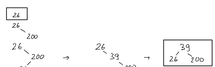
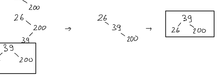
Homework 3
Monday, October 20, 2020 2:18 PM

Problem 1

a. Insert 26
Insert 200



Insert 39

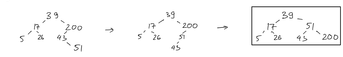


Insert 17

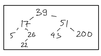
Insert 43

Insert 5

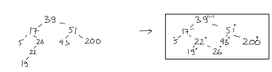
Insert 51



Insert 22

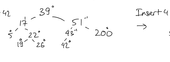


Insert 19



b To causes a single right rotation in the tree, add 42 and 41

Insert 42

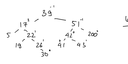


Insert 41

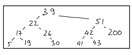
Right rotation

To rotate left, add 30.

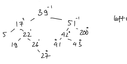
Insert 30



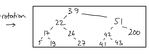
Left rotation



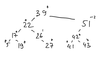
c. Insert 29 after right rotation



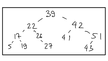
Left rotation



Delete 200



Right rotation



d $\boxed{\text{Minimum number of nodes} = 19}$

$$N(5) = N(4) + N(3) + 1 = N(3) + N(2) + N(2) + N(1) + 1$$
$$= 3N(2) + 2N(1) + 1$$
$$= 5N(1) + 3N(0) + 1 = 5 \cdot 2 + 3 \cdot 1 + 1 = 14$$

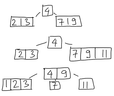
e. Every AVL tree is balanced: $\boxed{\text{True}}$
f. Every AVL tree is completed: $\boxed{\text{False}}$
g. Some AVL tree is completed: $\boxed{\text{True}}$

Problem 2

a,
Insert 4
Insert 3

Insert 9

Insert 2



Insert 7

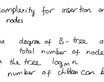
Insert 11

Insert 1

Insert 6

Insert 8

Insert 11



b. Delete 11

c, Time complexity for insertion and deletion operations in B-tree is $\boxed{O(\log N)}$ where N is number of nodes

We have degree of B-tree always $\leq m$
total number of nodes: n
Height of the tree $\log_m n$
Since the number of children can be changed per node $\Rightarrow$ insert. $O(\log m)$ $\Big\}$ $O(\log_m n) \cdot O(\log m)$

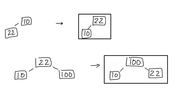
$\Rightarrow O(\log n / \log m) \cdot O(\log m) = O(\log n)$

That also applied for deletion operation in B tree

Problem 3

a, Insert 10

Insert 22



Insert 100

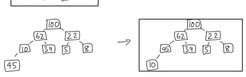
Insert 34

Insert 62

Insert 5

Insert 8

Insert 45



Insert 3

Insert 72

Insert 7

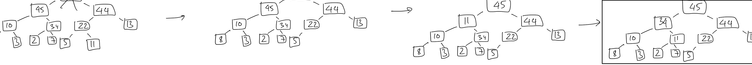
Insert 44

Insert 11

Insert 15

Insert 2

b Remove 100

Remove 72

Remove 62