```
import pandas as pd

# Load the sales data
sales_data = pd.read_csv('sales_data.csv')

# Display the first few rows of the dataframe
sales_data.head()
```

Show hidden output

```
# Count the occurrences of each product
product_counts = sales_data['Product Name'].value_counts()

# Display the most prevalent products
print(product_counts.head())
```

Show hidden output

```
# Define a large basket as having more than a certain number of items
large_basket_threshold = 5

# Group by CustomerID and count the number of items in each basket
basket_sizes = sales_data.groupby('CustomerID').size()

# Count the number of large baskets
large_basket_counts = basket_sizes[basket_sizes > large_basket_threshold].count()

# Display the frequency of large buyers
print(large_basket_counts)
```

```
10
```

```
# Group by StoreID and count the number of large baskets in each store
large_basket_stores = sales_data[sales_data['CustomerID'].isin(basket_sizes[basket_sizes > large_basket_threshold].index)]
store_large_basket_counts = large_basket_stores['StoreID'].value_counts()

# Display the stores with large-basket buyers
print(store_large_basket_counts)
```

Show hidden output

```
import matplotlib.pyplot as plt

# Plot the top stores with large-basket buyers
store_large_basket_counts.head(10).plot(kind='bar')
plt.title('Top Stores with Large-Basket Buyers')
plt.xlabel('StoreID')
plt.ylabel('Number of Large Baskets')
plt.show()
```

Show hidden output

```
# Get the products in large baskets
large_basket_products = large_basket_stores['Product Name'].value_counts()

# Display the top-N products
top_n = 10
print(large_basket_products.head(top_n))
```

Show hidden output

```
# Group by CustomerID and get the average basket makeup
basket_makeup = sales_data.groupby('CustomerID')['Product Name'].apply(lambda x: x.value_counts(normalize=True))

# Display the average categorical makeup of baskets
print(basket_makeup.head())
```

Show hidden output

```
# Plot the categorical makeup of baskets
basket_makeup_df = basket_makeup.unstack().mean().sort_values(ascending=False)
```

```
basket_makeup_df.plot(kind='bar')
plt.title('Average Categorical Makeup of Baskets')
plt.xlabel('Product Name')
plt.ylabel('Average Proportion in Basket')
plt.show()
```

Show hidden output

PROJECT #3 Below here

1. Analysis of Product Occurrences

```
# Count the occurrences of each product (PROJECT 3)
product_counts = sales_data['Product Name'].value_counts()

# Display the most prevalent products
print("Most Prevalent Products:")
print(product_counts.head())
```

```
Most Prevalent Products:
Product Name
Veggie         1176
Pepperoni      1143
Margherita     1136
Meat Lovers    1124
Hawaiian       1117
Name: count, dtype: int64
```

2. Analysis of Large Baskets

```
# Define a large basket as having more than a certain number of items (PROJECT 3)
large_basket_threshold = 5

# Group by CustomerID and count the number of items in each basket
basket_sizes = sales_data.groupby('CustomerID').size()

# Count the number of large baskets
large_basket_counts = basket_sizes[basket_sizes > large_basket_threshold].count()

# Display the frequency of large buyers
print("Number of Large Baskets:")
print(large_basket_counts)
```

```
Number of Large Baskets:
10
```

3. Store Analysis: Identify stores with the highest number of large-basket buyers.

```
# Group by StoreID and count the number of large baskets in each store (PROJECT 3)
large_basket_stores = sales_data[sales_data['CustomerID'].isin(basket_sizes[basket_sizes > large_basket_threshold].index)]
store_large_basket_counts = large_basket_stores['StoreID'].value_counts()

# Display the stores with large-basket buyers
print("Stores with Large-Basket Buyers:")
print(store_large_basket_counts)
```

```
Stores with Large-Basket Buyers:
StoreID
7     107
52    107
93    105
61    105
77    104
     ...
44     75
65     75
8      75
76     74
20     70
Name: count, Length: 100, dtype: int64
```

4. Plot Top Stores with Large-Basket Buyers: Visualize the top stores with large-basket buyers.

```
import matplotlib.pyplot as plt

# Plot the top stores with large-basket buyers (PROJECT 3)
store_large_basket_counts.head(10).plot(kind='bar')
plt.title('Top Stores with Large-Basket Buyers')
plt.xlabel('StoreID')
plt.ylabel('Number of Large Baskets')
plt.show()
```

5. Analysis of Products in Large Baskets

```
# Get the products in large baskets (PROJECT 3)
large_basket_products = large_basket_stores['Product Name'].value_counts()

# Display the top-N products
top_n = 10
print("Top Products in Large Baskets:")
print(large_basket_products.head(top_n))
```

```
Top Products in Large Baskets:
Product Name
Veggie         1176
Pepperoni      1143
Margherita     1136
Meat Lovers    1124
Hawaiian       1117
BBQ Chicken    1107
Supreme        1097
Cheese         1097
Name: count, dtype: int64
```

