

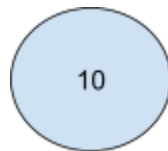
Jhymani Joseph
AVL Tree Homework

Set 1: Left-Right and Right-Left Rotations

Insert the following values in order:

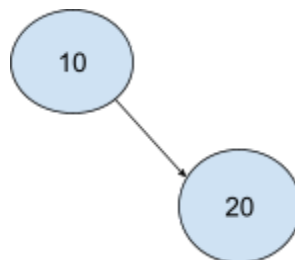
10, 20, 30, 15, 25, 5, 35, 27

Insert 10:



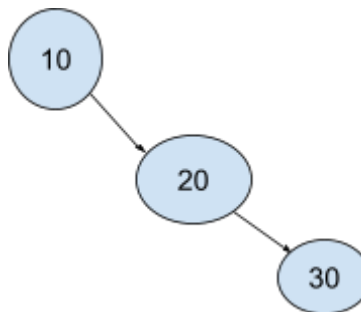
Bf at 10 = 0

Insert 20:



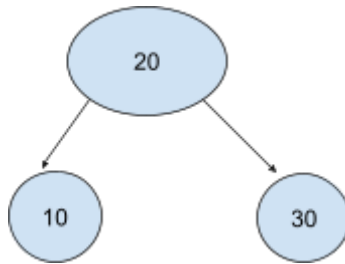
Bf at 10 = -1 , bf at 20 = 0

Insert 30:



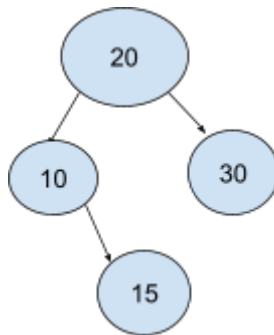
Bf at 10 = -2 (RR Imbalance at 10 → L Rotation), bf at 20 = -1 , bf at 30 = 0

After Left rotation on 10:



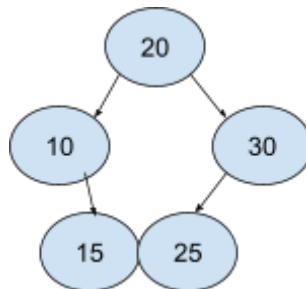
Bf at 20 = 0, bf at 10 = 0, bf at 30 = 0

Insert 15:



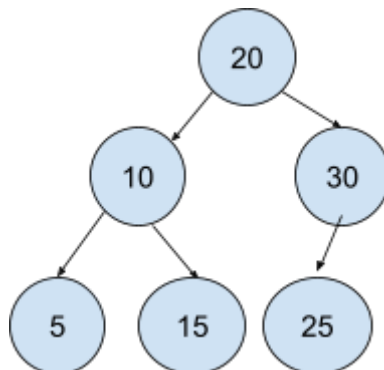
Bf at 15 = 0, bf at 10 = -1, bf at 30 = 0, bf at 20 = 1

Insert 25:



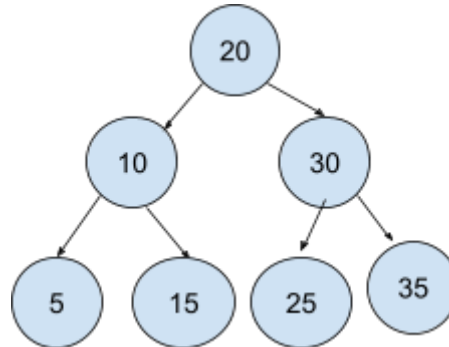
Bf at 20 = 0 , bf at 10 = -1, bf at 30 = 1, bf at 25 = 0, bf at 15 = 0

Insert 5:



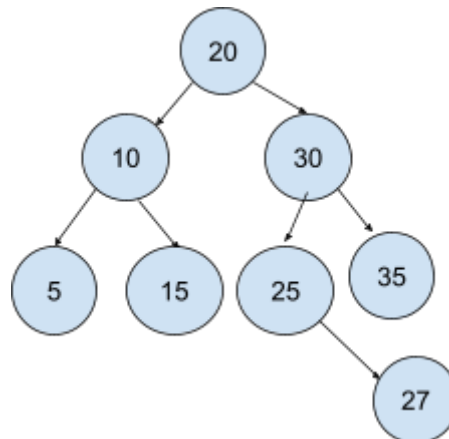
Bf at 20 = 0, bf at 10 = 0, bf at 30 = 1, bf at 5 = 0, bf at 15 = 0, bf at 25 = 0

Insert 35:



Bf at 20 = 0, bf at 10 = 0, bf at 30 = 0, bf at 5 = 0, bf at 15 = 0, bf at 25 = 0, bf at 35 = 0

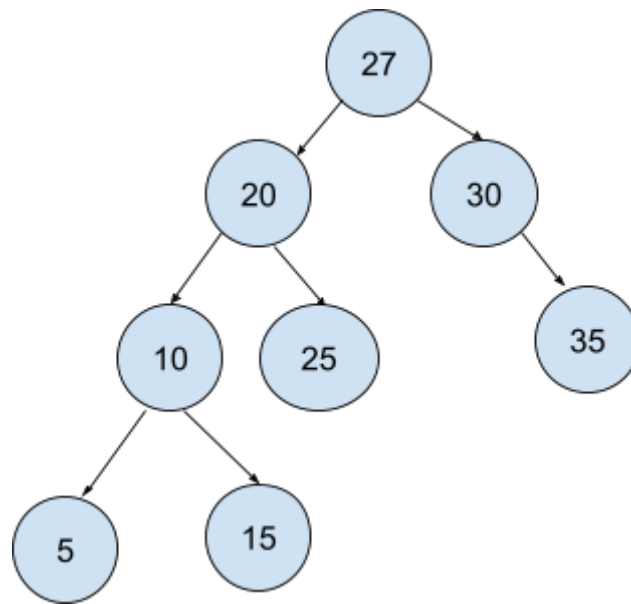
Insert 27:



Bf at 20 = 1, bf at 10 = 0, bf at 30 = 2 (RL Imbalance at 30 → LR Rotation), bf at 5 = 0,
bf at 15 = 0, bf at 25 = -1, bf at 35 = 0, bf at 27 = 0

After Right-Left rotation:

Final AVL Tree:



Set 2: Multiple Rotations in Different Branches

Insert the following values in order:

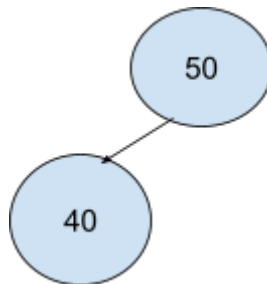
50, 40, 45, 60, 55, 70, 35, 30, 65, 75, 43

Insert 50:



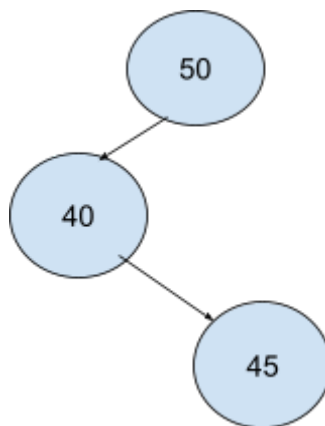
Bf at 50 = 0

Insert 40:



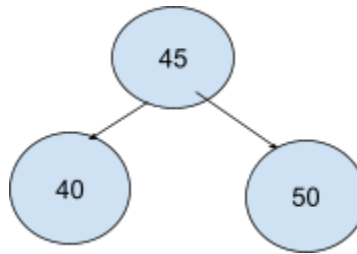
Bf at 50 = 1, bf at 40 = 0

Insert 45:



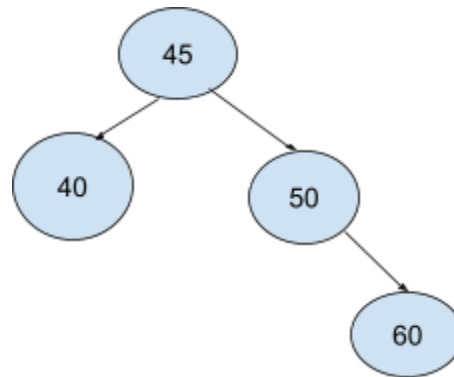
Bf at 50 = 2 (LR Imbalance at 50 → RL Rotation), bf at 40 = -1, bf at 45 = 0

After Right-Left rotation:

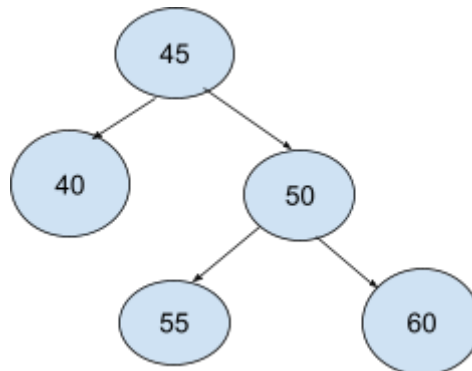


Bf at 45 = 0 , bf at 40 = 0 bf at 50 = 0

Insert 60:

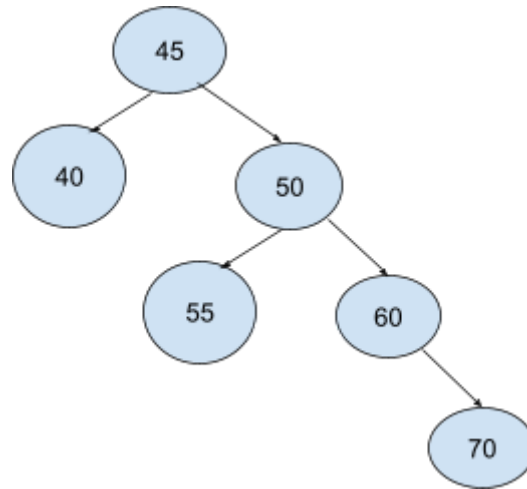


Insert 55:



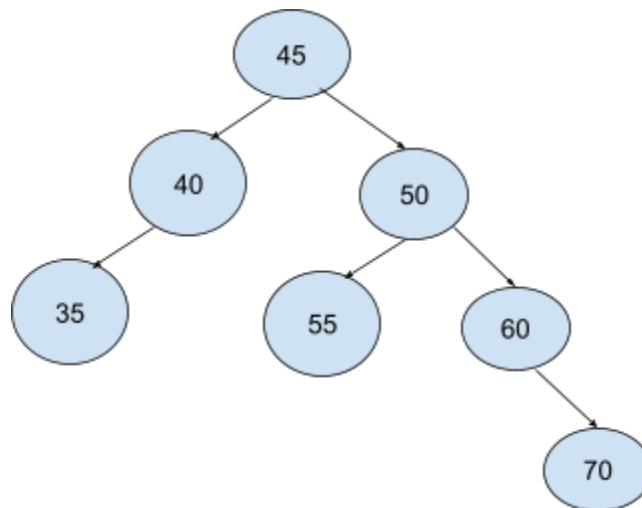
Bf at 55 = 0, bf at 50 = 0 , bf at 60 = 1 , bf at 40 = 0
bf at 45 = -1

Insert 70:



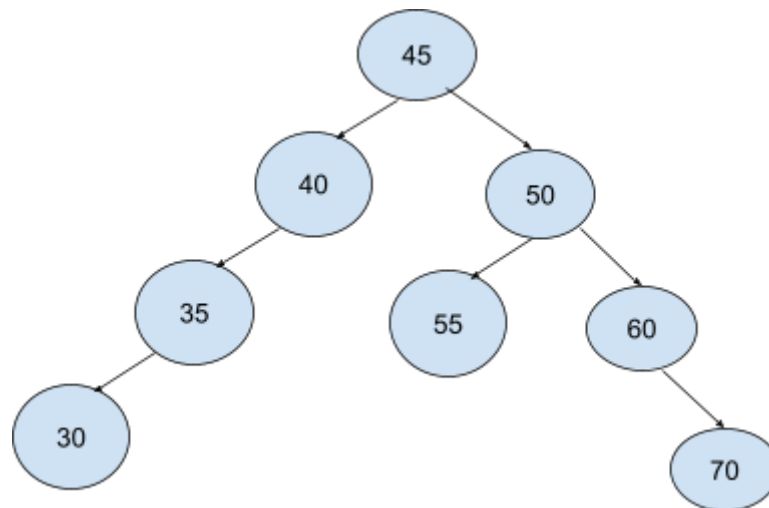
Bf at 55 = 0, bf at 50 = -1, bf at 60 = -1, bf at 40 = 0 , bf at 45 = -1, bf at 70 = 0

