Data Mining and Data Warehousing Lab

CSEL-4108

Assignment on Data Analysis Techniques Using Pandas – 2

Submitted By

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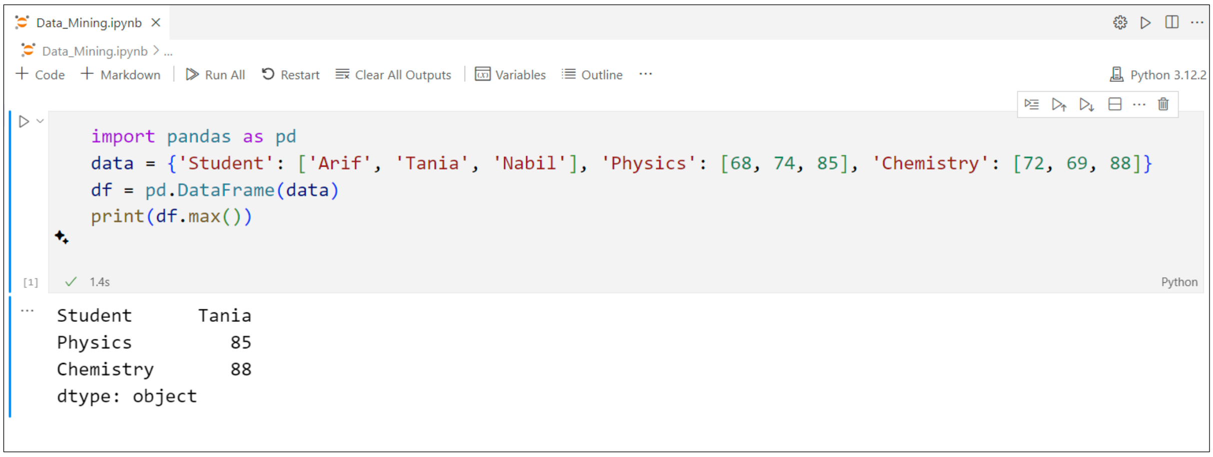
This assignment explores various data analysis techniques using the Pandas library in Python. Below are detailed explanations, code examples, and expected outputs for different operations.

1. Finding Maximum Values

Method: df.max()

This method finds the maximum value for each column in a DataFrame.



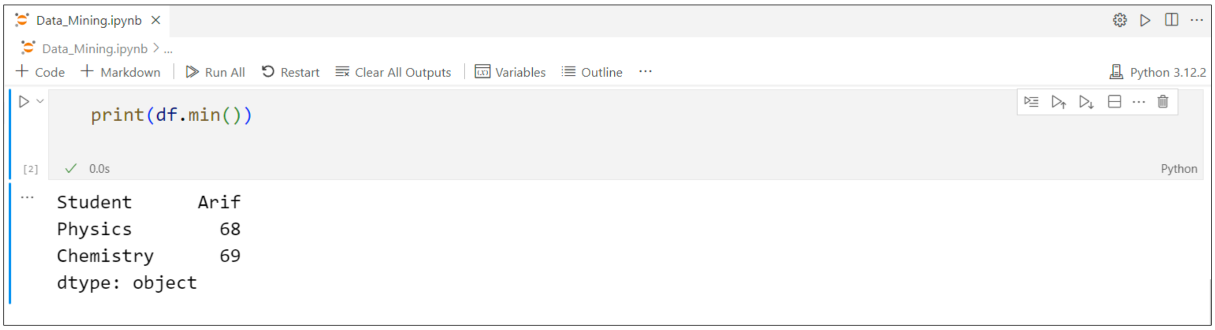
```
import pandas as pd
data = {'Student': ['Arif', 'Tania', 'Nabil'], 'Physics': [68, 74, 85], 'Chemistry': [72, 69, 88]}
df = pd.DataFrame(data)
print(df.max())
```

```
Student      Tania
Physics         85
Chemistry       88
dtype: object
```

2. Finding Minimum Values

Method: df.min()

This method finds the minimum value for each column in a DataFrame.



