1) Problem: Analyze a retail company's sales data to understand sales trends, top-selling products, and regional performance.

Tasks:

Load and clean the dataset

Find monthly/yearly sales trends

Top 10 products by sales and profit

Region-wise performance

Export summary as Excel report

** Solution : **

```
# Import libraries

import pandas as pd
import matplotlib as plt
import seaborn as sns
import numpy as np
```

Load dataset

```
# Load the Sales Performance dataset
!pip install xlrd


data = pd.read_excel(r"C:\Users\Samruddhi Yadav\Documents\Resume Project\Sales Performance Analysis\Sample - Superstore.xls")
data
```

```
WARNING: Ignoring invalid distribution ~orch (C:\Users\Samruddhi Yadav\AppData\Roaming\Python\Python312\site-packages)
WARNING: Ignoring invalid distribution ~orch (C:\Users\Samruddhi Yadav\AppData\Roaming\Python\Python312\site-packages)
WARNING: Ignoring invalid distribution ~orch (C:\Users\Samruddhi Yadav\AppData\Roaming\Python\Python312\site-packages)
WARNING: Ignoring invalid distribution ~orch (C:\Users\Samruddhi Yadav\AppData\Roaming\Python\Python312\site-packages)
WARNING: Ignoring invalid distribution ~orch (C:\Users\Samruddhi Yadav\AppData\Roaming\Python\Python312\site-packages)
WARNING: Ignoring invalid distribution ~orch (C:\Users\Samruddhi Yadav\AppData\Roaming\Python\Python312\site-packages)

Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: xlrd in c:\users\samruddhi yadav\appdata\roaming\python\python312\site-packages (2.0.1)
```

```
      Row ID        Order ID Order Date  Ship Date       Ship Mode  \
0          1  CA-2020-152156 2020-11-08 2020-11-11    Second Class
1          2  CA-2020-152156 2020-11-08 2020-11-11    Second Class
2          3  CA-2020-138688 2020-06-12 2020-06-16    Second Class
3          4  US-2019-108966 2019-10-11 2019-10-18  Standard Class
4          5  US-2019-108966 2019-10-11 2019-10-18  Standard Class
...      ...             ...        ...        ...             ...
9989    9990  CA-2018-110422 2018-01-21 2018-01-23    Second Class
9990    9991  CA-2021-121258 2021-02-26 2021-03-03  Standard Class
9991    9992  CA-2021-121258 2021-02-26 2021-03-03  Standard Class
9992    9993  CA-2021-121258 2021-02-26 2021-03-03  Standard Class
9993    9994  CA-2021-119914 2021-05-04 2021-05-09    Second Class

     Customer ID     Customer Name    Segment Country/Region
City  \
0       CG-12520       Claire Gute   Consumer  United States
Henderson
1       CG-12520       Claire Gute   Consumer  United States
Henderson
2       DV-13045   Darrin Van Huff  Corporate  United States      Los
Angeles
3       SO-20335    Sean O'Donnell   Consumer  United States  Fort
Lauderdale
4       SO-20335    Sean O'Donnell   Consumer  United States  Fort
Lauderdale
...          ...               ...        ...            ...
...
9989    TB-21400  Tom Boeckenhauer   Consumer  United States
Miami
9990    DB-13060       Dave Brooks   Consumer  United States
Costa Mesa
9991    DB-13060       Dave Brooks   Consumer  United States
Costa Mesa
9992    DB-13060       Dave Brooks   Consumer  United States
Costa Mesa
9993    CC-12220      Chris Cortes   Consumer  United States
Westminster

      ... Postal Code  Region       Product ID         Category Sub-
Category  \
0     ...     42420.0   South  FUR-BO-10001798        Furniture
Bookcases
1     ...     42420.0   South  FUR-CH-10000454        Furniture
Chairs
2     ...     90036.0    West  OFF-LA-10000240  Office Supplies
Labels
3     ...     33311.0   South  FUR-TA-10000577        Furniture
Tables
4     ...     33311.0   South  OFF-ST-10000760  Office Supplies
Storage
```

```
...   ...         ...     ...              ...               ...
...
9989  ...     33180.0   South  FUR-FU-10001889        Furniture
Furnishings
9990  ...     92627.0    West  FUR-FU-10000747        Furniture
Furnishings
9991  ...     92627.0    West  TEC-PH-10003645       Technology
Phones
9992  ...     92627.0    West  OFF-PA-10004041  Office Supplies
Paper
