Challenge of Zelda

Link, in order to please princess Zelda, has to solve one final challenge proposed by the princess. The challenge is a puzzle that takes place in a room full of gargoyles (stone statues with two faces, on two opposing sides of their head), mirrors, and obstacles. There is a door that leads to Zelda, and Link must unlock it. On that door is written, in an ancient tongue, the secret to opening the door:

"Every face of every gargoyle shall see a face of a gargoyle."

This means that the gargoyles must be rotated in such a way that there is a path for a beam of light to connect each gargoyle's face to another gargoyle's face (possibly its own). The beam of light is reflected by mirrors.

The floorplan of the room can be described as a rectangular $N \times M$ grid of cells:

- A dot ('.') represents an empty cell.

- A hash ('#') represents an obstacle.

- A slash ('/') represents a double-sided mirror, as does a backslash ('\') .

- A character 'V' represents a gargoyle with two faces facing top and bottom.

- A character 'H' represents a gargoyle with two faces facing left and right.

In addition to the '\' and '/' mirrors, the room is surrounded by walls of mirrors. The following common sense about light is assumed:

- Light travels in a straight line through empty cells.

- Two beams of light can intersect without interfering with each other.

- A '\' mirror reflects light coming from the top/bottom/left/right to the right/left/bottom/top. A '/' mirror reflects light coming from the top/bottom/left/right to the left/right/top/bottom.

- Light is reflected by 180 degrees when it hits a wall (walls are all mirrors).

- Light is blocked by obstacles and gargoyles.

Link may rotate any gargoyle by 90 degrees. As time is running short, he wants to know the minimum number of gargoyles that have to be rotated in order to unlock the door.

Input

The first line of input contains two space-separated integers N and M ($1 \leq N, M \leq 500$), the dimensions of the room.

Each of the next N lines contains a string s of length M with the characters described above. This is the floorplan of the room.
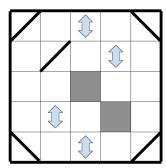
Output

Output a single integer, which is the minimum number of gargoyles that have to be rotated in order to unlock the door. If the puzzle has no solution, output `-1`.
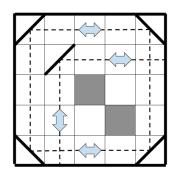
Examples

input	output
5 5 /.V.\\ ./.V. ..#.. .V.#. \\.V./	3
2 5 V...\\ H...V	-1
2 2 VV VV	0

Explanation

The puzzle from the first sample input is displayed in the following figure, with the initial configuration on the left and a solution on the right. Three gargoyles are rotated to solve this puzzle.