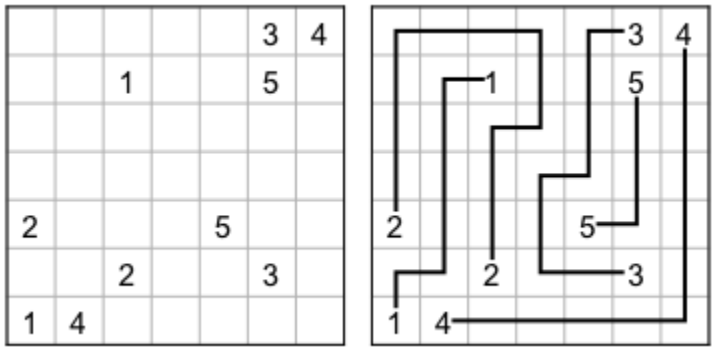
Siena College's 31st Annual High School Programming Contest
Sponsored by Transfinder
April 13, 2018

Gold Problem #7: The Transfinder Problem

Background Information: Transportation systems generate a variety of challenging problems. School bus routes, mail delivery, and trash collection are examples of systems that generally look for complete coverage while avoiding overlap. Many of these applications are connected to famous puzzles like the Konigsberg Bridge problem, the traveling salesperson problem, and the number link puzzle. The number link puzzle is a classic routing challenge that requires finding non-intersecting paths that connect matching numbers on an M x N rectangular grid. The object is to connect the matching numbers with "lines" connecting matching numbers at the endpoints. In addition, all spaces on the grid must be covered exactly once. Lines consist of vertical and horizontal segment. A puzzle and its solution are shown above.



To develop software to solve the puzzle (or the bus routing system) it is common to index the grid so that squares can be referenced. Row/column indices start at 0, with (0, 0) representing the upper left corner.

	0	1	2	3	4	5	6
0						3	4
1			1			5	
2							
3							
4	2				5		
5			2			3	
6	1	4					

The indexed grid on the left corresponds to the puzzle above. To indicate a pathway between matching numbers a pathway of segments can be designated with a sequence of North, South, East, West symbols. For example, the sequence NENNNNE designates the pathway from starting number 1 at (6, 0) to ending number 1 at (1, 2) in the diagram above..

Programming Problem:

Input: On the first line, the number of rows (R) and columns (C) (with R and C ≤ 7) of the grid followed by the number K (≤ half the number of squares in the grid) of numbers to match. The first line of input will be followed by K lines, each line containing starting row/column coordinates for a starting number and an ending number.

Output: K lines, one for each directional pathway from a starting number to an ending number. If there is no solution then just print NO SOLUTION.

Example

Input:

```
7 7 5
6 0 1 2
4 0 5 2
0 5 5 5
6 1 0 6
1 5 4 4
```

Output:

```
NENNNNE
NNNNEEESSWSSS
WSSSWSSSEE
EEEEENNNNNN
SSSW
```