```
# Import required libraries
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Optional: To display charts inline
%matplotlib inline
```

```
#Load the datasets
purchase_df = pd.read_csv('QVI_purchase_behaviour.csv')
transaction_df = pd.read_excel('QVI_transaction_data.xlsx')
```

```
#check missing values
print(purchase_df.info())
print(transaction_df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 72637 entries, 0 to 72636
Data columns (total 3 columns):
 #   Column            Non-Null Count  Dtype 
---  ------            --------------  ----- 
 0   LYLTY_CARD_NBR    72637 non-null  int64 
 1   LIFESTAGE         72637 non-null  object
 2   PREMIUM_CUSTOMER  72637 non-null  object
dtypes: int64(1), object(2)
memory usage: 1.7+ MB
None
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 264839 entries, 0 to 264838
Data columns (total 8 columns):
 #   Column               Non-Null Count   Dtype         
---  ------               --------------   -----         
 0   DATE                 264836 non-null  datetime64[ns]
 1   STORE_NBR            264836 non-null  float64       
 2   LYLTY_CARD_NBR       264836 non-null  float64       
 3   TXN_ID               264836 non-null  float64       
 4   PROD_NBR             264836 non-null  float64       
 5   Update_Product_Name  264836 non-null  object        
 6   PROD_QTY             264838 non-null  float64       
 7   TOT_SALES            264838 non-null  float64       
dtypes: datetime64[ns](1), float64(6), object(1)
memory usage: 16.2+ MB
None
```

```
#Description Statistics
print(transaction_df.describe())
transaction_df.isnull().sum()
```

```
                                DATE     STORE_NBR  LYLTY_CARD_NBR  \
count                         264836  264836.00000    2.648360e+05
mean   2018-12-30 00:52:12.879215360     135.08011    1.355495e+05
min              2018-07-01 00:00:00       1.00000    1.000000e+03
25%              2018-09-30 00:00:00      70.00000    7.002100e+04
50%              2018-12-30 00:00:00     130.00000    1.303575e+05
75%              2019-03-31 00:00:00     203.00000    2.030942e+05
max              2019-06-30 00:00:00     272.00000    2.373711e+06
std                              NaN      76.78418    8.057998e+04

             TXN_ID       PROD_NBR      PROD_QTY      TOT_SALES
count  2.648360e+05  264836.000000  264838.000000  264838.000000
mean   1.351583e+05      56.583157       1.907324       7.304259
min    1.000000e+00       1.000000       1.000000       1.500000
25%    6.760150e+04      28.000000       2.000000       5.400000
50%    1.351375e+05      56.000000       2.000000       7.400000
75%    2.027012e+05      85.000000       2.000000       9.200000
max    2.415841e+06     114.000000     200.000000     650.000000
std    7.813303e+04      32.826638       0.643683       3.083303
```

