Problem 1382: Balance a Binary Search Tree

Problem Information

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

Problem Description

Given the

root

of a binary search tree, return

a

balanced

binary search tree with the same node values
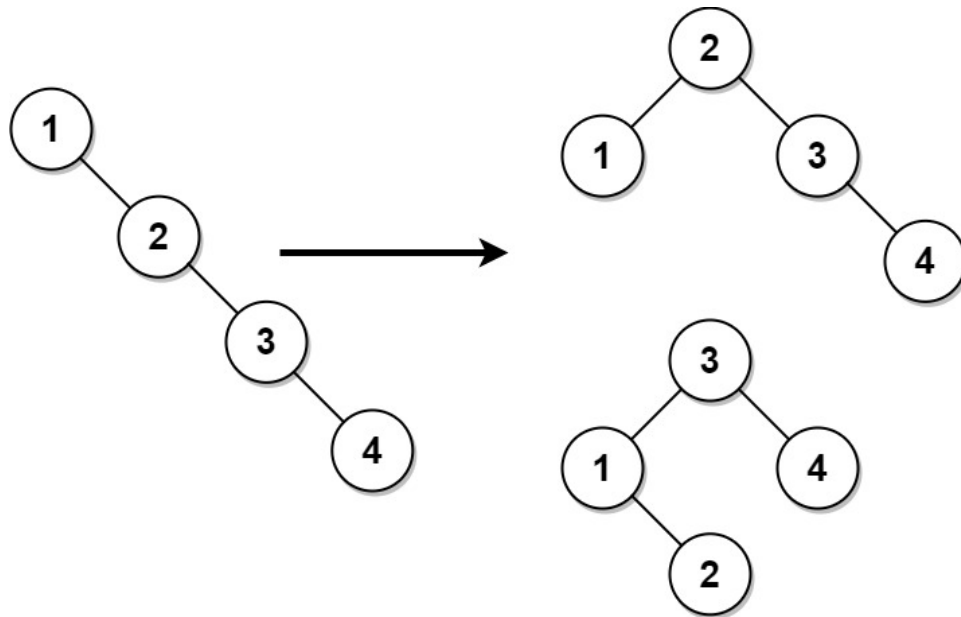
. If there is more than one answer, return

any of them

.

A binary search tree is

balanced

if the depth of the two subtrees of every node never differs by more than

1

.

Example 1:

Input:
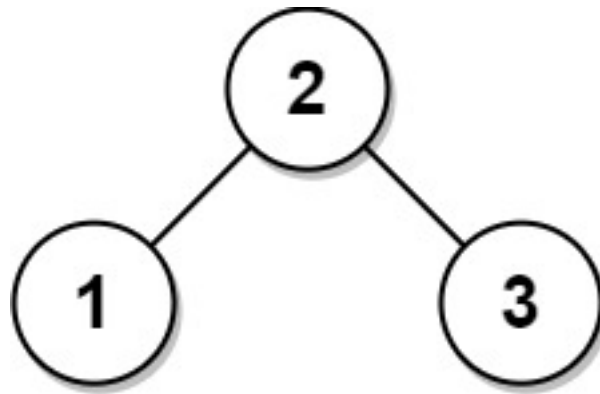
root = [1,null,2,null,3,null,4,null,null]

Output:

[2,1,3,null,null,null,4]

Explanation:

This is not the only correct answer, [3,1,4,null,2] is also correct.

Example 2:

Input:

root = [2,1,3]

Output:

[2,1,3]

Constraints:

The number of nodes in the tree is in the range

[1, 10

4

]

.

