Problem 1145: Binary Tree Coloring Game

Problem Information

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

Problem Description

Two players play a turn based game on a binary tree. We are given the

root

of this binary tree, and the number of nodes

n

in the tree.

n

is odd, and each node has a distinct value from

1

to

n

.

Initially, the first player names a value

x

with

$1 <= x <= n$

, and the second player names a value

y

with

$1 <= y <= n$

and

$y != x$

. The first player colors the node with value

x

red, and the second player colors the node with value

y

blue.

Then, the players take turns starting with the first player. In each turn, that player chooses a node of their color (red if player 1, blue if player 2) and colors an

uncolored

neighbor of the chosen node (either the left child, right child, or parent of the chosen node.)

If (and only if) a player cannot choose such a node in this way, they must pass their turn. If both players pass their turn, the game ends, and the winner is the player that colored more nodes.

You are the second player. If it is possible to choose such a

y

to ensure you win the game, return

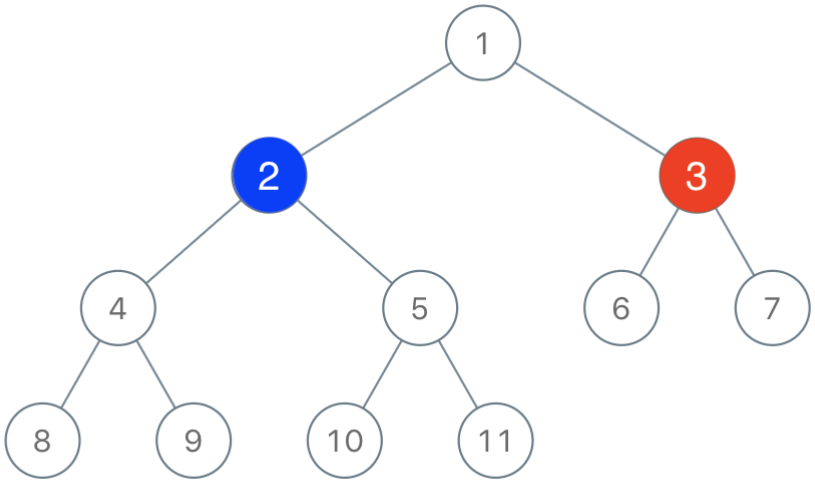
true

. If it is not possible, return

false

.

Example 1:



Input:

root = [1,2,3,4,5,6,7,8,9,10,11], n = 11, x = 3

Output:

true

Explanation:

The second player can choose the node with value 2.

Example 2:

Input:

root = [1,2,3], n = 3, x = 1

Output:

false

Constraints:

The number of nodes in the tree is

n

.

1 <= x <= n <= 100

n

is odd.

1 <= Node.val <= n

All the values of the tree are

unique

.

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:
bool btreeGameWinningMove(TreeNode* root, int n, int x) {

}
};
```

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 boolean btreeGameWinningMove(TreeNode root, int n, int x) {

}
}
```

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 btreeGameWinningMove(self, root: Optional[TreeNode], n: int, x: int) ->
bool:
```

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 btreeGameWinningMove(self, root, n, x):
"""
:type root: Optional[TreeNode]
:type n: int
:type x: int
:rtype: bool
"""
```

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} n
* @param {number} x
* @return {boolean}
*/
```

```
var btreeGameWinningMove = function(root, n, x) {

};
```

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 btreeGameWinningMove(root: TreeNode | null, n: number, x: number):
boolean {

};
```

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 bool BtreeGameWinningMove(TreeNode root, int n, int x) {

}
}
```

C:

```
/**
* Definition for a binary tree node.
* struct TreeNode {
* int val;
* struct TreeNode *left;
* struct TreeNode *right;
* };
*/
bool btreeGameWinningMove(struct TreeNode* root, int n, int x) {

}
```

Go:

```
/**
* Definition for a binary tree node.
* type TreeNode struct {
* Val int
* Left *TreeNode
* Right *TreeNode
* }
*/
func btreeGameWinningMove(root *TreeNode, n int, x int) bool {

}
```

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 btreeGameWinningMove(root: TreeNode?, n: Int, x: Int): Boolean {

}
}
```

