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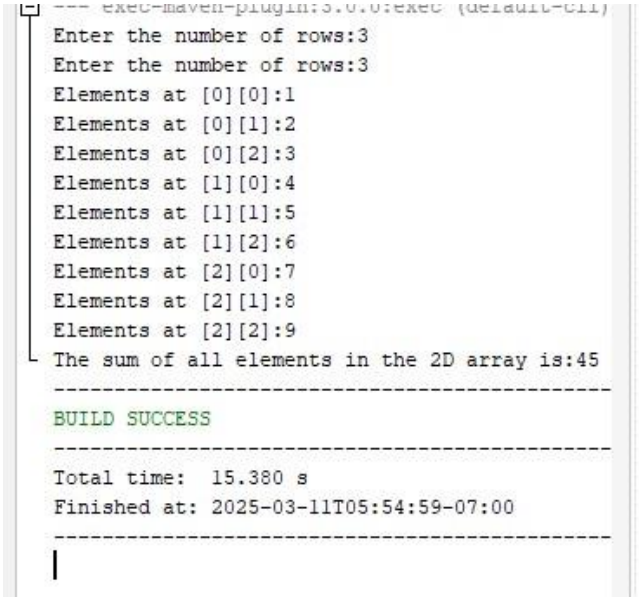
Problem-1: Write a Java program to print all elements of a given 2D array.

```java
package com.mycompany.arrayyy;

import java.util.Scanner;

public class print_array {

    public static void main(String[] args) {
        Scanner input = new Scanner( source: System.in);

        System.out.print( s: "Enter the number of rows: ");
        int row = input.nextInt();
        System.out.print( s: "Enter the number of columns: ");
        int col = input.nextInt();

        int[][] a = new int[row][col];

        for (int i = 0; i < row; i++) {
            for (int j = 0; j < col; j++) {
                System.out.print("Element at [" + i + "][" + j + "]: ");
                a[i][j] = input.nextInt();
            }
        }
        System.out.println( x: "\nThe 2D array is:");
        for (int i = 0; i < row; i++) {
            for (int j = 0; j < col; j++) {
                System.out.print(a[i][j] + " ");
            }
            System.out.println();
        }
    }

}
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli)
Enter the number of rows: 3
Enter the number of columns: 3
Element at [0][0]: 1
Element at [0][1]: 2
Element at [0][2]: 3
Element at [1][0]: 4
Element at [1][1]: 5
Element at [1][2]: 6
Element at [2][0]: 7
Element at [2][1]: 8
Element at [2][2]: 9

The 2D array is:
1 2 3
4 5 6
7 8 9
------------------------------------------------
BUILD SUCCESS
------------------------------------------------
Total time:  15.940 s
Finished at: 2025-03-11T05:53:42-07:00
------------------------------------------------
```

Problem-2: Write a Java program to calculate the sum of all elements in a 2D array.

```java
package com.mycompany.arrayyy;
import java.util.Scanner;

public class thesumof_array {
    public static void main(String[] args){

        Scanner input = new Scanner( source:System.in);

        System.out.print( s:"Enter the number of rows:");
        int row= input.nextInt();
        System.out.print( s:"Enter the number of rows:");
        int col= input.nextInt();

        int[][] array = new int[row][col];

        for(int i=0; i<row; i++){
            for(int j=0; j<col; j++){
                System.out.print("Elements at ["+ i +"]["+ j +"]:");
                array[i][j] = input.nextInt();
            }
        }
        int sum=0;
           for(int i=0; i<row; i++){
            for(int j=0; j<col; j++){
                sum = sum + array[i][j];
            }
        }

     System.out.print("The sum of all elements in the 2D array is:"+sum);

    }
}
```



Problem-3: Write a Java program to find the largest and smallest elements in a 2D array.

