importing the necessary libraries for data manipulation, visualization, and analysis.

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

Load dataset

```
df = pd.read_csv('Fashion_Retail_Sales.csv' )
```

Display first 5 rows

```
print(df.head(5))
```

```
    Customer Reference ID Item Purchased  Purchase Amount (USD) Date Purchase  \
0                   4018        Handbag                4619.0    05-02-2023
1                   4115          Tunic                2456.0    11-07-2023
2                   4019       Tank Top                2102.0    23-03-2023
3                   4097       Leggings                3126.0    15-03-2023
4                   3997         Wallet                3003.0    27-11-2022

   Review Rating Payment Method
0            NaN    Credit Card
1            2.0    Credit Card
2            4.1           Cash
3            3.2           Cash
4            4.7           Cash
```

```
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3400 entries, 0 to 3399
Data columns (total 6 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Customer Reference ID  3400 non-null   int64
 1   Item Purchased         3400 non-null   object
 2   Purchase Amount (USD)  2750 non-null   float64
 3   Date Purchase          3400 non-null   object
 4   Review Rating          3076 non-null   float64
 5   Payment Method         3400 non-null   object
dtypes: float64(2), int64(1), object(3)
memory usage: 159.5+ KB
None
```

checking for missing values

```
print(df.isnull().sum())
```

```
Customer Reference ID      0
Item Purchased             0
Purchase Amount (USD)    650
Date Purchase              0
Review Rating            324
Payment Method             0
dtype: int64
```

```
print(df.describe(include='all'))
```

```
        Customer Reference ID Item Purchased  Purchase Amount (USD)  \
count             3400.000000           3400            2750.000000
unique                    NaN             50                    NaN
top                       NaN           Belt                    NaN
freq                      NaN             90                    NaN
mean              4039.660588            NaN             156.709818
std                 48.122583            NaN             419.536669
min               3957.000000            NaN              10.000000
25%               3997.000000            NaN              57.000000
50%               4040.000000            NaN             110.000000
75%               4081.000000            NaN             155.750000
max               4122.000000            NaN            4932.000000

       Date Purchase  Review Rating Payment Method
count           3400    3076.000000           3400
unique           365            NaN              2
top       22-09-2023            NaN    Credit Card
freq              17            NaN           1770
mean             NaN       2.999057            NaN
std              NaN       1.156505            NaN
min              NaN       1.000000            NaN
25%              NaN       2.000000            NaN
50%              NaN       3.000000            NaN
75%              NaN       4.000000            NaN
max              NaN       5.000000            NaN
```

```
# Strategy: Fill missing numeric values with the median or mean, and categorical values
# For Purchase Amount (USD), fill missing values with the median
df['Purchase Amount (USD)'] = df['Purchase Amount (USD)'].fillna(df['Purchase Amount (U

# For Review Rating, fill missing values with the median
df['Review Rating'] = df['Review Rating'].fillna(df['Review Rating'].median())

# Verify that missing values have been handled
print("\nMissing Values After Handling:")
print(df.isnull().sum())
```

```

Missing Values After Handling:
Customer Reference ID    0
Item Purchased           0
Purchase Amount (USD)    0
Date Purchase            0
Review Rating            0
Payment Method           0
dtype: int64
```

Convert Date Column to DateTime Format

```
df['Date Purchase'] = pd.to_datetime(df['Date Purchase'], format='%d-%m-%Y')
```

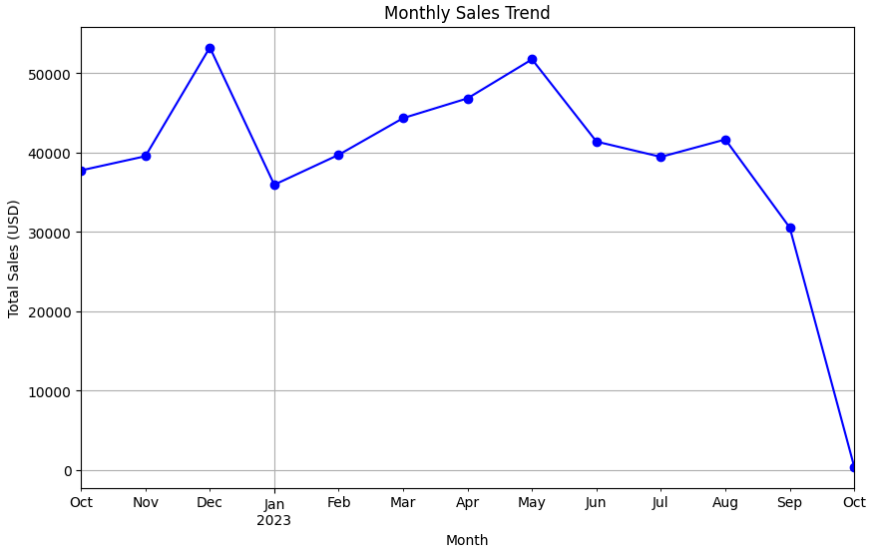
```
# Verify the conversion
print("\nDate Purchase Column After Conversion:")
print(df['Date Purchase'].head())
```

```
Date Purchase Column After Conversion:
0   2023-02-05
1   2023-07-11
2   2023-03-23
3   2023-03-15
4   2022-11-27
Name: Date Purchase, dtype: datetime64[ns]
```

```
df['Month'] = df['Date Purchase'].dt.to_period('M')
monthly_sales = df.groupby('Month')['Purchase Amount (USD)'].sum()
```

Exploratory Data Analysis (EDA)

