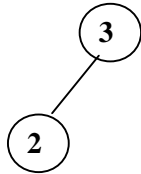


AVL Trees Example

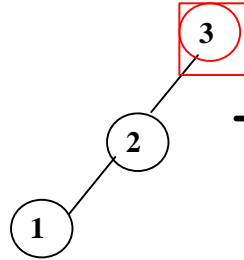
Insert 3



Insert 2

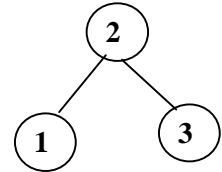


Insert 1 (non-AVL)

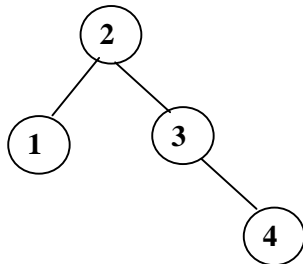


Single rotation

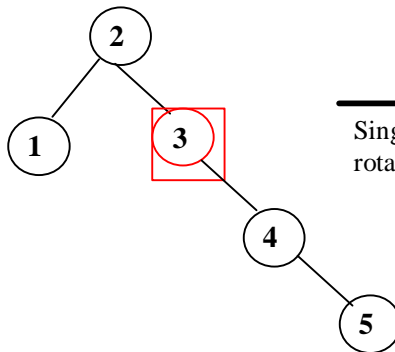
AVL



Insert 4

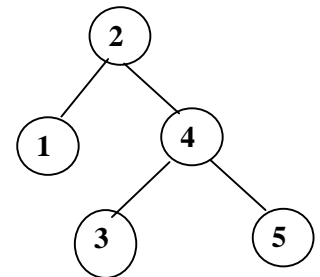


Insert 5 (non-AVL)

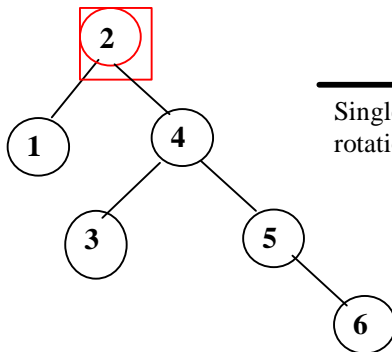


Single rotation

AVL

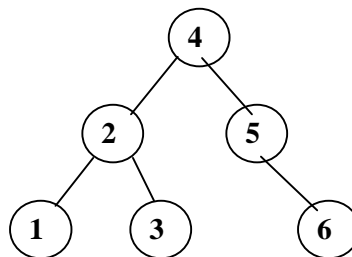


Insert 6 (non-AVL)

