# Sales Data Analysis Project

This project involves exploring a dummy sales dataset to uncover key insights such as:

- Top-selling products
- Region-wise sales performance
- Monthly sales trends
- Profit vs. sales relationship

The analysis is done using Python libraries such as **Pandas**, **Matplotlib**, and **Seaborn**.

# Step 1 : Import Required Libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

# Step 2 : Load and Preview Data

In [2]:
```
# Load dataset
df = pd.read_csv("Dummy_Sales_Data.csv")

# Show first few rows
print(df.head())
```

```
  Order ID        Date    Product     Category  Sales  Quantity Customer  \
0  ORD1000  2023-01-01   Monitor  Accessories   1786         2  CUST500
1  ORD1001  2023-01-02   Printer  Accessories   1061         3  CUST501
2  ORD1002  2023-01-03  Keyboard  Accessories   1762         2  CUST502
3  ORD1003  2023-01-04   Printer  Electronics    254         3  CUST503
4  ORD1004  2023-01-05   Printer  Electronics    589         7  CUST504

  Region  Profit
0   East     -76
1  South     479
2  South     293
3  South     -34
4  South     132
```

# Step 3 : Clean and Explore the Dataset

In [3]:

```python
# Import required libraries
import pandas as pd

# Load the dataset
df = pd.read_csv("Dummy_Sales_Data.csv")

# Check the shape
print("Total records:", df.shape)

# Check data types & missing values
print("\nInfo:")
print(df.info())

print("\nMissing values:")
print(df.isnull().sum())

# Basic stats
print("\nDescriptive statistics:")
print(df.describe())
```

```
Total records: (200, 9)

Info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 9 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   Order ID  200 non-null    object
 1   Date      200 non-null    object
 2   Product   200 non-null    object
 3   Category  200 non-null    object
 4   Sales     200 non-null    int64
 5   Quantity  200 non-null    int64
 6   Customer  200 non-null    object
 7   Region    200 non-null    object
 8   Profit    200 non-null    int64
dtypes: int64(3), object(6)
memory usage: 14.2+ KB
None

Missing values:
Order ID    0
Date        0
Product     0
Category    0
Sales       0
Quantity    0
Customer    0
Region      0
Profit      0
dtype: int64

Descriptive statistics:
             Sales    Quantity      Profit
count   200.000000  200.000000  200.000000
mean   1105.210000    4.890000  195.140000
std     520.807496    2.629156  173.844644
min     104.000000    1.000000 -100.000000
25%     678.500000    3.000000   39.750000
50%    1102.500000    5.000000  195.000000
75%    1542.500000    7.000000  334.250000
max    1990.000000    9.000000  497.000000
```

# Step 4: Clean & Prepare Date Columns

In [4]:
```
# Convert 'Date' column to datetime format
df['Date'] = pd.to_datetime(df['Date'])

# Confirm conversion
print(df.dtypes['Date'])
```

```
datetime64[ns]
```

In [5]:
```
# Extract Month, Year, and Month_Year
df['Month'] = df['Date'].dt.month_name()
df['Year'] = df['Date'].dt.year
df['Month_Year'] = df['Date'].dt.to_period('M')  # Useful for time-based analysis
```

# Step 5 : Sales Analysis

In [8]:
```
# Step 5: Product-wise Sales Analysis

# Top Products by Total Sales
top_products = df.groupby("Product")["Sales"].sum().sort_values(ascending=False)
print("Top Products by Sales:\n", top_products)

# Step 5.1: Region-wise Sales
region_sales = df.groupby("Region")["Sales"].sum().sort_values(ascending=False)
print("\nSales by Region:\n", region_sales)

# Step 5.2: Monthly Sales Trend
monthly_sales = df.groupby("Month_Year")["Sales"].sum()
print("\nMonthly Sales Trend:\n", monthly_sales)

# Step 5.3: Product-wise Multi-Metric Summary
product_summary = df.groupby("Product")[["Sales", "Quantity"]].sum().sort_values(by="Sales", ascending=False)
print("\nProduct-wise Summary:\n", product_summary)
```

