

## 1001 - Pipes

### Description

After writing a solver for the "movable maze" game, you have grown tired of it. After all, you already know the optimal solution. To entertain yourself, you find another puzzle game called "Pipes", and play that for a while. On one puzzle, you have not been able to find a solution by hand, and you think that there is no solution. You decide to write a program to tell you whether this is the case. The game is played on a grid with  $R$  rows and  $C$  columns. Each square of the grid contains a black dot in the center and black lines in the direction of some, none, or all of its north, east, south, and west neighboring squares, with the following restriction: if two opposite directions both have lines, then at least one of the other two directions has a line as well. In other words, it is forbidden for a square to consist of a straight line.

The objective of the game is to rotate each square, as many times as you like, such that for each square, if it has a line going in a compass direction (that is, north, east, south, or west), then it has a neighbor in that compass direction and that neighbor has a line going in the opposite compass direction. In other words, each edge in the grid should either have a line on both sides or neither side. Your task is to determine whether a given grid has a solution.

### Input specification

The input consists of multiple test cases (no more than 20). The first line of each test case contains two integers  $R$  and  $C$ , separated by spaces, with  $1 \leq R, C \leq 12$ . The following  $R$  lines of input each contain one row of the grid, from north to south. Each of these lines contains exactly  $C$  strings of letters, separated by spaces, that correspond to squares of the grid, from west to east. Their format is as follows:

\* If the string is the single character  $x$ , then the square does not contain a line to any of its neighbors.

\* Otherwise, the string contains some of the characters *N*, *E*, *S*, *W*, which indicate that a black line extends from this square's center in the direction of its north, east, south, or west neighbor, respectively.

No character will appear in the string more than once.

Input is terminated by a line containing 0 0.

These zeros should not be processed.

### Output specification

For each test case, output SOLVABLE if there is a solution to the puzzle, and UNSOLVABLE otherwise.

### Sample input

```
3 3
NW NW x
NES NESW W
E W x
2 2
ES x
x N
0 0
```

### Sample output

```
SOLVABLE
UNSOLVABLE
```

### Hint(s)

Source	2009 Waterloo Local Contest - Malcolm Sharpe
Added by	<b>ejaltuna</b>
Addition date	2011-10-11 23:59:37.0
Time limit (ms)	0

## Caribbean Online Judge

Test limit (ms)	0
Memory limit (kb)	0
Output limit (mb)	64
Size limit (bytes)	0
Enabled languages	Bash C C# C++ C++11 Java JavaScript-NodeJS Pascal Perl PHP Prolog Python Ruby