Minesweeper

HackerRank

Temoc is bored in his probability and statistics class and has decided to pull out his laptop and play minesweeper instead. In minesweeper, there is a grid of cells, some of which have hidden mines underneath them. When a cell is revealed, it will either display a number (the total number of mines adjacent in all 8 directions), or a mine, in which case Temoc will lose and the game will be over.

Given the current state of the grid, what is the probability that Temoc's next move will be safe, assuming he plays optimally?

Input Format

The first line of input will consist of a three space separated integers, R, C, and B denoting the number of rows and columns in the minesweeper grid, and the number of hidden bombs.

The next R lines will each consist of C characters, either 0-9 denoting a revealed safe square, or '`#`' denoting a tile that has not yet been revealed.

Constraints

$$1 \leq B < R \cdot C \leq 20$$

Each test case will be a valid minesweeper grid with at least one safe hidden tile.

Output Format

For each test case, output a single number, the probability that the optimal next tile to pick is safe, with an absolute error of at most 10^{-3}.

Sample Input 0

```
4 5 5
#####
#####
#####
#####
```

Sample Output 0

```
0.750
```

Explanation 0

There are 5 bombs, and 20 indistinguishable options. $\frac{15}{20}$ ($.75$) will be safe.

Sample Input 1

```
4 3 5
02#
14#
```

```
###
13#
```

Sample Output 1

```
0.500
```

Explanation 1

The only scenario in which the 3, 4, and 1's are all satisfied is if the rightmost column is all bombs. This leaves 2 hidden squares each with a 50% chance to be the remaining bomb.

Sample Input 2

```
4 5 16
#####
#####
#####
1####
```

Sample Output 2

```
0.667
```

Explanation 2

$\frac{2}{3}$ of the tiles adjacent to the 1 will be safe, while $\frac{15}{16}$ of the remaining tiles will be bombs.

Sample Input 3

```
4 5 6
#####
#####
#####
1####
```

Sample Output 3

```
0.688
```

Explanation 3

$\frac{2}{3}$ of the tiles adjacent to the 1 will be safe, while $\frac{11}{16}$ of the remaining tiles will be safe.