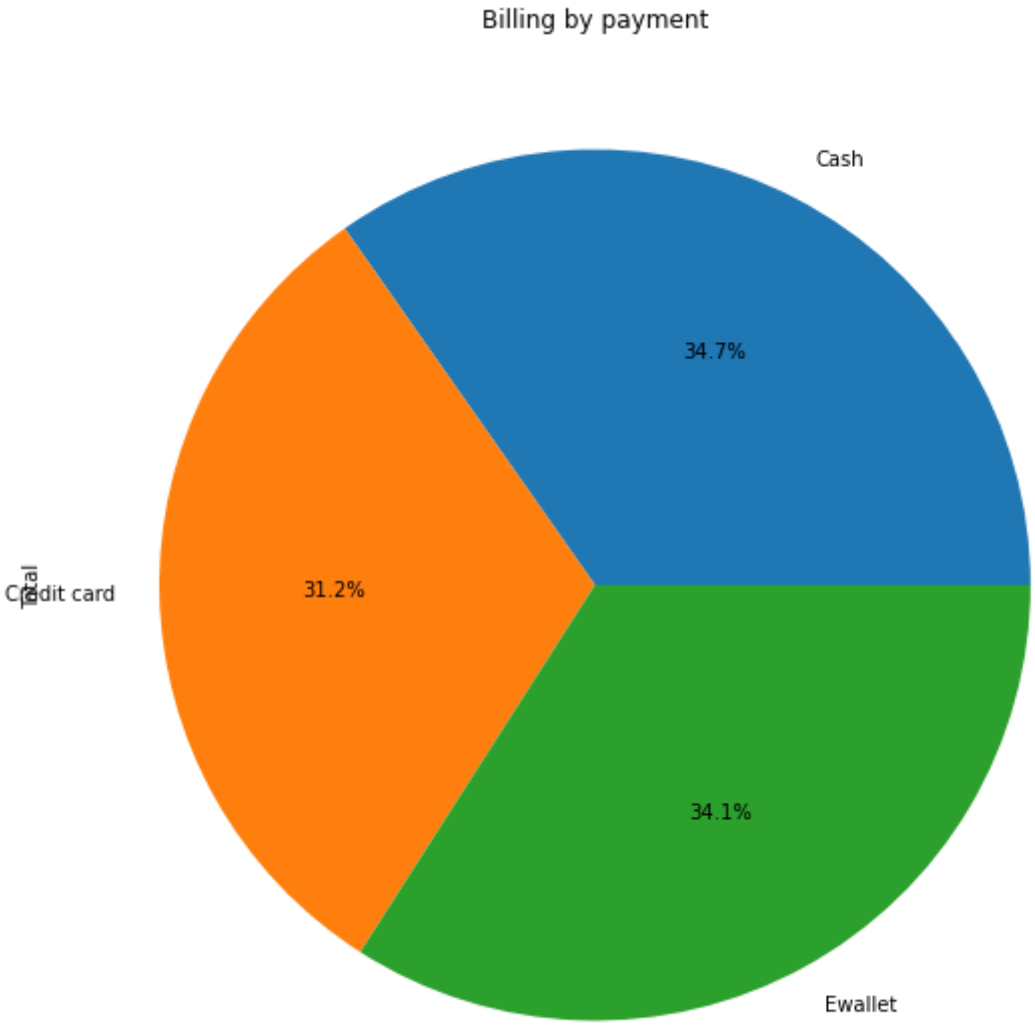


In [133…
```
#Billing by payment
sales_billing_per_payment_method = sales_file.groupby(['Payment'])['Total'].sum()
sales_billing_per_payment_method
```

Out[133]:
```
Payment
Cash           112206.570
Credit card    100767.072
Ewallet        109993.107
Name: Total, dtype: float64
```

In [134…
```
plt.figure(figsize=(14, 10))
sales_billing_per_payment_method.plot(kind='pie', autopct='%1.1f%%').set_title('Bi
```

Out[134]:
```
Text(0.5, 1.0, 'Billing by payment')
```



In [ ]:
```
#Summary
"""
1. Branch 'C' was the one that invoiced the most in the 3
months and the one that did the least was 'B'
2. Women were the highest spenders among all branches
during the 3 months
3. Without being a situation that occurs in all cases,
turnover tends to be higher in the next few days in the
middle of the month and the end of this
4. The days that were billed the most were Saturdays,
followed by Tuesdays
5. The days that were billed the least were Monday,
followed by Wednesdays
6. In branch 'A' more was invoiced in the 4:00 p.m. and
11:00 a.m. hours.
7. Branch 'A' billed less in the 6:00 p.m. and 2:00 p.m.
hours.
8. In the branch 'B' more was invoiced in the 7:00 p.m.
and 2:00 p.m. hours.
9. Branch 'B' billed less in the 4:00 p.m. and 12:00 p.m.
hours.
10. In branch 'C' more was invoiced in the hours of 7:00
p.m. and 1:00 p.m.
11. Branch 'C' billed less in the 5:00 p.m. and 12:00 p.m.
hours.
12. Branch 'A' billed more in the days sundays and saturdays.
13. Branch 'A' billed less in the days Wednesday and Monday.
```

```
14. In the branch 'B' more was invoiced in the days saturdays
and tuesdays.
15. In branch 'B' less was invoiced in the days sundays and
wednesdays.
16. In branch 'C' more was invoiced in the Saturdays and
Wednesdays (very even with Tuesdays).
17. In branch 'C' billed less in the days Monday and Thursday.
18. Electronic accessories reached their highest billing
points 6:00 p.m. and 11:00 a.m. (but containing various peaks)
19. Electronic accessories reached their lowest billing
points 12 noon and 4 p.m.
20. Fashion accessories hit their spots highest billing at
12 noon and 10 a.m. (very close to 7 p.m.)
21. Fashion accessories hit their spots lowest billing at
3:00 p.m. and 5:00 p.m.
22. Sports and travel products reached your highest billing
points at 7:00 p.m. and at 1:00 p.m.
23. Sports and travel products reached their lowest billing
points at 6:00 p.m. and at 11 a.m.
24. Home and lifestyle products reached their highest points
of billing at 5:00 p.m. and 11:00 a.m. (very closely they are
1:00 p.m. and 3:00 p.m.)
25. Home and lifestyle products reached their lowest billing
points at 2:00 p.m. and at 6:00 p.m.
26. Food and beverage products reached their highest billing
points at 7:00 p.m. and at 3:00 p.m.
27. Food and beverage products reached their lowest billing
points at 5:00 p.m. and at 1:00 p.m.
28. Health and beauty products reached their highest billing
points at 2:00 p.m. and at 1:00 p.m.
29. Health and beauty products reached their lowest billing
points at 4:00 p.m. and 11:00 a.m.
30. The product line that invoiced the most money was that of
food and drink (very closely that of sports and trips)
31. The product line that invoiced less money was health and
beauty
32. At branch 'A', the product lines that most billed were:
home and lifestyle, sports and travel
33. At branch 'A', the product lines that least invoiced were:
health and beauty, beauty accessories
34. At branch 'B', the product lines that most billed were:
sports and travel, health and lifestyle life
35. At branch 'B', the product lines that least invoiced were:
food and drink, fashion accessories
36. At branch 'C', the product lines that most invoiced were:
food and drink, fashion accessories
37. At branch 'C', the product lines that least billed were:
home and lifestyle, sports and travel
38. Considering the feedback given by customers about electronic
accessories, which reached their highest billing points were the
that have 6 and 5 valuation
39. Considering the feedback given by customers about accessories
electronics, which reached their lowest points billing were those
with 10 and 4 valuation
40. Considering the feedback given by customers about accessories
fashion, those who reached their highest points of billing were the
ones they have 7 and 8 valuation
41. Considering the feedback given by customers about accessories
fashion, those who reached their lowest points were those with 4
and 10 (very even with those with 5) rating
42. Considering the assessment given by the customers about the
products sport and travel, those who reached their points highest
billing were the who have 6 and 7 valuation
43. Considering the assessment given by the customers about the
```

```
products sport and travel, those who reached their
points lowest billing were the that have 8 and 10 valuation
44. Considering the assessment given by the customers about the
products home and lifestyle, those who achieved their highest
billing points were those who have 5 and 8 (very even with those
of 7) valuation
45. Considering the assessment given by the customers about
household products and lifestyle, those who reached their points
lowest billing were those who they have 10 and 9 valuation
46. Considering the feedback given by customers about food
and drink, those who reached their highest billing points
were those  with 9 and 8 (very closely those with 6) valuation
47. Considering the feedback given by customers about food
and drink that reached their lowest billing points were those
who have 10 and 7 (very close those with 5) rating
48. Considering the feedback given by customers about health
products and beauty, those who reached their highest points of
billing were those with 8 and 9 valuation
49. Considering the feedback given by customers about health
products and beauty, those who reached their lowest points of
billing were those with 10 and 7 rating
50. The method of payment for which the most was billed was
cash and the least was by credit card
"""
```

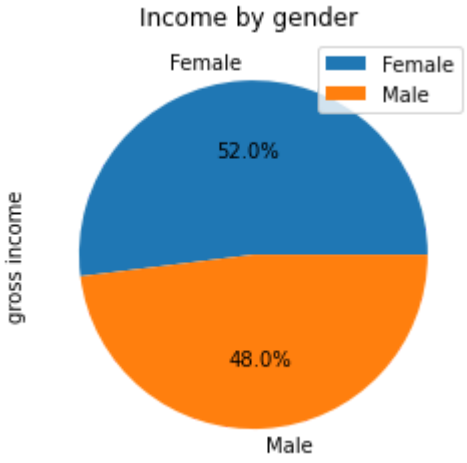
In [135…
```
#Income by gender
sales_file_gender_income = pd.DataFrame(sales_file.groupby('Gender')['gross income
sales_file_gender_income
```

Out[135]:

Gender	gross income
Female	7994.425
Male	7384.944

In [136…
```
sales_file_gender_income.plot(kind='pie',y='gross income',autopct='%1.1f%%').set_t
```