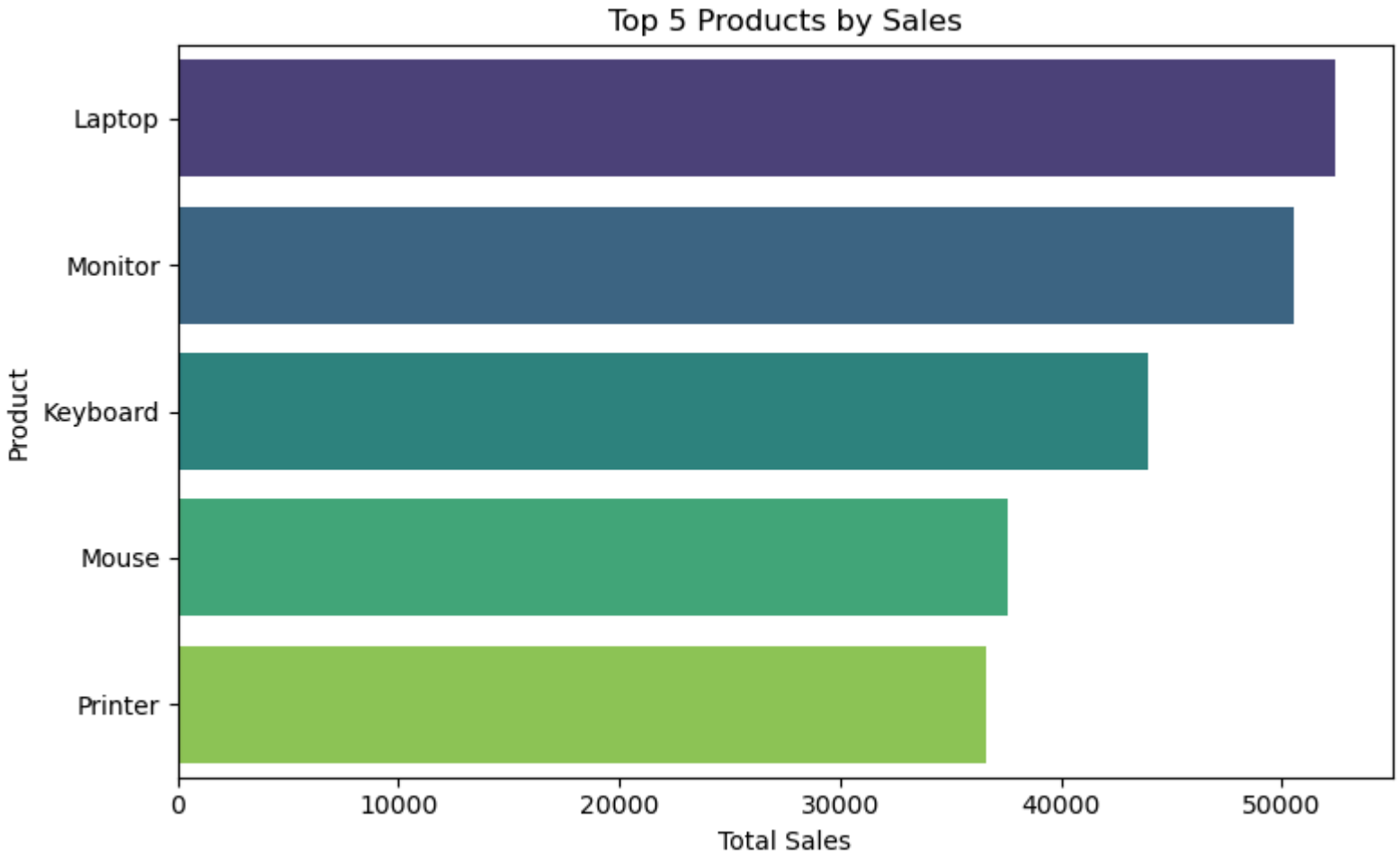
```
Top Products by Sales:
 Product
Laptop      52404
Monitor     50547
Keyboard    43928
Mouse       37566
Printer     36597
Name: Sales, dtype: int64

Sales by Region:
 Region
South    64364
East     58660
North    53965
West     44053
Name: Sales, dtype: int64

Monthly Sales Trend:
 Month_Year
2023-01    35173
2023-02    28907
2023-03    30692
2023-04    36713
2023-05    31338
2023-06    32996
2023-07    25223
Freq: M, Name: Sales, dtype: int64

Product-wise Summary:
            Sales  Quantity
Product
Laptop    52404       182
Monitor   50547       265
Keyboard  43928       184
Mouse     37566       149
Printer   36597       198
```