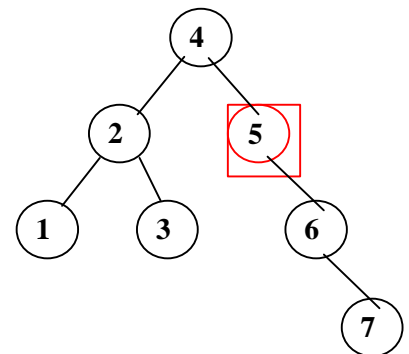


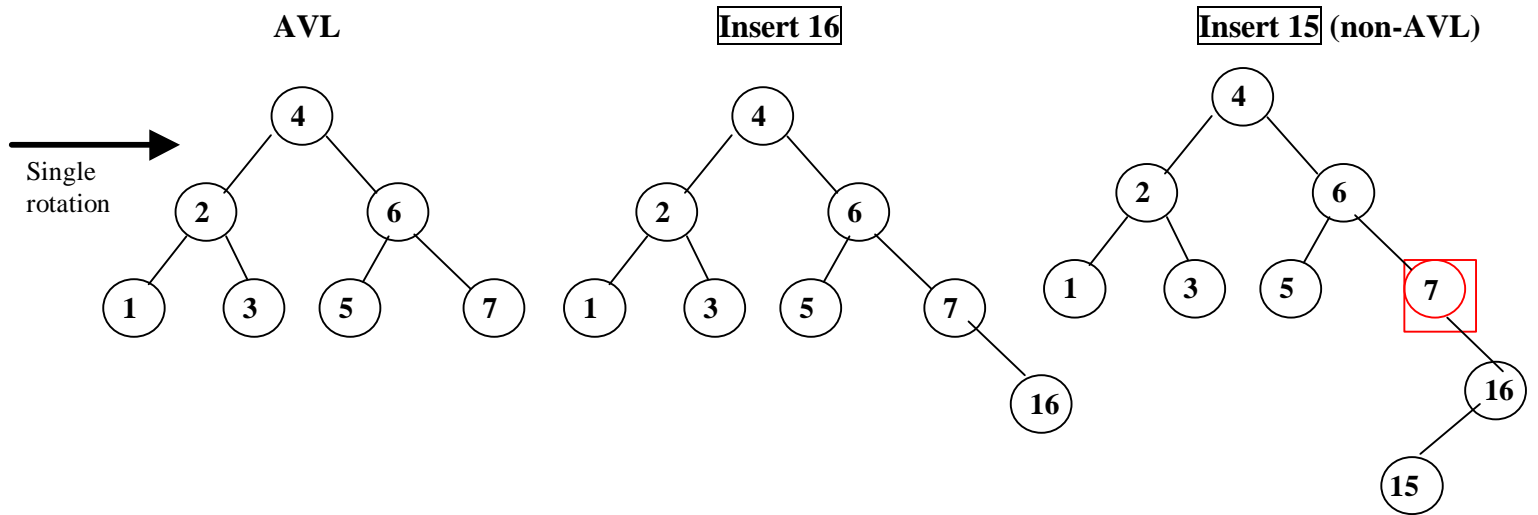
Single rotation

AVL



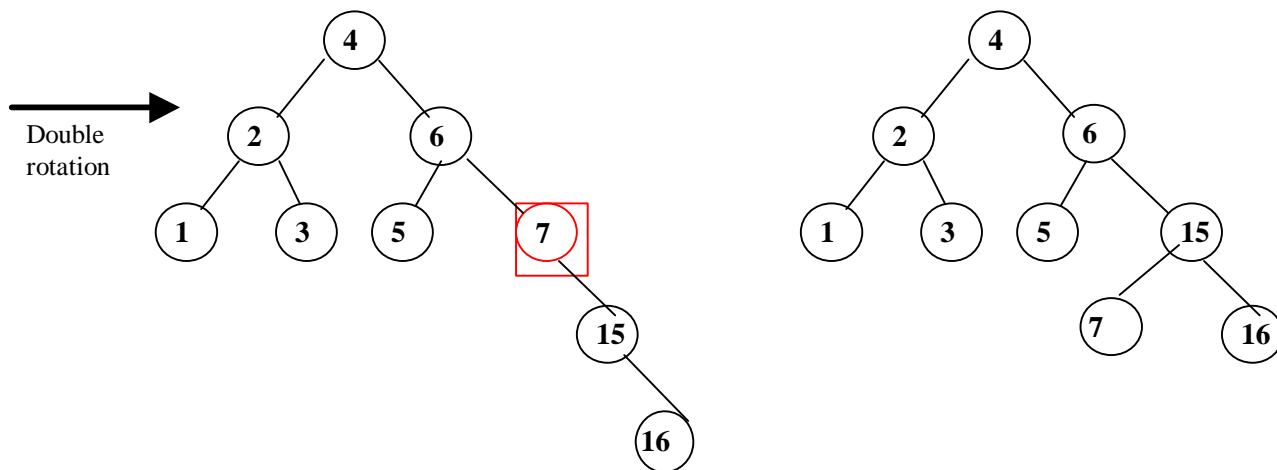
Insert 7 (non-AVL)





Step 1: Rotate child and grandchild

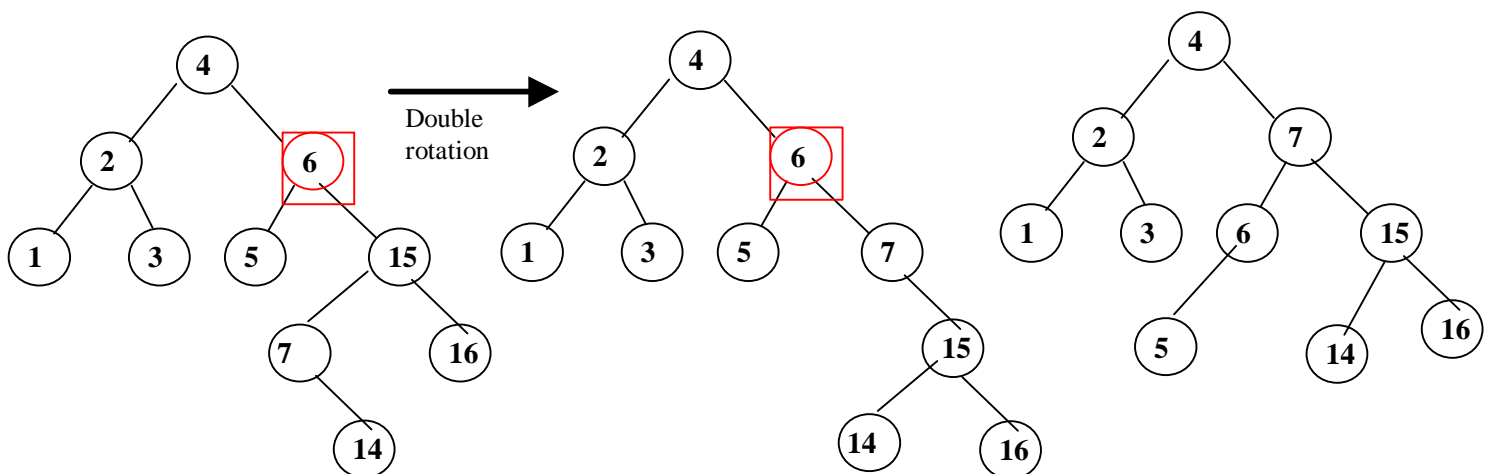
Step 2: Rotate node and new child (AVL)