1 <= Node.val <= 10

5

Code Snippets

C++:

```
/**
* Definition for a binary tree node.
* struct TreeNode {
* int val;
* TreeNode *left;
* TreeNode *right;
* TreeNode() : val(0), left(nullptr), right(nullptr) {}
* TreeNode(int x) : val(x), left(nullptr), right(nullptr) {}
* TreeNode(int x, TreeNode *left, TreeNode *right) : val(x), left(left),
right(right) {}
* };
*/
class Solution {
public:
TreeNode* balanceBST(TreeNode* root) {


}
};
```

Java:

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


}
}
```

Python3:

```python
# Definition for a binary tree node.
# class TreeNode:
# def __init__(self, val=0, left=None, right=None):
# self.val = val
# self.left = left
# self.right = right
class Solution:
def balanceBST(self, root: Optional[TreeNode]) -> Optional[TreeNode]:
```

Python:

```python
# Definition for a binary tree node.
# class TreeNode(object):
# def __init__(self, val=0, left=None, right=None):
# self.val = val
# self.left = left
# self.right = right
class Solution(object):
def balanceBST(self, root):
"""
:type root: Optional[TreeNode]
:rtype: Optional[TreeNode]
"""
```

JavaScript:

```javascript
/**
 * Definition for a binary tree node.
 * function TreeNode(val, left, right) {
 * this.val = (val===undefined ? 0 : val)
 * this.left = (left===undefined ? null : left)
 * this.right = (right===undefined ? null : right)
 * }
 */
/**
 * @param {TreeNode} root
 * @return {TreeNode}
 */
var balanceBST = function(root) {

};
```

TypeScript:

```typescript
/**
 * Definition for a binary tree node.
 * class TreeNode {
 *     val: number
 *     left: TreeNode | null
 *     right: TreeNode | null
 *     constructor(val?: number, left?: TreeNode | null, right?: TreeNode | null) {
 *         this.val = (val===undefined ? 0 : val)
 *         this.left = (left===undefined ? null : left)
 *         this.right = (right===undefined ? null : right)
 *     }
 * }
 */

function balanceBST(root: TreeNode | null): TreeNode | null {

};
```

C#:

```csharp
/**
 * Definition for a binary tree node.
 * public class TreeNode {
 *     public int val;
 *     public TreeNode left;
 *     public TreeNode right;
 *     public TreeNode(int val=0, TreeNode left=null, TreeNode right=null) {
 *         this.val = val;
 *         this.left = left;
 *         this.right = right;
 *     }
 * }
 */
public class Solution {
    public TreeNode BalanceBST(TreeNode root) {

    }
}
```

C:

```c
/**
 * Definition for a binary tree node.
 * struct TreeNode {
 * int val;
 * struct TreeNode *left;
 * struct TreeNode *right;
 * };
 */
struct TreeNode* balanceBST(struct TreeNode* root) {


}
```

Go:

```go
/**
 * Definition for a binary tree node.
 * type TreeNode struct {
 * Val int
 * Left *TreeNode
 * Right *TreeNode
 * }
 */
func balanceBST(root *TreeNode) *TreeNode {


}
```

Kotlin:

```kotlin
/**
 * Example:
 * var ti = TreeNode(5)
 * var v = ti.`val`
 * Definition for a binary tree node.
 * class TreeNode(var `val`: Int) {
 * var left: TreeNode? = null
 * var right: TreeNode? = null
 * }
 */
class Solution {
fun balanceBST(root: TreeNode?): TreeNode? {
```

```
    }
}
```

Swift:

```swift
/**
 * Definition for a binary tree node.
 * public class TreeNode {
 * public var val: Int
 * public var left: TreeNode?
 * public var right: TreeNode?
 * public init() { self.val = 0; self.left = nil; self.right = nil; }
 * public init(_ val: Int) { self.val = val; self.left = nil; self.right =
 nil; }
 * public init(_ val: Int, _ left: TreeNode?, _ right: TreeNode?) {
 * self.val = val
 * self.left = left
 * self.right = right
 * }
 * }
 */
class Solution {
func balanceBST(_ root: TreeNode?) -> TreeNode? {


}
}
```

Rust:

