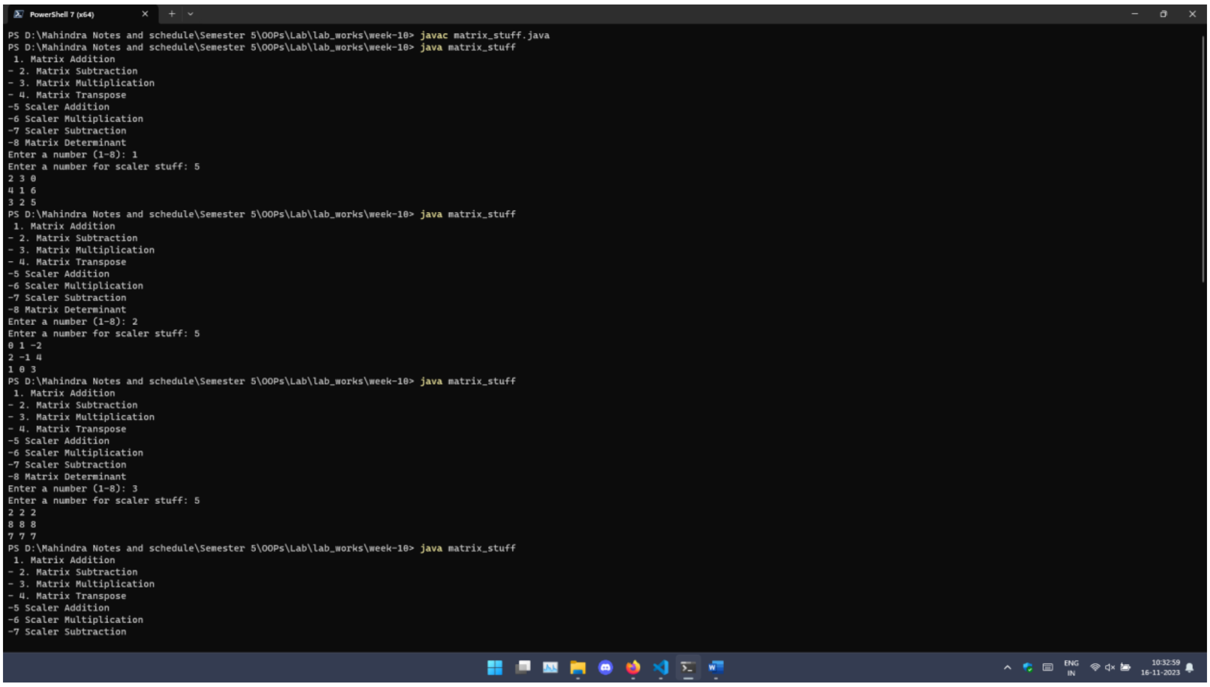
Report OOP Matrices

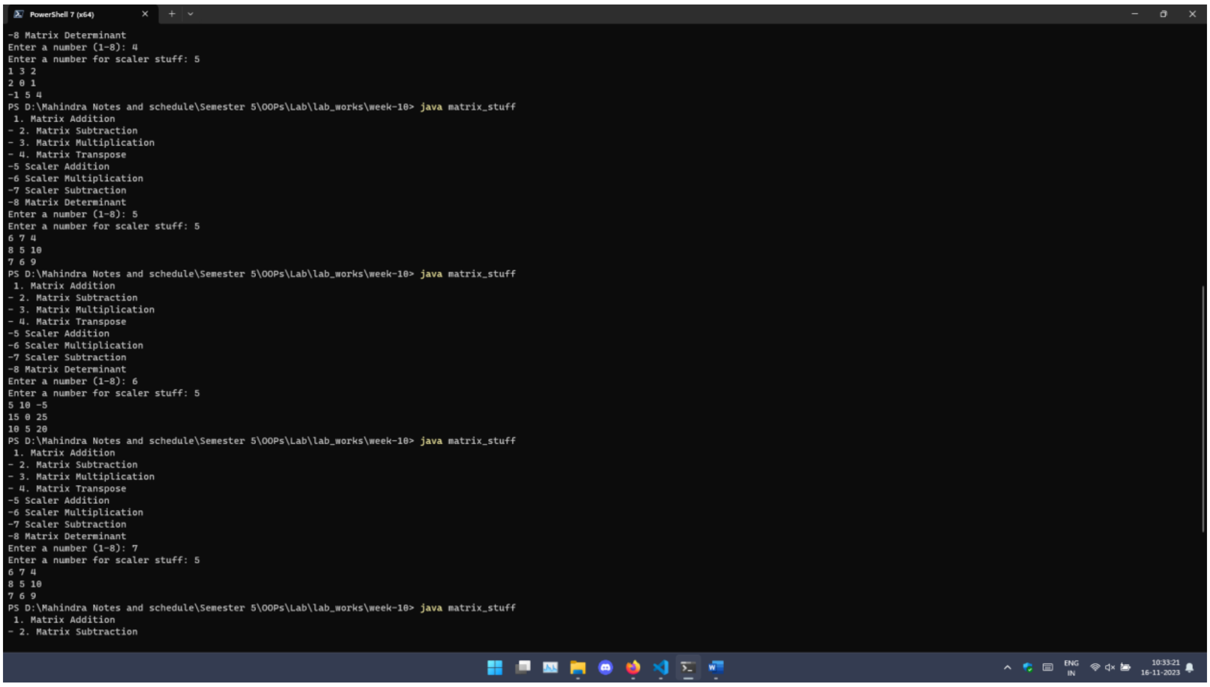
Shashank K

SE21UCSE198

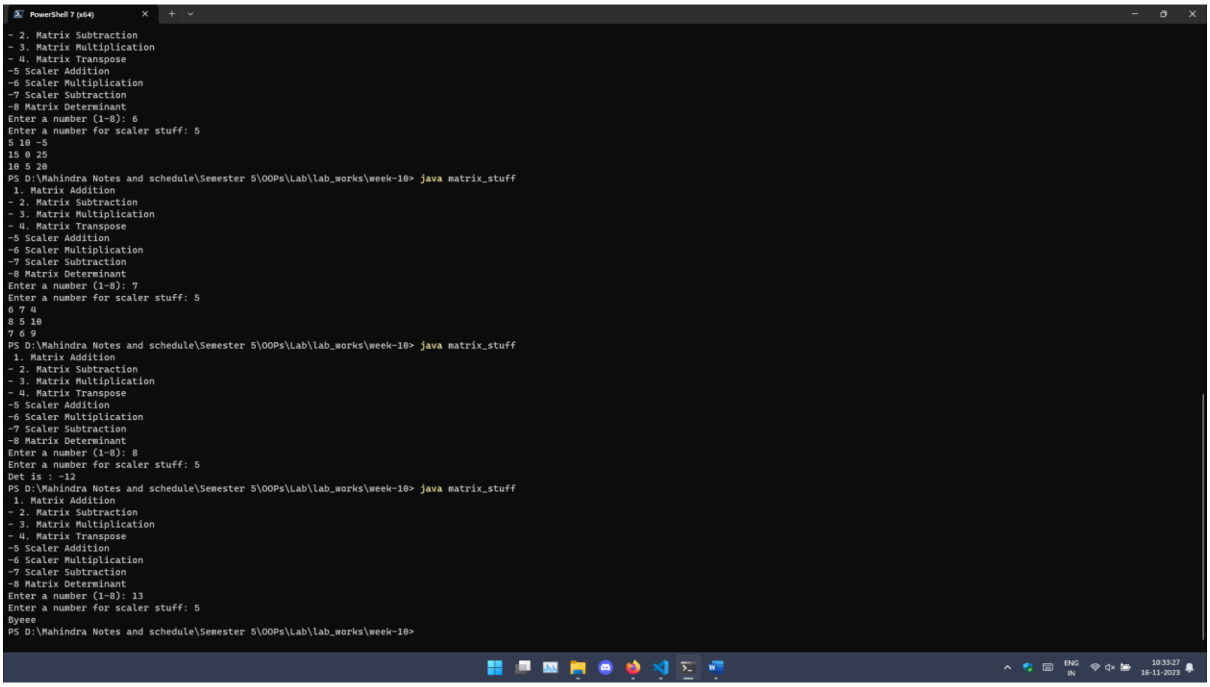
Output



```
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> javac matrix_stuff.java
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 1
Enter a number for scaler stuff: 5
2 3 0
4 1 6
3 2 5
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 2
Enter a number for scaler stuff: 5
0 1 -2
2 -1 4
1 0 3
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 3
Enter a number for scaler stuff: 5
2 2 2
8 8 8
7 7 7
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
```



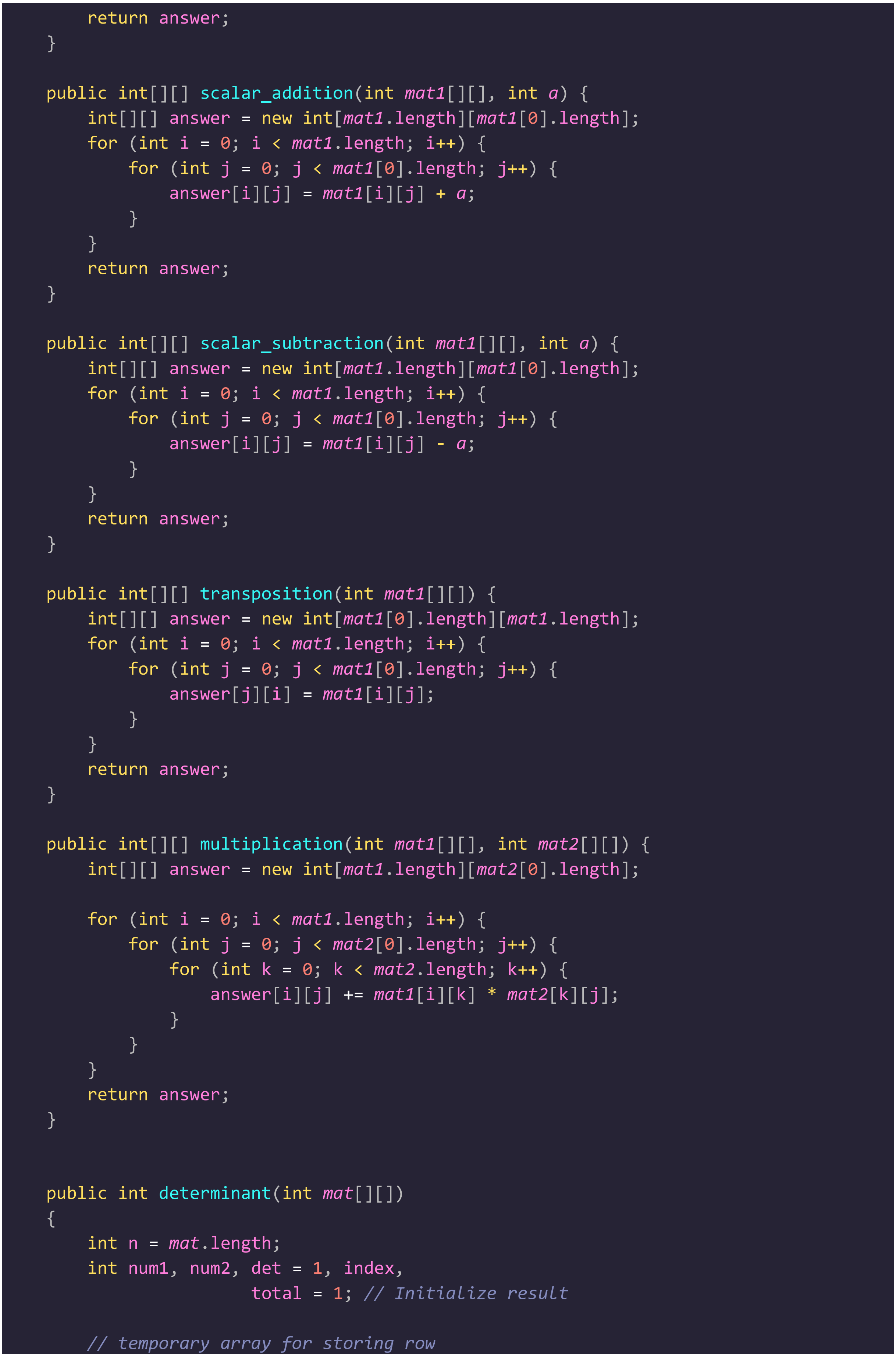
```
-8 Matrix Determinant
Enter a number (1-8): 4
Enter a number for scaler stuff: 5
1 3 2
2 0 1
-1 5 4
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 5
Enter a number for scaler stuff: 5
6 7 4
8 5 10
7 6 9
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 6
Enter a number for scaler stuff: 5
5 10 -5
15 0 25
10 5 20
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 7
