

# Problem 101: Symmetric Tree

## Problem Information

**Difficulty:** Easy

**Acceptance Rate:** 0.00%

**Paid Only:** No

## Problem Description

Given the

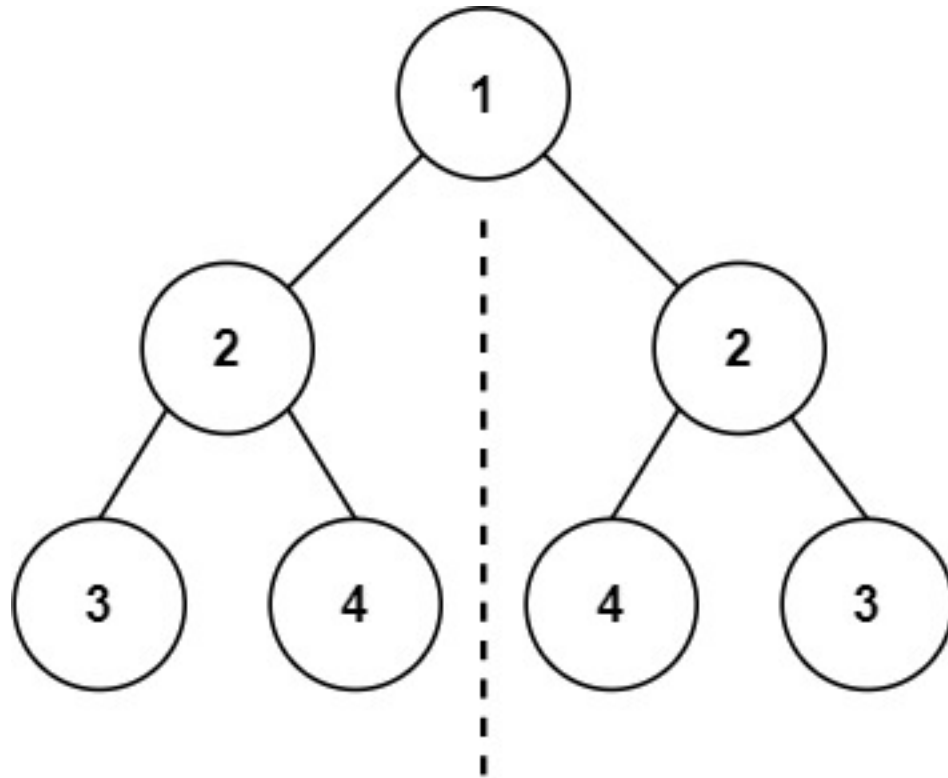
root

of a binary tree,

check whether it is a mirror of itself

(i.e., symmetric around its center).

Example 1:



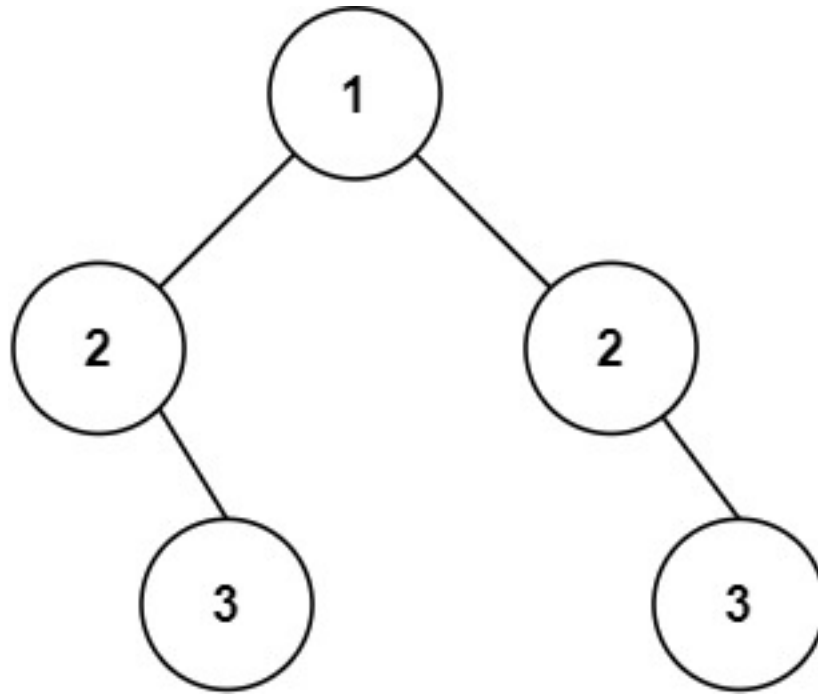
Input:

root = [1,2,2,3,4,4,3]

