CSC 226 - Assignment 1

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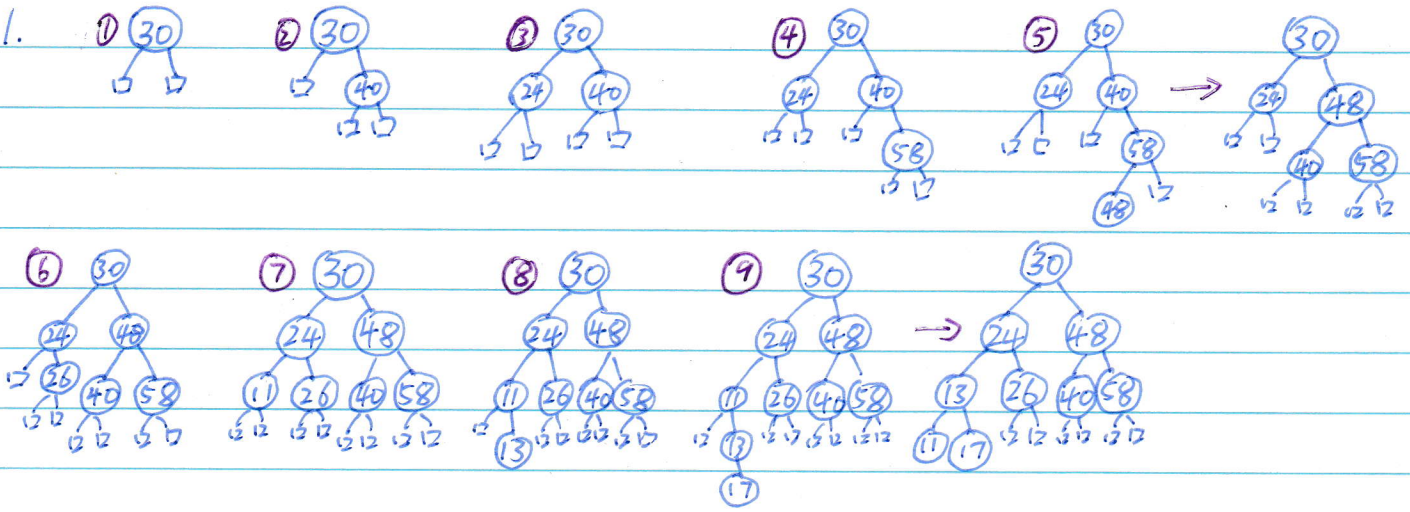
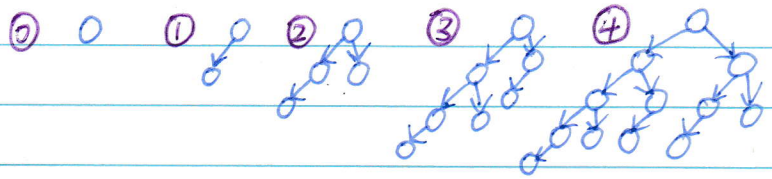
1.

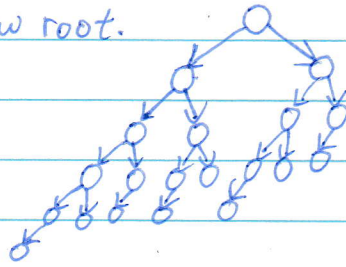


2. To get a minimum AVL tree of height 5 we need first to find minimum AVL trees of height 0-4, since we can conbine the AVL trees with h-1 and h-2 to find it



now we can use the property of the AVL tree to find the minmum tree of h=5 by conbine ③ and ④ with an new root.

if h starts with 1 not 0 then the minimum AVL tree with h=5 is ④ which has [7] internal nodes



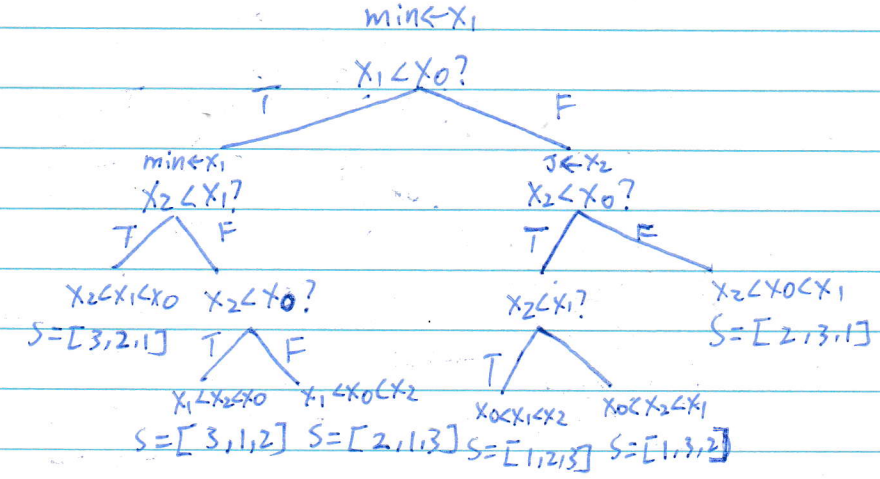
Since the internal nodes of a minimum AVL tree of height h = the node in the minimum AVL tree of h-1, the internal nodes = [12]

3. Since $f(n) \in O(g(n))$ then $\exists c_1 > 0$ and n_0 s.t. $f(n) \leq c_1 g(n)$ for all $n_1 > n_0$

Since $f(n) \in \Omega(g(n))$ then $\exists c_2 > 0$ and n_0 s.t. $f(n) \geq c_2 g(n)$ for all $n_2 > n_0$

Let $n = max(n_1, n_2)$ we have $c_2 g(n) \leq f(n) \leq c_1 g(n) \rightarrow f(n) \Theta g(n)$

4.



5. As we know in quick sort we only have 50% chance to get a good pivot so that the height of the tree is $2 \cdot \log_{4/3} n$ and we need to pick pivot n times. The running time of Quick sort is $2 \cdot n \cdot \log_{4/3} n \in O(n \log n)$. In this situation, my Rustbucket has 50% chance of having internal disk fault. which means we may need to do each comparison two times so that we have $2 \cdot 2n \log_{4/3} n$ $= 4n \log_{4/3} n \in O(n \log n)$