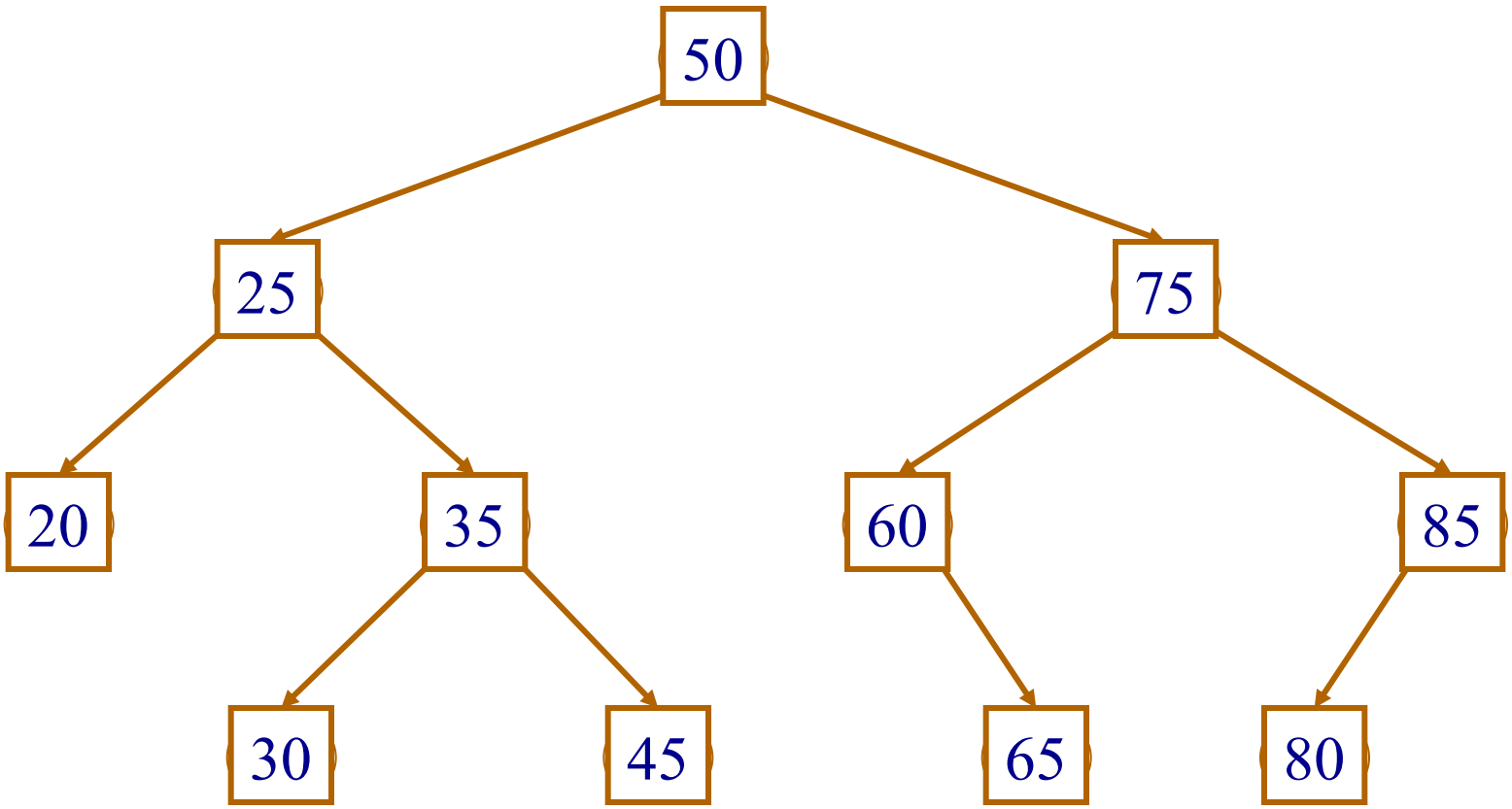
AVL Trees

Motivation and Introduction

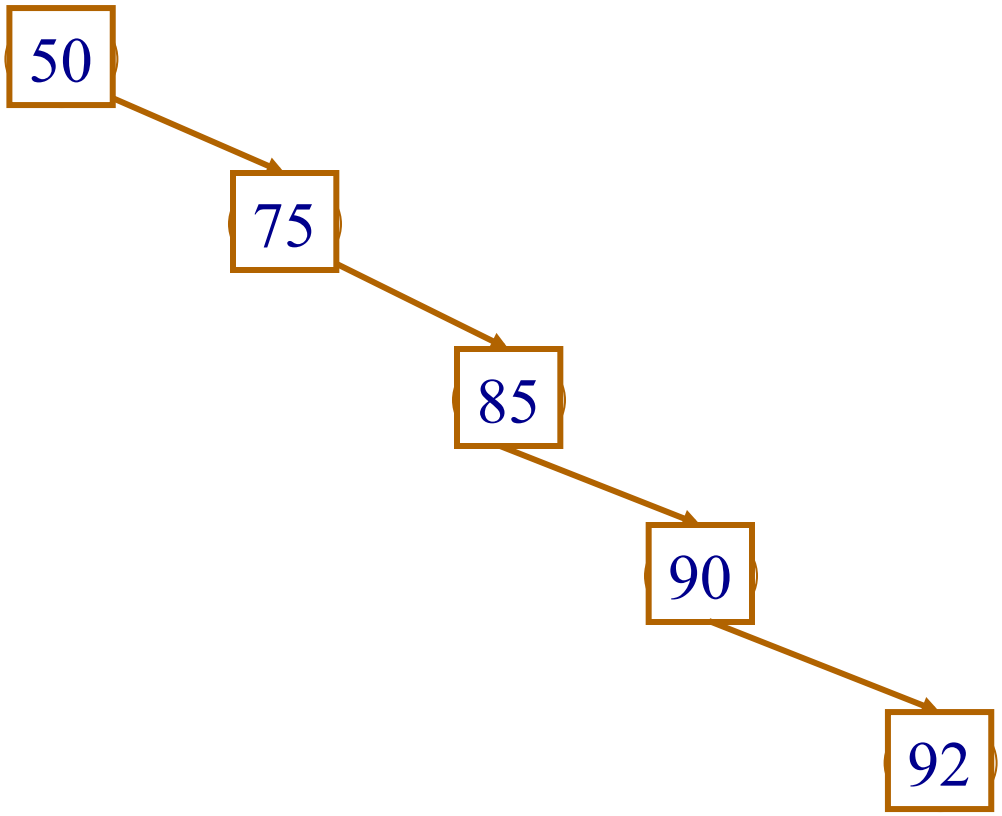
Goals

- Pros/Cons of a BST
- AVL Solution
- Height-Balanced

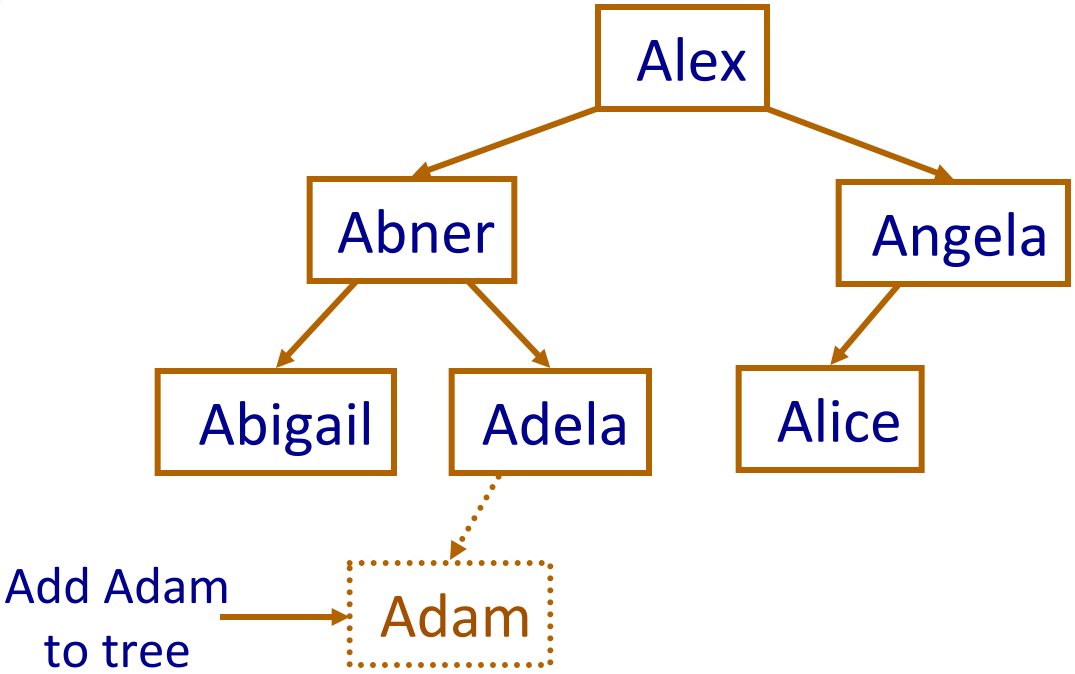
Binary Search Tree: Balance



