1. Give an algorithm to compute the
   (a) height
   (b) number of leaves
   of a binary tree. *Hint:* using recursion will help.

2. (a) How many nodes are there in a complete binary tree of height 10? How about height 20, 30 or 40?
   (b) Analogous to a binary tree, let a *decimal tree* be such that each node can have at most ten children, which are called child_0, child_1, ..., child_9. How many nodes can a decimal tree have on level k? How many nodes in total can there be in a decimal tree of height h? What is the minimum height for a decimal tree with 5,000,000 nodes. How about 5,000,000,000 nodes, or 5,000,000,000,000 nodes?
   (c) Suppose we have a complete binary tree that contains n nodes and has height h. What is the minimum height of a decimal tree that contains the same amount of nodes? (Give your answer in terms of h.) How many nodes would there be in a complete decimal tree of height h? (Give your answer in terms of n.)

3. (a) Show that a non-empty complete binary tree satisfies the equation
   \[ \text{number of leaves} = \text{number of internal nodes} + 1. \]
   (b) Show that the above equation actually holds for any non-empty full binary tree. *Hint:* induction over the height of the tree.