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



# Load datasets
customers = pd.read_csv('Customers.csv')
products = pd.read_csv('Products.csv')
transactions = pd.read_csv('Transactions.csv')

# Display the first few rows of each dataset
print(customers.head())
print(products.head())
print(transactions.head())
```

```
  CustomerID        CustomerName         Region  SignupDate
0      C0001    Lawrence Carroll  South America  2022-07-10
1      C0002      Elizabeth Lutz           Asia  2022-02-13
2      C0003      Michael Rivera  South America  2024-03-07
3      C0004  Kathleen Rodriguez  South America  2022-10-09
4      C0005         Laura Weber           Asia  2022-08-15
  ProductID              ProductName     Category   Price
0      P001     ActiveWear Biography        Books  169.30
1      P002    ActiveWear Smartwatch  Electronics  346.30
2      P003  ComfortLiving Biography        Books   44.12
3      P004            BookWorld Rug   Home Decor   95.69
4      P005          TechPro T-Shirt     Clothing  429.31
  TransactionID CustomerID ProductID      TransactionDate  Quantity  \
0        T00001      C0199      P067  2024-08-25 12:38:23         1
1        T00112      C0146      P067  2024-05-27 22:23:54         1
2        T00166      C0127      P067  2024-04-25 07:38:55         1
3        T00272      C0087      P067  2024-03-26 22:55:37         2
4        T00363      C0070      P067  2024-03-21 15:10:10         3

   TotalValue   Price
0      300.68  300.68
1      300.68  300.68
2      300.68  300.68
3      601.36  300.68
4      902.04  300.68
```

```
# Check for missing values
print(customers.isnull().sum())
print(products.isnull().sum())
print(transactions.isnull().sum())
```

```
CustomerID      0
CustomerName    0
Region          0
SignupDate      0
dtype: int64
ProductID      0
ProductName    0
Category       0
Price          0
dtype: int64
TransactionID      0
CustomerID         0
ProductID          0
TransactionDate    0
Quantity           0
TotalValue         0
Price              0
dtype: int64
```

```
# Check for duplicates
print(customers.duplicated().sum())
```

```
print(products.duplicated().sum())
print(transactions.duplicated().sum())
```

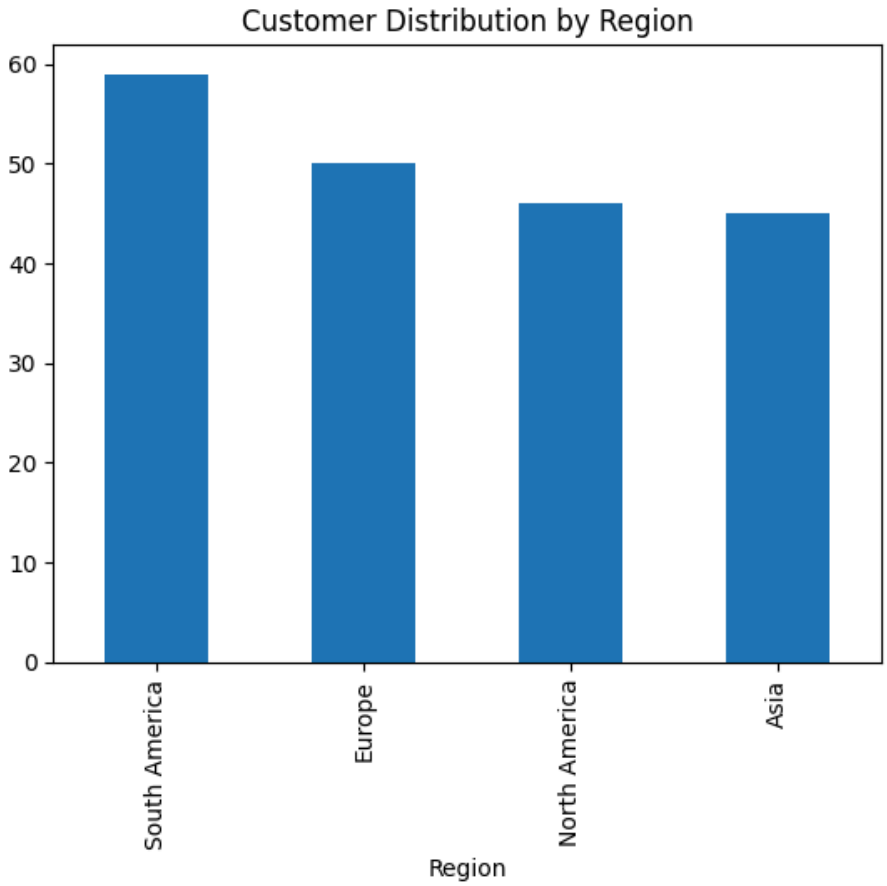
```
0
0
0
```

```
# Convert date columns to datetime
customers['SignupDate'] = pd.to_datetime(customers['SignupDate'])
transactions['TransactionDate'] = pd.to_datetime(transactions['TransactionDate'])
```

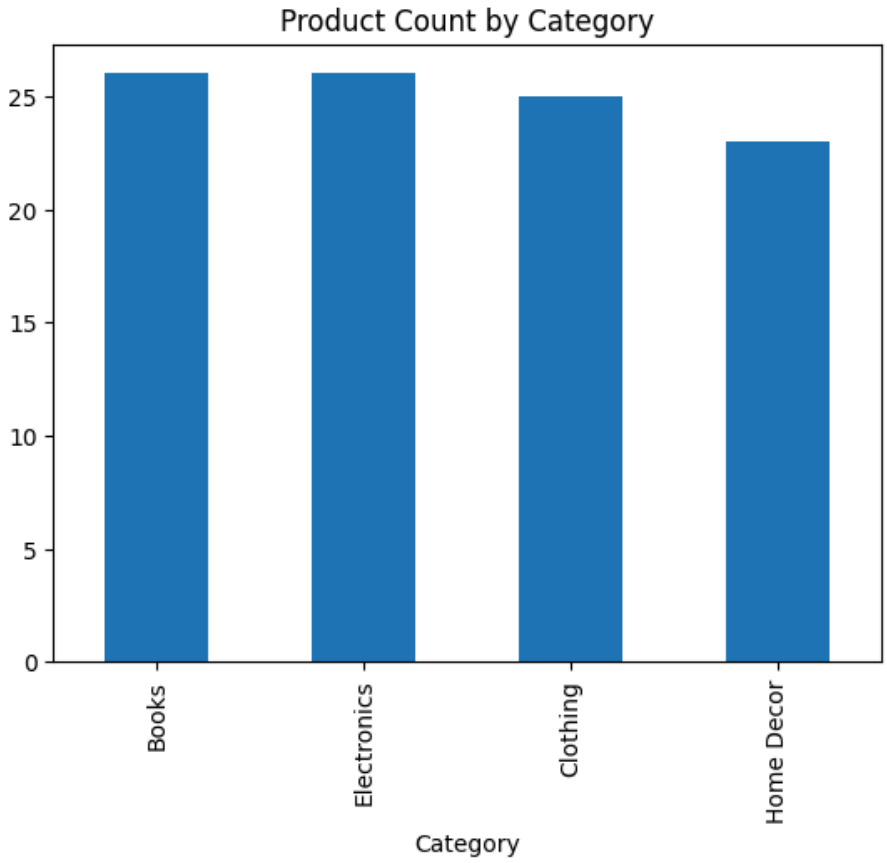
```
# Summary statistics
print(customers.describe(include='all'))
print(products.describe(include='all'))
print(transactions.describe())
```

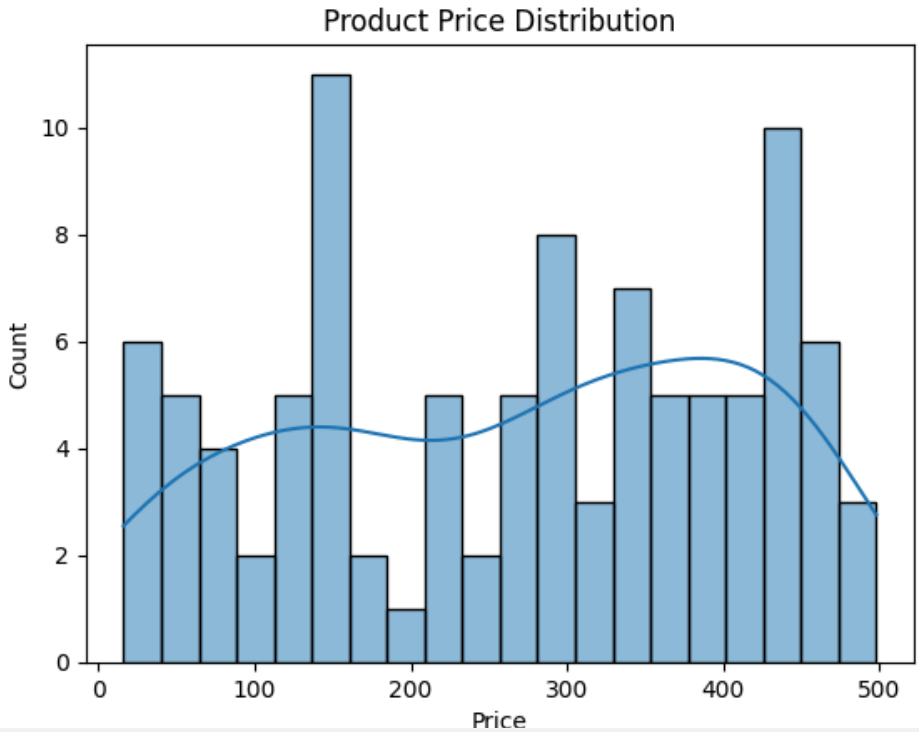
```
       CustomerID      CustomerName         Region           SignupDate
count         200               200            200                  200
unique        200               200              4                  NaN
top         C0001  Lawrence Carroll  South America                  NaN
freq            1                 1             59                  NaN
mean          NaN               NaN            NaN  2023-07-19 08:31:12
min           NaN               NaN            NaN  2022-01-22 00:00:00
25%           NaN               NaN            NaN  2022-09-26 12:00:00
50%           NaN               NaN            NaN  2023-08-31 12:00:00
75%           NaN               NaN            NaN  2024-04-12 12:00:00
max           NaN               NaN            NaN  2024-12-28 00:00:00
       ProductID            ProductName Category       Price
count        100                    100      100  100.000000
unique       100                     66        4         NaN
top         P001  ActiveWear Smartwatch    Books         NaN
freq           1                      4       26         NaN
mean         NaN                    NaN      NaN  267.551700
std          NaN                    NaN      NaN  143.219383
min          NaN                    NaN      NaN   16.080000
25%          NaN                    NaN      NaN  147.767500
50%          NaN                    NaN      NaN  292.875000
75%          NaN                    NaN      NaN  397.090000
max          NaN                    NaN      NaN  497.760000
                     TransactionDate     Quantity   TotalValue       Price
count                           1000  1000.000000  1000.000000  1000.00000
mean   2024-06-23 15:33:02.768999936     2.537000   689.995560   272.55407
min              2023-12-30 15:29:12     1.000000    16.080000    16.08000
25%        2024-03-25 22:05:34.500000     2.000000   295.295000   147.95000
50%        2024-06-26 17:21:52.500000     3.000000   588.880000   299.93000
75%              2024-09-19 14:19:57     4.000000  1011.660000   404.40000
max              2024-12-28 11:00:00     4.000000  1991.040000   497.76000
std                              NaN     1.117981   493.144478   140.73639
```

```
# Distribution of customers by region
region_counts = customers['Region'].value_counts()
region_counts.plot(kind='bar', title='Customer Distribution by Region')
plt.show()

# Signup trends
customers['SignupYear'] = customers['SignupDate'].dt.year
signup_trends = customers['SignupYear'].value_counts().sort_index()
signup_trends.plot(kind='line', title='Customer Signup Trends')
plt.show()
```




```
# Count of products by category
category_counts = products['Category'].value_counts()
category_counts.plot(kind='bar', title='Product Count by Category')
plt.show()

# Distribution of product prices
sns.histplot(products['Price'], kde=True, bins=20)
plt.title('Product Price Distribution')
plt.show()
```






```
# Total revenue
total_revenue = transactions['TotalValue'].sum()
print(f'Total Revenue: ${total_revenue}')

# Top-selling products
top_products = transactions.groupby('ProductID')['Quantity'].sum().sort_values(ascending=False).head(10)
print(top_products)

# Seasonal trends
transactions['Month'] = transactions['TransactionDate'].dt.month
monthly_sales = transactions.groupby('Month')['TotalValue'].sum()
monthly_sales.plot(kind='bar', title='Monthly Sales Trends')
plt.show()
```

```
Total Revenue: $689995.56
ProductID
P059    46
P054    46
P029    45
P079    43
P061    43
P057    43
P048    43
P062    39
P020    38
P028    38
Name: Quantity, dtype: int64
```

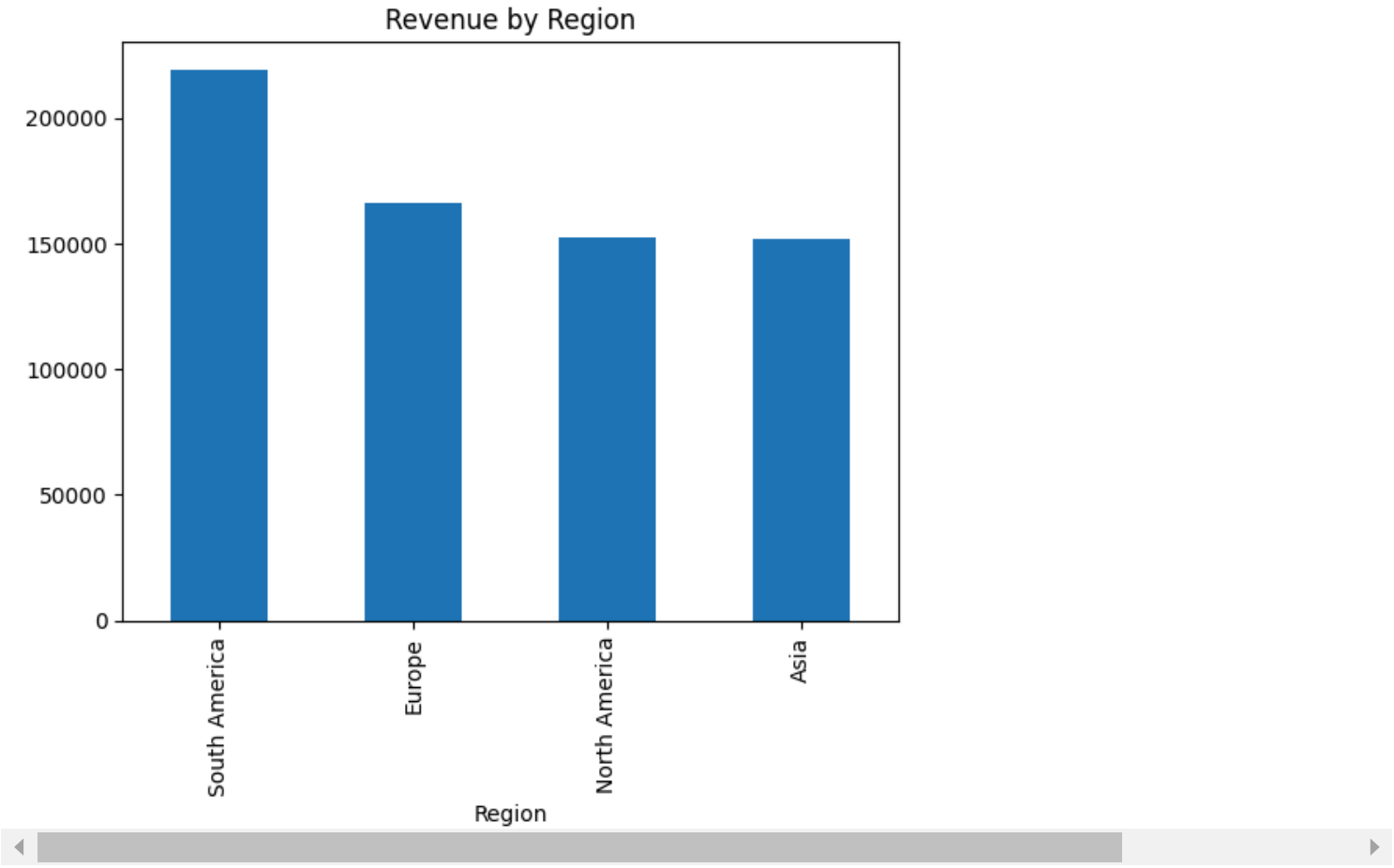