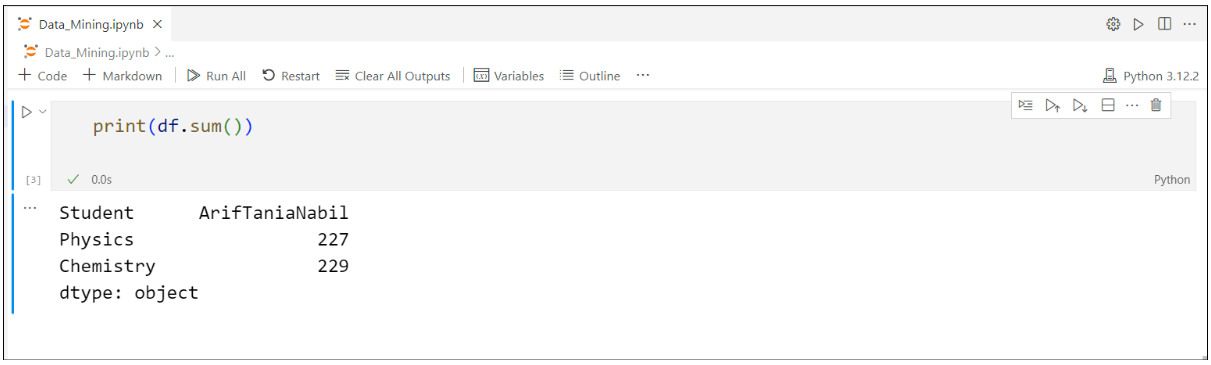
```
print(df.min())
```

```
Student      Arif
Physics        68
Chemistry      69
dtype: object
```

3. Summing Values

Method: df.sum()

This method adds up the values for each column in a DataFrame. For non-numeric columns, it concatenates the values.


Data_Mining.ipynb
Data_Mining.ipynb > ...
+ Code + Markdown | Run All Restart Clear All Outputs | Variables Outline ...
Python 3.12.2
[3]
0.0s
Python

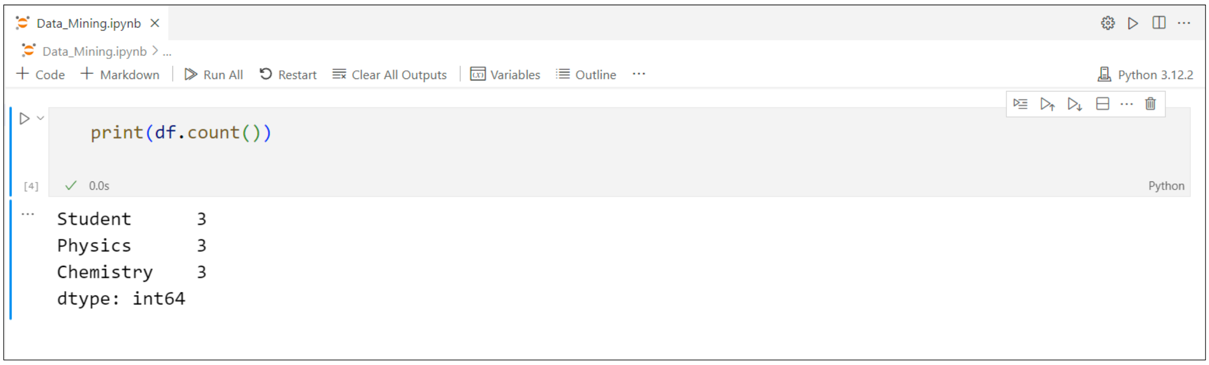
```
print(df.sum())
```

```
Student      ArifTaniaNabil
Physics                 227
Chemistry               229
dtype: object
```

4. Counting Values

Method: df.count()

This method counts the number of non-null values in each column.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Python 3.12.2
[4]
0.0s
Python