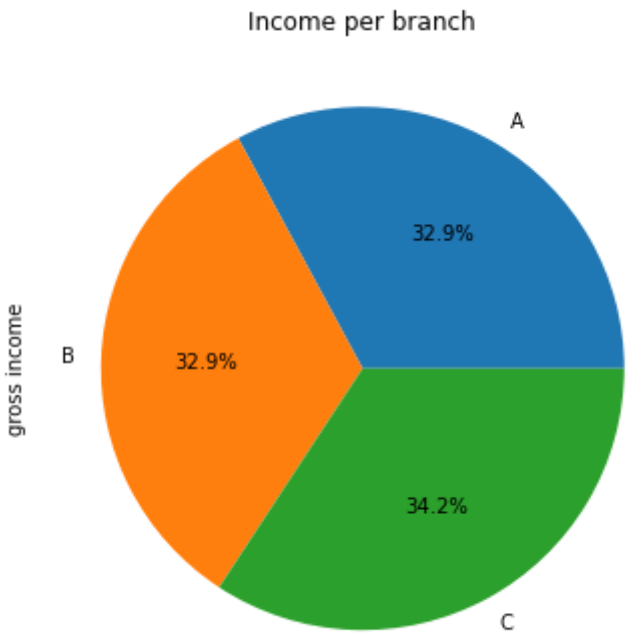
Out[136]:
```
Text(0.5, 1.0, 'Income by gender ')
```



In [137…
```
#Income per branch
sales_file_branch_income = sales_file.groupby('Branch')['gross income'].sum()
sales_file_branch_income
```

Out[137]:
```
Branch
A    5057.1605
B    5057.0320
C    5265.1765
Name: gross income, dtype: float64
```

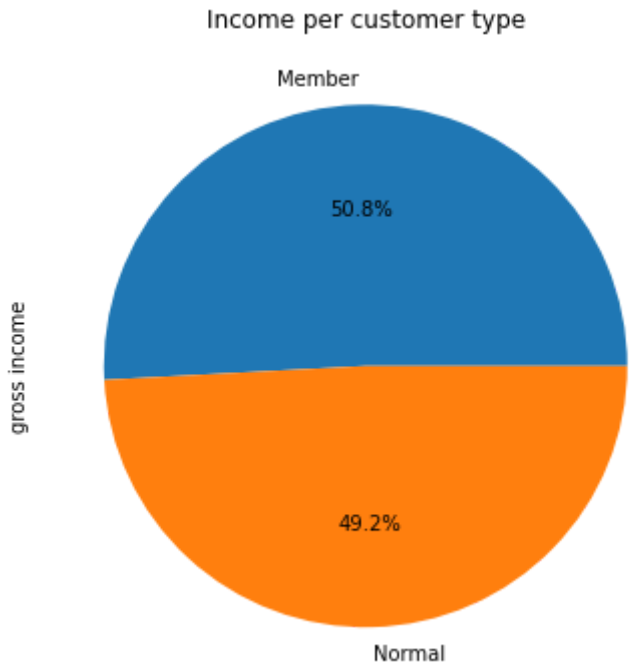
In [138…
```
plt.figure(figsize=(10, 6))
sales_file_branch_income.plot(kind='pie',y='gross income',autopct='%1.1f%%').set_t
plt.show()
```



In [139…
```
#Income per customer type
sales_file_customer_type_income = sales_file.groupby('Customer type')['gross incom
sales_file_customer_type_income
```

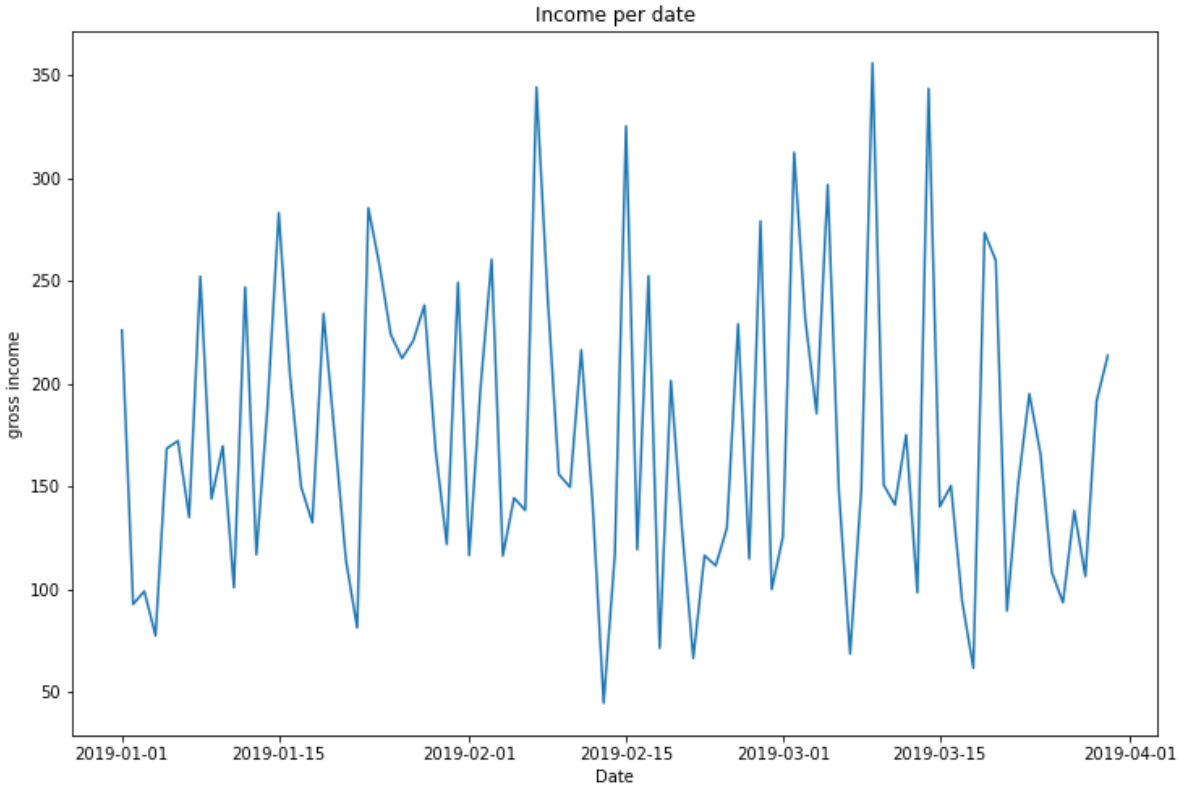
Out[139]:
```
Customer type
Member    7820.164
Normal    7559.205
Name: gross income, dtype: float64
```

In [140…
```
plt.figure(figsize=(10, 6))
sales_file_customer_type_income.plot(kind='pie',y='gross income',autopct='%1.1f%%'
plt.show()
```



In [141…
```
#Income per date
sales_income_date = pd.DataFrame(sales_file.groupby(['Date'])['gross income'].sum(
sales_income_date = sales_income_date.reset_index()
plt.figure(figsize=(12,8))
sns.lineplot(x = 'Date', y = 'gross income',data = sales_income_date).set_title('In
```

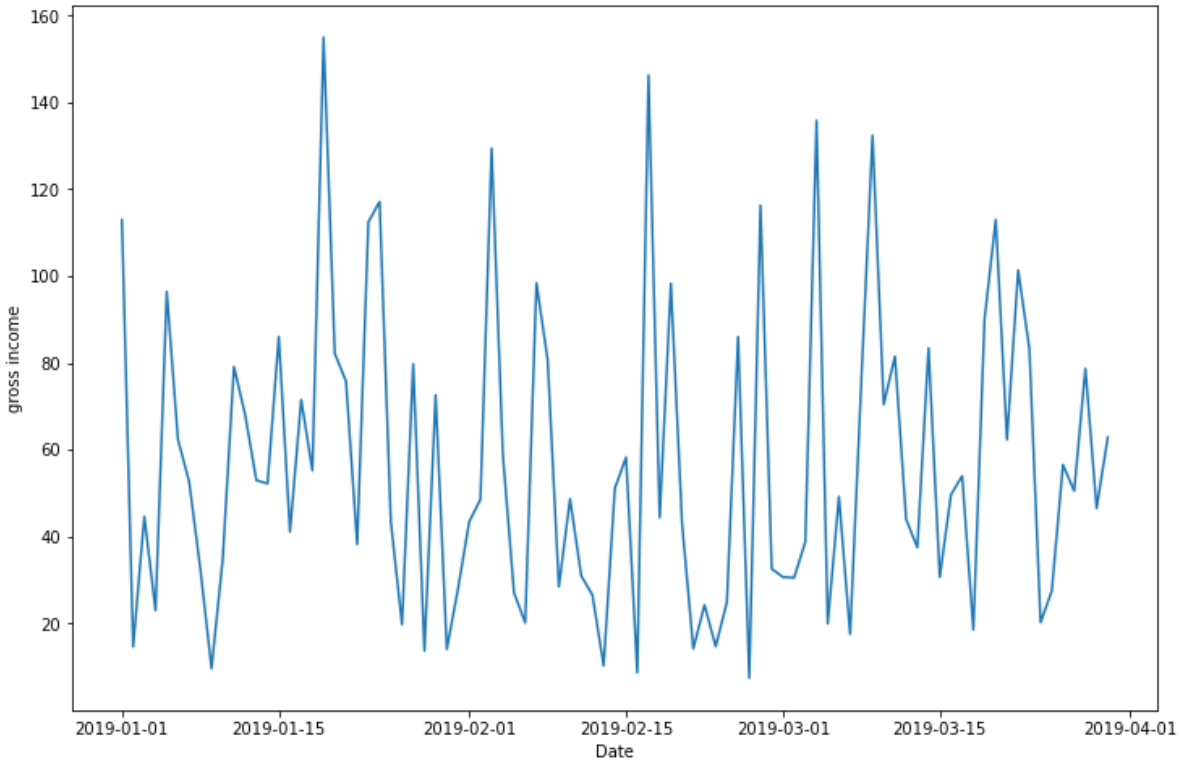
Out[141]:
```
Text(0.5, 1.0, 'Income per date')
```



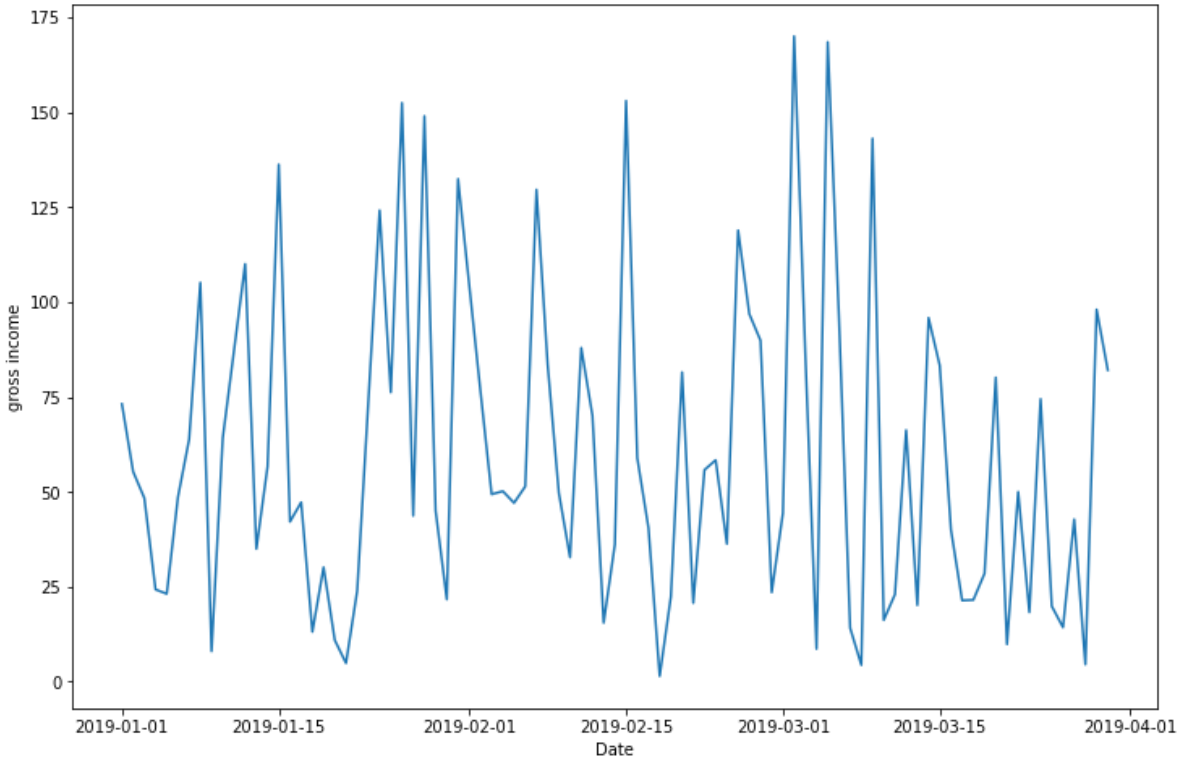
In [142…
```
#Income based on date (for each branch)
Branch = ['A', 'B', 'C']
for branch in Branch:
    sales_branch = sales_file[sales_file['Branch']==branch]
    sales_income_date_branch = pd.DataFrame(sales_branch.groupby(['Branch', 'Date'
    sales_income_date_branch = sales_income_date_branch.reset_index()
    print(f'Income of branch {branch} based on date')
```

```
    plt.figure(figsize=(12,8))
    sns.lineplot(x = 'Date', y = 'gross income',data = sales_income_date_branch)
    plt.show()
```

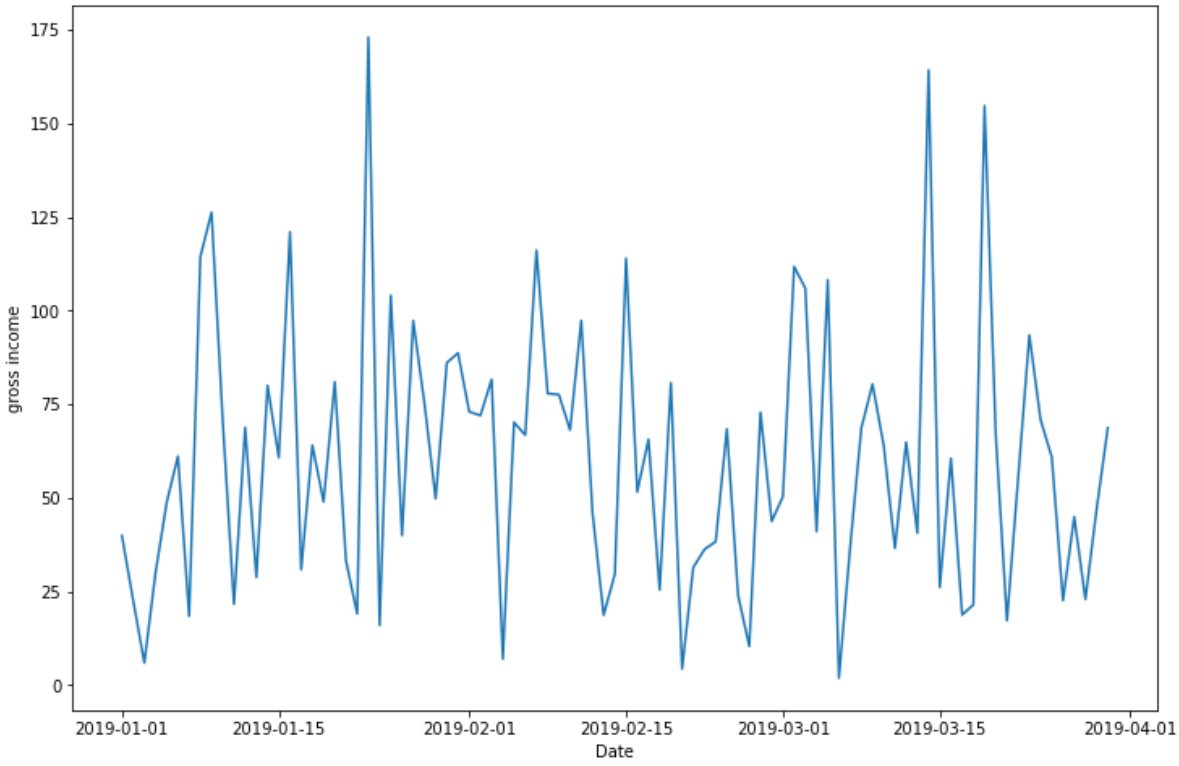
Income of branch A based on date



Income of branch B based on date



Income of branch C based on date

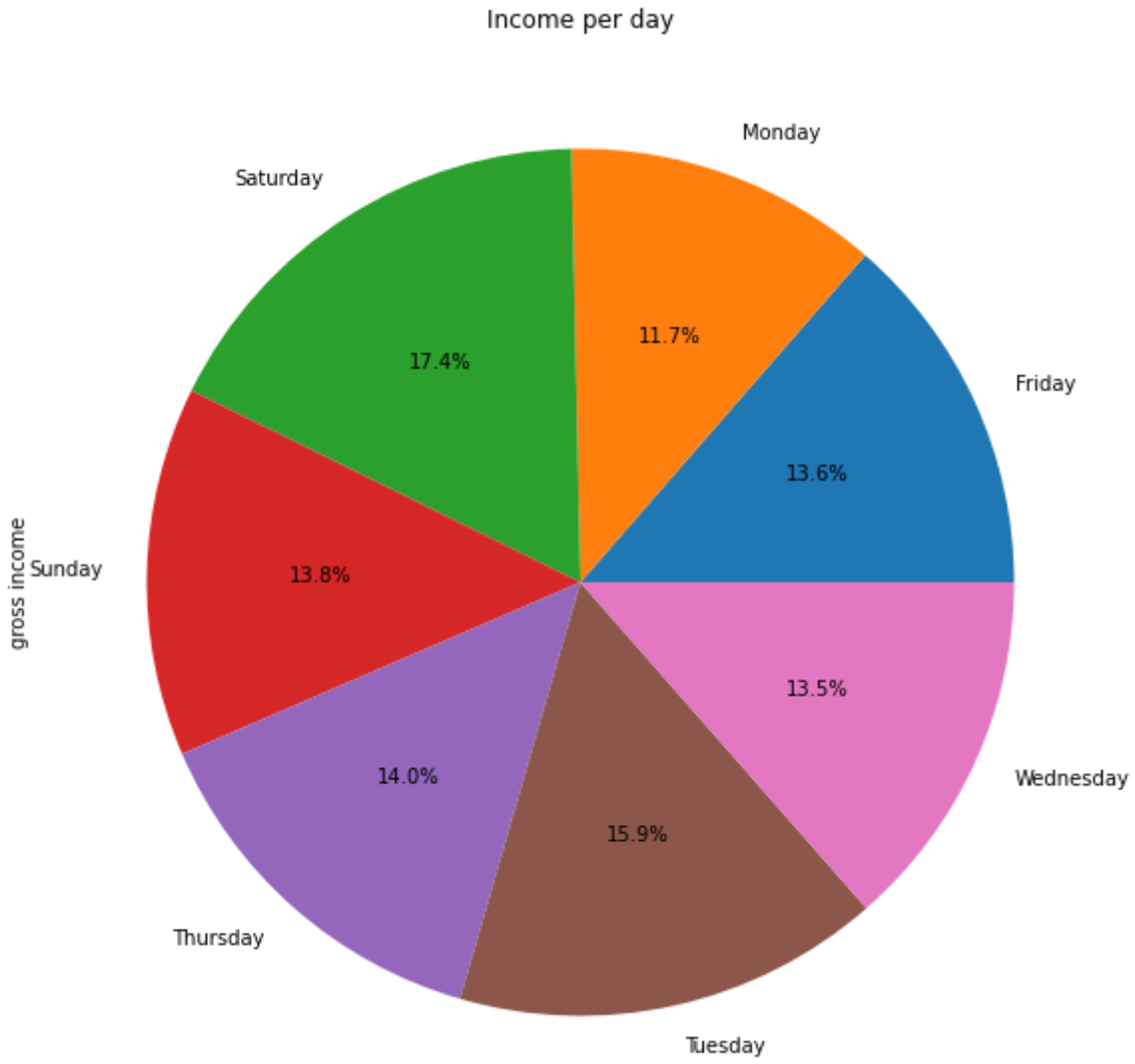


In [143…
```
#Income per day
sales_income_per_day = sales_file.groupby(['day'])['gross income'].sum()
sales_income_per_day
```

Out[143]:
```
day
Friday       2091.7305
Monday       1804.7180
Saturday     2672.4195
Sunday       2117.0425
Thursday     2159.4880
Tuesday      2451.5355
Wednesday    2082.4350
Name: gross income, dtype: float64
```

