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Section 03

# CS 202-Homework 02 Report

## Question 1

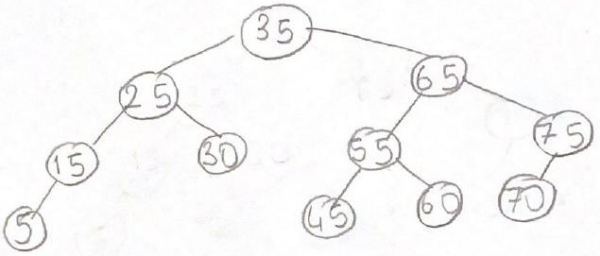
Question 1)

a) pre-order: K-N-P-T-C-O-R-S-A

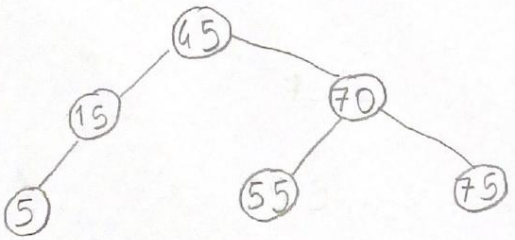
in-order: P-T-N-C-K-R-O-S-A

post-order: T-P-C-N-R-A-S-O-K

b) final tree after all insertions:

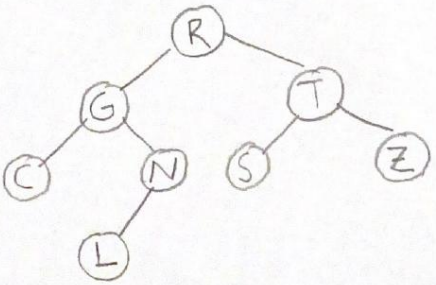



final tree after deletion operations:

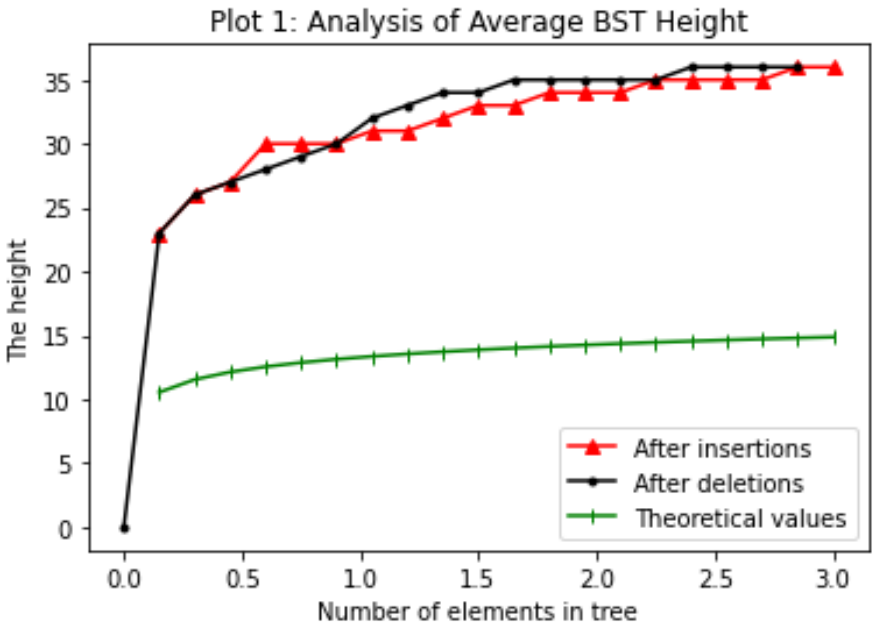



c) post-order traversal = C-L-N-G-S-Z-T-R

the tree =



## Question 3




The graphical analysis of the number of elements in the tree versus the tree height is shown in Plot 1. As it can be seen, the lines of insertion and deletion are similar to log(n). The height increases by one or two in each interval for insertion and deletion lines just like the line of log(n), except for the starting interval. This makes sense because we know that theoretically, in the average case, the height of a complete binary tree with n elements is close to log(n+1) in base 2. The best case for the height is also log(n+1) while the worst case is n. So the difference between my results and the theoretical values can be explained because since the inserted elements are random, the height of the tree should have a value between the worst case and best case which were n and log(n+1). Therefore, the results that I have obtained satisfy the theoretical values.

As it can be seen from Plot 1, there are slight differences between the insertion and deletion lines. This is due to the fact that the array is shuffled before it is inserted. So the deletion is not done in the same order of nodes as insertion, therefore their lines differ slightly. If the array was not shuffled before the nodes are deleted, then the two lines would have been expected to be the same.