

## Assignment Tasks

Let's start with a common DataFrame containing time series data for these problems:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

Create a sample DataFrame with time series data

```
daterng = pd.date_range(start='2023-01-01', end='2023-01-31', freq='D')
data = np.random.rand(len(daterng)) # Random data for demonstration
df = pd.DataFrame({'Date': daterng, 'Value': data})
df.set_index('Date', inplace=True)
```

Display the DataFrame

```
print(df.head())
```

1. Calculate the mean value of the 'Value' column for the month of January 2023.
2. Extract and display data for the week of January 15, 2023, to January 21, 2023.
3. Calculate the rolling 7-day average of the 'Value' column and create a new DataFrame with the original data and the rolling average.
4. Create a line plot to visualize the 'Value' column and the rolling 7-day average together.

## ▼ Importing Libraries

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

## ▼ Creating a sample DataFrame with time series data

```
daterng = pd.date_range(start='2023-01-01', end='2023-01-31', freq='D')
data = np.random.rand(len(daterng)) # Random data for demonstration
df = pd.DataFrame({'Date': daterng, 'Value': data})
df.set_index('Date', inplace=True)
```

## ▼ Displaying the DataFrame

```
print(df.head())
```

Date	Value
2023-01-01	0.260945
2023-01-02	0.647761
2023-01-03	0.664927
2023-01-04	0.348542
2023-01-05	0.695912

1. Calculating the mean value of the 'Value' column for the month of January 2023.

```
df['Value'].mean()

0.492162366776982
```

```
.
.
.
.
.
```

## 2. Extracting and displaying data for the week of January 15, 2023, to January 21, 2023.

```
week_data = df['2023-01-15':'2023-01-21']

print(week_data)
```

Date	Value
2023-01-15	0.288779
2023-01-16	0.999715
2023-01-17	0.745157
2023-01-18	0.794631
2023-01-19	0.765355
2023-01-20	0.777187
2023-01-21	0.217057

## 3. Calculating the rolling 7-day average of the 'Value' column.

```
rolling_average = df['Value'].rolling(window = 7).mean()
```

## Creating a new DataFrame with the original data and the rolling average.

```
new_df = pd.DataFrame({'Date': df.index, 'Original_Value': df['Value'], 'Rolling_Average': rolling_average})
new_df.set_index('Date', inplace = True)
```

```
new_df.head(10)
```

Date	Original_Value	Rolling_Average
2023-01-01	0.260945	NaN
2023-01-02	0.647761	NaN
2023-01-03	0.664927	NaN
2023-01-04	0.348542	NaN
2023-01-05	0.695912	NaN
2023-01-06	0.422459	NaN
2023-01-07	0.405953	0.492357
2023-01-08	0.298946	0.497786
2023-01-09	0.658651	0.499341
2023-01-10	0.223672	0.436305

## 4. Creating a line plot to visualize the 'Value' column and the rolling 7-day average together.

```
plt.figure(figsize=(10, 5))
plt.plot(new_df['Original_Value'], label = 'Original Value', color = 'b', marker = '.', linestyle = '-', markersize = 8, markerfacecolor = 'y')
plt.plot(new_df['Rolling_Average'], label = 'Rolling 7-day Average', color = 'r', marker = '.', linestyle = '-', markersize = 8, markerfacecolor = 'y')

plt.xlabel('Date')
plt.ylabel('Value')
plt.title('Original Value vs Rolling 7-day Average')
plt.legend()

plt.show()
```

