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Algorithm 7 Assignment

1. True or False questions
   a. BST Operations (Search, Predecessor, Successor, Minimum, Insert, Delete) are O(h), where h is tree height.
   b. Height of a binary search tree with n elements is $\theta(\log(n))$.
   c. A new node is always inserted as a leaf node in BST.
   d. Inorder tree walk of a binary search tree outputs an unsorted sequence.
   e. When deleting node z with 2 children, we cannot replace z by its predecessor.
   f. In an AVL tree, the right subtree and the left subtree of any node have the same height.

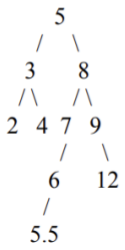
a. True
b. False
c. True
d. False
e. False
f. False

2. Write pseudocode for RIGHT-ROTATE. (Exercise 13.2-1 in CLRS Textbook, page 313)

Question 2.

```
Right-Rotate(T, x):
    y = x.left
    x.left = y.right
    if y.right ≠ NIL
        y.right.p = x
    y.p = x.p
    if x.p = NIL
        T.root = y
    elif x == x.p.right.
        x.p.right = y
    else
        x.p.left = y
    y.right = x
    x.p = y.
```

3. Build an AVL Tree out of the Binary Search Tree according to the rotation operations in the lecture with one rotation operation. Also answer the type of this rotation (Single or Double).



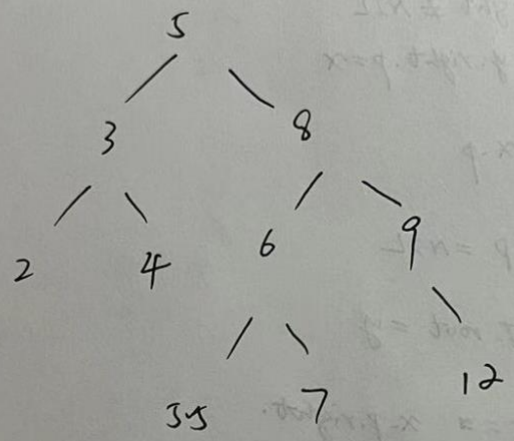
Question 3

Doing the Right Rotation

Based on Height of left subtree − Height of right subtree

⇒

⇒ we have



∴ Single Rotation.

4. Build an AVL tree: keys are inserted in the order of:

   40->30->20->29->24->27,

   Please plot the AVL tree after each key is inserted, and mark the type of rotation taken, if any, at each step.

Question 4.

∴ height of left subtree − height of right subtree.

① 1) 40 / 30 ⇒ 2) 40 / 30 / 20 ⇒ single right rotation ⇒ 30 / 20 40

② insert 29

1) 30 / 20 40 / 29 ⇒ insert 24 ⇒ 30 / 20 40 / 29 / 24 ⇒ right rotation at 29 ⇒ 30 / 20 40 / 24 / 29

left rotation at 20 ⇒ 30 / 24 40 / 20 29

③ insert 27

1) 30 / 24 40 / 20 29 / 27 ⇒ Left Rotate ⇒ 2) 30 / 29 40 / 24 / 20 27 ⇒ right rotate ⇒ 29 / 24 30 / 20 27 40

final Balance