Output:

true

Example 2:



Input:

root = [1,2,2,null,3,null,3]

Output:

false

Constraints:

The number of nodes in the tree is in the range

[1, 1000]

.

$-100 \leq \text{Node.val} \leq 100$

Follow up:

Could you solve it both recursively and iteratively?

## 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 isSymmetric(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 boolean isSymmetric(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 isSymmetric(self, root: Optional[TreeNode]) -> 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 isSymmetric(self, root):  
        """  
        :type root: Optional[TreeNode]  
        :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  
 * @return {boolean}
```

```

*/
var isSymmetric = 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 isSymmetric(root: TreeNode | null): 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 IsSymmetric(TreeNode root) {

}

}

```

**C:**

```

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

}

```

**Go:**

```

/**
 * Definition for a binary tree node.
 * type TreeNode struct {
 *   Val int
 *   Left *TreeNode
 *   Right *TreeNode
 * }
 */
func isSymmetric(root *TreeNode) 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 isSymmetric(root: TreeNode?): 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 isSymmetric(_ root: TreeNode?) -> 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 is_symmetric(root: Option<Rc<RefCell<TreeNode>>>) -> 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
# @return {Boolean}
def is_symmetric(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 $root
    * @return Boolean
    */
    function isSymmetric($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 {
  bool isSymmetric(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 isSymmetric(root: TreeNode): 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 is_symmetric(root :: TreeNode.t | nil) :: boolean
  def is_symmetric(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 is_symmetric(Root :: #tree_node{} | null) -> boolean().
is_symmetric(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 (is-symmetric root)
  (-> (or/c tree-node? #f) boolean?)
)
```

## Solutions

### C++ Solution:

```
/*
 * Problem: Symmetric Tree
 * 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:
bool isSymmetric(TreeNode* root) {

}
};

```

## Java Solution:

```

/**
 * Problem: Symmetric Tree
 * 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 boolean isSymmetric(TreeNode root) {

}
}

```

### Python3 Solution:

```

"""
Problem: Symmetric Tree
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 isSymmetric(self, root: Optional[TreeNode]) -> 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 isSymmetric(self, root):
        """
        :type root: Optional[TreeNode]
        :rtype: bool
        """

```

### JavaScript Solution:

```

/**
 * Problem: Symmetric Tree
 * 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 {boolean}
 */
var isSymmetric = function(root) {

};

```

### TypeScript Solution:

```

/**
 * Problem: Symmetric Tree
 * 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 isSymmetric(root: TreeNode | null): boolean {

};

```

## C# Solution:

```

/*
 * Problem: Symmetric Tree
 * 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 bool IsSymmetric(TreeNode root) {

}
}

```

## C Solution:

```

/*
* Problem: Symmetric Tree
* 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;
* };
*/
bool isSymmetric(struct TreeNode* root) {

}

```

### Go Solution:

```
// Problem: Symmetric Tree
// 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 isSymmetric(root *TreeNode) 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 isSymmetric(root: TreeNode?): 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 isSymmetric(_ root: TreeNode?) -> Bool {

}

}

```

## Rust Solution:

```

// Problem: Symmetric Tree
// 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 is_symmetric(root: Option<Rc<RefCell<TreeNode>>>) -> 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
# @return {Boolean}
def is_symmetric(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 $root
 * @return Boolean
 */
function isSymmetric($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 {
  bool isSymmetric(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 isSymmetric(root: TreeNode): 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 is_symmetric(root :: TreeNode.t | nil) :: boolean
  def is_symmetric(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 is_symmetric(Root :: #tree_node{} | null) -> boolean().
is_symmetric(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 (is-symmetric root)
  (-> (or/c tree-node? #f) boolean?)
  )
```