	0
DATE	3
STORE_NBR	3
LYLTY_CARD_NBR	3
TXN_ID	3
PROD_NBR	3
Update_Product_Name	3
PROD_QTY	1
TOT_SALES	1

dtype: int64

```
#merge datasets
merged_df = pd.merge(transaction_df, purchase_df, on='LYLTY_CARD_NBR', how='left')
print(merged_df)
```

```
             DATE  STORE_NBR  LYLTY_CARD_NBR    TXN_ID  PROD_NBR  \
0      2018-07-01        4.0          4074.0    2982.0      57.0
1      2018-07-01        4.0          4149.0    3333.0      16.0
2      2018-07-01        4.0          4196.0    3539.0      24.0
3      2018-07-01        5.0          5026.0    4525.0      42.0
4      2018-07-01        7.0          7215.0    7176.0      16.0
...           ...        ...             ...       ...       ...
264834 2019-06-22      208.0        208205.0  207318.0      37.0
264835 2019-06-22      264.0        264149.0  262909.0      25.0
264836        NaT        NaN             NaN       NaN       NaN
264837        NaT        NaN             NaN       NaN       NaN
```

```
264838        NaT        NaN             NaN       NaN       NaN

                           Update_Product_Name  PROD_QTY  TOT_SALES  \
0        Old El Paso Salsa Dip Tomato Mild 300g       1.0        5.1
1       Smiths Crinkle Chips Salt & Vinegar 330g       1.0        5.7
2                  Grain Waves Sweet Chilli 210g       1.0        3.6
3        Doritos Corn Chip Mexican Jalapeno 150g       1.0        3.9
4       Smiths Crinkle Chips Salt & Vinegar 330g       1.0        5.7
...                                         ...       ...        ...
264834        Smiths Thinly Swt Chli&S/Cream175G       5.0       15.0
264835             Pringles SourCream Onion 134g       5.0       18.5
264836                                      NaN       NaN        NaN
264837                                      NaN       5.0       18.5
264838                                      NaN       3.0       11.8

                     LIFESTAGE PREMIUM_CUSTOMER
0       MIDAGE SINGLES/COUPLES           Budget
1       MIDAGE SINGLES/COUPLES           Budget
2       MIDAGE SINGLES/COUPLES           Budget
3       MIDAGE SINGLES/COUPLES           Budget
4       MIDAGE SINGLES/COUPLES           Budget
...                        ...              ...
264834   YOUNG SINGLES/COUPLES          Premium
264835   YOUNG SINGLES/COUPLES          Premium
264836                     NaN              NaN
264837                     NaN              NaN
264838                     NaN              NaN

[264839 rows x 10 columns]
```

```
transaction_df.dropna(inplace=True)
transaction_df.isnull().sum()
```