# Step 6 : Visualizations

In [15]:
```python
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
```

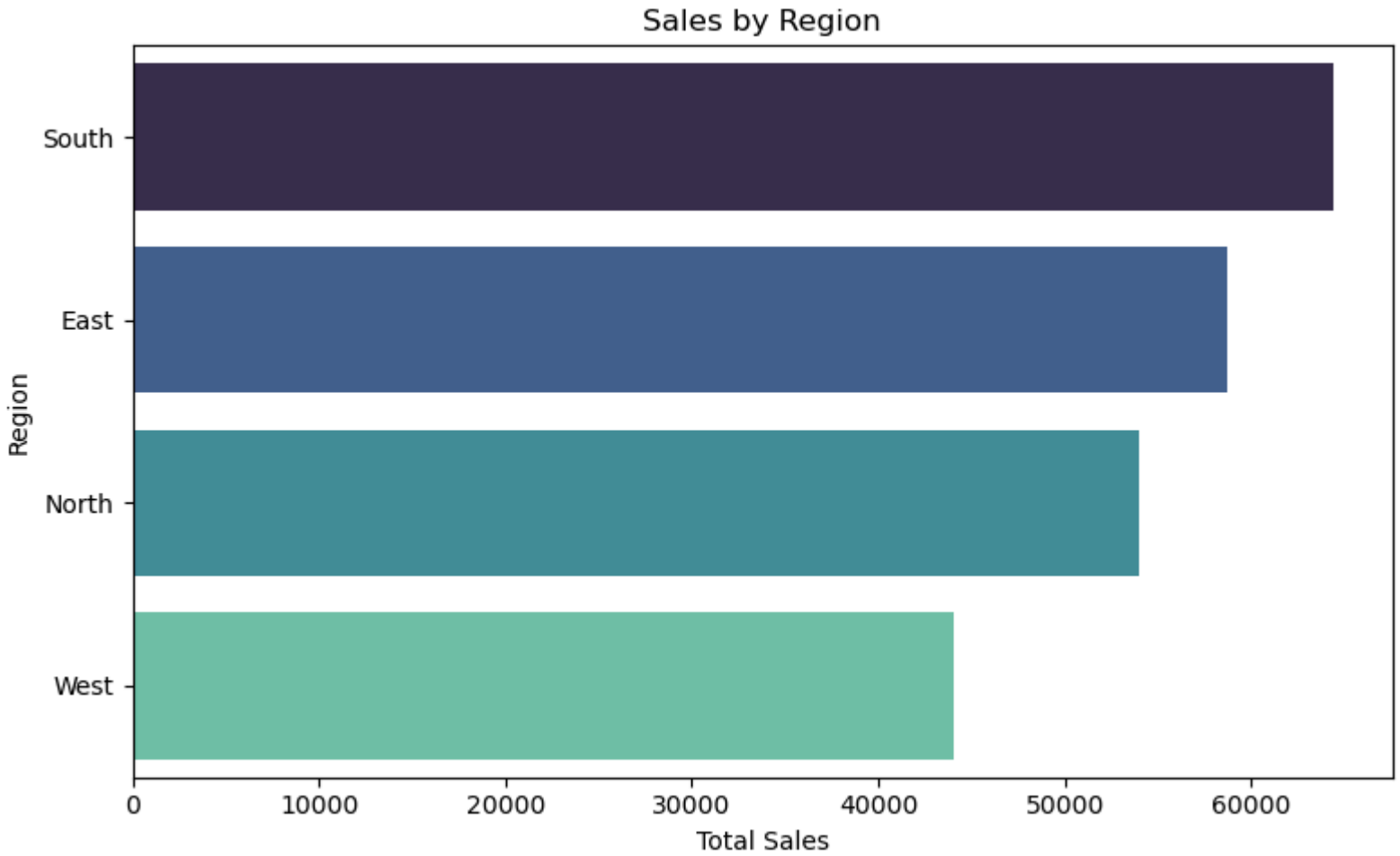
# 6.1 : Top 5 Products by Sales - Bar Chart

In [16]:
```
# Step 6.1: Top 5 Products by Sales
top5 = df.groupby("Product")["Sales"].sum().sort_values(ascending=False).head(5)

plt.figure(figsize=(8,5))
sns.barplot(x=top5.values, y=top5.index, palette="viridis")
plt.title("Top 5 Products by Sales")
plt.xlabel("Total Sales")
plt.ylabel("Product")
plt.tight_layout()
plt.show()
```



