

Problem 129: Sum Root to Leaf Numbers

Problem Information

Difficulty: **Medium**

Acceptance Rate: 0.00%

Paid Only: No

Problem Description

You are given the

root

of a binary tree containing digits from

0

to

9

only.

Each root-to-leaf path in the tree represents a number.

For example, the root-to-leaf path

1 -> 2 -> 3

represents the number

123

.

Return

the total sum of all root-to-leaf numbers

. Test cases are generated so that the answer will fit in a

32-bit

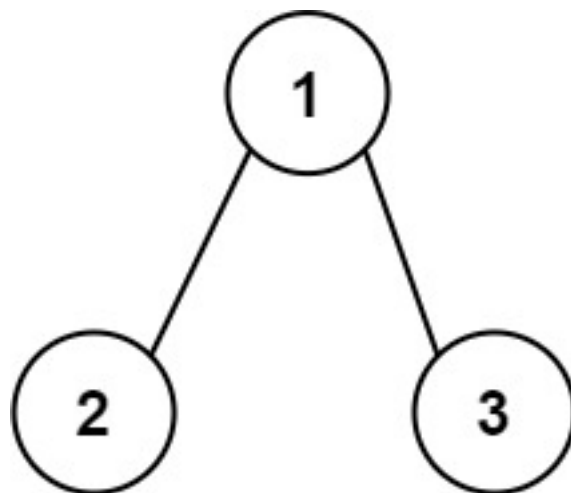
integer.

A

leaf

node is a node with no children.

Example 1:



Input:

root = [1,2,3]

Output:

25

Explanation:

The root-to-leaf path

1->2

represents the number

12

. The root-to-leaf path

1->3

represents the number

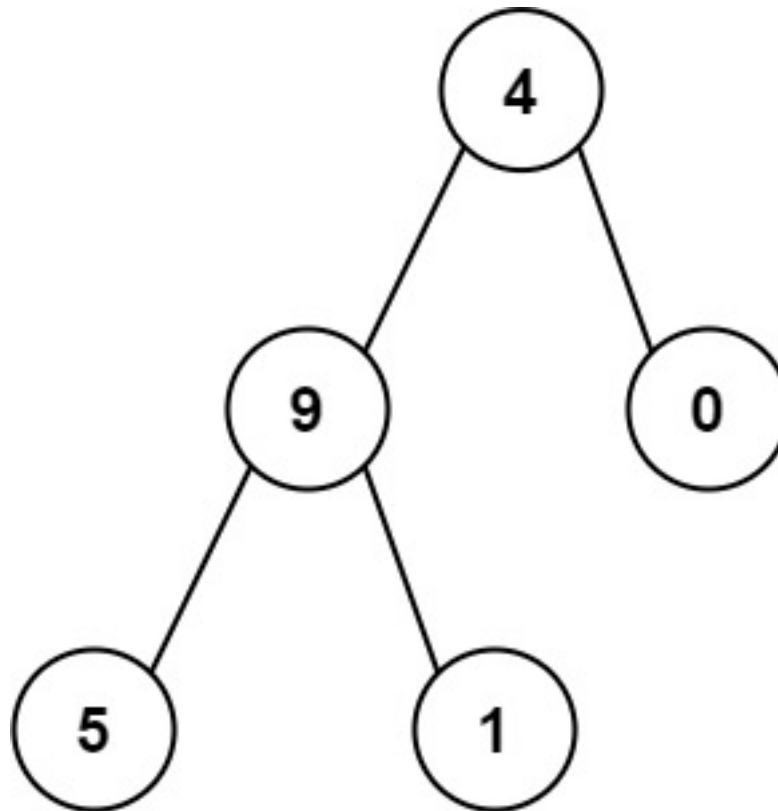
13

. Therefore, $\text{sum} = 12 + 13 =$

25

.

Example 2:



Input:

root = [4,9,0,5,1]

Output:

1026

Explanation:

The root-to-leaf path

4->9->5

represents the number 495. The root-to-leaf path

4->9->1

represents the number 491. The root-to-leaf path

4->0

represents the number 40. Therefore, $\text{sum} = 495 + 491 + 40 =$

1026

.

Constraints:

The number of nodes in the tree is in the range

[1, 1000]

.

$0 \leq \text{Node.val} \leq 9$

The depth of the tree will not exceed

10

.

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:
int sumNumbers(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 int sumNumbers(TreeNode root) {

}

}

```

Python3:

```

# 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 sumNumbers(self, root: Optional[TreeNode]) -> int:

```

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 sumNumbers(self, root):
    """
    :type root: Optional[TreeNode]
    :rtype: int
    """

```

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 {number}
 */
var sumNumbers = function(root) {

};

```

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 sumNumbers(root: TreeNode | null): number {

};

```

C#:

```

/**
 * 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 int SumNumbers(TreeNode root) {

    }
}

```

C:

```

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

```



```
}
```

Go:

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

}
```

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 sumNumbers(root: TreeNode?): Int {

}

}
```

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 sumNumbers(_ root: TreeNode?) -> Int {

}
}

```

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,
//             left: None,
//             right: None
//         }
//     }
// }
use std::rc::Rc;
use std::cell::RefCell;
impl Solution {
    pub fn sum_numbers(root: Option<Rc<RefCell<TreeNode>>>) -> i32 {

    }
}

```

```
}
```

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 {Integer}
def sum_numbers(root)

end
```

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 $root
 * @return Integer
 */
function sumNumbers($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 {  
  int sumNumbers(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 sumNumbers(root: TreeNode): Int = {  
  
  }  
}
```

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 sum_numbers(root :: TreeNode.t | nil) :: integer
  def sum_numbers(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 sum_numbers(Root :: #tree_node{} | null) -> integer().
sum_numbers(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 (sum-numbers root)
  (-> (or/c tree-node? #f) exact-integer?)
)
```

Solutions

C++ Solution:

```
/*
 * Problem: Sum Root to Leaf Numbers
 * 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() : val(0), left(nullptr), right(nullptr) {
 * // TODO: Implement optimized solution
 *   return 0;
 * }
 *   TreeNode(int x) : val(x), left(nullptr), right(nullptr) {
 * // TODO: Implement optimized solution
 *   return 0;
 * }
 *   TreeNode(int x, TreeNode *left, TreeNode *right) : val(x), left(left),
 *   right(right) {
 * // TODO: Implement optimized solution
 *   return 0;
 * }
 * };
```

```

*/
class Solution {
public:
    int sumNumbers(TreeNode* root) {

    }

};

```

Java Solution:

```

/**
 * Problem: Sum Root to Leaf Numbers
 * 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() {
 *         // 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;
 * }
 * }
 */
class Solution {
    public int sumNumbers(TreeNode root) {

```

```
}  
}
```

Python3 Solution:

```
"""  
Problem: Sum Root to Leaf Numbers  
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, val=0, left=None, right=None):  
#         self.val = val  
#         self.left = left  
#         self.right = right  
class Solution:  
    def sumNumbers(self, root: Optional[TreeNode]) -> int:  
        # TODO: Implement optimized solution  
        pass
```

Python Solution:

```
# 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 sumNumbers(self, root):  
        """  
        :type root: Optional[TreeNode]  
        :rtype: int  
        """
```


JavaScript Solution:

```
/**
 * Problem: Sum Root to Leaf Numbers
 * 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, left, right) {
 *   this.val = (val===undefined ? 0 : val)
 *   this.left = (left===undefined ? null : left)
 *   this.right = (right===undefined ? null : right)
 * }
 */

/**
 * @param {TreeNode} root
 * @return {number}
 */
var sumNumbers = function(root) {

};
```

TypeScript Solution:

```
/**
 * Problem: Sum Root to Leaf Numbers
 * 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 {
```

```

* 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 sumNumbers(root: TreeNode | null): number {

};

```

C# Solution:

```

/*
* Problem: Sum Root to Leaf Numbers
* 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 val=0, TreeNode left=null, TreeNode right=null) {
* this.val = val;
* this.left = left;
* this.right = right;
* }
* }
*/

```

```

public class Solution {
    public int SumNumbers(TreeNode root) {

    }

}

```

C Solution:

```

/*
 * Problem: Sum Root to Leaf Numbers
 * 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;
 *     struct TreeNode *left;
 *     struct TreeNode *right;
 * };
 */
int sumNumbers(struct TreeNode* root) {

}

```

Go Solution:

```

// Problem: Sum Root to Leaf Numbers
// 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.
* type TreeNode struct {
*   Val int
*   Left *TreeNode
*   Right *TreeNode
* }
*/
func sumNumbers(root *TreeNode) int {

}

```

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 sumNumbers(root: TreeNode?): Int {

}

}

```

Swift Solution:

```

/**
 * 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 sumNumbers(_ root: TreeNode?) -> Int {

}

}

```

Rust Solution:

```

// Problem: Sum Root to Leaf Numbers
// 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.
// #[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 sum_numbers(root: Option<Rc<RefCell<TreeNode>>>) -> i32 {

}
}

```

Ruby Solution:

```

# 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 {Integer}
def sum_numbers(root)

end

```

PHP Solution:

```

/**
 * 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 $root
 * @return Integer
 */
function sumNumbers($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 {
  int sumNumbers(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 sumNumbers(root: TreeNode): Int = {

  }
}

```

```
}
```

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 sum_numbers(root :: TreeNode.t | nil) :: integer
  def sum_numbers(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 sum_numbers(Root :: #tree_node{} | null) -> integer().
sum_numbers(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 (sum-numbers root)
  (-> (or/c tree-node? #f) exact-integer?)
  )
```