CSCI 305, Homework # 8

YOUR NAME HERE

Due date: Midnight, Tuesday, June 5

Binary search trees with equal keys. This is problem 12-1 in the book.

Equal keys pose a problem for the implementation of binary search trees.

a. What is the asymptotic performance of TREE-INSERT when used to insert n items with identical keys into an initially empty binary search tree?

   Sould just be n as the tree grows down the left or right side. Each insert takes N time at worst thus it is N^2

We propose to improve TREE-INSERT by testing before line 5 to determine whether $z.key == x.key$ and by testing before line 11 to determine whether $z.key == y.key$.

If equality holds, we implement one of the following strategies. For each strategy, find the asymptotic performance of inserting n items with identical keys into an initially empty binary search tree. (The strategies are described for line 5, in which we compare the keys of z and x. Substitute y for x to arrive at the strategies for line 11.)

b. Keep a boolean flag $x.b$ at node x, and set x to either $x.left$ or $x.right$ based on the value of $x.b$, which alternates between FALSE and TRUE each time we visit x while inserting a node with the same key as x.

   n lg n

c. Keep a list of nodes with equal keys at x, and insert z into the list.

   n

d. Randomly set x to either $x.left$ or $x.right$. (Give the worst-case performance and informally derive the expected running time.)

   worst is n^2

   n lgn