```rust
// Definition for a binary tree node.
// #[derive(Debug, PartialEq, Eq)]
// pub struct TreeNode {
// pub val: i32,
// pub left: Option<Rc<RefCell<TreeNode>>>,
// pub right: Option<Rc<RefCell<TreeNode>>>,
// }
//
// impl TreeNode {
// #[inline]
// pub fn new(val: i32) -> Self {
// TreeNode {
// val,
```

```rust
// left: None,
// right: None
// }
// }
// }
use std::rc::Rc;
use std::cell::RefCell;
impl Solution {
pub fn balance_bst(root: Option<Rc<RefCell<TreeNode>>>) ->
Option<Rc<RefCell<TreeNode>>> {


}
}
```

Ruby:

```ruby
# Definition for a binary tree node.
# class TreeNode
# attr_accessor :val, :left, :right
# def initialize(val = 0, left = nil, right = nil)
# @val = val
# @left = left
# @right = right
# end
# end
# @param {TreeNode} root
# @return {TreeNode}
def balance_bst(root)

end
```

PHP:

```php
/**
* Definition for a binary tree node.
* class TreeNode {
* public $val = null;
* public $left = null;
* public $right = null;
* function __construct($val = 0, $left = null, $right = null) {
* $this->val = $val;
* $this->left = $left;
```

```
* $this->right = $right;
* }
* }
*/
class Solution {

/**
* @param TreeNode $root
* @return TreeNode
*/
function balanceBST($root) {


}
}
```

Dart:

```
/**
* Definition for a binary tree node.
* class TreeNode {
* int val;
* TreeNode? left;
* TreeNode? right;
* TreeNode([this.val = 0, this.left, this.right]);
* }
*/
class Solution {
TreeNode? balanceBST(TreeNode? root) {


}
}
```

Scala:

```
/**
* Definition for a binary tree node.
* class TreeNode(_value: Int = 0, _left: TreeNode = null, _right: TreeNode =
null) {
* var value: Int = _value
* var left: TreeNode = _left
* var right: TreeNode = _right
* }
```

```
*/
object Solution {
def balanceBST(root: TreeNode): TreeNode = {


}
}
```

Elixir:

```
# Definition for a binary tree node.
#
# defmodule TreeNode do
# @type t :: %__MODULE__{
# val: integer,
# left: TreeNode.t() | nil,
# right: TreeNode.t() | nil
# }
# defstruct val: 0, left: nil, right: nil
# end

defmodule Solution do
@spec balance_bst(root :: TreeNode.t | nil) :: TreeNode.t | nil
def balance_bst(root) do

end
end
```

Erlang:

```
%% Definition for a binary tree node.
%%
%% -record(tree_node, {val = 0 :: integer(),
%% left = null :: 'null' | #tree_node{},
%% right = null :: 'null' | #tree_node{}}).

-spec balance_bst(Root :: #tree_node{} | null) -> #tree_node{} | null.
balance_bst(Root) ->
.
```

Racket:

```
; Definition for a binary tree node.
#|

; val : integer?
; left : (or/c tree-node? #f)
; right : (or/c tree-node? #f)
(struct tree-node
(val left right) #:mutable #:transparent)

; constructor
(define (make-tree-node [val 0])
(tree-node val #f #f))

|#

(define/contract (balance-bst root)
(-> (or/c tree-node? #f) (or/c tree-node? #f))
)
```

Solutions

C++ Solution:

```cpp
/*
 * Problem: Balance a Binary Search Tree
 * Difficulty: Medium
 * Tags: tree, greedy, 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() : val(0), left(nullptr), right(nullptr) {}
 * TreeNode(int x) : val(x), left(nullptr), right(nullptr) {}
```

```
* TreeNode(int x, TreeNode *left, TreeNode *right) : val(x), left(left),
right(right) {}
* };
*/
class Solution {
public:
TreeNode* balanceBST(TreeNode* root) {


}
};
```

Java Solution:

```
/**
* Problem: Balance a Binary Search Tree
* Difficulty: Medium
* Tags: tree, greedy, 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() {
// TODO: Implement optimized solution
return 0;
}
* TreeNode(int val) { this.val = val; }
* TreeNode(int val, TreeNode left, TreeNode right) {
* this.val = val;
* this.left = left;
* this.right = right;
* }
* }
*/
```

```java
class Solution {
public TreeNode balanceBST(TreeNode root) {


}
}
```

Python3 Solution:

```python
"""
Problem: Balance a Binary Search Tree
Difficulty: Medium
Tags: tree, greedy, 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, val=0, left=None, right=None):
# self.val = val
# self.left = left
# self.right = right
class Solution:
def balanceBST(self, root: Optional[TreeNode]) -> Optional[TreeNode]:
# TODO: Implement optimized solution
pass
```

Python Solution:

```python
# Definition for a binary tree node.
# class TreeNode(object):
# def __init__(self, val=0, left=None, right=None):
# self.val = val
# self.left = left
# self.right = right
class Solution(object):
def balanceBST(self, root):
"""
:type root: Optional[TreeNode]
```

```
    :rtype: Optional[TreeNode]
    """
```

JavaScript Solution:

```javascript
/**
 * Problem: Balance a Binary Search Tree
 * Difficulty: Medium
 * Tags: tree, greedy, 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, left, right) {
 * this.val = (val===undefined ? 0 : val)
 * this.left = (left===undefined ? null : left)
 * this.right = (right===undefined ? null : right)
 * }
 */
/**
 * @param {TreeNode} root
 * @return {TreeNode}
 */
var balanceBST = function(root) {

};
```

TypeScript Solution:

```typescript
/**
 * Problem: Balance a Binary Search Tree
 * Difficulty: Medium
 * Tags: tree, greedy, 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 {
    * val: number
    * left: TreeNode | null
    * right: TreeNode | null
    * constructor(val?: number, left?: TreeNode | null, right?: TreeNode | null)
    {
    * this.val = (val===undefined ? 0 : val)
    * this.left = (left===undefined ? null : left)
    * this.right = (right===undefined ? null : right)
    * }
    * }
    */

    function balanceBST(root: TreeNode | null): TreeNode | null {

    };
```

C# Solution:

```
    /*
    * Problem: Balance a Binary Search Tree
    * Difficulty: Medium
    * Tags: tree, greedy, 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 val=0, TreeNode left=null, TreeNode right=null) {
    * this.val = val;
```

```
 * this.left = left;
 * this.right = right;
 * }
 * }
 */
public class Solution {
public TreeNode BalanceBST(TreeNode root) {


}
}
```

C Solution:

```c
/*
 * Problem: Balance a Binary Search Tree
 * Difficulty: Medium
 * Tags: tree, greedy, 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;
 * struct TreeNode *left;
 * struct TreeNode *right;
 * };
 */
struct TreeNode* balanceBST(struct TreeNode* root) {


}
```

Go Solution:

```go
// Problem: Balance a Binary Search Tree
// Difficulty: Medium
// Tags: tree, greedy, 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.
* type TreeNode struct {
* Val int
* Left *TreeNode
* Right *TreeNode
* }
*/
func balanceBST(root *TreeNode) *TreeNode {

}
```

Kotlin Solution:

```
/**
* Example:
* var ti = TreeNode(5)
* var v = ti.`val`
* Definition for a binary tree node.
* class TreeNode(var `val`: Int) {
* var left: TreeNode? = null
* var right: TreeNode? = null
* }
*/
class Solution {
fun balanceBST(root: TreeNode?): TreeNode? {

}
}
```

Swift Solution:

```
/**
* Definition for a binary tree node.
* public class TreeNode {
* public var val: Int
* public var left: TreeNode?
```