Enter a number for scaler stuff: 5
6 7 4
8 5 10
7 6 9
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
```



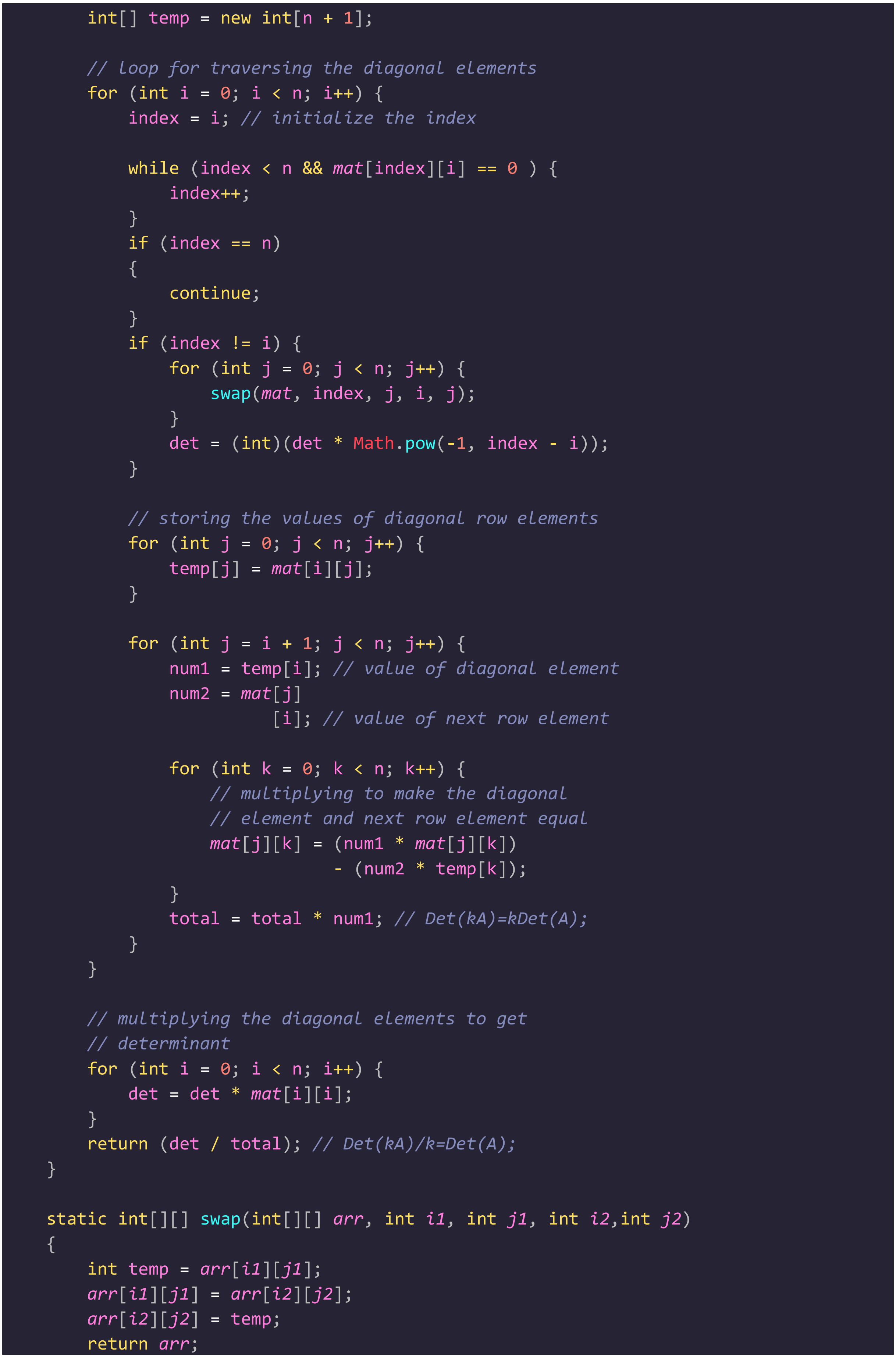
```
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 6
Enter a number for scaler stuff: 5
5 10 -5
15 0 25
10 5 20
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 7
Enter a number for scaler stuff: 5
6 7 4
8 5 10
7 6 9
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 8
Enter a number for scaler stuff: 5
Det is : -12
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10> java matrix_stuff
 1. Matrix Addition
- 2. Matrix Subtraction
- 3. Matrix Multiplication
- 4. Matrix Transpose
-5 Scaler Addition
-6 Scaler Multiplication
-7 Scaler Subtraction
-8 Matrix Determinant
Enter a number (1-8): 13
Enter a number for scaler stuff: 5
Byeee
PS D:\Mahindra Notes and schedule\Semester 5\OOPs\Lab\lab_works\week-10>
```

Program:

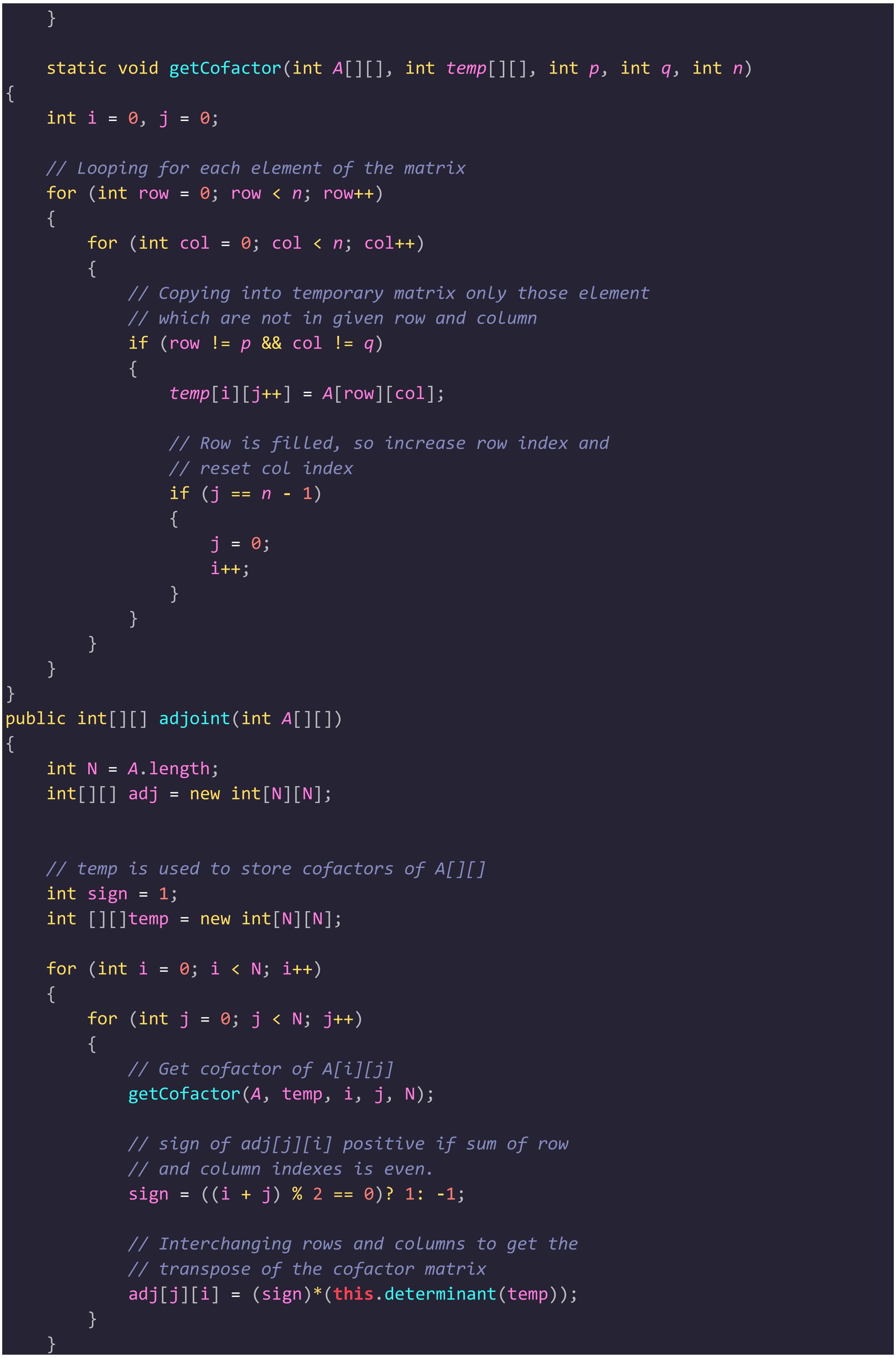
```java
import java.util.*;

class Matrix {

    public int[][] subtraction(int mat1[][], int mat2[][]) {
        int[][] answer = new int[mat1.length][mat1[0].length];
