

You are provided monthly sales data for four regions (North, South, East, West) for January–March. Use Python (pandas, seaborn, matplotlib) or a spreadsheet to analyze and visualize the data, then interpret results and recommend business actions.

| Region | January | February | March |
|--------|---------|----------|-------|
| North | 1500 | 3100 | 1600 |
| South | 900 | 0 | 2000 |
| East | 1100 | 1500 | 0 |
| West | 1300 | 0 | 0 |

1. create a pandas DataFrame named df using the above data. Set the Region column as the index of the DataFrame. Display the DataFrame.
2. Use the seaborn library to create a heat map that shows sales values by region and month.

Requirements: • Display numeric values inside each cell (annot=True). • Use a color map (for example 'YlGnBu'). • Add a suitable figure size and title (Sales Heat Map by Region and Month). Display the heat map using plt.show().

3. After generating the heat map:

Observe which region and month show the highest and lowest sales. Print the following results in the output: Region with highest total sales. Region with lowest total sales. Month with highest total sales. Month with lowest total sales. (Hint: Use df.sum(axis=1) for region totals and df.sum(axis=0) for month totals.)

```
In [3]: import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
data = {
    'Region': ['North', 'South', 'East', 'West'],
    'January': [1500, 900, 1100, 1300],
    'February': [3100, 0, 1500, 0],
    'March': [1600, 2000, 0, 0]
}
df=pd.DataFrame(data)
print(df)
df.set_index('Region',inplace=True)
print("Sales Data (in units):")
print(df)
print("\n")
plt.figure(figsize=(4,4))
sns.heatmap(df,annot=True,cmap='YlGnBu', fmt='d')
plt.title('Sales Heat Map by Region and Month')
plt.xlabel('Month')
plt.ylabel('Region')
plt.show()
region_totals=df.sum(axis=1)
month_totals=df.sum(axis=0)
print("Total Sales by Region:")
print(region_totals)
print("\nTotal Sales by Month:")
print(month_totals)
print("\n")
max_region = region_totals.idxmax()
min_region= region_totals.idxmin()
min_region = region_totals.idxmin()
max_month = month_totals.idxmax()
```

```

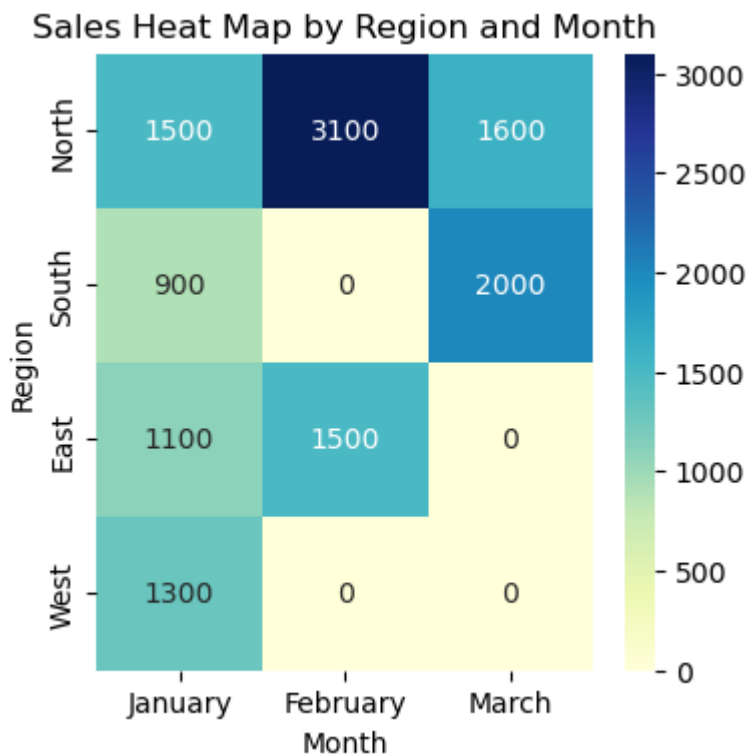
min_month = month_totals.idxmin()
print(f"Region with highest total sales: {max_region} ({region_totals[max_region]}")
print(f"Region with lowest total sales: {min_region} ({region_totals[min_region]}")
print(f"Month with highest total sales: {max_month} ({month_totals[max_month]}")
print(f"Month with lowest total sales: {min_month} ({month_totals[min_month]}")

```

| | Region | January | February | March |
|---|--------|---------|----------|-------|
| 0 | North | 1500 | 3100 | 1600 |
| 1 | South | 900 | 0 | 2000 |
| 2 | East | 1100 | 1500 | 0 |
| 3 | West | 1300 | 0 | 0 |

Sales Data (in units):

| | | January | February | March |
|--------|--|---------|----------|-------|
| Region | | | | |
| North | | 1500 | 3100 | 1600 |
| South | | 900 | 0 | 2000 |
| East | | 1100 | 1500 | 0 |
| West | | 1300 | 0 | 0 |



Total Sales by Region:

Region

North 6200

South 2900

East 2600

West 1300

dtype: int64

Total Sales by Month:

January 4800

February 4600

March 3600

dtype: int64

Region with highest total sales: North (6200)

Region with lowest total sales: West (1300)

Month with highest total sales: January (4800)

Month with lowest total sales: March (3600)

Student Performance Heat Map

You are given the average test scores of students in four subjects across four classes.