9993  ...     92683.0    West  OFF-AP-10002684  Office Supplies
Appliances

                                             Product Name     Sales
Quantity  \
0                     Bush Somerset Collection Bookcase  261.9600
2
1     Hon Deluxe Fabric Upholstered Stacking Chairs,...  731.9400
3
2     Self-Adhesive Address Labels for Typewriters b...   14.6200
2
3         Bretford CR4500 Series Slim Rectangular Table  957.5775
5
4                         Eldon Fold 'N Roll Cart System   22.3680
2
...                                                 ...       ...
...
9989                              Ultra Door Pull Handle   25.2480
3
9990  Tenex B1-RE Series Chair Mats for Low Pile Car...   91.9600
2
9991                                Aastra 57i VoIP phone  258.5760
2
9992  It's Hot Message Books with Stickers, 2 3/4" x 5"   29.6000
4
9993  Acco 7-Outlet Masterpiece Power Center, Wihtou...  243.1600
2

      Discount    Profit
0         0.00   41.9136
1         0.00  219.5820
2         0.00    6.8714
3         0.45 -383.0310
4         0.20    2.5164
...        ...       ...
9989      0.20    4.1028
9990      0.00   15.6332
9991      0.20   19.3932
9992      0.00   13.3200
9993      0.00   72.9480
```

```
[9994 rows x 21 columns]
```

```
# Dataset info.

data.info()      # No.of rows,count,dtype
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9994 entries, 0 to 9993
Data columns (total 21 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Row ID          9994 non-null   int64
 1   Order ID        9994 non-null   object
 2   Order Date      9994 non-null   datetime64[ns]
 3   Ship Date       9994 non-null   datetime64[ns]
 4   Ship Mode       9994 non-null   object
 5   Customer ID     9994 non-null   object
 6   Customer Name   9994 non-null   object
 7   Segment         9994 non-null   object
 8   Country/Region  9994 non-null   object
 9   City            9994 non-null   object
 10  State           9994 non-null   object
 11  Postal Code     9983 non-null   float64
 12  Region          9994 non-null   object
 13  Product ID      9994 non-null   object
 14  Category        9994 non-null   object
 15  Sub-Category    9994 non-null   object
 16  Product Name    9994 non-null   object
 17  Sales           9994 non-null   float64
 18  Quantity        9994 non-null   int64
 19  Discount        9994 non-null   float64
 20  Profit          9994 non-null   float64
dtypes: datetime64[ns](2), float64(4), int64(2), object(13)
memory usage: 1.6+ MB
```

```
data.describe()      # Describes whole dataset
```

```
            Row ID                      Order Date  \
count  9994.000000                            9994
mean   4997.500000  2020-04-30 00:07:03.614168576
min       1.000000            2018-01-03 00:00:00
25%    2499.250000            2019-05-23 00:00:00
50%    4997.500000            2020-06-26 00:00:00
75%    7495.750000            2021-05-14 00:00:00
max    9994.000000            2021-12-30 00:00:00
std    2885.163629                            NaN

                           Ship Date   Postal Code         Sales
Quantity  \
```

```
count                           9994   9983.000000   9994.000000
9994.000000
mean   2020-05-03 23:06:58.571142656  55245.233297    229.858001
3.789574
min               2018-01-07 00:00:00   1040.000000      0.444000
1.000000
25%               2019-05-27 00:00:00  23223.000000     17.280000
2.000000
50%               2020-06-29 00:00:00  57103.000000     54.490000
3.000000
75%               2021-05-18 00:00:00  90008.000000    209.940000
5.000000
max               2022-01-05 00:00:00  99301.000000  22638.480000
14.000000
std                               NaN  32038.715955    623.245101
2.225110

          Discount       Profit
count  9994.000000  9994.000000
mean      0.156203    28.656896
min       0.000000 -6599.978000
25%       0.000000     1.728750
50%       0.200000     8.666500
75%       0.200000    29.364000
max       0.800000  8399.976000
std       0.206452   234.260108
```

