Problem 1644: Lowest Common Ancestor of a Binary Tree II

Problem Information

Difficulty: Medium
Acceptance Rate: 0.00%
Paid Only: No

Problem Description

Given the

root

of a binary tree, return

the lowest common ancestor (LCA) of two given nodes,

p

and

q

. If either node

p

or

q

does not exist

in the tree, return

null

. All values of the nodes in the tree are

unique

.

According to the

definition of LCA on Wikipedia

: "The lowest common ancestor of two nodes

p

and

q

in a binary tree

T

is the lowest node that has both

p

and

q

as

descendants

(where we allow

a node to be a descendant of itself

)". A

descendant

of a node

x

is a node

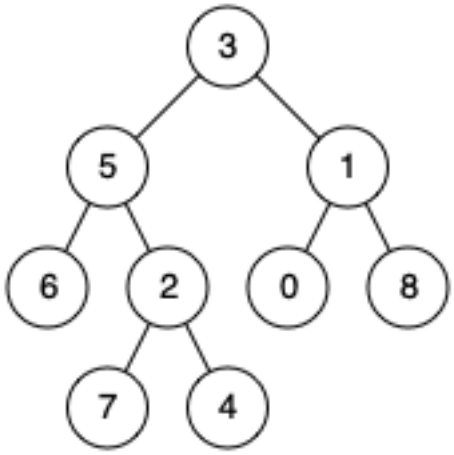
y

that is on the path from node

x

to some leaf node.

Example 1:



Input:

root = [3,5,1,6,2,0,8,null,null,7,4], p = 5, q = 1

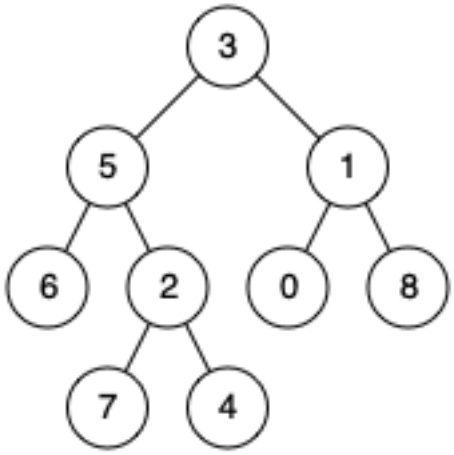
Output:

3

Explanation:

The LCA of nodes 5 and 1 is 3.

Example 2:



Input:

root = [3,5,1,6,2,0,8,null,null,7,4], p = 5, q = 4

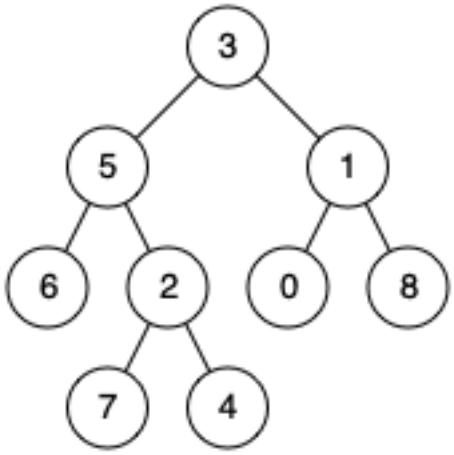
Output:

5

Explanation:

The LCA of nodes 5 and 4 is 5. A node can be a descendant of itself according to the definition of LCA.

Example 3:



Input:

root = [3,5,1,6,2,0,8,null,null,7,4], p = 5, q = 10

Output:

null

Explanation:

Node 10 does not exist in the tree, so return null.

Constraints:

The number of nodes in the tree is in the range

[1, 10

4

]

.

-10

9

<= Node.val <= 10

9

All

Node.val

are

unique

.

p != q

Follow up:

Can you find the LCA traversing the tree, without checking nodes existence?

Code Snippets

C++:

```
/**
* Definition for a binary tree node.
* struct TreeNode {
* int val;
* TreeNode *left;
* TreeNode *right;
* TreeNode(int x) : val(x), left(NULL), right(NULL) {}
* };
*/
class Solution {
public:
TreeNode* lowestCommonAncestor(TreeNode* root, TreeNode* p, TreeNode* q) {

}
};
```

Java:

```
/**
* Definition for a binary tree node.
* public class TreeNode {
* int val;
* TreeNode left;
* TreeNode right;
* TreeNode(int x) { val = x; }
* }
*/
class Solution {
public TreeNode lowestCommonAncestor(TreeNode root, TreeNode p, TreeNode q) {

}
}
```

Python3:

```
# Definition for a binary tree node.
# class TreeNode:
# def __init__(self, x):
# self.val = x
# self.left = None
# self.right = None

class Solution:
def lowestCommonAncestor(self, root: 'TreeNode', p: 'TreeNode', q:
'TreeNode') -> 'TreeNode':
```

