```
#IMPORTING LIBRARIES

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


#LOADING DATA FROM CSV FILE
import requests
import pandas as pd
import io

# Corrected URL to point to the raw CSV file
url = "https://raw.githubusercontent.com/Praveenraj0803/OIBSIP/main/EDA%20Retail%20Sales%20Data/retail.csv" # Updated URL to raw file
response = requests.get(url)

# Check if the request was successful
if response.status_code == 200:
    data = pd.read_csv(io.StringIO(response.text), sep=',') # Explicitly set the delimiter to comma
    print(data.head()) # Print first few rows to verify
else:
    print("Failed to download the file. Check the URL.")
```

```
   Transaction ID        Date Customer ID  Gender  Age Product Category  \
0               1  24-11-2023     CUST001    Male   34           Beauty
1               2  27-02-2023     CUST002  Female   26         Clothing
2               3  13-01-2023     CUST003    Male   50      Electronics
3               4  21-05-2023     CUST004    Male   37         Clothing
4               5  06-05-2023     CUST005    Male   30           Beauty

   Quantity  Price per Unit  Total Amount
0         3              50           150
1         2             500          1000
2         1              30            30
3         1             500           500
4         2              50           100
```

```
#showing the rows
data.head(1001)
```

	Transaction ID	Date	Customer ID	Gender	Age	Product Category	Quantity	Price per Unit	Total Amount
0	1	24-11-2023	CUST001	Male	34	Beauty	3	50	150
1	2	27-02-2023	CUST002	Female	26	Clothing	2	500	1000
2	3	13-01-2023	CUST003	Male	50	Electronics	1	30	30
3	4	21-05-2023	CUST004	Male	37	Clothing	1	500	500
4	5	06-05-2023	CUST005	Male	30	Beauty	2	50	100
...	...	...	...	...	...	...	...	...	...

```
#gives (num rows, num col)
data.shape
```

```
(1000, 9)
```

```
data.dtypes
```

```
Transaction ID       int64
Date                object
Customer ID         object
```

```
Gender              object
Age                  int64
Product Category    object
Quantity             int64
Price per Unit       int64
Total Amount         int64
dtype: object
```

```
data.nunique()
```

```
Transaction ID      1000
Date                 345
Customer ID         1000
Gender                 2
Age                   47
Product Category       3
Quantity               4
Price per Unit         5
Total Amount          18
dtype: int64
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 9 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   Transaction ID    1000 non-null   int64
 1   Date              1000 non-null   object
 2   Customer ID       1000 non-null   object
 3   Gender            1000 non-null   object
 4   Age               1000 non-null   int64
 5   Product Category  1000 non-null   object
 6   Quantity          1000 non-null   int64
 7   Price per Unit    1000 non-null   int64
 8   Total Amount      1000 non-null   int64
dtypes: int64(5), object(4)
memory usage: 70.4+ KB
```

```
pd.isnull(data).sum()
```

```
Transaction ID      0
Date                0
Customer ID         0
Gender              0
Age                 0
Product Category    0
Quantity            0
Price per Unit      0
Total Amount        0
dtype: int64
```

```
data["Date"]] = data[["Date"]].apply(pd.to_datetime)
data["Quantity"] = data["Quantity"].astype(float).astype('Int64')
data.dtypes
```

```
<ipython-input-10-759fd6069785>:1: UserWarning: Parsing dates in %d-%m-%Y format when dayfirst=False (the default) was specified. Pass `
  data[["Date"]] = data[["Date"]].apply(pd.to_datetime)
Transaction ID              int64
Date               datetime64[ns]
Customer ID                object
Gender                     object
Age                         int64
Product Category           object
Quantity                    Int64
Price per Unit              int64
Total Amount                int64
dtype: object
```

```
data.nunique()
```

```
Transaction ID      1000
Date                 345
Customer ID         1000
Gender                 2
Age                   47
Product Category       3
```

```
Quantity              4
Price per Unit        5
Total Amount         18
dtype: int64
```

```
data.describe()
```

