

Problem 1022: Sum of Root To Leaf Binary Numbers

Problem Information

Difficulty: [Easy](#)

Acceptance Rate: 0.00%

Paid Only: No

Problem Description

You are given the

root

of a binary tree where each node has a value

0

or

1

. Each root-to-leaf path represents a binary number starting with the most significant bit.

For example, if the path is

0 -> 1 -> 1 -> 0 -> 1

, then this could represent

01101

in binary, which is

.

For all leaves in the tree, consider the numbers represented by the path from the root to that leaf. Return

the sum of these numbers

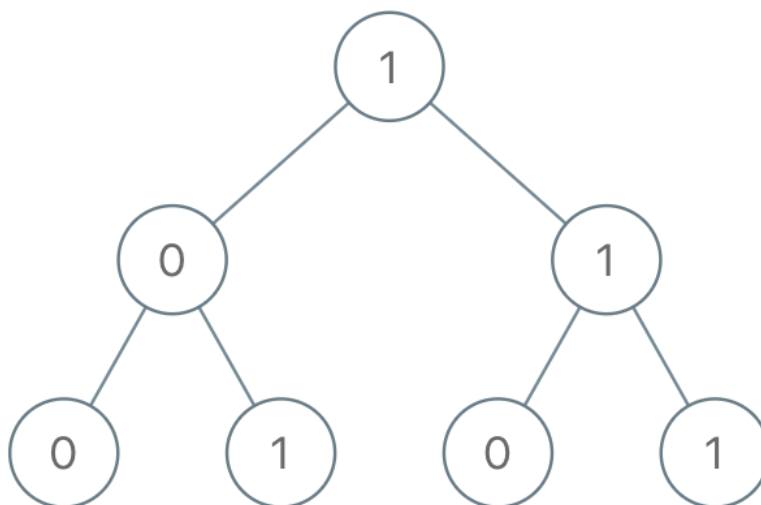
.

The test cases are generated so that the answer fits in a

32-bits

integer.

Example 1:



Input:

root = [1,0,1,0,1,0,1]

Output:

Explanation:

$$(100) + (101) + (110) + (111) = 4 + 5 + 6 + 7 = 22$$

Example 2:

Input:

root = [0]

Output:

0

Constraints:

The number of nodes in the tree is in the range

[1, 1000]

.

Node.val

is

0

or

1

.

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 sumRootToLeaf(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 sumRootToLeaf(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 sumRootToLeaf(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 sumRootToLeaf(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 sumRootToLeaf = 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 sumRootToLeaf(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 SumRootToLeaf(TreeNode root) {

    }
}
```

C:

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

}
```

Go:

```
/**
 * Definition for a binary tree node.
 * type TreeNode struct {
 *   Val int
 *   Left *TreeNode
 *   Right *TreeNode
 * }
 */
func sumRootToLeaf(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 sumRootToLeaf(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 sumRootToLeaf(_ 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_root_to_leaf(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_root_to_leaf(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 $root
 * @return Integer
 */
function sumRootToLeaf($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 sumRootToLeaf(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 sumRootToLeaf(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_root_to_leaf(root :: TreeNode.t() | nil) :: integer
  def sum_root_to_leaf(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_root_to_leaf(Root :: #tree_node{} | null) -> integer().
sum_root_to_leaf(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-root-to-leaf root)
  (-> (or/c tree-node? #f) exact-integer?)
  )

```

Solutions

C++ Solution:

```

/*
 * Problem: Sum of Root To Leaf Binary Numbers
 * Difficulty: Easy
 * 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 sumRootToLeaf(TreeNode* root) {

    }
    };

```

Java Solution:

```

/**
 * Problem: Sum of Root To Leaf Binary Numbers
 * Difficulty: Easy
 * 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 sumRootToLeaf(TreeNode root) {

}

}

```

Python3 Solution:

```

"""
Problem: Sum of Root To Leaf Binary Numbers
Difficulty: Easy
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 sumRootToLeaf(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 sumRootToLeaf(self, root):
        """
        :type root: Optional[TreeNode]
        :rtype: int
        """

```

JavaScript Solution:

```

/**
 * Problem: Sum of Root To Leaf Binary Numbers
 * Difficulty: Easy
 * 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 sumRootToLeaf = function(root) {

};

```

TypeScript Solution:

```

/**
 * Problem: Sum of Root To Leaf Binary Numbers
 * Difficulty: Easy
 * 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 sumRootToLeaf(root: TreeNode | null): number {

};

```

C# Solution:

```

/*
 * Problem: Sum of Root To Leaf Binary Numbers
 * Difficulty: Easy
 * 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 SumRootToLeaf(TreeNode root) {

}
}

```

C Solution:

```

/*
* Problem: Sum of Root To Leaf Binary Numbers
* Difficulty: Easy
* 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 sumRootToLeaf(struct TreeNode* root) {

}

```

Go Solution:

```
// Problem: Sum of Root To Leaf Binary Numbers
// Difficulty: Easy
// 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 sumRootToLeaf(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 sumRootToLeaf(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 sumRootToLeaf(_ root: TreeNode?) -> Int {

}
}

```

Rust Solution:

```

// Problem: Sum of Root To Leaf Binary Numbers
// Difficulty: Easy
// 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_root_to_leaf(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_root_to_leaf(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 $root
 * @return Integer
 */
function sumRootToLeaf($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 sumRootToLeaf(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 sumRootToLeaf(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_root_to_leaf(root :: TreeNode.t() | nil) :: integer
  def sum_root_to_leaf(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_root_to_leaf(Root :: #tree_node{} | null) -> integer().
sum_root_to_leaf(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-root-to-leaf root)
  (-> (or/c tree-node? #f) exact-integer?)
  )
```