

Business Analytics using Python & Excel

Business Analytics with the Retail Sales Dataset analyzing using Python & Excel. This project is mainly focused on the Objective of the following targeted categories using Frameworks like pandas, plotly and Excel Workbook, so they are as follows,

- Sales Performance
- Customer Behavior
- Product Analysis
- Segmentation & Targeting

Using these four Analytics the **Actionable Recommendations** are provided increase the Profit in the Retail Business.

Libraries needed:-

Pandas & Plotly

```
[30]: import pandas as pd
import plotly.express as px
import plotly.graph_objects as go
```

Load Dataset

```
[31]: df = pd.read_csv(r"/kaggle/input/retail-sales-dataset/retail_sa
df.head()
```

The Above data is now ready to go for an Analysis.

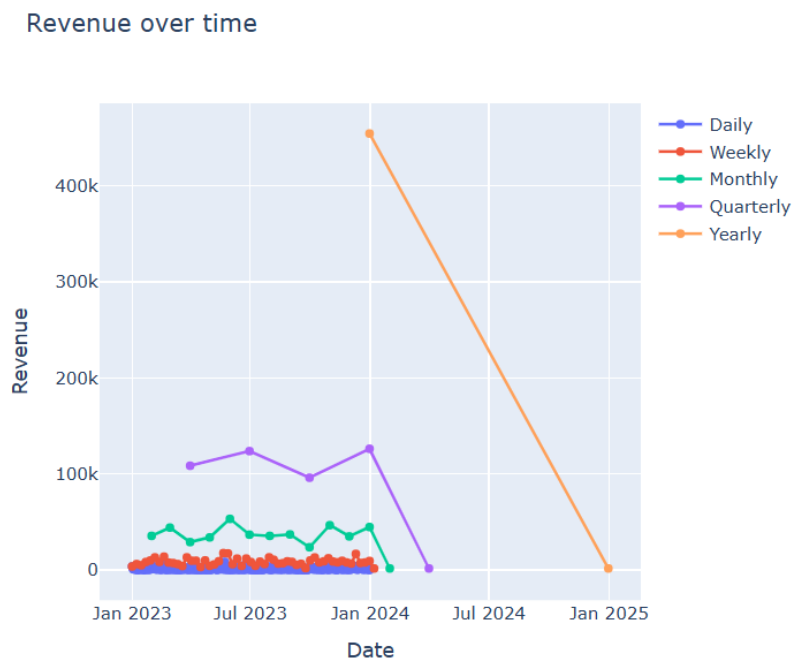
Let's Deep Dive into the process to know more about Business Analytics and to know how Business Analytics works with Pandas and Excel. The step-by-step process is explained below.

Firstly, Let's See about the Sales Performance,

Sales Performance

1. What is the total revenue generated over a specific period (e.g., monthly, quarterly)?

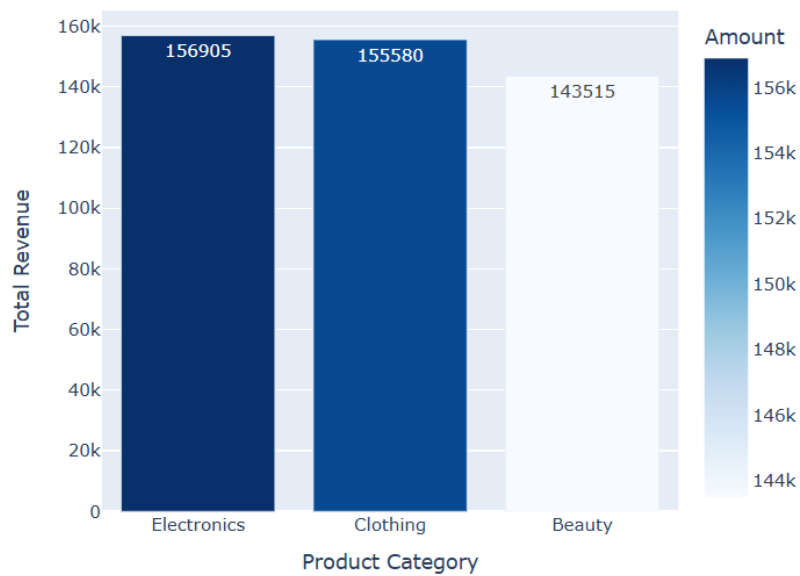
Plotly



2.Which product category generates the highest revenue?

