Portatol Robot

Input File: *standard input*
Output File: *standard output*

Time limit	Memory limit
1 second	256 MB

Statement

There is an $N \times M$ grid covered in strange potato and teleporter squares. To collect potatoes for his upcoming *Potato Pyramid Project*, Farmer John has deployed a specially designed *portatol* robot in the top-left square of the grid. However, the robot was designed to collect potatoes and withstand the quantum side-effects of teleportation, not to be intelligent. As such, the robot may only move a single square down to the right at a time and it does so in a uniformly random manner.

If the robot walks over a potato square, it will collect a single potato. If the robot walks over a teleporter square, it will teleport to a uniformly random position on the grid. It could even teleport back to the same square and teleport again!

Due to the behaviour of teleporters, the robot may pass over the same potato square multiple times. If this occurs, it will collect a potato each time it passes over the square.

The bottom-right square is never a teleporter square. Therefore the robot will eventually become stuck there. Farmer John is a cautious man. He wants to check if he will likely collect sufficient potatoes for his plans. What is the expected number of potatoes the robot will collect before it becomes stuck?

Input

The first line of input contains the integer dimensions of the grid N and M. N lines follow, each containing a string of M characters. A 'P' indicates a potato square. A 'T' indicates a teleporter square. A '.' indicates an empty square which the robot may pass over with no effect.

Output

Output a single real number: the expected number of potatoes the robot will collect. Your output will be accepted if it is within 10^{-5} of the judge's output.

Sample Input 1

```
2 2
..
PP
```

Sample Output 1

```
1.5
```

Sample Input 2

```
2 2
TP
PP
```

Sample Output 2

```
1.666667
```

Sample Input 3

```
1 4
PT.P
```

Sample Output 3

```
2.5
```

Explanation

For Sample 1, the portatol robot has two possible paths. If it moves right then down, it collects a single potato. If it moves down then right, it collects 2 potatoes. On average, the robot collects 1.5 potatoes. *This is an example of subtask 1.*

For Sample 2, when the robot is deployed in the top-left square it immediately teleports. If it teleports back to square (1,1), it will only teleport again. Therefore there are only 3 unique possibilities each with a $\frac{1}{3}$ probability of occurring. If it lands in square (1,2) or (2,1) it will collect 2 potatoes. If it lands on square (2,2) it will only collect a single potato. Therefore the expected number of potatoes is $\frac{1}{3}(2+2+1) = \frac{5}{3} \approx 1.666667$. Note: any value between 1.666657 and 1.666677 would also be accepted. *This is an example of subtask 3.*

For Sample 3, the robot always collects at least 2 potatoes as it starts and ends on a potato square. However, when the robot teleports, it has a $\frac{1}{3}$ chance of collecting an additional potato and teleporting again. This means the expected number of potatoes is $2 + \frac{1}{3}(1 + \frac{1}{3}(1 + \frac{1}{3}(1 + ...)))$ which simplifies to 2.5. *This is an example of subtask 2.*

Constraints

- $1 \leq N, M \leq 1000$
- The bottom-right square will not be a teleporter square.

Subtasks

- For Subtask 1 (20 points), There are no teleporter squares.
- For Subtask 2 (30 points), $N = 1$ and there is exactly 1 teleporter square.
- For Subtask 3 (50 points), No additional constraints apply.