	Transaction ID	Date	Age	Quantity	Price per Unit	Total Amount
count	1000.000000	1000	1000.00000	1000.0	1000.000000	1000.000000
mean	500.500000	2023-07-03 00:25:55.200000256	41.39200	2.514	179.890000	456.000000
min	1.000000	2023-01-01 00:00:00	18.00000	1.0	25.000000	25.000000
25%	250.750000	2023-04-08 00:00:00	29.00000	1.0	30.000000	60.000000
50%	500.500000	2023-06-29 12:00:00	42.00000	3.0	50.000000	135.000000
75%	750.250000	2023-10-04 00:00:00	53.00000	4.0	300.000000	900.000000
max	1000.000000	2024-01-01 00:00:00	64.00000	4.0	500.000000	2000.000000

```
#DATA_CLEANING
data.isnull().sum()
```

```
Transaction ID      0
Date                0
Customer ID         0
Gender              0
Age                 0
Product Category    0
Quantity            0
Price per Unit      0
Total Amount        0
dtype: int64
```

```
#null values are set to 1
data['Quantity'].fillna(1, inplace=True)


data['Price per Unit'].fillna(data.groupby('Product Category')['Price per Unit'].transform('mean'), inplace=True)
data['Price per Unit'].fillna(data['Price per Unit'].mean(), inplace=True)


data = data[data['Product Category'].notna()]


data.loc[data['Date'] > data['Date'], 'Date'] = 'Past Due'


print(data['Total Amount'].mean(), data['Total Amount'].std(), data['Total Amount'].mean() - 3 * data['Total Amount'].std(), data['Total Amc
data = data[data['Total Amount'] < (data['Total Amount'].mean() + (3 * data['Total Amount'].std()))]
data = data[data['Total Amount'] > (data['Total Amount'].mean() - (3 * data['Total Amount'].std()))]
```

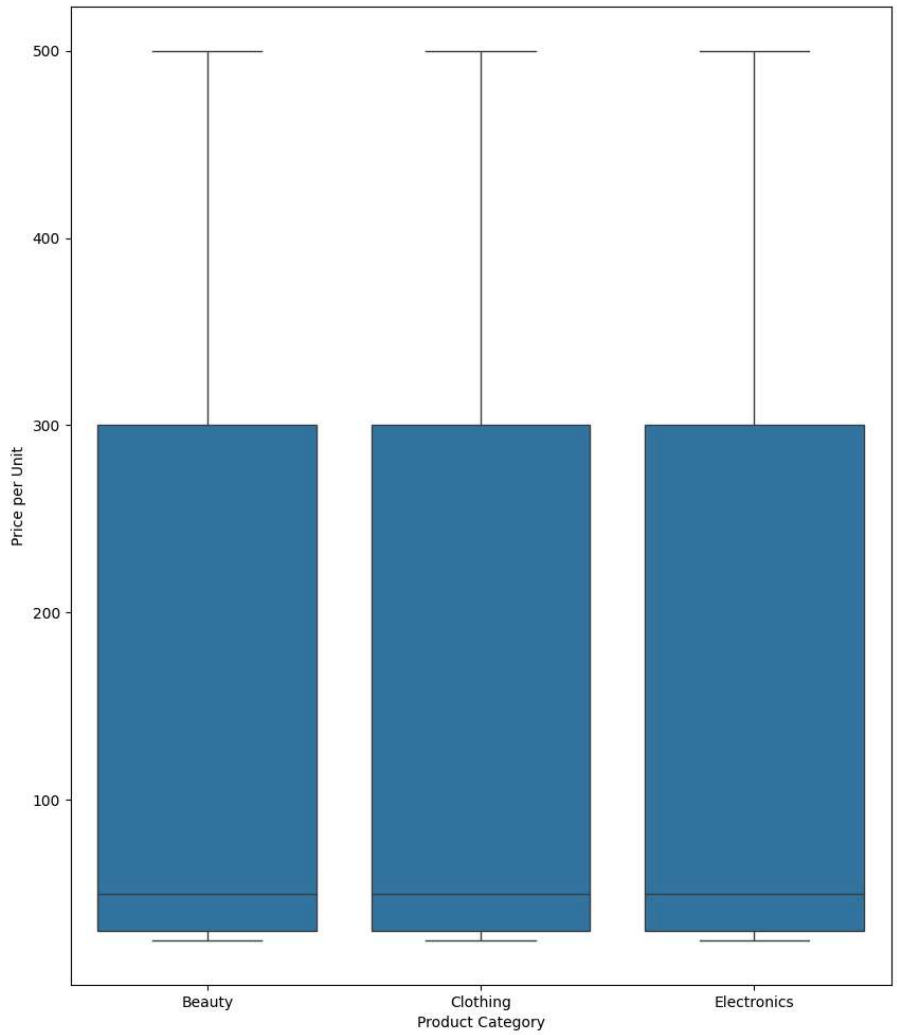
```
456.0 559.997631555123 -1223.992894665369 2135.992894665369
```

```
data.groupby(['Product Category']).agg({'Quantity':np.sum}).reset_index()
```

