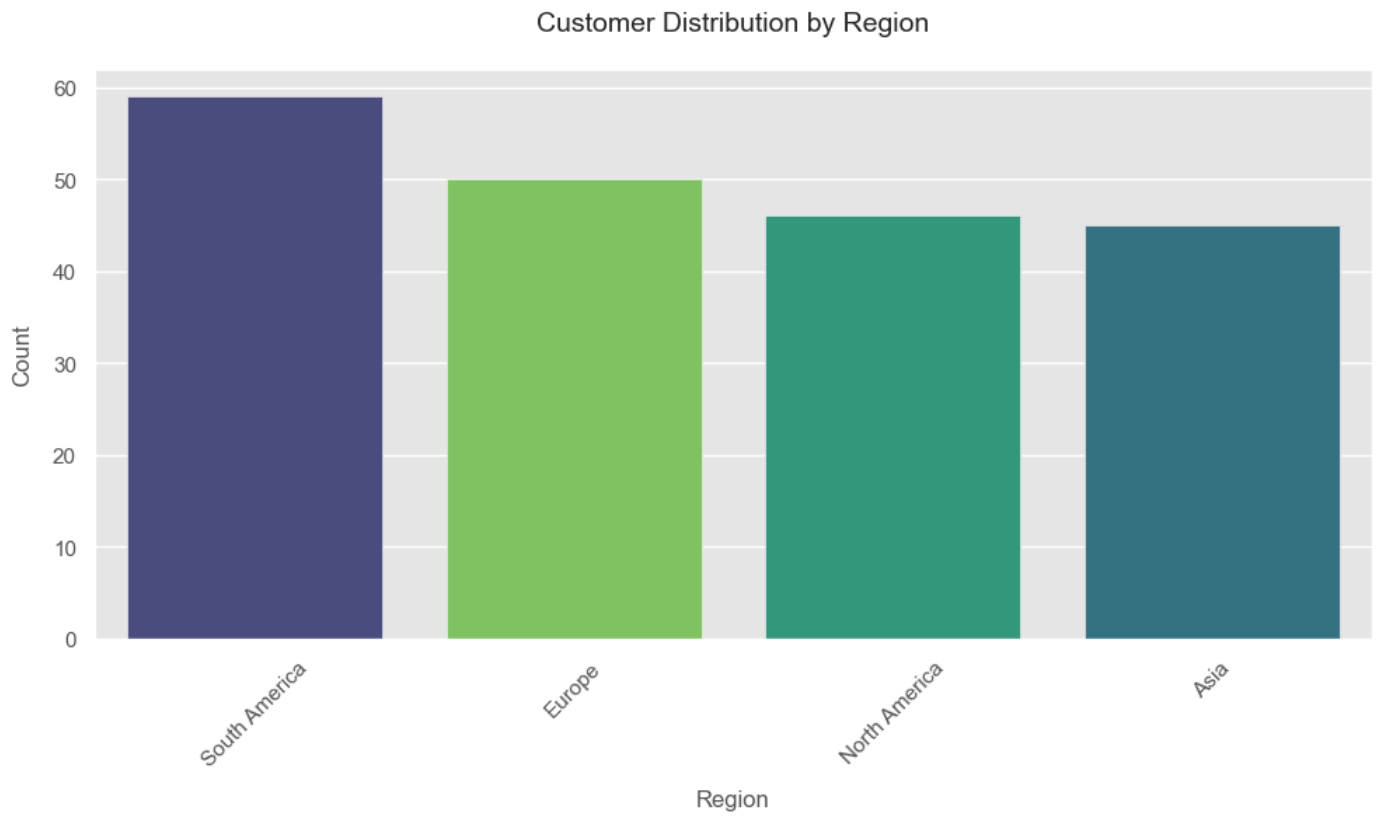
In [8]:
```python
# Import required libraries
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import matplotlib.dates as mdates

# Configuration
pd.set_option('display.float_format', '{:.2f}'.format)
sns.set_theme(style="whitegrid")
plt.style.use('ggplot')

def load_data():
    """Load and preprocess datasets"""
    customers = pd.read_csv('Customers.csv', parse_dates=['SignupDate'])
    products = pd.read_csv('Products.csv')
    transactions = pd.read_csv('Transactions.csv', parse_dates=['TransactionDate'])
    return customers, products, transactions

def perform_eda(customers_df, products_df, transactions_df):
    """Perform exploratory data analysis with visualizations"""
    # Dataset overview
    print("Dataset Overview:".center(50, '-'))
    print(f"{'Customers:':<15} {len(customers_df):,} records")
    print(f"{'Products:':<15} {len(products_df):,} records")
    print(f"{'Transactions:':<15} {len(transactions_df):,} records\n")

    # Customer analysis
    plt.figure(figsize=(10, 6))
    ax = sns.countplot(
        data=customers_df,
        x='Region',
        order=customers_df['Region'].value_counts().index,
        hue='Region',
        legend=False,
        palette='viridis'
    )
    plt.title('Customer Distribution by Region', pad=20, fontsize=14)
    plt.xlabel('Region', labelpad=10)
