



## Problem E: Island Challenge

Time limit: 1s; Memory limit: 512 MB

In a video game, your hero has a challenge at an island. The challenge is visiting all shrines in this island.

The island can be described by  $R \times C$  rectangle table. Each cell of the table is either a mountain, a shrine or an empty plot. Shrines are labeled as characters 'S', mountains are labeled as characters '#', empty plots are labeled as characters '.'. These mountains are so high and dangerous that the hero can not enter these cells, the hero can only enter shrines or empty plots.

Initially, the hero starts at the cell  $(1, 1)$  - guaranteed to be an empty plot. If he is in the cell  $(i, j)$ , he can only move to the cells  $(i + 1, j)$ ,  $(i - 1, j)$ ,  $(i, j + 1)$ ,  $(i, j - 1)$  and not allowed to leave the island. Each such move takes 1 unit of time.

To win the challenge, your hero have to visit all  $N$  shrines in the minimum time. Given the map of the island, find the minimum time.

### Input

- The first line contains three positive integers  $R, C, N$ . ( $1 \leq R, C \leq 100, 1 \leq N \leq 15$ )
- In the next  $R$  lines, each line contains  $C$  characters consists of characters '.', '#', or 'S' - that is an empty plot, a moutain or a shrine respectively. It is guaranteed that the map consists of  $N$  characters 'S', and the cell  $(1, 1)$  is guaranteed to be an empty plot.

### Output

- Print an integer which is the minimum time to visit all  $N$  shrines in the island. If no such path exists, print  $-1$ .

### Sample

Input	Output
3 6 3 S.#. ..#.#. S.#S..	9



3 3 2 .# #S. ..S	-1
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### Explanation

**Explanation for example 1:** The path was:  $(1,1) - (2,1) - (3,1) - (3,2) - (2,2) - (1,2) - (1,3) - (1,4) - (2,4) - (3,4)$ , the hero made 9 moves.

**Explanation for example 2:** There is no path to visit shrines.