

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 | | | | |
| 5 | | 3 | | | |
| | | | | | |
| | | 2 | | | 6 |
| | | | | | |

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:

```
6 Sample
D D D D D L
D 1 D L D L
5 D 3 L D L
L D D D D L
L D 2 L D 6
L L D D D L
0 END
```

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
D L L 7 L
D L L D D
1 D L D 1
D D D D D
L 5 L L L
6 Sample3
2 D 1 D 1 D
L D D D D .
D D L 4 D L
3 D 4 L D .
L L D D D .
D . D L L 6
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 [Nikoli](#) 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 puzzle-nurikabe.com, [Logic Games Online](#), and [Conceptis Puzzles](#).