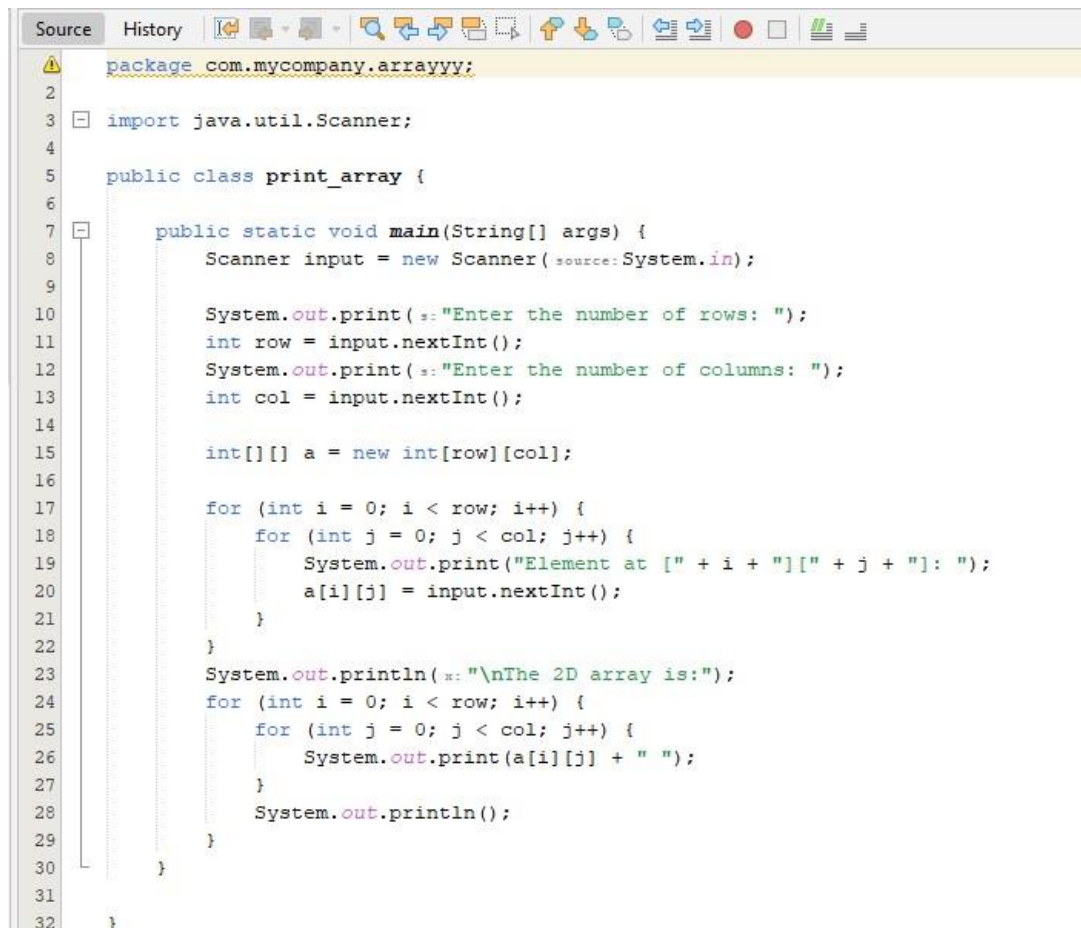


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Problem-1: Write a Java program to print all elements of a given 2D array.

A screenshot of a Java IDE window. The window has a title bar with 'Source' and 'History' tabs. Below the tabs is a toolbar with various icons for file operations, editing, and running. The main editor area shows a Java program. The code starts with a package declaration 'package com.mycompany.arrayyy;', followed by an import statement 'import java.util.Scanner;'. A class 'print_array' is defined with a 'main' method. Inside the 'main' method, a 'Scanner' object is created from 'System.in'. The program prompts the user to enter the number of rows and columns, reads these values, and creates a 2D integer array 'a'. It then uses nested loops to read elements from the array and prints them. Finally, it prints the entire 2D array using another set of nested loops.

```
1 package com.mycompany.arrayyy;
2
3 import java.util.Scanner;
4
5 public class print_array {
6
7     public static void main(String[] args) {
8         Scanner input = new Scanner(System.in);
9
10        System.out.print("Enter the number of rows: ");
11        int row = input.nextInt();
12        System.out.print("Enter the number of columns: ");
13        int col = input.nextInt();
14
15        int[][] a = new int[row][col];
16
17        for (int i = 0; i < row; i++) {
18            for (int j = 0; j < col; j++) {
19                System.out.print("Element at [" + i + "][" + j + "]: ");
20                a[i][j] = input.nextInt();
21            }
22        }
23        System.out.println("\nThe 2D array is:");
24        for (int i = 0; i < row; i++) {
25            for (int j = 0; j < col; j++) {
26                System.out.print(a[i][j] + " ");
27            }
28            System.out.println();
29        }
30    }
31 }
32 }
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli) P
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.