Data Cleaning

```
# Check missing data

data.isnull().sum()
```

```
Row ID             0
Order ID           0
Order Date         0
Ship Date          0
Ship Mode          0
Customer ID        0
Customer Name      0
Segment            0
Country/Region     0
City               0
State              0
Postal Code       11
Region             0
Product ID         0
Category           0
Sub-Category       0
Product Name       0
```

```
Sales               0
Quantity            0
Discount            0
Profit              0
dtype: int64
```

```
# Handling missing value

data = data.dropna(subset=["Postal Code"])

data.isnull().sum()
```

```
Row ID              0
Order ID            0
Order Date          0
Ship Date           0
Ship Mode           0
Customer ID         0
Customer Name       0
Segment             0
Country/Region      0
City                0
State               0
Postal Code         0
Region              0
Product ID          0
Category            0
Sub-Category        0
Product Name        0
Sales               0
Quantity            0
Discount            0
Profit              0
dtype: int64
```

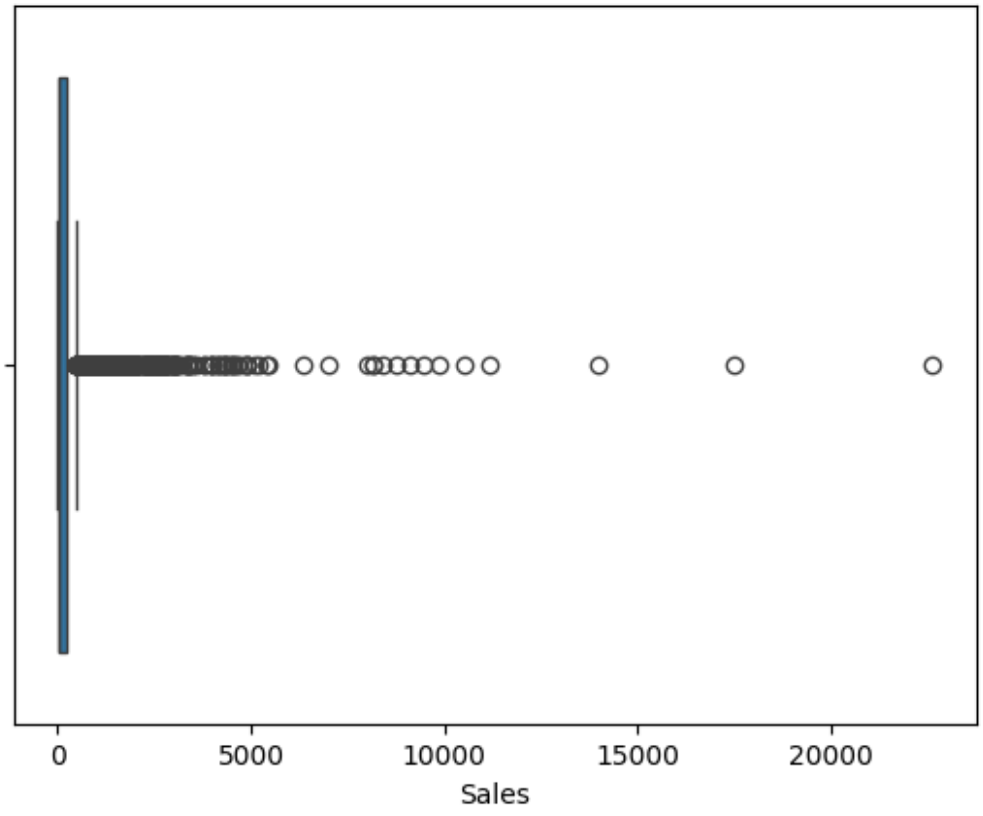
```
# Check duplicates data
data.duplicated().sum()

0
```