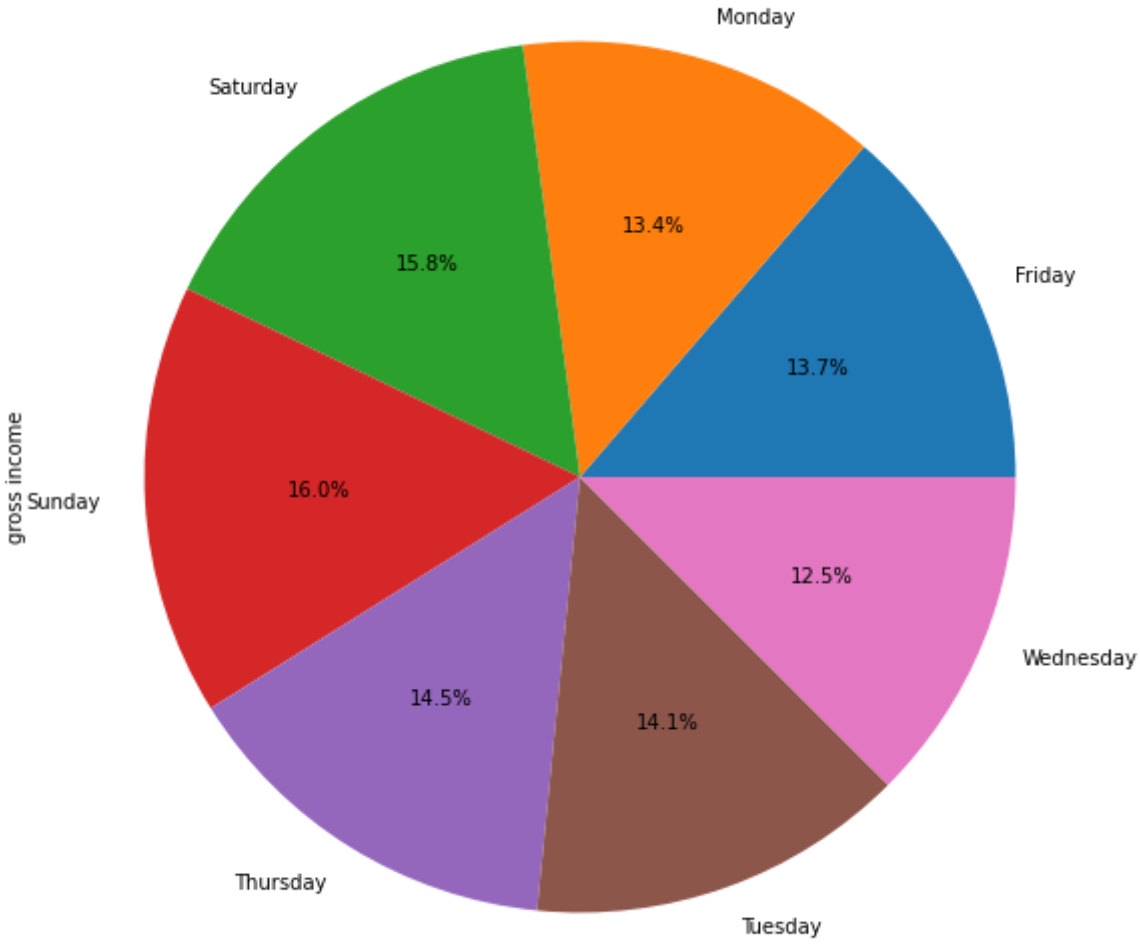
In [144…
```
plt.figure(figsize=(14,10))
sales_income_per_day.plot(kind='pie', autopct='%1.1f%%').set_title('Income per day
```

Out[144]:
```
Text(0.5, 1.0, 'Income per day')
```

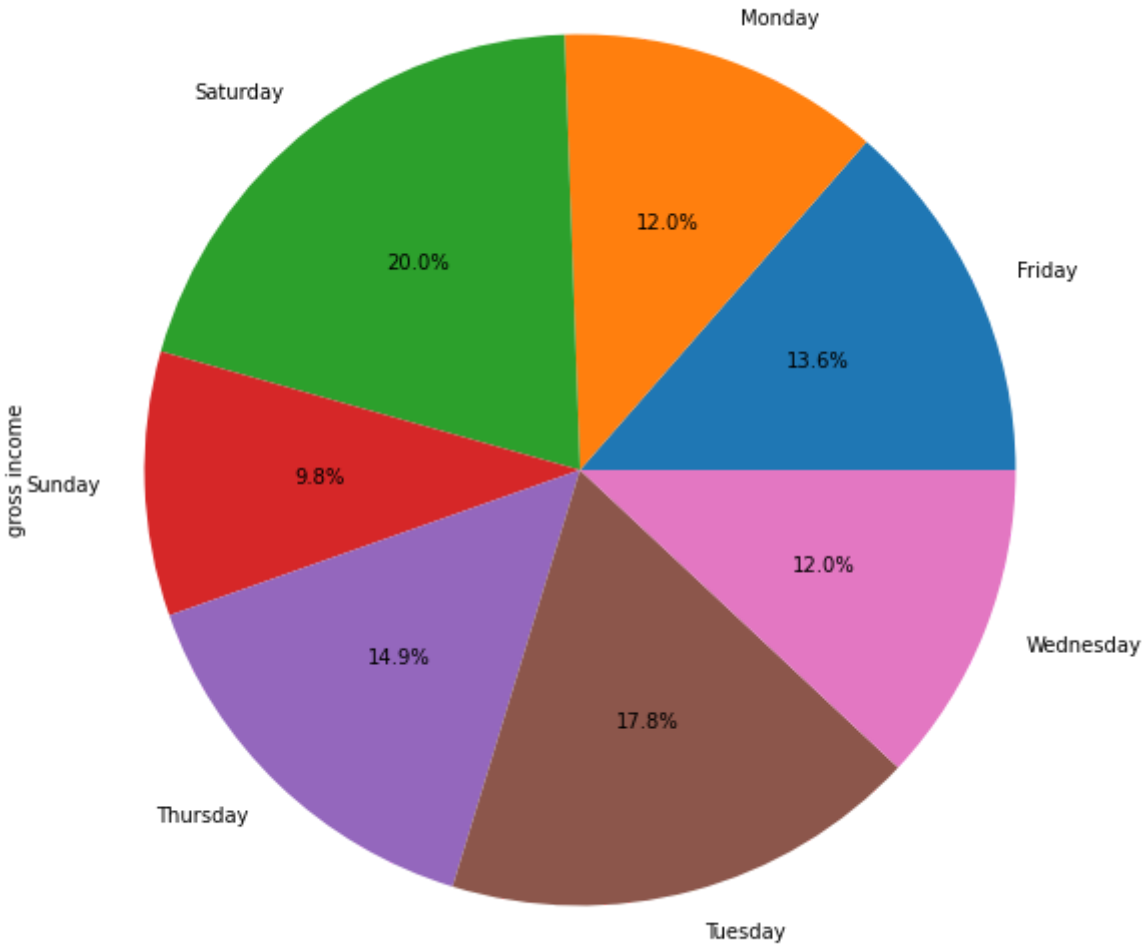


In [145…
```
#Income based on the day (of each branch)
for branch in Branch:
    sales_branch = sales_file[sales_file['Branch']==branch]
    income_per_day_and_branch = sales_branch.groupby('day')['gross income'].sum()
    print(f'Income of branch {branch} per day')
    plt.figure(figsize=(14,10))
    income_per_day_and_branch.plot(kind='pie', autopct='%1.1f%%')
    plt.show()
```

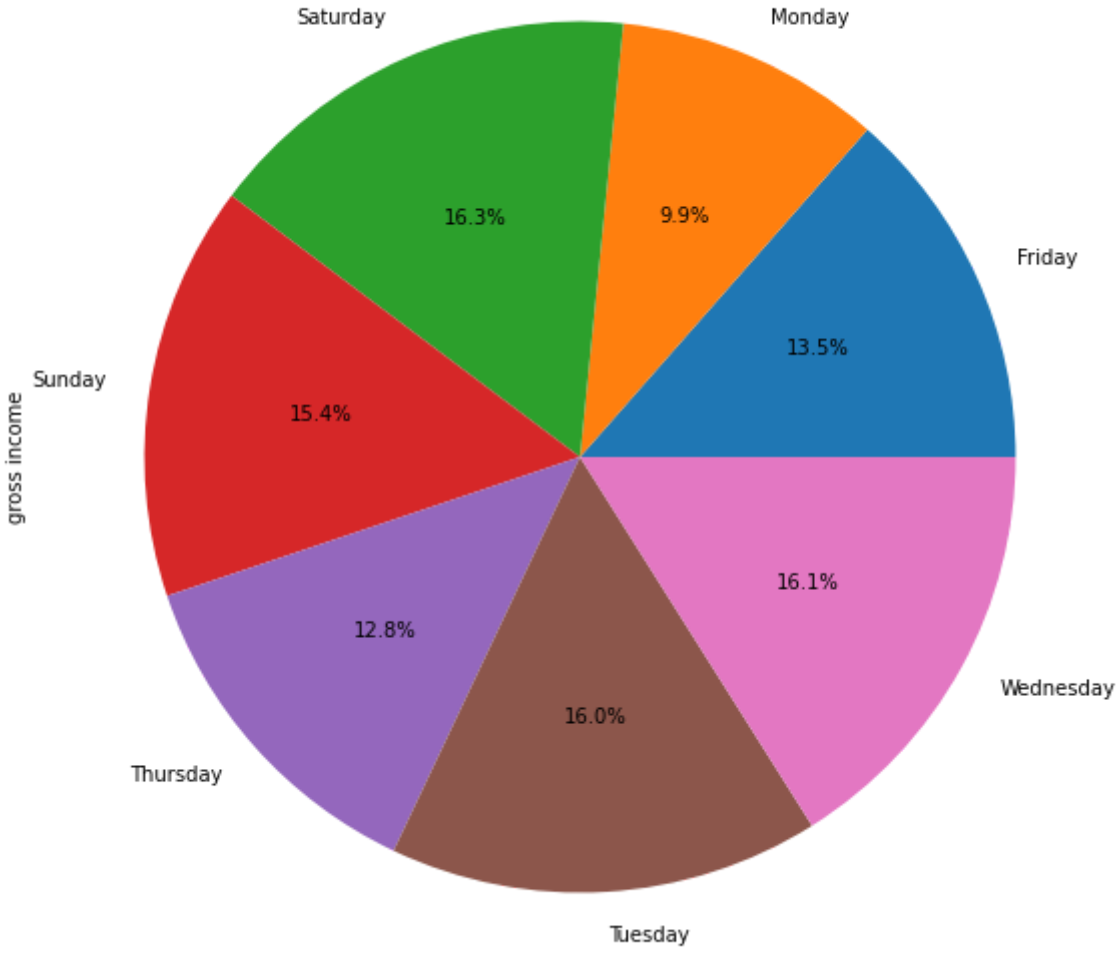
```
Income of branch A per day
```



Income of branch B per day

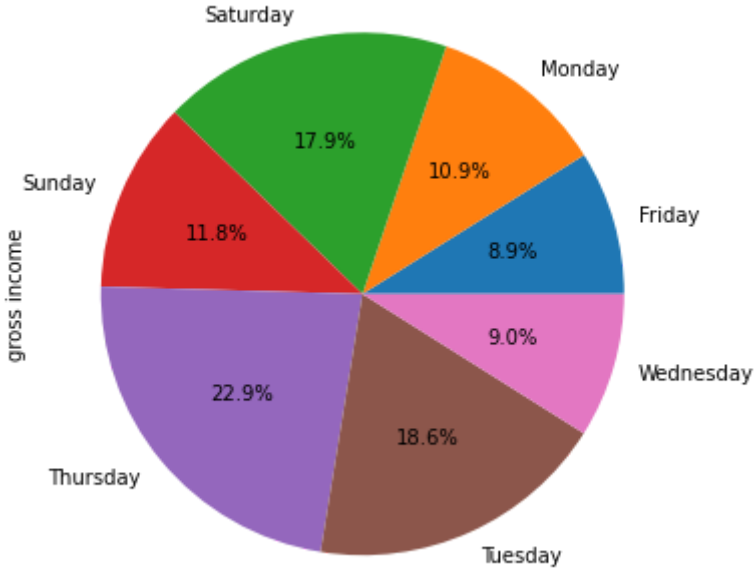


Income of branch C per day

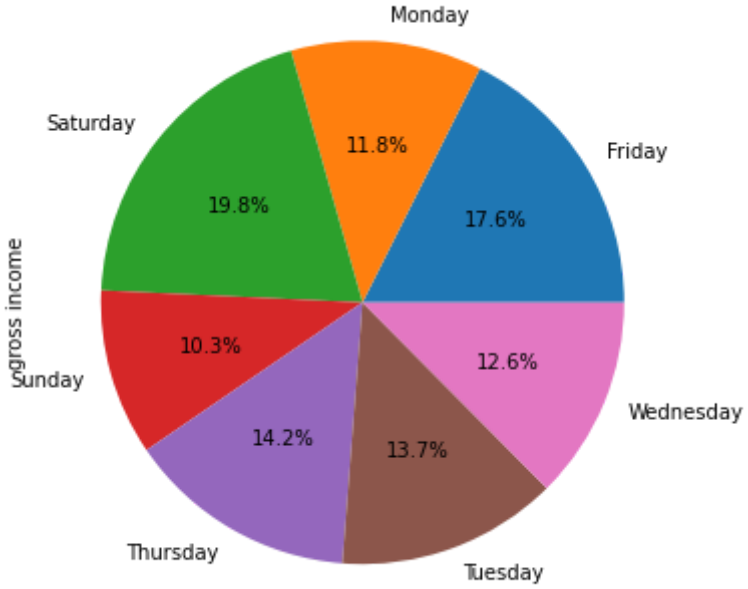


In [146…
```
#Income of each product line based on the day
for line in product_lines:
    sales_line = sales_file[sales_file['Product line']==line]
    income_per_day_and_line = sales_line.groupby('day')['gross income'].sum()
    print(f'Income of {line} per day')
    plt.figure(figsize=(8,6))
    income_per_day_and_line.plot(kind='pie', autopct='%1.1f%%')
    plt.show()
```

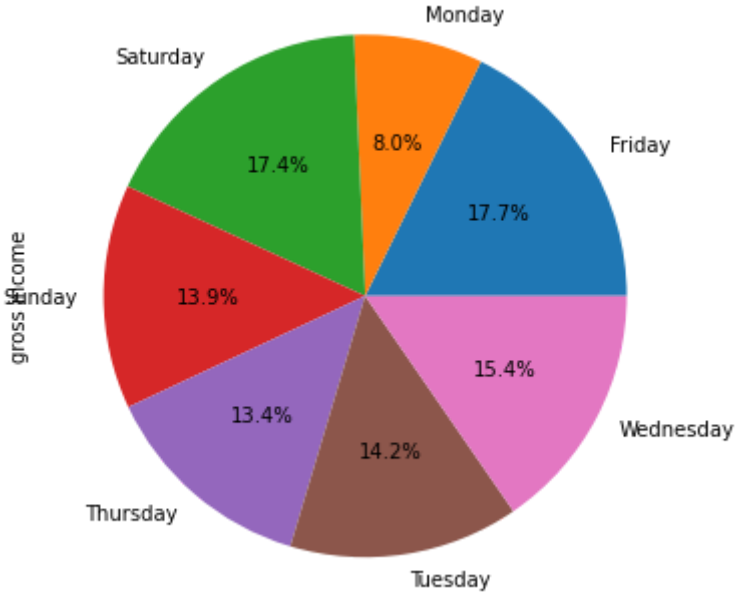
```
Income of Electronic accessories per day
```



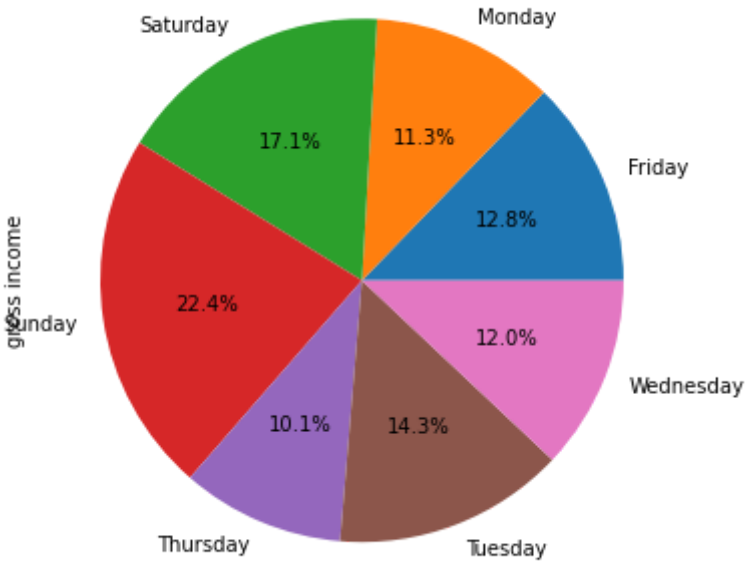
Income of Fashion accessories per day



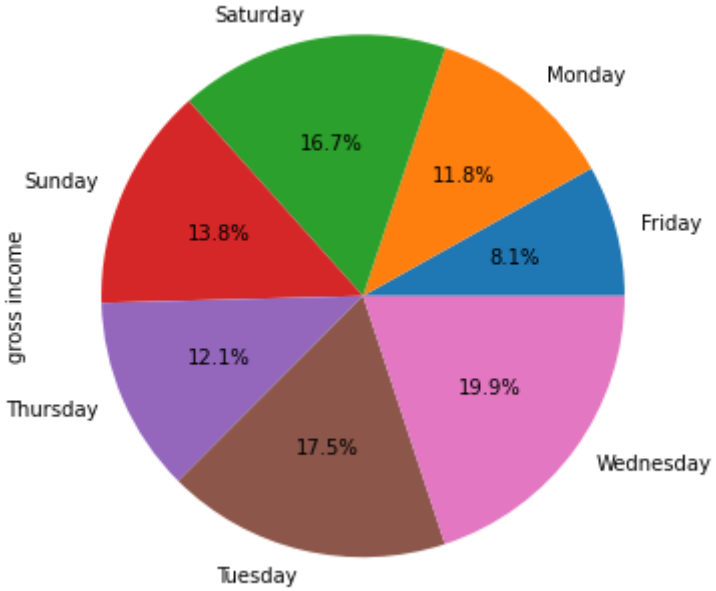
Income of Sports and travel per day



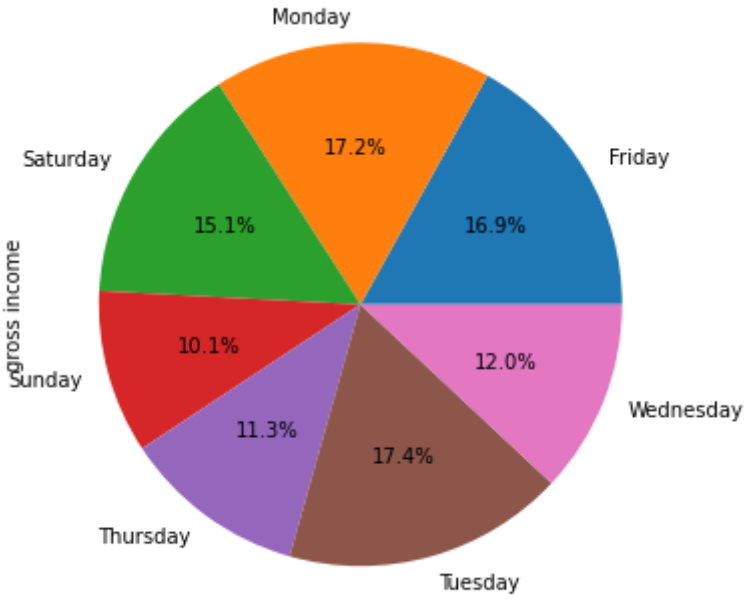
Income of Home and lifestyle per day



Income of Food and beverages per day



Income of Health and beauty per day

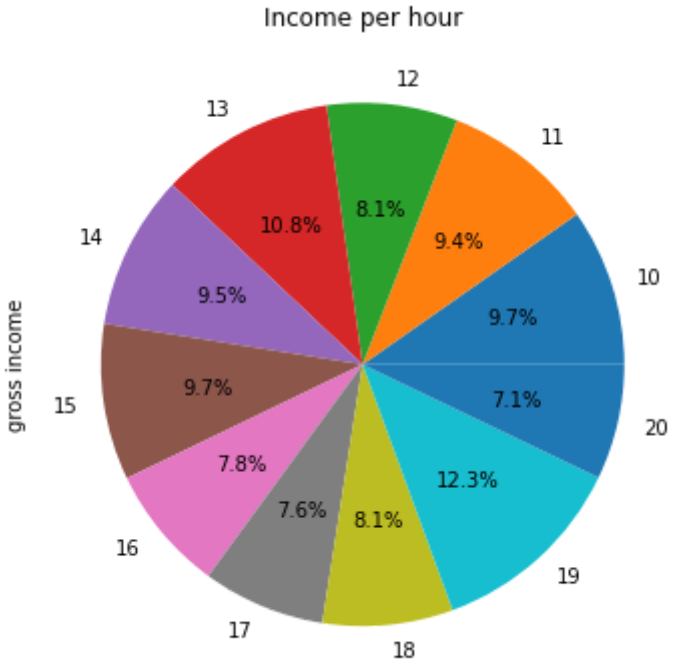


In [147…
```
#Income per hour
sales_income_hour = sales_file.groupby('hour')['gross income'].sum()
sales_income_hour
```

