DMOPC '22 Contest 4 P2 - Fake Painting

Time limit: 2.0s **Memory limit:** 256M

In the 20th century, Picasso used an unconventional painting technique to create his art. Initially, he started with a canvas A that can be represented by an N by M grid of integers. Let (x, y) denote the position of the cell in the x-th row from the top and y-th column from the left.

Picasso painted the canvas using a special type of brushstroke, which he used an unknown (possibly zero) number of times. Each brushstroke consisted of the following: First, he chose a nonzero integer K and a position (x, y). Then, he added K to cell (x, y), flipped the grid either horizontally or vertically, and added K to cell (x, y) again.

Specifically, a horizontal flip reverses the order of the columns, while a vertical flip reverses the order of the rows.

You want to buy one of Picasso's masterpieces, however, it could be a fake. Given the original canvas A and a potential canvas T, determine if T could have been created by Picasso.

Constraints

$1 \leq N, M \leq 1500$

$1 \leq A_{i,j} \leq 10^9$

$1 \leq T_{i,j} \leq 10^9$

Subtask 1 [30%]

$N = 2$

$M = 2$

Subtask 2 [70%]

No additional constraints.

Input Specification

The first line contains 2 space-separated integers N and M.

The next N lines contain M space-separated integers $A_{i,j}$ representing the cells of the original canvas.

The last N lines contain M space-separated integers $T_{i,j}$ representing the cells of the potential canvas.

Output Specification

Output `YES` if T could have been created by Picasso, and `NO` otherwise.

Sample Input 1

```
2 2
1 2
3 5
2 1
4 2
```

Sample Output 1

```
YES
```

Explanation for Sample 1

Picasso can perform 1 brushstroke to transform A into T: choose K as -1, add K to $A_{2,1}$, flip the grid horizontally, and add K to $A_{2,1}$ again.

Sample Input 2

```
2 2
1 2
3 5
1 2
3 6
```

Sample Output 2

```
NO
```

Explanation for Sample 2

No sequence of moves can be performed which transforms A to T.

Sample Input 3

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

Sample Output 3

```
NO
```

Explanation for Sample 3

No sequence of moves can be performed which transforms A to T.