** There are no any duplicate data **

Check Outlier

```
# □ Visual Methods (Boxplot/Histogram)

sns.boxplot(x = data["Sales"])
plt.show()

-------------------------------------------------------------------------
-----
```

```
AttributeError                            Traceback (most recent call
last)
Cell In[14], line 4
      1 # □ Visual Methods (Boxplot/Histogram)
      3 sns.boxplot(x = data["Sales"])
----> 4 plt.show()

File ~\AppData\Roaming\Python\Python312\site-packages\matplotlib\_api\
__init__.py:218, in caching_module_getattr.<locals>.__getattr__(name)
    216 if name in props:
    217     return props[name].__get__(instance)
--> 218 raise AttributeError(
    219     f"module {cls.__module__!r} has no attribute {name!r}")

AttributeError: module 'matplotlib' has no attribute 'show'
```




```
# 1. Using the IQR (Interquartile Range) method

for col in ["Sales","Profit"]:
    Q1 = data[col].quantile(0.25)
    Q3 = data[col].quantile(0.75)
    IQR = Q3 - Q1
```

```
    lower_bound = Q1 - 1.5*IQR
    upper_bound = Q3 + 1.5*IQR

    Clean_data= data[(data[col] < lower_bound) | (data[col] >
upper_bound)]
print(Clean_data)
```

```
      Row ID        Order ID Order Date  Ship Date       Ship Mode  \
1          2  CA-2020-152156 2020-11-08 2020-11-11    Second Class
3          4  US-2019-108966 2019-10-11 2019-10-18  Standard Class
7          8  CA-2018-115812 2018-06-09 2018-06-14  Standard Class
10        11  CA-2018-115812 2018-06-09 2018-06-14  Standard Class
13        14  CA-2020-161389 2020-12-05 2020-12-10  Standard Class
...      ...             ...        ...        ...             ...
9957    9958  US-2018-143287 2018-11-11 2018-11-17  Standard Class
9962    9963  CA-2019-168088 2019-03-19 2019-03-22     First Class
9968    9969  CA-2021-153871 2021-12-11 2021-12-17  Standard Class
9979    9980  US-2020-103674 2020-12-06 2020-12-10  Standard Class
9993    9994  CA-2021-119914 2021-05-04 2021-05-09    Second Class

     Customer ID     Customer Name      Segment Country/Region  \
1       CG-12520       Claire Gute     Consumer  United States
3       SO-20335    Sean O'Donnell     Consumer  United States
7       BH-11710   Brosina Hoffman     Consumer  United States
10      BH-11710   Brosina Hoffman     Consumer  United States
13      IM-15070      Irene Maddox     Consumer  United States
...          ...               ...          ...            ...
9957    KN-16705     Kristina Nunn  Home Office  United States
9962    CM-12655  Corinna Mitchell  Home Office  United States
9968    RB-19435   Richard Bierner     Consumer  United States
9979    AP-10720        Anne Pryor  Home Office  United States
9993    CC-12220      Chris Cortes     Consumer  United States

                 City  ... Postal Code   Region       Product ID  \
1           Henderson  ...     42420.0    South  FUR-CH-10000454
3     Fort Lauderdale  ...     33311.0    South  FUR-TA-10000577
7         Los Angeles  ...     90032.0     West  TEC-PH-10002275
10        Los Angeles  ...     90032.0     West  FUR-TA-10001539
13            Seattle  ...     98103.0     West  OFF-BI-10003656
...               ...  ...         ...      ...              ...
9957     New Rochelle  ...     10801.0     East  OFF-PA-10004039
9962          Houston  ...     77041.0  Central  FUR-BO-10004218
9968       Plainfield  ...      7060.0     East  OFF-BI-10004600
9979      Los Angeles  ...     90032.0     West  OFF-BI-10002026
9993      Westminster  ...     92683.0     West  OFF-AP-10002684

             Category Sub-Category  \
1           Furniture       Chairs
3           Furniture       Tables
7          Technology       Phones
```

