Binary Search Tree (BST) Finale

Q: How does our data determine the height?

$$1\ 3\ 2\ 4\ 5\ 7\ 6 \qquad \text{vs.} \qquad 4\ 2\ 3\ 6\ 7\ 1\ 5$$

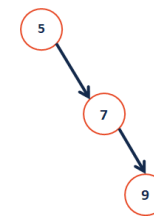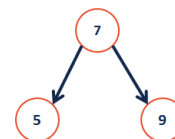**Q:** How many different ways are there to insert data into a BST?

Q: What is the average height of every arrangement?

....what's the intuition for this argument?

| operation	BST Avg. Case	BST Worst Case	Sorted Array	Sorted List
find				
insert				
delete				
traverse				

Height Balance on BST

What tree makes you happier?

Let us describe the **balance (b)** of a BST to be:

- If **b** is negative:

- If **b** is positive:

We define a BST tree T to be **height balanced** if:

A node is considered to be **out of balance** it's not height balanced. What is the lowest node that is out of balance?
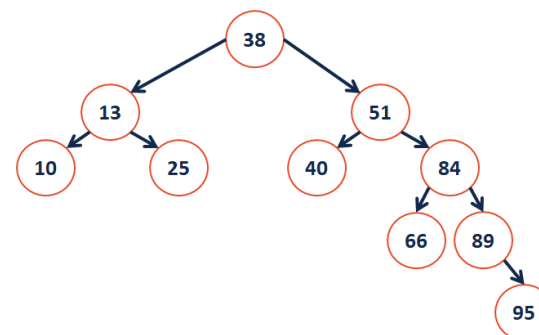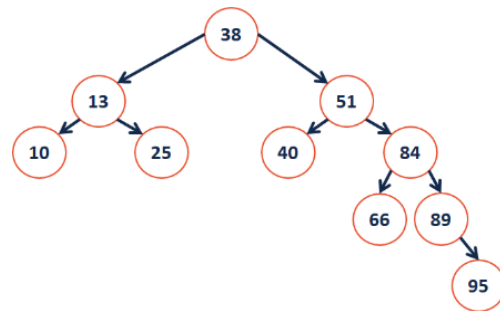
Brining a tree back into balance

Goal: Create a strategy to bring a BST back into balance after an operation has caused the three to be out of balance.

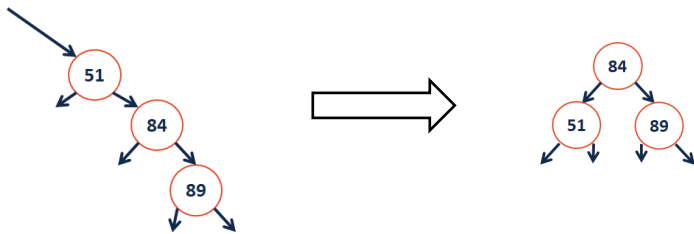A **Tree Rotation** is an operation that maintains two properties:
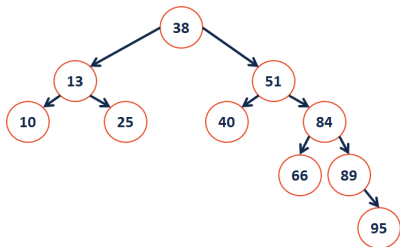
    1.

    2.

Example 1: Defining a Rotation

1. Where is the deepest point of imbalance in the tree: ➔

2. Perform a left rotation to balance this tree:
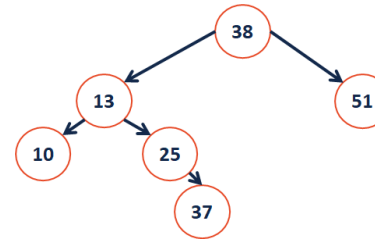
Implementing a left rotation:

Example 2: A Complex Rotation

Rotation #1:

Rotation #2:

BST Rotation Summary:
1. Four kinds of rotations (L, R, LR, and RL)
2. All rotations are local
3. All rotations run in constant time, O(1)
4. BST property is maintained!

Overall Goal:

    ...and we call these trees:

CS 225 – Things To Be Doing:
1. Quiz 4 ends today (topic list is online)
2. mp_lists due **tonight**; MP4 released on Tuesday
3. lab_huffman released Wednesday
4. Daily POTDs