Binary Search Tree: Balance



Complete Binary Trees



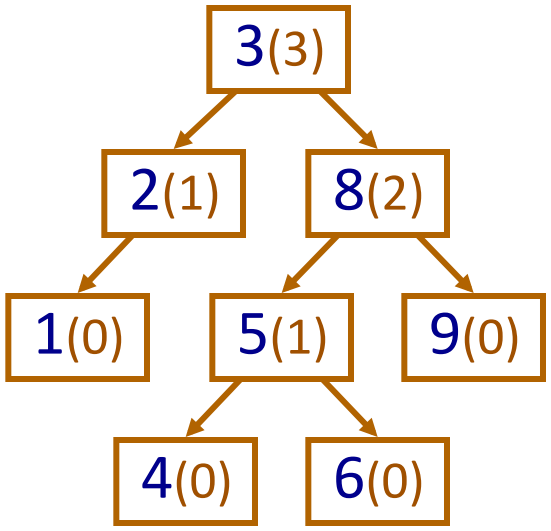
- Very costly to maintain a complete binary tree

Height-Balanced BST

- For each node, the ***height difference*** between the left and right subtrees ***is at most one***

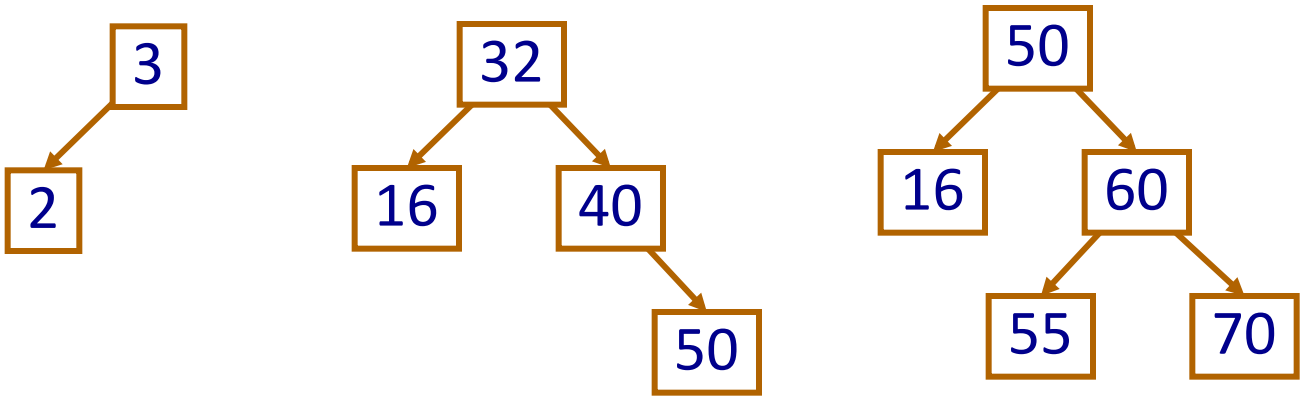
- Trees are locally balanced, but globally they can be slightly more unbalanced

Height-Balanced Tree



Quiz

- Are these trees height balanced? If not, which node is out of balance?