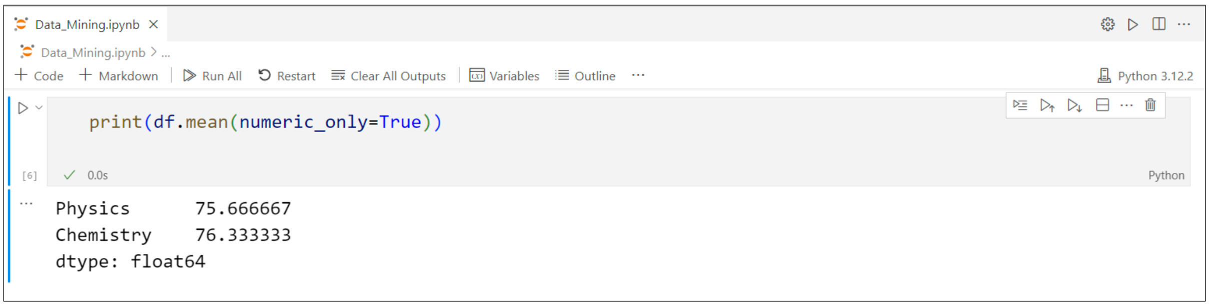
```
print(df.count())
```

```
Student      3
Physics      3
Chemistry    3
dtype: int64
```

5. Calculating Mean

Method: df.mean()

This method calculates the mean (average) of numeric values for each column.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Python 3.12.2
[6]
0.0s
Python

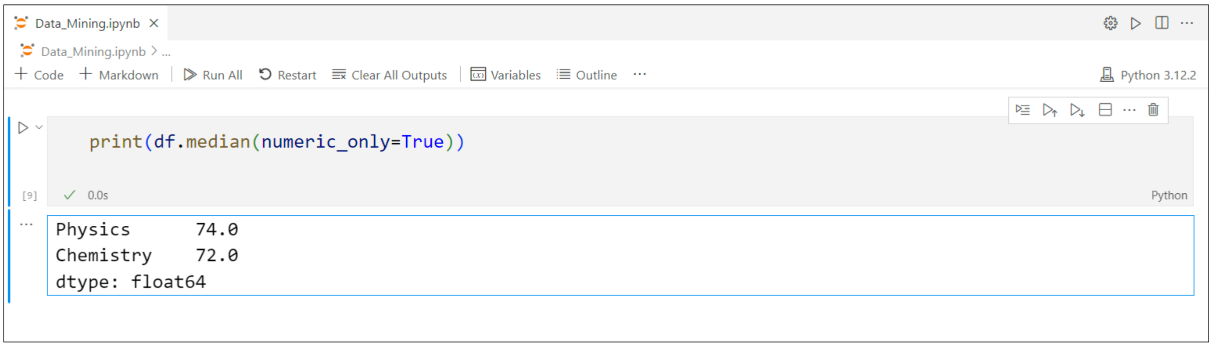
```
print(df.mean(numeric_only=True))
```

```
Physics      75.666667
Chemistry    76.333333
dtype: float64
```

6. Calculating Median

Method: df.median()

This method finds the median value for each column in a DataFrame.



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+ Code + Markdown | Run All Restart Clear All Outputs | Variables Outline ...
Python 3.12.2
[9] ✓ 0.0s
Python

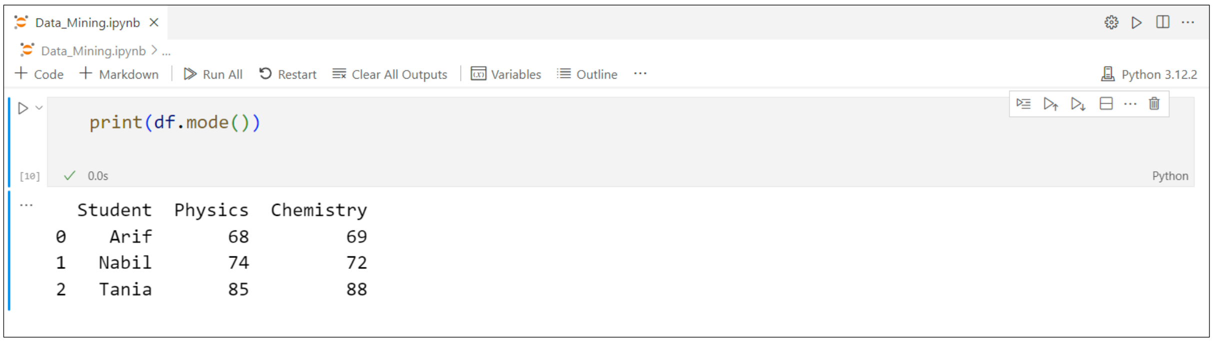
```
print(df.median(numeric_only=True))
```

```
Physics      74.0
Chemistry    72.0
dtype: float64
```

7. Calculating Mode

Method: df.mode()

This method finds the mode (most frequent value) for each column.