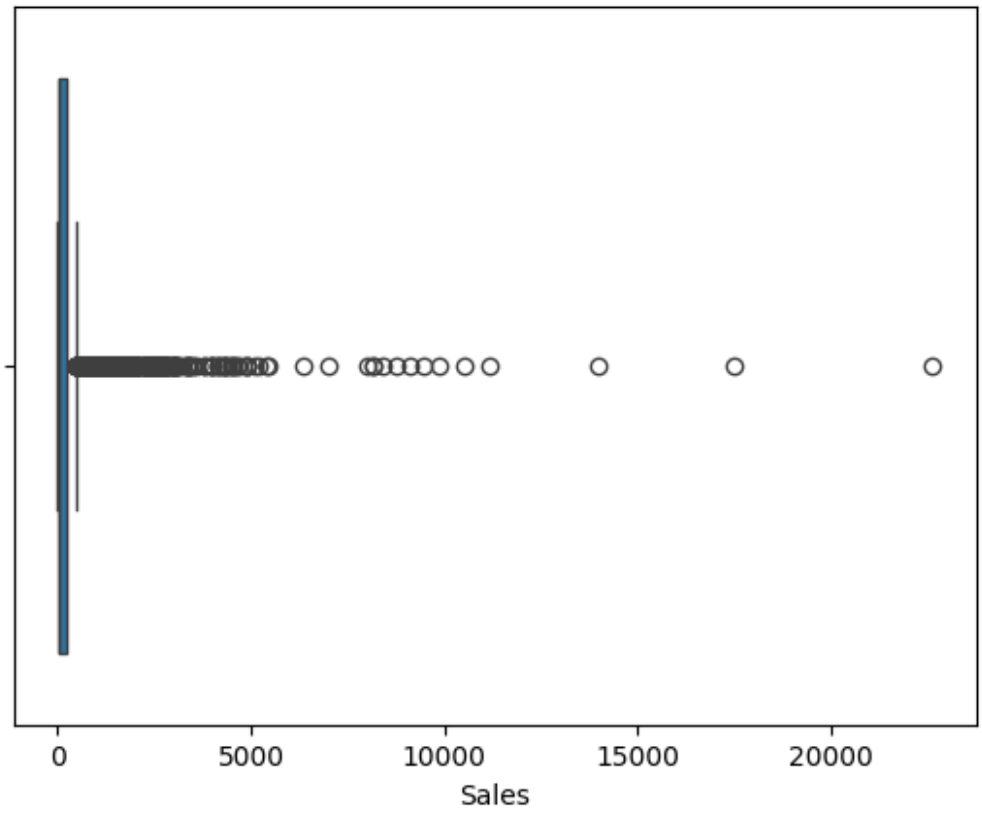
```
10          Furniture       Tables
13    Office Supplies      Binders
...                ...          ...
9957  Office Supplies        Paper
9962        Furniture    Bookcases
9968  Office Supplies      Binders
9979  Office Supplies      Binders
9993  Office Supplies   Appliances

                                                 Product Name      Sales
Quantity  \
1     Hon Deluxe Fabric Upholstered Stacking Chairs,...   731.9400
3
3         Bretford CR4500 Series Slim Rectangular Table   957.5775
5
7                       Mitel 5320 IP Phone VoIP phone   907.1520
6
10             Chromcraft Rectangular Conference Tables  1706.1840
9
13          Fellowes PB200 Plastic Comb Binding Machine   407.9760
3
...                                                 ...         ...
...
9957                                        Xerox 1882   223.9200
4
9962  Bush Heritage Pine Collection 5-Shelf Bookcase...   383.4656
4
9968          Ibico Ibimaster 300 Manual Binding System   735.9800
2
9979                    Ibico Recycled Linen-Style Covers   437.4720
14
9993  Acco 7-Outlet Masterpiece Power Center, Wihtou...   243.1600
2

      Discount    Profit
1         0.00  219.5820
3         0.45 -383.0310
7         0.20   90.7152
10        0.20   85.3092
13        0.20  132.5922
...        ...       ...
9957      0.00  109.7208
9962      0.32  -67.6704
9968      0.00  331.1910
9979      0.20  153.1152
9993      0.00   72.9480

[1877 rows x 21 columns]
```

```
    print(f"{col} has {Clean_data.shape[0]} Clean_data")
```

```
Profit has 1877 Clean_data

# □ 2. Using Z-score (from scipy)

from scipy.stats import zscore

data['z_score'] = zscore(data['Sales'])
outliers = data[(data['z_score'] > 3) | (data['z_score'] < -3)]
print(outliers)


      Row ID        Order ID Order Date  Ship Date       Ship Mode  \
27        28  US-2019-150630 2019-09-17 2019-09-21  Standard Class
165      166  CA-2018-139892 2018-09-08 2018-09-12  Standard Class
251      252  CA-2020-145625 2020-09-11 2020-09-17  Standard Class
262      263  US-2018-106992 2018-09-19 2018-09-21    Second Class
263      264  US-2018-106992 2018-09-19 2018-09-21    Second Class
...      ...             ...        ...        ...             ...
9660    9661  CA-2020-160717 2020-06-06 2020-06-11  Standard Class
9774    9775  CA-2018-169019 2018-07-26 2018-07-30  Standard Class
9857    9858  CA-2019-164301 2019-03-26 2019-03-30  Standard Class
9929    9930  CA-2020-129630 2020-09-04 2020-09-04        Same Day
9948    9949  CA-2021-121559 2021-06-01 2021-06-03    Second Class

     Customer ID    Customer Name      Segment Country/Region
City  \
27      TB-21520  Tracy Blumstein     Consumer  United States
Philadelphia
165     BM-11140     Becky Martin     Consumer  United States    San