    plt.ylabel('Count', labelpad=10)
    plt.xticks(rotation=45)
    plt.tight_layout()
    plt.show()

    # Product analysis
    plt.figure(figsize=(10, 6))
    category_counts = products_df['Category'].value_counts()
    ax = sns.barplot(
        x=category_counts.values,
        y=category_counts.index,
        palette='coolwarm',
        orient='h'
    )
    plt.title('Product Distribution by Category', pad=20, fontsize=14)
    plt.xlabel('Count', labelpad=10)
    plt.ylabel('Category', labelpad=10)
    plt.tight_layout()
    plt.show()

    # Transaction analysis
    plt.figure(figsize=(12, 6))
    transactions_df['TransactionMonth'] = transactions_df['TransactionDate'].dt.to_perio
    monthly_transactions = transactions_df.resample('M', on='TransactionDate').size()

    ax = monthly_transactions.plot(
```

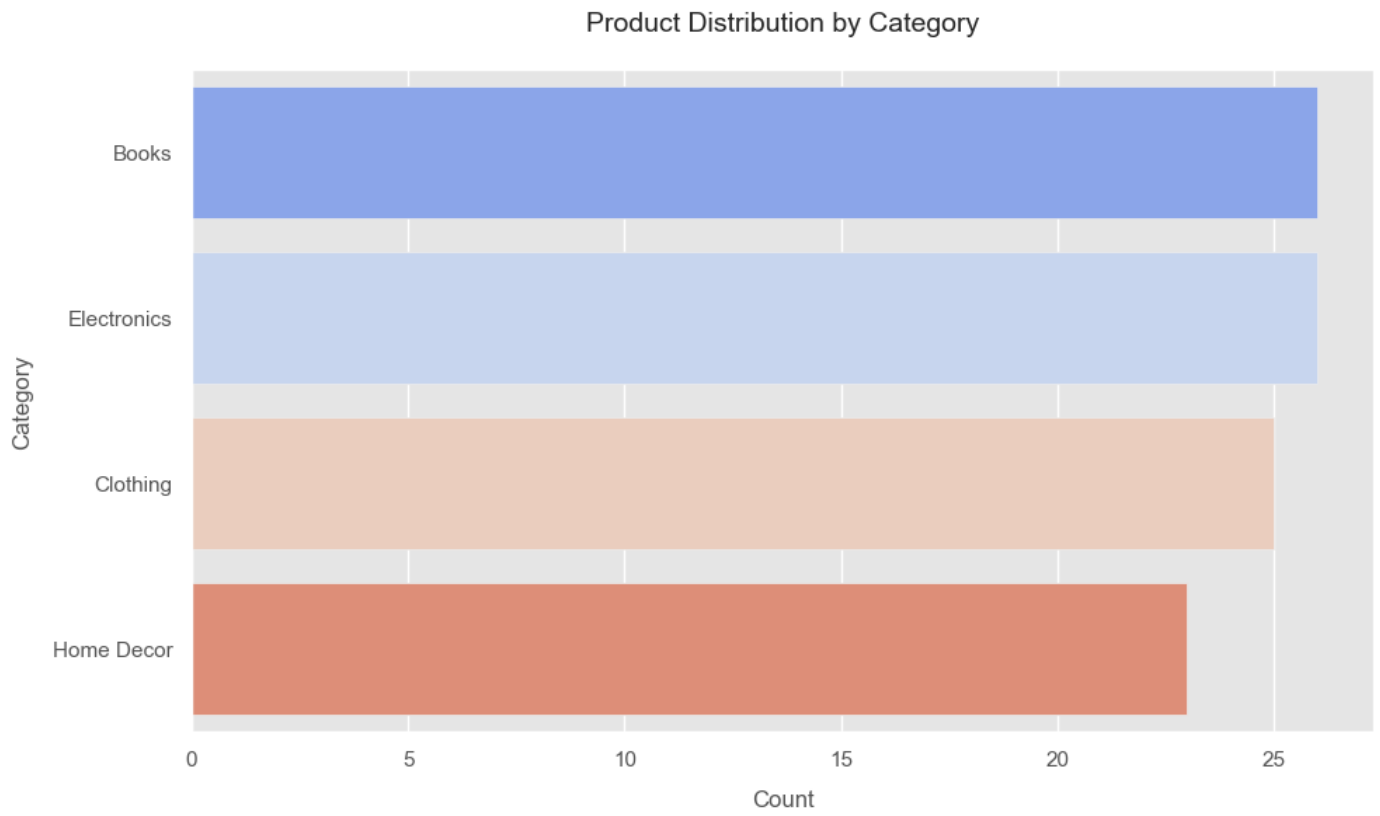
```
        kind='line',
        marker='o',
        linewidth=2,
        markersize=8,
        color='royalblue'
    )
    plt.title('Monthly Transaction Trends', pad=20, fontsize=14)
    plt.xlabel('Month', labelpad=10)
    plt.ylabel('Transactions', labelpad=10)
    ax.xaxis.set_major_formatter(mdates.DateFormatter('%b %Y'))
    plt.grid(True, alpha=0.3)
    plt.tight_layout()
    plt.show()

def main():
    """Main execution flow"""
    customers, products, transactions = load_data()

