Problem 2: Matrix Operations (Medium Level)

Description:
Write a Java program to perform **addition, subtraction, and multiplication** on two matrices. The program should:

- Check the dimensions of the matrices to ensure valid operations.

Code:

```java
import java.util.Scanner;

public class MatrixOperations {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.println("Enter dimensions of the matrices (rows and columns): ");
        int rows = scanner.nextInt();
        int cols = scanner.nextInt();

        int[][] matrix1 = new int[rows][cols];
        int[][] matrix2 = new int[rows][cols];

        System.out.println("Enter elements of Matrix 1:");
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                matrix1[i][j] = scanner.nextInt();
            }
        }

        System.out.println("Enter elements of Matrix 2:");
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                matrix2[i][j] = scanner.nextInt();
            }
        }

        // Addition
        System.out.println("Addition:");
        int[][] addition = new int[rows][cols];
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                addition[i][j] = matrix1[i][j] + matrix2[i][j];
                System.out.print(addition[i][j] + " ");
            }
            System.out.println();
        }

        // Subtraction
        System.out.println("Subtraction:");
        int[][] subtraction = new int[rows][cols];
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                subtraction[i][j] = matrix1[i][j] - matrix2[i][j];
                System.out.print(subtraction[i][j] + " ");
            }
            System.out.println();
```

```
        }

        // Multiplication
        System.out.println("Multiplication:");
        int[][] multiplication = new int[rows][cols];
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                for (int k = 0; k < cols; k++) {
                    multiplication[i][j] += matrix1[i][k] * matrix2[k][j];
                }
                System.out.print(multiplication[i][j] + " ");
            }
            System.out.println();
        }
    }
}
```

Output:

```
"C:\Program Files\Java\jdk-22\bin\java.exe" "-javaager
Enter dimensions of the matrices (rows and columns):
2 2
Enter elements of Matrix 1:
1 2
3 4
Enter elements of Matrix 2:
5 6
7 8
Addition:
6 8
10 12
Subtraction:
-4 -4
-4 -4
Multiplication:
19 22
43 50

Process finished with exit code 0
```