```swift
 * public var right: TreeNode?
 * public init() { self.val = 0; self.left = nil; self.right = nil; }
 * public init(_ val: Int) { self.val = val; self.left = nil; self.right =
 nil; }
 * public init(_ val: Int, _ left: TreeNode?, _ right: TreeNode?) {
 * self.val = val
 * self.left = left
 * self.right = right
 * }
 * }
 */
class Solution {
func balanceBST(_ root: TreeNode?) -> TreeNode? {


}
}
```

Rust Solution:

```rust
// Problem: Balance a Binary Search Tree
// Difficulty: Medium
// Tags: tree, greedy, 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.
// #[derive(Debug, PartialEq, Eq)]
// pub struct TreeNode {
// pub val: i32,
// pub left: Option<Rc<RefCell<TreeNode>>>,
// pub right: Option<Rc<RefCell<TreeNode>>>,
// }
//
// impl TreeNode {
// #[inline]
// pub fn new(val: i32) -> Self {
// TreeNode {
// val,
// left: None,
```

```
// right: None
// }
// }
// }
use std::rc::Rc;
use std::cell::RefCell;
impl Solution {
pub fn balance_bst(root: Option<Rc<RefCell<TreeNode>>>) ->
Option<Rc<RefCell<TreeNode>>> {

}
}
```

Ruby Solution:

```ruby
# Definition for a binary tree node.
# class TreeNode
# attr_accessor :val, :left, :right
# def initialize(val = 0, left = nil, right = nil)
# @val = val
# @left = left
# @right = right
# end
# end
# @param {TreeNode} root
# @return {TreeNode}
def balance_bst(root)

end
```

PHP Solution:

```php
/**
 * Definition for a binary tree node.
 * class TreeNode {
 * public $val = null;
 * public $left = null;
 * public $right = null;
 * function __construct($val = 0, $left = null, $right = null) {
 * $this->val = $val;
 * $this->left = $left;
```

```
    * $this->right = $right;
    * }
    * }
    */
    class Solution {

    /**
    * @param TreeNode $root
    * @return TreeNode
    */
    function balanceBST($root) {


    }
    }
```

Dart Solution:

```
/**
* Definition for a binary tree node.
* class TreeNode {
* int val;
* TreeNode? left;
* TreeNode? right;
* TreeNode([this.val = 0, this.left, this.right]);
* }
*/
class Solution {
TreeNode? balanceBST(TreeNode? root) {


}
}
```

Scala Solution:

```
/**
* Definition for a binary tree node.
* class TreeNode(_value: Int = 0, _left: TreeNode = null, _right: TreeNode =
null) {
* var value: Int = _value
* var left: TreeNode = _left
* var right: TreeNode = _right
```

```
*  }
*/
object Solution {
def balanceBST(root: TreeNode): TreeNode = {


}
}
```

Elixir Solution:

```
# Definition for a binary tree node.
#
# defmodule TreeNode do
# @type t :: %__MODULE__{
# val: integer,
# left: TreeNode.t() | nil,
# right: TreeNode.t() | nil
# }
# defstruct val: 0, left: nil, right: nil
# end

defmodule Solution do
@spec balance_bst(root :: TreeNode.t | nil) :: TreeNode.t | nil
def balance_bst(root) do

end
end
```

Erlang Solution:

```
%% Definition for a binary tree node.
%%
%% -record(tree_node, {val = 0 :: integer(),
%% left = null :: 'null' | #tree_node{},
%% right = null :: 'null' | #tree_node{}}).

-spec balance_bst(Root :: #tree_node{} | null) -> #tree_node{} | null.
balance_bst(Root) ->
.
```

Racket Solution:

```
; Definition for a binary tree node.
#|


; val : integer?
; left : (or/c tree-node? #f)
; right : (or/c tree-node? #f)
(struct tree-node
(val left right) #:mutable #:transparent)


; constructor
(define (make-tree-node [val 0])
(tree-node val #f #f))


|#


(define/contract (balance-bst root)
(-> (or/c tree-node? #f) (or/c tree-node? #f))
)
```