

Problem 2371: Minimize Maximum Value in a Grid

Problem Information

Difficulty: Hard

Acceptance Rate: 70.40%

Paid Only: Yes

Tags: Array, Union Find, Graph, Topological Sort, Sorting, Matrix

Problem Description

You are given an `m x n` integer matrix `grid` containing **distinct** positive integers.

You have to replace each integer in the matrix with a positive integer satisfying the following conditions:

- * The **relative** order of every two elements that are in the same row or column should stay the **same** after the replacements.
- * The **maximum** number in the matrix after the replacements should be as **small** as possible.

The relative order stays the same if for all pairs of elements in the original matrix such that `grid[r1][c1] > grid[r2][c2]` where either `r1 == r2` or `c1 == c2`, then it must be true that `grid[r1][c1] > grid[r2][c2]` after the replacements.

For example, if `grid = [[2, 4, 5], [7, 3, 9]]` then a good replacement could be either `grid = [[1, 2, 3], [2, 1, 4]]` or `grid = [[1, 2, 3], [3, 1, 4]]` .

Return _the**resulting** matrix._ If there are multiple answers, return **any** of them.

Example 1:

Input: grid = [[3,1],[2,5]] **Output:** [[2,1],[1,2]] **Explanation:** The above diagram shows a valid replacement. The maximum number in the matrix is 2. It can be shown that no smaller value can be obtained.

****Example 2:****

****Input:**** grid = [[10]] ****Output:**** [[1]] ****Explanation:**** We replace the only number in the matrix with 1.

****Constraints:****

* `m == grid.length` * `n == grid[i].length` * `1 <= m, n <= 1000` * `1 <= m * n <= 105` * `1 <= grid[i][j] <= 109` * `grid` consists of distinct integers.

Code Snippets

C++:

```
class Solution {
public:
    vector<vector<int>> minScore(vector<vector<int>>& grid) {
        ...
    };
}
```

Java:

```
class Solution {
    public int[][] minScore(int[][] grid) {
        ...
    }
}
```

Python3:

```
class Solution:
    def minScore(self, grid: List[List[int]]) -> List[List[int]]:
```