Data *Structures*
BST Homework 1

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Teaching, Training and Coaching since more than a decade!

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Problem #1: Iterative Search

- bool search_iterative(int target)
- The same logic as our search but iterative

Problem #2: Is BST?

- bool is_bst()
- The function returns true if the current binary tree is BST
- Describe 2 **fundamentally different** approaches to check that
  - E.g. don't do it recursive then iterative. This is same idea with different implementation

Problem #3: Array to Balanced BST

- *Background*: Sometimes we have very imbalance BST and we want to convert to Balanced BST. We get its inorder traversal and rebuild it
- Given a **sorted** array create external function to create balanced BST
- BinarySearchTree* build_balanced_bst_tree(vector<int> &values)

Problem #3: Array to Balanced BST

- Example: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
- On right side, is only one way to make it balanced BST
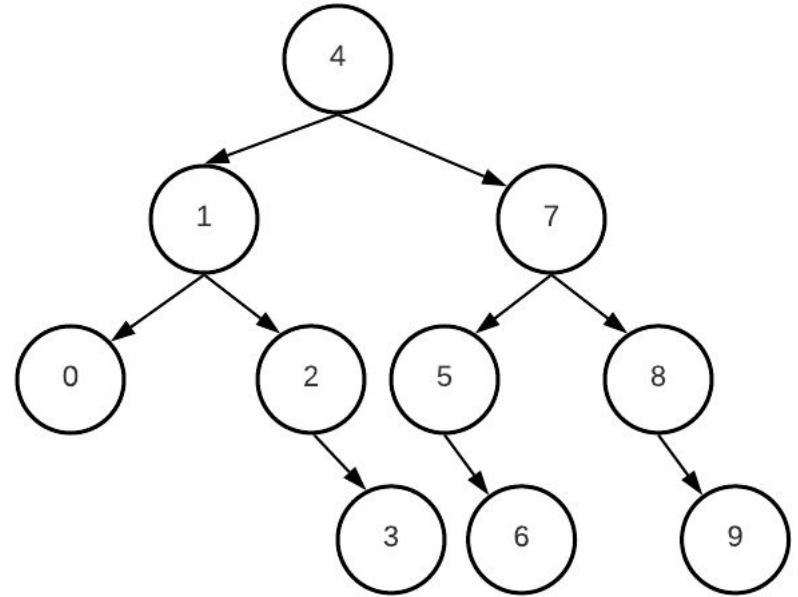
Problem #4: Kth smallest number

- Given a BST and integer K (1-based), find the kth smallest number
  - A trivial way: compute inorder traversal, output is inorder[k-1]
- Implement: int kth_smallest(int &k)
  - It returns integer for the kth value, or -1234 if it doesn't exist
- E.g. if we inserted in the BST tree: 20 10 80 15
  - The kth(1) = 10, kth(2) = 20, kth(6) = -1234

Problem #5: Lowest Common Ancestor (LCA)

- Given 2 values that exists in a BST, find their LCA
- LCA(x, y): the farthest node from the root that is an ancestor for both x and y.
  - Root is common ancestor for any pair, but now lowest
  - LCA(16, 45) = ~~35~~ 20
  - LCA(45, 36) = 45
  - LCA(15, 70) = 50
  - LCA(58, 70) = 60
  - LCA(36, 75) = 50
  - LCA(70, 75) = 70
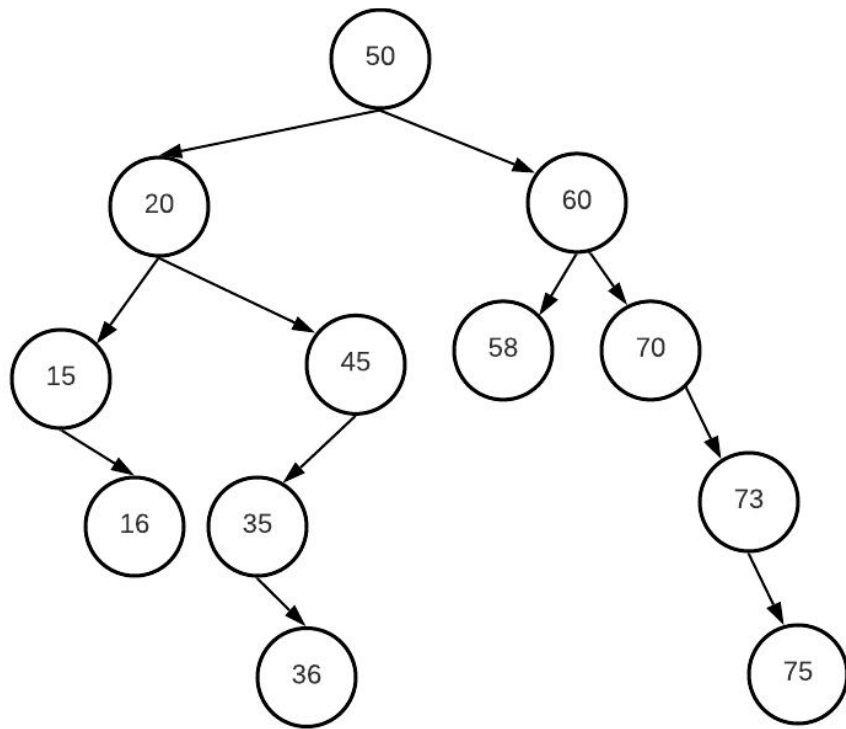
"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."