

## UCF "Practice" Local Contest — Aug 29, 2015

## Twins in Maze

*Filename:* masetwins  
(*Difficulty Level:* Hard)

Dr. Orooji's twins (Mack and Zack) are 14-years old and, at times, they drive Dr. O crazy. The situation is really bad when Mrs. O is not home and Dr. O has to watch the twins by himself. To make sure he keeps his sanity, Dr. O has devised a square maze and, when he needs a break, he puts the twins in two different cells in this maze. While Mack and Zack are running around, trying to find each other, Dr. O has some peace! But, here you come, trying to write a program to help the twins and make Dr. O mad!

Let's define cell A to be a "neighbor" of an adjacent cell B if A is to the north, south, east, or west of cell B (i.e., diagonal cells are not considered neighbors). For mazes with more than two rows, cells in the first row are not considered neighbors of cells in the last row (i.e., no wrap around). Similarly, for mazes with more than two columns, cells in the first column are not considered neighbors of cells in the last column (i.e., no wrap around).

The twins can travel only one cell at a time. From a cell, they can only go to a neighboring cell. The twins are originally placed, by Dr. O, in two cells that are not neighbors. The twins find each other by making some moves such that they end up in neighboring cells.

*The Input:*

The first input line will be a positive integer  $d$ , indicating the number of data sets (mazes) to be processed. The data sets are on the following input lines.

Each data set starts with an integer  $n$  ( $3 \leq n \leq 15$ ), representing a maze size. Each of the following  $n$  input lines contains  $n$  characters (starting in column 1 and ending in column  $n$ ), representing a row of the maze. These characters are as follows:

**M** shows the original position for Mack (exactly one M in each input maze).

**Z** shows the original position for Zack (exactly one Z in each input maze).

**0** a cell where neither twin can move to.

**1** a cell where only Mack (twin #1) can move to.

**2** a cell where only Zack (twin #2) can move to.

**3** a cell where either twin (i.e., both) can move to.

Assume that each input maze is such that the twins will find each other (Dr. O needs to rest sometimes but he is not a mean dad).

### *The Output:*

Print a heading for each data set. Then, print all the moves Mack has to make (in order), followed by all the moves Zack has to make (in order). Also print the total number of moves made by Mack and Zack. Leave a blank line after the output for each data set. Follow the format illustrated in Sample Output.

Your program must find the solution with the smallest number of total moves. If there is more than one solution with the smallest total, you may print any one of them.

### *Sample Input:*

```
2
6
000000
00M130
000010
000020
000030
00Z220
4
000Z
1022
3010
31M0
```

### *Sample Output:*

```
Maze #1:
    Mack move east
    Mack move east
    Mack move south
    Zack move east
    Zack move east
    Zack move north
    Zack move north
    Total number of moves: 7
```

```
Maze #2:
    Mack move north
    Zack move south
    Zack move west
    Total number of moves: 3
```