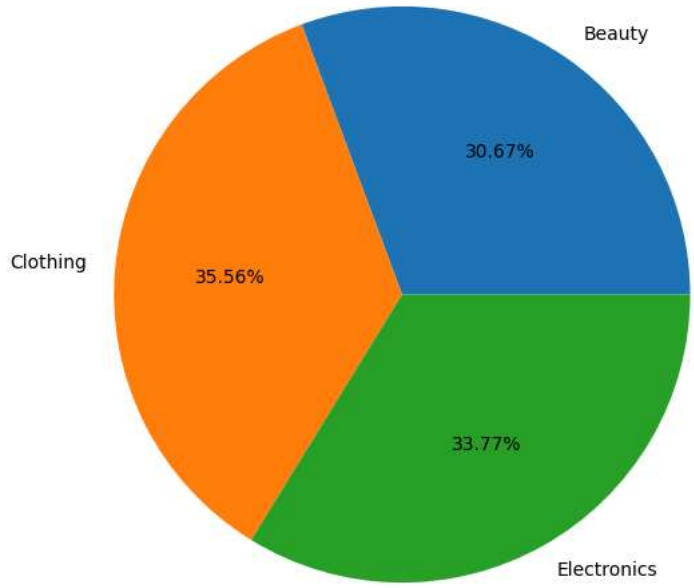
	Product Category	Quantity
0	Beauty	771
1	Clothing	894
2	Electronics	849

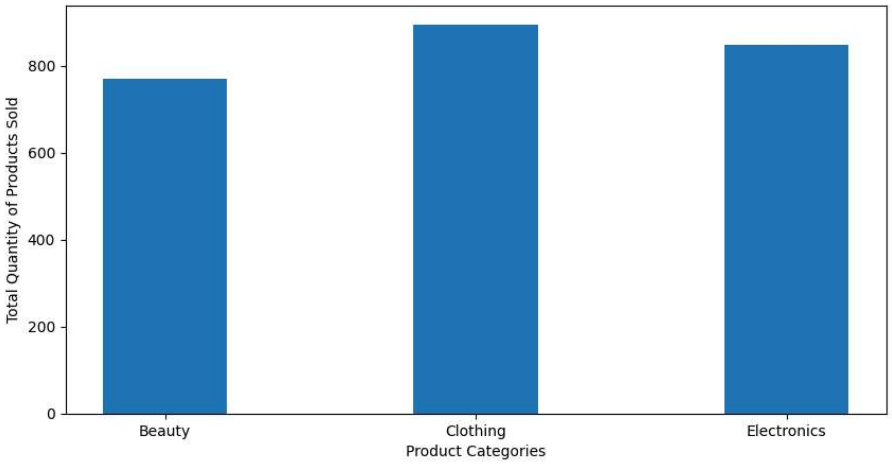
```
plt.figure(figsize =(10, 12))
sns.boxplot(y= data['Price per Unit'], x = data['Product Category'])
```

```
<Axes: xlabel='Product Category', ylabel='Price per Unit'>
```

