

Progcomp 2014 Grand Final

Task 5. Nurikabe

Available marks: 28

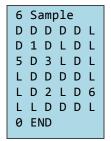
Nurikabe is yet another Japanese solitaire game of logic, played on a square grid. Each cell is coloured either dark (blue here), light (yellow) or grey, and some of the light cells contain positive single-digit integers. The aim of the game is to turn all the grey cells into either dark cells or light cells so that the following rules are observed.

- 1. Each light cell must be part of an island of light cells containing exactly one numbered cell.
- 2. The numbered cell in an island indicates how many cells the island contains.
- 3. Islands are surrounded by dark cells, though islands can touch diagonally.
- 4. All the dark cells are connected.
- 5. There are no 2x2 blocks of dark cells.

Format

Each file contains one or more games in some state. Each game starts with a line giving *N*, the order of the game (number of cells per row or column), followed by a short identifying name. Then follows the cell contents in row order, one row per line. Each cell is either dark (D), light (L), numbered, or grey (.), separated by a space. The last line contains 0 and the name END.

The solved game pictured above could be represented by this input:

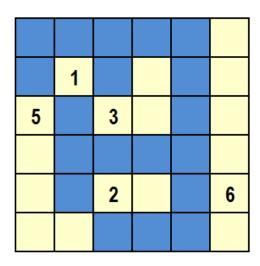


Your Task

There are two parts to the task: validation, worth 16 marks, and solution, worth 12 marks.

For each game in an input file, report the name and the state it is in. If it violates rule 1, 2, 4 or 5, report which rule it violates and the position of one of the invalid cells, if applicable. One error message is sufficient. You can assume error conditions can only occur in a complete portion of the grid, not involving grey cells.

If the game is already solved, report **Solved**. Otherwise report **Unsolved** and attempt to solve the game, displaying the solution using a similar format to the input. All valid inputs are solvable.



Sample Data and Output

Input (task5sample.dat):

```
4 Sample1
L D 2 L
2 D D D
D D 3 D
1 D L L
5 Sample2
DLL7L
DLLDD
1 D L D 1
DDDDD
L 5 L L L
6 Sample3
2 D 1 D 1 D
LDDDD.
DDL4DL
3 D 4 L D .
LLDDD.
D.DLL6
0 END
```

Output:

```
Sample1 is Solved
Sample2 violates rule 4: dark cell at [0,0] (0-origin) is not connected to all other dark cells
Sample3 violates rule 1: multiple numbered cell in island at [3,2] (0-origin)
```

Besides the sample tests above, there are two assessable test files, **task5A.dat** and **task5B.dat**. They have 7 test cases in total. The maximum order of any puzzle is 9.

References

Nurikabe is from the <u>Nikoli</u> stable. Its name is that of a wall-spirit in Japanese folklore, which impedes travellers on foot and extends when they try to go around it.

Other sites with online versions of the game include <u>puzzle-nurikabe.com</u>, <u>Logic Games Online</u>, and <u>Conceptis Puzzles</u>.