# 6406   Start-up Network

A start-up communication company plans to build a proprietary network using cheaply available 3-way routers (a *router* is a device that forwards data packets between two, or more, networks. A router is said to be 3-way if it only has three communication ports) from a local supplier. The network will be configured in a tree-like architecture with all the customers as its leaf nodes.

Customers may be engaged in one-to-one calls or in conference calls but a customer cannot be simultaneously engaged in more than one call. An active one-to-one call uses the links on the unique path between the two leaf nodes corresponding to the two customers. An active conference call uses the links of the connected sub-tree that spans leaf nodes corresponding to the participating customers.

The company is worried about the negative effect that too many active calls using a single link may have on the overall performance of its network. The company wants you to calculate the maximum number of active calls using any link (that is, any edge of the tree) in the network for a given set of calls.

The dashed link in the example network, shown below,
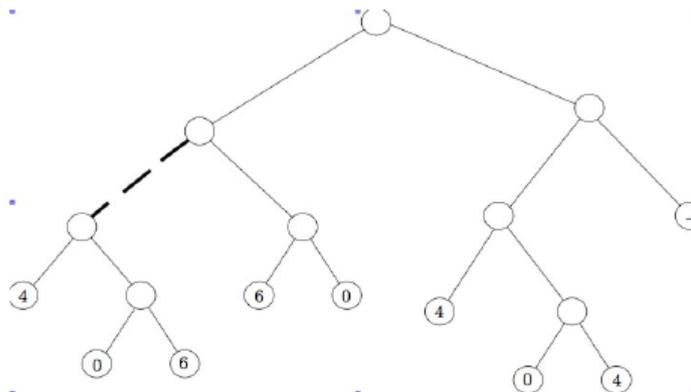
is used by the three active calls, which is the maximum value.

Input

The input consists of a number of test cases, where the data for each case is a full binary rooted tree (a full binary rooted tree consists of a single leaf node, or a root node connected to two full binary rooted trees. In such a tree, each node has either zero or two child nodes) of T leaf nodes on a line by itself. A tree is described by a set of matched parentheses and a set of integers in the range of -1 to $T - 1$, $3 \le T \le 5000$. Parentheses and integers are separated by single spaces.

A pair of matching parentheses represents the root of one full binary rooted tree and an integer represents a leaf node in the tree. Leaf nodes with the same integer value correspond to the subset of customers engaged in an active call. A leaf node with a value of '-1' indicates a customer who is not engaged in a call.

Two matched parentheses, separated by a single space, on a line by themselves indicate the end of input data and should not be processed.

Output

For each test case, the output consists of a single line. The line begins with the word 'Tree' followed by a space, an integer N, the character sequence ':␣', and then an integer indicating the maximum

communication load on any tree edge. N is the number of the test case starting with the value 1, and the symbol '␣' indicates a single space.

Sample Input

```
((01)((11)0))
((0(03))(((10)(10))3))
(((4(06))(60))((4(04))-1))
()
```

Sample Output

```
Tree 1: 2
Tree 2: 2
Tree 3: 3
```