In [1]:
```
# 1.1 Task
```

In [ ]:
```
# Loading dataset: importing pandas

import pandas as pd
```

In [3]:
```
# Loading dataset

df = pd.read_csv('train.csv')
df.head()
```

Out[3]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment	Countr
0	1	CA-2017-152156	08/11/2017	11/11/2017	Second Class	CG-12520	Claire Gute	Consumer	Unite Stat
1	2	CA-2017-152156	08/11/2017	11/11/2017	Second Class	CG-12520	Claire Gute	Consumer	Unite Stat
2	3	CA-2017-138688	12/06/2017	16/06/2017	Second Class	DV-13045	Darrin Van Huff	Corporate	Unite Stat
3	4	US-2016-108966	11/10/2016	18/10/2016	Standard Class	SO-20335	Sean O'Donnell	Consumer	Unite Stat
4	5	US-2016-108966	11/10/2016	18/10/2016	Standard Class	SO-20335	Sean O'Donnell	Consumer	Unite Stat

In [10]:
```
# Standardize column names

df.columns = df.columns.str.strip().str.replace(' ', '_')
```

In [11]:
```
# Converting date columns

df['Order_Date'] = pd.to_datetime(df['Order_Date'], errors='coerce')
df['Ship_Date'] = pd.to_datetime(df['Ship_Date'], errors='coerce')
```

In [12]:
```
# Converting month columns

df['Month'] = df['Order_Date'].dt.to_period('M')
```

In [7]:
```
# Determining missing values

df.isnull().sum()
```

Out[7]:
```
Row_ID             0
Order_ID           0
Order_Date      5841
Ship_Date       5985
Ship_Mode          0
Customer_ID        0
Customer_Name      0
Segment            0
Country            0
City               0
State              0
Postal_Code       11
Region             0
Product_ID         0
Category           0
Sub-Category       0
Product_Name       0
Sales              0
Month           5841
dtype: int64
```

In [14]:
```
# Dropping rows with empty order dates

df = df.dropna(subset=['Order_Date'])
```

In [15]:
```
# Re-converting to datetime

df['Order_Date'] = pd.to_datetime(df['Order_Date'], errors='coerce')
```

In [16]:
```
# Recreating Month column

df['Month'] = df['Order_Date'].dt.to_period('M')
```

In [17]:
```
# Saving "cleaned" data

df.to_csv('cleaned_sales_data.csv', index=False)
```

In [18]:
```
# Preview of "cleaned" data

df.head()
```

Out[18]:

	Row_ID	Order_ID	Order_Date	Ship_Date	Ship_Mode	Customer_ID	Customer_Name	
0	1	CA-2017-152156	2017-08-11	2017-11-11	Second Class	CG-12520	Claire Gute	C
1	2	CA-2017-152156	2017-08-11	2017-11-11	Second Class	CG-12520	Claire Gute	C
2	3	CA-2017-138688	2017-12-06	NaT	Second Class	DV-13045	Darrin Van Huff	C
3	4	US-2016-108966	2016-11-10	NaT	Standard Class	SO-20335	Sean O'Donnell	C
4	5	US-2016-108966	2016-11-10	NaT	Standard Class	SO-20335	Sean O'Donnell	C

In [19]:
```
# total sales

total_sales = df['Sales'].sum()
print(f"Total Sales: ${total_sales:,.2f}")
```

```
Total Sales: $872,363.12
```

In [20]:
```
# Average Daily Sales

daily_sales = df.groupby('Order_Date')['Sales'].sum()
avg_daily_sales = daily_sales.mean()
print(f"Average Daily Sales: ${avg_daily_sales:,.2f}")
```

```
Average Daily Sales: $1,821.22
```

In [25]:
```
# Monthly Sales

monthly_sales = df.groupby('Month')['Sales'].sum().reset_index()
```

