Data to be used for all problems below

import pandas as pd

# Create the DataFrame to be reused in all problems

data = {

'Product': ['A', 'A', 'B', 'B', 'C', 'C', 'D', 'D'],

'Region': ['East', 'West', 'East', 'West', 'East', 'West', 'East', 'West'],

'Year': [2020, 2020, 2021, 2021, 2020, 2020, 2021, 2021],

'Sales': [100, 150, 200, 250, 300, 350, 400, 450],

'Discount': [10, 15, 20, 25, 30, 35, 40, 45],

'Profit': [90, 135, 180, 225, 270, 315, 360, 405]

}

df = pd.DataFrame(data)

**Problems**

**Problem 1: Pivot the DataFrame**

Pivot the DataFrame to show the total Sales for each Product across different Regions.

**Problem 2: Use groupby to Aggregate Data**

Use groupby to calculate the sum of Profit for each Product and Year combination.

**Problem 3: Stack the DataFrame**

Stack the DataFrame by "Product" and "Region". Then display the stacked DataFrame.

**Problem 4: Unstack the DataFrame**

Unstack the DataFrame to display "Region" in the column index while keeping "Product" as the row index.

**Problem 5: Pivot Table with Aggregation**

Create a pivot table showing the mean Discount and the sum of Sales for each combination of Product and Year.

**Problem 6: Multi-Index Sorting**

Convert the DataFrame to a multi-indexed DataFrame with Product and Region as indices. Sort the DataFrame by Product first and then by Region.

**Problem 7: Selecting Data with Multi-Index**

Using the multi-indexed DataFrame from Problem 6, select all data for Product = 'A'.

**Problem 8: Stack and Unstack Operations**

Perform a stack operation to convert the DataFrame into a stacked format based on the Year and Region. Then, unstack it back, using Year as the column header.

**Problem 9: Handling Missing Data**

Modify the Sales column by setting some values as NaN (missing). Create a pivot table using Product and Region to find the sum of Sales, and use the fill\_value argument to fill missing values with 0.

**Problem 10: Group by Multiple Columns**

Group the DataFrame by both Product and Region to find the average Profit for each group.