Task 5: `Flooding`

Pavementland is a rectangle-shaped city, which can be modelled as a $h \times w$ grid of cells. The rows of the grid are numbered 1 to h from north to south, and the columns of the grid are numbered 1 to w from west to east. We refer to the cell located at row r and column c of the grid as cell (r, c).

In the grid, each cell is either empty or contains a building. At least one cell is empty.

Due to a monsoon surge, flash floods are occurring throughout Pavementland. Initially, one empty cell becomes flooded with water by the rain. Then, the water flows according to the following rules:

- If an empty cell is adjacent to at least one flooded cell, it becomes flooded.
- If a cell containing a building is adjacent to at least two flooded cells, the building collapses and the cell becomes flooded.

Note that a cell is adjacent to another cell if they share an edge. A cell is adjacent to at most four other cells. Further note that water may not flow outside the grid. Let $f((r, c))$ be the number of cells that would be flooded after the process if the cell (r, c) were initially flooded.

City officials are seeking to forecast the extent of flash floods in all possible scenarios. Help them determine the sum of $f((r, c))$ over all empty cells (r, c).

Input Format

Your program must read from standard input.

The first line of input contains two space-separated integers h and w.

The next h lines of input each contain a binary string of length w. If the c-th character of the r-th line is `0`, then the cell (r, c) is empty. If the c-th character of the r-th line is `1`, then the cell (r, c) contains a building.

Output Format

Your program must print to standard output.

Output a single integer, the sum of $f((r, c))$ over all empty cells (r, c).

Subtasks

For all test cases, the input will satisfy the following bounds:

- $1 \leq h, w \leq 5000$
- There is at least one empty cell in the grid.

Your program will be tested on input instances that satisfy the following restrictions:

Subtask	Marks	Additional Constraints
0	0	Sample test cases
1	5	$h = 1$
2	7	$h, w \leq 80$
3	16	$h, w \leq 500$
4	32	$h, w \leq 2000$
5	40	No additional constraints

Sample Test Case 1

This test case is valid for subtasks 2 to 5.

Input	Output
3 3 000 011 010	46

Sample Test Case 1 Explanation

If cells $(1, 1), (1, 2), (1, 3), (2, 1)$, or $(3, 1)$ were initially flooded, the entire grid would become flooded after the process. If cell $(3, 3)$ were initially flooded, only 1 cell would become flooded after the process. Hence, the output is $9 + 9 + 9 + 9 + 9 + 1 = 46$.

Sample Test Case 2

This test case is valid for subtasks 2 to 5.

Input	Output
5 5 00101 01011 11010 01101 11000	182

Sample Test Case 3

This test case is valid for all subtasks.

Input	Output
1 10 1101011100	6