Rajalakshmi Engineering College

Name: Priyan S
Email: 240701402@rajalakshmi.edu.in
Roll no: 240701402
Phone: 9150170939
Branch: REC
Department: CSE - Section 6
Batch: 2028
Degree: B.E - CSE

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2024_28_III_OOPS Using Java Lab

REC_2028_OOPS using Java_Week 3_CY

Attempt : 1
Total Mark : 40
Marks Obtained : 40

Section 1 : Coding

1. Problem Statement:

Emma, a budding computer vision enthusiast, is working on a challenging image processing project. She has a square image represented as a 2D matrix of integers. As part of a special filter operation, she needs to rotate the image by 90 degrees clockwise, but there's a twist — she must perform the rotation in-place, using no extra space.

This means Emma has to rotate the matrix without creating a new one. Your task is to help her implement a Java program that takes this square matrix as input and rotates it within the same structure.

Can you help Emma efficiently rotate the image so that her project can move to the next stage?

Input Format

The first line of input contains a single integer n, representing the number of rows and columns of the square matrix (i.e., the matrix is of size n x n).

The next n lines each contain n space-separated integers, representing the elements of each row of the 2D array.

Output Format

The first line of output prints "Rotated 2D Array:"

The next n lines of output print the rotated matrix.

Each line contains n space-separated integers representing a row of the rotated matrix.

Refer to the sample output for format specification.

Sample Test Case

Input: 3
1 2 3
4 5 6
7 8 9
Output: Rotated 2D Array:
7 4 1
8 5 2
9 6 3

Answer

```
import java.util.Scanner;

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

        int n = sc.nextInt();
        int[][] mat = new int[n][n];

        // Input matrix
        for (int i = 0; i < n; i++)
            for (int j = 0; j < n; j++)
```

```
            mat[i][j] = sc.nextInt();

        for (int i = 0; i < n; i++) {
            for (int j = i + 1; j < n; j++) {
                int temp = mat[i][j];
                mat[i][j] = mat[j][i];
                mat[j][i] = temp;
            }
        }
        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n / 2; j++) {
                int temp = mat[i][j];
                mat[i][j] = mat[i][n - 1 - j];
                mat[i][n - 1 - j] = temp;
            }
        }

        System.out.println("Rotated 2D Array:");
        for (int i = 0; i < n; i++) {
            for (int j = 0; j < n; j++)
                System.out.print(mat[i][j] + " ");
            System.out.println();
        }

        sc.close();
    }
}
```

Status : Correct **Marks : 10/10**

2. Problem Statement

Rina is managing the inventory for a library, where each row of a 2D matrix represents the number of different genres of books available on each shelf.

She wants to perform the following operations:

Transformation: Replace each element in a row with the sum of all elements in that row.Merging: After transformation, Rina will provide one additional matrix, and specify whether to merge the transformed matrix

with this new matrix row-wise or column-wise.

Input Format

The first line contains two integers R and C, representing the number of rows and columns of the initial matrix.

The next R lines contain C space-separated integers, representing the book counts in the library.

The next line contains two integers MR and MC, representing the dimensions of the second matrix (to be merged).

The next MR lines contain MC space-separated integers, representing the second matrix.

The last line contains an integer mergeType:

- 0 Row-wise merging (append the second matrix below the transformed matrix).
- 1 Column-wise merging (append the second matrix to the right of the transformed matrix).

Output Format

The output prints "Transformed matrix: "followed by the transformed 2D matrix where each element in a row is replaced with the sum of the elements in that row.

The output prints "Final merged matrix: ", followed by the merging based on mergeType.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 3 4
8 2 4 9
4 5 6 1
7 8 9 3
2 4

3 5 7 2
6 1 4 9
0
Output: Transformed matrix:
23 23 23 23
16 16 16 16
27 27 27 27
Final merged matrix:
23 23 23 23
16 16 16 16
27 27 27 27
3 5 7 2
6 1 4 9

Answer

```
// You are using Java
import java.util.*;

class LibraryInventory {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int R=sc.nextInt();
        int C = sc.nextInt();
        int[][] matrix = new int[R][C];

        for (int i = 0; i < R; i++)
            for (int j = 0; j < C; j++)
                matrix[i][j] = sc.nextInt();

        for (int i = 0; i < R; i++) {
            int rowSum = 0;
            for (int j = 0; j < C; j++)
                rowSum += matrix[i][j];
            Arrays.fill(matrix[i], rowSum);
        }

        int MR = sc.nextInt();
        int MC = sc.nextInt();
        int[][] secondMatrix = new int[MR][MC];

        for (int i = 0; i < MR; i++)
            for (int j = 0; j < MC; j++)
```

```
        secondMatrix[i][j] = sc.nextInt();

    int mergeType = sc.nextInt();

    System.out.println("Transformed matrix:");
    for (int i = 0; i < R; i++) {
        for (int j = 0; j < C; j++) {
            System.out.print(matrix[i][j]);
            if (j != C - 1) System.out.print(" ");
        }
        System.out.println();
    }

    System.out.println("Final merged matrix:");
    if (mergeType == 0) {

        for (int i = 0; i < R; i++) {
            for (int j = 0; j < C; j++) {
                System.out.print(matrix[i][j]);
                if (j != C - 1) System.out.print(" ");
            }
            System.out.println();
        }
        for (int i = 0; i < MR; i++) {
            for (int j = 0; j < MC; j++) {
                System.out.print(secondMatrix[i][j]);
                if (j != MC - 1) System.out.print(" ");
            }
            System.out.println();
        }
    } else {

        for (int i = 0; i < R; i++) {
            for (int j = 0; j < C; j++) {
                System.out.print(matrix[i][j]);
                System.out.print(" ");
            }
            for (int j = 0; j < MC; j++) {
                System.out.print(secondMatrix[i][j]);
                if (j != MC - 1) System.out.print(" ");
            }
            System.out.println();
```

```
    }
  }
 }
}
```

Status : Correct **Marks : 10/10**

3. Problem Statement

Emma is a data analyst working with a grid-based system where each cell contains important numerical data. The grid represents spatial data, inventory records, or structured reports that require periodic updates.

