

Jumping to Conclusions

Input file: **standard input**
Output file: **standard output**
Time limit: 0.25 seconds
Memory limit: 4 megabytes

You are given a matrix with n rows and m columns. The cell at the intersection of the i -th row and j -th column contains an integer, denoted by a_{ij} .

Initially, you are located at cell $(1, 1)$. Your goal is to reach cell (n, m) . For that purpose, you can perform the following operation **any** number of times:

- Move from cell (i, j) to any cell within a distance equal to a_{ij} , either in the same row or in the same column.

Find out the minimum number of operations to reach the goal, or whether it is impossible to do so.

Input

The first line of the input contains a single integer, t ($1 \leq t \leq 10^4$) — the number of test cases.

The first line of each test case contains two integers, n and m ($1 \leq n \cdot m \leq 2 \cdot 10^5$) — the number of rows and columns in the matrix.

The next n lines of each test case describe the matrix. The i -th line contains m integers, $a_{i1}, a_{i2}, \dots, a_{im}$ ($1 \leq a_{ij} \leq \max(n, m)$) — the elements of the i -th row of the matrix.

It is guaranteed that the sum of $n \cdot m$ across all test cases does not exceed $2 \cdot 10^5$.

Output

For each test case, output a single integer — the minimum number of operations to reach the goal, or -1 if it is impossible.

Example

standard input	standard output
3	0
1 1	-1
1	5
2 2	
1 0	
0 1	
3 8	
1 1 1 1 3 1 1 2	
4 1 1 1 1 1 1 1	
1 1 1 1 1 1 1 1	

Note

In the first test case, no operation is needed.

In the second test case, the goal cannot be reached.

In the third test case, the following path can be taken:

$$(1, 1) \rightarrow (2, 1) \rightarrow (2, 5) \rightarrow (1, 5) \rightarrow (1, 8) \rightarrow (3, 8)$$