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+ Code + Markdown | Run All Restart Clear All Outputs | Variables Outline ...
Python 3.12.2
[10] ✓ 0.0s
Python

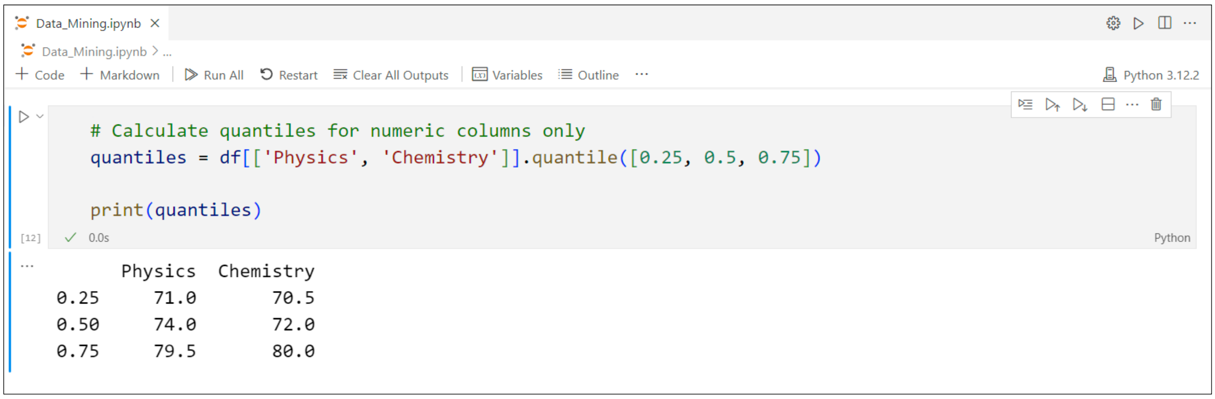
```
print(df.mode())
```

```
  Student  Physics  Chemistry
0    Arif       68         69
1   Nabil       74         72
2   Tania       85         88
```

8. Calculating Quartiles

Method: df.quantile([0.25, 0.5, 0.75])

This method calculates the quartiles of numeric values in each column.



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+ Code + Markdown | Run All Restart Clear All Outputs | Variables Outline ...
Python 3.12.2
[12] ✓ 0.0s
Python

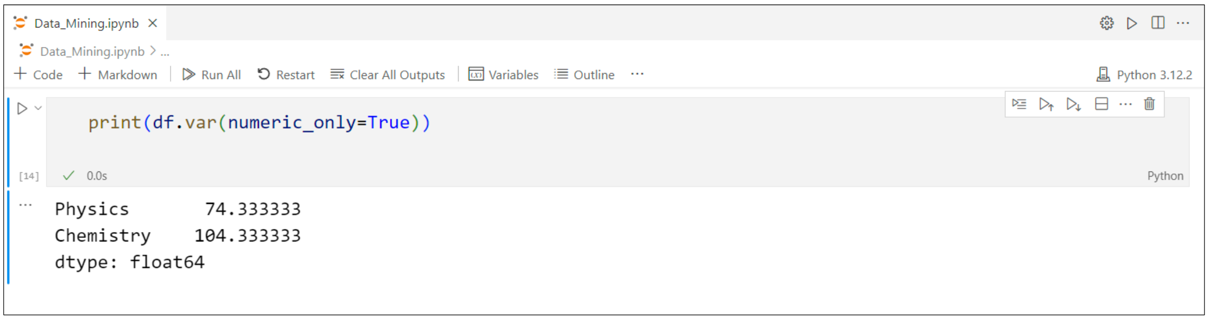
```
# Calculate quantiles for numeric columns only
quantiles = df[['Physics', 'Chemistry']].quantile([0.25, 0.5, 0.75])

print(quantiles)
```

```
      Physics  Chemistry
0.25     71.0       70.5
0.50     74.0       72.0
0.75     79.5       80.0
```

9. Calculating Variance

Method: df.var()

This method calculates the variance of numeric values in each column.