Pandas & Plotly

	Products	Amount
0	Electronics	156905
1	Clothing	155580
2	Beauty	143515



3. What are the top-selling products by quantity sold?

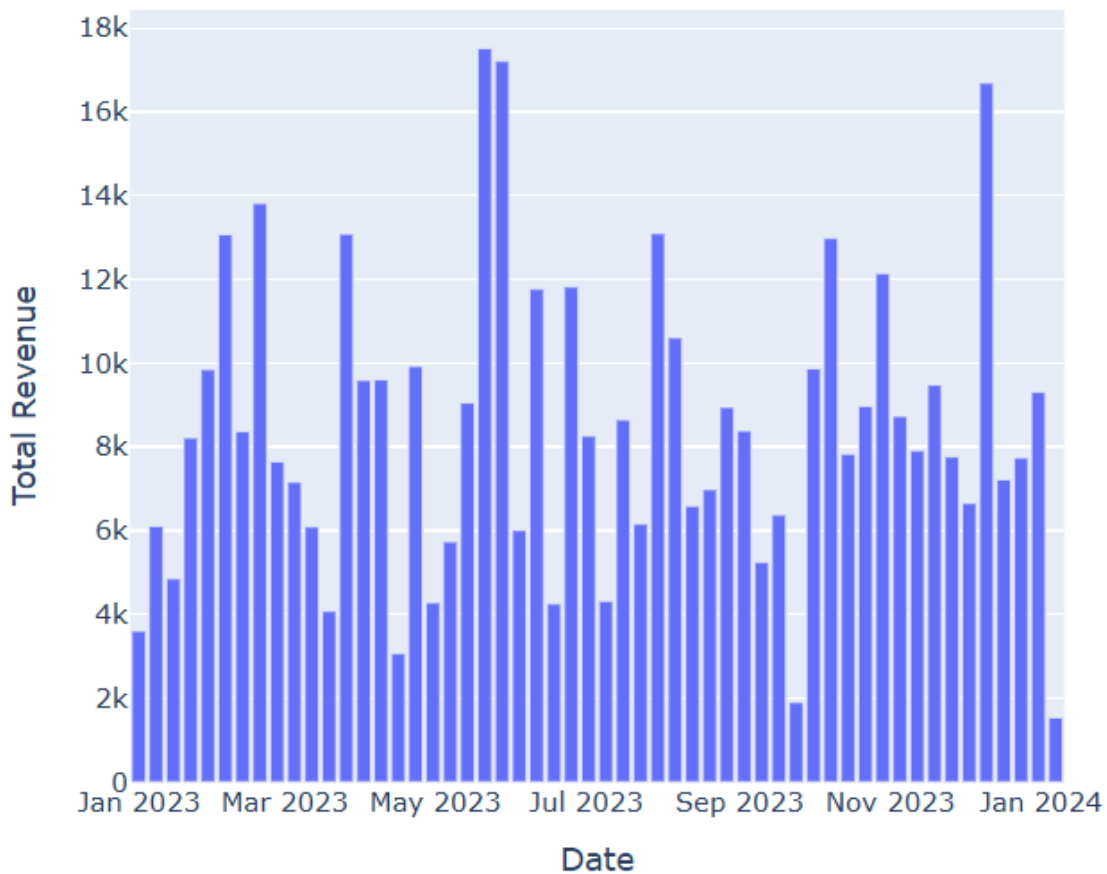
Top Product Sales by Quantity



4. How has the total amount of transactions changed over time?

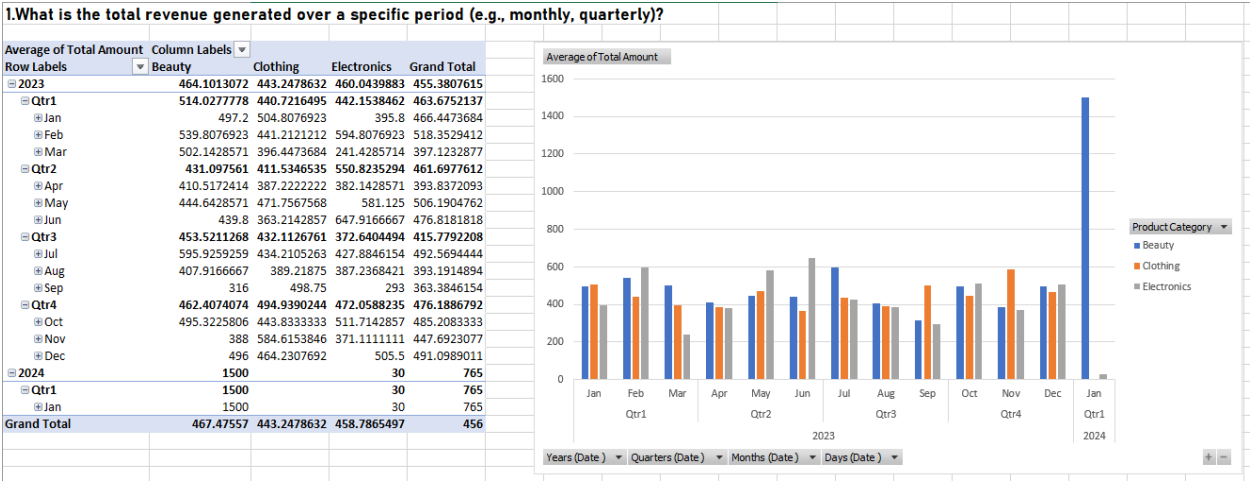
Total Revenue - Weekly

Weekly ▼



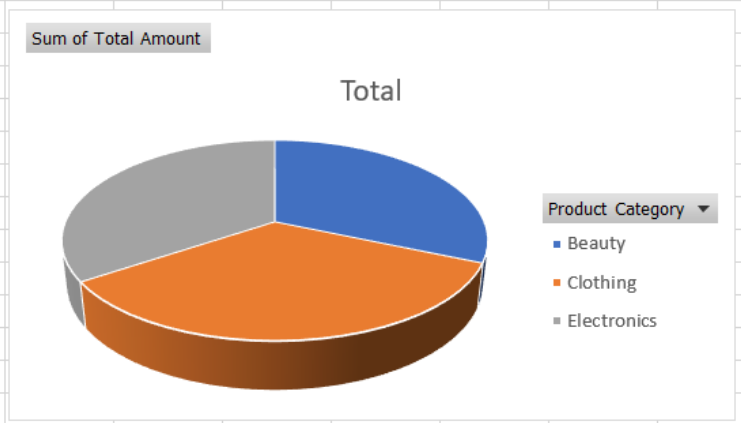
The above drop-down is used to change the Options like Weekly, Monthly, Daily, Quarterly and Yearly Revenue over Time.

Excel



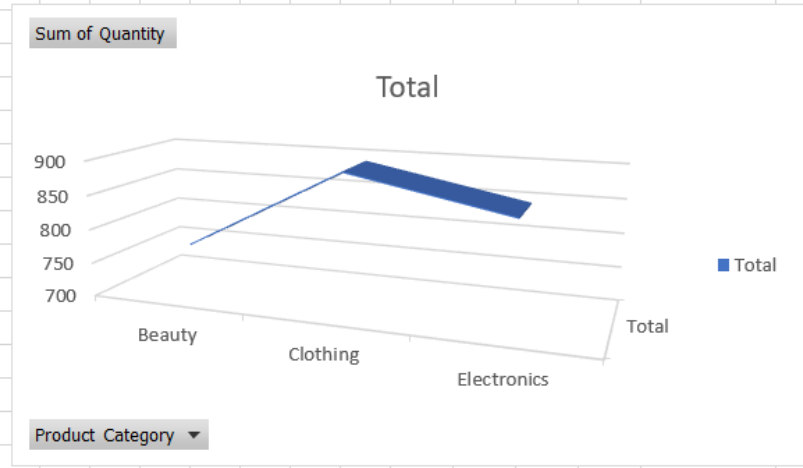
2.Which product category generates the highest revenue?

Row Labels	Sum of Total Amount
Beauty	143515
Clothing	155580
Electronics	156905
Grand Total	456000



3. What are the top-selling products by quantity sold?

Row Labels	Sum of Quantity
Beauty	771
Clothing	894
Electronics	849
Grand Total	2514



4. How has the total amount of transactions changed over time?

Sum of Total Amo Colum	Beauty	Clothing	Electronics	Grand Total
2023				
Qtr1	37010	42750	28740	108500
Qtr2	35350	41565	46820	123735
Qtr3	32200	30680	33165	96045
Qtr4	37455	40585	48150	126190
2024	1500		30	1530
Grand Total	143515	155580	156905	456000