Out[147]:
```
hour
10    1496.2610
11    1446.5395
12    1241.2325
13    1653.4870
14    1468.0190
15    1484.7385
16    1201.2535
17    1164.0580
18    1239.5400
19    1890.4530
20    1093.7870
Name: gross income, dtype: float64
```

In [148…
```
plt.figure(figsize=(10,6))
sales_income_hour.plot(kind='pie', autopct='%1.1f%%').set_title('Income per hour')
```

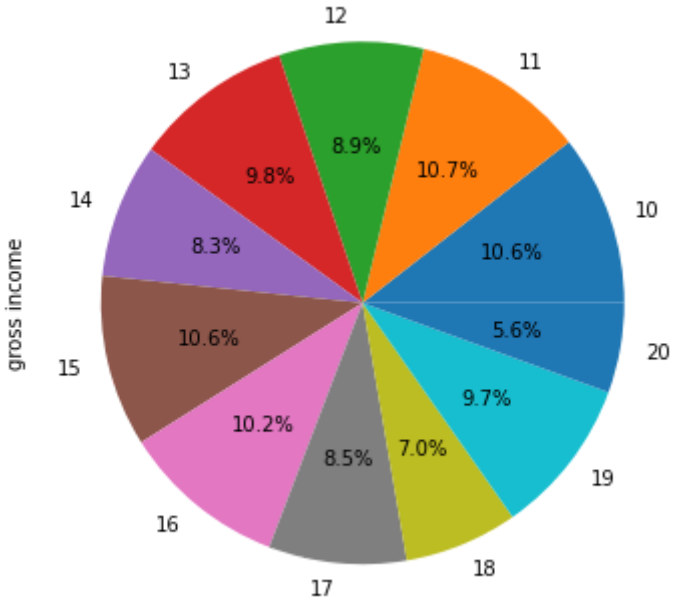
```
plt.show()
```



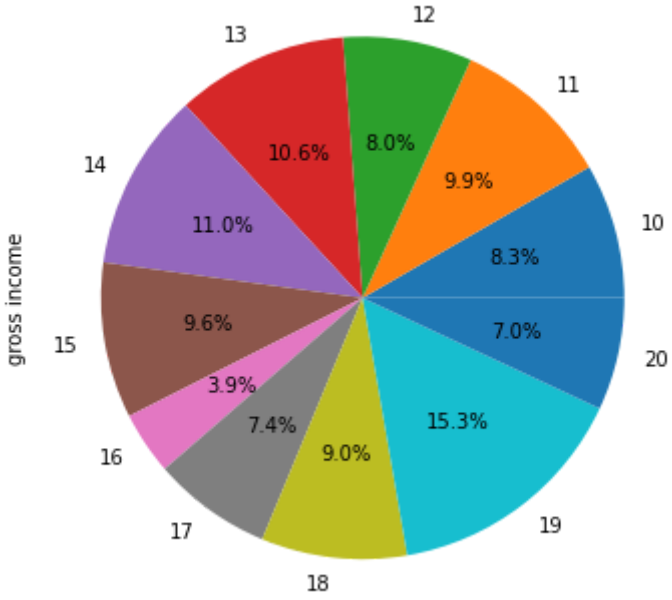
In [149…

```
#Income based on the hour (of each branch)
for branch in Branch:
    sales_branch = sales_file[sales_file['Branch']==branch]
    sales_income_hour_branch = sales_branch.groupby('hour')['gross income'].sum()
    print(f'Income of branch {branch} pero hour')
    plt.figure(figsize=(10,6))
    sales_income_hour_branch.plot(kind='pie', autopct='%1.1f%%')
    plt.show()
```

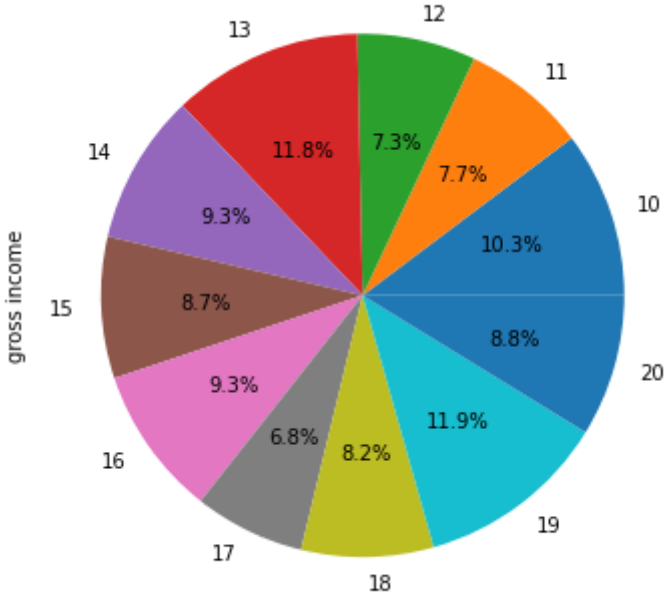
```
Income of branch A pero hour
```




```
Income of branch B pero hour
```

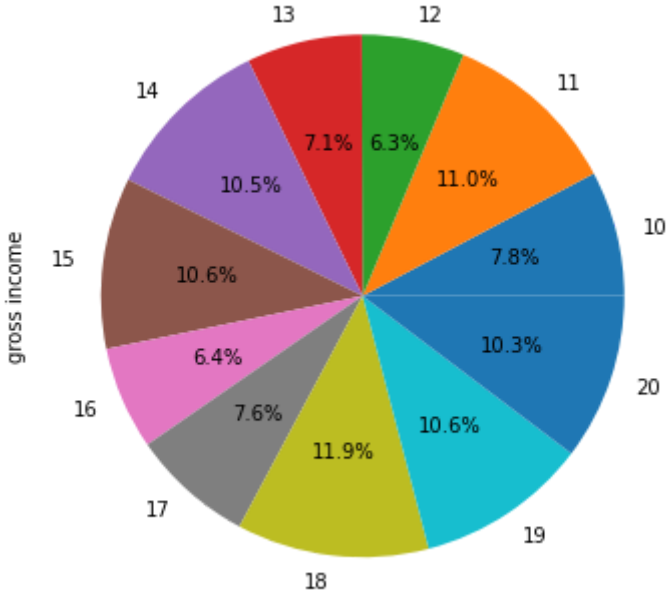


Income of branch C pero hour

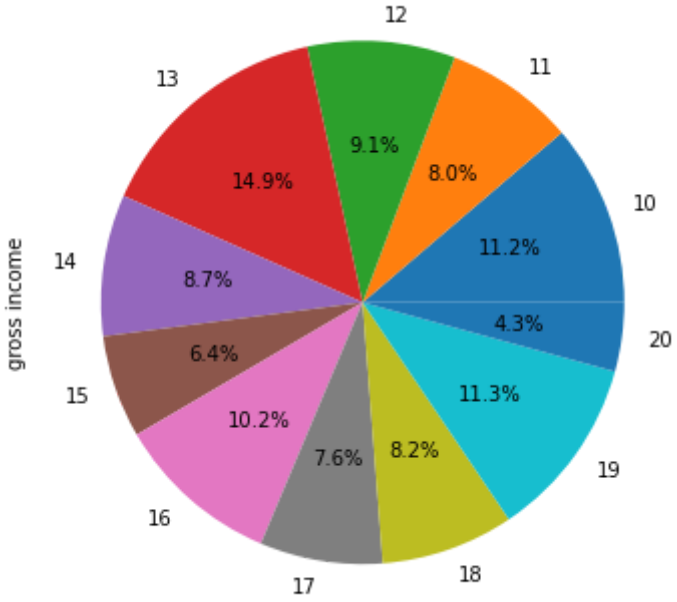


In [150…
```
#Profit obtained from each product line based on the hour
for line in product_lines:
    sales_line_2 = sales_file[sales_file['Product line']==line]
    sales_income_hour_line = sales_line_2.groupby('hour')['gross income'].sum()
    print(f'Income of {line} per hour')
    plt.figure(figsize=(8,6))
    sales_income_hour_line.plot(kind='pie', autopct='%1.1f%%')
    plt.show()
```

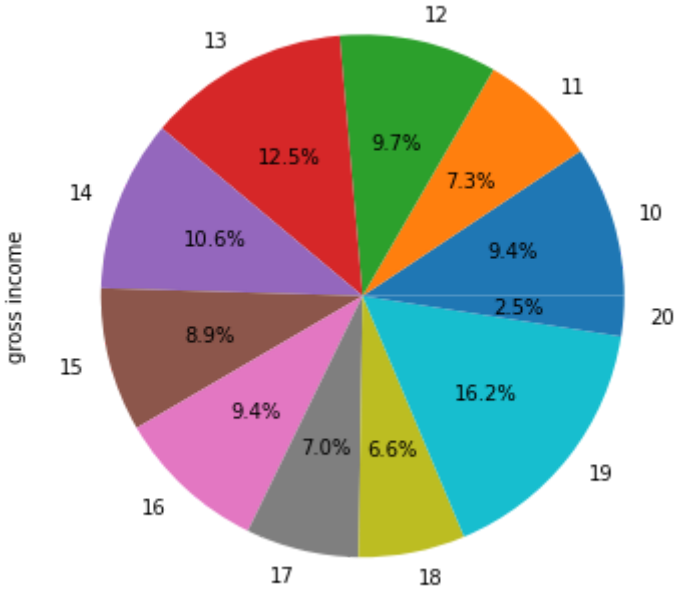
Income of Electronic accessories per hour



