

Problem 9: TangTangTang

7 Points

Problem ID: `splitters`

Rank: 2

Introduction

The Protocol Automation-Core (PAC) is the heart of the Automated Industry Complex (AIC) Factory. Every Endfield power grid facility in the region must ultimately link back to the PAC.

To secure more funds to colonize industrialize regions across Talos-II, you want to spend time securing funds through ~~market manipulation~~ stock redistribution. You decided to let Tangtang handle the [AIC](#) while you are busy trading. However, Tangtang builds useless AIC that does nothing but move items around and sometimes destroy them! You want to find out how many items remain.

Problem Statement

Note: the first portion of `splitters` and `splitters2` are exactly the same. Problem text shared between the two problems is outlined below.

This problem deals with the notion of factories, which distribute items throughout a rectangular grid of tiles. Items in a factory move from tile to tile using conveyor tiles, which can point up, down, left, or right. Items on a conveyor tile are moved to the adjacent tile in the direction pointed by the conveyor. If a conveyor tile on the edge of the factory points out of the grid, items on that tile will be moved out of the factory and collected.

Factories can also contain destroy tiles, which cause items on it to be removed from the factory altogether. In addition to conveyor tiles and destroy tiles, there are also splitter tiles. A splitter tile evenly distributes incoming items to its valid adjacent tiles. An adjacent tile is considered valid if it is a destroy tile, or if it is a conveyor tile that is not pointing directly back at the splitter.

All items that enter a factory start on the top left tile. All factories are set up in such a way that:

- Splitter tiles will not be placed adjacent to other splitter tiles or the edge of the factory.
- If a tile is empty, it is impossible for items to reach it.
- Items in the factory will never move into the same tile twice.
- The top left tile is either a conveyor tile or a destroy tile.

Problem text unique to this problem starts here.

You are given an $N \times M$ grid of tiles representing the layout of a factory satisfying the above constraints. What percentage of items that enter the factory will eventually be collected instead of destroyed? The answer can be represented by an irreducible fraction $\frac{p}{q}$ such that $0 \leq p, q \leq 10^9$.

In addition to the conditions above, the factory provided will satisfy the following:

- If a tile is not empty, it is always possible for items to reach it.
- The factory will collect items at at most one location. In other words, at most one conveyor tile against the edge of the factory will point out of the grid.
- Each splitter tile will distribute items to at least two adjacent tiles.

Input Format

The first line of the input contains a single integer T denoting the number of test cases that follow.

For each test case:

- The first line contains two space-separated integers N M , denoting the number of rows and columns in the factory grid.
- The next N lines each contain a string of M characters representing a row of tiles in the factory. Each character can be one of the following:
 - A `.` character, representing an empty tile.
 - Any of the characters `<` `>` `^` or `v`, representing a conveyor tile pointing left, right, up, and down, respectively.
 - An `x` character, representing a destroy tile.
 - An `s` character, representing a splitter tile.

Output Format

For each test case, output two space-separated integers p q representing the percentage of items entering the factory that are collected as an irreducible fraction $\frac{p}{q}$. Note that if the probability is 0, $p = 0$ and $q = 1$.

Constraints

$$1 \leq T \leq 50$$

$$1 \leq N \leq 15$$

$$1 \leq M \leq 15$$

There will be at most 20 splitter tiles in a factory.

Sample Test Cases

Sample Input

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```
2
6 10
v.>>>>v.^.
v.^...v.^.
>>S>S>>>S.
..X.v...v.
....>>>>X.
.....
3 3
vX.
>SX
.X.
```

Sample Output

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```
1 4
0 1
```