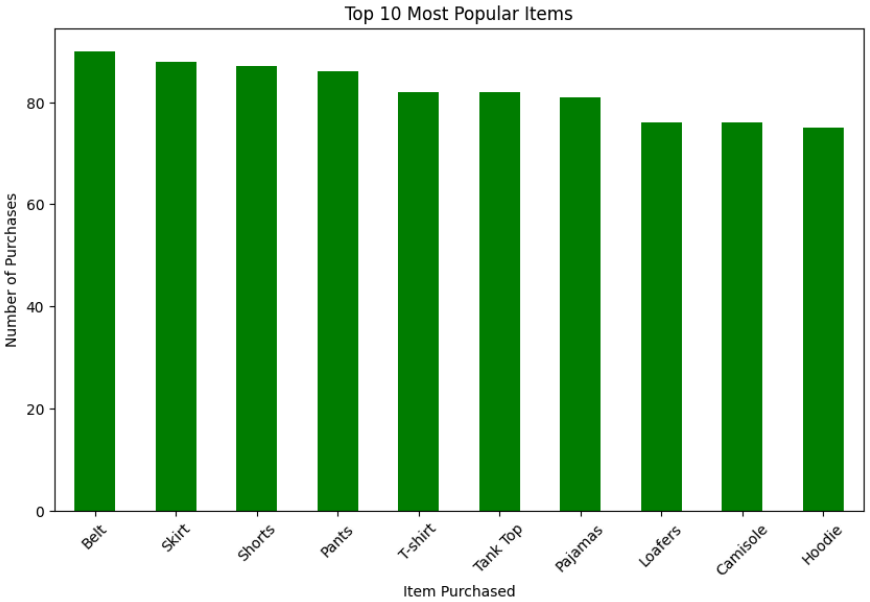
```
# Plot monthly sales
plt.figure(figsize=(10, 6))
monthly_sales.plot(kind='line', marker='o', color='blue')
plt.title('Monthly Sales Trend')
plt.xlabel('Month')
plt.ylabel('Total Sales (USD)')
plt.grid()
plt.show()
```



Most Popular Items

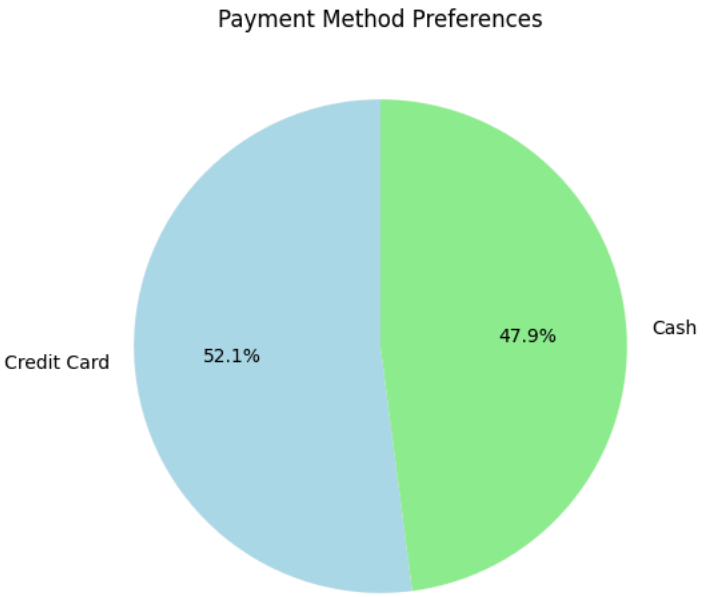
```
item_counts = df['Item Purchased'].value_counts().head(10)  # Updated column name

# Plot top 10 most popular items
plt.figure(figsize=(10, 6))
item_counts.plot(kind='bar', color='green')
plt.title('Top 10 Most Popular Items')
plt.xlabel('Item Purchased')  # Updated label
plt.ylabel('Number of Purchases')
plt.xticks(rotation=45)
plt.show()
```




```
# Count the occurrences of each payment method
payment_counts = df['Payment Method'].value_counts()
```

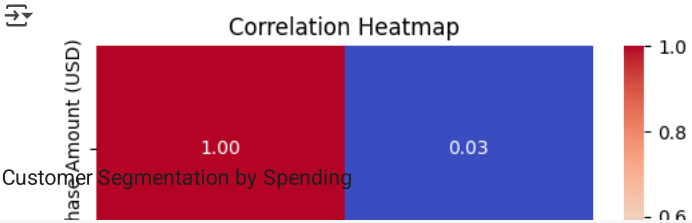
```
# Plot payment method preferences
plt.figure(figsize=(8, 6))
payment_counts.plot(kind='pie', autopct='%1.1f%%', startangle=90, colors=['lightblue',
plt.title('Payment Method Preferences')
plt.ylabel('')
plt.show()
```



Advanced Analysis

```
# Calculate correlation
correlation = df[['Purchase Amount (USD)', 'Review Rating']].corr()
```

```
# Plot heatmap
plt.figure(figsize=(6, 4))
sns.heatmap(correlation, annot=True, cmap='coolwarm', fmt='.2f')
plt.title('Correlation Heatmap')
plt.show()
```



Customer Segmentation by Spending

```
# Create bins for spending categories
bins = [0, 50, 100, 200, np.inf]
labels = ['Low', 'Medium', 'High', 'Very High']
df['Spending Category'] = pd.cut(df['Purchase Amount (USD)'], bins=bins, labels=labels)
```

```
# Count customers in each category
spending_counts = df['Spending Category'].value_counts()
```

```
# Plot spending categories
plt.figure(figsize=(8, 6))
spending_counts.plot(kind='bar', color='orange')
plt.title('Customer Spending Categories')
plt.xlabel('Spending Category')
plt.ylabel('Number of Customers')
plt.xticks(rotation=0)
plt.show()
```