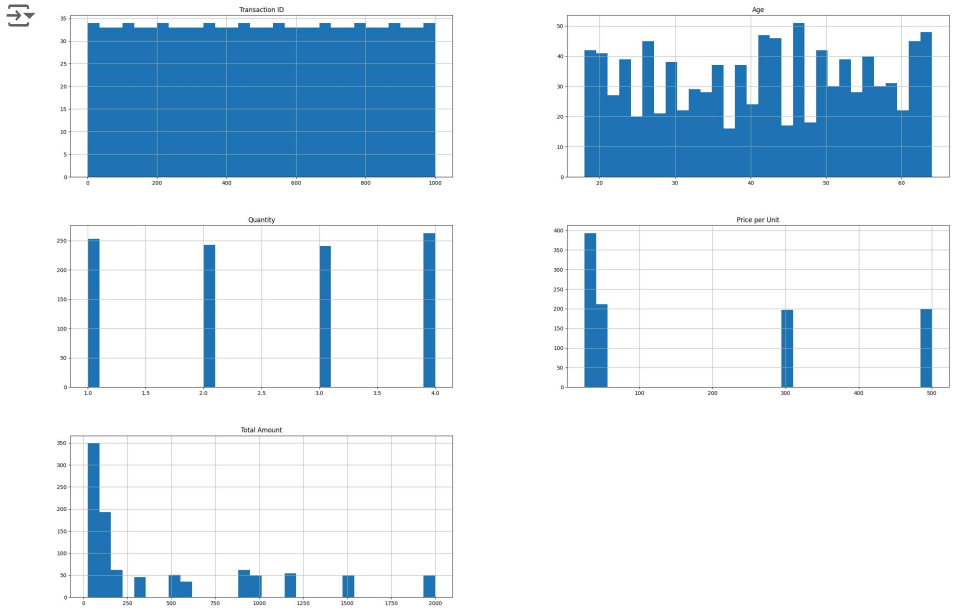



```
df = data.groupby(['Product Category']).agg({'Quantity':np.sum}).reset_index()
fig1 = plt.figure(figsize =(10, 7))
plt.pie(df.Quantity, labels = df['Product Category'],autopct='%1.2f%%')
# show plot
plt.show()

fig2 = plt.figure(figsize = (10, 5))
plt.bar(df['Product Category'], df.Quantity, width = 0.4)
plt.xlabel("Product Categories")
plt.ylabel("Total Quantity of Products Sold")
# show plot
plt.show()
```