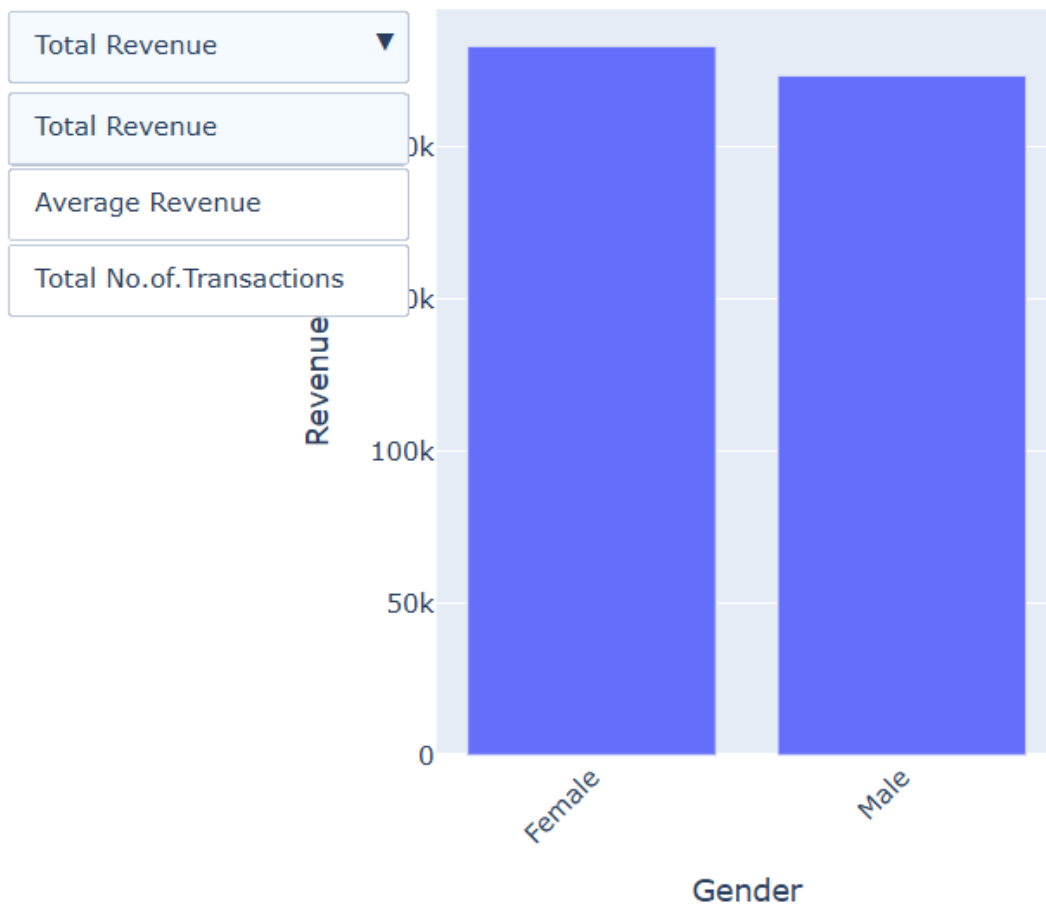
Secondly, Let's See about the Customer Behavior that is how the customers behaves at the time of Purchase and to notice some Trends like Gender & Age Group.

Customer Behavior

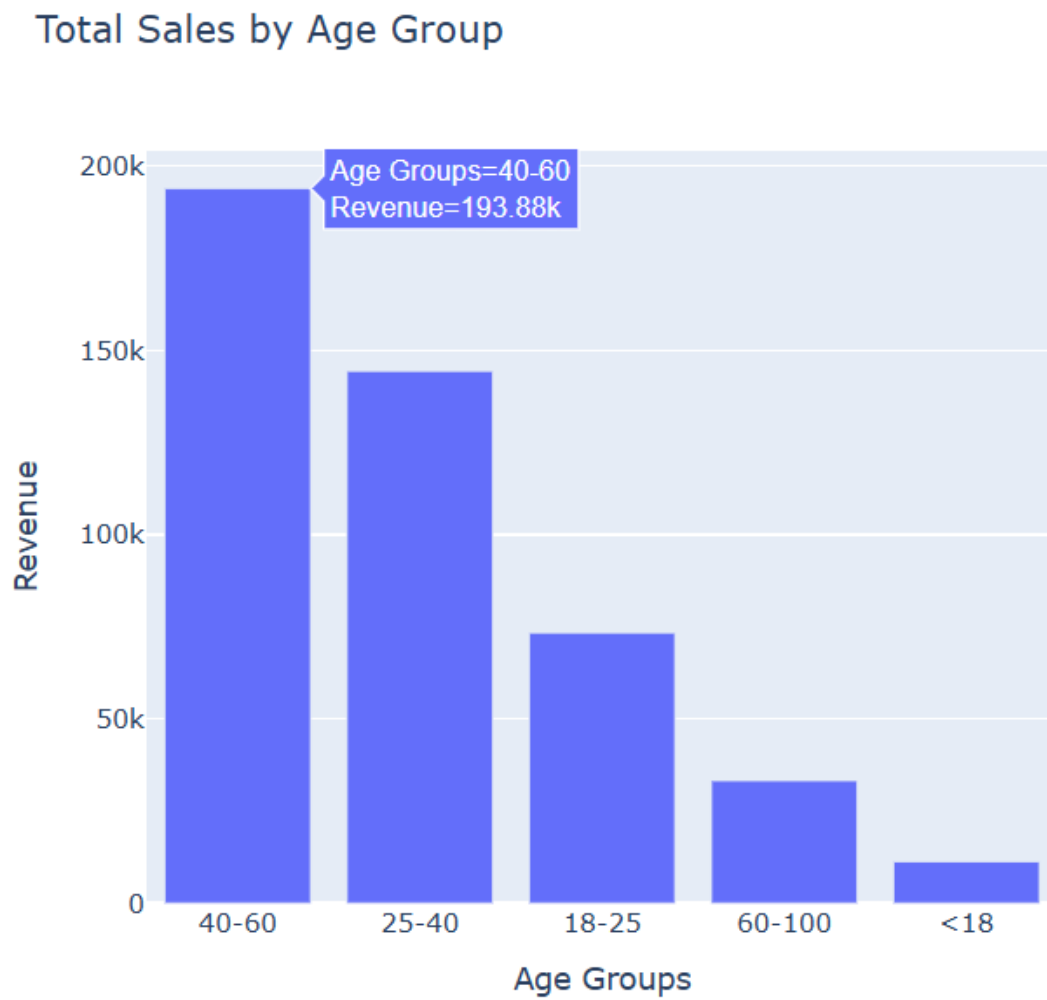
Using Plotly

- 1. How does purchasing behavior differ between genders?*

Purchasing Behaviour by Gender

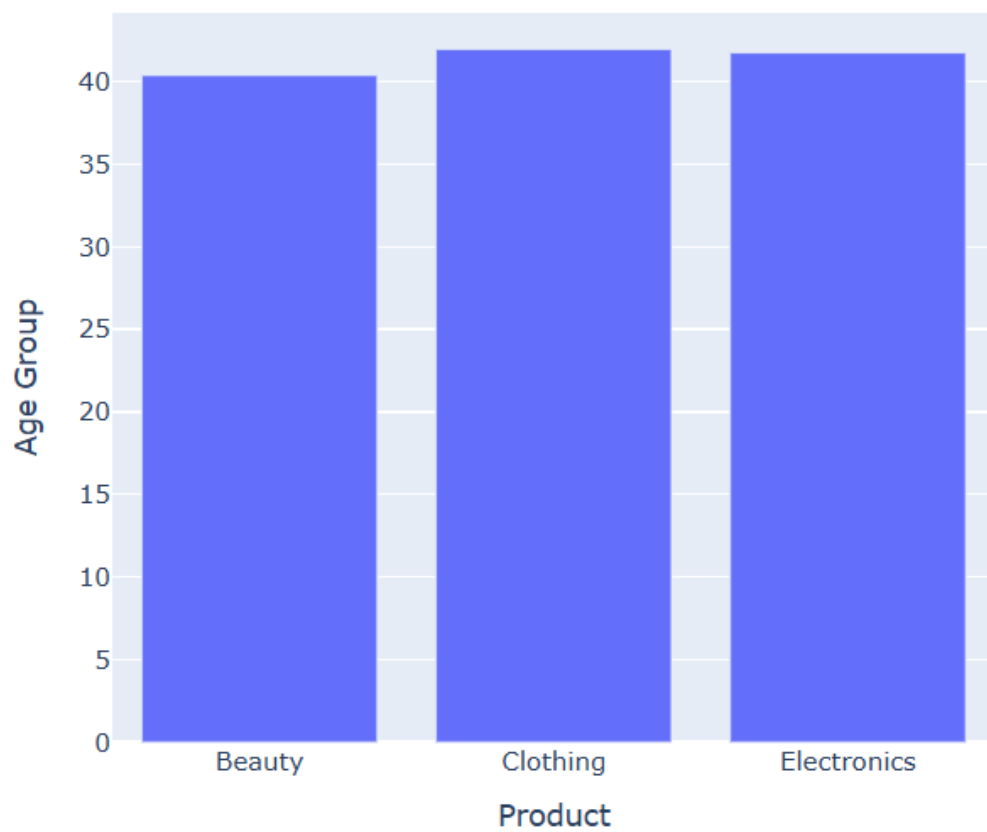


2. Which age group contributes the most to total sales?



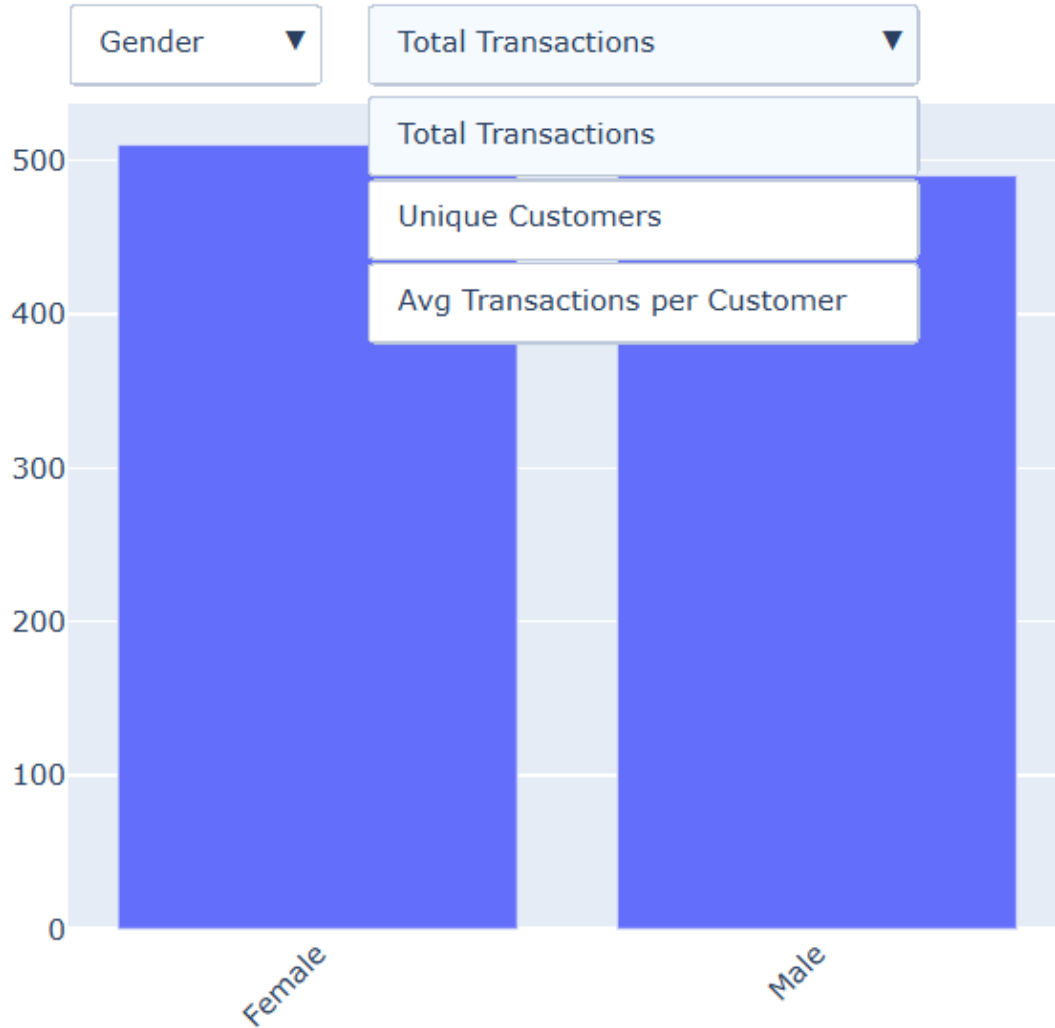
3. What is the average age of customers, and how does it vary by product category?