```
# Merge transactions with products
merged_data = transactions.merge(products, on='ProductID')

# Merge with customers
merged_data = merged_data.merge(customers, on='CustomerID')

print(merged_data.head())
```

```
  TransactionID CustomerID ProductID     TransactionDate  Quantity  \
0        T00001      C0199      P067 2024-08-25 12:38:23         1
1        T00112      C0146      P067 2024-05-27 22:23:54         1
2        T00166      C0127      P067 2024-04-25 07:38:55         1
3        T00272      C0087      P067 2024-03-26 22:55:37         2
4        T00363      C0070      P067 2024-03-21 15:10:10         3

   TotalValue  Price_x  Month                      ProductName     Category  \
0      300.68   300.68      8  ComfortLiving Bluetooth Speaker  Electronics
1      300.68   300.68      5  ComfortLiving Bluetooth Speaker  Electronics
2      300.68   300.68      4  ComfortLiving Bluetooth Speaker  Electronics
3      601.36   300.68      3  ComfortLiving Bluetooth Speaker  Electronics
4      902.04   300.68      3  ComfortLiving Bluetooth Speaker  Electronics

   Price_y     CustomerName         Region SignupDate  SignupYear
0   300.68   Andrea Jenkins         Europe 2022-12-03        2022
1   300.68  Brittany Harvey           Asia 2024-09-04        2024
2   300.68  Kathryn Stevens         Europe 2024-04-04        2024
3   300.68  Travis Campbell  South America 2024-04-11        2024
4   300.68    Timothy Perez         Europe 2022-03-15        2022
```

```
# Total spending by customer
customer_spending = merged_data.groupby('CustomerID')['TotalValue'].sum().sort_values(ascending=False)
print(customer_spending.head())
```

```
# Average transaction value
avg_transaction_value = merged_data['TotalValue'].mean()
print(f'Average Transaction Value: ${avg_transaction_value:.2f}')

# Most active regions
region_revenue = merged_data.groupby('Region')['TotalValue'].sum().sort_values(ascending=False)
region_revenue.plot(kind='bar', title='Revenue by Region')
plt.show()
```

```
CustomerID
C0141    10673.87
C0054     8040.39
C0065     7663.70
C0156     7634.45
C0082     7572.91
Name: TotalValue, dtype: float64
Average Transaction Value: $690.00
```




```
merged_data.to_csv('Merged_Data.csv', index=False)
```

Start coding or generate with AI.