Problem E

E - Chess Solitaire

Time Limit: 3 seconds, Memory limit: 2G

Chess Solitaire is a version of chess meant to be played by a single person. Okay, you probably figured that out on your own, but the exact rules are as follows: given a board with 2 or more chess pieces, none of which are pawns, find a series of captures which result in a single piece left on the board. Any piece that is moved must capture another piece, so if there are initially m pieces on the board, the solution involves $m-1$ moves. An example puzzle and its solution is shown in Figure E.1 (which corresponds to Sample Input 1):

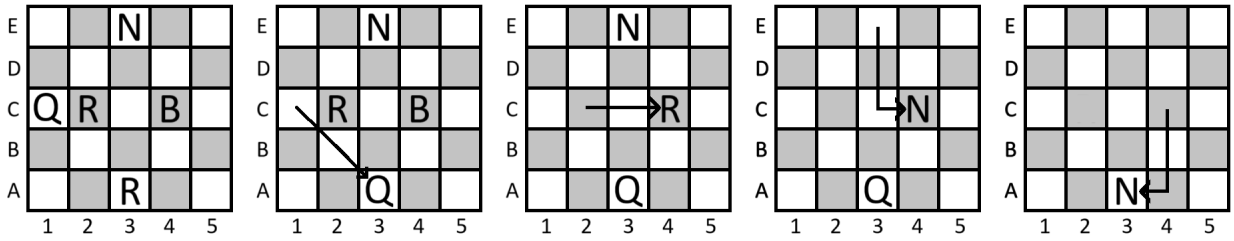


Figure E.1: Chess solitaire problem and a solution.

As a reminder, here are how the various chess pieces can capture other pieces:

For this problem, you will be given a chess solitaire puzzle and output a series to solve that puzzle.

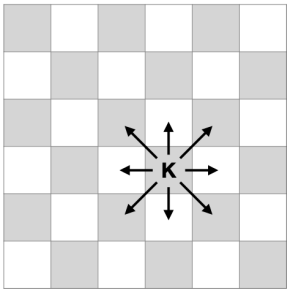
Input

The input begins with a line $n\ m$ where n ($2 \leq n \leq 8$) is the number of rows and columns in the board, and m ($2 \leq m \leq 10$) is the number of pieces in the problem. Following this are m lines of the form $p\ loc$, where p is one of `'N', 'B', 'R', 'Q', 'K'` indicating knight, bishop, rook, queen and king, respectively, and loc is a string of length 2 indicating the location of the piece on the board. The first character is an upper case letter indicating the row and the second character is an integer indicating the column (as shown in the figure above). All locations are valid and no two locations will be the same.

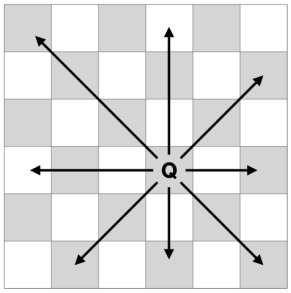
Output

Output $m-1$ lines displaying the $m-1$ moves to solve the problem. Each line will be of the form $p\ loc_1$ -> loc_2 indicating a move of piece p from location loc_1 to location loc_2. If there are multiple solutions, print the one which has a first move with the lexicographic lowest loc_1. If there is still a tie, print the one which has a first move with the lexicographic lowest loc_2. If there is still a tie, apply these rules to the second move, and so on.

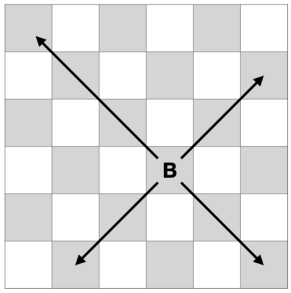
If there is no possible solution to the puzzle, output `No solution`



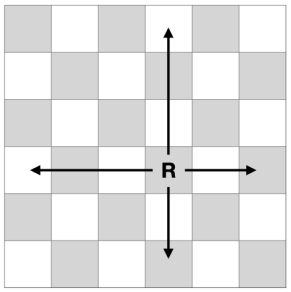
A king may move one square in any of the eight cardinal and diagonal directions.



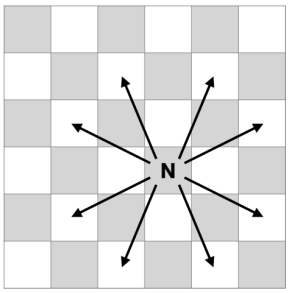
A queen may move any number of squares in any of the eight cardinal and diagonal directions, but may not jump over other pieces.



A bishop may move any number of squares in any of the four diagonal directions, but may not jump over other pieces.



A rook may move any number of squares in any of the four cardinal directions, but may not jump over other pieces.



A knight may move exactly two squares in one cardinal direction plus one square in a perpendicular direction, and may jump over other pieces.

Sample Input 1

```
5 5
N E3
Q C1
R C2
B C4
R A3
```

Sample Output 1

```
Q: C1 -> A3
R: C2 -> C4
N: E3 -> C4
N: C4 -> A3
```

Sample Input 2

```
4 4
Q D4
Q B1
Q C2
K A3
```

Sample Output 2

```
No solution
```