In [26]:
```
# Seaborn installation

!pip install seaborn
```

```
Defaulting to user installation because normal site-packages is not writeable
Collecting seaborn
  Downloading seaborn-0.13.2-py3-none-any.whl.metadata (5.4 kB)
Requirement already satisfied: numpy!=1.24.0,>=1.20 in c:\users\emmanuel cerrer\appd
ata\local\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\loc
al-packages\python313\site-packages (from seaborn) (2.2.4)
Requirement already satisfied: pandas>=1.2 in c:\users\emmanuel cerrer\appdata\local
\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-packag
es\python313\site-packages (from seaborn) (2.2.3)
Requirement already satisfied: matplotlib!=3.6.1,>=3.4 in c:\users\emmanuel cerrer\a
ppdata\local\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache
\local-packages\python313\site-packages (from seaborn) (3.10.1)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\emmanuel cerrer\appdata
\local\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-
packages\python313\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (1.3.1)
Requirement already satisfied: cycler>=0.10 in c:\users\emmanuel cerrer\appdata\loca
l\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-packa
ges\python313\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\emmanuel cerrer\appdata
\local\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-
packages\python313\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (4.56.0)
Requirement already satisfied: kiwisolver>=1.3.1 in c:\users\emmanuel cerrer\appdata
\local\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-
packages\python313\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (1.4.8)
Requirement already satisfied: packaging>=20.0 in c:\users\emmanuel cerrer\appdata\l
ocal\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-pa
ckages\python313\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (24.2)
Requirement already satisfied: pillow>=8 in c:\users\emmanuel cerrer\appdata\local\p
ackages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-packages
\python313\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (11.1.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\emmanuel cerrer\appdata
\local\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-
packages\python313\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (3.2.3)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\emmanuel cerrer\appd
ata\local\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\loc
al-packages\python313\site-packages (from matplotlib!=3.6.1,>=3.4->seaborn) (2.9.0.p
ost0)
Requirement already satisfied: pytz>=2020.1 in c:\users\emmanuel cerrer\appdata\loca
l\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-packa
ges\python313\site-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: tzdata>=2022.7 in c:\users\emmanuel cerrer\appdata\lo
cal\packages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-pac
kages\python313\site-packages (from pandas>=1.2->seaborn) (2025.2)
Requirement already satisfied: six>=1.5 in c:\users\emmanuel cerrer\appdata\local\pa
ckages\pythonsoftwarefoundation.python.3.13_qbz5n2kfra8p0\localcache\local-packages
\python313\site-packages (from python-dateutil>=2.7->matplotlib!=3.6.1,>=3.4->seabor
n) (1.17.0)
Downloading seaborn-0.13.2-py3-none-any.whl (294 kB)
Installing collected packages: seaborn
Successfully installed seaborn-0.13.2
[notice] A new release of pip is available: 25.1.1 -> 25.2
[notice] To update, run: C:\Users\Emmanuel Cerrer\AppData\Local\Microsoft\WindowsApp
s\PythonSoftwareFoundation.Python.3.13_qbz5n2kfra8p0\python.exe -m pip install --upg
rade pip
```

