

Expected Cells (Stretch)

time limit per test: 2 seconds (5 seconds for Python)

memory limit per test: 500 megabytes

input: standard input

output: standard output

points: 100 · problem code: expectedcells

This is a stretch problem.

There is an $n \times m$ grid of cells. Cell (r, c) has a positive weight $w_{r,c}$. Let $W = \sum_{r,c} w_{r,c}$.

Two cells A and B are sampled independently, with replacement. The probability of choosing cell (r, c) on a single sample is $w_{r,c}/W$.

Let R be the smallest axis-aligned rectangle of grid cells that contains both sampled cells, and let A be the number of cells inside R (the area of R counted in cells). If A and B are the same cell, then R is that single cell and the area is 1.

Output the expected value of A .

It can be shown that the answer can be expressed as a rational number P/Q in lowest terms with Q coprime to $10^9 + 7$. Output $P \cdot Q^{-1} \bmod (10^9 + 7)$.

Input

The first line contains two integers n and m .

Each of the next n lines contains m integers. The c -th number on the r -th of these lines is $w_{r,c}$.

Rows and columns are indexed from 1.

Output

Print a single integer: the expected number of cells in the bounding rectangle, modulo $10^9 + 7$.

Constraints

- $1 \leq n, m$
- $n \cdot m \leq 2 \cdot 10^5$
- $1 \leq w_{r,c} \leq 10^6$

Example 1

Input

```
2 2
1 1
1 1
```

Output

```
2500000004
```

Explanation

All 16 ordered pairs of cells are equally likely. The expected area is $9/4$, and $9 \cdot 4^{-1} \equiv 2500000004 \pmod{10^9 + 7}$.

Example 2

Input

```
1 1
5
```

Output

1

Explanation

Both samples are the only cell, so the rectangle always has area 1.

Example 3

Input

1 3
1 1 1

Output

888888897

Explanation

The expected area is $17/9$, and $17 \cdot 9^{-1} \equiv 888888897 \pmod{10^9 + 7}$.