Python:

```
# Definition for a binary tree node.
# class TreeNode(object):
# def __init__(self, x):
# self.val = x
# self.left = None
# self.right = None

class Solution(object):
def lowestCommonAncestor(self, root, p, q):
"""
:type root: TreeNode
```

```
:type p: TreeNode
:type q: TreeNode
:rtype: TreeNode
"""
```

JavaScript:

```
/**
* Definition for a binary tree node.
* function TreeNode(val) {
* this.val = val;
* this.left = this.right = null;
* }
*/
/**
* @param {TreeNode} root
* @param {TreeNode} p
* @param {TreeNode} q
* @return {TreeNode}
*/
var lowestCommonAncestor = function(root, p, q) {

};
```

C#:

```
/**
* Definition for a binary tree node.
* public class TreeNode {
* public int val;
* public TreeNode left;
* public TreeNode right;
* public TreeNode(int x) { val = x; }
* }
*/
public class Solution {
public TreeNode LowestCommonAncestor(TreeNode root, TreeNode p, TreeNode q) {

}
}
```

Solutions

C++ Solution:

```
/*
* Problem: Lowest Common Ancestor of a Binary Tree II
* Difficulty: Medium
* Tags: tree, search
*
* Approach: DFS or BFS traversal
* Time Complexity: O(n) where n is number of nodes
* Space Complexity: O(h) for recursion stack where h is height
*/

/**
* Definition for a binary tree node.
* struct TreeNode {
* int val;
* TreeNode *left;
* TreeNode *right;
* TreeNode(int x) : val(x), left(NULL), right(NULL) {}
* };
*/
class Solution {
public:
TreeNode* lowestCommonAncestor(TreeNode* root, TreeNode* p, TreeNode* q) {

}
};
```

Java Solution:

```
/**
* Problem: Lowest Common Ancestor of a Binary Tree II
* Difficulty: Medium
* Tags: tree, search
*
* Approach: DFS or BFS traversal
* Time Complexity: O(n) where n is number of nodes
* Space Complexity: O(h) for recursion stack where h is height
*/

/**
```

```
* Definition for a binary tree node.
* public class TreeNode {
* int val;
* TreeNode left;
* TreeNode right;
* TreeNode(int x) { val = x; }
* }
*/
class Solution {
public TreeNode lowestCommonAncestor(TreeNode root, TreeNode p, TreeNode q) {

}
}
```

Python3 Solution:

```
"""
Problem: Lowest Common Ancestor of a Binary Tree II
Difficulty: Medium
Tags: tree, search

Approach: DFS or BFS traversal
Time Complexity: O(n) where n is number of nodes
Space Complexity: O(h) for recursion stack where h is height
"""

# Definition for a binary tree node.
# class TreeNode:
# def __init__(self, x):
# self.val = x
# self.left = None
# self.right = None

class Solution:
def lowestCommonAncestor(self, root: 'TreeNode', p: 'TreeNode', q:
'TreeNode') -> 'TreeNode':
# TODO: Implement optimized solution
pass
```

Python Solution:

```
# Definition for a binary tree node.
# class TreeNode(object):
# def __init__(self, x):
# self.val = x
# self.left = None
# self.right = None

class Solution(object):
def lowestCommonAncestor(self, root, p, q):
"""
:type root: TreeNode
:type p: TreeNode
:type q: TreeNode
:rtype: TreeNode
"""
```

JavaScript Solution:

```
/**
* Problem: Lowest Common Ancestor of a Binary Tree II
* Difficulty: Medium
* Tags: tree, search
*
* Approach: DFS or BFS traversal
* Time Complexity: O(n) where n is number of nodes
* Space Complexity: O(h) for recursion stack where h is height
*/

/**
* Definition for a binary tree node.
* function TreeNode(val) {
* this.val = val;
* this.left = this.right = null;
* }
*/
/**
* @param {TreeNode} root
* @param {TreeNode} p
* @param {TreeNode} q
* @return {TreeNode}
*/
var lowestCommonAncestor = function(root, p, q) {
```

```
};
```

C# Solution:

```
/*
* Problem: Lowest Common Ancestor of a Binary Tree II
* Difficulty: Medium
* Tags: tree, search
*
* Approach: DFS or BFS traversal
* Time Complexity: O(n) where n is number of nodes
* Space Complexity: O(h) for recursion stack where h is height
*/

/**
* Definition for a binary tree node.
* public class TreeNode {
* public int val;
* public TreeNode left;
* public TreeNode right;
* public TreeNode(int x) { val = x; }
* }
*/
public class Solution {
public TreeNode LowestCommonAncestor(TreeNode root, TreeNode p, TreeNode q) {

}
}
```