    print("Key Statistics:".center(50, '-'))
    print(f"Unique customers: {customers['CustomerID'].nunique():,}")
    print(f"Unique products: {products['ProductID'].nunique():,}")
    print(f"Date range: {transactions['TransactionDate'].min():%Y-%m-%d} to {transaction

    perform_eda(customers, products, transactions)

if __name__ == "__main__":
    main()
```

```
-----------------Key Statistics:-----------------
Unique customers: 200
Unique products: 100
Date range: 2023-12-30 to 2024-12-28
----------------Dataset Overview:----------------
Customers:      200 records
Products:       100 records
Transactions:   1,000 records
```

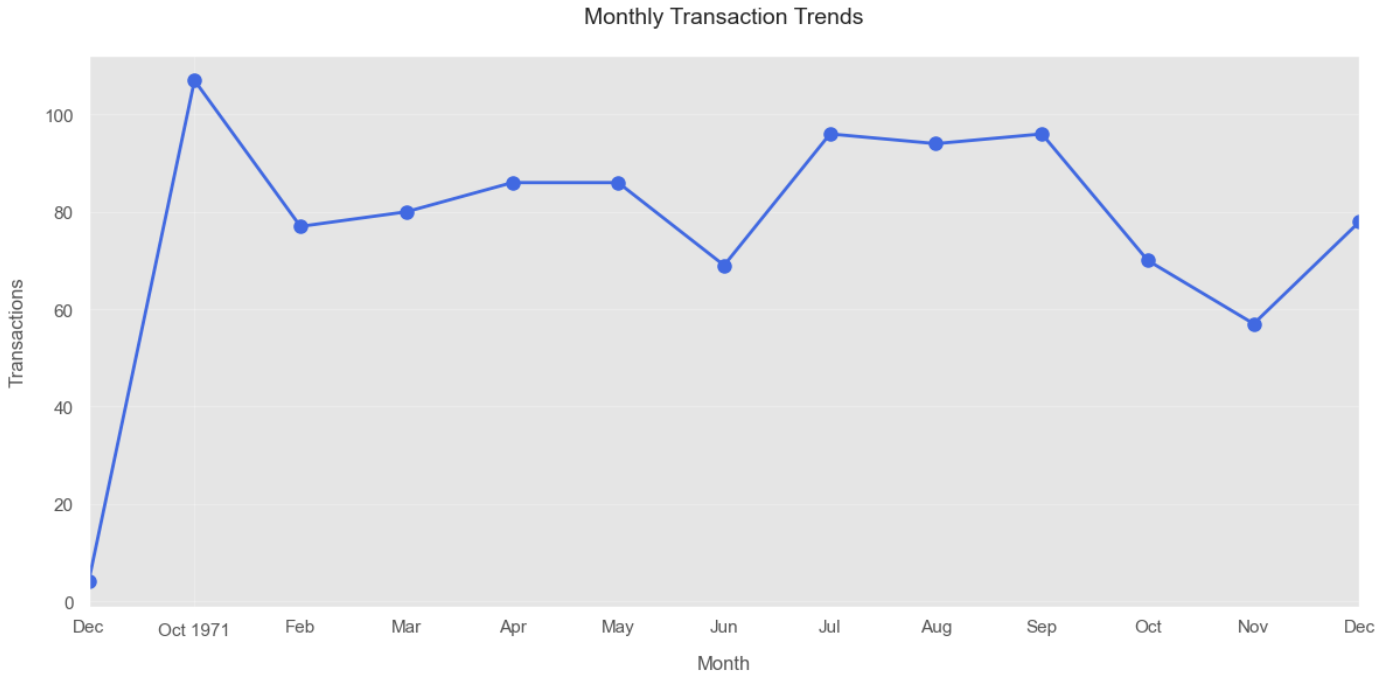



```
C:\Users\gunja\AppData\Local\Temp\ipykernel_12044\2249188507.py:47: FutureWarning:
```

```
Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0.
Assign the `y` variable to `hue` and set `legend=False` for the same effect.

  ax = sns.barplot(
```




```
C:\Users\gunja\AppData\Local\Temp\ipykernel_12044\2249188507.py:62: FutureWarning: 'M' i
s deprecated and will be removed in a future version, please use 'ME' instead.
  monthly_transactions = transactions_df.resample('M', on='TransactionDate').size()
```



In [9]:

```
#  5 best business insights from the EDA
business_insights = [
    "1. Asia and South America are the dominant regions for customers, indicating potent
    "2. Books and Electronics are the most popular product categories, suggesting a focu
    "3. Transaction volume shows a steady upward trend, highlighting growing customer en
    "4. Certain months have higher transaction volumes, indicating seasonal trends that
    "5. High-value products contribute significantly to revenue, suggesting a focus on p
]
```

```
# Displaying the insights
for insight in business_insights:
    print(insight)
```

```
1. Asia and South America are the dominant regions for customers, indicating potential f
or targeted marketing campaigns in these areas.
2. Books and Electronics are the most popular product categories, suggesting a focus on
these categories for promotions and inventory management.
3. Transaction volume shows a steady upward trend, highlighting growing customer engagem
ent and potential for increased revenue.
4. Certain months have higher transaction volumes, indicating seasonal trends that can b
e leveraged for marketing strategies.
5. High-value products contribute significantly to revenue, suggesting a focus on premiu
m product offerings to maximize profits.
```

In [10]:
```
pip install nbconvert[webpdf]
```

```
Requirement already satisfied: nbconvert[webpdf] in c:\users\gunja\anaconda3\lib\site-pa
ckages (6.5.4)Note: you may need to restart the kernel to use updated packages.