Average Age of Customers per Category



4. Are there any trends in purchase frequency by gender or age?

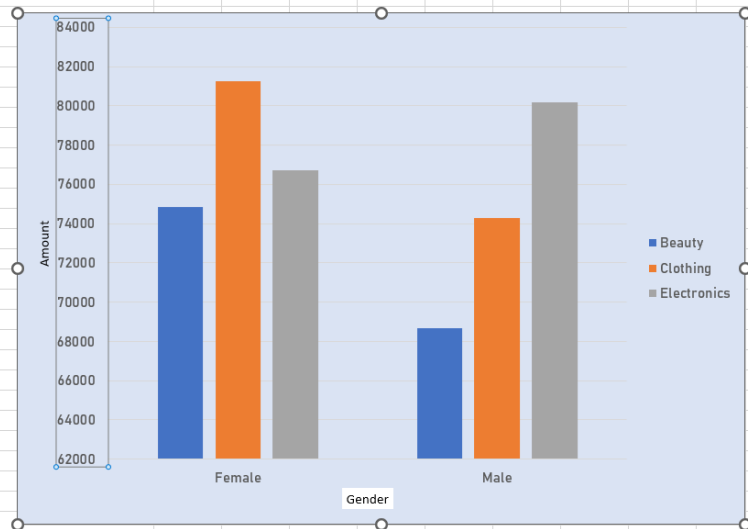
Total Transactions by Gender



Using Excel,

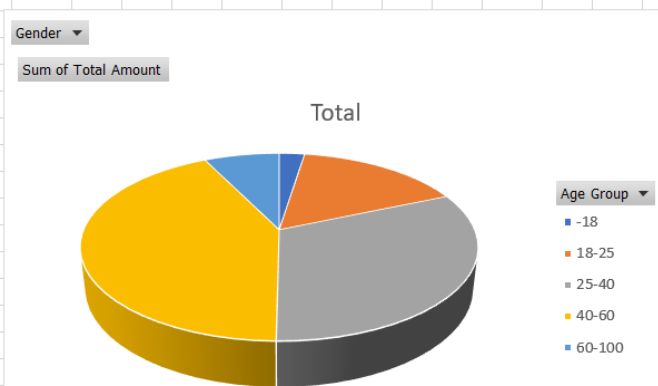
How does purchasing behavior differ between genders?

Sum of Tot: Column L	Beauty	Clothing	Electronics	Grand Total
Female	74830	81275	76735	232840
Male	68685	74305	80170	223160
Grand Total	143515	155580	156905	456000



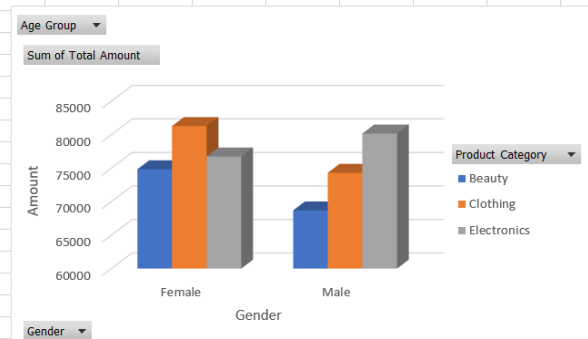
2. Which age group contributes the most to total sales?

Gender	(All)
Row Labels	Sum of Total Amount
-18	11215
18-25	73335
25-40	144345
40-60	193880
60-100	33225
Grand Total	456000



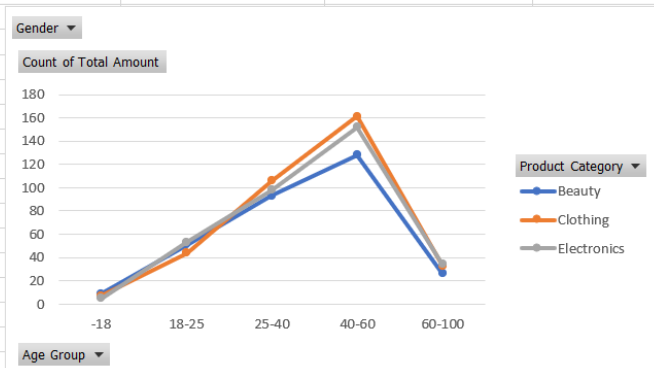
3. What is the average age of customers, and how does it vary by product category?

Age Group	(All)			
Sum of Total Amount	Column Labels			
Row Labels	Beauty	Clothing	Electronics	Grand Total
Female	74830	81275	76735	232840
Male	68685	74305	80170	223160
Grand Total	143515	155580	156905	456000
AVERAGE AGE OF CUSTOMERS	41.392			



4. Are there any trends in purchase frequency by gender or age?

Total Transaction	Gender (All)			
Count of Total Amount	Column Labels			
Row Labels	Beauty	Cloth	Elec	Grand Total
-18	9	7	5	21
18-25	51	44	53	148
25-40	93	106	98	297
40-60	128	161	152	441
60-100	26	33	34	93
Grand Total	307	351	342	1000

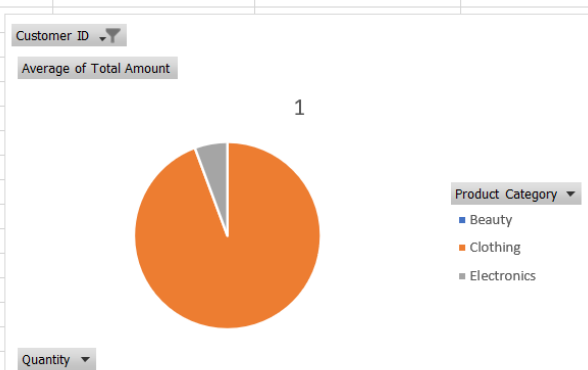


Unique Customers

Unique Customers = 1001

Average Transaction per Customer

Customer ID	(Multiple Items)			
Average of Total Amount	Column Labels			
Row Labels	1	2	3	Grand Total
Beauty		100	150	125
Clothing		500	1000	750
Electronics		30		30
Grand Total	265	550	150	356



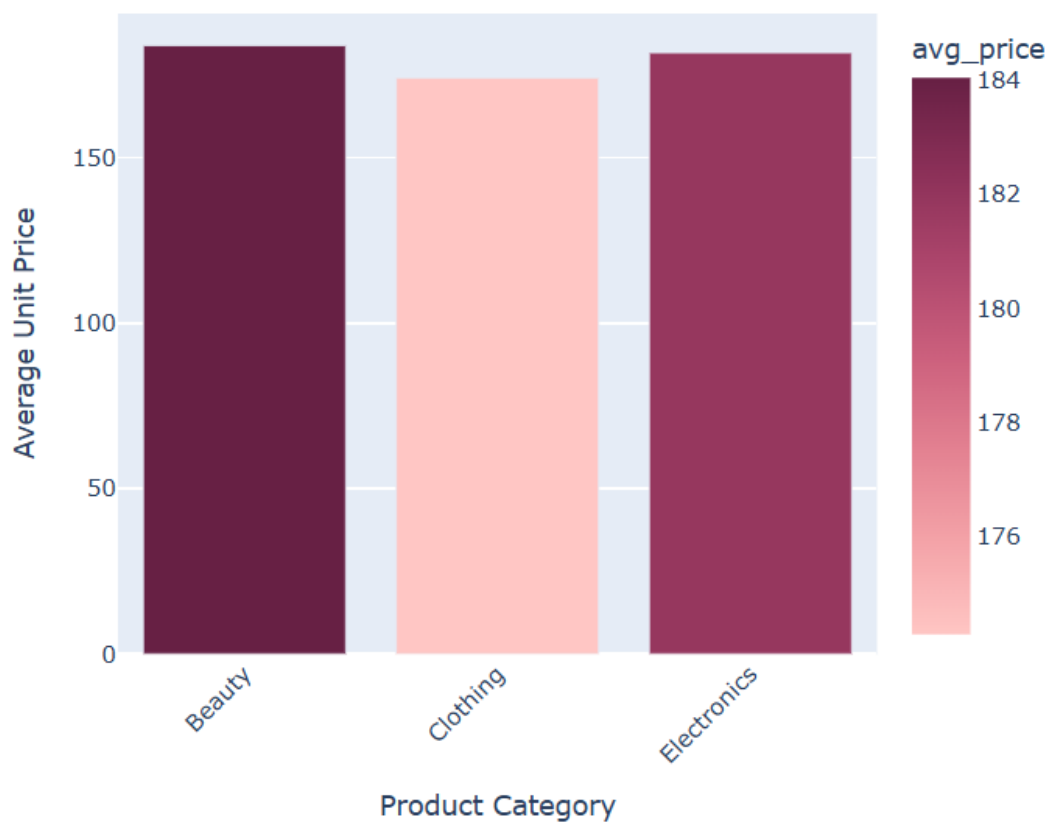
Thirdly, Let's See about the Product Analysis, To analyse the Product Category like Clothing, Electronics and Beauty in detail.

