```python
import pandas as pd
import matplotlib.pyplot as plt

data =
pd.read_csv('C:/Users/Senthil/Documents/product/statsfinal.csv')  #
Replace 'your_file_path.csv' with the actual file path

# Display the first few rows of the data
data.head()
```

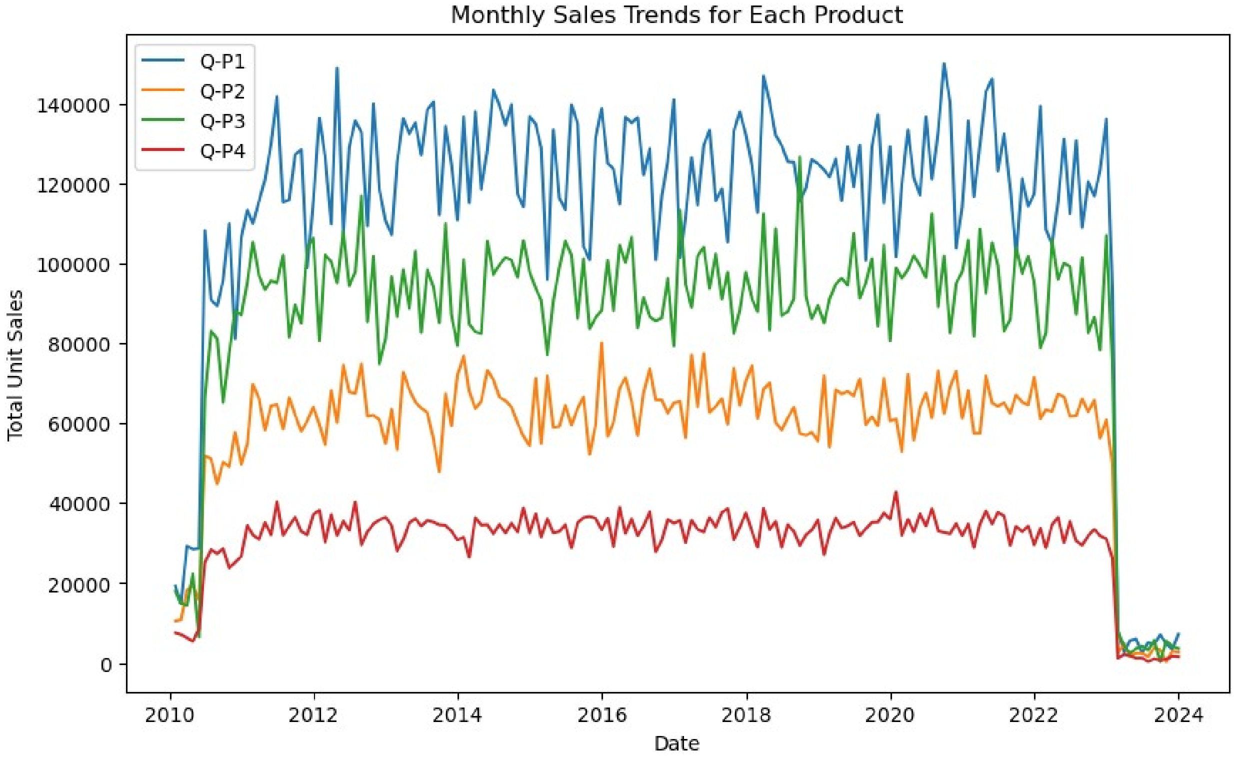
```
   Unnamed: 0        Date  Q-P1  Q-P2  Q-P3  Q-P4      S-P1      S-P2
\
0           0  13-06-2010  5422  3725   576   907  17187.74  23616.50

1           1  14-06-2010  7047   779  3578  1574  22338.99   4938.86

2           2  15-06-2010  1572  2082   595  1145   4983.24  13199.88

3           3  16-06-2010  5657  2399  3140  1672  17932.69  15209.66

4           4  17-06-2010  3668  3207  2184   708  11627.56  20332.38


       S-P3      S-P4
0   3121.92   6466.91
1  19392.76  11222.62
2   3224.90   8163.85
3  17018.80  11921.36
4  11837.28   5048.04
```

```python
if 'Unnamed: 0' in data.columns:
    data = data.drop(columns=['Unnamed: 0'])

data['Date'] = pd.to_datetime(data['Date'], errors='coerce')
data = data.dropna(subset=['Date'])
data.set_index('Date', inplace=True)

# Check for any missing values
data.info()

# Display basic statistics of the data
data.describe()
```

```
C:\Users\Senthil\AppData\Local\Temp\ipykernel_8608\3604024517.py:4:
UserWarning: Parsing dates in DD/MM/YYYY format when dayfirst=False
(the default) was specified. This may lead to inconsistently parsed
dates! Specify a format to ensure consistent parsing.