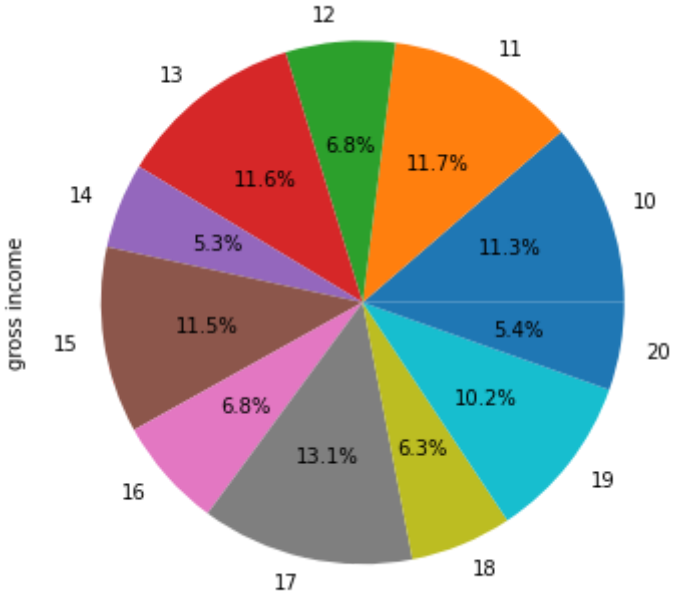
Income of Fashion accessories per hour



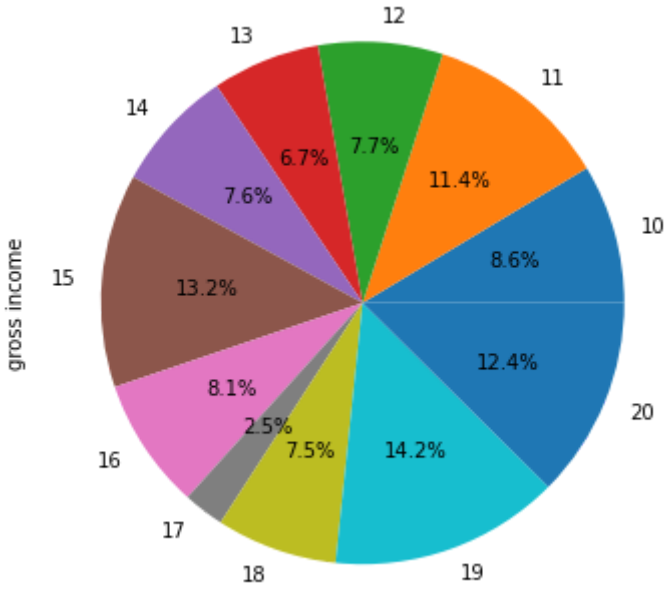
Income of Sports and travel per hour



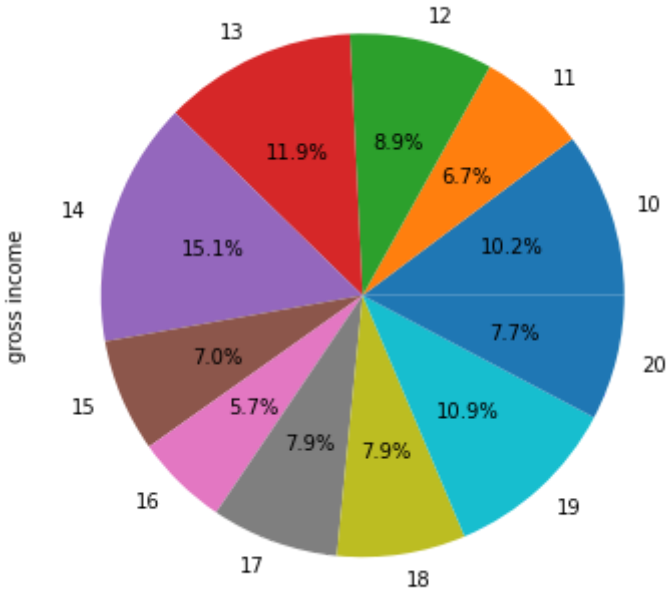
Income of Home and lifestyle per hour



Income of Food and beverages per hour



Income of Health and beauty per hour

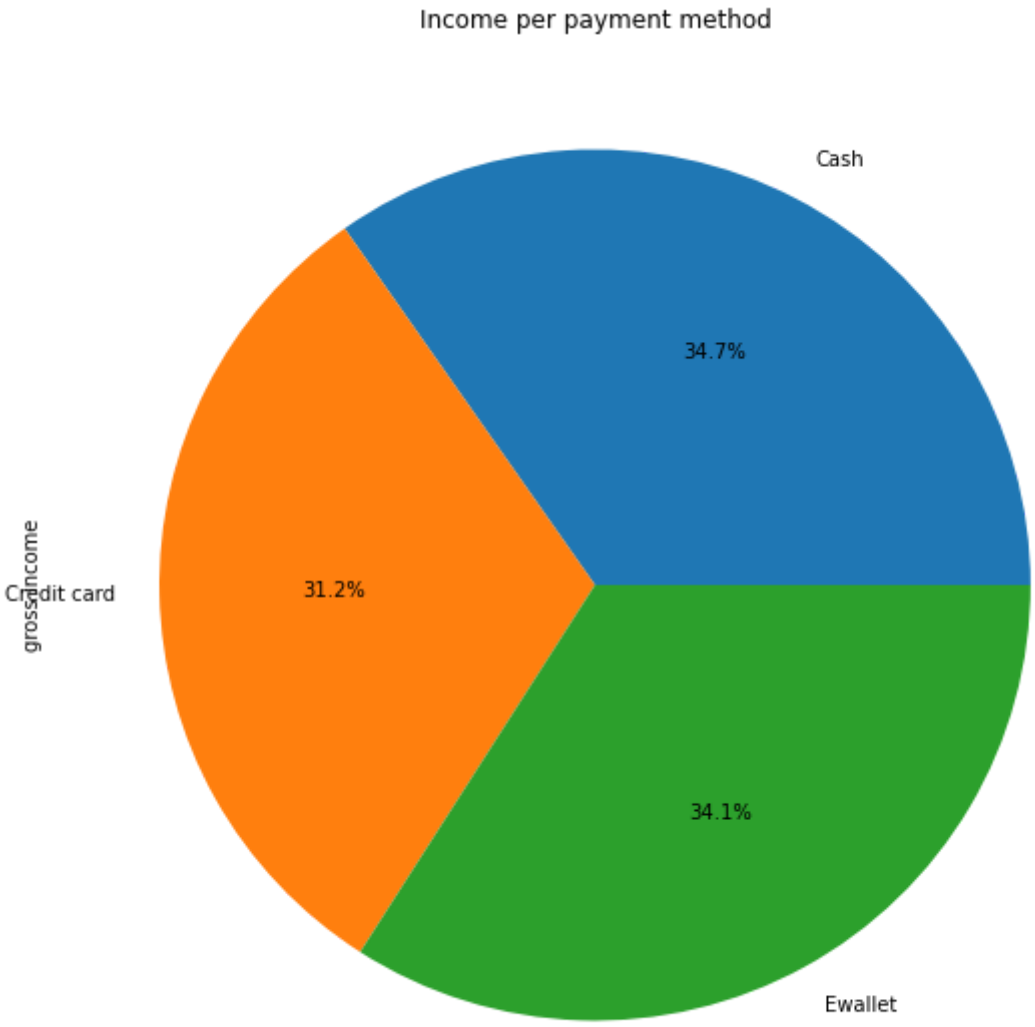


In [152…
```
#Income per payment method
sales_income_per_payment_method = sales_file.groupby(['Payment'])['gross income'].
sales_income_per_payment_method
```

Out[152]:
```
Payment
Cash           5343.170
Credit card    4798.432
Ewallet        5237.767
Name: gross income, dtype: float64
```

In [153…
```
plt.figure(figsize=(14, 10))
sales_income_per_payment_method.plot(kind='pie', autopct='%1.1f%%').set_title('Inc
```

Out[153]:
```
Text(0.5, 1.0, 'Income per payment method')
```

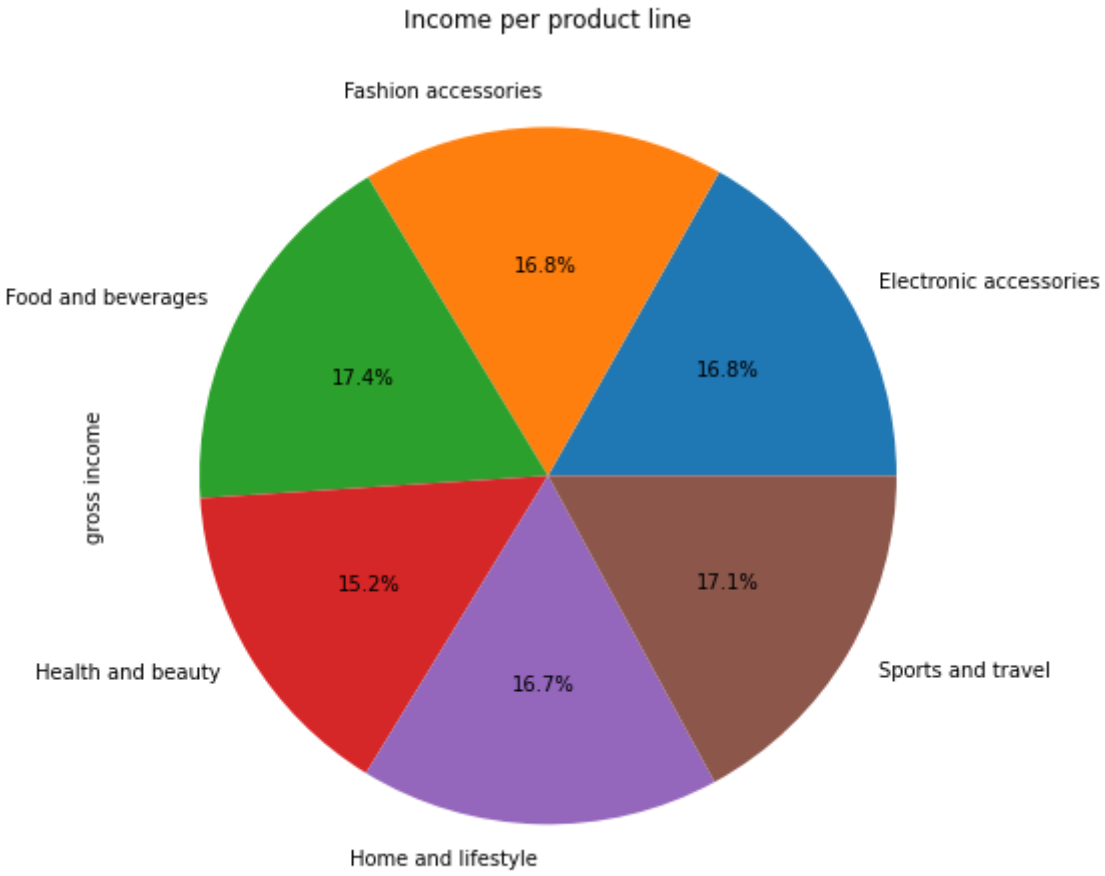


In [154…
```
#Income per product line
sales_income_per_product_line = sales_file.groupby(['Product line'])['gross income
sales_income_per_product_line
```

