

FIGURE 6.3 Four rotation types for AVL trees with three nodes. (a) Single R -rotation. (b) Single L -rotation. (c) Double LR -rotation. (d) Double RL -rotation.

The second rotation type is called the *double left-right rotation (LR-rotation)*. It is, in fact, a combination of two rotations: we perform the L -rotation of the left subtree of root r followed by the R -rotation of the new tree rooted at r (Figure 6.5). It is performed after a new key is inserted into the right subtree of the left child of a tree whose root had the balance of $+1$ before the insertion.

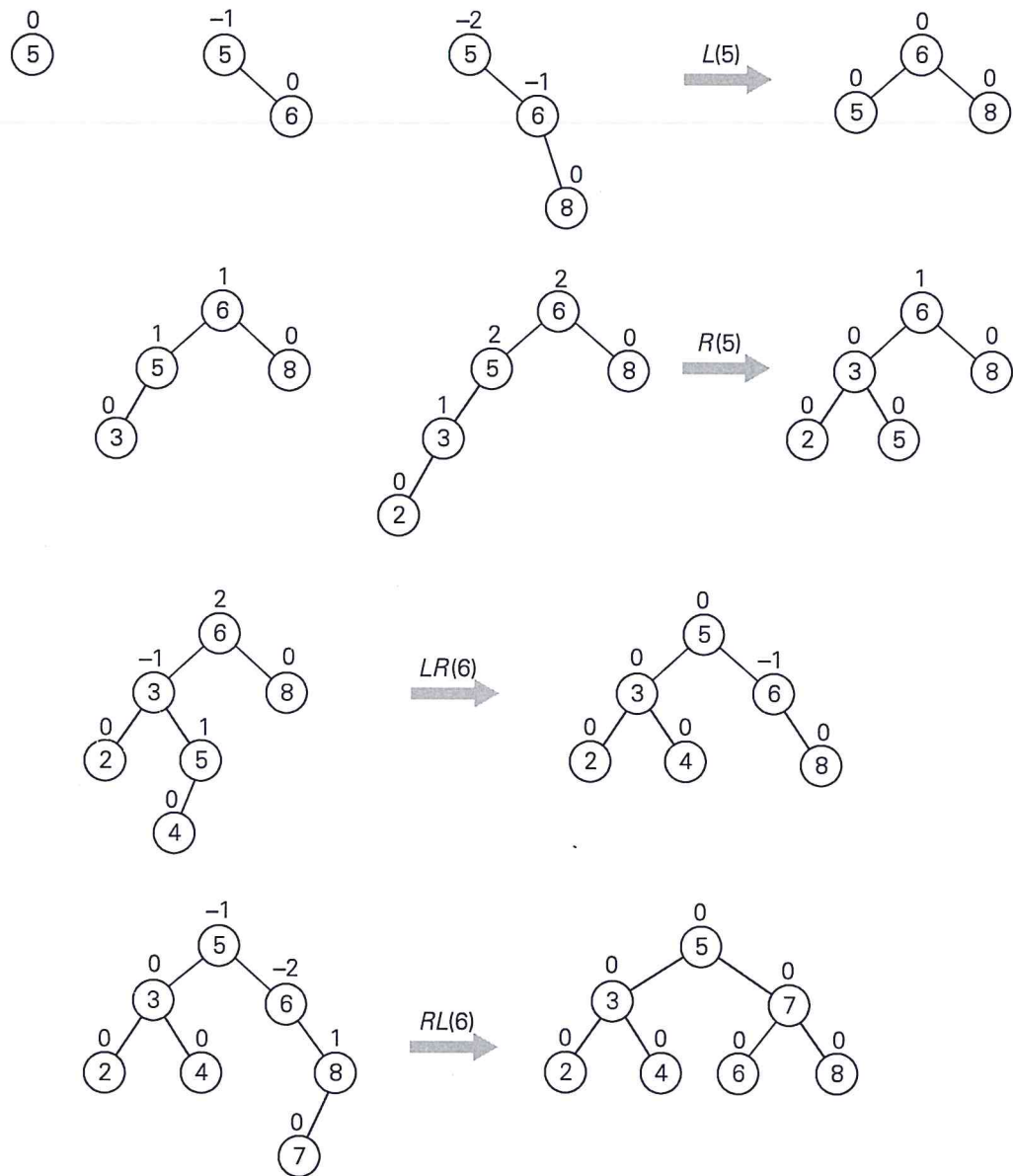


FIGURE 6.6 Construction of an AVL tree for the list 5, 6, 8, 3, 2, 4, 7 by successive insertions. The parenthesized number of a rotation’s abbreviation indicates the root of the tree being reorganized.

An example of constructing an AVL tree for a given list of numbers is shown in Figure 6.6. As you trace the algorithm’s operations, keep in mind that if there are several nodes with the ± 2 balance, the rotation is done for the tree rooted at the unbalanced node that is the closest to the newly inserted leaf.

How efficient are AVL trees? As with any search tree, the critical characteristic is the tree’s height. It turns out that it is bounded both above and below