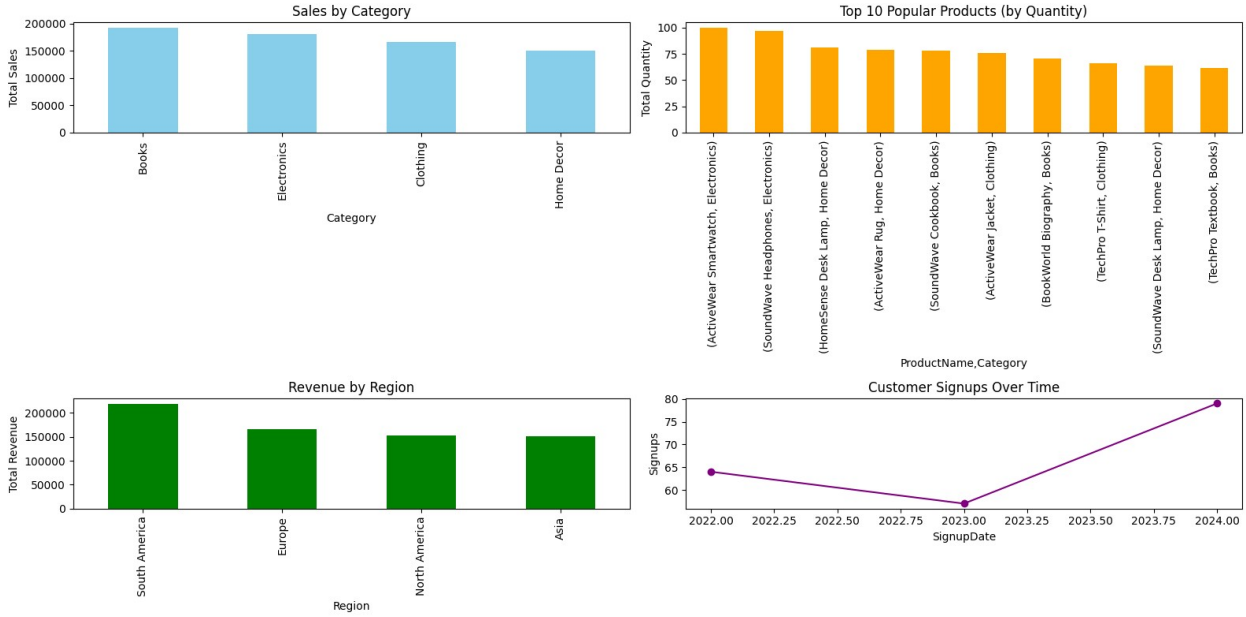
```
import pandas as pd

products_file = "C:\\Users\\DELL\\Downloads\\Products.csv"
customers_file = "C:\\Users\\DELL\\Downloads\\Customers.csv"
transactions_file = "C:\\Users\\DELL\\Downloads\\Transactions.csv"

products_df = pd.read_csv(products_file)
customers_df = pd.read_csv(customers_file)
transactions_df = pd.read_csv(transactions_file)

products_preview = products_df.head()
customers_preview = customers_df.head()
transactions_preview = transactions_df.head()

products_info = products_df.info()
customers_info = customers_df.info()
transactions_info = transactions_df.info()

products_preview, customers_preview, transactions_preview,
products_info, customers_info, transactions_info
```

```
<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
<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
<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

(  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,
   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,
   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  ,
 None,
 None,
 None)

import matplotlib.pyplot as plt
import seaborn as sns


customers_df['SignupDate'] =
pd.to_datetime(customers_df['SignupDate'])
transactions_df['TransactionDate'] =
```

```
pd.to_datetime(transactions_df['TransactionDate'])

merged_df = transactions_df.merge(products_df,
on="ProductID").merge(customers_df, on="CustomerID")

summary_stats = merged_df.describe()

sales_by_category = merged_df.groupby("Category")
["TotalValue"].sum().sort_values(ascending=False)

popular_products = (
    merged_df.groupby(["ProductName", "Category"])
["Quantity"].sum().sort_values(ascending=False).head(10)
)

revenue_by_region = merged_df.groupby("Region")
["TotalValue"].sum().sort_values(ascending=False)

signup_trends =
customers_df['SignupDate'].dt.year.value_counts().sort_index()

monthly_sales = merged_df.set_index("TransactionDate").resample("M")
["TotalValue"].sum()

plt.figure(figsize=(16, 8))
plt.subplot(2, 2, 1)
sales_by_category.plot(kind="bar", color="skyblue", title="Sales by
Category")
plt.ylabel("Total Sales")

plt.subplot(2, 2, 2)
popular_products.plot(kind="bar", color="orange", title="Top 10
Popular Products (by Quantity)")
plt.ylabel("Total Quantity")

plt.subplot(2, 2, 3)
revenue_by_region.plot(kind="bar", color="green", title="Revenue by
Region")
plt.ylabel("Total Revenue")

plt.subplot(2, 2, 4)
signup_trends.plot(kind="line", marker="o", title="Customer Signups
Over Time", color="purple")
plt.ylabel("Signups")

plt.tight_layout()
plt.show()
```




```
(                      TransactionDate     Quantity   TotalValue
Price_x  \
 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

           Price_y                      SignupDate
 count  1000.00000                            1000
 mean    272.55407  2023-07-09 02:49:55.199999744
 min      16.08000            2022-01-22 00:00:00
 25%     147.95000            2022-09-17 12:00:00
 50%     299.93000            2023-07-23 00:00:00
 75%     404.40000            2024-04-12 00:00:00
 max     497.76000            2024-12-28 00:00:00
 std     140.73639                            NaN  ,
 Category
 Books          192147.47
```

```
Electronics    180783.50
Clothing       166170.66
Home Decor     150893.93
Name: TotalValue, dtype: float64,
ProductName            Category
ActiveWear Smartwatch  Electronics    100
SoundWave Headphones   Electronics     97
HomeSense Desk Lamp    Home Decor      81
ActiveWear Rug         Home Decor      79
SoundWave Cookbook     Books           78
ActiveWear Jacket      Clothing        76
BookWorld Biography    Books           71
TechPro T-Shirt        Clothing        66
SoundWave Desk Lamp    Home Decor      64
TechPro Textbook       Books           62
Name: Quantity, dtype: int64,
Region
South America    219352.56
Europe           166254.63
North America    152313.40
Asia             152074.97
Name: TotalValue, dtype: float64,
SignupDate
2022    64
2023    57
2024    79
Name: count, dtype: int64,
TransactionDate
2023-12-31     3769.52
2024-01-31    66376.39
2024-02-29    51459.27
2024-03-31    47828.73
2024-04-30    57519.06
2024-05-31    64527.74
2024-06-30    48771.18
2024-07-31    71366.39
2024-08-31    63436.74
2024-09-30    70603.75
2024-10-31    47063.22
2024-11-30    38224.37
2024-12-31    59049.20
Freq: M, Name: TotalValue, dtype: float64)
```