

Misc [III]

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output
points: 100 · problem code: misc3 · author: glipR

The Tales of Helga is a single player game which is played by the protagonist Chain.

The game is played on a 2d grid, in order to beat the game, Chain will need to collect all two pieces of the di-force and then only then can they defeat the final boss Nox

There's a recent trend going on called "Random Plays Helga", whereby this game is played with completely random inputs (random inputs being up, down, left, right). You are interested in the *expected* number of turns it takes "Random Plays Helga" to beat the game on a specific map.

(If an invalid input is entered, then the player just stands where they are).

Input

Input will contain two integers n and m representing the height and width of the playable map. The next n lines will contain strings of m characters, representing the map. The characters will be one of the following:

- `.`: Empty terrain - Chain can move here.
- `X`: Walled terrain - Chain cannot move here.
- `A` or `B`: One piece of the di-force - If Chain moves to this location, they collect the di-force piece.
- `S`: The spawn point for Chain.
- `G`: The final boss Nox - If chain moves to this location *after* collecting all pieces of the di-force, they win the game.

Output

Output a single value representing the expected number of steps to beat the game. Your answer must have an absolute or relative difference of at most 10^{-6}

Constraints

- $1 \leq n \times m \leq 50$

Example

Input

```
3 5
XXXBG
XXX.X
S.A.X
```

Output

```
84
```

1. The chances that we finish the game in 6 steps is $\frac{1}{4^6}$
2. The chances that we finish the game in 7 steps is $\frac{1}{4^6} \times \frac{1}{2} \binom{5}{1} + \frac{1}{4^6} \times \frac{3}{4}$ (Either our first move is a dud (3/4 chance) or one of the following 5 moves takes us nowhere (1/2 chance))
3. ...

Continuing this process ad infinitum we get:

$$\sim \frac{6}{4^6} + 7 \times \left(\frac{1}{4^6} \times \frac{1}{2} \binom{5}{1} + \frac{1}{4^6} \times \frac{3}{4} \right) + \dots = 84 \sim$$