Out[154]:
```
Product line
Electronic accessories    2587.5015
Fashion accessories       2585.9950
Food and beverages        2673.5640
Health and beauty         2342.5590
Home and lifestyle        2564.8530
Sports and travel         2624.8965
Name: gross income, dtype: float64
```

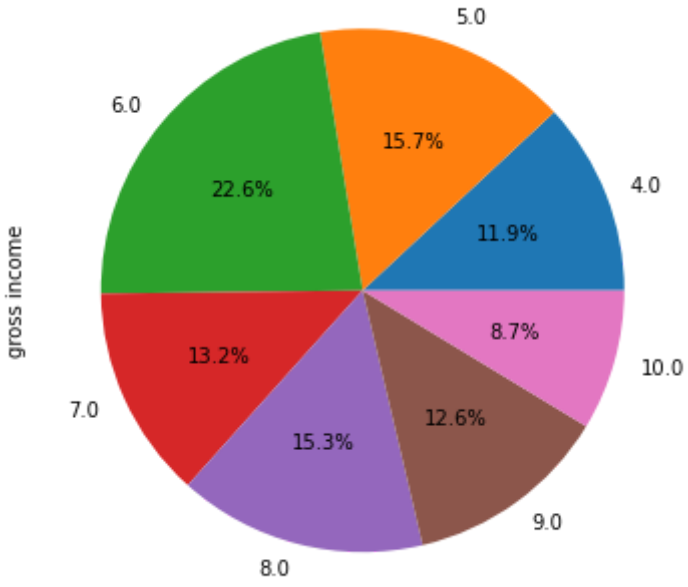
In [155…
```
plt.figure(figsize=(12, 8))
sales_income_per_product_line.plot(kind='pie', autopct='%1.1f%%').set_title('Income
```

Out[155]:
```
Text(0.5, 1.0, 'Income per product line')
```

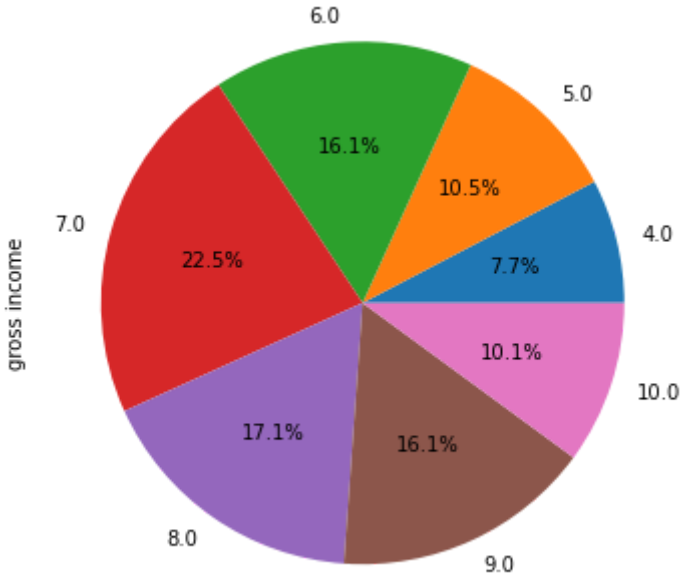


In [156…
```
#Income based on the rating of each product line
for line in product_lines:
    sales_line_3 = sales_rating[sales_rating['Product line']==line]
    sales_income_rating_product_line = sales_line_3.groupby('Rating')['gross income
    print(f'Income of {line} based on the rating')
    plt.figure(figsize=(8,6))
    sales_income_rating_product_line.plot(kind='pie', autopct='%1.1f%%')
    plt.show()
```

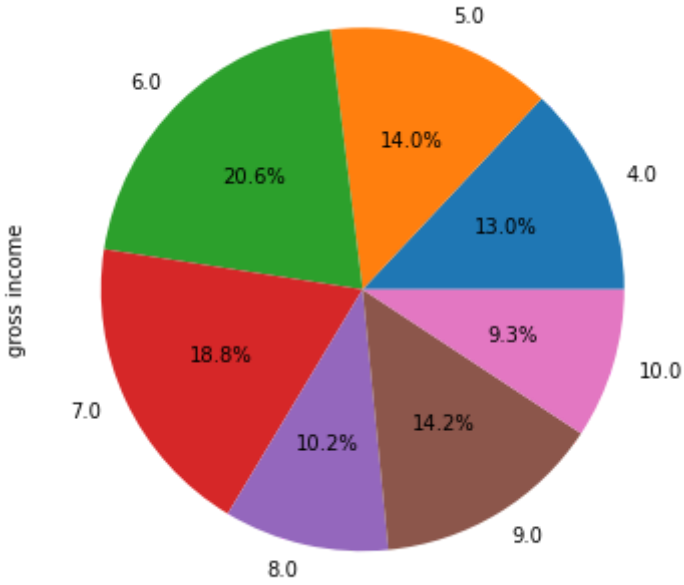
```
Income of Electronic accessories based on the rating
```



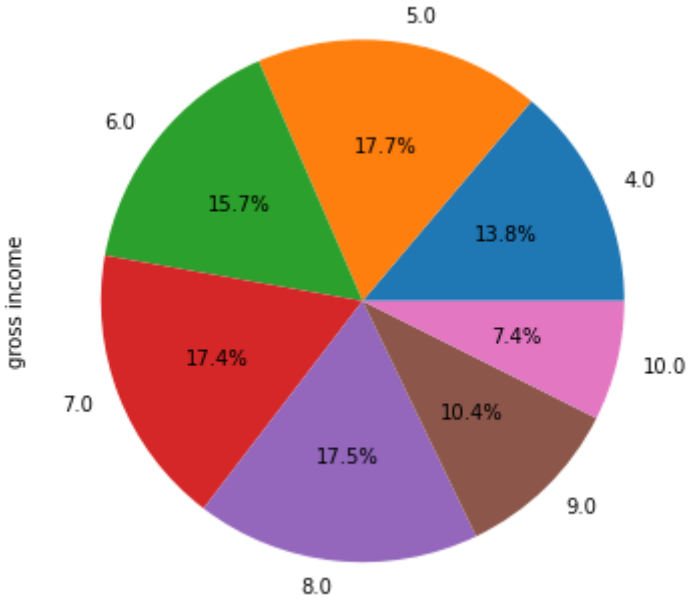

```
Income of Fashion accessories based on the rating
```



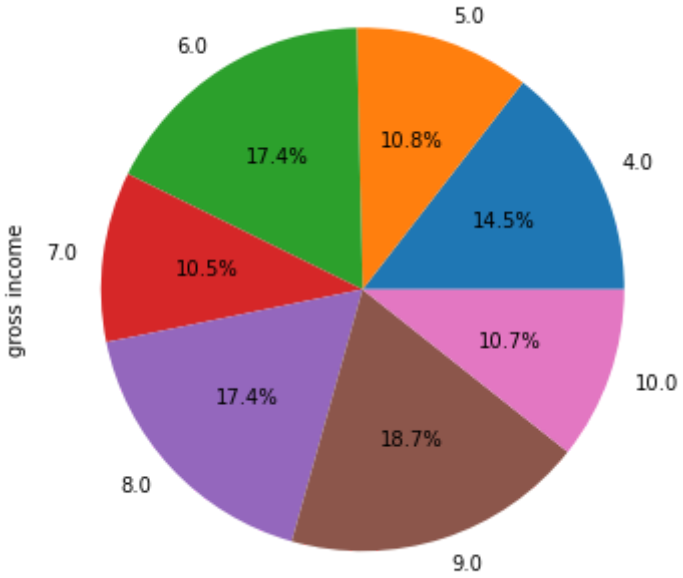
Income of Sports and travel based on the rating



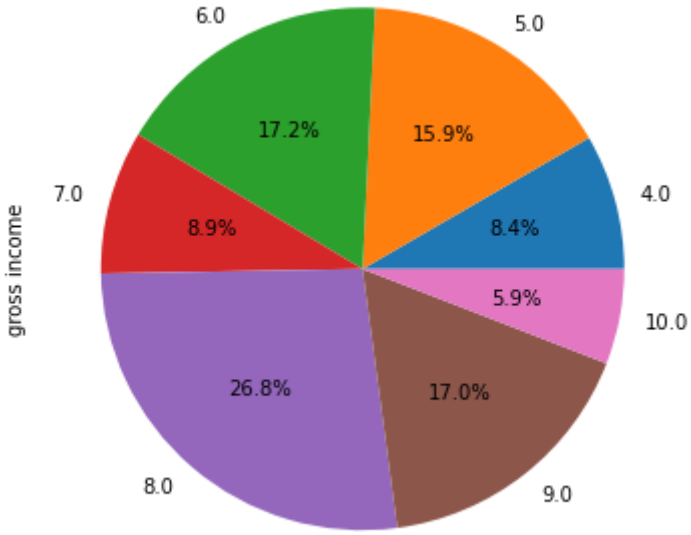
Income of Home and lifestyle based on the rating



Income of Food and beverages based on the rating



Income of Health and beauty based on the rating



In [ ]:
```
#Summary
"""
1. What is analyzed in this section is the same as in the
billing section, but with another graph style To better
visualize the percentage that represents each value
"""
```

In [ ]:
```
#Recommendations
"""
1. The valuation does not tend to be very high, it is
product quality needs to be improved or services
2. Wholesale purchase offers can be made, among other
activities on the days fewer people attend branches,
thus attracting more clients
3. If we manage to increase the quality of our products
we could try to upload in certain grade the prices, well
get more profit
4. After analyzing the tastes of men and women Regarding
the product lines we can conclude that it is the women you
prefer accessories of fashion and men health and beauty,
but in turn the least popular among women are health and
beauty products, this can happen because of the offers that
are offered and to whom advertising is targeted, etc. Would
interesting to try to add advertising or offers to the other
gender, in this way we would have more potential customers.
5. It is necessary to consider for the following analyzes
customer service, so we'll see if the rating given by customers
is not affected by this.
6. Start implementing strategies such as increasing the size
of the shopping carts, more strategically place products,
implement home delivery, among others, which are ways to increase
sales in supermarkets and then analyze its impact on the business.
"""
```