Problem Set 5

Data Structures and Algorithms, Fall 2019

Due: October 17, in class.

From CLRS

Exercise 9.1-1, 9.2-1, 9.3-1, 9.3-6 (read the English version of this problem, the translation in the Chinese version may be incorrect), 9.3-8. Problem 9-2, 9-3. Exercise 10.4-4.

Additional Problem One

The pre/in/post-order numbering of a binary tree labels the nodes of a binary tree with the integers $0, \cdots, n-1$ in the order that they are encountered by a pre/in/post-order traversal. (See Figure 1.)
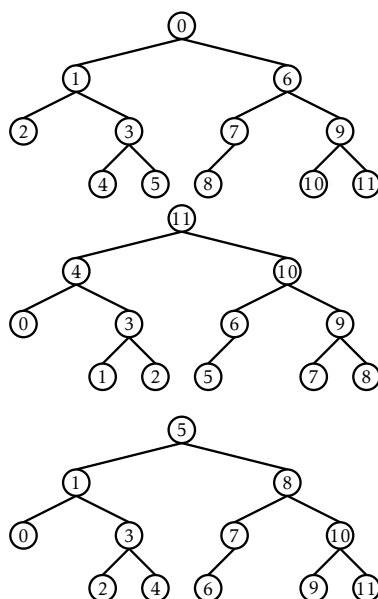

Figure 1: Pre-order, post-order, and in-order numberings of a binary tree.

Suppose you are given a list of nodes with pre-order and in-order numbers assigned. Prove that there is at most one possible binary tree with this pre-order/in-order numbering and show how to construct it.

Additional Problem Two

Suppose we are given a binary tree with pre-, post-, and in-order numbers assigned to the nodes. (That is, for each node in the tree, there is a data field storing the pre-, post-, and in-order numbers of this node.) Show how these numbers can be used to answer each of the following two questions in $O(1)$ time: **(a)** Given a node u, determine the size of the subtree rooted at u; and **(b)** Given two nodes u and w, determine if u is an ancestor of w.