beCP
2024
Task 1.2: Flooded city (flood)

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Time limit: 1 s Memory limit: 128 MB

You're preparing to visit an tropical city to help out with the organization of a competitive programming contest. The region and the city are known for suffering of bouts of extreme weather and in particular monsoon rains. Hence, in order to pick a location to hold the competition, you need to run a few simulations to see the amount of rain it will take for a location to get flooded.

For convenience, the city is represented as a rectangular grid, where each cell of the grid is represented by a single uniform height. You can assume the city is surrounded by infinitely high walls on all sides, so no rain that falls into the city can escape. The simulation will repeatedly take a grid coordinate, and let rain fall onto that grid cell until the water level above that cell is at least one unit above the current height (be it city or water). Of course, the falling rain will flow to the lowest point first, so all surrounding lower cells will need to flood to the same level, and their surrounding lower cells, and so on.

Input

The first line contains two integers: the dimensions of the city N and M. Next a line containing $N \cdot M$ integers h_i is given, containing the city cell heights in N rows of M columns each. Then follows a line indicating the number of steps S the simulation will take. Each of the next following S lines contain integers x_i, y_i indicating the cell receiving the rain in this step of the simulation.

Output

For each step of the simulation, output one line containing an integer: how much rain needs to fall (starting at the end of the previous step of the simulation), until the cell has been flooded for a height of at least 1, modulo $10^9 + 7$.

General limits

- $1 \leq N, M, N \cdot M \leq 100\,000$

- $0 \leq h_i \leq 100\,000\,000$.
- $S \leq 40\,000$
- $1 \leq x_i \leq N$ and $1 \leq y_i \leq M$

Additional constraints

Subtask	Points	Constraints
A	10	All h_i are the same
B	10	$S = 1$ and $N = 1$
C	15	$N = 1$
D	15	$S = 1$
E	25	$N \cdot M \leq 1000$
F	25	No additional constraint

Example 1

sample1.in

```
3 2
1 2 3 1 2 3
2
1 1
3 2
```

sample1.out

```
1
11
```

This sample corresponds to this initial city:

1	2
3	1
2	3

The first step at $(1, 1)$ will fill up only that cell to a height of 2, resulting in this state of the city, and a total rainfall of 1 unit.

2	2
3	1
2	3

The second step will fill up the entire grid to 4, with a total rainfall of 11 units.

Example 2

sample2.in

```
2 2
100 101 101 101
2
1 1
1 1
```

sample2.out

```
1
4
```

Initial state:

100	101
101	101

In the first step, we bring the first cell up to 101, along the rest of the city.

101	101
101	101

In the second step, the water should rise by another level, so the entire city floods to a height of 102.

102	102
102	102