	0
DATE	0
STORE_NBR	0
LYLTY_CARD_NBR	0
TXN_ID	0
PROD_NBR	0
Update_Product_Name	0
PROD_QTY	0
TOT_SALES	0

dtype: int64

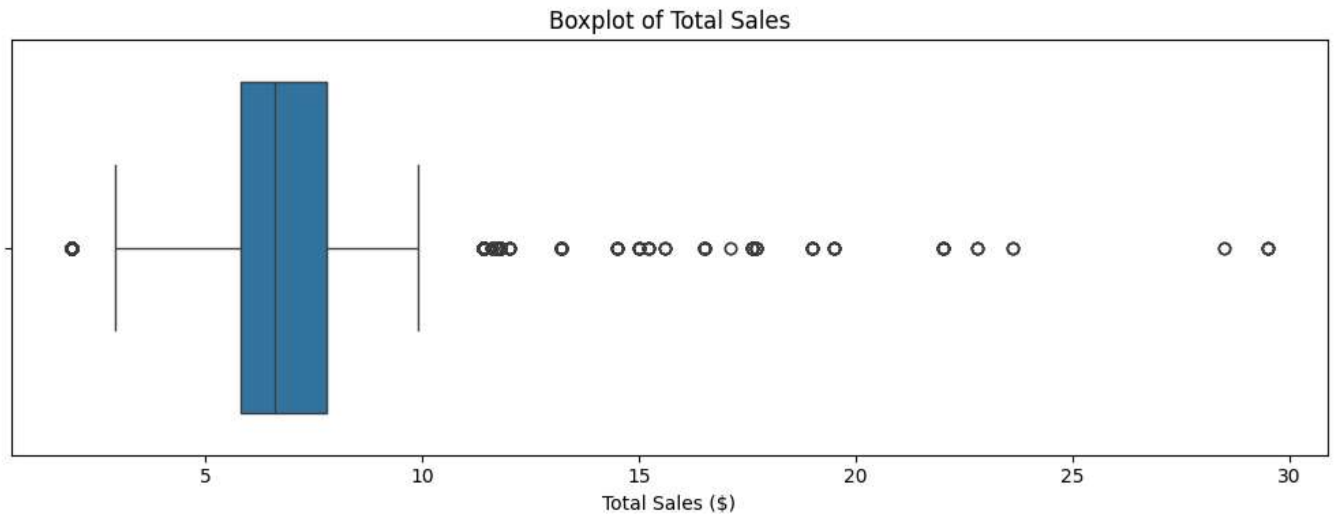
```
#Keep only chip-related products
merged_df = merged_df[merged_df['Update_Product_Name'].str.contains("chip|chips", case=False


# Remove outlier customer who bought 200 units
merged_df = merged_df[merged_df['LYLTY_CARD_NBR'] != 226000]


# Check for missing dates
merged_df['DATE'] = pd.to_datetime(merged_df['DATE'])
full_dates = pd.date_range(start="2018-07-01", end="2019-06-30")
actual_dates = merged_df['DATE'].dt.normalize().unique()
missing_dates = [date for date in full_dates if date not in actual_dates]
print("Missing dates:", missing_dates)
```

```
Missing dates: [Timestamp('2018-12-25 00:00:00')]
```

```
# Boxplot of sales to check outliers
plt.figure(figsize=(10, 4))
sns.boxplot(x=merged_df['TOT_SALES'])
plt.title("Boxplot of Total Sales")
plt.xlabel("Total Sales ($)")
plt.tight_layout()
plt.show()
```



```
# Remove outliers using IQR
Q1 = merged_df['TOT_SALES'].quantile(0.25)
Q3 = merged_df['TOT_SALES'].quantile(0.75)
IQR = Q3 - Q1
merged_df = merged_df[(merged_df['TOT_SALES'] >= Q1 - 1.5 * IQR) &
                      (merged_df['TOT_SALES'] <= Q3 + 1.5 * IQR)]
```

```
# Extract PACK_SIZE from PROD_NAME
merged_df['PACK_SIZE'] = merged_df['Update_Product_Name'].str.extract(r'(\d+)').astype(float



# Extract and clean BRAND
merged_df['BRAND'] = merged_df['Update_Product_Name'].str.extract(r'^([A-Za-z]+)')
brand_fix = {'RED': 'RRD', 'SNBTS': 'SUNBITES', 'WW': 'WOOLWORTHS', 'SMITH': 'SMITHS',
             'NCC': 'NATURAL', 'DORITO': 'DORITOS', 'INFZNS': 'INFUZIONS', 'GRAIN': 'GRNWVES
merged_df['BRAND'].replace(brand_fix, inplace=True)
```