Antonio
251     KC-16540  Kelly Collister     Consumer  United States      San
Diego
262     SB-20290     Sean Braxton    Corporate  United States
Houston
263     SB-20290     Sean Braxton    Corporate  United States
Houston
...          ...              ...          ...             ...
...
9660    ME-17320    Maria Etezadi  Home Office  United States  Santa
Barbara
9774    LF-17185      Luke Foster     Consumer  United States    San
Antonio
9857    EB-13840    Ellis Ballard    Corporate  United States
Seattle
9929    IM-15055    Ionia McGrath     Consumer  United States  San
Francisco
9948    HW-14935  Helen Wasserman    Corporate  United States
Indianapolis

      ...   Region       Product ID         Category Sub-Category  \
```

```
27    ...     East  FUR-BO-10004834        Furniture    Bookcases
165   ...  Central  TEC-MA-10000822       Technology     Machines
251   ...     West  TEC-AC-10003832       Technology  Accessories
262   ...  Central  TEC-MA-10000822       Technology     Machines
263   ...  Central  TEC-MA-10003353       Technology     Machines
...   ...      ...              ...              ...          ...
9660  ...     West  TEC-PH-10001459       Technology       Phones
9774  ...  Central  OFF-BI-10004995  Office Supplies      Binders
9857  ...     West  FUR-TA-10001889        Furniture       Tables
9929  ...     West  TEC-CO-10003763       Technology      Copiers
9948  ...  Central  OFF-AP-10002945  Office Supplies   Appliances

                                              Product Name     Sales
Quantity  \
27    Riverside Palais Royal Lawyers Bookcase, Royal...  3083.430
7
165           Lexmark MX611dhe Monochrome Laser Printer  8159.952
8
251                  Logitech P710e Mobile Speakerphone  3347.370
13
262           Lexmark MX611dhe Monochrome Laser Printer  3059.982
3
263   Xerox WorkCentre 6505DN Laser Multifunction Pr...  2519.958
7
...                                                 ...       ...
...
9660                           Samsung Galaxy Mega 6.3  3023.928
9
9774          GBC DocuBind P400 Electric Binding System  2177.584
8
9857  Bush Advantage Collection Racetrack Conference...  3393.680
8
9929                 Canon PC1060 Personal Laser Copier  2799.960
5
9948  Honeywell Enviracaire Portable HEPA Air Cleane...  2405.200
8

      Discount     Profit    z_score
27         0.5 -1665.0522   4.589664
165        0.4 -1359.9920  12.752870
251        0.0   636.0003   5.014088
262        0.4  -509.9970   4.551959
263        0.4  -251.9958   3.683583
...        ...        ...        ...
9660       0.2   226.7946   4.493983
9774       0.8 -3701.8928   3.133035
9857       0.0   610.8624   5.088556
9929       0.2   944.9865   4.133835
9948       0.0   793.7160   3.499049
```

