Splay Tree

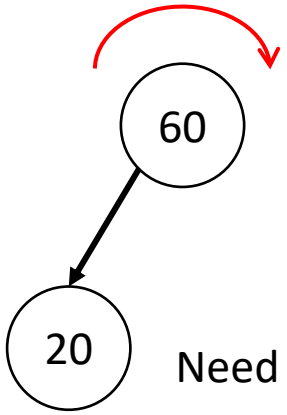
SIX CASES OF ROTATION:

1. ZIG : rotate right at parent
2. ZAG : rotate left at parent

3. ZIG-ZIG : (1) rotate right at grandparent first, then (2) rotate right at parent later
4. ZAG-ZAG : (1) rotate left at grandparent first, then (2) rotate left at parent later

5. ZIG-ZAG : (1) rotate right at parent first, then (2) rotate left at grandparent later
6. ZAG-ZIG : (1) rotate left at parent first, then (2) rotate right at grandparent later

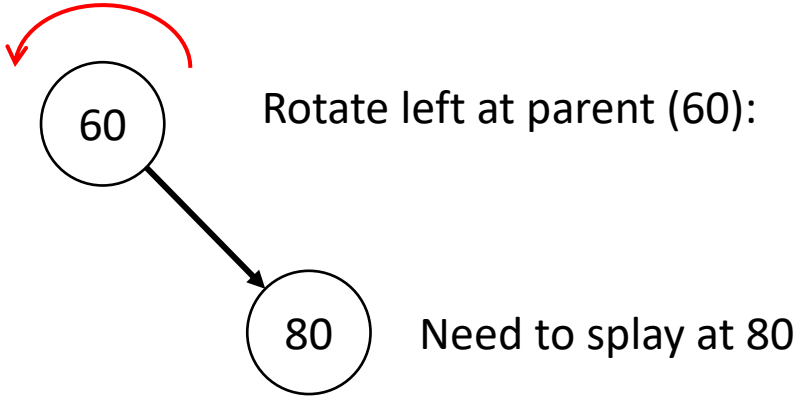
ZIG Rotation:



Rotate Right at parent (60):

Need to splay at 20

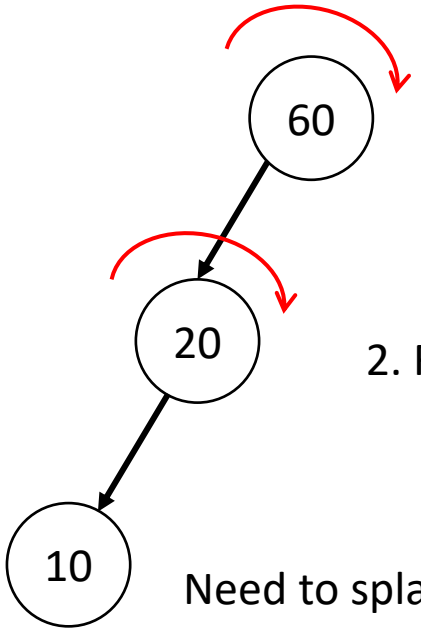
ZAG Rotation:



Rotate left at parent (60):

Need to splay at 80

ZIG-ZIG Rotation:

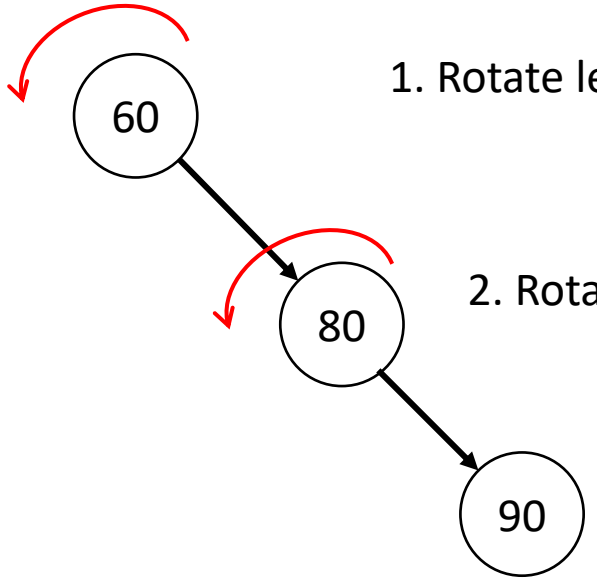


1. Rotate Right at grandparent first (60):

2. Rotate Right at parent later (20):

Need to splay at 10

ZAG-ZAG Rotation:

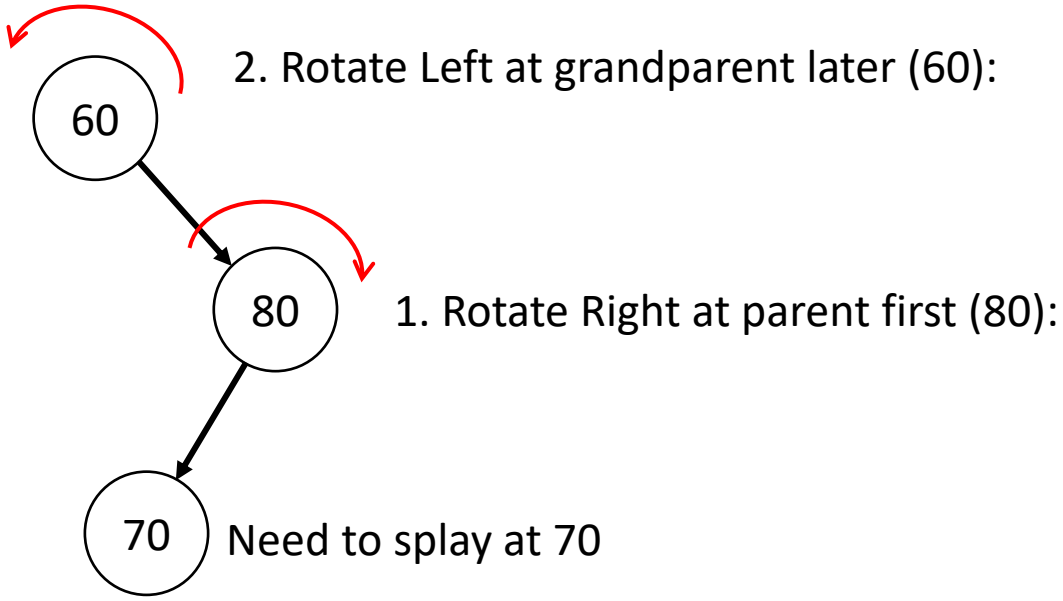


1. Rotate left at grandparent first (60):

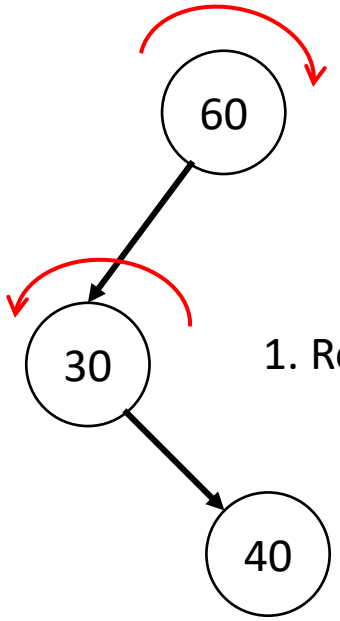
2. Rotate left at parent later (80):

Need to splay at 90

ZIG-ZAG Rotation:



ZAG-ZIG Rotation:



2. Rotate right at grandparent later (60):

1. Rotate left at parent first (30):

Need to splay at 40

OTHER NAMES OF ROTATION:

1. ZIG
2. ZAG

} **ZIG**

3. ZIG-ZIG
4. ZAG-ZAG

} **ZIG-ZIG**

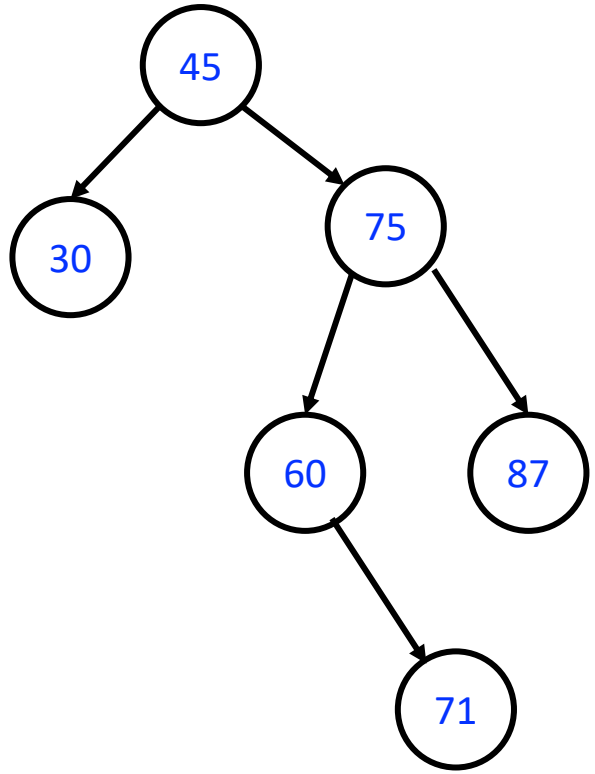
5. ZIG-ZAG
6. ZAG-ZIG

} **ZIG-ZAG**

Slay tree - Insertion

Splay Tree Insertion:

1. Insert new item as in BST
2. Splay the new item to the root
    - Example: insert 35?

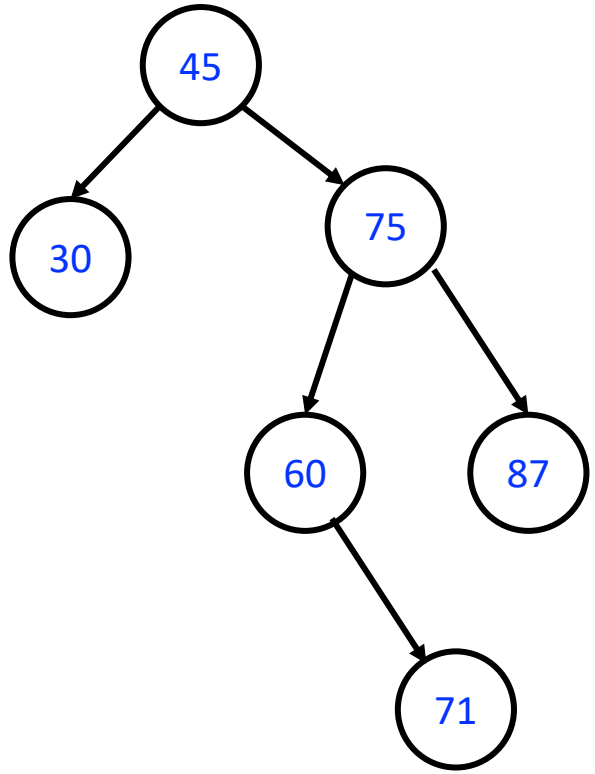


Slay tree - Searching

Splay Tree Searching:

1. CASE 1: Found
   - Splay the found node to root
     - Example: search for 60
       => FOUND => Splay 60

2. CASE 2: NOT FOUND
   - (1) Splay the last node visited to the root
     - Example: search for 73
       => NOT FOUND => Splay 71



Slay tree - Deletion

Splay Tree deletion:

1. Approach 1: Bottom-Up
    - Identify the parent of the node being deleted (called p)
    - Delete the node as BST
    - Splay p to the root

2. Approach 2: Top-Down
    - (1) Splay the node being deleted to root
    - (2) For left subtree of the main tree:
        - Splay the largest to the root of the subtree
    - (3) Attach the right subtree of the main tree
      as the right subtree of the tree obtained from step (2)