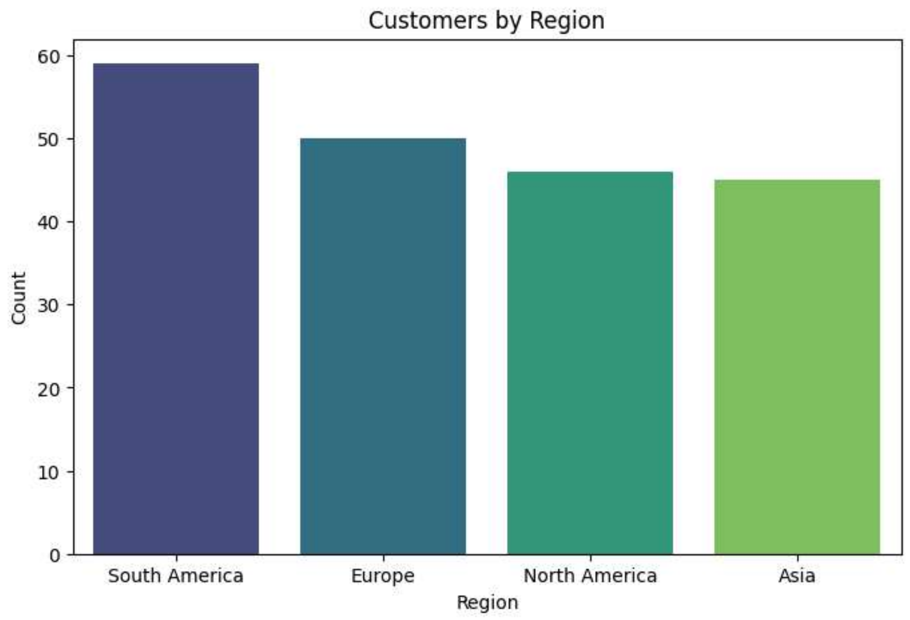
```
# Import necessary libraries
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

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

# Display basic information
print("Customers Dataset:")
print(customers.info())
print(customers.head())

print("\nProducts Dataset:")
print(products.info())
print(products.head())

print("\nTransactions Dataset:")
print(transactions.info())
print(transactions.head())

# Check for missing values
print("\nMissing Values:")
print("Customers:", customers.isnull().sum())
print("Products:", products.isnull().sum())
print("Transactions:", transactions.isnull().sum())

# Check for duplicates
print("\nDuplicate Entries:")
print("Customers:", customers.duplicated().sum())
print("Products:", products.duplicated().sum())
print("Transactions:", transactions.duplicated().sum())

# Merge datasets for comprehensive analysis
merged_data = pd.merge(transactions, customers, on='CustomerID')
merged_data = pd.merge(merged_data, products, on='ProductID')

# Display merged data
print("\nMerged Dataset:")
print(merged_data.info())
print(merged_data.head())

# Analyze customer regions
region_counts = customers['Region'].value_counts()
plt.figure(figsize=(8, 5))
sns.barplot(x=region_counts.index, y=region_counts.values, palette='viridis')
plt.title('Customers by Region')
plt.xlabel('Region')
plt.ylabel('Count')
plt.show()

# Analyze product categories
category_counts = products['Category'].value_counts()
plt.figure(figsize=(8, 5))
sns.barplot(x=category_counts.index, y=category_counts.values, palette='coolwarm')
plt.title('Product Categories')
plt.xlabel('Category')
plt.ylabel('Count')
plt.show()

# Analyze transaction trends over time
merged_data['TransactionDate'] = pd.to_datetime(merged_data['TransactionDate'])
merged_data['MonthYear'] = merged_data['TransactionDate'].dt.to_period('M')
monthly_sales = merged_data.groupby('MonthYear')['TotalValue'].sum()

plt.figure(figsize=(10, 6))