Insert 35:



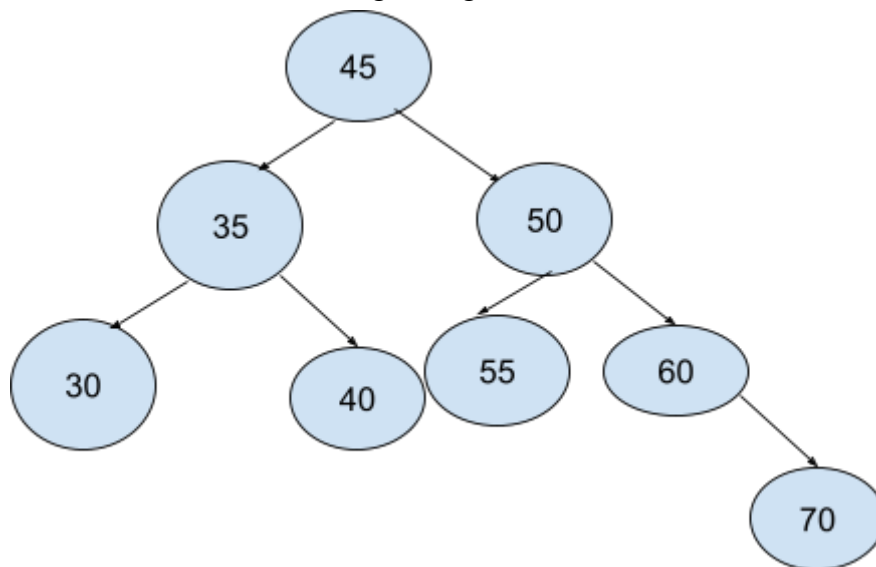
Bf at 55 = 0, bf at 50 = -1, bf at 60 = -1 ,bf at 70 = 0, bf at 40 = 1, bf at 45 = 0 bf at 35 = 0

Insert 30:

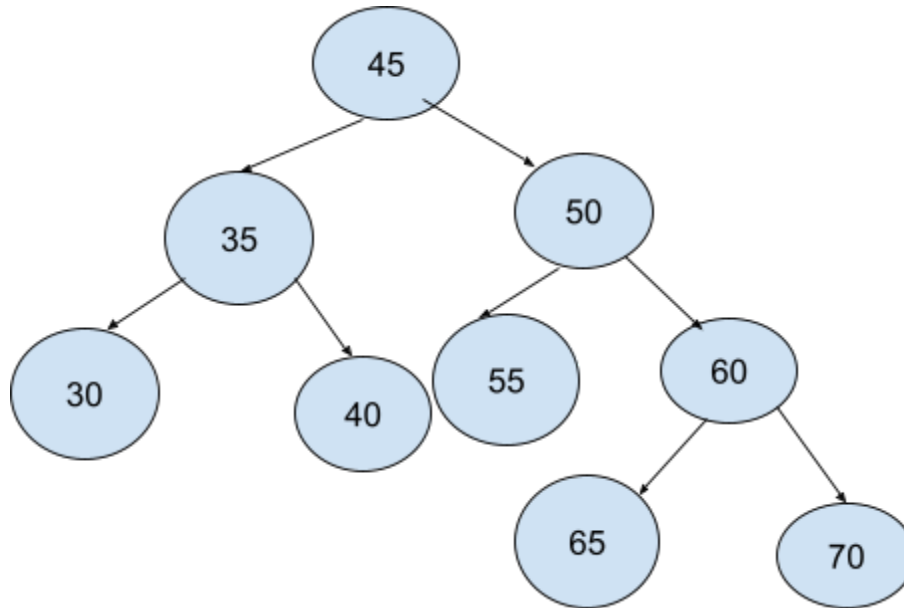


Bf at 55 = 0, bf at 50 = -1, bf at 60 = -1, bf at 70 = 0, bf at 40 = -2 (LL Imbalance at 40 → PR Rotation), bf at 30 = 0, bf at 45 = 1, bf at 35 = -1

After Right- Right Rotation:

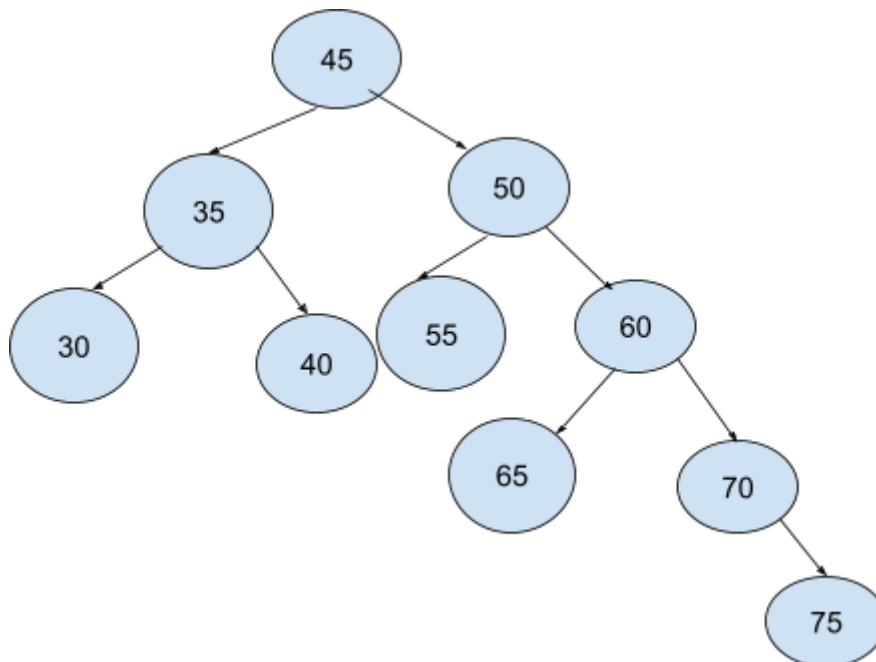


Insert 65:

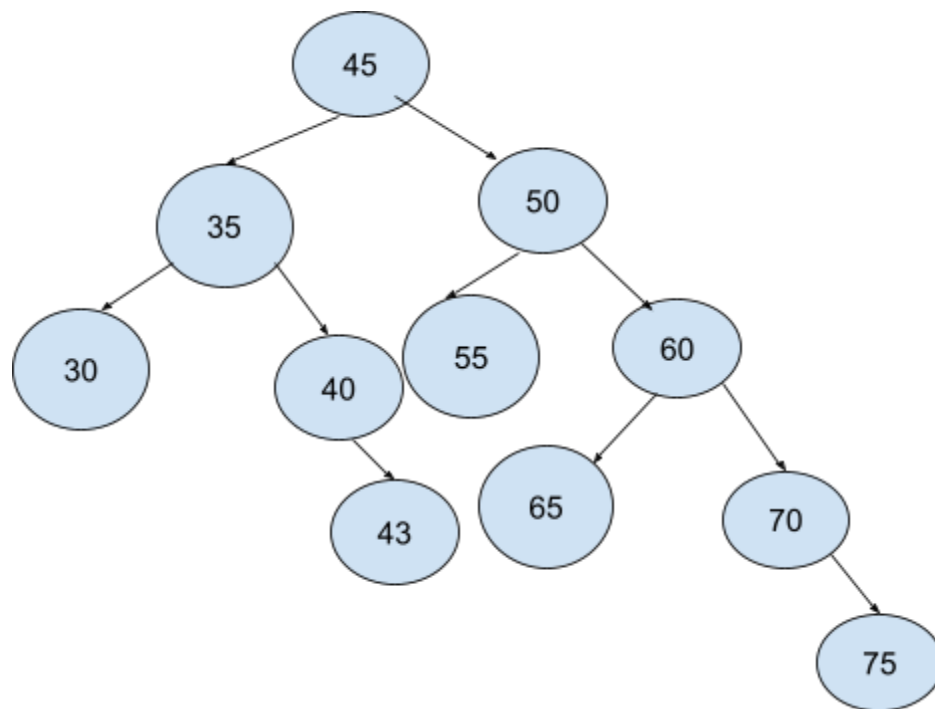


Bf at 40 = 0, bf at 35 = 0, bf at 30 = 0 ,bf at 55= 0, bf at 45 = 0, bf at 50 = -1 , bf at 60 = 0, bf at 70 = 0, bf at 65 = 0

Insert 75:



Insert 43:
Final AVL Tree:

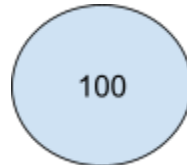


Set 3: Alternating Insertions Causing Frequent Rebalancing

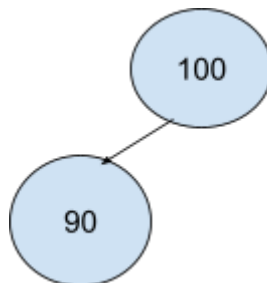
Insert the following values in order:

100, 90, 110, 80, 95, 85, 105, 120, 102, 108

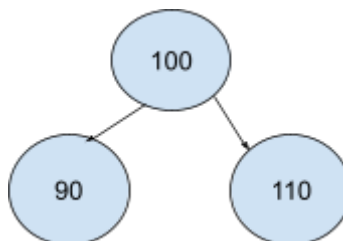
Insert 100:



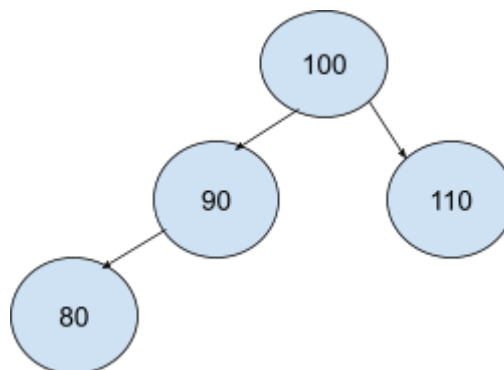
Insert 90:



Insert 110:

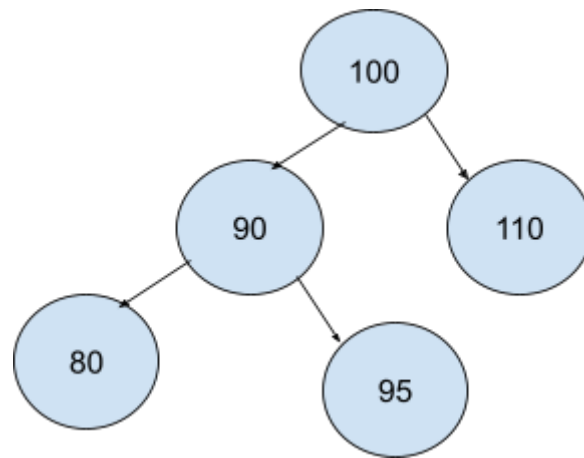


Insert 80:

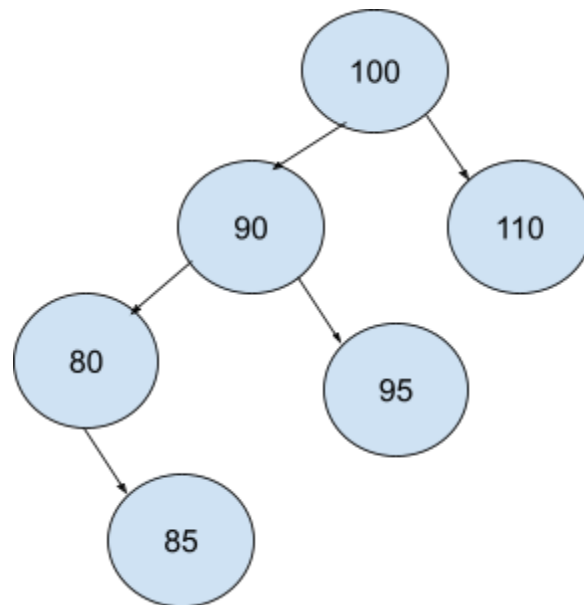


Bf at 100 = 1, bf at 80 = 0, bf at 100 = 0, bf at 110 = 0.

Insert 95:

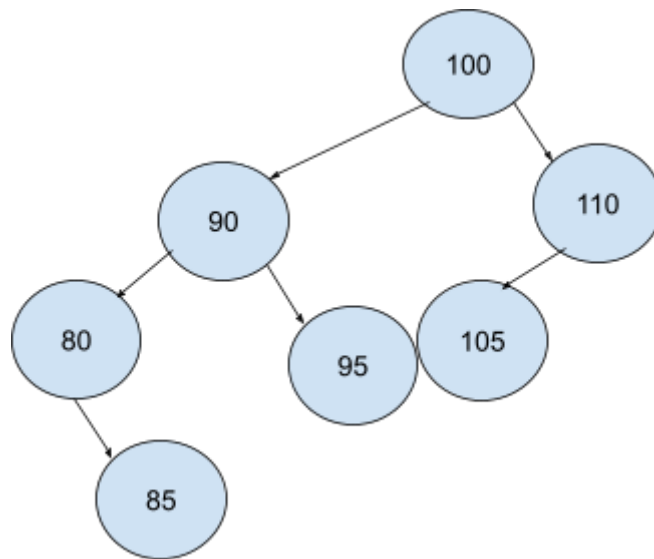


Insert 85:



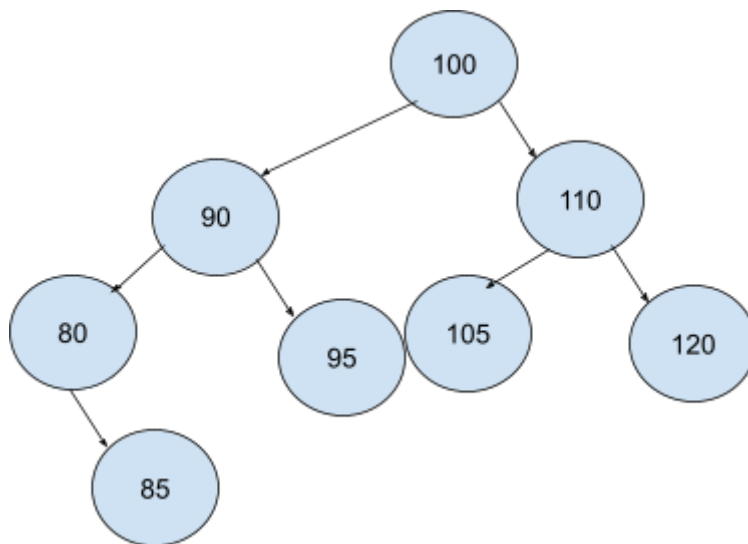
Bf at 85 = 0, bf at 80 = -1, bf at 90 = 1, bf at 95 = 0, bf at 100 = 1, bf at 110 = 0

Insert 105:



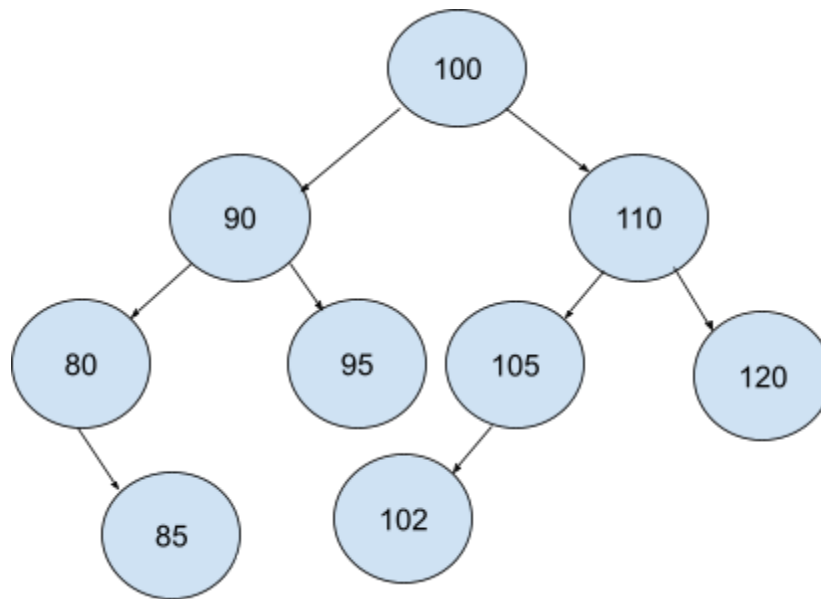
Bf at 100 = 0 , bf at 90 = 1, bf at 110 = 1, bf at 80 = -1, bf at 95 = 0 , bf at 85 = 0, bf at 105 = 0

Insert 120:



Bf at 100 = 0 , bf at 90 = 1, bf at 80 = -1, bf at 95 = 0 , bf at 85 = 0, bf at 110 = 0, bf at 105 = 0,
bf at 120 = 0

Insert 102:

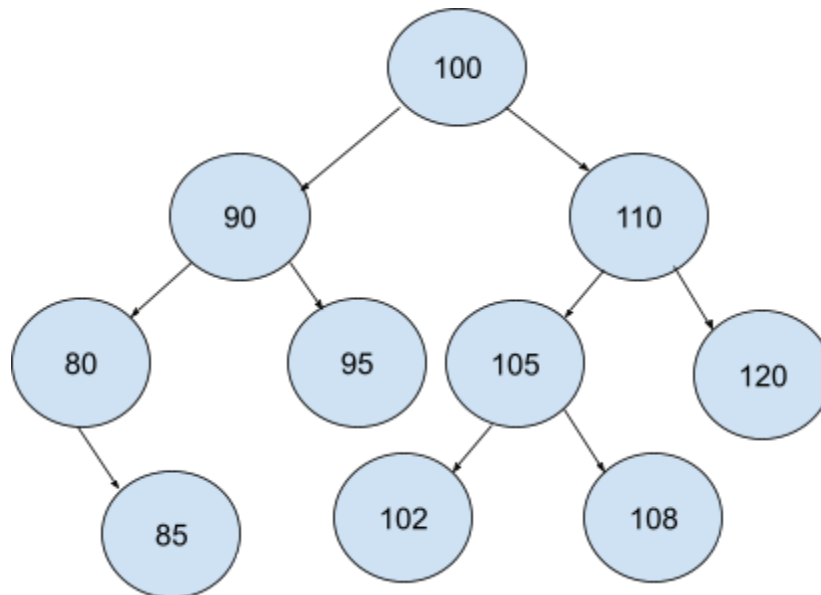


Bf at 100 = 0 , bf at 90 = 1, bf at 80 = -1, bf at 95 = 0 , bf at 85 = 0, bf at 110 = 1, bf at 105 = 1,
bf at 120 = 0, bf at 102 = 0

Insert 108:

Final AVL Tree:

No rotations necessary:



Bf at 100 = 0 , bf at 90 = 1, bf at 80 = -1, bf at 95 = 0 , bf at 85 = 0, bf at 110 = 1, bf at 105 = 0,
bf at 120 = 0, bf at 102 = 0, bf at 108 = 0.