Jutge.org

The Virtual Learning Environment for Computer Programming

Film searcher   X14417_en

To make the days of lockdown more bearable, Professor Oak has signed up for an Internet TV platform. As the film catalogue is immense, the system provides a searcher that, by means of the remote control, allows one to look for films by their title. More precisely, the searcher displays on the TV screen a matrix with letters and a cursor on one of them, at the beginning that on the upper left corner. By means of the buttons ↑, ↓, → and ← of the remote control, one can move the cursor. Some of the cells of the matrix, however, cannot be selected (in the image, in red; in the test cases, with an asterisk *), and then the cursor cannot move in that direction. It is not possible to move beyond the top, bottom, right and left borders of the matrix either. Once the cursor is on the aimed letter, the *OK* button must be pressed.

Before checking whether a film is in the catalogue, Professor Oak wants to find out how many buttons he will have to press in order to insert the title into the searcher. Can you help him?

To adapt the problem to *Jutge.org*, from now on we will assume that the cells of the matrix can contain a word (viewed as a unit) instead of just a single letter, and that therefore what we insert into the searcher is a sequence of words, rather than a sequence of letters.

Input

The input contains several cases. Each case begins with n the number of rows and m the number of columns of the matrix of the searcher. Then n lines follow with m **words** each, separated by blank spaces. The words consisting of a single character * represent forbidden cells of the matrix. Except for *, which can be repeated, the rest of the words can only appear at most once. Then a number p follows, which is the number of words of the sequence we want to insert into the searcher. Finally the p words of the sequence follow, each of them different from *. Any word in the input is formed with upper case letters of the alphabet or underscore _, or is the word *. It holds that $1 \leq n, m \leq 300$, $1 \leq p \leq \min(2 \cdot n \cdot m, 1000)$, and that for each case the upper left corner does not contain the word *.

Output

For each case, write a line with the total number of times that a button of the remote control (↑, ↓, →, ← or *OK*) must be pressed so as to insert the p words of the sequence into the

searcher. If it is not possible (because a word cannot be reached, or does not appear in the matrix), write impossible.

Sample input

```
2 3
PA  PI  *
*   MA  MI
3
PI MI PA


2 3
PA  PI  *
*   MA  MI
3
PA MI MI


2 3
PA  *   *
*   MA  MI
3
PA MA NA


3 10
A B C D E F G H I J
K L M N * O P Q R S
T U V W X Y Z _ * *
12
B L A D E _ R U N N E R
```

Sample output

```
9
6
impossible
45
```