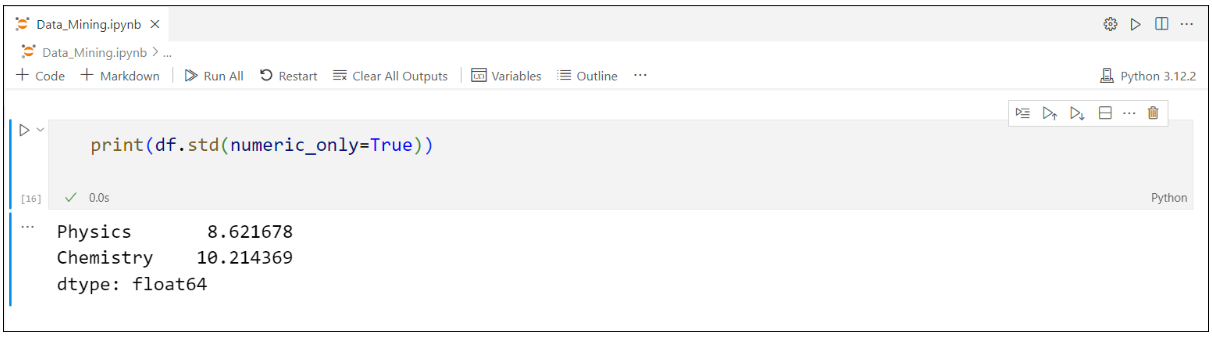
```
print(df.var(numeric_only=True))
```

```
Physics       74.333333
Chemistry    104.333333
dtype: float64
```

10. Calculating Standard Deviation

Method: df.std()

This method calculates the standard deviation of numeric values in each column.



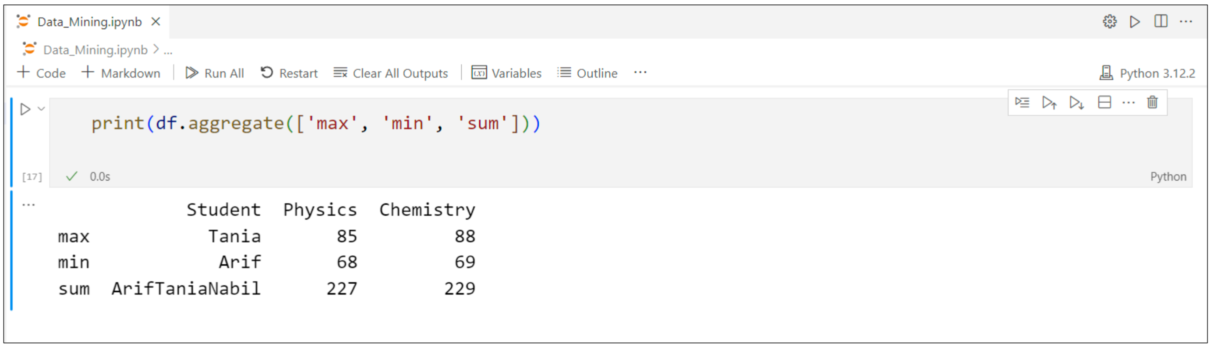
```
print(df.std(numeric_only=True))
```

```
Physics       8.621678
Chemistry    10.214369
dtype: float64
```

11. Performing Aggregation

Method: df.aggregate(['max', 'min', 'sum'])

This method applies multiple aggregation functions to the columns.