6. Analysis of Basket Makeup

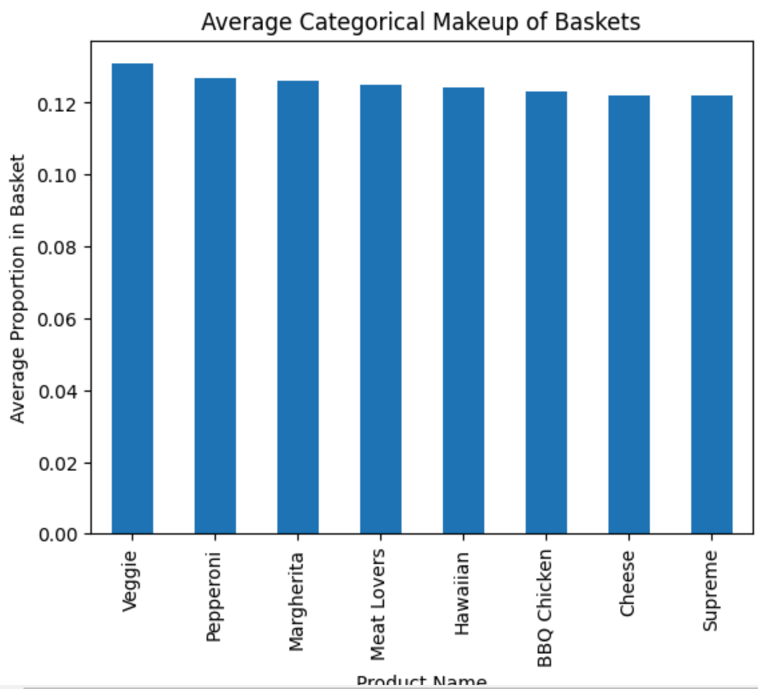
```
# Group by CustomerID and get the average basket makeup
basket_makeup = sales_data.groupby('CustomerID')['Product Name'].apply(lambda x: x.value_counts(normalize=True))

# Display the average categorical makeup of baskets
print("Average Categorical Makeup of Baskets:")
print(basket_makeup.head())
```

```
Average Categorical Makeup of Baskets:
CustomerID
0            Pepperoni      0.148649
             Veggie         0.137387
             Cheese         0.131757
```

```
            Hawaiian       0.130631
            Meat Lovers    0.120495
Name: Product Name, dtype: float64
```

7. Plot Basket Makeup: Visualize the average categorical makeup of baskets.

```
# Plot the categorical makeup of baskets
basket_makeup_df = basket_makeup.unstack().mean().sort_values(ascending=False)
basket_makeup_df.plot(kind='bar')
plt.title('Average Categorical Makeup of Baskets')
plt.xlabel('Product Name')
plt.ylabel('Average Proportion in Basket')
plt.show()
```



8. Market Basket Analysis

```
from mlxtend.frequent_patterns import apriori, association_rules

# Create a basket for each store
basket = (sales_data.groupby(['StoreID', 'OrderID', 'Product Name'])['Product Name']
          .count().unstack().reset_index().fillna(0)
          .set_index(['StoreID', 'OrderID']))

# Convert the values to 1 and 0
def encode_units(x):
    return 1 if x >= 1 else 0

basket_sets = basket.applymap(encode_units)

# Perform market basket analysis using the Apriori algorithm
frequent_itemsets = apriori(basket_sets, min_support=0.01, use_colnames=True)

# Generate the association rules, specifying num_itemsets
rules = association_rules(frequent_itemsets, metric="lift", min_threshold=1, support_only=False, num_itemsets=frequent_itemsets['itemsets'].
# Display the most frequently occurring itemsets
print(frequent_itemsets.sort_values(by='support', ascending=False).head())

# Display the association rules
print(rules.head())
```

```
    support      itemsets
7  0.990000      (Veggie)
2  0.983333    (Hawaiian)
3  0.983333  (Margherita)
6  0.983333     (Supreme)
```

```
1  0.983333      (Cheese)
            antecedents            consequents  antecedent support  \
0         (Meat Lovers)          (BBQ Chicken)            0.980000
1         (BBQ Chicken)          (Meat Lovers)            0.966667
2  (Meat Lovers, Cheese)          (BBQ Chicken)            0.963333
3  (BBQ Chicken, Cheese)          (Meat Lovers)            0.950000
4         (Meat Lovers)  (BBQ Chicken, Cheese)            0.980000

   consequent support   support  confidence      lift  representativity  \
0            0.966667  0.950000    0.969388  1.002815               1.0
1            0.980000  0.950000    0.982759  1.002815               1.0
2            0.966667  0.933333    0.968858  1.002267               1.0
3            0.980000  0.933333    0.982456  1.002506               1.0
4            0.950000  0.933333    0.952381  1.002506               1.0

   leverage  conviction  zhangs_metric   jaccard  certainty  kulczynski
0  0.002667    1.088889       0.140351  0.953177   0.081633    0.976073
1  0.002667    1.160000       0.084211  0.953177   0.137931    0.976073
2  0.002111    1.070370       0.061688  0.936455   0.065744    0.967188
3  0.002333    1.140000       0.050000  0.936455   0.122807    0.967419
4  0.002333    1.050000       0.125000  0.936455   0.047619    0.967419
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell`
  and should_run_async(code)
<ipython-input-23-2ba1fc29c1ab>:12: FutureWarning: DataFrame.applymap has been deprecated. Use DataFrame.map instead.
  basket_sets = basket.applymap(encode_units)
/usr/local/lib/python3.10/dist-packages/mlxtend/frequent_patterns/fpcommon.py:161: DeprecationWarning: DataFrames with non-bool types re
  warnings.warn(
```