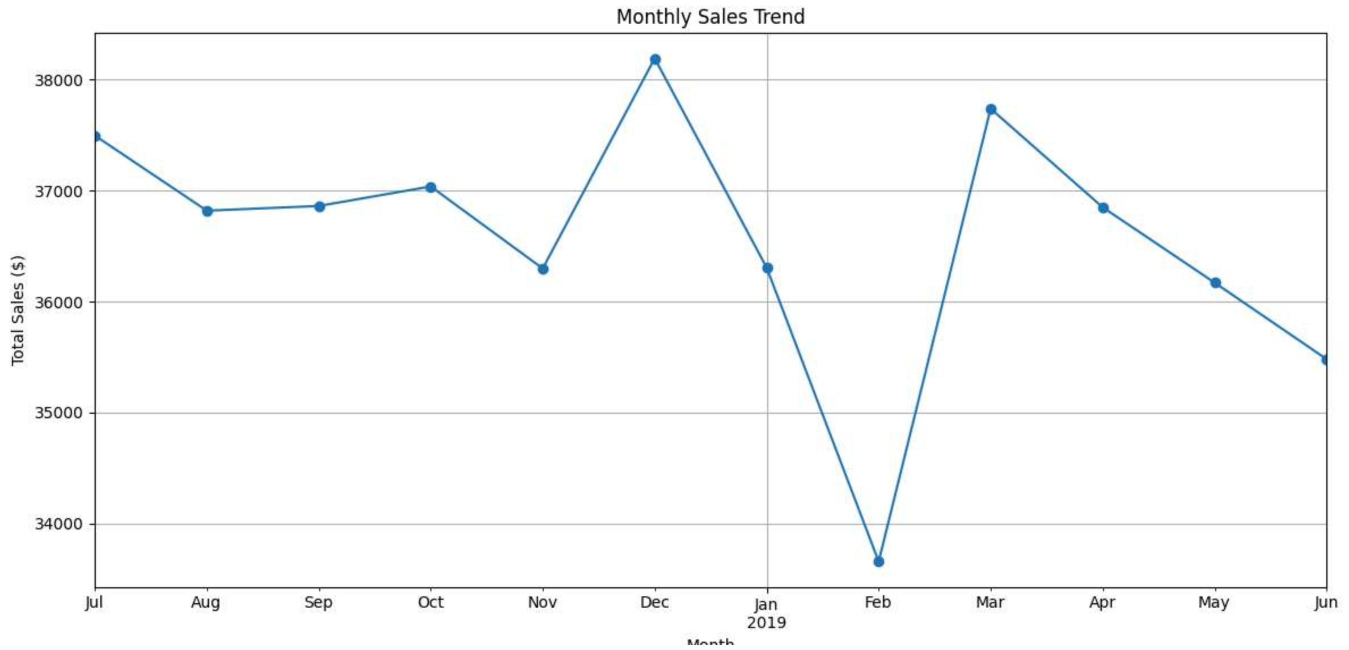
```
ed1ba893524e>:5: FutureWarning: A value is trying to be set on a copy of a DataFrame or
change in pandas 3.0. This inplace method will never work because the intermediate objec

doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=


'].replace(brand_fix, inplace=True)
```

```
# Monthly sales trend
monthly_sales = merged_df.resample('M', on='DATE')['TOT_SALES'].sum()
monthly_sales.plot(kind='line', marker='o', figsize=(12, 6), title='Monthly Sales Trend')
plt.ylabel('Total Sales ($)')
plt.xlabel('Month')
plt.grid(True)
plt.tight_layout()
plt.show()
```