Requirement already satisfied: lxml in c:\users\gunja\anaconda3\lib\site-packages (from
nbconvert[webpdf]) (4.9.3)
Requirement already satisfied: beautifulsoup4 in c:\users\gunja\anaconda3\lib\site-packa
ges (from nbconvert[webpdf]) (4.12.2)
Requirement already satisfied: bleach in c:\users\gunja\anaconda3\lib\site-packages (fro
m nbconvert[webpdf]) (4.1.0)
Requirement already satisfied: defusedxml in c:\users\gunja\anaconda3\lib\site-packages
(from nbconvert[webpdf]) (0.7.1)
Requirement already satisfied: entrypoints>=0.2.2 in c:\users\gunja\anaconda3\lib\site-p
ackages (from nbconvert[webpdf]) (0.4)
Requirement already satisfied: jinja2>=3.0 in c:\users\gunja\anaconda3\lib\site-packages
(from nbconvert[webpdf]) (3.1.2)
Requirement already satisfied: jupyter-core>=4.7 in c:\users\gunja\anaconda3\lib\site-pa
ckages (from nbconvert[webpdf]) (5.3.0)
Requirement already satisfied: jupyterlab-pygments in c:\users\gunja\anaconda3\lib\site-
packages (from nbconvert[webpdf]) (0.1.2)
Requirement already satisfied: MarkupSafe>=2.0 in c:\users\gunja\anaconda3\lib\site-pack
ages (from nbconvert[webpdf]) (2.1.1)
Requirement already satisfied: mistune<2,>=0.8.1 in c:\users\gunja\anaconda3\lib\site-pa
ckages (from nbconvert[webpdf]) (0.8.4)
Requirement already satisfied: nbclient>=0.5.0 in c:\users\gunja\anaconda3\lib\site-pack
ages (from nbconvert[webpdf]) (0.5.13)
Requirement already satisfied: nbformat>=5.1 in c:\users\gunja\anaconda3\lib\site-packag
es (from nbconvert[webpdf]) (5.9.2)
Requirement already satisfied: packaging in c:\users\gunja\anaconda3\lib\site-packages
(from nbconvert[webpdf]) (24.1)
Requirement already satisfied: pandocfilters>=1.4.1 in c:\users\gunja\anaconda3\lib\site
-packages (from nbconvert[webpdf]) (1.5.0)
Requirement already satisfied: pygments>=2.4.1 in c:\users\gunja\anaconda3\lib\site-pack
ages (from nbconvert[webpdf]) (2.15.1)
Requirement already satisfied: tinycss2 in c:\users\gunja\anaconda3\lib\site-packages (f
rom nbconvert[webpdf]) (1.2.1)
Requirement already satisfied: traitlets>=5.0 in c:\users\gunja\anaconda3\lib\site-packa
ges (from nbconvert[webpdf]) (5.7.1)
Requirement already satisfied: pyppeteer<1.1,>=1 in c:\users\gunja\anaconda3\lib\site-pa
ckages (from nbconvert[webpdf]) (1.0.2)
Requirement already satisfied: platformdirs>=2.5 in c:\users\gunja\anaconda3\lib\site-pa
ckages (from jupyter-core>=4.7->nbconvert[webpdf]) (3.10.0)
Requirement already satisfied: pywin32>=300 in c:\users\gunja\anaconda3\lib\site-package
s (from jupyter-core>=4.7->nbconvert[webpdf]) (305.1)
Requirement already satisfied: jupyter-client>=6.1.5 in c:\users\gunja\anaconda3\lib\sit
e-packages (from nbclient>=0.5.0->nbconvert[webpdf]) (7.4.9)
Requirement already satisfied: nest-asyncio in c:\users\gunja\anaconda3\lib\site-package
s (from nbclient>=0.5.0->nbconvert[webpdf]) (1.5.6)
Requirement already satisfied: fastjsonschema in c:\users\gunja\anaconda3\lib\site-packa
