Meow Maze

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Nyan Cat has arrived at UM Maze. This maze consists of N rows and M columns. He is currently located at a starting point labelled as 'S' and needs to arrive at the exit of the maze labelled as 'E'. There are blocked walls, which are labelled as '#' and the emptied cells are labelled as '.'. Nyan Cat moves one cell from the current cell to its neighbouring cell takes one second. Two cells are considered to be neighbouring if they have a common edge. However UM Land is interesting, it contains several teleport portals (possibly none) which are labelled as 'O'. He could teleport from one 'O' cell to an 'O' cell instantaneously, to be precise it takes 0 seconds for each teleportation. Determine the minimum time (in seconds) needed for Nyan Cat to reach the exit point. Output -1 if it is impossible.

Note: Nyan Cat needs to teleport regardlessly when he arrives at an 'O' cell and he could teleport from the 'O' cell to the same 'O' cell.

Input

The first line contains two space-separated integers N and M ($1 \leq N, M \leq 1000$) — the number of rows and the number of columns UM Maze has respectively. The following N lines each contain a string of M characters, denoting the grid. Each character is one of the following: 'S', 'E', 'O', '.', or '#'. 'S' denotes the starting point of Nyan Cat, 'E' denotes the exit of the maze, 'O' denotes the teleport portal, '.' denotes an empty cell, and '#' denotes a blocked cell.

Output

Output the minimum number of seconds required for Nyan Cat to reach the exit of the maze. If the task is impossible, output -1.

Examples

standard input	standard output
2 3 S#E ...	4
3 5 S...O ##### O...E	8
2 3 E#. .#S	-1