

122 Trees on the level

Background

Trees are fundamental in many branches of computer science¹. Current state-of-the art parallel computers such as Thinking Machines' CM-5 are based on *fat trees*. Quad- and octal-trees are fundamental to many algorithms in computer graphics.

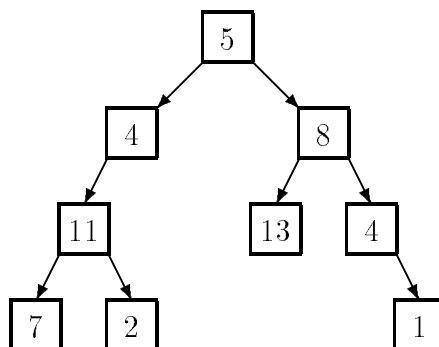
This problem involves building and traversing binary trees.

The Problem

Given a sequence of binary trees, you are to write a program that prints a level-order traversal of each tree. In this problem each node of a binary tree contains a positive integer and all binary trees have have fewer than 256 nodes.

In a *level-order* traversal of a tree, the data in all nodes at a given level are printed in left-to-right order and all nodes at level k are printed before all nodes at level $k + 1$.

For example, a level order traversal of the tree



is: 5, 4, 8, 11, 13, 4, 7, 2, 1.

In this problem a binary tree is specified by a sequence of pairs (n,s) where n is the value at the node whose path from the root is given by the string s . A path is given by a sequence of L 's and R 's where L indicates a left branch and R indicates a right branch. In the tree diagrammed above, the node containing 13 is specified by $(13,RL)$, and the node containing 2 is specified by $(2,LLR)$. The root node is specified by $(5,)$ where the empty string indicates the path from the root to itself. A binary tree is considered to be *completely specified* if every node on all root-to-node paths in the tree is given a value exactly once.

The Input

The input is a sequence of binary trees specified as described above. Each tree in a sequence consists of several pairs (n,s) as described above separated by whitespace. The last entry in each tree is $()$. No whitespace appears between left and right parentheses.

All nodes contain a positive integer. Every tree in the input will consist of at least one node and no more than 256 nodes. Input is terminated by end-of-file.

¹Pun definitely intended.

The Output

For each completely specified binary tree in the input file, the level order traversal of that tree should be printed. If a tree is not completely specified, i.e., some node in the tree is NOT given a value or a node is given a value more than once, then the string “not complete” should be printed.

Sample Input

```
(11,LL) (7,LLL) (8,R)
(5,) (4,L) (13,RL) (2,LLR) (1,RRR) (4,RR) ()
(3,L) (4,R) ()
```

Sample Output

```
5 4 8 11 13 4 7 2 1
not complete
```