E. TONTON AND GAME

Time limit: 1s | Memory limit: 512MB
Input stream: stdin | Output stream: stdout

Winnie likes to be alone and likes to stay at home. Winnie hates worms but Winnie is friendly with earthworms. It is everything people know about Winnie, but there is one more thing, not many people know: Winnie likes playing game. This little bear is always crazy about game of maze. A maze can be presented as a matrix with size $m \times n$ with m rows from top to bottom starting at 1, and n columns from left to right starting at 1. Four corners are cells (1, 1), (1, n), (m, 1), (m, n). For each cell (i, j) there is an integer number $a_{i,j}$ written on it. A journey starting at the (1, 1) corner and ends at the (m, n) corner by only right, or down move. In other words, for each cell (i, j), player can only move to either cell (i + 1, j) or (i, j + 1) if these cells are inside of the table. The cost for each journey is sum of integers written on cells. Denote W as the biggest cost among all possible journeys.

The gameplay is simple, player needs to choose a submatrix with size $p \times q$, then blocking every cells of this submatrix with a condition that the new table, after blocking a number of cells, should consist of at least one journey. Blocking means that player can not make a move through blocked cells. Similarly, denote W' as the biggest cost of journeys in the new matrix. A submatrix with size $p \times q$ is called excellent if and only if $W' < W$.

Your task is to find an excellent submatrix with the smallest size, it means that $p \times q$ is smallest.

Input

- The first line contains two integer m, n ($1 \leq m, n \leq 1000$)
- The next following m lines. For each line, there are n non negative integers which is the matrix description. All number is not greater than 10^9

Output

- Print exactly one integer – the smallest value of $p \times q$. If there is no satisfied submatrix, print -1

Sample 1

Input	Output
4 4 2 2 2 1 2 2 2 2 1 1 2 2	1

Sample 2

Input	Output
4 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-1