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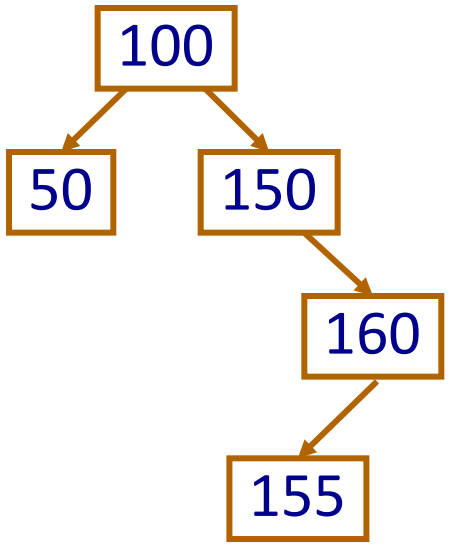
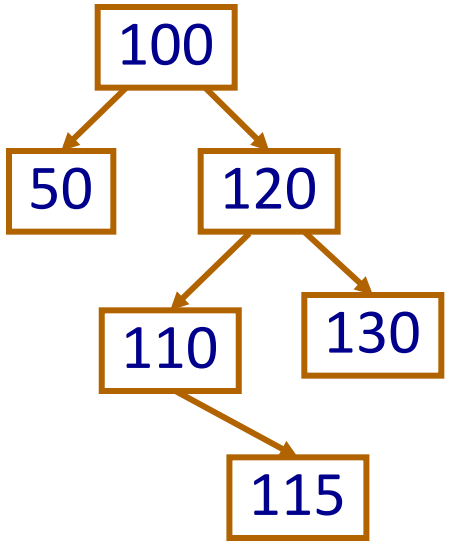


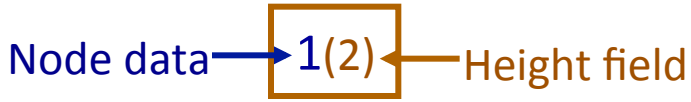


Height-Balanced Trees

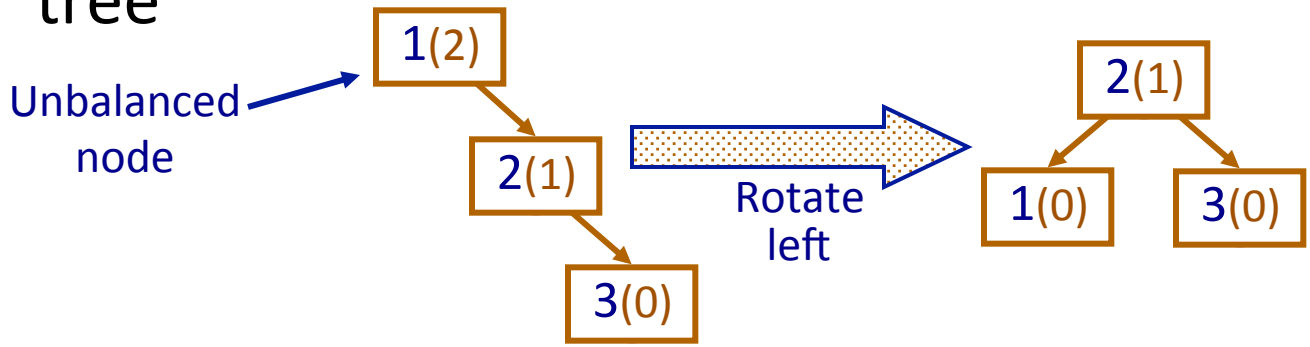
- Mathematically, the longest path in a height-balanced tree has been shown to be, at worst, 44% longer than log *n*
- Therefore, algorithms on height-balanced trees that run in time proportional to the path length are still O(log *n*)
- So.....How do we maintain height balance??

AVL Trees

- Named after the inventors' initials: G.M. Adelson-Velskii, E.M. Landis
- Maintain the height balanced property of a BST through a series of rotations



- When unbalanced, performs a "rotation" to balance the tree



Your Turn

- Read Chapter 10 and Worksheet 31
  - but do not yet work on the problems