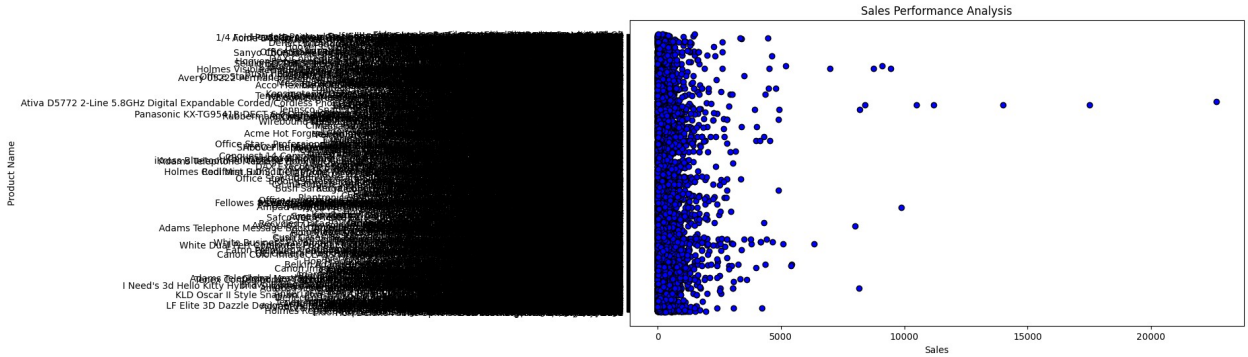
```
[126 rows x 22 columns]

C:\Users\Samruddhi Yadav\AppData\Local\Temp\
ipykernel_55264\3714516637.py:5: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  data['z_score'] = zscore(data['Sales'])



---------------------------------------------------------------------
-----
AttributeError                            Traceback (most recent call
last)
Cell In[13], line 4
      1 # □ 3. Visual Methods (Boxplot/Histogram)
      3 sns.boxplot(x = data["Sales"])
----> 4 plt.show()

File ~\AppData\Roaming\Python\Python312\site-packages\matplotlib\_api\
__init__.py:218, in caching_module_getattr.<locals>.__getattr__(name)
    216 if name in props:
    217     return props[name].__get__(instance)
--> 218 raise AttributeError(
    219     f"module {cls.__module__!r} has no attribute {name!r}")

AttributeError: module 'matplotlib' has no attribute 'show'
```