Source History

```
6   public static void main(String[] args){
7       Scanner input = new Scanner( source: System.in);
8
9       System.out.print( s: "Enter the number of rows: ");
10      int row = input.nextInt();
11      System.out.print( s: "Enter the number of cols: ");
12      int col = input.nextInt();
13
14      int[][] a= new int[row][col];
15      for(int i=0; i<row; i++){
16          for(int j=0; j<col; j++){
17              System.out.print("Elements at ["+i+"] ["+j+"]: ");
18              a[i][j] = input.nextInt();
19          }
20      }
21
22      int largest = a[0][0];
23      int smallest = a[0][0];
24
25      for(int i=0; i<row; i++){
26          for(int j=0; j<col; j++){
27              if(largest<a[i][j]){
28                  largest = a[i][j];
29              }
30                if(smallest>a[i][j]){
31                  smallest = a[i][j];
32              }
33          }
34      }
35      System.out.print("The largest num= " +largest);
36      System.out.print("\n The smallest num= " +smallest);
37  }
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli)
Enter the number of rows: 2
Enter the number of cols: 2
Elements at [0] [0]: 1
Elements at [0] [1]: 2
Elements at [1] [0]: 3
Elements at [1] [1]: 4
The largest num= 4
 The smallest num= 1
------------------------------------------------
BUILD SUCCESS
------------------------------------------------
Total time:  10.251 s
```

Problem-4: Write a Java program to find the sum of each row and each column in a 2D array.

```java
public class thesumofeach_rowandcol {
    public static void main(String[] args){
        Scanner input = new Scanner( source: System.in);

        System.out.print( s: "Enter the num of rows: ");
        int rows = input.nextInt();
         System.out.print( s: "Enter the num of rows: ");
        int cols = input.nextInt();

         int[][] array = new int[rows][cols];

         for(int i=0; i<rows; i++){
             for(int j=0; j<cols; j++){
                 System.out.print("Elements at ["+ i +"]["+ j +"]:");
                 array[i][j] = input.nextInt();
             }
              System.out.println();
         }
         System.out.println( x: "Array :");
           for(int i=0; i<rows; i++){
             for(int j=0; j<cols; j++){
                System.out.print(" " +array[i][j]);
             }
             System.out.println();
         }
         // Calculate and print sum of each row
         System.out.println( x: "\n Sum of each row:");
         for (int i = 0; i < rows; i++) {
             int rowSum = 0;
             for (int j = 0; j < cols; j++) {
                 rowSum += array[i][j];
             }
             System.out.println("Row " + (i + 1) + ": " + rowSum);
         }

         // Calculate and print sum of each column
         System.out.println( x: "\nSum of each column:");
         for (int j = 0; j < cols; j++) {
             int colSum = 0;
             for (int i = 0; i < rows; i++) {
                 colSum += array[i][j];
             }
             System.out.println("Column " + (j + 1) + ": " + colSum);
         }
    }
}
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli)
Enter the num of rows: 2
Enter the num of rows: 2
Elements at [0][0]:1
Elements at [0][1]:3

Elements at [1][0]:5
Elements at [1][1]:6

Array :
 1 3
 5 6

 Sum of each row:
Row 1: 4
Row 2: 11

Sum of each column:
Column 1: 6
Column 2: 9
------------------------------------------------
BUILD SUCCESS
```

Problem-5: Write a Java program to add two matrices and store the result in another 2D array.

```
10          System.out.print( s: "Enter the number of rows:");
11          int rows = input.nextInt();
12          System.out.print( s: "Enter the number of cols:");
13          int cols = input.nextInt();
14
15          int[][] matrix1 = new int[rows][cols];
16          int[][] matrix2 = new int[rows][cols];
17          int[][] sum_matrix = new int[rows][cols];
18
19          System.out.println( x: "Matrix 1 =");
20          for(int i=0; i<rows; i++){
21              for(int j=0; j<cols; j++){
22                  System.out.print("Elements at matrix1 ["+ i +"]["+ j +"]: ");
23                  matrix1[i][j] = input.nextInt();
24              }
25              System.out.println();
26          }
27          System.out.println( x: "Matrix 2 =");
28            for(int i=0; i<rows; i++){
29              for(int j=0; j<cols; j++){
30                  System.out.print("Elements at matrix2  ["+ i +"]["+ j +"]: ");
31                  matrix2[i][j] = input.nextInt();
32              }
33              System.out.println();
34          }
```

```
35
36              for(int i=0; i<rows; i++){
37              for(int j=0; j<cols; j++){
38                  sum_matrix[i][j] = matrix1[i][j] + matrix2[i][j];
39              }
40              System.out.println();
41          }
42              System.out.println( x: "The sum of two matrix: ");
43               for(int i=0; i<rows; i++){
44              for(int j=0; j<cols; j++){
45                 System.out.print(sum_matrix[i][j] +" ");
46              }
47              System.out.println();
48          }
49      }
50  }
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli)
Enter the number of rows:2
Enter the number of cols:2
Matrix 1 =
Elements at matrix1 [0][0]: 1
Elements at matrix1 [0][1]: 2

Elements at matrix1 [1][0]: 3
Elements at matrix1 [1][1]: 4

Matrix 2 =
Elements at matrix2  [0][0]: 5
Elements at matrix2  [0][1]: 6

Elements at matrix2  [1][0]: 7
Elements at matrix2  [1][1]: 8



The sum of two matrix:
6 8
10 12
------------------------------------------------
BUILD SUCCESS
------------------------------------------------
```

