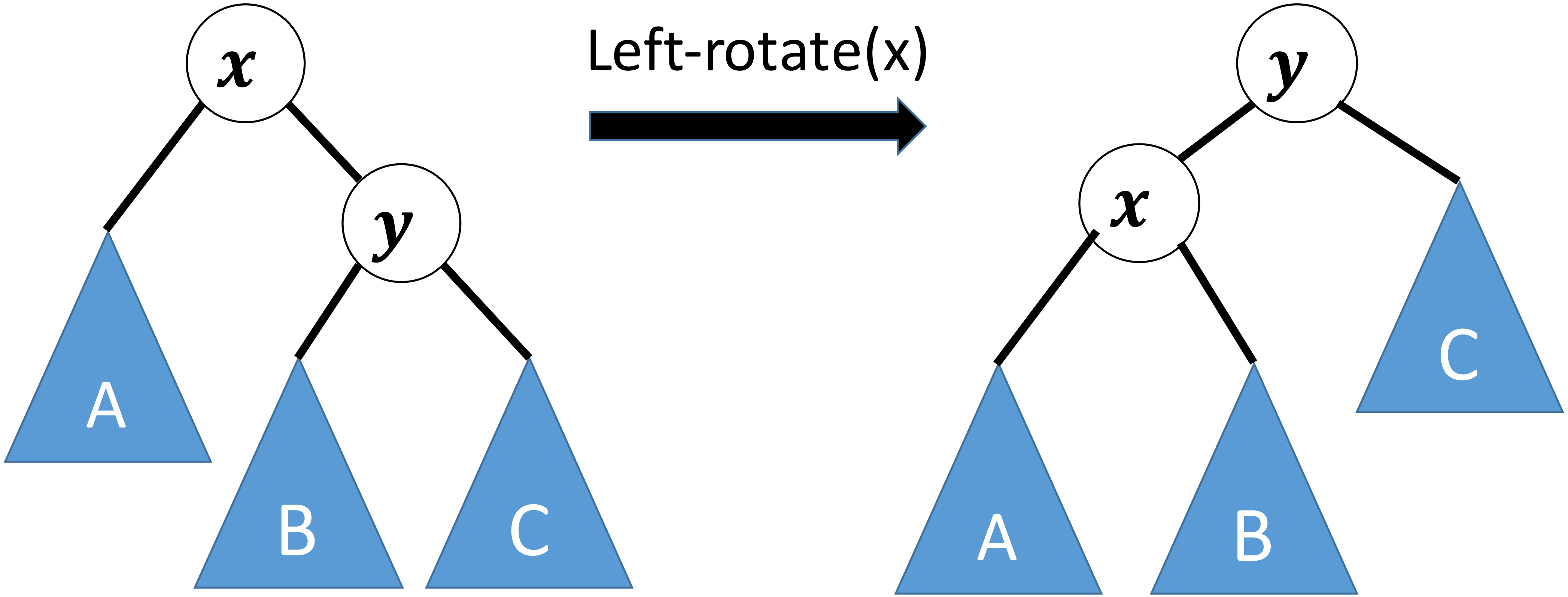
Rotations

- We have either **left rotation** or **right rotation** of a node:

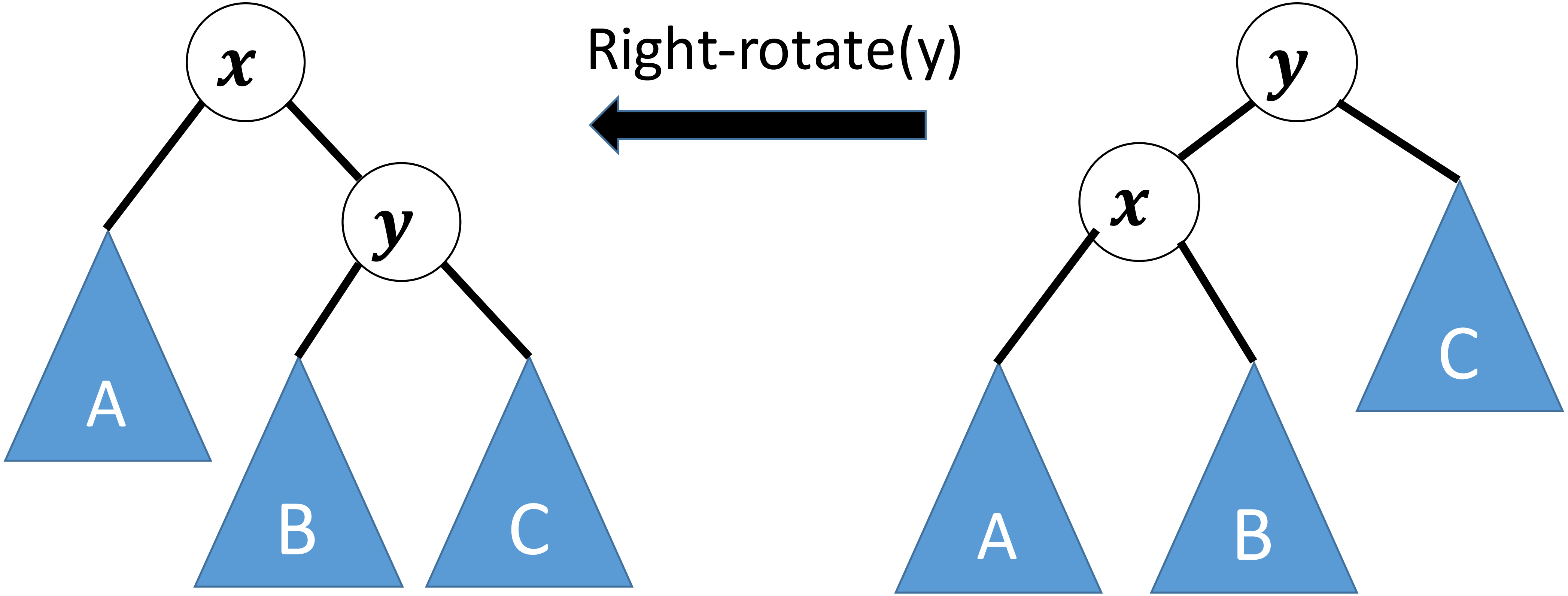


Left-rotate(x)

Both trees have the **same in-order traversal** of $AxByC$ which means the BST property is preserved.

Rotations

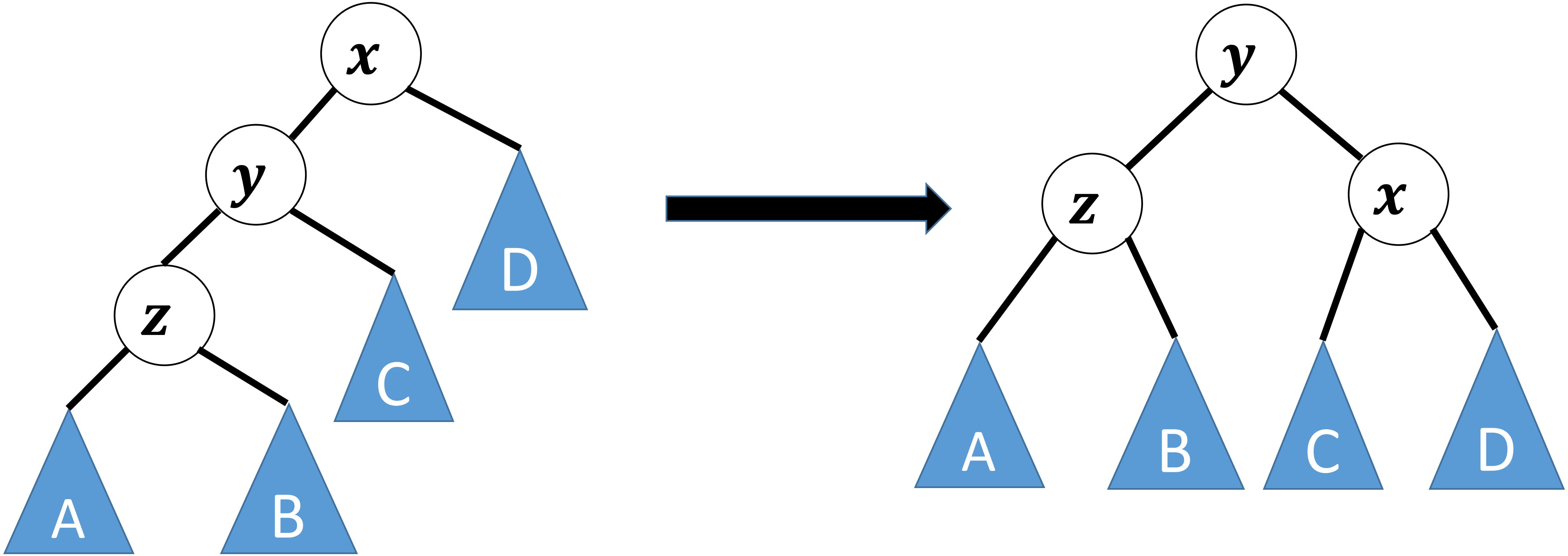
- We have either **left rotation** or **right rotation** of a node:



AVL tree operations

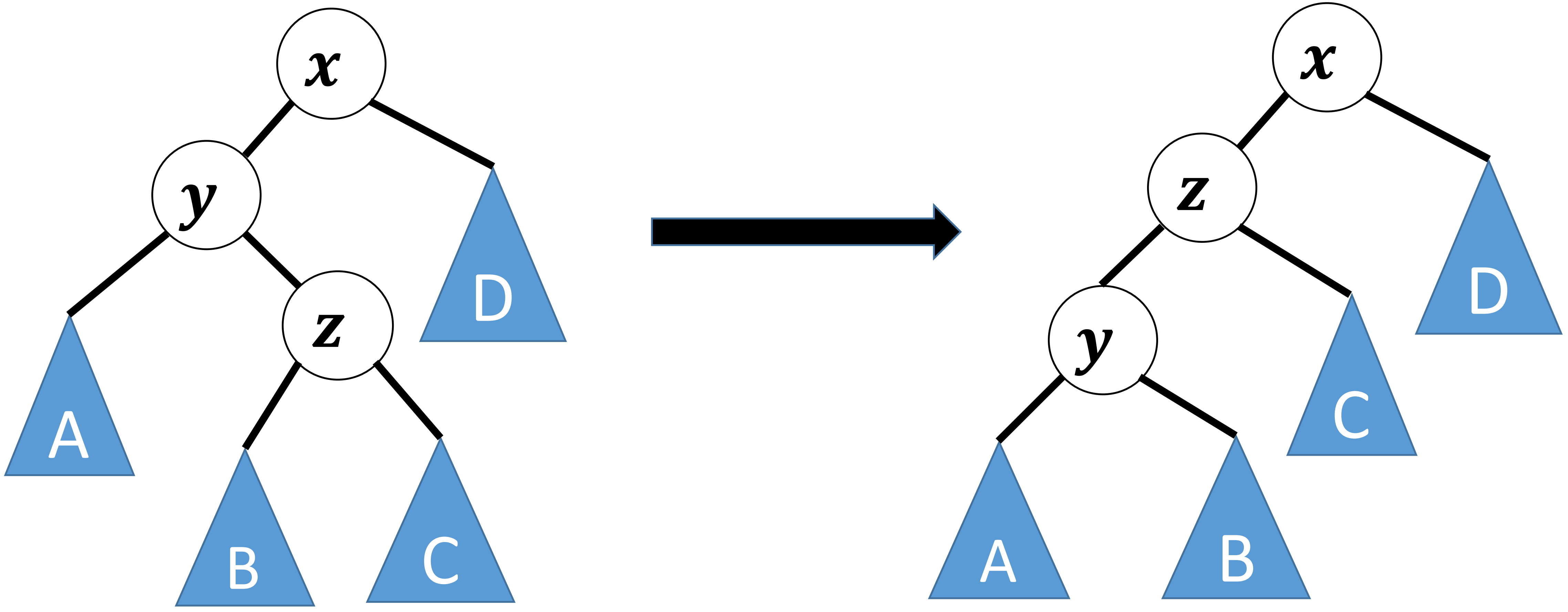
In general, there are **four types of violations** that we encounter:

1. A **zig-zig** case: Solution is to **Right-rotate(x)**



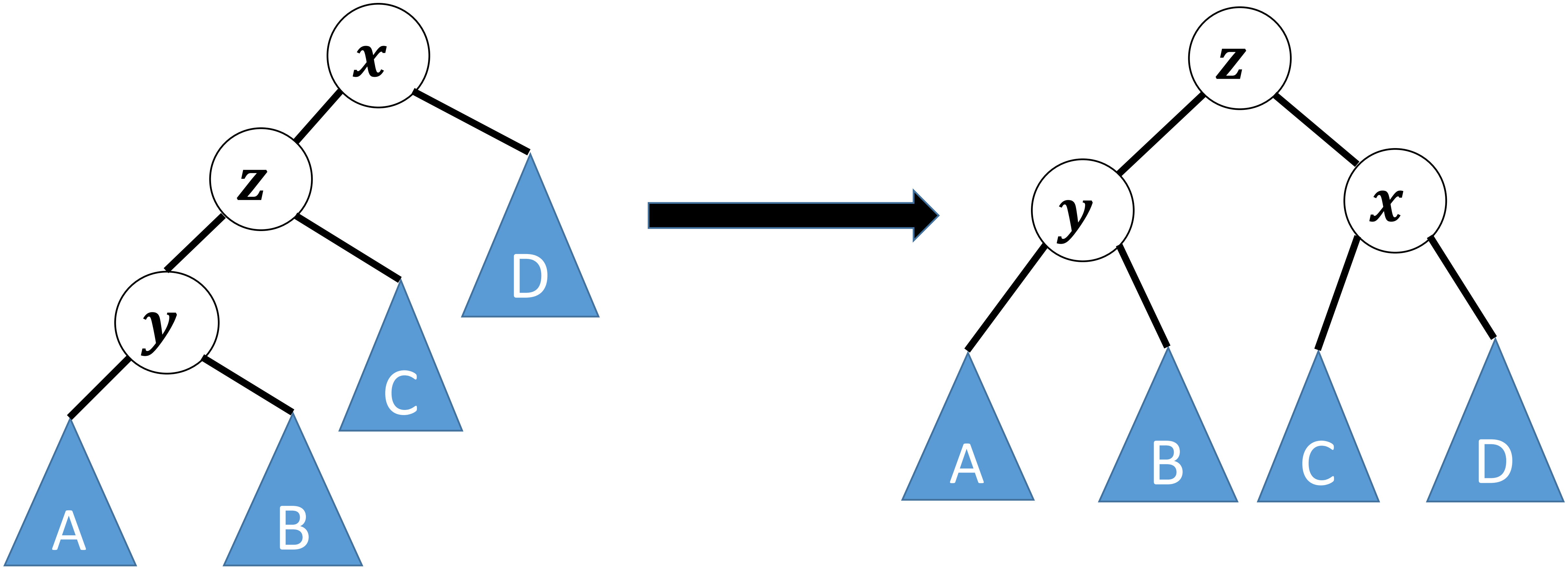
AVL tree operations

2. A **zig-zag** case: Solution is to **Left-rotate(y), then Right-rotate(x)**



AVL tree operations

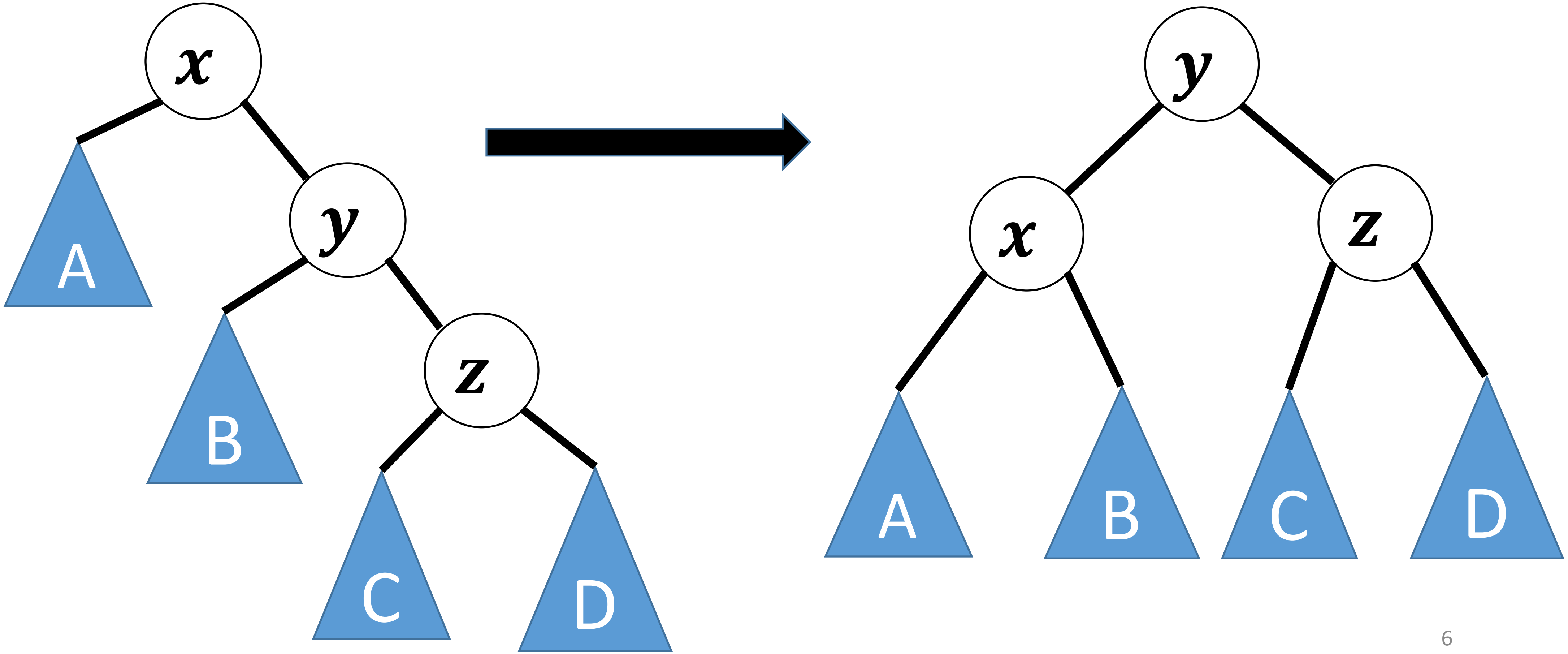
2. A **zig-zag** case: Solution is to **Left-rotate(y), then Right-rotate(x)**