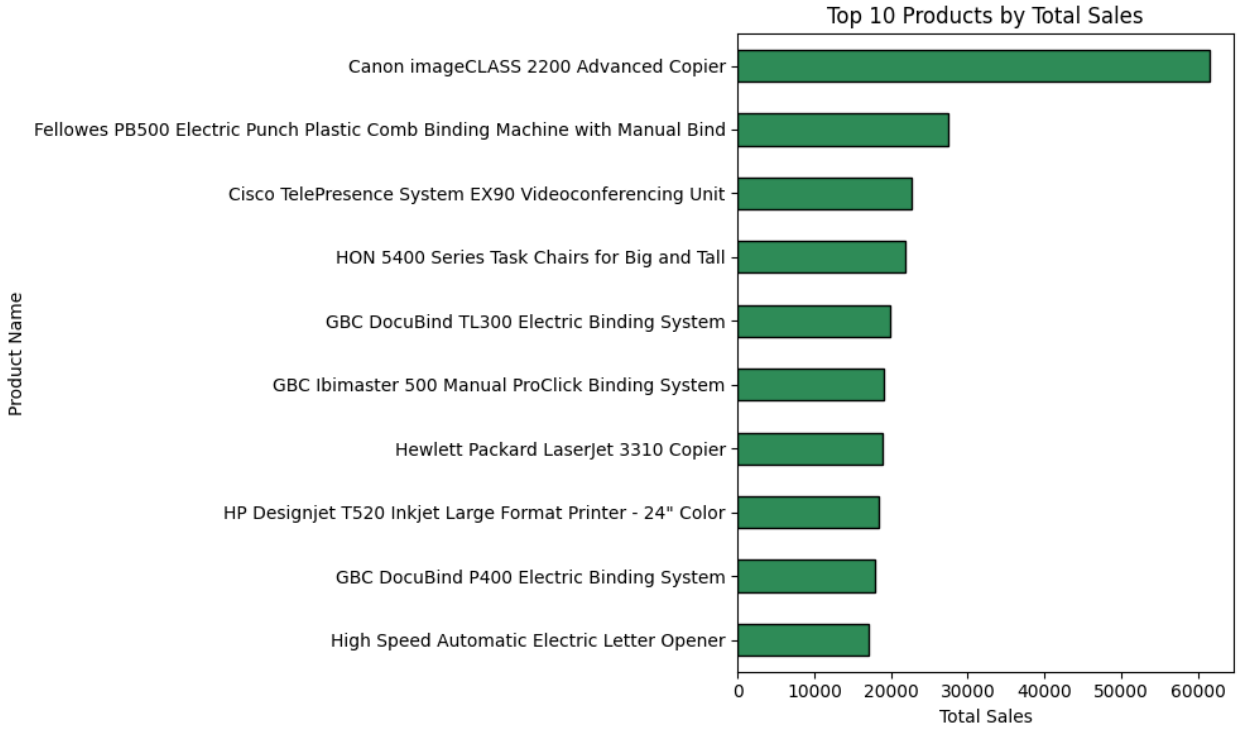
Data Visualization

** Find monthly/yearly sales trends **

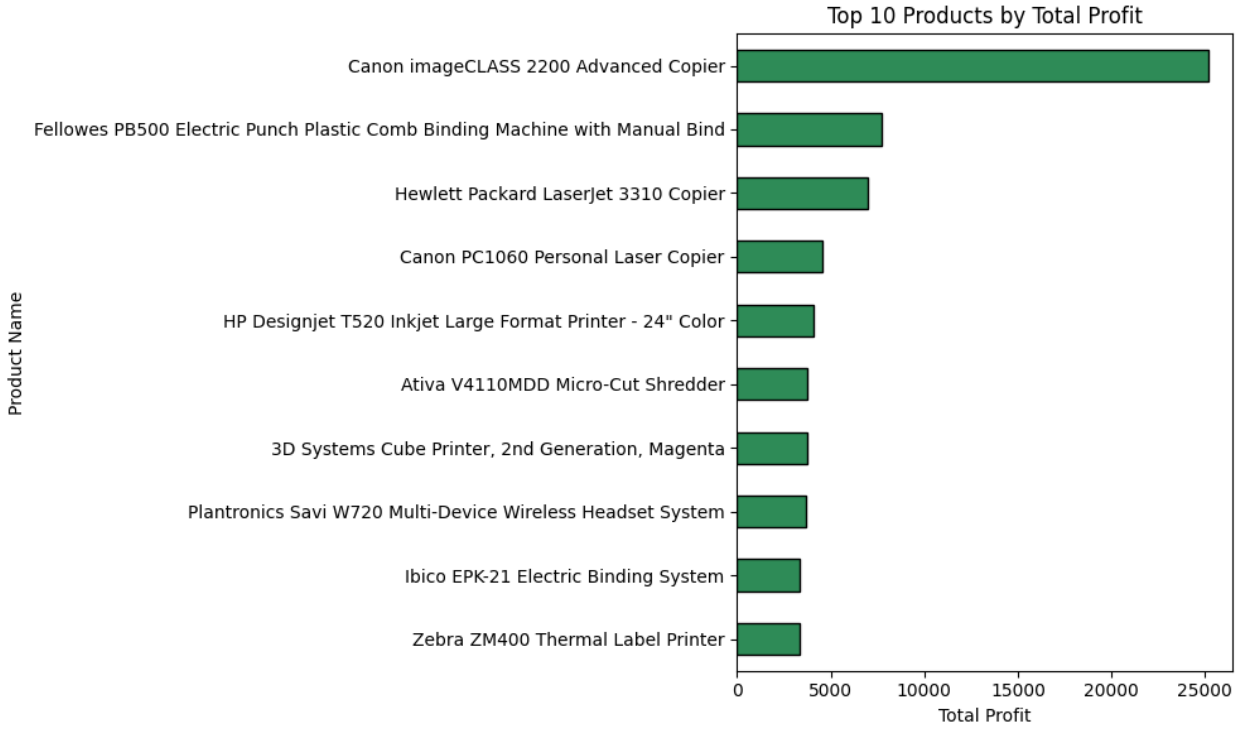
```
# Scatter plot
import matplotlib.pyplot as plt

plt.figure(figsize=(12, 6))
plt.scatter(x = data["Sales"],y = data["Product Name"],color =
"blue",edgecolor = "black")
plt.title("Sales Performance Analysis")
plt.xlabel("Sales")
plt.ylabel("Product Name")

plt.show()
```




```
#  Plot for 10 Products

import matplotlib.pyplot as plt

# Group by product and sum sales
top_products = data.groupby("Product Name")
["Sales"].sum().sort_values(ascending=False).head(10)

# Plotting
plt.figure(figsize=(10, 6))
top_products.plot(kind='barh', color='seagreen', edgecolor='black')
plt.title("Top 10 Products by Total Sales")
plt.xlabel("Total Sales")
plt.ylabel("Product Name")
plt.gca().invert_yaxis()  # Highest at the top
plt.tight_layout()
plt.show()
```




```
top_products1 = data.groupby("Product Name")
["Profit"].sum().sort_values(ascending=False).head(10)

# Plotting
plt.figure(figsize=(10, 6))
top_products1.plot(kind='barh', color='seagreen', edgecolor='black')
plt.title("Top 10 Products by Total Profit")
plt.xlabel("Total Profit")
plt.ylabel("Product Name")
plt.gca().invert_yaxis()  # Highest at the top
plt.tight_layout()
plt.show()
```


Top 10 Products by Total Profit
Canon imageCLASS 2200 Advanced Copier
Fellowes PB500 Electric Punch Plastic Comb Binding Machine with Manual Bind
Hewlett Packard LaserJet 3310 Copier
Canon PC1060 Personal Laser Copier
HP Designjet T520 Inkjet Large Format Printer - 24" Color
Ativa V4110MDD Micro-Cut Shredder
3D Systems Cube Printer, 2nd Generation, Magenta
Plantronics Savi W720 Multi-Device Wireless Headset System
Ibico EPK-21 Electric Binding System
Zebra ZM400 Thermal Label Printer
Product Name
0
5000
10000
15000
20000
25000
Total Profit