Product Analysis

Plotly,

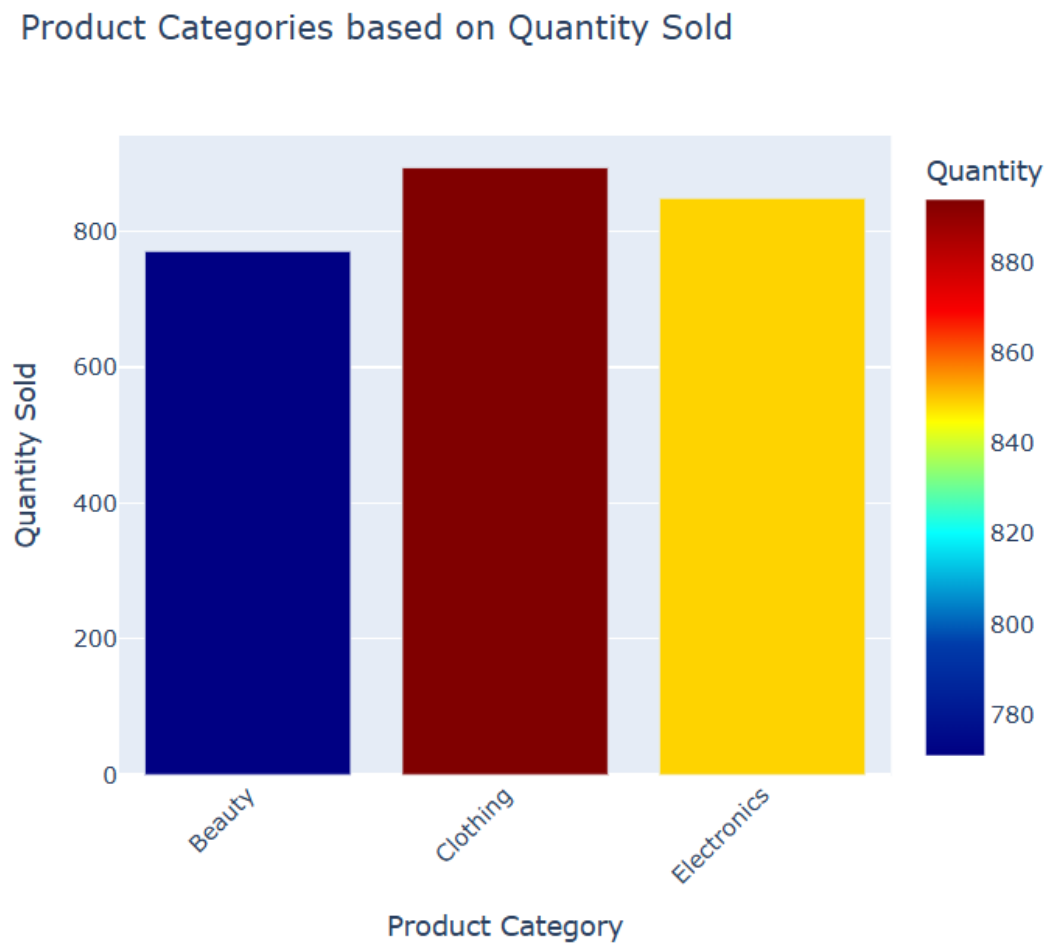
1. Which product category has the highest average price per unit?

Average Unit Price by Product Category



	Product Category	avg_price
0	Beauty	184.055375
1	Clothing	174.287749
2	Electronics	181.900585

2.How does the quantity sold vary across different product categories



3. Are there any product categories with unusually high or low total amounts?

No unusualls detected as the Z-Score is between -1 to +1

Code

```
#To find outliers to calculate Z-score = (Total + Mean) / SD
category_tot = df.groupby('Product Category')['Revenue'].sum().reset_index()
category_tot

#Mean
mean_tot = category_tot['Revenue'].mean()

#Standard Deviation
std_tot = category_tot['Revenue'].std()

#Z-Score
category_tot['z_score'] = (category_tot['Revenue'] - mean_tot) / std_tot

#Check Unusualls
category_tot['Unusualls'] = category_tot['z_score'].apply(
    lambda x: 'High' if x > 2 else ('Low' if x < -2 else 'Normal')
)

category_tot.drop(columns=['z_score'], errors='ignore')
```

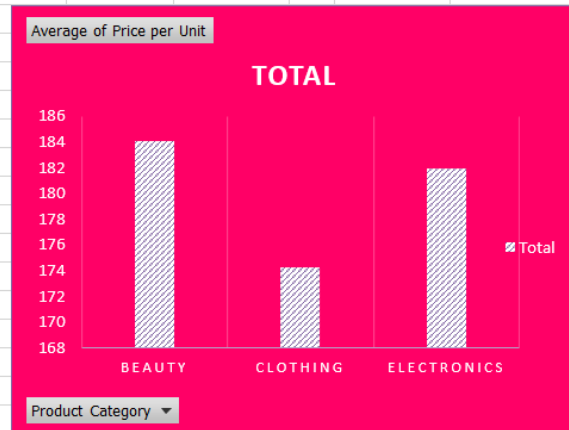
Pandas

	Product Category	Revenue	Unusualls
0	Beauty	143515	Normal
1	Clothing	155580	Normal
2	Electronics	156905	Normal

Excel

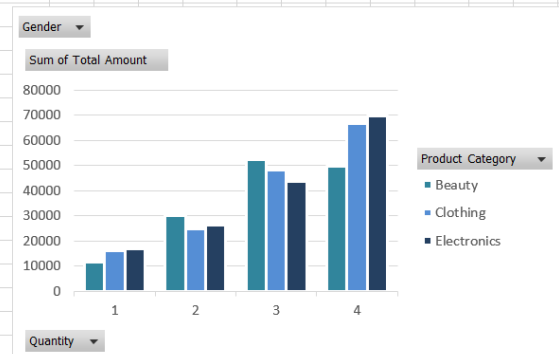
1. Which product category has the highest average price per unit?

