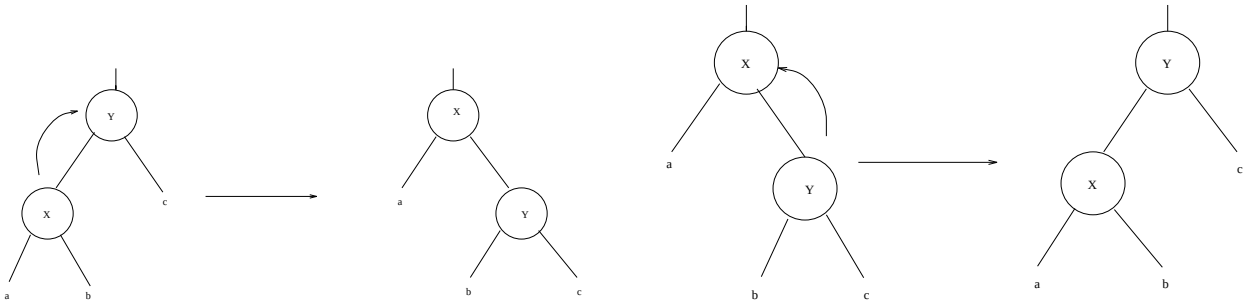
Rotations

The basic restructuring step for binary search trees are left and right rotation:



1. Rotation is a local operation changing $O(1)$ pointers.

2. An in-order search tree before a rotation *stays* an in-order search tree.

3. In a rotation, one subtree gets one level closer to the root and one subtree one level further from the root.

LEFT-ROTATE(T,x)

$y \leftarrow right[x]$ (* Set y*)
$right[x] \leftarrow left[y]$ (* Turn y's left into x's right*)
if $left[y] =$ NIL
    then $p[left[y]] \leftarrow x$
$p[y] \leftarrow p[x]$ (* Link x's parent to y *)
if $p[x] =$ NIL
    then $root[T] \leftarrow y$
    else if $x = left[p[x]]$
        then $left[p[x]] \leftarrow y$
        else $right[p[x]] \leftarrow y$
$left[y] \leftarrow x$
$p[x] \leftarrow y$

Note the in-order property is preserved.