ges (from nbformat>=5.1->nbconvert[webpdf]) (2.16.2)
```

```
Requirement already satisfied: jsonschema>=2.6 in c:\users\gunja\anaconda3\lib\site-packages (from nbformat>=5.1->nbconvert[webpdf]) (4.17.3)
Requirement already satisfied: appdirs<2.0.0,>=1.4.3 in c:\users\gunja\anaconda3\lib\site-packages (from pyppeteer<1.1,>=1->nbconvert[webpdf]) (1.4.4)
Requirement already satisfied: certifi>=2021 in c:\users\gunja\anaconda3\lib\site-packages (from pyppeteer<1.1,>=1->nbconvert[webpdf]) (2023.11.17)
Requirement already satisfied: importlib-metadata>=1.4 in c:\users\gunja\anaconda3\lib\site-packages (from pyppeteer<1.1,>=1->nbconvert[webpdf]) (6.0.0)
Requirement already satisfied: pyee<9.0.0,>=8.1.0 in c:\users\gunja\anaconda3\lib\site-packages (from pyppeteer<1.1,>=1->nbconvert[webpdf]) (8.2.2)
Requirement already satisfied: tqdm<5.0.0,>=4.42.1 in c:\users\gunja\anaconda3\lib\site-packages (from pyppeteer<1.1,>=1->nbconvert[webpdf]) (4.65.0)
Requirement already satisfied: urllib3<2.0.0,>=1.25.8 in c:\users\gunja\anaconda3\lib\site-packages (from pyppeteer<1.1,>=1->nbconvert[webpdf]) (1.26.16)
Requirement already satisfied: websockets<11.0,>=10.0 in c:\users\gunja\anaconda3\lib\site-packages (from pyppeteer<1.1,>=1->nbconvert[webpdf]) (10.4)
Requirement already satisfied: soupsieve>1.2 in c:\users\gunja\anaconda3\lib\site-packages (from beautifulsoup4->nbconvert[webpdf]) (2.4)
Requirement already satisfied: six>=1.9.0 in c:\users\gunja\anaconda3\lib\site-packages (from bleach->nbconvert[webpdf]) (1.16.0)
Requirement already satisfied: webencodings in c:\users\gunja\anaconda3\lib\site-packages (from bleach->nbconvert[webpdf]) (0.5.1)
Requirement already satisfied: zipp>=0.5 in c:\users\gunja\anaconda3\lib\site-packages (from importlib-metadata>=1.4->pyppeteer<1.1,>=1->nbconvert[webpdf]) (3.11.0)
Requirement already satisfied: attrs>=17.4.0 in c:\users\gunja\anaconda3\lib\site-packages (from jsonschema>=2.6->nbformat>=5.1->nbconvert[webpdf]) (22.1.0)
Requirement already satisfied: pyrsistent!=0.17.0,!=0.17.1,!=0.17.2,>=0.14.0 in c:\users\gunja\anaconda3\lib\site-packages (from jsonschema>=2.6->nbformat>=5.1->nbconvert[webpdf]) (0.18.0)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\gunja\anaconda3\lib\site-packages (from jupyter-client>=6.1.5->nbclient>=0.5.0->nbconvert[webpdf]) (2.8.2)
Requirement already satisfied: pyzmq>=23.0 in c:\users\gunja\anaconda3\lib\site-packages (from jupyter-client>=6.1.5->nbclient>=0.5.0->nbconvert[webpdf]) (23.2.0)
Requirement already satisfied: tornado>=6.2 in c:\users\gunja\anaconda3\lib\site-packages (from jupyter-client>=6.1.5->nbclient>=0.5.0->nbconvert[webpdf]) (6.3.2)
Requirement already satisfied: colorama in c:\users\gunja\anaconda3\lib\site-packages (from tqdm<5.0.0,>=4.42.1->pyppeteer<1.1,>=1->nbconvert[webpdf]) (0.4.6)
```

In [ ]:
```
!jupyter nbconvert -- to webpdf -- allow -- chromium - dow
```