        for (int i = 0; i < mat2.length; i++) {
            for (int j = 0; j < mat2[0].length; j++) {
                answer[i][j] = mat1[i][j] - mat2[i][j];
            }
        }
        return answer;
    }

    public int[][] addition(int mat1[][], int mat2[][]) {
        int[][] answer = new int[mat1.length][mat1[0].length];
        for (int i = 0; i < mat2.length; i++) {
            for (int j = 0; j < mat2[0].length; j++) {
                answer[i][j] = mat1[i][j] + mat2[i][j];
            }
        }
        return answer;
    }

    public int[][] scalar_multiplication(int mat1[][], int a) {
        int[][] answer = new int[mat1.length][mat1[0].length];
        for (int i = 0; i < mat1.length; i++) {
            for (int j = 0; j < mat1[0].length; j++) {
                answer[i][j] = mat1[i][j] * a;
            }
        }
```



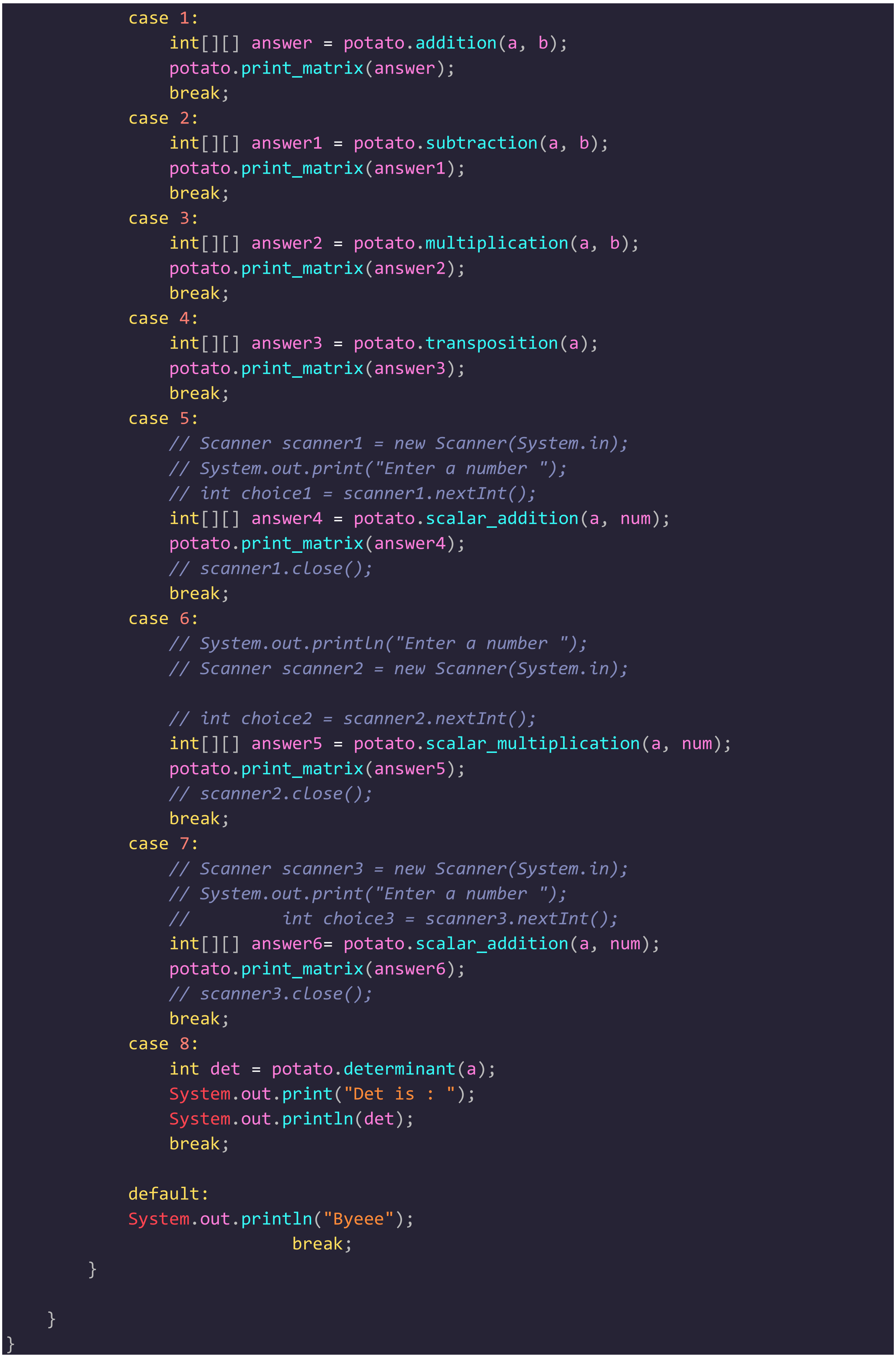
```
        return answer;
    }

    public int[][] scalar_addition(int mat1[][], int a) {
        int[][] answer = new int[mat1.length][mat1[0].length];
