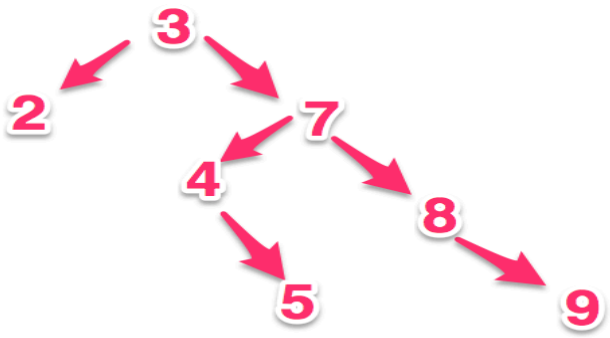
Part 1 – Theory

Problem 1

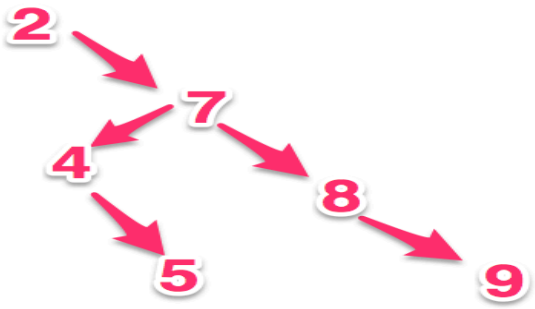
(a) Assume you start with an empty Binary Search Tree. Show the result of inserting 3,7,2,8,9,4,5 into the tree (in this sequence). Is the tree balanced? If not, where is the balance condition violated?

answer: It is unbalanced the node 7 and node 3 is unbalanced.

(b) Show the result of deleting the root of the tree from part (a) (using the convention for the deletion operation made in class).
Before deleting the root.



After deleting the root, the node 2 will go to the top. It is still unbalanced.



Problem 2

When insert 9 into the tree, we need rotate node 7. We using single rotation, the k1 is 7, k2 is 8, z is 9, after rotation, 8 will be right side of child of root 3, the 7 will be left side child of root 8, and the 9 will be right side child of node 8(Figure 3). Then we insert 4. The node 3 will become unbalanced. Then we use right-left double rotation, k1 is 3, A is 2, k3 is 8, k2 is 7, B is 4, D is 9. After double rotation, the tree will become like this. The 7 is root, and 3 is left child of 7, 8 is right child of 7. The 2 is left child of node 3, the 4 is right child of node 4. The 9 will be right child of node 8(Figure 4). Next, we want to insert 5. It will still be balanced. After insert 5, it will like this. The 7 is top root. The node 3 is left child of node 7, the 8 is right child of

node 7. The 2 is left child of node 3, the 4 is right child of node 3. The 5 is right child of node 4. The 9 is right child of node 8(Figure 5).

Figure 3: Inserting 9

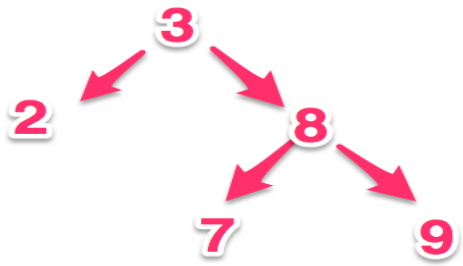


Figure 4: Inserting 4

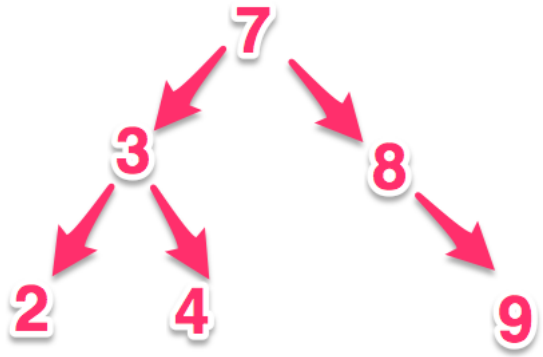


Figure 5: Inserting 5