Problem-6: Write a Java program to multiply two matrices and store the result in another 2D array.

```
        System.out.print("Enter the number of rows for first matrix:");
        int rows1 = input.nextInt();
        System.out.print("Enter the number of cols for first natrix(rows of second matrix):");
        int cols1 = input.nextInt();
        System.out.print("Enter the number of cols for second matrix:");
        int cols2 = input.nextInt();

         int[][] matrix1 = new int[rows1][cols1];
         int[][] matrix2 = new int[cols1][cols2];
         int[][] multiply_matrix = new int[rows1][cols2];

        System.out.print("Enter first matrix:");
        for(int i=0; i<rows1; i++){
            for(int j=0; j<cols1; j++){
                matrix1[i][j] = input.nextInt();
            }
            System.out.println();
        }
        System.out.print("Enter second matrix:");
         for(int i=0; i<cols1; i++){
            for(int j=0; j<cols2; j++){
                matrix2[i][j] = input.nextInt();
            }
        }
          for(int i=0; i<rows1; i++){
            for(int j=0; j<cols2; j++){
                for(int k=0;k<cols1; k++){
                multiply_matrix[i][j] = multiply_matrix[i][j] + matrix1[i][k] * matrix2[k][j];
                }
                }
            }
          }
           System.out.print("Multiply of the two matrix: ");
            for(int i=0; i<rows1; i++){
             for(int j=0; j<cols2; j++){
                System.out.println(multiply_matrix[i][j] +" ");
             }
             System.out.println();
          }
        }
    }
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli) @ arrayyy ·
Enter the number of rows for first matrix:2
Enter the number of cols for first natrix(rows of second :
Enter the number of cols for second matrix:2
Elements at matrix1 [0][0]: 1
Elements at matrix1 [0][1]: 2
Elements at matrix1 [1][0]: 3
Elements at matrix1 [1][1]: 4
Elements at matrix2 [0][0]: 5
Elements at matrix2 [0][1]: 6
Elements at matrix2 [1][0]: 7
Elements at matrix2 [1][1]: 8
Multiply of the two matrix:
19 22
43 50
------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------
Total time:  19.834 s
```

Problem-7: Write a Java program to check if a matrix is symmetric (i.e., matrix is equal to its transpose).

