

Problem D

Directed mazes

Input file: maze.in

Output file: maze.out

Directed mazes are—as most mazes—traversed by moving from intersection to intersection until the goal intersection is reached. As each intersection is approached from a given direction, a sign near the entry to the intersection indicates in which directions the intersection can be exited. These directions are always left, forward, right, or any combination of these.

Figure 1 on the following page illustrates a directed maze. The intersections are identified as “(row,column)” pairs, with the upper left being (1,1). The “Entrance” intersection for Figure 1 is (3,1) and the “Goal” intersection is (3,3). You begin the maze by moving north from (3,1). As you walk from (3,1) to (2,1), the sign at (2,1) indicates that as you approach (2,1) from the south (traveling north) you may continue to go only forward. Continuing forward takes you toward (1,1). The sign at (1,1) as you approach from the south indicates that you may exit (1,1) only by making a right turn. This turns you to the east now walking from (1,1) toward (1,2). So far there have been no choices to be made. This is also the case as you continue to move from (1,2) to (2,2) to (2,3) to (1,3). Now, however, as you move west from (1,3) toward (1,2), you have the option of continuing straight on or turning left. Continuing straight on would take you on toward (1,1), while turning left would take you south to (2,2). The actual (unique) solution to this maze is the following sequence of intersections: (3,1), (2,1), (1,1), (1,2), (2,2), (2,3), (1,3), (1,2), (1,1), (2,1), (2,2), (1,2), (1,3), (2,3), (3,3).

If you arrive at an intersection having no sign for any direction (for instance, when traveling south to (3,1) in Figure 1), you have come to a dead end and may not proceed beyond that intersection.

You must write a program to solve valid directed mazes. Solving a maze means (if possible) finding a route through the maze that leaves the Entrance in the prescribed direction, and ends in the Goal. This route should not be longer than necessary, of course.

Input specifications

The input file will consist of one or more directed mazes. The first line of each maze description contains the name of the maze, which is an

column 1, and all other lines should start in column 3, i.e., indented two spaces. Solutions should be output as a list of intersections in the format “(R,C)” in the order they are visited from the entrance to the goal, should be delimited by a single space, and all but the last line of the solution should contain exactly 10 intersections.

The first maze in the following sample input is the maze in Figure 1.

Sample input

```
Sample
3 1 N 3 3
1 1 WL NR *
1 2 WLF NR ER *
1 3 NL ER *
2 1 SL WR NF *
2 2 SL WF ELF *
2 3 SFR EL *
0
NoSolution
3 1 N 3 2
1 1 WL NR *
1 2 NL ER *
2 1 SL WR NFR *
2 2 SR EL *
0
END
```

Output for sample input

```
Sample
(3,1) (2,1) (1,1) (1,2) (2,2) (2,3) (1,3) (1,2) (1,1) (2,1)
(2,2) (1,2) (1,3) (2,3) (3,3)
NoSolution
No solution possible
```