  data['Date'] = pd.to_datetime(data['Date'], errors='coerce')

<class 'pandas.core.frame.DataFrame'>
DatetimeIndex: 4574 entries, 2010-06-13 to 2023-03-02
```

```
Data columns (total 8 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   Q-P1    4574 non-null   int64  
 1   Q-P2    4574 non-null   int64  
 2   Q-P3    4574 non-null   int64  
 3   Q-P4    4574 non-null   int64  
 4   S-P1    4574 non-null   float64
 5   S-P2    4574 non-null   float64
 6   S-P3    4574 non-null   float64
 7   S-P4    4574 non-null   float64
dtypes: float64(4), int64(4)
memory usage: 321.6 KB

              Q-P1         Q-P2         Q-P3         Q-P4          S-
P1  \
count  4574.000000  4574.000000  4574.000000  4574.000000   
4574.000000   
mean   4123.342589  2129.705072  3143.769786  1123.738303  
13070.996006   
std    2243.691134  1089.503315  1671.052866   497.813557   
7112.500894   
min     254.000000   251.000000   250.000000   250.000000   
805.180000   
25%    2149.500000  1167.250000  1695.250000   696.000000   
6813.915000   
50%    4138.000000  2133.500000  3196.500000  1137.000000  
13117.460000   
75%    6072.000000  3069.750000  4564.750000  1545.750000  
19248.240000   
max    7998.000000  3998.000000  6000.000000  2000.000000  
25353.660000   

               S-P2          S-P3          S-P4  
count   4574.000000   4574.000000   4574.000000  
mean   13502.330157  17039.232239   8012.254104  
std     6907.451018   9057.106532   3549.410662  
min     1591.340000   1355.000000   1782.500000  
25%     7400.365000   9188.255000   4962.480000  
50%    13526.390000  17325.030000   8106.810000  
75%    19462.215000  24740.945000  11021.197500  
max    25347.320000  32520.000000  14260.000000  

monthly_sales = data.resample('M').sum()

plt.figure(figsize=(10, 6))
for product in ['Q-P1', 'Q-P2', 'Q-P3', 'Q-P4']:
    plt.plot(monthly_sales.index, monthly_sales[product], 
label=product)
```

```
plt.xlabel('Date')
plt.ylabel('Total Unit Sales')
plt.title('Monthly Sales Trends for Each Product')
plt.legend()
plt.show()
```



```
# Calculate total unit sales for each product
total_unit_sales = data[['Q-P1', 'Q-P2', 'Q-P3', 'Q-P4']].sum()

# Find the product with the highest total unit sales
top_product = total_unit_sales.idxmax()
top_sales = total_unit_sales.max()

print(f"The top-performing product based on total unit sales is
{top_product} with {top_sales} units sold.")
```

```
The top-performing product based on total unit sales is Q-P1 with
18860169 units sold.
```

```
# Filter data for 31st December
dec_31_sales = data[data.index.day == 31]

# Calculate average units sold on 31st December
avg_units_dec_31 = dec_31_sales[['Q-P1', 'Q-P2', 'Q-P3', 'Q-
P4']].mean()
```

```
print("Estimated Units Sold on 31st December:")
print(avg_units_dec_31)
```

```
Estimated Units Sold on 31st December:
Q-P1    3847.269841
Q-P2    2012.460317
Q-P3    3074.333333
Q-P4    1124.746032
dtype: float64
```

```
# Calculate total unit sales and total revenue for each product
total_unit_sales = data[['Q-P1', 'Q-P2', 'Q-P3', 'Q-P4']].sum()
total_revenue = data[['S-P1', 'S-P2', 'S-P3', 'S-P4']].sum()

# Find the product with the lowest total unit sales and revenue
(assuming this indicates its contribution)
lowest_sales_product = total_unit_sales.idxmin()
lowest_revenue_product = total_revenue.idxmin()

# Calculate the percentage contribution of each product to total sales
and revenue
sales_contribution = total_unit_sales / total_unit_sales.sum() * 100
revenue_contribution = total_revenue / total_revenue.sum() * 100

print(f"The product with the lowest total unit sales is
{lowest_sales_product}.")
print(f"The product with the lowest total revenue is
{lowest_revenue_product}.")

print("\nSales Contribution (%):")
print(sales_contribution)

print("\nRevenue Contribution (%):")
print(revenue_contribution)
```

```
The product with the lowest total unit sales is Q-P4.
The product with the lowest total revenue is S-P4.

Sales Contribution (%):
Q-P1    39.193201
Q-P2    20.243275
Q-P3    29.882165
Q-P4    10.681359
dtype: float64

Revenue Contribution (%):
S-P1    25.319213
S-P2    26.154730
S-P3    33.005897
S-P4    15.520161
dtype: float64
```

```python
# Calculate annual averages for sales and revenues
annual_sales = data[['Q-P1', 'Q-P2', 'Q-P3', 'Q-P4']].resample('A').sum()
annual_revenue = data[['S-P1', 'S-P2', 'S-P3', 'S-P4']].resample('A').sum()

# Create a dataframe for 2024 with dates from January to December
dates_2024 = pd.date_range(start='2024-01-01', end='2024-12-31', freq='D')
df_2024 = pd.DataFrame(index=dates_2024)

# Calculate moving averages for sales and revenues
for product in ['Q-P1', 'Q-P2', 'Q-P3', 'Q-P4']:
    df_2024[f'MA-{product}'] = data[product].rolling(window=365, min_periods=1).mean()

for product in ['S-P1', 'S-P2', 'S-P3', 'S-P4']:
    df_2024[f'MA-{product}'] = data[product].rolling(window=365, min_periods=1).mean()

# Extract the predicted values for 2024
predicted_sales_2024 = df_2024[['MA-Q-P1', 'MA-Q-P2', 'MA-Q-P3', 'MA-Q-P4']].iloc[-1]
predicted_revenue_2024 = df_2024[['MA-S-P1', 'MA-S-P2', 'MA-S-P3', 'MA-S-P4']].iloc[-1]

print("Predicted Sales for 2024:")
print(predicted_sales_2024)

print("\nPredicted Revenue for 2024:")
print(predicted_revenue_2024)
```

```
Predicted Sales for 2024:
MA-Q-P1   NaN
MA-Q-P2   NaN
MA-Q-P3   NaN
MA-Q-P4   NaN
Name: 2024-12-31 00:00:00, dtype: float64

Predicted Revenue for 2024:
MA-S-P1   NaN
MA-S-P2   NaN
MA-S-P3   NaN
MA-S-P4   NaN
Name: 2024-12-31 00:00:00, dtype: float64
```