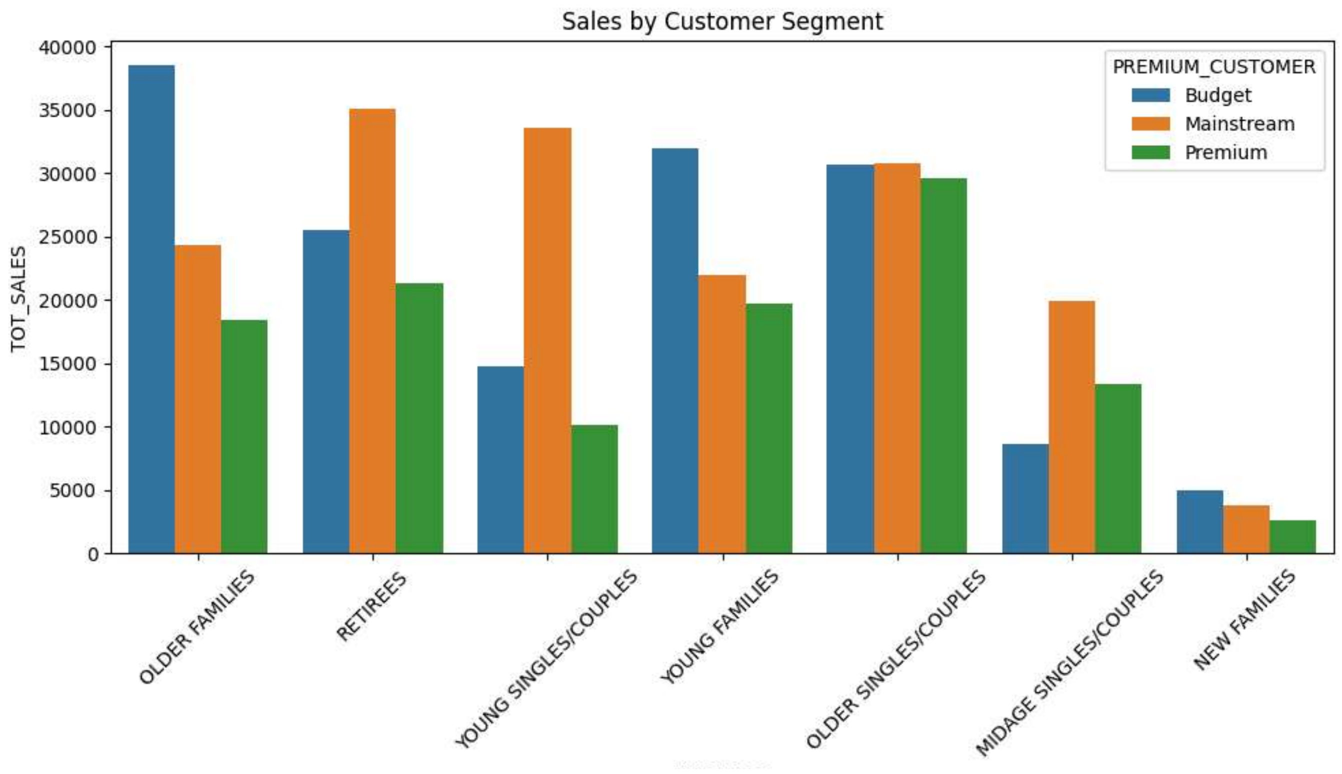
```
<ipython-input-15-5a280820b557>:2: FutureWarning: 'M' is deprecated and will be removed
  monthly_sales = merged_df.resample('M', on='DATE')['TOT_SALES'].sum()
```



```
# Total sales by customer segment
sales_by_type = (merged_df.groupby(['LIFESTAGE', 'PREMIUM_CUSTOMER'])['TOT_SALES']
                 .sum()
                 .reset_index()
                 .sort_values(by='TOT_SALES', ascending=False))
print(sales_by_type)
```

```
                 LIFESTAGE PREMIUM_CUSTOMER  TOT_SALES
6           OLDER FAMILIES           Budget    38481.0
13                RETIREES       Mainstream    35074.7
19   YOUNG SINGLES/COUPLES       Mainstream    33518.9
15          YOUNG FAMILIES           Budget    31905.7
10   OLDER SINGLES/COUPLES       Mainstream    30728.1
9    OLDER SINGLES/COUPLES           Budget    30615.1
11   OLDER SINGLES/COUPLES          Premium    29595.4
12                RETIREES           Budget    25493.5
7           OLDER FAMILIES       Mainstream    24268.3
16          YOUNG FAMILIES       Mainstream    21895.2
14                RETIREES          Premium    21268.2
1   MIDAGE SINGLES/COUPLES       Mainstream    19857.4
17          YOUNG FAMILIES          Premium    19736.2
8           OLDER FAMILIES          Premium    18352.9
18   YOUNG SINGLES/COUPLES           Budget    14735.6
2   MIDAGE SINGLES/COUPLES          Premium    13317.3
20   YOUNG SINGLES/COUPLES          Premium    10088.2
0   MIDAGE SINGLES/COUPLES           Budget     8613.0
3             NEW FAMILIES           Budget     4999.5
4             NEW FAMILIES       Mainstream     3757.1
5             NEW FAMILIES          Premium     2595.9
```

```
# 📊 Bar chart of customer segment sales
plt.figure(figsize=(10, 6))
sns.barplot(data=sales_by_type, x='LIFESTAGE', y='TOT_SALES', hue='PREMIUM_CUSTOMER')
plt.title('Sales by Customer Segment')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



```
# 🔢 Average units per customer
avg_units = merged_df.groupby(['LIFESTAGE', 'PREMIUM_CUSTOMER'])['PROD_QTY'].sum() / \
            merged_df.groupby(['LIFESTAGE', 'PREMIUM_CUSTOMER'])['LYLTY_CARD_NBR'].nunique()
print("Average units per customer:\n", avg_units)
```

