CCO '04 P5 - Jengaism

Time limit: 1.0s **Memory limit:** 32M

Canadian Computing Competition: 2004 Stage 2, Day 2, Problem 2

Jenga is a popular game involving a tower constructed of $1 \times 1 \times 3$ blocks. Initially, this tower has 18 levels, each consisting of three blocks laid side to side. The blocks on alternating levels are oriented at right angles. Thus, each block touches all three of the blocks in the levels above and below it. Here is a picture of the actual game:

Play involves each player removing a block from somewhere in the tower, and putting it in a new position on top. The goal is to do this without knocking over the tower. Blocks are always removed from below the highest complete level, and the top level is always completed before a new level is started (at right angles, of course).

Write a program which reads sequential moves of a Jenga game and determines at what point the tower (or any part of it) falls or topples.

Note that a structure will topple if its center of gravity, projected onto its base, lies outside the convex hull of its support points. If the center of gravity lies exactly on the edge of this hull, we will assume that the structure is stable.

Input Specification

The first line contains N, the number of moves. The next N lines describe one move per line, with two locations separated by a single space. The first is the location of the block to be removed, and the second is where it will be put back. A location is specified as a number, specifying the level, and then a letter `A-C`, specifying its position in the level (left to right or front to back). For instance, the top level of the initial tower configuration consists of blocks at `18A`, `18B`, and `18C`. Below is a diagram of the pieces, labelled with a front and right side perspective.

<table>
<tr><td colspan="3">18C</td></tr>
<tr><td>17A</td><td>17B</td><td>17C</td></tr>
<tr><td colspan="3">16C</td></tr>
</table>

<table>
<tr><td>18A</td><td>18B</td><td>18C</td></tr>
<tr><td colspan="3">17C</td></tr>
<tr><td>16A</td><td>16B</td><td>16C</td></tr>
</table>

15A	15B	15C
14C		
13A	13B	13C
12C		
11A	11B	11C
10C		
9A	9B	9C
8C		
7A	7B	7C
6C		
5A	5B	5C
4C		
3A	3B	3C
2C		
1A	1B	1C

Front

15C		
14A	14B	14C
13C		
12A	12B	12C
11C		
10A	10B	10C
9C		
8A	8B	8C
7C		
6A	6B	6C
5C		
4A	4B	4C
3C		
2A	2B	2C
1C		

Right Side

Output Specification

If the tower collapses after removing a block at location L, output `The tower collapses after removing L`.

If the tower collapses after placing a block at location L, output `The tower collapses after placing L`.

If all moves execute successfully (i.e., without causing the tower to fall), output `The tower never collapses`.

Sample Input 1

```
4
6B 19B
7B 19A
17B 19C
17A 20B
```

Sample Output 1

```
The tower collapses after removing 17A
```

Sample Input 2

```
2
17C 19C
17A 19A
```

Sample Output 2

```
The tower never collapses
```