Row Labels	Average of Price per Unit
Beauty	184.0553746
Clothing	174.2877493
Electronics	181.9005848
Grand Total	179.89



2. How does the quantity sold vary across different product categories?

Gender	(All)				
Sum of Total Amount	Column Labels				
Row Labels	Beauty	Clothing	Electronics	Grand Total	
1		11730	16115	16960	44805
2		29930	24670	26450	81050
3		52155	48315	43815	144285
4		49700	66480	69680	185860
Grand Total		143515	155580	156905	456000



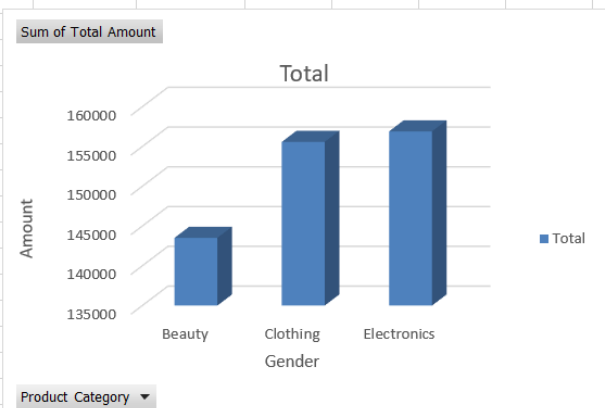
3. Are there any product categories with unusually high or low total amounts?

Row Labels	Sum of Total Amount
Beauty	143515
Clothing	155580
Electronics	156905
Grand Total	456000

Z - SCORE
Normal
No Outliers Detected

Refer Table Sheet for z_score calculation

$$[(I2 - \text{AVERAGE}(\$I\$2:\$I\$1001)) / \text{STDEV.S}(\$I\$2:\$I\$1001)]$$



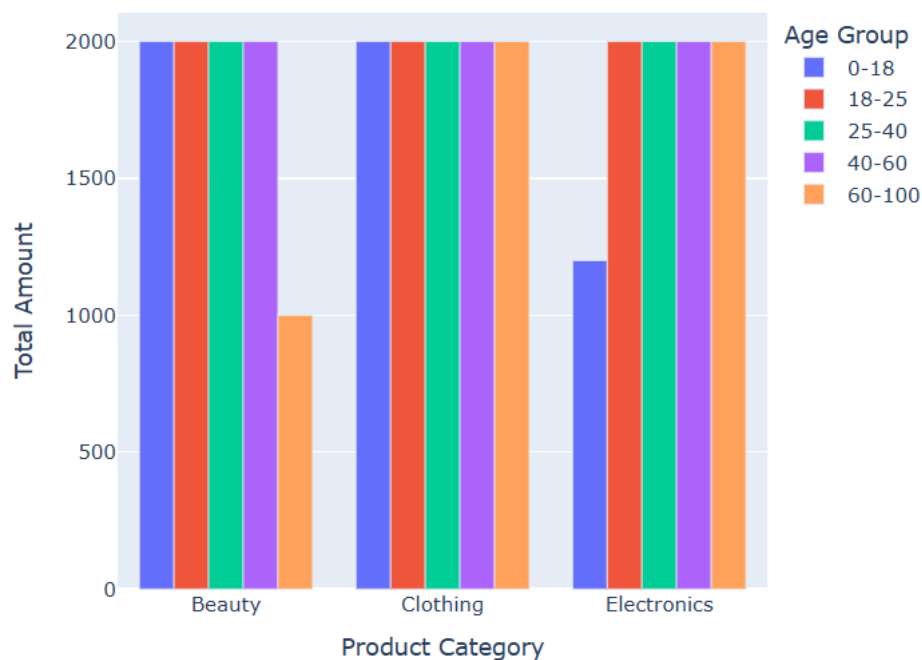
Fourly, Let's See about the Segmentation & Targeting, This involves Segmenting the Column Names according to our analysis and targeting on specific Trends for growth of the Business.