Due to system updates and new requirements, Emma needs to modify the grid in the following ways:

She wants to insert either a new row or a new column at a given position.Later, she needs to delete either a row or a column from the modified matrix.

Input Format

The first line contains two integers rows and cols (the dimensions of the matrix).

The next rows lines contain cols space-separated integers representing the initial matrix.

The next line contains two integers insertType and insertIndex:

- insertType = 0 for row insertion, 1 for column insertion.
- insertIndex is the position where the new row/column should be added.

If inserting a row, the next cols integers represent the new row or If inserting a column, the next rows integers represent the new column.

The next line contains two integers deleteType and deleteIndex:

- deleteType = 0 for row deletion, 1 for column deletion.
- deleteIndex is the position to be deleted.

Output Format

The first line of output prints the string "After insertion" followed by the modified matrix with the inserted row or column.

Each row of the matrix is printed on a new line with space-separated integers.

The next line prints the string "After deletion" followed by the final matrix after the specified deletion operation.

Each row of the resulting matrix is printed on a new line with space-separated integers.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 3 3
1 2 3
4 5 6
7 8 9
0 1
10 11 12
1 2
Output: After insertion
1 2 3
10 11 12
4 5 6
7 8 9
After deletion
1 2
10 11
4 5
7 8

Answer

```
// You are using Java
import java.util.*;

class GridModifier {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
```

```
int rows = sc.nextInt();
int cols = sc.nextInt();
int[][] matrix = new int[rows][cols];

for (int i = 0; i < rows; i++)
    for (int j = 0; j < cols; j++)
        matrix[i][j] = sc.nextInt();

int insertType = sc.nextInt();
int insertIndex = sc.nextInt();

if (insertType == 0) {
    int[] newRow = new int[cols];
    for (int i = 0; i < cols; i++)
        newRow[i] = sc.nextInt();

    int[][] temp = new int[rows + 1][cols];
    for (int i = 0; i < insertIndex; i++)
        temp[i] = matrix[i];
    temp[insertIndex] = newRow;
    for (int i = insertIndex; i < rows; i++)
        temp[i + 1] = matrix[i];

    matrix = temp;
    rows++;
} else {
    int[] newCol = new int[rows];
    for (int i = 0; i < rows; i++)
        newCol[i] = sc.nextInt();

    int[][] temp = new int[rows][cols + 1];
    for (int i = 0; i < rows; i++) {
        for (int j = 0; j < insertIndex; j++)
            temp[i][j] = matrix[i][j];
        temp[i][insertIndex] = newCol[i];
        for (int j = insertIndex; j < cols; j++)
            temp[i][j + 1] = matrix[i][j];
    }

    matrix = temp;
    cols++;
```

```
}

System.out.println("After insertion");
for (int i = 0; i < rows; i++) {
    for (int j = 0; j < cols; j++) {
        System.out.print(matrix[i][j]);
        if (j != cols - 1) System.out.print(" ");
    }
    System.out.println();
}

int deleteType = sc.nextInt();
int deleteIndex = sc.nextInt();

if (deleteType == 0) {
    int[][] temp = new int[rows - 1][cols];
    for (int i = 0, k = 0; i < rows; i++) {
        if (i == deleteIndex) continue;
        temp[k++] = matrix[i];
    }
    matrix = temp;
    rows--;
} else {
    int[][] temp = new int[rows][cols - 1];
    for (int i = 0; i < rows; i++) {
        for (int j = 0, k = 0; j < cols; j++) {
            if (j == deleteIndex) continue;
            temp[i][k++] = matrix[i][j];
        }
    }
    matrix = temp;
    cols--;
}

System.out.println("After deletion");
for (int i = 0; i < rows; i++) {
    for (int j = 0; j < cols; j++) {
        System.out.print(matrix[i][j]);
        if (j != cols - 1) System.out.print(" ");
    }
    System.out.println();
}
```

```
    }
}
```

Status : Correct ***Marks : 10/10***

4. Problem Statement:

Mason is participating in a coding challenge where he must manipulate an integer array. His task is to replace every element in the array with the next greatest element to its right. The last element of the array remains unchanged, as there is no element to its right.

Your job is to help Mason write a program that performs this transformation and outputs the modified array.

Input Format

The first line of input contains an integer n representing the number of elements in the array.

The second line of input contains n space-separated integers representing the elements of the array.

Output Format

The output prints the modified array of n integers, where each element (except the last one) is replaced by the maximum element to its right, and the last element remains unchanged.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 6
12 3 91 15 12 14
Output: 91 91 15 14 14 14

Answer

```
import java.util.Scanner;
```

```
class NextGreatestElement {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        int n = sc.nextInt();
        int[] arr = new int[n];
        for (int i = 0; i < n; i++) {
            arr[i] = sc.nextInt();
        }
        int maxRight = arr[n - 1];
        for (int i = n - 2; i >= 0; i--) {
            int temp = arr[i];
            arr[i] = maxRight;
            if (temp > maxRight) {
                maxRight = temp;
            }
        }
        for (int i = 0; i < n; i++) {
            System.out.print(arr[i]);
            if (i != n - 1) System.out.print(" ");
        }
    }
}
```

Status : Correct ***Marks : 10/10***