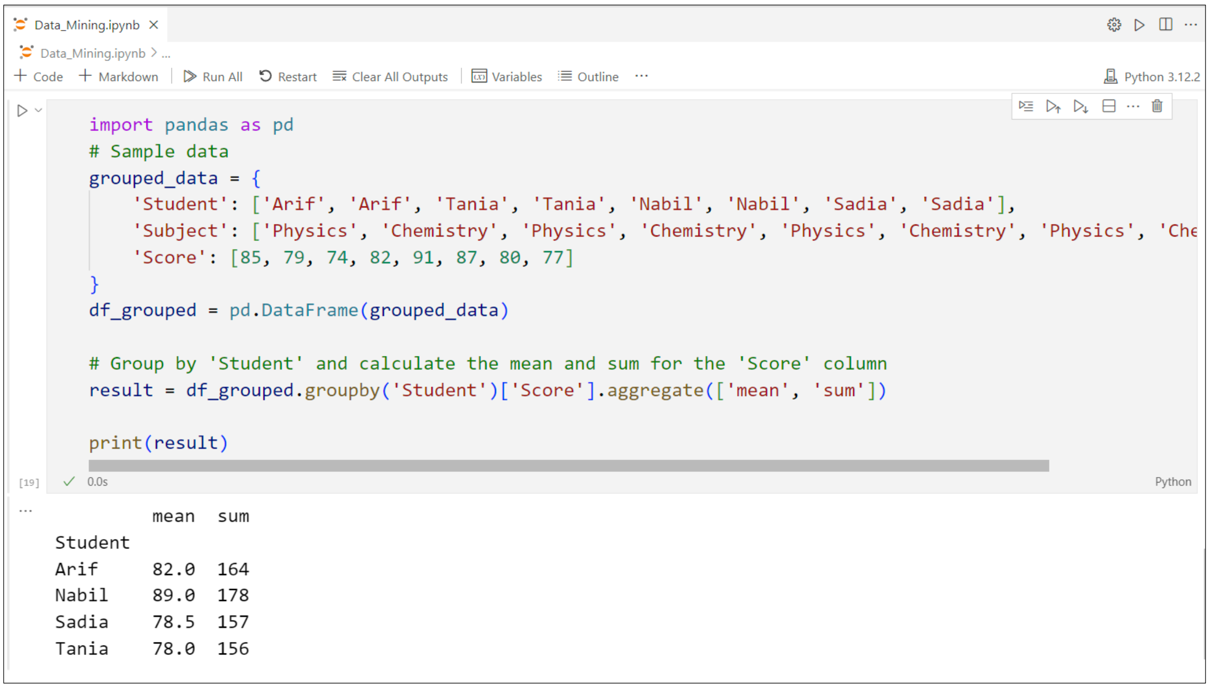
```
print(df.aggregate(['max', 'min', 'sum']))
```

```
            Student  Physics  Chemistry
max           Tania       85         88
min            Arif       68         69
sum  ArifTaniaNabil      227        229
```

12. Grouping and Aggregation

Method: df.groupby('Student').aggregate(['mean', 'sum'])

This method groups the DataFrame by a column and applies aggregation functions.



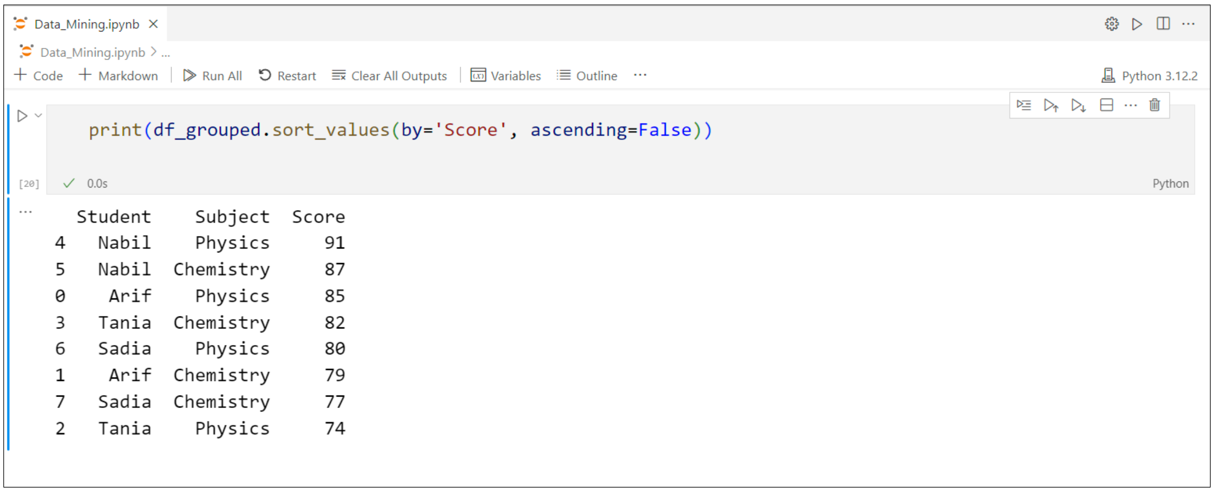
```python
import pandas as pd
# Sample data
grouped_data = {
    'Student': ['Arif', 'Arif', 'Tania', 'Tania', 'Nabil', 'Nabil', 'Sadia', 'Sadia'],
    'Subject': ['Physics', 'Chemistry', 'Physics', 'Chemistry', 'Physics', 'Chemistry', 'Physics', 'Che
    'Score': [85, 79, 74, 82, 91, 87, 80, 77]
}
df_grouped = pd.DataFrame(grouped_data)

# Group by 'Student' and calculate the mean and sum for the 'Score' column
result = df_grouped.groupby('Student')['Score'].aggregate(['mean', 'sum'])

print(result)
```

```
         mean  sum
Student
Arif     82.0  164
Nabil    89.0  178
Sadia    78.5  157
Tania    78.0  156
```

