**PRACTICAL 1: Topic: Time series with moving average and least square**

### **Sales Forecasting for a Retail Store**

**Description:**

A retail store has been recording its monthly sales for the past two years. The manager wants to forecast the sales for the next three months using a time series analysis.

**Data:**

|  |  |
| --- | --- |
| Month | Sales (in units) |
| Jan-22 | 500 |
| Feb-22 | 520 |
| Mar-22 | 510 |
| Apr-22 | 530 |
| May-22 | 540 |
| Jun-22 | 550 |
| Jul-22 | 560 |
| Aug-22 | 570 |
| Sep-22 | 580 |
| Oct-22 | 590 |
| Nov-22 | 600 |
| Dec-22 | 610 |
| Jan-23 | 620 |
| Feb-23 | 630 |
| Mar-23 | 640 |
| Apr-23 | 650 |
| May-23 | 660 |
| Jun-23 | 670 |
| Jul-23 | 680 |
| Aug-23 | 690 |
| Sep-23 | 700 |
| Oct-23 | 710 |
| Nov-23 | 720 |
| Dec-23 | 730 |

**Step 1: Calculate the 3-month moving average for the given sales data.** **Step 2: Use the least squares method to fit a linear trend to the sales data.** **Step 3: Forecast the sales for January, February, and March 2024 using both methods.**

### Problem 2: Temperature Monitoring for a City

**Description:**

A city council wants to analyze the temperature trends to plan for climate adaptation strategies. They have collected the average monthly temperatures for the past three years.

|  |  |  |
| --- | --- | --- |
| Month | Year | Temperature (°C) |
| Jan | 2021 | 2.1 |
| Feb | 2021 | 3 |
| Mar | 2021 | 5.5 |
| Apr | 2021 | 9.2 |
| May | 2021 | 14 |
| Jun | 2021 | 18.2 |
| Jul | 2021 | 21 |
| Aug | 2021 | 20.5 |
| Sep | 2021 | 16.5 |
| Oct | 2021 | 10 |
| Nov | 2021 | 5 |
| Dec | 2021 | 2.5 |
| Jan | 2022 | 2.3 |
| Feb | 2022 | 3.2 |
| Mar | 2022 | 5.7 |
| Apr | 2022 | 9.5 |
| May | 2022 | 14.3 |
| Jun | 2022 | 18.5 |
| Jul | 2022 | 21.3 |
| Aug | 2022 | 20.8 |
| Sep | 2022 | 16.8 |
| Oct | 2022 | 10.2 |
| Nov | 2022 | 5.3 |
| Dec | 2022 | 2.8 |
| Jan | 2023 | 2.5 |
| Feb | 2023 | 3.4 |
| Mar | 2023 | 6 |
| Apr | 2023 | 9.8 |
| May | 2023 | 14.6 |
| Jun | 2023 | 18.7 |
| Jul | 2023 | 21.5 |
| Aug | 2023 | 21 |
| Sep | 2023 | 17 |
| Oct | 2023 | 10.5 |
| Nov | 2023 | 5.5 |
| Dec | 2023 | 3 |

**Step 1: Calculate the 6-month moving average for the given temperature data.** **Step 2: Use the least squares method to fit a linear trend to the temperature data.** **Step 3: Forecast the average temperatures for January, February, and March 2024 using both methods.**