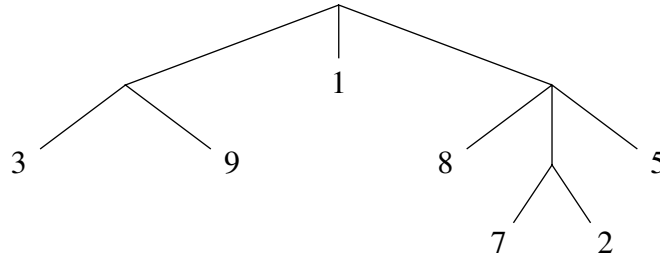


1993 Paper 3 Question 2

Common Lisp

Consider trees that have two kinds of nodes. A node is either a **leaf**, labelled by a number, or a **branch**, and has one or more subtrees. For example:



One imagines that the edges from each branch node are numbered from left to right starting from 0. A list of these numbers thus designates the path from the root to a node. In the tree shown above, the path (2 1 1) designates the path to the node labelled 2.

- (a) Describe a good representation for such trees in Lisp. [3 marks]
- (b) Write a Lisp function `getnode` such that `(getnode path tree)` returns the node of `tree` designated by `path`, assuming that the tree contains such a node. [5 marks]
- (c) Write a Lisp function `maxpath` such that `(maxpath tree)` returns the maximum of the leaf nodes in the tree, together with the path to that node. For the tree shown above, `maxpath` should return 9 as the maximum and (0 1) as the path. [12 marks]