

AVL Tree Rotations with Examples

Right Rotation (LL Rotation)

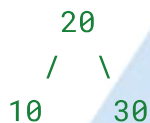
Happens when we insert into the **left subtree of the left child**.

Example: Insert 30, 20, 10

Before Rotation (Unbalanced):



After Right Rotation:



Fixed balance by rotating right.

Left Rotation (RR Rotation)

Happens when we insert into the **right subtree of the right child**.

Example: Insert 10, 20, 30

Before Rotation (Unbalanced):



After Left Rotation:

```

    20
   /  \
  10   30

```

Fixed balance by rotating left.

Left-Right Rotation (LR Rotation)

Happens when we insert into the **right subtree of the left child**.

Fix: First **Left Rotation** on child, then **Right Rotation** on parent.

Example: Insert 30, 10, 20

Before Rotation (Unbalanced):

```

    30
   /
  10
   \
    20

```

Step 1 (Left Rotate 10):

```

    30
   /
  20
 /
10

```

Step 2 (Right Rotate 30):

```

    20
   /  \
  10   30

```

Balanced by LR rotation.

Right-Left Rotation (RL Rotation)

Happens when we insert into the **left subtree of the right child**.

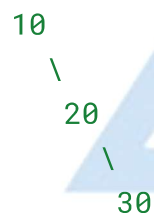
Fix: First **Right Rotation** on child, then **Left Rotation** on parent.

Example: Insert 10, 30, 20

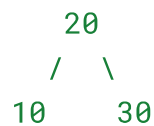
Before Rotation (Unbalanced):



Step 1 (Right Rotate 30):



Step 2 (Left Rotate 10):



Balanced by RL rotation.