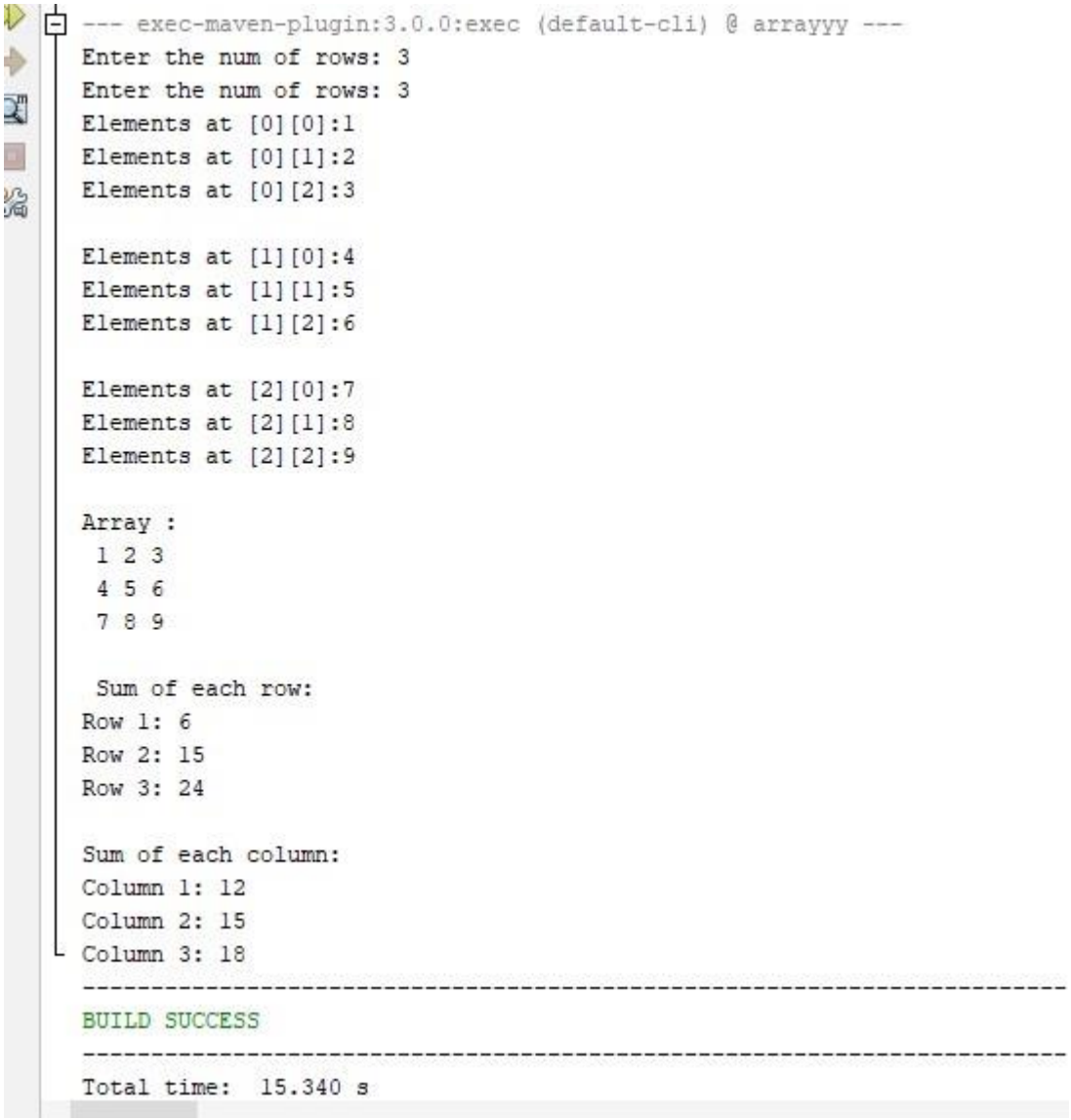
```
8           System.out.print( s: "Enter the number of rows: ");
9           int row = input.nextInt();
10          System.out.print( s: "Enter the number of cols: ");
11          int col = input.nextInt();
12
13          if (row != col) {
14              System.out.println( x: "Matrix is not symmetric (not a square matrix).");
15              return;
16          }
17          int[][] matrix = new int[row][col];
18          for (int i = 0; i < row; i++) {
19              for (int j = 0; j < col; j++) {
20                  System.out.print("Element at [" + i + "][" + j + "]: ");
21                  matrix[i][j] = input.nextInt();
22              }
23          }
24          boolean isSymmetric = true;
25          for (int i = 0; i < row; i++) {
26              for (int j = 0; j < col; j++) {
27                  if (matrix[i][j] != matrix[j][i]) {
28                      isSymmetric = false;
29                      break;
```

```
30                  }
31              }
32              if (!isSymmetric) {
33                  break;
34              }
35          }
36          if (isSymmetric) {
37              System.out.println( x: "The matrix is symmetric.");
38          } else {
39              System.out.println( x: "The matrix is not symmetric.");
40          }
41      }
42  }
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli) @ arrayyy ---
Enter the number of rows: 3
Enter the number of cols: 3
Element at [0][0]: 1
Element at [0][1]: 2
Element at [0][2]: 3
Element at [1][0]: 2
Element at [1][1]: 4
Element at [1][2]: 5
Element at [2][0]: 3
Element at [2][1]: 5
Element at [2][2]: 6
The matrix is symmetric.
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
```