Class Math Science English Computer A 78 85 88 92 B 65 70 75 80 C 90 88 84 89 D 55 60 65 70 1 Create a DataFrame using pandas and set Class as the index. 2 Plot a heat map using Seaborn to visualize the performance of each class across subjects. • Use `annot=True`, `fmt='.0f'`, and a colormap like 'coolwarm'. 3 Calculate and print: • The subject with the highest overall average score. • The class with the highest total score. 4 Display the heat map and print the results.

```
In [8]: import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
Data = {
    'Class': ['A', 'B', 'C', 'D'],
    'Math': [78, 65, 90, 55],
    'Science': [85, 70, 88, 60],
    'English': [88, 75, 84, 65],
    'Computer': [92, 80, 89, 70]
}
df = pd.DataFrame(Data)
df.set_index('Class', inplace=True)
print("Student Performance DataFrame:\n")
print(df)
plt.figure(figsize=(5, 4))
sns.heatmap(df, annot=True, cmap='coolwarm', fmt='.0f')
plt.title('Student Performance Heat Map')
plt.xlabel('Subject')
plt.ylabel('Class')
plt.show()
Subject_totals = df.mean(axis=0)
Class_totals = df.sum(axis=1)
print("\nAverage by Subject:")
print(Subject_totals)
print("\nTotal marks by Class:")
print(Class_totals)
highmarksub = Subject_totals.idxmax()
```

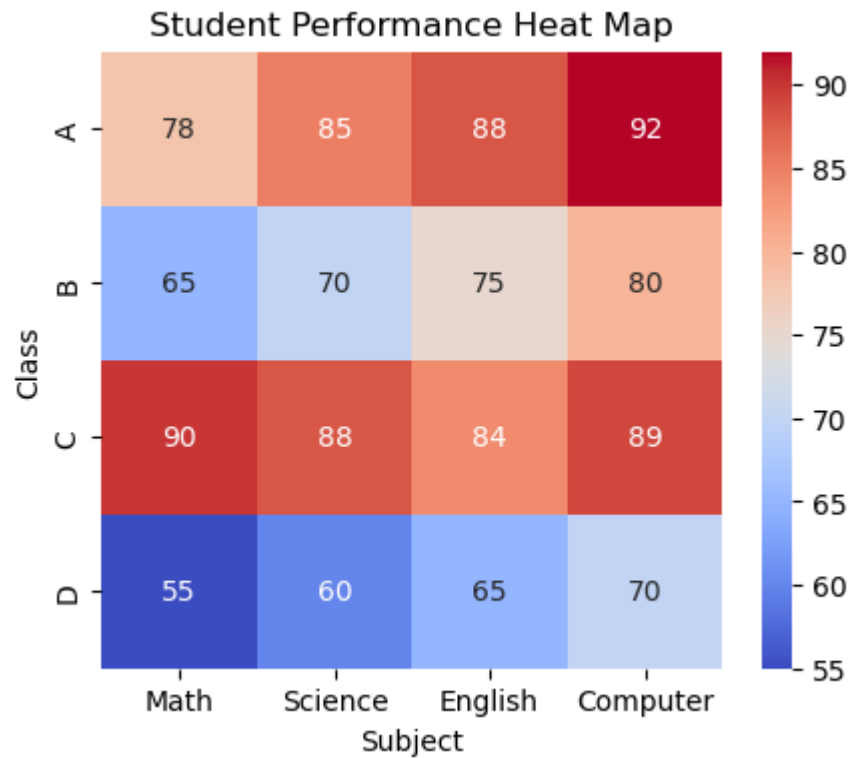
```

hightotmark = Class_totals.idxmax()
print(f"\nHighest average by Subject: {highmarksub} ({Subject_totals[highmarksub]
print(f"Class with highest total score: {hightotmark} ({Class_totals[hightotmark]

```

Student Performance DataFrame:

| | Math | Science | English | Computer |
|-------|------|---------|---------|----------|
| Class | | | | |
| A | 78 | 85 | 88 | 92 |
| B | 65 | 70 | 75 | 80 |
| C | 90 | 88 | 84 | 89 |
| D | 55 | 60 | 65 | 70 |



Average by Subject:

```

Math      72.00
Science   75.75
English   78.00
Computer  82.75
dtype: float64

```

Total marks by Class:

```

Class
A      343
B      290
C      351
D      250
dtype: int64

```

Highest average by Subject: Computer (82.75)

Class with highest total score: C (351)

Hospital Department Patient Count Analysis

A hospital recorded the number of patients treated in different departments over three months.

