Path Summing Problem

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	1024 megabytes

There is a grid with n rows and m columns. Each cell of the grid has an integer in it, where $a_{i,j}$ indicates the integer in the cell located at the i-th row and the j-th column.

Let (i, j) be the cell located at the i-th row and the j-th column. You now start from $(1, 1)$ and need to reach (n, m). When you are in cell (i, j), you can either move to its right cell $(i, j + 1)$ if $j < m$ or move to its bottom cell $(i + 1, j)$ if $i < n$.

Let $\mathbb{S}$ be the set consisting of integers in each cell on your path, including $a_{1,1}$ and $a_{n,m}$. The value of a path is defined as the number of elements in $\mathbb{S}$ (recall that sets do not contain duplicated elements). For all possible paths, calculate the sum of their values.

Input

There are multiple test cases. The first line of the input contains an integer T $(1 \le T \le 10^3)$ indicating the number of test cases. For each test case:

The first line contains two integers n and m $(1 \le n, m \le 10^5, 1 \le n \times m \le 10^5)$ indicating the number of rows and columns of the grid.

For the following n lines, the i-th line contains m integers $a_{i,1}, a_{i,2}, \cdots, a_{i,m}$ $(1 \le a_{i,j} \le n \times m)$ where $a_{i,j}$ indicates the integer in cell (i, j).

It's guaranteed that the sum of $n \times m$ of all test cases will not exceed 10^5.

Output

For each test case, output one line containing one integer indicating the sum of values of all possible paths. As the answer might be large, output it modulo 998 244 353.

Example

standard input	standard output
3 2 3 5 2 1 1 5 5 1 1 1 2 3 3 3 3 3 3 3	7 1 3

Note

For the first sample test case, there are 3 possible paths.

- The first path is $(1, 1) \to (1, 2) \to (1, 3) \to (2, 3)$. $\mathbb{S} = \{1, 2, 5\}$.
- The second path is $(1, 1) \to (1, 2) \to (2, 2) \to (2, 3)$. $\mathbb{S} = \{2, 5\}$.
- The third path is $(1, 1) \to (2, 1) \to (2, 2) \to (2, 3)$. $\mathbb{S} = \{1, 5\}$.

So the answer is $3 + 2 + 2 = 7$.