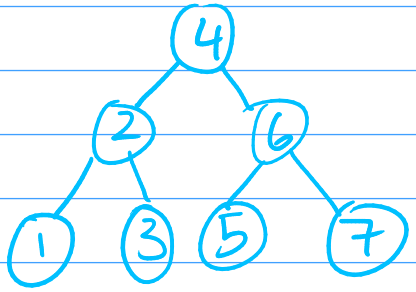
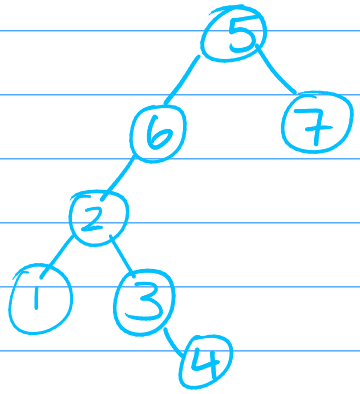
Q1.

a. Values to insert: ~~4 2 6 5 1 7 3~~



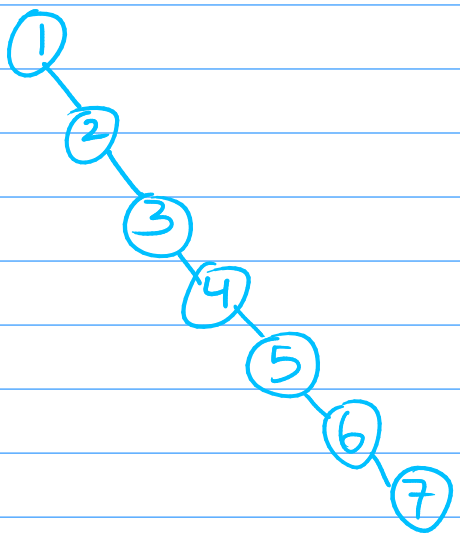
This is a perfectly balanced tree, since it is both height and weight balanced.

b. Values to insert: ~~5 6 2 3 4 7 1~~



This is an unbalanced tree, since its left and right subtrees differ in height by >1.

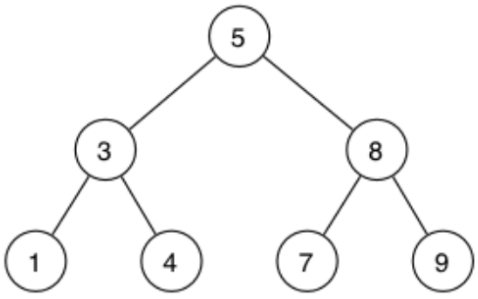
c. Values to insert: ~~1 2 3 4 5 6 7~~



This is called a degenerate tree

Its performance is similar to that of a linked list.

Q2.



Infix Order 1 3 4 5 7 8 9

Prefix Order 5 3 1 4 8 7 9

Postfix Order 1 4 3 7 9 8 5

Level Order 5 3 8 1 4 7 9

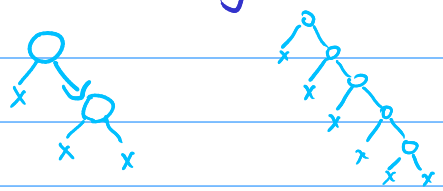
Infix traversal: (inorder) visit left child then the node then right child. Useful for visiting the tree nodes in increasing/sorted order

Prefix traversal: (preorder) visit the node then left child then right child. Useful for creating a copy of a tree

Postfix traversal: (postorder) visit left child then right child then the node. Useful for deleting a tree.

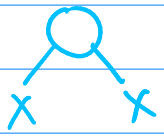
Which trees have the same infix and prefix traversals?

Right-degenerate binary trees (basically linked lists):



What about trees with all 4 traversals the same?

Single-node (leaf) trees and empty trees.

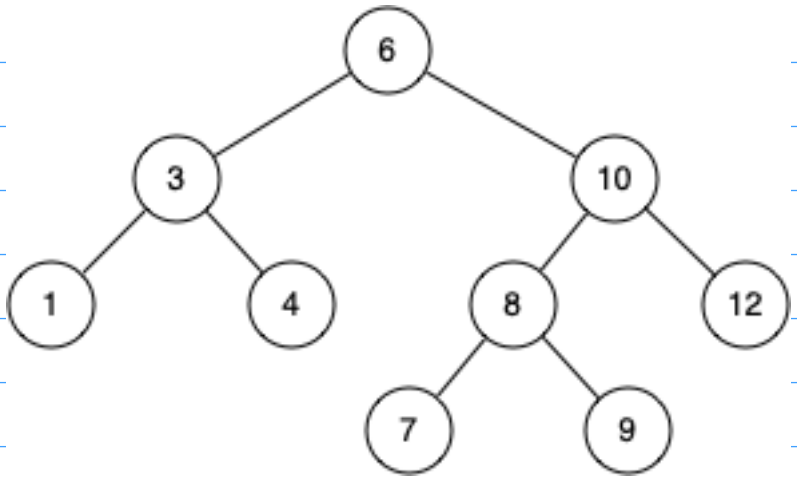


Leaf

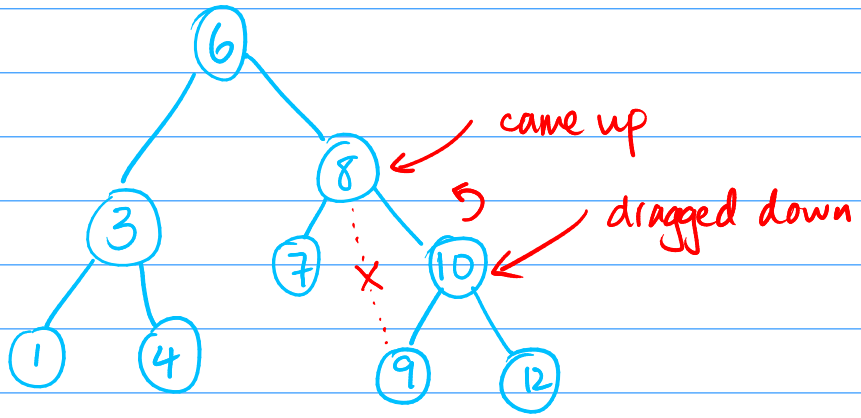
X

Empty

Q9.



After rotating 10 right:



After rotating 6 left: