



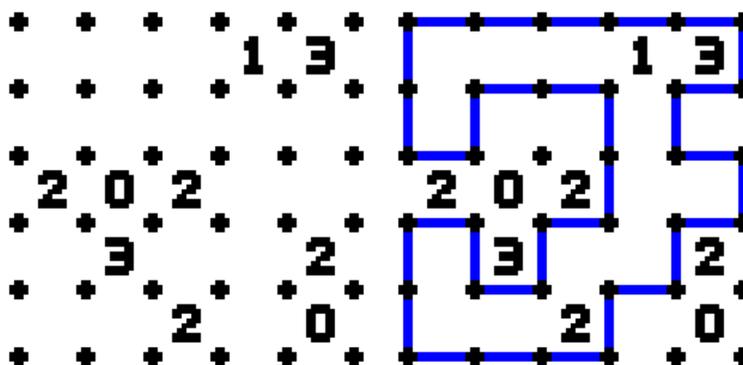
The Sidewinder Sleeps Tonite

Introduction:

Slitherlink is a type of logic puzzle made popular by Nikoli, the same Japanese puzzle company that has made Sudoku popular the world over. Like most good logic puzzles, it has a set of very basic rules that can nonetheless result in devilishly difficult (and delightful!) puzzling experiences.

The rules of Slitherlink are as follows:

- A Slitherlink board is made up of a lattice of dots; in this problem, it will be a regular rectangular lattice.
- Some of the boxes (or *cells*) defined by the lattice have numbers within them; with a regular rectangular lattice, the numbers will be between 0 and 3 inclusive.
- The goal of a Slitherlink puzzle is to connect adjacent dots (horizontally or vertically, like the sides of boxes) so that there is a *single* loop that never crosses itself, with no line segments that are not part of the loop (no "dangling" segments or other, separate loops) such that every cell that has a number has exactly that many sides as segments of the loop.



Unsolved 5x5 Puzzle

Solved 5x5 Puzzle

Given a supposedly solved Slitherlink puzzle, your task will be to determine whether or not it is indeed legitimately solved.

Input:

Input to this problem will begin with a line containing a single integer N ($1 \leq N \leq 100$) indicating the number of data sets. Each data set consists of the following components:

- A line containing two integers H, W ($1 \leq H, W \leq 20$) representing the height and width of the Slitherlink puzzle by the number of *cells* (not dots!) per edge;
- A series of $2H + 1$ lines representing the Slitherlink puzzle, using the following non-whitespace characters:
 - 0, 1, 2, 3, ?: The numbers written inside a given cell. A ? represents an empty cell, as in the example graphic above.
 - #: A dot in the lattice.
 - -, |: A horizontal or vertical line segment.
 - .: An empty adjacency between two dots in the lattice.

Note that all Slitherlink puzzles will be fully represented; that is, there is no internal whitespace on a given line to represent empty cells or adjacencies.

Output:

For each data set, print "VALID" if the solution is a valid solution to the given Slitherlink, or "INVALID" if the solution is not valid.

Sample Input:

```
2
5 5
#-#-#-#-#
|?.?.?.1.3|
#.#-#-#.#-#
|?|?.?|?|?.
#-#.##.#-#
.2.0.2|?.?|
#-#.##.#-#
```

```
|?|3|?.?|2.  
#.#-#.#-#.#  
|?.?.2|?.0.  
#-#-#-#.#.#  
5 5  
#-#-#-#-#-#  
|?|?.?.1.3|  
#.#-#-#.#-#  
|?|?.?|?|?.  
#-#.#.#.#-#  
.2.0.2|?.?|  
#-#.#-#.#-#  
|?|3|?.?|2.  
#.#-#.#-#.#  
|?.?.2|?.0.  
#-#-#-#-#.#
```

Sample Output:

```
VALID  
INVALID
```

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