13. Sorting Values

Method: df.sort_values(by='Score', ascending=False)

This method sorts the DataFrame by a specified column.



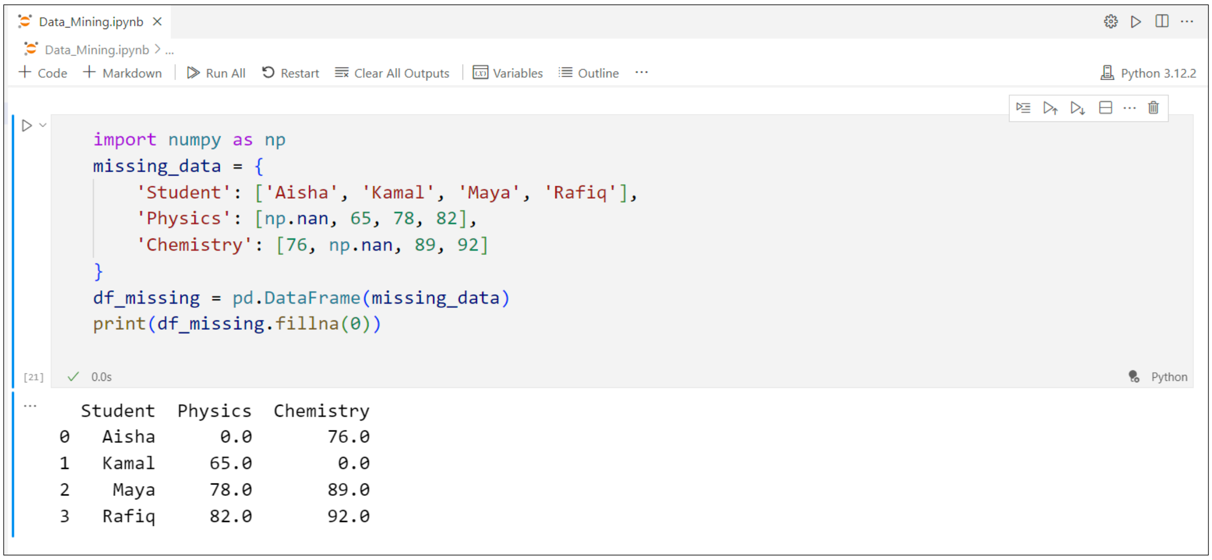
```python
print(df_grouped.sort_values(by='Score', ascending=False))
```

```
  Student    Subject  Score
4   Nabil    Physics     91
5   Nabil  Chemistry     87
0    Arif    Physics     85
3   Tania  Chemistry     82
6   Sadia    Physics     80
1    Arif  Chemistry     79
7   Sadia  Chemistry     77
2   Tania    Physics     74
```

14. Handling Missing Values

Method: df.fillna(0)

This method replaces missing values in the DataFrame with a specified value.



```python
import numpy as np
missing_data = {
    'Student': ['Aisha', 'Kamal', 'Maya', 'Rafiq'],
    'Physics': [np.nan, 65, 78, 82],
    'Chemistry': [76, np.nan, 89, 92]
}
df_missing = pd.DataFrame(missing_data)
print(df_missing.fillna(0))
```

```
  Student  Physics  Chemistry
0   Aisha      0.0       76.0
1   Kamal     65.0        0.0
2    Maya     78.0       89.0
3   Rafiq     82.0       92.0
```