        for (int i = 0; i < mat1.length; i++) {
            for (int j = 0; j < mat1[0].length; j++) {
                answer[i][j] = mat1[i][j] + a;
            }
        }
        return answer;
    }

    public int[][] scalar_subtraction(int mat1[][], int a) {
        int[][] answer = new int[mat1.length][mat1[0].length];
        for (int i = 0; i < mat1.length; i++) {
            for (int j = 0; j < mat1[0].length; j++) {
                answer[i][j] = mat1[i][j] - a;
            }
        }
        return answer;
    }

    public int[][] transposition(int mat1[][]) {
        int[][] answer = new int[mat1[0].length][mat1.length];
        for (int i = 0; i < mat1.length; i++) {
            for (int j = 0; j < mat1[0].length; j++) {
                answer[j][i] = mat1[i][j];
            }
        }
        return answer;
    }

    public int[][] multiplication(int mat1[][], int mat2[][]) {
        int[][] answer = new int[mat1.length][mat2[0].length];

        for (int i = 0; i < mat1.length; i++) {
            for (int j = 0; j < mat2[0].length; j++) {
                for (int k = 0; k < mat2.length; k++) {
                    answer[i][j] += mat1[i][k] * mat2[k][j];
                }
            }
        }
        return answer;
    }


    public int determinant(int mat[][])
    {
        int n = mat.length;
        int num1, num2, det = 1, index,
                        total = 1; // Initialize result

        // temporary array for storing row
```



```
        int[] temp = new int[n + 1];

        // loop for traversing the diagonal elements
        for (int i = 0; i < n; i++) {
            index = i; // initialize the index

            while (index < n && mat[index][i] == 0 ) {
                index++;
            }
            if (index == n)
            {
                continue;
            }
            if (index != i) {
                for (int j = 0; j < n; j++) {
                    swap(mat, index, j, i, j);
                }
                det = (int)(det * Math.pow(-1, index - i));
            }

            // storing the values of diagonal row elements
            for (int j = 0; j < n; j++) {
                temp[j] = mat[i][j];