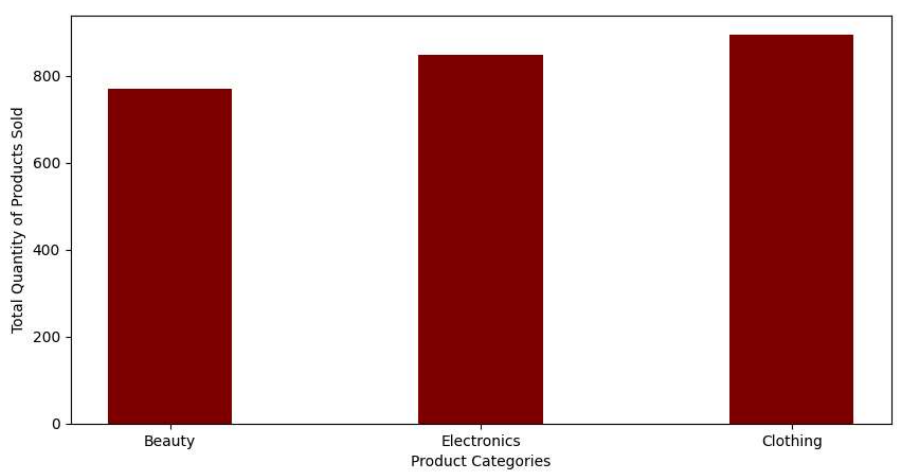




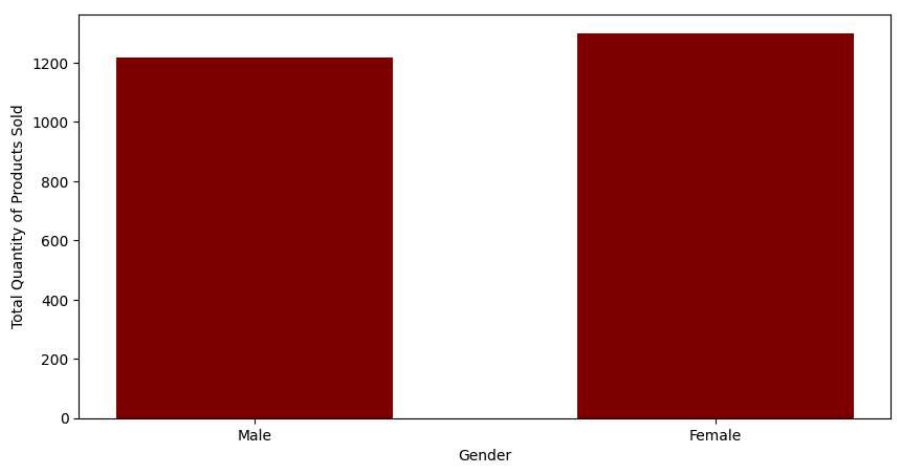

```
#Plot histogram of all numeric attrubites to see their distribution
# Plot the histograms of each
data.hist(bins=30, figsize=(30,20))
plt.show()
```



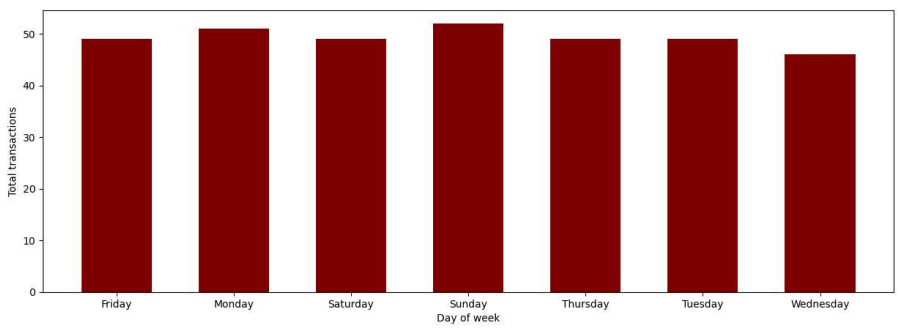

```
# Product Category
df=df.sort_values('Quantity')
fig2 = plt.figure(figsize = (10, 5))
plt.bar(df['Product Category'], df.Quantity, color ='maroon', width = 0.4)
plt.xlabel("Product Categories")
plt.ylabel("Total Quantity of Products Sold")
# show plot
plt.show()
```




```
#Region
df = data.groupby(['Gender']).agg({'Quantity':np.sum}).reset_index().sort_values('Quantity')
fig = plt.figure(figsize = (10, 5))
plt.bar(df.Gender, df.Quantity, color ='maroon', width = 0.6)
plt.xlabel("Gender")
plt.ylabel("Total Quantity of Products Sold")
# show plot
plt.show()
```




```
#Plot number of transactions on each day of week.
df = data.groupby(['Date']).size()
new_df = df.to_frame(name = 'ize').reset_index()
new_df['NumberofTransactions']=1
new_df['day_of_week'] = new_df['Date'].dt.day_name()

dataTransactions = new_df.groupby('day_of_week')['NumberofTransactions'].agg('sum').reset_index()
dataTransactions = dataTransactions.loc[[0,1,2,3,4,5,6], :]  # Sunday to Saturday

# #plotting bar chart
fig = plt.figure(figsize = (15, 5))
plt.bar(dataTransactions.day_of_week, dataTransactions.NumberofTransactions, color ='maroon', width = 0.6)
plt.xlabel("Day of week")
plt.ylabel("Total transactions")
plt.show()
```



