Task Natjecanje

Dino has been practicing for a package delivery competition for weeks. In the competition, the winner is the contestant who delivers all the packages from the warehouse to the designated destinations the fastest. Unfortunately, Dino has only two hands, so he can carry at most two packages at a time.

He can drop and pick up packages however he wants, as long as he carries at most two at a time. He can also carry and deliver them in any order, and each package can be delivered to any destination. After completing his delivery route, there must be a package at each of the k destinations.

During the competition, Dino moves on a grid of n rows and m columns, where free cells are marked with ".", obstacles with "#", Dino's starting cell and all packages with "S", and package destinations with "X". In one second, he can move to any adjacent cell in the four directions (up, down, left, or right) that is not an obstacle. Dropping and picking up packages takes negligible time.

Help Dino determine the minimum number of seconds he needs to deliver all packages to their destinations and return to the starting cell, or print -1 if it is impossible.

Input

In the first line, there are three natural numbers n, m, and k ($1 \leq n, m \leq 500, 1 \leq k \leq 67$), the number of rows and columns of the matrix and the number of package destinations.

In each of the next n lines, there are m characters c_{ij} describing the board. Each character of the matrix will be one of ".", "#", "S", or "X" (without quotes).

The letter "X" will appear exactly k times in the matrix.

Output

In the first line, print a single number - the minimum number of seconds required for Dino to deliver all the packages to their destinations and return to the starting cell, or -1 if this is impossible.

Scoring

Subtask	Points	Constraints
1	17	$k = 2$
2	26	$k \leq 16$
3	29	$k \leq 22$
4	38	No additional constraints.

Examples

input

```
5 5 3
X...X
.....
.....
.....
S...X
```

output

```
24
```

input

```
5 5 4
..X..
#X#..
#...X
.SX#.
.....
```

output

```
16
```

Clarification of the first example: Dino will go with 1 package to the bottom-right destination, leave the package, and return to the cell with the letter S. Then he will take 2 packages and visit the top-right destination and the top-left destination. After that, he will return to the starting cell and finish his route in 24 seconds.