            }

            for (int j = i + 1; j < n; j++) {
                num1 = temp[i]; // value of diagonal element
                num2 = mat[j]
                          [i]; // value of next row element

                for (int k = 0; k < n; k++) {
                    // multiplying to make the diagonal
                    // element and next row element equal
                    mat[j][k] = (num1 * mat[j][k])
                                - (num2 * temp[k]);
                }
                total = total * num1; // Det(kA)=kDet(A);
            }
        }

        // multiplying the diagonal elements to get
        // determinant
        for (int i = 0; i < n; i++) {
            det = det * mat[i][i];
        }
        return (det / total); // Det(kA)/k=Det(A);
    }

    static int[][] swap(int[][] arr, int i1, int j1, int i2,int j2)
    {
        int temp = arr[i1][j1];
        arr[i1][j1] = arr[i2][j2];
        arr[i2][j2] = temp;
        return arr;
```



```
    }

    static void getCofactor(int A[][], int temp[][], int p, int q, int n)
{
    int i = 0, j = 0;

    // Looping for each element of the matrix
    for (int row = 0; row < n; row++)
    {
        for (int col = 0; col < n; col++)
        {
            // Copying into temporary matrix only those element
            // which are not in given row and column
            if (row != p && col != q)
            {
                temp[i][j++] = A[row][col];

                // Row is filled, so increase row index and
                // reset col index
                if (j == n - 1)
                {
                    j = 0;
                    i++;
                }
            }
        }
    }
}
public int[][] adjoint(int A[][])
{
    int N = A.length;
    int[][] adj = new int[N][N];


    // temp is used to store cofactors of A[][]
    int sign = 1;
    int [][]temp = new int[N][N];

    for (int i = 0; i < N; i++)
    {
        for (int j = 0; j < N; j++)
        {
            // Get cofactor of A[i][j]
            getCofactor(A, temp, i, j, N);

            // sign of adj[j][i] positive if sum of row
            // and column indexes is even.