monthly_sales.plot(kind='line', marker='o', color='blue')
plt.title('Monthly Sales Trends')
plt.xlabel('Month-Year')
plt.ylabel('Total Sales (USD)')
plt.grid()
plt.show()

# Analyze top-performing products
```

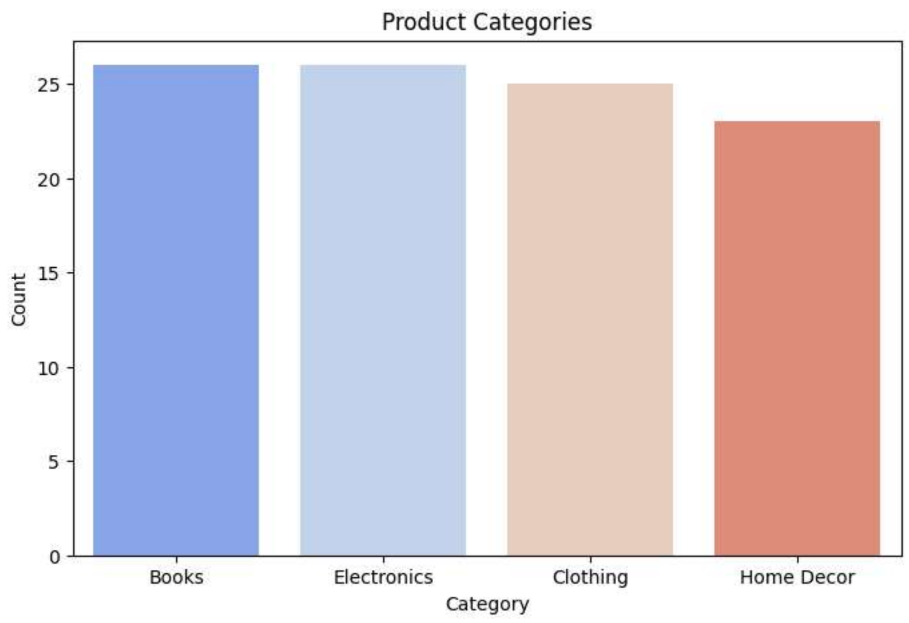
```
top_products = merged_data.groupby('ProductName')['TotalValue'].sum().sort_values(ascending=False).head(10)
plt.figure(figsize=(10, 5))
sns.barplot(x=top_products.values, y=top_products.index, palette='magma')
plt.title('Top 10 Performing Products')
plt.xlabel('Total Sales (USD)')
plt.ylabel('Product Name')
plt.show()

# Analyze regions generating the highest revenue
region_revenue = merged_data.groupby('Region')['TotalValue'].sum().sort_values(ascending=False)
plt.figure(figsize=(8, 5))
sns.barplot(x=region_revenue.index, y=region_revenue.values, palette='plasma')
plt.title('Revenue by Region')
plt.xlabel('Region')
plt.ylabel('Total Revenue (USD)')
plt.show()

# Business Insights (examples):
print("\nBusiness Insights:")
print("1. Majority of the customers come from [Region with highest count].")
print("2. [Top Category] is the most popular category with X products sold.")
print("3. Monthly sales peaked in [Peak Month-Year] with total sales of $X.")
print("4. [Top Product] is the best-performing product with total sales of $Y.")
print("5. [Region with highest revenue] generates the highest revenue of $Z.")
```

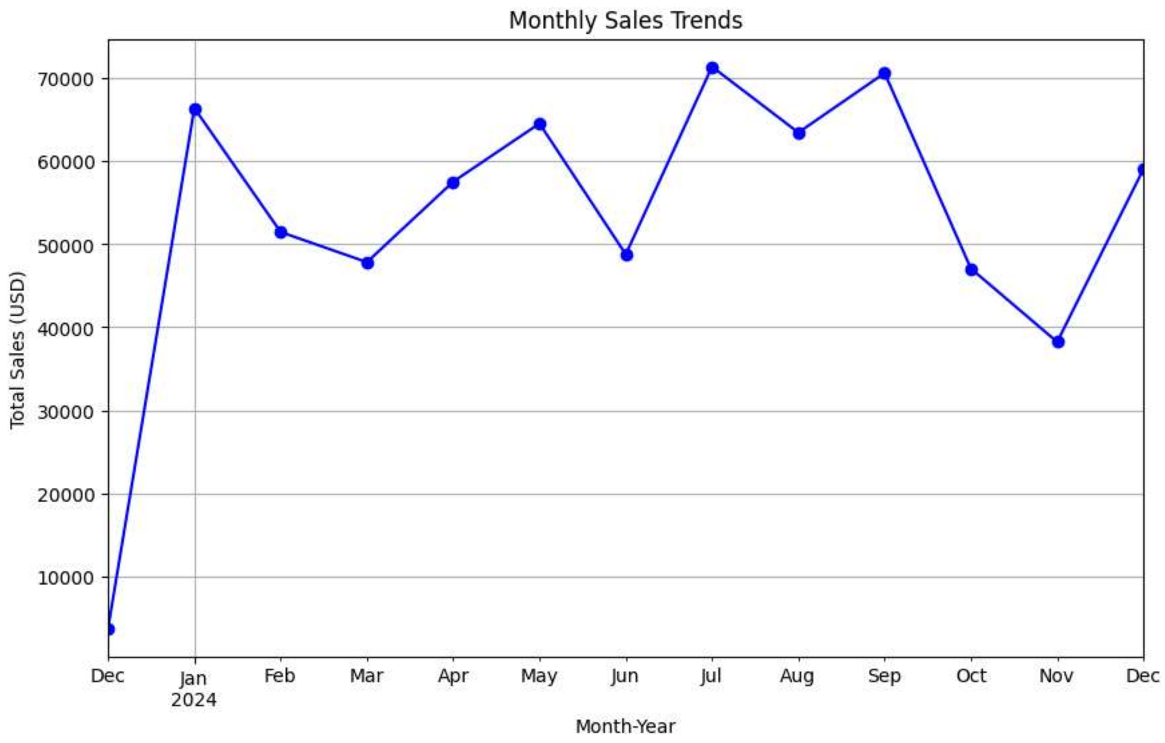
```
Customers Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 4 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   CustomerID    200 non-null    object
 1   CustomerName  200 non-null    object
 2   Region        200 non-null    object
 3   SignupDate    200 non-null    object
dtypes: object(4)
memory usage: 6.4+ KB
None
  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

Products Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 4 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   ProductID    100 non-null    object 
 1   ProductName  100 non-null    object 
