Problem B. Break A Prison

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	1024 mebibytes

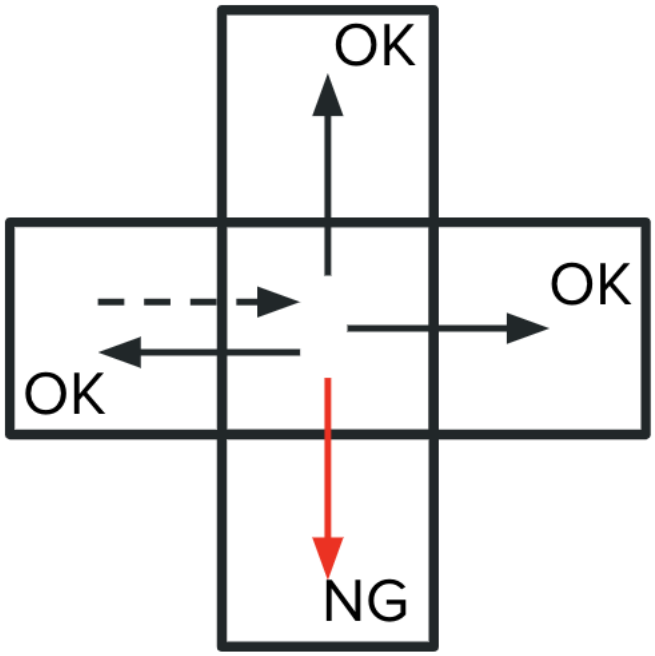
Jennifer is a software engineer at a tech company. Her company decided to join ICPC (Inter-Company Prison-breaking Contest), and she was chosen as the representative of the company.

In ICPC, every participant needs to escape from a prison. The prison can be represented as an $n \times m$ grid: it has n rows and m columns of rooms. Rows are numbered from 1 (top) to n (bottom), and columns are numbered from 1 (left) to m (right). The room in the i-th row and j-th column in the prison is denoted as room (i, j). Two rooms (i_1, j_1) and (i_2, j_2) are adjacent if and only if $|i_2 - i_1| + |j_2 - j_1| = 1$.

Weirdly, there is an unlocked door between each pair of adjacent rooms. Some rooms in the prison are under surveillance. Participants can move to a room only if it's not under surveillance.

The participant will start from the designated starting room. The goal of the participant is to reach the room with the exit. It is guaranteed that the starting room and the room with the exit are not under surveillance.

To show talents in the company, the CEO asked Jennifer not to turn right during the contest. Formally, if Jennifer moved from room (i_1, j_1) to room (i_2, j_2) and then immediately to (i_3, j_3), then the value $(i_2 - i_1) \cdot (j_3 - j_2) - (j_2 - j_1) \cdot (i_3 - i_2)$ **must not be equal to** -1.



For example, in the figure above, if the last move is along the dashed arrow, Jennifer cannot move downward, but she can move in the other three directions.

Note that U-turns (180 degree turns) are allowed with this condition.

As Jennifer's colleague, you have to help her! Write a program for her to find the minimum number of moves between rooms to reach the exit.

Input

The first line of input contains two integers, n and m: the number of rows and columns in the prison ($2 \le n, m \le 500$).

Then n lines follow, each containing exactly m characters. Character $c_{i,j}$ (where $1 \le i \le n$ and $1 \le j \le m$) describes the status of the room in the i-th row and j-th column. It can be one of the following:

- '`S`' denotes the starting room for the participant,
- '`E`' denotes the room with an exit,
- '`.`' denotes an ordinary room (not under surveillance),
- '`#`' denotes a room under surveillance.

It is guaranteed that each of '`S`' and '`E`' appears exactly once in the input.

Output

Print the minimum number of moves between rooms for Jennifer to reach the exit. If she cannot reach the exit following all the rules, print -1.

Examples

standard input	*standard output*
2 4 S..# ..E.	3
2 4 S..# ##E.	-1
2 4 S... ##E.	5

Note

One of the optimal routes for Sample 3: