Problem J. Referee Without Red

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	512 megabytes

Night falls, neon flickers, and the crowd shouts. As the grand show in the Moon Theater begins, Calatonia, a city of assorted anthropomorphic animals, feels ready for a sleepless night. Over the years since its revival, the annual show has never failed to ignite animals' passion for music, mainly due to the various genres it includes. So this time, it adds more attractive elements, such as dance!

If you inquire of some creature in Calatonia about the best dance troupe, they are most likely to answer: Icy Cold Predators Crew (ICPC). Its performance will be a highlight of tonight's show without doubt. And you may overhear how Referee — well, that's his name — led the troupe to its peak. As the director, Referee starts every day by selecting background music and gets busy with choreographing in the afternoon. Before sleep, he tends to make dazzling costumes which are of little use in such a world actually. The routine is exhausting, but he somehow enjoys it.

Referee considers himself a born perfectionist. That's true when it comes to formation design. Offstage, he arranged the whole crew into a matrix of n rows and m columns, numbering rows $1, 2, \ldots, n$ from front to back and columns $1, 2, \ldots, m$ from left to right. The species of each dancer can be labeled as a positive integer not more than 3×10^6, where there may be animals of identical species. Two arrangements are different if and only if there exists at least a position where the species of dancers in the two arrangements are different.

Unsatisfied with the initial arrangement, Referee intends to reorder the crew without breaking its matrix formation. He thinks it's a good idea to adjust by showing cards. Certainly not red cards — Referee, after all, does not serve as a referee. Instead, he prepared white cards with $1, 2, \ldots, n$ written on them respectively and black cards with $1, 2, \ldots, m$, and commanded the crew to do as follows:

- Once Referee shows the white card with k $(1 \le k \le n)$, all dancers in the k-th row count off from 1 to m from left to right. Those who count an even number immediately move to the right end of the row. Lastly, align to keep the matrix formation.
- Once Referee shows the black card with k $(1 \le k \le m)$, all dancers in the k-th column count off from 1 to n from front to back. Those who count an even number immediately move to the back end of the column. Lastly, align to keep the matrix formation.

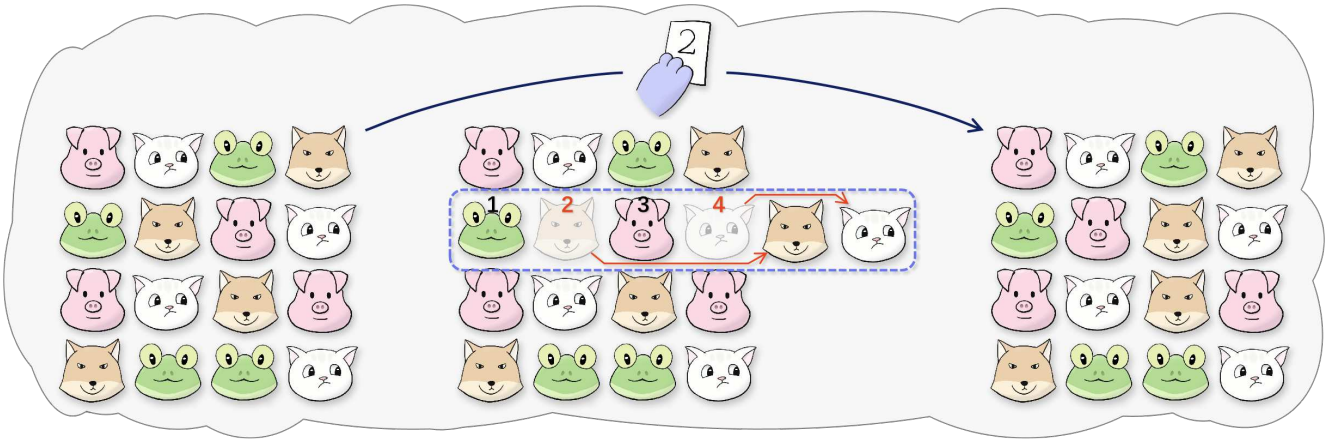


Figure: Referee shows the white card with 2

Referee can show any card any number (possibly zero) of times he wants, and your task is to calculate the number of different arrangements he may obtain, modulo 998 244 353 since it could be extremely large.

Input

The first line contains an integer T ($1 \le T \le 10^5$), denoting the number of test cases.

For each test case:

The first line contains two integers n and m ($2 \le n, m \le 10^6$), denoting the number of rows and columns respectively.

Then n lines follow, the i-th of which contains m integers $a_{i,1}, a_{i,2}, \ldots, a_{i,m}$ ($1 \le a_{i,j} \le 3 \times 10^6$), where $a_{i,j}$ denotes the species of the dancer in the i-th row and the j-th column initially.

It is guaranteed that the sum of $n \times m$ over all test cases does not exceed 3×10^6.

Output

For each test case, output a line containing a single integer, indicating the number of different arrangements modulo 998 244 353.

Example

standard input	standard output
2 4 4 1 2 3 4 3 4 1 2 1 2 4 1 4 3 3 2 3 9 1 8 1 1 8 1 1 8 1 1 8 8 8 8 8 8 8 1 1 1 1 8 8 8 1 1 1	96 6336