```
Average units per customer:
 LIFESTAGE               PREMIUM_CUSTOMER
MIDAGE SINGLES/COUPLES  Budget              3.020095
                        Mainstream          3.031686
                        Premium             3.026134
NEW FAMILIES            Budget              2.636531
                        Mainstream          2.527316
                        Premium             2.537415
OLDER FAMILIES          Budget              3.810909
                        Mainstream          3.869010
                        Premium             3.843923
OLDER SINGLES/COUPLES   Budget              3.041424
                        Mainstream          3.126477
                        Premium             3.077309
RETIREES                Budget              2.879181
                        Mainstream          2.856139
                        Premium             2.848951
YOUNG FAMILIES          Budget              3.718640
                        Mainstream          3.690355
                        Premium             3.722716
YOUNG SINGLES/COUPLES   Budget              2.507090
                        Mainstream          2.542340
                        Premium             2.543024
dtype: float64
```

```
# 💲 Average price per unit
avg_price = merged_df.groupby(['LIFESTAGE', 'PREMIUM_CUSTOMER'])['TOT_SALES'].sum() / \
            merged_df.groupby(['LIFESTAGE', 'PREMIUM_CUSTOMER'])['PROD_QTY'].sum()
print("Average price per unit:\n", avg_price)
```

```
Average price per unit:
 LIFESTAGE               PREMIUM_CUSTOMER
MIDAGE SINGLES/COUPLES  Budget              3.371037
                        Mainstream          3.517697
                        Premium             3.382601
NEW FAMILIES            Budget              3.498600
                        Mainstream          3.531109
                        Premium             3.479759
OLDER FAMILIES          Budget              3.338046
                        Mainstream          3.339981
                        Premium             3.297323
OLDER SINGLES/COUPLES   Budget              3.446094
                        Mainstream          3.414992
                        Premium             3.442126
RETIREES                Budget              3.484623
                        Mainstream          3.450536
                        Premium             3.480314
YOUNG FAMILIES          Budget              3.352848
                        Mainstream          3.346355
                        Premium             3.363934
YOUNG SINGLES/COUPLES   Budget              3.333846
                        Mainstream          3.613118
                        Premium             3.314126
dtype: float64
```

```
# 🎯 Brand affinity: Mainstream + Young Singles/Couples
segment = merged_df[(merged_df['LIFESTAGE'] == "YOUNG SINGLES/COUPLES") &
                    (merged_df['PREMIUM_CUSTOMER'] == "Mainstream")]
segment_brand_share = segment['BRAND'].value_counts(normalize=True)
other_brand_share = merged_df[~merged_df.index.isin(segment.index)]['BRAND'].value_counts(nc
brand_affinity = (segment_brand_share / other_brand_share).dropna().sort_values(ascending=Fa
print("Brand Affinity:\n", brand_affinity)
```

```
Brand Affinity:
 BRAND
Doritos       1.286385
Cobs          1.217147
Tostitos      1.213476
Thins         1.125839
French        0.723629
Smiths        0.713365
Natural       0.699358
WOOLWORTHS    0.496231
Name: proportion, dtype: float64
```

```
# Pack size affinity
segment_qty = segment['PROD_QTY'].sum()
other = merged_df[~merged_df.index.isin(segment.index)]
other_qty = other['PROD_QTY'].sum()
segment_pack_share = segment.groupby('PACK_SIZE')['PROD_QTY'].sum() / segment_qty
other_pack_share = other.groupby('PACK_SIZE')['PROD_QTY'].sum() / other_qty
pack_affinity = (segment_pack_share / other_pack_share).dropna().sort_values(ascending=False
print("Pack Size Affinity:\n", pack_affinity)
```

```
Pack Size Affinity:
 PACK_SIZE
380.0    2.319916
330.0    2.247313
110.0    1.227404
150.0    1.213443
170.0    1.071249
175.0    0.948822
160.0    0.532697
200.0    0.494835
Name: PROD_QTY, dtype: float64
```

```
merged_df.to_csv("QVI_cleaned_data.csv", index=False)
```

Start coding or generate with AI.