Taking care of Dexter is no easy task. He requires constant attention and guessing whether he currently wants pets, snacks, plays, or something else entirely is a challenge. All the while his humans also need to do boring things like work or chores and – worst of all – would prefer to sometimes sleep!

A total of n people are involved in taking care of Dexter. They want to coordinate their caretaking over the next L hours (the interval $[0, L)$). During each hour (a unit segment of the interval $[i, i+1)$ for integers $0 \le i < L$) they know exactly which person will be busy with **chores**. If a person is not busy with chores then they can take **care** of Dexter or **sleep**.

Each person will go to sleep *at most once* during the L hours. To keep things fair, we want everyone to sleep the same amount of time T (a non-negative real number). Chores and cat care take a whole fragment $[i, i+1)$, while sleeping can take place during any fragment $[a, a + T)$ for any non-negative real number a such that $a + T \le L$.

To help the caretakers you should find the maximal T such that each of the n caretakers can sleep for T *and* for every moment $x \in [0, L)$ there is at least one person who can respond to Dexter's whims (does not have chores and is not asleep). *Note: It can be proven that the optimal T is always rational, if it exists.*

Input

The first line of input contains two integers n, L the number of caretakers and the number of hours.

The next n lines contain strings of length L consisting of characters 'X' and '.' (period), describing the chores. The i-th string describes the schedule of the i-th caretaker, where the j-th character of the string decides if the person has chores during $[j-1, j)$:
- character X means the person is busy with chores;
- character . means the person is available and can sleep or care for Dexter.

Output

If creating a schedule where Dexter is cared for during every moment is impossible, your program should print a single line containing the string SAD CAT. Otherwise, it should contain the maximal T as a single *rational* number in its simplest form $\frac{p}{q}$, where $p, q \in \mathbb{N}, \gcd(p, q) = 1, q > 0$.

Examples

For the input:

```
3 6
..X.XX
.X..X.
X..X..
```

the correct output is:

```
4/3
```

For the input:

```
3 2
..
XX
..
```

the correct output is

```
0/1
```

For the input:

```
1 3
.X.
```

the correct output is:

```
SAD CAT
```

Explanation: In the first test every person can sleep for $\frac{4}{3}$ of an hour if they sleep in, respectively, $\left[0, \frac{4}{3}\right)$, $\left[\frac{8}{3}, 4\right)$, and $\left[\frac{4}{3}, \frac{8}{3}\right)$.

In the second test the second caretaker is always busy with chores, so cannot sleep.

In the third test there exists a moment when no one can look after Dexter, e.g. $x = \frac{\pi}{2}$.

Additional examples

The following initial tests are also available:

- `0d` – $n = 6$, $L = 1{,}000$, first caretaker is always free, but others are busy all the time except for $[123, 177)$, solution is `27/1`;
- `0e` – $n = 10$, $L = 30{,}000$, no one has any chores; solution is `15000/1`;
- `0f` – $n = 18$, $L = 100{,}000$, i-th caretaker (numbering from 0) is free during all intervals $[x, \min(x + 2, L))$ where $x \equiv i \bmod 18$ and busy otherwise; solution is `2/1`.

Limits

Your solution will be evaluated on a number of hidden test cases divided into groups. Points for a group are awarded if and only if the submission returns the correct answer for each of the tests in the group within the allotted time limit. These groups are organised into subtasks with the following limits and points awarded.

Subtask	Limits	Points
1.	$1 \le n \le 6$, $1 \le L \le 1{,}000$	2
2.	$1 \le n \le 10$, $1 \le L \le 30{,}000$	2
3.	$1 \le n \le 18$, $1 \le L \le 100{,}000$	6

Cat Care Coordination