AVL tree operations

Case 3 is symmetric to case 1:

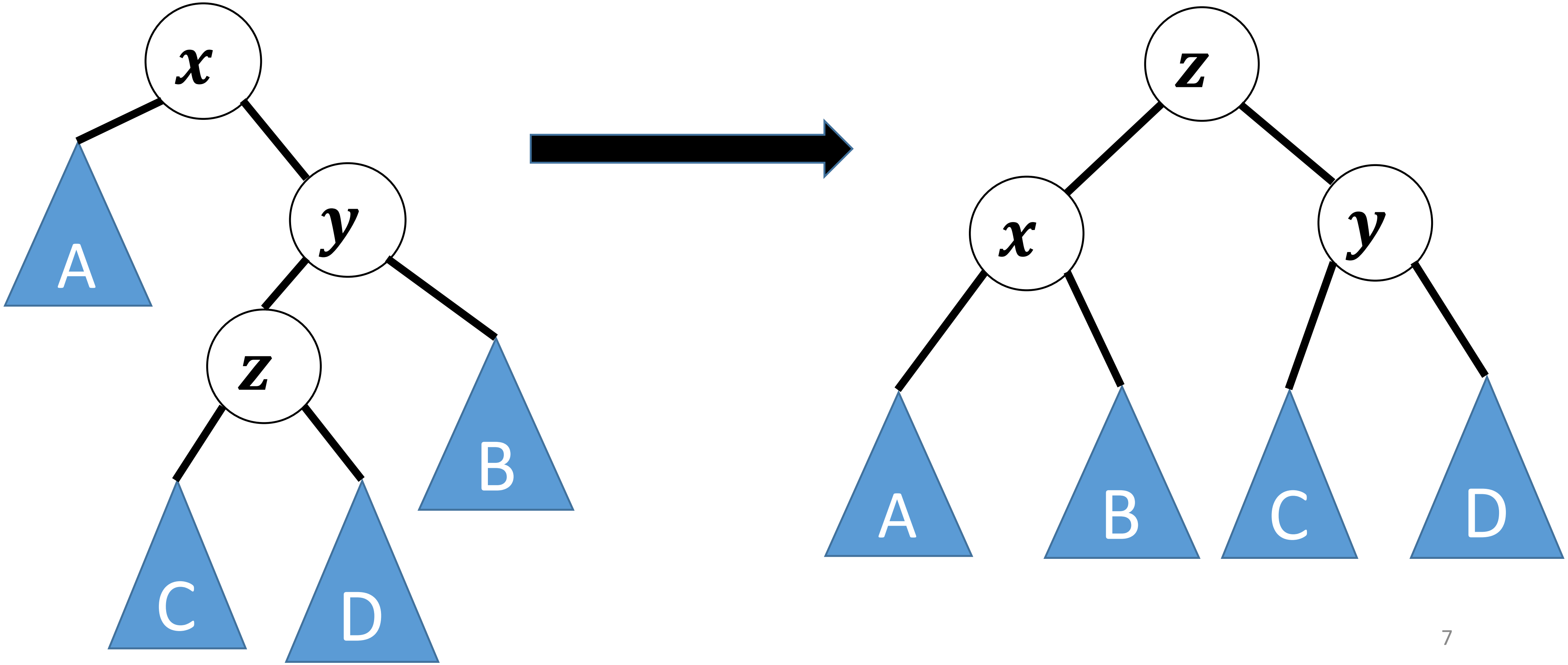
3. A **zag-zag** case: Solution is to **Left-rotate(x)**



AVL tree operations

Case 4 is symmetric to case 2:

4. A **zag-zig** case: Solution is to **Right-rotate(y), then Left-rotate(x)**



x
y
z
A
B
C
D
z
x
y
A
B
C
D