 2   Category     100 non-null    object 
 3   Price        100 non-null    float64
dtypes: float64(1), object(3)
memory usage: 3.3+ KB
None
  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

Transactions Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   TransactionID    1000 non-null   object 
 1   CustomerID       1000 non-null   object 
 2   ProductID        1000 non-null   object 
 3   TransactionDate  1000 non-null   object 
 4   Quantity         1000 non-null   int64  
 5   TotalValue       1000 non-null   float64
 6   Price            1000 non-null   float64
dtypes: float64(2), int64(1), object(4)
memory usage: 54.8+ KB
None
  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  

Missing Values:
Customers: CustomerID      0
CustomerName    0
Region          0
SignupDate      0
dtype: int64
Products: ProductID      0
ProductName    0
Category       0
Price          0
dtype: int64
Transactions: TransactionID      0
CustomerID         0
ProductID          0
```

```
TransactionDate    0
Quantity           0
TotalValue         0
Price              0
dtype: int64

Duplicate Entries:
Customers: 0
Products: 0
Transactions: 0

Merged Dataset:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 13 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   TransactionID    1000 non-null   object 
 1   CustomerID       1000 non-null   object 
 2   ProductID        1000 non-null   object 
 3   TransactionDate  1000 non-null   object 
 4   Quantity         1000 non-null   int64  
 5   TotalValue       1000 non-null   float64
 6   Price_x          1000 non-null   float64
 7   CustomerName     1000 non-null   object 
 8   Region           1000 non-null   object 
 9   SignupDate       1000 non-null   object 
 10  ProductName      1000 non-null   object 
 11  Category         1000 non-null   object 
 12  Price_y          1000 non-null   float64
dtypes: float64(3), int64(1), object(9)
memory usage: 101.7+ KB
None