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 btreeGameWinningMove(_ root: TreeNode?, _ n: Int, _ x: Int) -> Bool {

}
}
```

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 btree_game_winning_move(root: Option<Rc<RefCell<TreeNode>>>, n: i32,
x: i32) -> bool {

}
}
```

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} n
# @param {Integer} x
# @return {Boolean}
def btree_game_winning_move(root, n, x)

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 $n
* @param Integer $x
* @return Boolean
*/
function btreeGameWinningMove($root, $n, $x) {

}
}
```

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 {
bool btreeGameWinningMove(TreeNode? root, int n, int x) {

}
}
```

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 btreeGameWinningMove(root: TreeNode, n: Int, x: Int): Boolean = {

}
}
```

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 btree_game_winning_move(root :: TreeNode.t | nil, n :: integer, x ::
integer) :: boolean
def btree_game_winning_move(root, n, x) 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 btree_game_winning_move(Root :: #tree_node{} | null, N :: integer(), X
:: integer()) -> boolean().
btree_game_winning_move(Root, N, X) ->
.
```

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 (btree-game-winning-move root n x)
(-> (or/c tree-node? #f) exact-integer? exact-integer? boolean?)
)
```

Solutions

C++ Solution:

```
/*
* Problem: Binary Tree Coloring Game
* 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:
bool btreeGameWinningMove(TreeNode* root, int n, int x) {

}
};
```

Java Solution:

```
/**
* Problem: Binary Tree Coloring Game
* 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 boolean btreeGameWinningMove(TreeNode root, int n, int x) {

}
}
```

Python3 Solution:

```
"""
Problem: Binary Tree Coloring Game
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 btreeGameWinningMove(self, root: Optional[TreeNode], n: int, x: int) ->
bool:
# 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 btreeGameWinningMove(self, root, n, x):
"""
:type root: Optional[TreeNode]
:type n: int
:type x: int
:rtype: bool
"""
```

JavaScript Solution:

```
/**
* Problem: Binary Tree Coloring Game
* 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
* @param {number} n
* @param {number} x
* @return {boolean}
*/
var btreeGameWinningMove = function(root, n, x) {

};
```

TypeScript Solution:

```
/**
* Problem: Binary Tree Coloring Game
* 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 btreeGameWinningMove(root: TreeNode | null, n: number, x: number):
boolean {

};
```

C# Solution:

```
/*
* Problem: Binary Tree Coloring Game
* 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 bool BtreeGameWinningMove(TreeNode root, int n, int x) {

}
}
```

C Solution:

```
/*
* Problem: Binary Tree Coloring Game
```

```
* 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;
* };
*/
bool btreeGameWinningMove(struct TreeNode* root, int n, int x) {

}
```

Go Solution:

```
// Problem: Binary Tree Coloring Game
// 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 btreeGameWinningMove(root *TreeNode, n int, x int) bool {

}
```

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 btreeGameWinningMove(root: TreeNode?, n: Int, x: Int): Boolean {

}
}
```

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 btreeGameWinningMove(_ root: TreeNode?, _ n: Int, _ x: Int) -> Bool {

}
}
```

Rust Solution:

```
// Problem: Binary Tree Coloring Game
// 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 btree_game_winning_move(root: Option<Rc<RefCell<TreeNode>>>, n: i32,
x: i32) -> bool {

}
}
```

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} n
# @param {Integer} x
# @return {Boolean}
def btree_game_winning_move(root, n, x)

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 $n
* @param Integer $x
* @return Boolean
*/
function btreeGameWinningMove($root, $n, $x) {

}
}
```

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 {
bool btreeGameWinningMove(TreeNode? root, int n, int x) {

}
}
```

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 btreeGameWinningMove(root: TreeNode, n: Int, x: Int): Boolean = {

}
}
```

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 btree_game_winning_move(root :: TreeNode.t | nil, n :: integer, x ::
integer) :: boolean
def btree_game_winning_move(root, n, x) 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 btree_game_winning_move(Root :: #tree_node{} | null, N :: integer(), X
:: integer()) -> boolean().
btree_game_winning_move(Root, N, X) ->
.
```

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 (btree-game-winning-move root n x)
(-> (or/c tree-node? #f) exact-integer? exact-integer? boolean?)
)
```