```
2 package com.mycompany.arrayyy;
3 import java.util.Scanner;
4
5 public class thesumof_array {
6     public static void main(String[] args){
7
8         Scanner input = new Scanner(System.in);
9
10        System.out.print("Enter the number of rows:");
11        int row= input.nextInt();
12        System.out.print("Enter the number of rows:");
13        int col= input.nextInt();
14
15        int[][] array = new int[row][col];
16
17        for(int i=0; i<row; i++){
18            for(int j=0; j<col; j++){
19                System.out.print("Elements at ["+ i +"]["+ j +"]:" );
20                array[i][j] = input.nextInt();
21            }
22        }
23        int sum=0;
24        for(int i=0; i<row; i++){
25            for(int j=0; j<col; j++){
26                sum = sum + array[i][j];
27            }
28        }
29
30        System.out.print("The sum of all elements in the 2D array is:"+sum);
31
32    }
33 }
```

```
--- exec-maven-plugin:3.0.0:exec (default-cli)
Enter the number of rows:3
Enter the number of rows:3
Elements at [0][0]:1
Elements at [0][1]:2
Elements at [0][2]:3
Elements at [1][0]:4
Elements at [1][1]:5
Elements at [1][2]:6
Elements at [2][0]:7
Elements at [2][1]:8
Elements at [2][2]:9
The sum of all elements in the 2D array is:45
-----
BUILD SUCCESS
-----
Total time: 15.380 s
Finished at: 2025-03-11T05:54:59-07:00
-----
|
```

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(System.in);
8
9     System.out.print("Enter the number of rows: ");
10    int row = input.nextInt();
11    System.out.print("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.

```
4 public class thesumofeach_rowandcol {
5     public static void main(String[] args){
6         Scanner input = new Scanner(System.in);
7
8         System.out.print(": Enter the num of rows: ");
9         int rows = input.nextInt();
10        System.out.print(": Enter the num of rows: ");
11        int cols = input.nextInt();
12
13        int[][] array = new int[rows][cols];
14
15        for(int i=0; i<rows; i++){
16            for(int j=0; j<cols; j++){
17                System.out.print("Elements at [" + i + "][" + j + "]:");
18                array[i][j] = input.nextInt();
19            }
20            System.out.println();
21        }
22        System.out.println("Array :");
23        for(int i=0; i<rows; i++){
24            for(int j=0; j<cols; j++){
25                System.out.print(" " + array[i][j]);
26            }
27            System.out.println();
28        }
29        // Calculate and print sum of each row
30        System.out.println("Sum of each row:");
31        for (int i = 0; i < rows; i++) {
32            int rowSum = 0;
33            for (int j = 0; j < cols; j++) {
34                rowSum += array[i][j];
35            }
36            System.out.println("Row " + (i + 1) + ": " + rowSum);
37        }
38
39        // Calculate and print sum of each column
40        System.out.println("Sum of each column:");
41        for (int j = 0; j < cols; j++) {
42            int colSum = 0;
43            for (int i = 0; i < rows; i++) {
44                colSum += array[i][j];
45            }
46            System.out.println("Column " + (j + 1) + ": " + colSum);
47        }
48    }
49 }
```

```

--- exec-maven-plugins:0.0.0: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( ": Enter the number of rows:");
11      int rows = input.nextInt();
12      System.out.print( ": 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( ": 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( ": 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("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.

```

9      System.out.print( ":"Enter the number of rows for first matrix:");
10     int rows1 = input.nextInt();
11     System.out.print( ":"Enter the number of cols for first matrix(rows of second matrix):");
12     int cols1 = input.nextInt();
13     System.out.print( ":"Enter the number of cols for second matrix:");
14     int cols2 = input.nextInt();
15
16     int[][] matrix1 = new int[rows1][cols1];
17     int[][] matrix2 = new int[cols1][cols2];
18     int[][] multiply_matrix = new int[rows1][cols2];
19
20     System.out.print( ":"Enter first matrix:");
21     for(int i=0; i<rows1; i++){
22         for(int j=0; j<cols1; j++){
23             matrix1[i][j] = input.nextInt();
24         }
25         System.out.println();
26     }
27     System.out.print( ":"Enter second matrix:");
28     for(int i=0; i<cols1; i++){
29         for(int j=0; j<cols2; j++){
30             matrix2[i][j] = input.nextInt();
31         }
32     }
33     for(int i=0; i<rows1; i++){
34         for(int j=0; j<cols2; j++){
35             for(int k=0; k<cols1; k++){
36                 multiply_matrix[i][j] = multiply_matrix[i][j] + matrix1[i][k] * matrix2[k][j];
37             }
38         }
39     }
40     System.out.print( ":"Multiply of the two matrix: ");
41     for(int i=0; i<rows1; i++){
42         for(int j=0; j<cols2; j++){
43             System.out.println(multiply_matrix[i][j] + " ");
44         }
45         System.out.println();
46     }
47 }
48 }
49

```



```

--- 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 matrix(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( ": "Enter the number of rows: ");
9      int row = input.nextInt();
10     System.out.print( ": "Enter the number of cols: ");
11     int col = input.nextInt();
12
13     if (row != col) {
14         System.out.println( ": "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("The matrix is symmetric.");
38 } else {
39     System.out.println("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.