Segmentation & Targeting

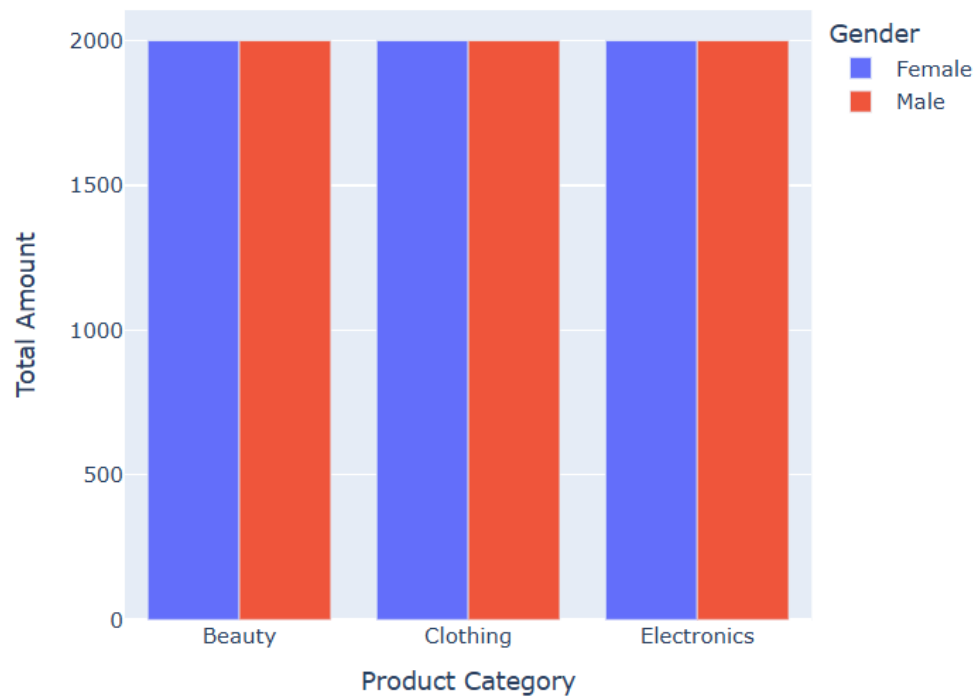
Plotly,

1. Which combination of gender and age group buys the most expensive products?

Most Expensive Product Price by Age Group



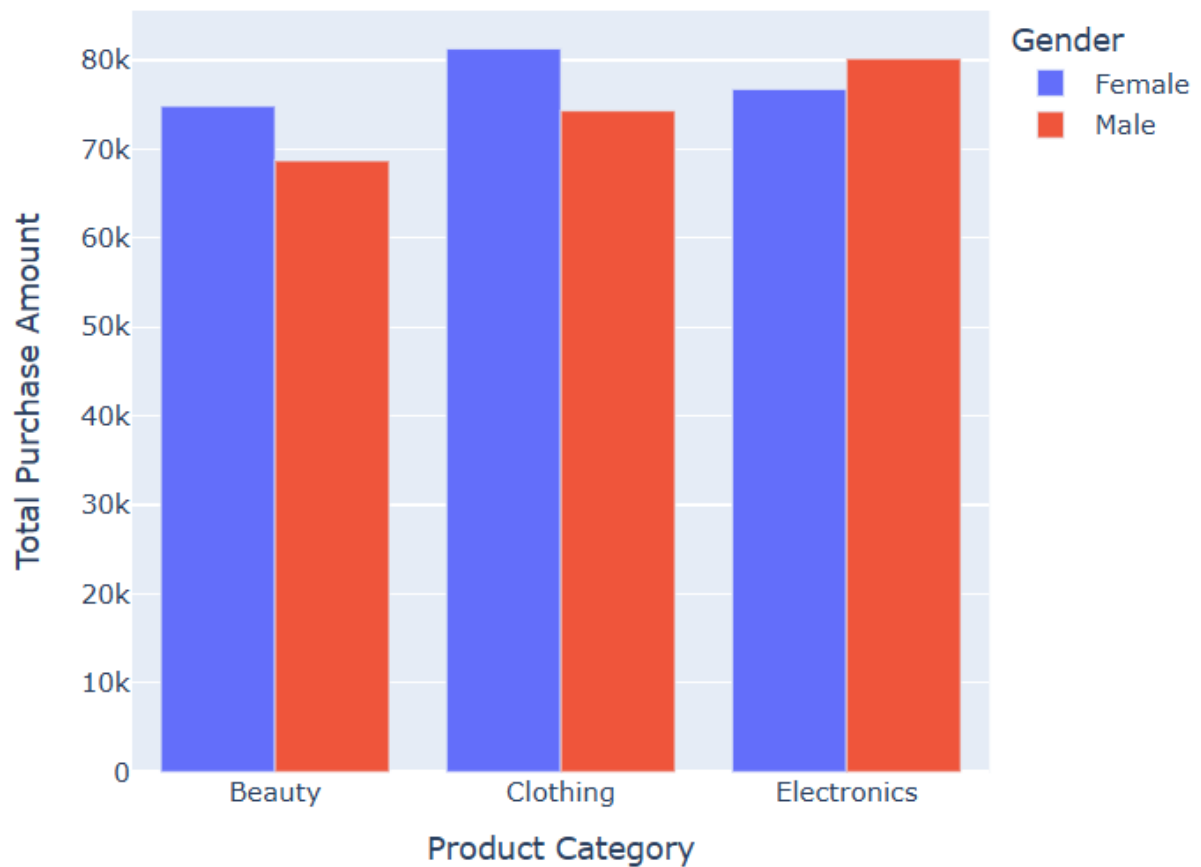
Most Expensive Product Price by Gender



The above tells us Both the Male and Female brought Expensive Gift

2. Are there specific product categories preferred by certain demographic segments?

Product Category Preferences by Gender



3. What is the average transaction value per customer segment (e.g., by gender or age range)?

Average Transaction Value by Gender



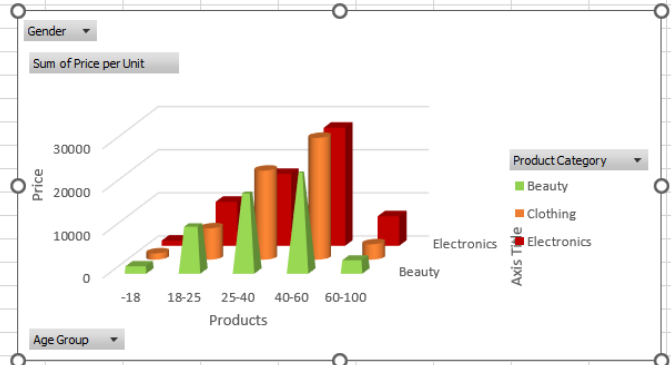
Excel,

1. Which combination of gender and age group buys the most expensive products?

Gender (All) ▼

Sum of Price per Unit

Row Labels	Beauty	Clothing	Electronics	Grand Total
-18	1690	1455	1180	4325
18-25	10660	7265	10185	28110
25-40	18185	20640	16655	55480
40-60	22930	28255	27350	78535
60-100	3040	3560	6840	13440
Grand Total	56505	61175	62210	179890

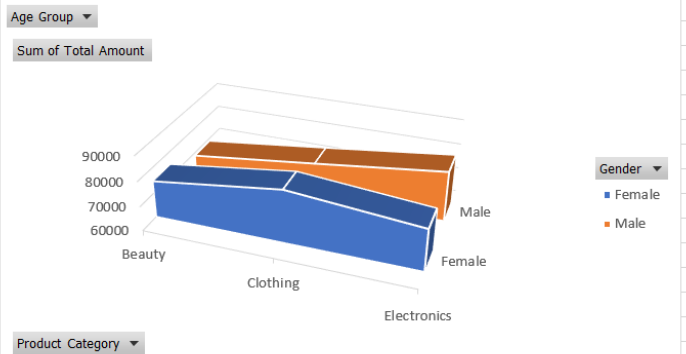


2. Are there specific product categories preferred by certain demographic segments?

Age Group (All) ▼

Sum of Total Amount

Row Labels	Female	Male	Grand Total
Beauty	74830	68685	143515
Clothing	81275	74305	155580
Electronics	76735	80170	156905
Grand Total	232840	223160	456000



3.What is the average transaction value per customer segment (e.g., by gender or age range)?

Gender Female

Average of Total Amount Column Labels

Row Labels	-18	18-25	25-40	40-60	60-100	Grand Total
Beauty	639	379.25926	579	415.94595	166.5	450.78313
Clothing	858.3333333	544.11765	542.2449	410.63953	398.15789	467.0977
Electronics	434	501.66667	453.75	457.15278	323.07692	451.38235
Grand Total	610.7692308	463.67647	522.12903	426.76724	319.7619	456.54902

AVERAGE TRANSACTION

Female = 455.43

Male =456.55