Problem-8: Write a Java program to search for a given number in a 2D array and print its position.

```
        System.out.print( s: "Enter the num of rows: ");
        int rows = input.nextInt();
         System.out.print( s: "Enter the num of rows: ");
        int cols = input.nextInt();

         int[][] array = new int[rows][cols];

         for(int i=0; i<rows; i++){
             for(int j=0; j<cols; j++){
                 System.out.print("Elements at ["+ i +"]["+ j +"]:");
                 array[i][j] = input.nextInt();
             }
              System.out.println();
         }
         System.out.println( x: "Array :");
           for(int i=0; i<rows; i++){
             for(int j=0; j<cols; j++){
                System.out.print(" " +array[i][j]);
             }
             System.out.println();
         }
         // Calculate and print sum of each row
         System.out.println( x: "\n Sum of each row:");
         for (int i = 0; i < rows; i++) {
             int rowSum = 0;
             for (int j = 0; j < cols; j++) {
                 rowSum += array[i][j];
             }
             System.out.println("Row " + (i + 1) + ": " + rowSum);
         }

         System.out.println( x: "\nSum of each column:");
         for (int j = 0; j < cols; j++) {
             int colSum = 0;
             for (int i = 0; i < rows; i++) {
                 colSum += array[i][j];
             }
             System.out.println("Column " + (j + 1) + ": " + colSum);
         }
    }
}

```



Problem-9: Write a Java program to check if a matrix is an identity matrix (diagonal elements are 1, and all others are 0)

```java
    public static boolean isIdentityMatrix(int[][] matrix) {
        int rows = matrix.length;
        int cols = matrix[0].length;

        if (rows != cols) {
            return false;
        }
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                if (i == j && matrix[i][j] != 1) {
                    return false;
                } else if (i != j && matrix[i][j] != 0) {
                    return false;
                }
            }
        }
        return true;
    }
    public static void main(String[] args) {
        Scanner scanner = new Scanner( source: System.in);
        System.out.print( s: "Enter the size of the square matrix (n): ");
        int n = scanner.nextInt();
        int[][] matrix = new int[n][n];

        System.out.println( x: "Enter the matrix elements:");
        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n; j++) {
                matrix[i][j] = scanner.nextInt();
            }
        }
        if (isIdentityMatrix(matrix)) {
            System.out.println( x: "The matrix is an identity matrix.");
        } else {
            System.out.println( x: "The matrix is NOT an identity matrix.");
        }
    }
}
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli) @ arrayyy ---
Enter the size of the square matrix (n): 3
Enter the matrix elements:
1 0 0 0 1 0 0 0 1
The matrix is an identity matrix.
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
Total time:  01:04 min
```

Problem-10: Write a Java program to print only the boundary elements of a 2D array.

```java
    public static void printBoundaryElements(int[][] matrix) {
        int rows = matrix.length;
        int cols = matrix[0].length;

        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                if (i == 0 || i == rows - 1 || j == 0 || j == cols - 1) {
                    System.out.print(matrix[i][j] + " ");
                } else {
                    System.out.print( s: "  ");
                }
            }
            System.out.println();
        }
    }
    public static void main(String[] args) {
        Scanner scanner = new Scanner( source: System.in);
        System.out.print( s: "Enter the number of rows: ");
        int rows = scanner.nextInt();
        System.out.print( s: "Enter the number of columns: ");
        int cols = scanner.nextInt();

        int[][] matrix = new int[rows][cols];

        System.out.println( x: "Enter the matrix elements:");
        for (int i = 0; i < rows; i++) {
            for (int j = 0; j < cols; j++) {
                matrix[i][j] = scanner.nextInt();
            }
        }

        System.out.println( x: "Boundary elements of the matrix:");
        printBoundaryElements(matrix);
    }
}
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli) @ arrayyy ---
Enter the number of rows: 3
Enter the number of columns: 3
Enter the matrix elements:
1 2 3 4 5 6 7 8 9
Boundary elements of the matrix:
1 2 3
4   6
7 8 9
------------------------------------------------------------------------
BUILD SUCCESS
------------------------------------------------------------------------
```