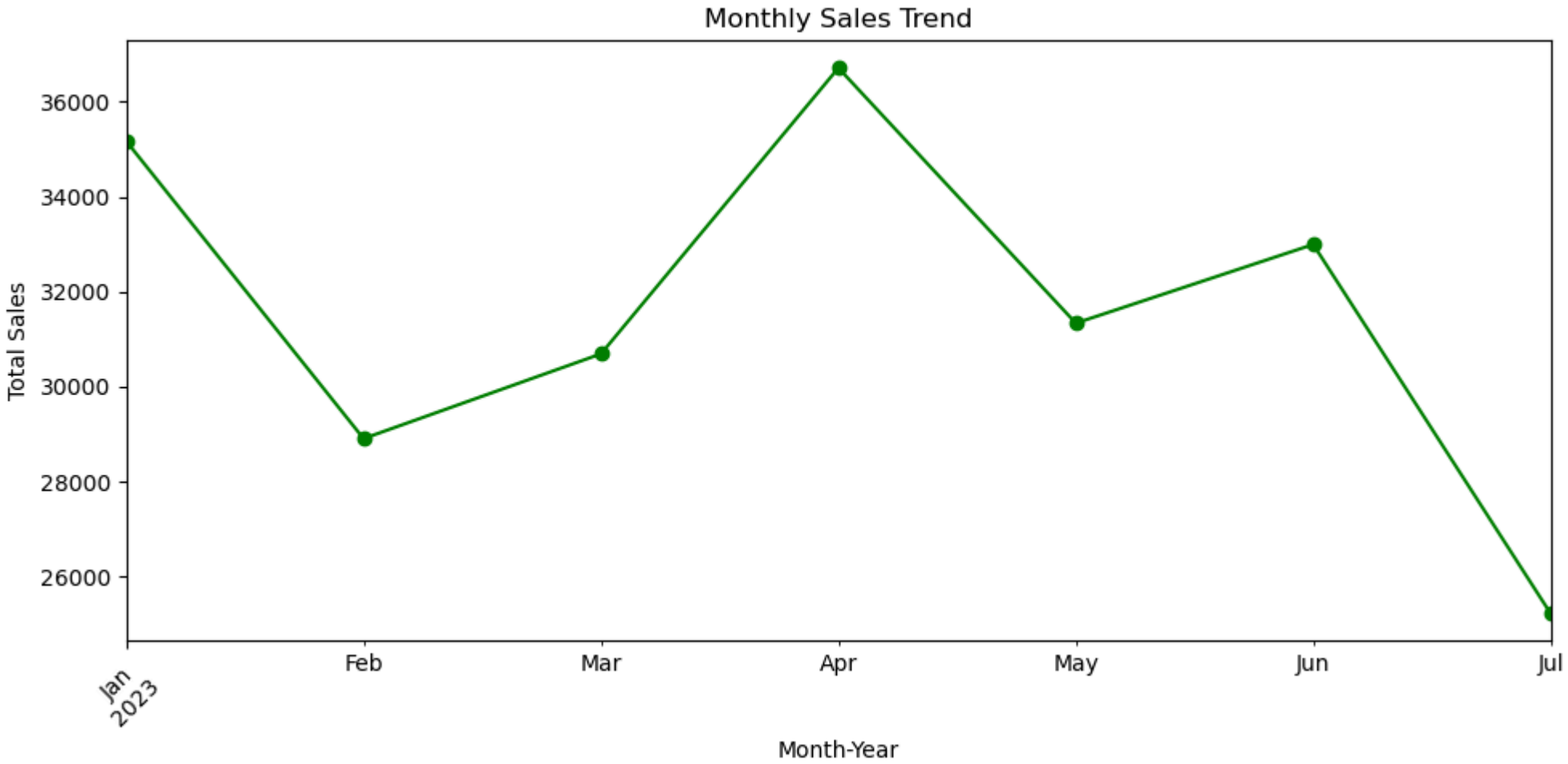
# 6.2 : Sales by Region - Bar Chart

In [18]:
```
# Step 6.2: Region-wise Sales
region = df.groupby("Region")["Sales"].sum().sort_values(ascending=False)

plt.figure(figsize=(8,5))
sns.barplot(x=region.values, y=region.index, palette="mako")
plt.title("Sales by Region")
plt.xlabel("Total Sales")
plt.ylabel("Region")
plt.tight_layout()
plt.show()
```



# 6.3 : Monthly Sales Trend - Line Chart

In [17]:
```
# Step 6.3: Monthly Sales Trend
monthly = df.groupby("Month_Year")["Sales"].sum()

plt.figure(figsize=(10,5))
monthly.plot(kind='line', marker='o', color='green')
plt.title("Monthly Sales Trend")
plt.xlabel("Month-Year")
plt.ylabel("Total Sales")
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



# Step 7 : Insights

# Step 7.1 : Find Top 5 Products by Profit

In [20]:
```
df.groupby('Product')['Profit'].sum().sort_values(ascending=False).head(5)
```

Out[20]:
```
Product
Monitor     8831
Mouse       8458
Laptop      8353
Keyboard    7636
Printer     5750
Name: Profit, dtype: int64
```

# Step 7.2: Compare it with Top 5 Products by Sales

In [21]:
```
df.groupby('Product')['Sales'].sum().sort_values(ascending=False).head(5)
```

Out[21]:
```
Product
Laptop      52404
Monitor     50547
Keyboard    43928
Mouse       37566
Printer     36597
Name: Sales, dtype: int64
```

# Step 7 : Insights

1.**Top-selling products** are Laptop,Monitor and Keyboard.

2.**Highest sales regions** are South and East.

3.**Sales peaked in April** followed by January and June.

4.**Products with the highest sales did not always generate the highest profit**. This indicates the need to optimize pricing and discount strategies.