```

8      System.out.print( ":Enter the num of rows: ");
9      int rows = input.nextInt();
10     System.out.print( ":Enter the num of rows: ");
11     int cols = input.nextInt();
12
13     int[][] array = new int[rows][cols];
14
15     for(int i=0; i<rows; i++){
16         for(int j=0; j<cols; j++){
17             System.out.print("Elements at ["+ i +"]["+ j +"]:");
18             array[i][j] = input.nextInt();
19         }
20         System.out.println();
21     }
22     System.out.println( ":Array :");
23     for(int i=0; i<rows; i++){
24         for(int j=0; j<cols; j++){
25             System.out.print(" " +array[i][j]);
26         }
27         System.out.println();
28     }
29     // Calculate and print sum of each row
30     System.out.println( ": \n Sum of each row:");
31     for (int i = 0; i < rows; i++) {
32         int rowSum = 0;
33         for (int j = 0; j < cols; j++) {
34             rowSum += array[i][j];
35         }
36         System.out.println("Row " + (i + 1) + ": " + rowSum);
37     }

```

```

40     System.out.println( ": \n Sum of each column:");
41     for (int j = 0; j < cols; j++) {
42         int colSum = 0;
43         for (int i = 0; i < rows; i++) {
44             colSum += array[i][j];
45         }
46         System.out.println("Column " + (j + 1) + ": " + colSum);
47     }

```

```

48 }
49 }
50

```

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

Elements at [1][0]:4
Elements at [1][1]:5
Elements at [1][2]:6

Elements at [2][0]:7
Elements at [2][1]:8
Elements at [2][2]:9

Array :
 1 2 3
 4 5 6
 7 8 9

Sum of each row:
Row 1: 6
Row 2: 15
Row 3: 24

Sum of each column:
Column 1: 12
Column 2: 15
Column 3: 18

-----
BUILD SUCCESS
-----

Total time: 15.340 s
```

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

```

5 public static boolean isIdentityMatrix(int[][] matrix) {
6     int rows = matrix.length;
7     int cols = matrix[0].length;
8
9     if (rows != cols) {
10         return false;
11     }
12     for (int i = 0; i < rows; i++) {
13         for (int j = 0; j < cols; j++) {
14             if (i == j && matrix[i][j] != 1) {
15                 return false;
16             } else if (i != j && matrix[i][j] != 0) {
17                 return false;
18             }
19         }
20     }
21     return true;
22 }
23
24 public static void main(String[] args) {
25     Scanner scanner = new Scanner(System.in);
26     System.out.print("Enter the size of the square matrix (n): ");
27     int n = scanner.nextInt();
28     int[][] matrix = new int[n][n];
29
30     System.out.println("Enter the matrix elements:");
31     for (int i = 0; i < n; i++) {
32         for (int j = 0; j < n; j++) {
33             matrix[i][j] = scanner.nextInt();
34         }
35     }
36     if (isIdentityMatrix(matrix)) {
37         System.out.println("The matrix is an identity matrix.");
38     } else {
39         System.out.println("The matrix is NOT an identity matrix.");
40     }
41 }

```

```

--- 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.

```
5 public static void printBoundaryElements(int[][] matrix) {
6     int rows = matrix.length;
7     int cols = matrix[0].length;
8
9     for (int i = 0; i < rows; i++) {
10         for (int j = 0; j < cols; j++) {
11             if (i == 0 || i == rows - 1 || j == 0 || j == cols - 1) {
12                 System.out.print(matrix[i][j] + " ");
13             } else {
14                 System.out.print(" ");
15             }
16         }
17         System.out.println();
18     }
19 }
20 public static void main(String[] args) {
21     Scanner scanner = new Scanner(System.in);
22     System.out.print("Enter the number of rows: ");
23     int rows = scanner.nextInt();
24     System.out.print("Enter the number of columns: ");
25     int cols = scanner.nextInt();
26
27     int[][] matrix = new int[rows][cols];
28
29     System.out.println("Enter the matrix elements:");
30     for (int i = 0; i < rows; i++) {
31         for (int j = 0; j < cols; j++) {
32             matrix[i][j] = scanner.nextInt();
33         }
34     }
35
36     System.out.println("Boundary elements of the matrix:");
37     printBoundaryElements(matrix);
38 }
39 }
```

```
--- 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
-----
```