

Escape

Problem ID: escape

Victor is trapped in a $n \times m$ maze monitored by k guards and we want to help him escape without being seen by any of the guards. The i -th guard is initially located at (r_i, c_i) and covers distance d_i , which means guard i monitors any cell (r, c) in the maze as long as (r, c) is reachable from (r_i, c_i) in d_i moves. The maze has walls which neither Victor nor the guards can occupy or pass through. The guards and Victor may move to any of the 4 adjacent cells in a single move as long as it is empty.

Given Victor's initial location, find the shortest path to the exit without touching cells monitored by guards.

Input

Your program will receive input from standard input.

The first line contains three space-separated positive integers n, m , and k , representing the number of rows of the maze, the number of columns of the maze, and the number of guards, respectively. The following n lines each contain m characters representing a map of the maze. Each character is one of the following:

- `.`: represents an empty cell
- `#`: represents a wall
- `S`: represents Victor's initial location
- `E`: represents the exit

There is only one `S` and `E`. The border of the maze is always a wall `#`.

In the next k lines, the i -th line contains three space-separated integers r_i, c_i , and d_i , representing the initial location and movement range of the i -th guard. The top-left corner is represented as $(1, 1)$, and the bottom-right corner is represented as (n, m) .

Output

Your program should write to standard output.

Print exactly one line. The line should contain the length of the shortest path that Victor can take to move to the exit without touching cells monitored by guards if it is possible, otherwise print `IMPOSSIBLE` instead. Note that Victor's initial location or the exit may already be monitored by a guard, in which case you should print `IMPOSSIBLE`.

Constraints

- $5 \leq n, m \leq 10^3$
- $0 \leq k \leq 10^4$
- $1 < r_i < n; 1 < c_i < m; 0 \leq d_i \leq nm$
- Guards cannot be placed on a wall
- The border of the maze is always a wall
- No two guards are placed at the same location

Subtasks

You will get points for each subtask when you pass all of the testcases of the subtask.

- 1. $n, m \leq 100, k \leq 10^3$ (43 points)
- 2. No additional constraints (57 points)

Sample Input 1

```
10 10 2
#####
#.....#
#.....#
#...#...E#
#.....#
#.....#
#.S.....#
#.....##
#.....#
#####
6 7 2
4 4 1
```

Sample Output 1

15

Sample Input 2

```
9 9 2
#####
#.....#
#.#.###.#
#.....#
#...###.E.#
#.....#
#...S##.#
#.....#
#####
4 4 1
5 6 0
```

Sample Output 2

8