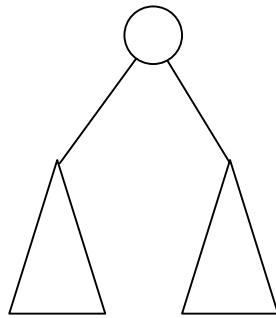
Insert 14 (non-AVL)

Step 1: Rotate child and grandchild

Step 2: Rotate node and new child (AVL)

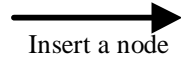


AVL Tree



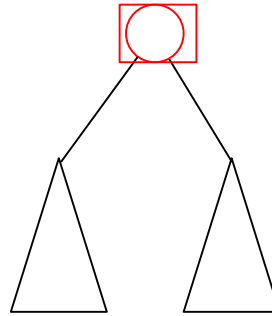
h

$h+1$



Insert a node

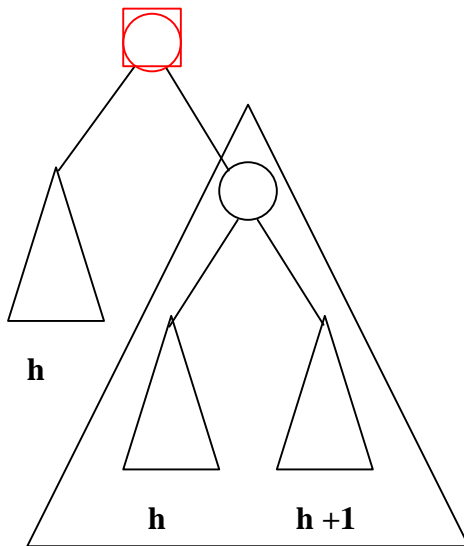
No longer AVL, must rebalance



h

$h+2$

Two ways to expand subtree of height $h+2$:



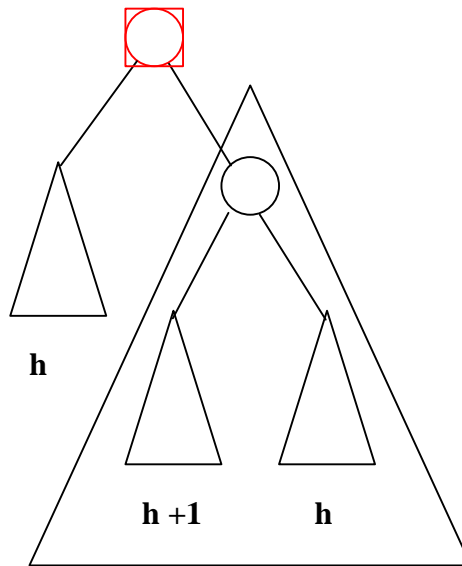
h

h

$h+1$

$h+2$

Apply a **Single** Rotation



h

$h+1$

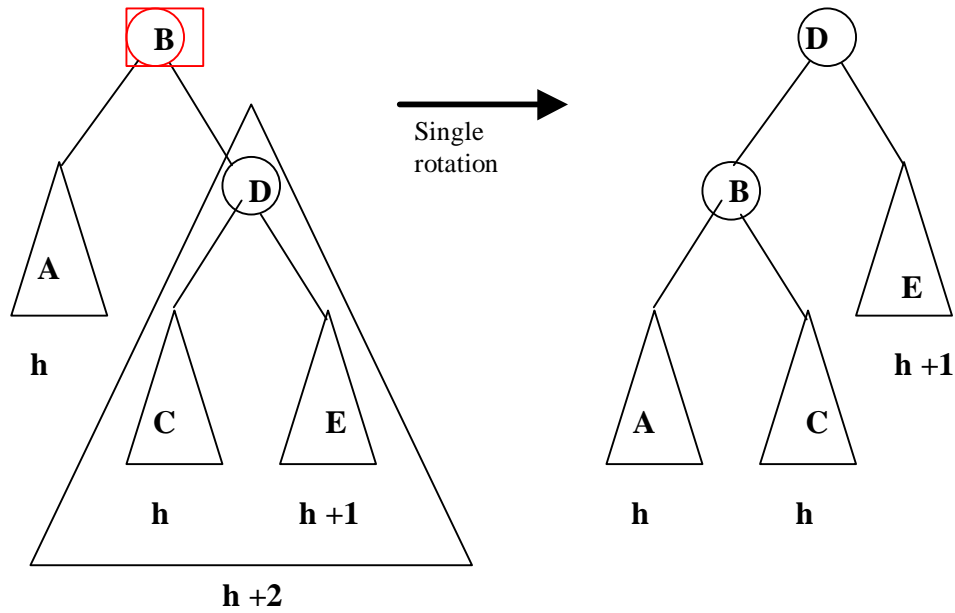
h

$h+2$

Apply a **Double** Rotation

Note: the symmetrical case is handled identically (i.e. mirror image)

Single Rotation:



Double Rotation:

