2020-03-28 - Handout – Binary Tree / BST Algorithms

Q1. Path Sum (and variations)

Link: https://leetcode.com/problems/path-sum/

Given a binary tree and a sum, determine if the tree has a root-to-leaf path such that adding up all the values along the path equals the given sum.

Note: A leaf is a node with no children.

Example:

Given the below binary tree and `sum = 22`, return true, as there exist a root-to-leaf path `5->4->11->2` which sum is 22.

Follow-up (Path sum II): what if you have to return all root to leaf paths which sum to the target sum? Return type should be List<List<Integer>>

Follow-up (Path sum III): Now, suppose that the path need not start at the root or end with a leaf (it should still flow down from the top of the tree towards child nodes). Return the number of such paths which sum to the target sum.

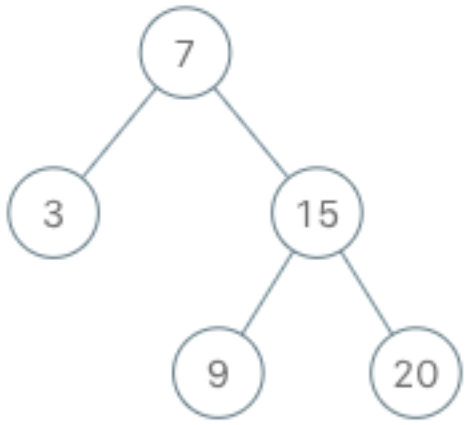
Q2. Binary Search Tree Iterator

Link: https://leetcode.com/problems/binary-search-tree-iterator/

Implement an iterator over a binary search tree (BST). Your iterator will be initialized with the root node of a BST.

Calling `next()` will return the next smallest number in the BST.

Example:




```
BSTIterator iterator = new BSTIterator(root);
iterator.next();    // return 3
iterator.next();    // return 7
iterator.hasNext(); // return true
iterator.next();    // return 9
iterator.hasNext(); // return true
iterator.next();    // return 15
iterator.hasNext(); // return true
iterator.next();    // return 20
iterator.hasNext(); // return false
```

Note:

- `next()` and `hasNext()` should run in average O(1) time and uses O(*h*) memory, where *h* is the height of the tree.
- You may assume that `next()` call will always be valid, that is, there will be at least a next smallest number in the BST when `next()` is called.

Q3.Binary Tree Right Side View

Link: https://leetcode.com/problems/binary-tree-right-side-view/

Given a binary tree, imagine yourself standing on the *right* side of it, return the values of the nodes you can see ordered from top to bottom.

Example:

```
Input: [1,2,3,null,5,null,4]
Output: [1, 3, 4]
Explanation:
```

```
   1            <---
 /   \
2     3         <---
 \     \
  5     4       <---
```

Follow-up: How would you find the left-side view?