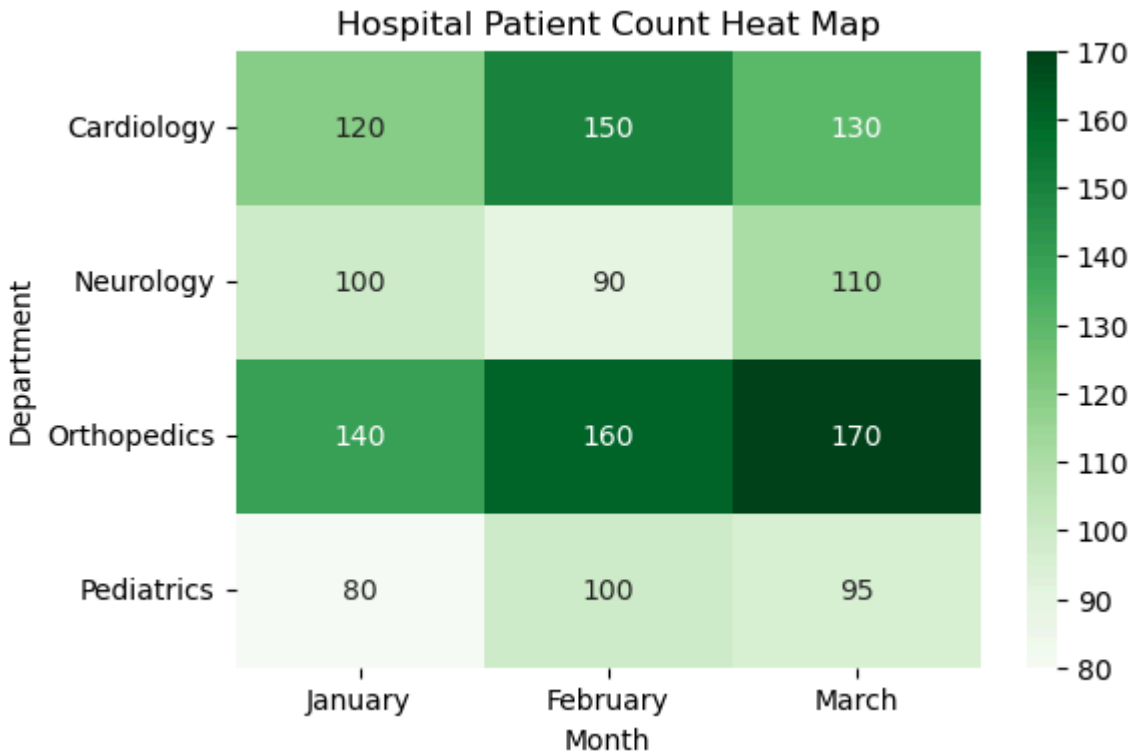
Department January February March Cardiology 120 150 130 Neurology 100 90 110
Orthopedics 140 160 170 Pediatrics 80 100 95

1 Create a pandas DataFrame from the above data. 2 Set Department as the index and display it. 3 Create a heat map with: • annot=True, fmt='d', cmap='Greens'. 4 Calculate and print: • Department with the highest total patients. • Month with the lowest total patients. 5 Add a suitable title: "Hospital Patient Count Heat Map" and display it.

```
In [11]: import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
data = {
    'Department': ['Cardiology', 'Neurology', 'Orthopedics', 'Pediatrics'],
    'January': [120, 100, 140, 80],
    'February': [150, 90, 160, 100],
    'March': [130, 110, 170, 95]
}
df = pd.DataFrame(data)
df.set_index('Department', inplace=True)
print("Hospital Patient Data:\n")
print(df)
plt.figure(figsize=(6, 4))
sns.heatmap(df, annot=True, fmt='d', cmap='Greens')
plt.title("Hospital Patient Count Heat Map")
plt.xlabel("Month")
plt.ylabel("Department")
plt.show()
dept_totals = df.sum(axis=1)
month_totals = df.sum(axis=0)
max_dept = dept_totals.idxmax()
min_month = month_totals.idxmin()
print("\nTotal patients by Department:")
print(dept_totals)
print("\nTotal patients by Month:")
print(month_totals)
print(f"\nDepartment with highest total patients: {max_dept} ({dept_totals[max_dept]}")
print(f"Month with lowest total patients: {min_month} ({month_totals[min_month]}")
```

Hospital Patient Data:

| | January | February | March |
|-------------|---------|----------|-------|
| Department | | | |
| Cardiology | 120 | 150 | 130 |
| Neurology | 100 | 90 | 110 |
| Orthopedics | 140 | 160 | 170 |
| Pediatrics | 80 | 100 | 95 |



Total patients by Department:

| | |
|-------------|-----|
| Department | |
| Cardiology | 400 |
| Neurology | 300 |
| Orthopedics | 470 |
| Pediatrics | 275 |

dtype: int64

Total patients by Month:

| | |
|----------|-----|
| January | 440 |
| February | 500 |
| March | 505 |

dtype: int64

Department with highest total patients: Orthopedics (470)
Month with lowest total patients: January (440)