            sign = ((i + j) % 2 == 0)? 1: -1;

            // Interchanging rows and columns to get the
            // transpose of the cofactor matrix
            adj[j][i] = (sign)*(this.determinant(temp));
        }
    }
    return adj;
}
public float[][] inverse(int A[][])
{
    // Find determinant of A[][]
    int det = this.determinant(A);
    int N = A.length;
    float[][] inverse = new float[N][N];
    if (det == 0)
    {
        System.out.print("Singular matrix, can't find its inverse");
    }

    // Find adjoint
    int [][]adj = this.adjoint(A);

    for (int i = 0; i < N; i++)
        for (int j = 0; j < N; j++)
            inverse[i][j] = adj[i][j]/(float)det;

    return inverse;
}

    public void print_matrix(int[][] answer) {
        for (int i = 0; i < answer.length; i++) {
            for (int j = 0; j < answer[0].length; j++) {
                System.out.print(answer[i][j] + " ");
            }
            System.out.println("");

        }
    }

}

public class matrix_stuff {
    public static void main(String[] args) {
        Matrix potato = new Matrix();
        int[][] a = { { 1,2, -1 },
        { 3, 0, 5 },
        { 2, 1, 4 }};
        int[][] b= { { 1, 1, 1 }, { 1, 1, 1 }, { 1, 1, 1 }};

        Scanner scanner = new Scanner(System.in);

        System.out.println(" 1. Matrix Addition\n- 2. Matrix Subtraction\n- 3. Matrix Multiplication\n- 4. Matrix Transpose\n-5 Scaler Addition\n-6 Scaler Multiplication\n-7 Scaler Subtraction\n-8 Matrix Determinant");
        System.out.print("Enter a number (1-8): ");
        int choice = scanner.nextInt();
        System.out.print("Enter a number for scaler stuff: ");
        int num = scanner.nextInt();
        scanner.close();
        switch (choice) {
```



```java
            case 1:
                int[][] answer = potato.addition(a, b);
                potato.print_matrix(answer);
                break;
            case 2:
                int[][] answer1 = potato.subtraction(a, b);
                potato.print_matrix(answer1);
                break;
            case 3:
                int[][] answer2 = potato.multiplication(a, b);
                potato.print_matrix(answer2);
                break;
            case 4:
                int[][] answer3 = potato.transposition(a);
                potato.print_matrix(answer3);
                break;
            case 5:
                // Scanner scanner1 = new Scanner(System.in);
                // System.out.print("Enter a number ");
                // int choice1 = scanner1.nextInt();
                int[][] answer4 = potato.scalar_addition(a, num);
                potato.print_matrix(answer4);
                // scanner1.close();
                break;
            case 6:
                // System.out.println("Enter a number ");
                // Scanner scanner2 = new Scanner(System.in);

                // int choice2 = scanner2.nextInt();
                int[][] answer5 = potato.scalar_multiplication(a, num);
                potato.print_matrix(answer5);
                // scanner2.close();
                break;
            case 7:
                // Scanner scanner3 = new Scanner(System.in);
                // System.out.print("Enter a number ");
                //         int choice3 = scanner3.nextInt();
                int[][] answer6= potato.scalar_addition(a, num);
                potato.print_matrix(answer6);
                // scanner3.close();
                break;
            case 8:
                int det = potato.determinant(a);
                System.out.print("Det is : ");
                System.out.println(det);
                break;

            default:
            System.out.println("Byeee");
                            break;
        }

    }
}
```