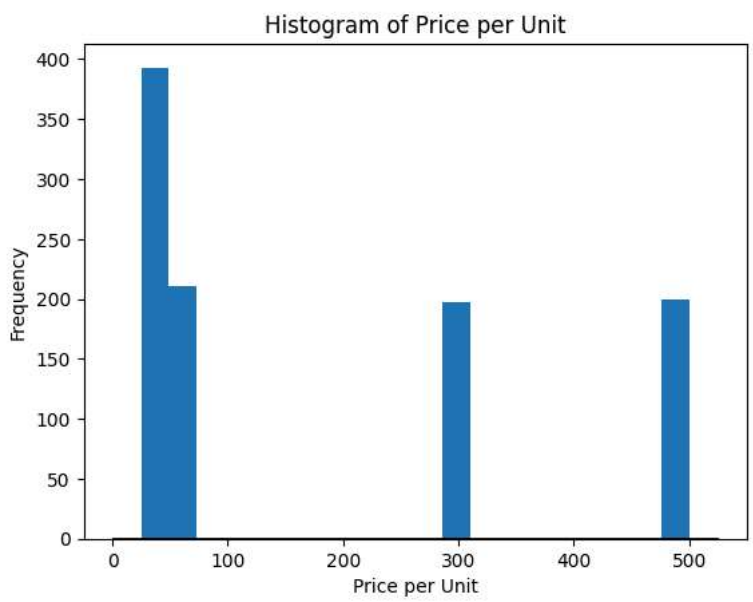

```
df.head(20)
df = data.groupby(['Transaction ID'], sort=False).size().reset_index(name='Count')
df['Count'].describe()
```

```
count    1000.0
mean        1.0
std         0.0
min         1.0
25%         1.0
50%         1.0
75%         1.0
max         1.0
Name: Count, dtype: float64
```

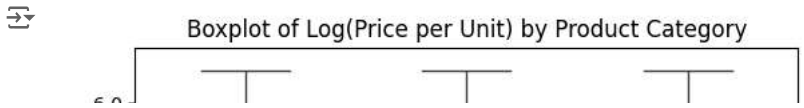
```
data['NormalizedPrice'] = (data['Price per Unit'] - data['Price per Unit'].mean()) / data['Price per Unit'].std()
data.head(1000)
```

	Transaction ID	Date	Customer ID	Gender	Age	Product Category	Quantity	Price per Unit	Total Amount	Nc
0	1	2023-11-24 00:00:00	CUST001	Male	34	Beauty	3	50	150	
1	2	2023-02-27 00:00:00	CUST002	Female	26	Clothing	2	500	1000	
2	3	2023-01-13 00:00:00	CUST003	Male	50	Electronics	1	30	30	
3	4	2023-05-21 00:00:00	CUST004	Male	37	Clothing	1	500	500	
4	5	2023-05-06 00:00:00	CUST005	Male	30	Beauty	2	50	100	

```
import matplotlib.pyplot as plt
import numpy as np
from scipy.stats import norm

plt.hist(data['Price per Unit'], bins=20)
plt.xlabel('Price per Unit')
plt.ylabel('Frequency')
plt.title('Histogram of Price per Unit')

# Calculate the mean and standard deviation of the column
mean = np.mean(data['Price per Unit'])
std = np.std(data['Price per Unit'])

# Calculate the theoretical normal distribution
xmin, xmax = plt.xlim()
x = np.linspace(xmin, xmax, 100)
p = norm.pdf(x, mean, std)

# Plot the theoretical normal distribution on top of the histogram
plt.plot(x, p, 'k', linewidth=2)
plt.show()
```




```
import seaborn as sns
import matplotlib.pyplot as plt

sns.boxplot(y=np.log(data['Price per Unit']), x=data['Product Category'])
plt.title('Boxplot of Log(Price per Unit) by Product Category')
plt.xlabel('Product Category')
plt.ylabel('Log(Price per Unit)')
plt.show()
```




```
from sklearn.preprocessing import KBinsDiscretizer

# Create an instance of KBinsDiscretizer with 5 bins, ordinal encoding, and uniform strategy
enc = KBinsDiscretizer(n_bins=5, encode='ordinal', strategy='uniform')

# Select the 'Price per Unit' column from the dataframe
X = data[['Price per Unit']]

# Fit the KBinsDiscretizer to the 'Price per Unit' column and transform it into binned data
X_binned = enc.fit_transform(X)

# Print the original data, bin edges, and binned data
print('Original Data:')
print(X.head(20))
print('\nBin edges:')
```