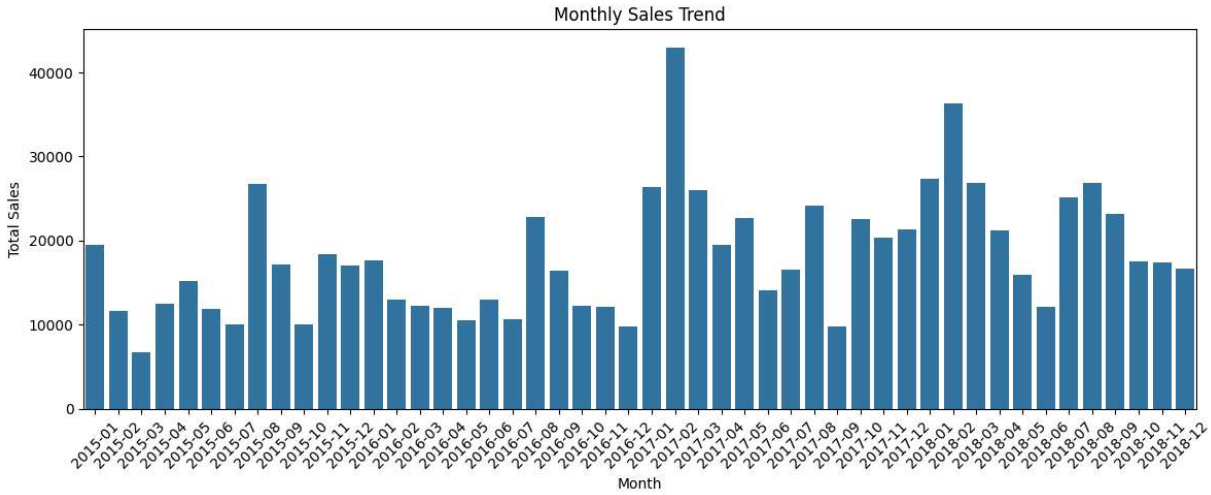
In [28]:
```
#Seaborn installation

import seaborn as sns
```

In [29]:
```
#Monthly Sales Bar Chart

import matplotlib.pyplot as plt
import seaborn as sns

plt.figure(figsize=(12, 5))
sns.barplot(x='Month', y='Sales', data=monthly_sales)
plt.xticks(rotation=45)
plt.title('Monthly Sales Trend')
plt.xlabel('Month')
plt.ylabel('Total Sales')
plt.tight_layout()
plt.show()
```



In [ ]:
```
# Key Insight 1: Sales performance shows significant fluctuations across months, su
# Key Insight 2: The highest sales were recorded in January 2017, indicating a stro
# Key Insight 3: Monthly sales attained its lowest drop on February 2015, possibly
```

In [ ]:
```
Question 1.2: Data Ingestion and Validation

### 1. How would you set up the pipeline if the data is ingested periodically?

If data is received on a recurring basis (e.g., daily or weekly), I would set up a

- **Step 1: File Monitoring / Scheduling**
  - Automate ingestion using `cron`, Windows Task Scheduler, or Apache Airflow.

- **Step 2: Ingestion**
  - Load new batches using `pandas.read_csv()` or a database connector.

- **Step 3: Logging & Versioning**
  - Save each raw file with a timestamp-based naming convention (e.g., `raw/2025-08
  - Log key metadata such as row count, file size, and time of ingestion.

- **Step 4: Validation**
```

```
  - Apply checks on missing values, duplicates, and schema consistency.
  - Trigger alerts if issues are found.

- **Step 5: Cleaning and Output**
  - Clean the dataset and save to a processed location for reporting and analysis.

---

### 2. How will you verify the correctness of the ingested data?

The function below demonstrates a basic data ingestion and validation pipeline. Thi

def ingest_and_validate(file_path):
    import pandas as pd

    # Step 1: Ingest
    df = pd.read_csv(file_path)

    # Step 2: Validation checks
    print("✅ Shape:", df.shape)
    print("🟧 Missing values:\n", df.isnull().sum())
    print("🟧 Duplicates:", df.duplicated().sum())
    print("🟧 Data types:\n", df.dtypes)

    # Step 3: Column schema check
    expected_cols = ['Order_ID', 'Order_Date', 'Sales']
    missing_cols = [col for col in expected_cols if col not in df.columns]
    if missing_cols:
        print("❌ Missing required columns:", missing_cols)
    else:
        print("✅ All expected columns present.")

    # Step 4: Sanity checks
    if 'Sales' in df.columns and (df['Sales'] < 0).any():
        print("❌ Negative values found in Sales.")
    if 'Order_Date' in df.columns:
        try:
            df['Order_Date'] = pd.to_datetime(df['Order_Date'], errors='coerce')
            if df['Order_Date'].isnull().sum() > 0:
                print("❌ Some Order_Date values could not be parsed.")
        except Exception as e:
            print("❌ Error parsing dates:", e)

    return df
```