

* binary search trees

	←-----→			
restriction	loose			strict
worst search time	$O(n)$	$>$	$O(h) \approx O(h)$	$>$ $O(\log n)$
maintenance time after insertion	$O(1)$	$<$	$O(1)$	$<$ $O(n)$
worst height	$O(n)$	$>$	$O(\log n) \approx O(\log n)$	$>$ $O(\log n)$
	arbitrary BST		RB tree	AVL tree
				complete BST

* AVL tree (1962)
Adelson Velskii Landis

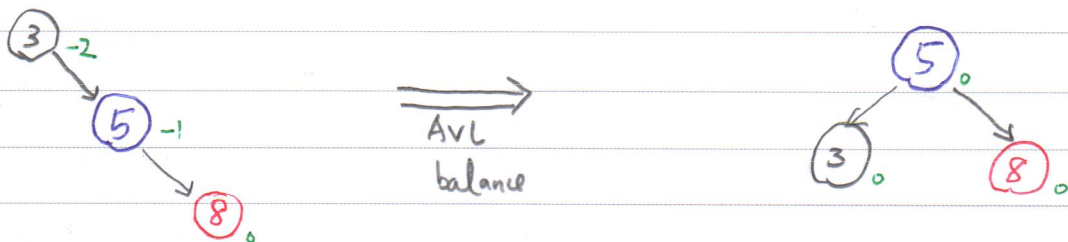
a BST such that

$$\left| \underbrace{\text{height}(T_L)}_{h_L} - \underbrace{\text{height}(T_R)}_{h_R} \right| \leq 1 \quad \text{for every subtree}$$

balance factor

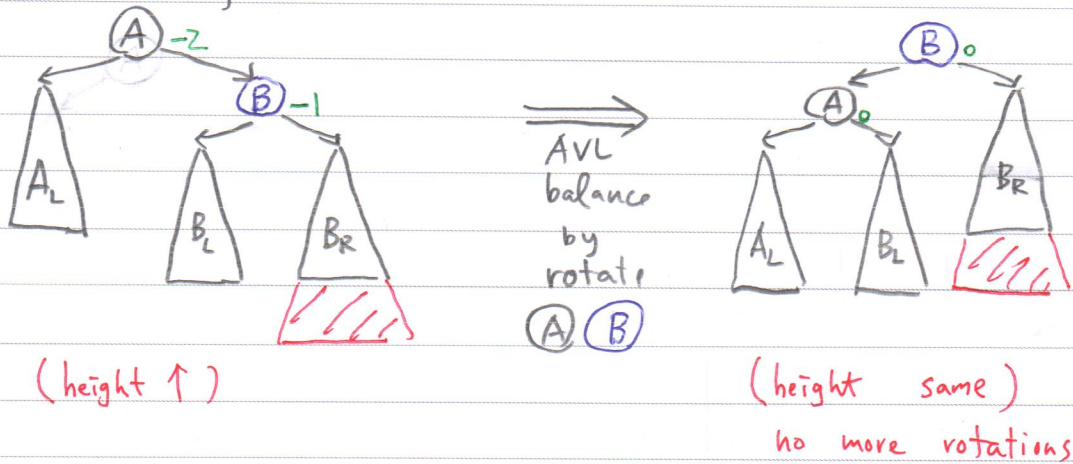
$$BF(T) = h_L - h_R = \begin{cases} 1 \\ 0 \\ -1 \end{cases}$$

* insert 3, 5, 8 to AVL



operation: rotate 3 5

* case RR during insertion



similar for LL

* insert 1, 2, 3, 4, 5, 6, 7

