Problem 2458: Height of Binary Tree After Subtree Removal Queries

Problem Information

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

Problem Description

You are given the

root

of a

binary tree

with

n

nodes. Each node is assigned a unique value from

1

to

n

. You are also given an array

queries

of size

m

.

You have to perform

m

independent

queries on the tree where in the

i

th

query you do the following:

Remove

the subtree rooted at the node with the value

queries[i]

from the tree. It is

guaranteed

that

queries[i]

will

not

be equal to the value of the root.

Return

an array

answer

of size

m

where

answer[i]

is the height of the tree after performing the

i

th

query

.

Note

:

The queries are independent, so the tree returns to its

initial

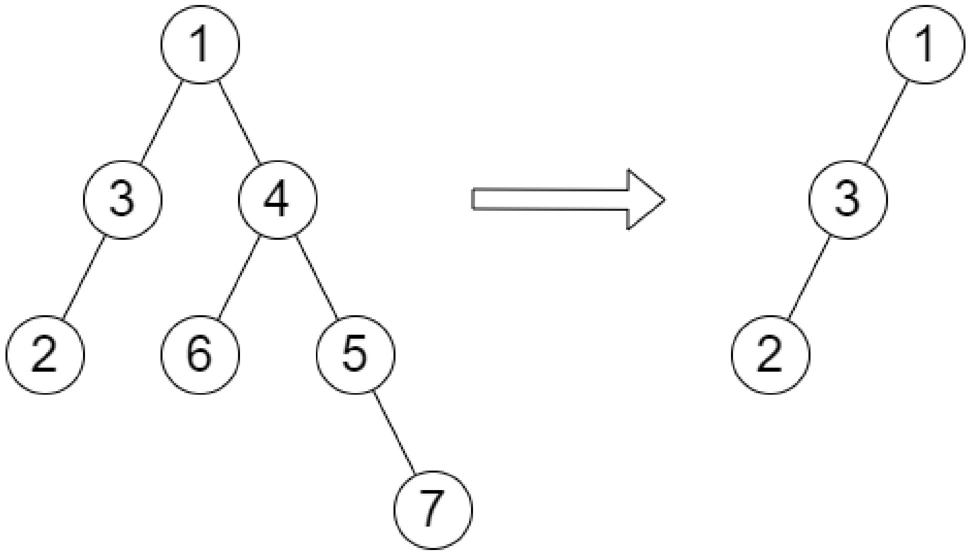
state after each query.

The height of a tree is the

number of edges in the longest simple path

from the root to some node in the tree.

Example 1:



Input:

root = [1,3,4,2,null,6,5,null,null,null,null,null,7], queries = [4]

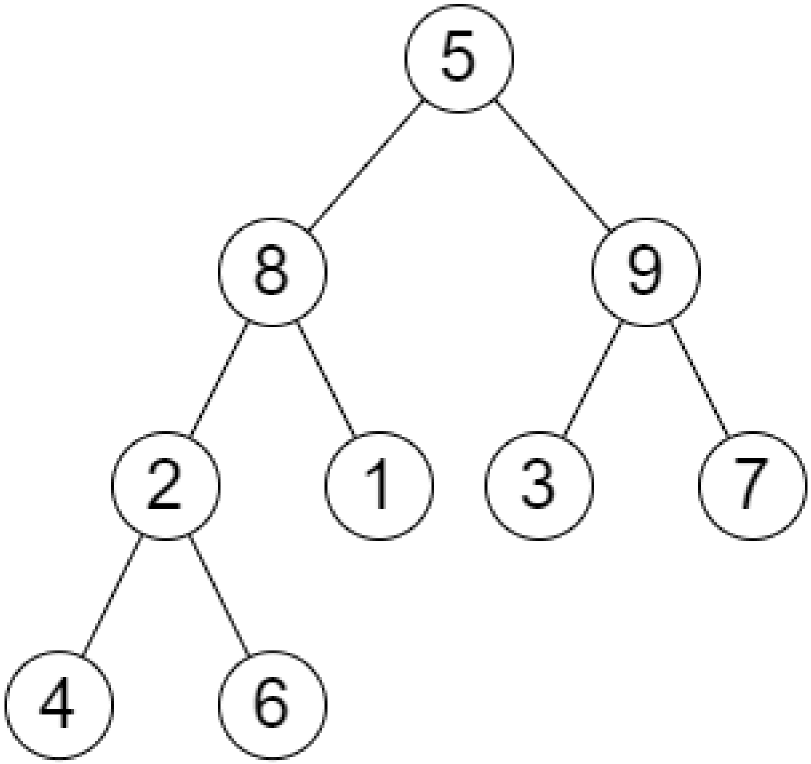
Output:

[2]

Explanation:

The diagram above shows the tree after removing the subtree rooted at node with value 4.
The height of the tree is 2 (The path 1 -> 3 -> 2).

Example 2:



Input:

root = [5,8,9,2,1,3,7,4,6], queries = [3,2,4,8]

Output:

[3,2,3,2]

Explanation:

We have the following queries: - Removing the subtree rooted at node with value 3. The height of the tree becomes 3 (The path 5 -> 8 -> 2 -> 4). - Removing the subtree rooted at node with value 2. The height of the tree becomes 2 (The path 5 -> 8 -> 1). - Removing the subtree rooted at node with value 4. The height of the tree becomes 3 (The path 5 -> 8 -> 2 -> 6). - Removing the subtree rooted at node with value 8. The height of the tree becomes 2 (The path 5 -> 9 -> 3).

Constraints:

The number of nodes in the tree is

n

.

2 <= n <= 10

5

1 <= Node.val <= n

All the values in the tree are

unique

.

m == queries.length

1 <= m <= min(n, 10

4

)

1 <= queries[i] <= n

queries[i] != root.val

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:
vector<int> treeQueries(TreeNode* root, vector<int>& queries) {

}
};
```

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[] treeQueries(TreeNode root, int[] queries) {

}
}
```

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 treeQueries(self, root: Optional[TreeNode], queries: List[int]) ->
List[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 treeQueries(self, root, queries):
"""
:type root: Optional[TreeNode]
:type queries: List[int]
:rtype: List[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
* @param {number[]} queries
* @return {number[]}
*/
var treeQueries = function(root, queries) {

};
```

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 treeQueries(root: TreeNode | null, queries: number[]): 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[] TreeQueries(TreeNode root, int[] queries) {

}
}
```

C:

```
/**
* Definition for a binary tree node.
* struct TreeNode {
* int val;
* struct TreeNode *left;
* struct TreeNode *right;
* };
*/
/**
* Note: The returned array must be malloced, assume caller calls free().
*/
int* treeQueries(struct TreeNode* root, int* queries, int queriesSize, int*
returnSize) {

}
```

Go:

```
/**
* Definition for a binary tree node.
* type TreeNode struct {
* Val int
* Left *TreeNode
* Right *TreeNode
* }
*/
func treeQueries(root *TreeNode, queries []int) []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 treeQueries(root: TreeNode?, queries: IntArray): IntArray {

}
}
```

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 treeQueries(_ root: TreeNode?, _ queries: [Int]) -> [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 tree_queries(root: Option<Rc<RefCell<TreeNode>>>, queries: Vec<i32>)
-> Vec<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
# @param {Integer[]} queries
# @return {Integer[]}
def tree_queries(root, queries)

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
* @param Integer[] $queries
* @return Integer[]
*/
function treeQueries($root, $queries) {

}
}
```

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 {
List<int> treeQueries(TreeNode? root, List<int> queries) {

}
}
```

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 treeQueries(root: TreeNode, queries: Array[Int]): Array[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 tree_queries(root :: TreeNode.t | nil, queries :: [integer]) ::
[integer]
def tree_queries(root, queries) 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 tree_queries(Root :: #tree_node{} | null, Queries :: [integer()]) ->
[integer()].
```

```
tree_queries(Root, Queries) ->
.
```

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 (tree-queries root queries)
(-> (or/c tree-node? #f) (listof exact-integer?) (listof exact-integer?))
)
```

Solutions

C++ Solution:

```
/*
* Problem: Height of Binary Tree After Subtree Removal Queries
* Difficulty: Hard
* Tags: array, tree, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* 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:
vector<int> treeQueries(TreeNode* root, vector<int>& queries) {

}
};
```

Java Solution:

```
/**
* Problem: Height of Binary Tree After Subtree Removal Queries
* Difficulty: Hard
* Tags: array, tree, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* 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() {}
* 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[] treeQueries(TreeNode root, int[] queries) {

}
}
```

Python3 Solution:

```
"""
Problem: Height of Binary Tree After Subtree Removal Queries
Difficulty: Hard
Tags: array, tree, search

Approach: Use two pointers or sliding window technique
Time Complexity: O(n) or O(n log n)
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 treeQueries(self, root: Optional[TreeNode], queries: List[int]) ->
List[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 treeQueries(self, root, queries):
"""
:type root: Optional[TreeNode]
:type queries: List[int]
:rtype: List[int]
"""
```

JavaScript Solution:

```
/**
* Problem: Height of Binary Tree After Subtree Removal Queries
* Difficulty: Hard
* Tags: array, tree, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* 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
* @param {number[]} queries
* @return {number[]}
*/
var treeQueries = function(root, queries) {

};
```

TypeScript Solution:

```
/**
* Problem: Height of Binary Tree After Subtree Removal Queries
```

```
* Difficulty: Hard
* Tags: array, tree, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* 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 treeQueries(root: TreeNode | null, queries: number[]): number[] {

};
```

C# Solution:

```
/*
* Problem: Height of Binary Tree After Subtree Removal Queries
* Difficulty: Hard
* Tags: array, tree, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* 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[] TreeQueries(TreeNode root, int[] queries) {

}
}
```

C Solution:

```
/*
* Problem: Height of Binary Tree After Subtree Removal Queries
* Difficulty: Hard
* Tags: array, tree, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* 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;
* };
*/
/**
* Note: The returned array must be malloced, assume caller calls free().
*/
int* treeQueries(struct TreeNode* root, int* queries, int queriesSize, int*
```

```
returnSize) {

}
```

Go Solution:

```
// Problem: Height of Binary Tree After Subtree Removal Queries
// Difficulty: Hard
// Tags: array, tree, search
//
// Approach: Use two pointers or sliding window technique
// Time Complexity: O(n) or O(n log n)
// 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 treeQueries(root *TreeNode, queries []int) []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 treeQueries(root: TreeNode?, queries: IntArray): IntArray {

}
```

```
}
```

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 treeQueries(_ root: TreeNode?, _ queries: [Int]) -> [Int] {

}
}
```

Rust Solution:

```
// Problem: Height of Binary Tree After Subtree Removal Queries
// Difficulty: Hard
// Tags: array, tree, search
//
// Approach: Use two pointers or sliding window technique
// Time Complexity: O(n) or O(n log n)
// 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 tree_queries(root: Option<Rc<RefCell<TreeNode>>>, queries: Vec<i32>)
-> Vec<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
# @param {Integer[]} queries
# @return {Integer[]}
def tree_queries(root, queries)

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
* @param Integer[] $queries
* @return Integer[]
*/
function treeQueries($root, $queries) {

}
}
```

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 {
List<int> treeQueries(TreeNode? root, List<int> queries) {

}
}
```

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 treeQueries(root: TreeNode, queries: Array[Int]): Array[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 tree_queries(root :: TreeNode.t | nil, queries :: [integer]) ::
[integer]
def tree_queries(root, queries) 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 tree_queries(Root :: #tree_node{} | null, Queries :: [integer()]) ->
[integer()].
tree_queries(Root, Queries) ->
.
```

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 (tree-queries root queries)
(-> (or/c tree-node? #f) (listof exact-integer?) (listof exact-integer?))
)
```