  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     CustomerName         Region  SignupDate  \
0      300.68   300.68   Andrea Jenkins         Europe  2022-12-03   
1      300.68   300.68  Brittany Harvey           Asia  2024-09-04   
2      300.68   300.68  Kathryn Stevens         Europe  2024-04-04   
3      601.36   300.68  Travis Campbell  South America  2024-04-11   
4      902.04   300.68    Timothy Perez         Europe  2022-03-15   

                      ProductName     Category  Price_y  
0  ComfortLiving Bluetooth Speaker  Electronics   300.68  
1  ComfortLiving Bluetooth Speaker  Electronics   300.68  
2  ComfortLiving Bluetooth Speaker  Electronics   300.68  
3  ComfortLiving Bluetooth Speaker  Electronics   300.68  
4  ComfortLiving Bluetooth Speaker  Electronics   300.68  
<ipython-input-1-c8419f691f0c>:48: FutureWarning: 

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `leg

  sns.barplot(x=region_counts.index, y=region_counts.values, palette='viridis')
```

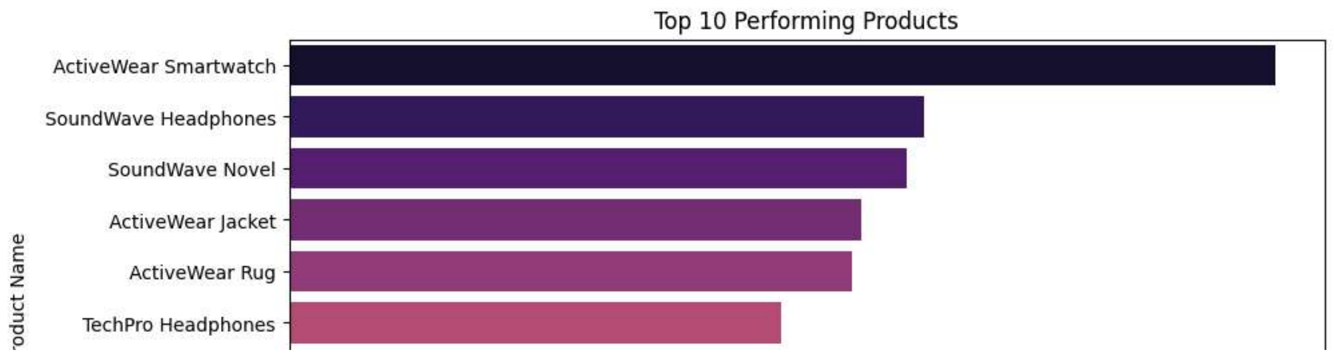


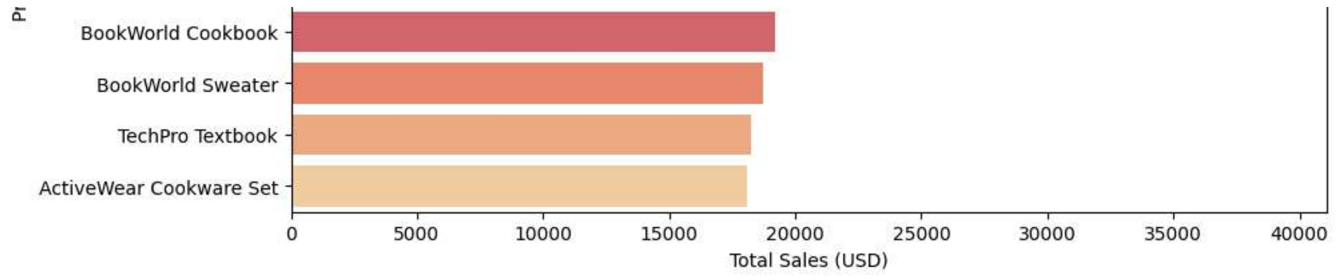
```
<ipython-input-1-c8419f691f0c>:57: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `leg

  sns.barplot(x=category_counts.index, y=category_counts.values, palette='coolwarm')
```



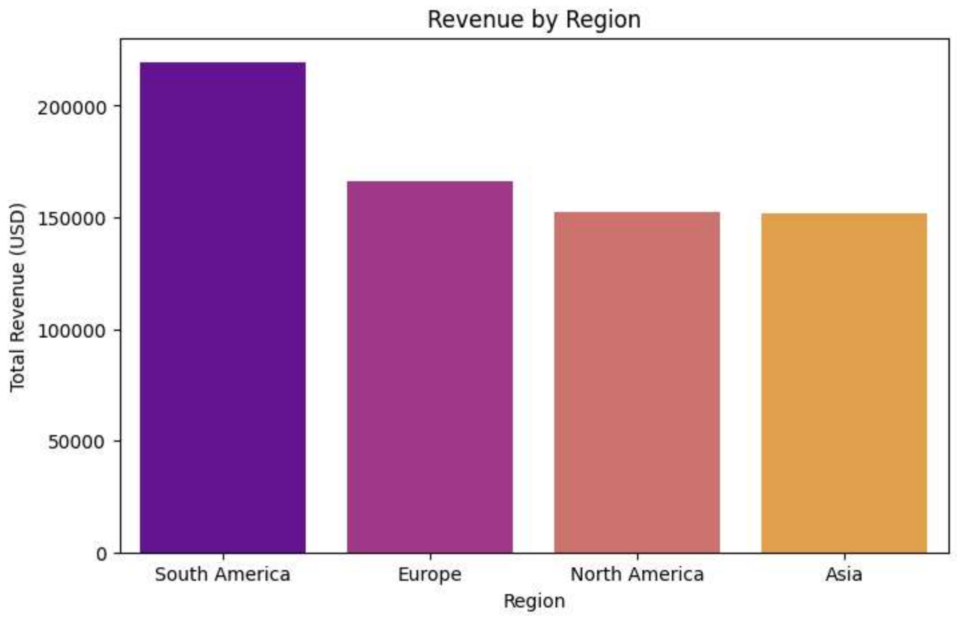


```
<ipython-input-1-c8419f691f0c>:79: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `y` variable to `hue` and set `leg

  sns.barplot(x=top_products.values, y=top_products.index, palette='magma')
```





```
<ipython-input-1-c8419f691f0c>:88: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `leg

  sns.barplot(x=region_revenue.index, y=region_revenue.values, palette='plasma')
```



```
Business Insights:
1. Majority of the customers come from [Region with highest count].
2. [Top Category] is the most popular category with X products sold.
3. Monthly sales peaked in [Peak Month-Year] with total sales of $X.
4. [Top Product] is the best-performing product with total sales of $Y.
```