Problem 3575: Maximum Good Subtree Score

Problem Information

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

Problem Description

You are given an undirected tree rooted at node 0 with

n

nodes numbered from 0 to

n - 1

. Each node

i

has an integer value

vals[i]

, and its parent is given by

par[i]

.

A

subset

of nodes within the

subtree

of a node is called

good

if every digit from 0 to 9 appears

at most

once in the decimal representation of the values of the selected nodes.

The

score

of a good subset is the sum of the values of its nodes.

Define an array

maxScore

of length

n

, where

maxScore[u]

represents the

maximum

possible sum of values of a good subset of nodes that belong to the subtree rooted at node

u

, including

u

itself and all its descendants.

Return the sum of all values in

maxScore

.

Since the answer may be large, return it

modulo

10

9

+ 7

.

Example 1:

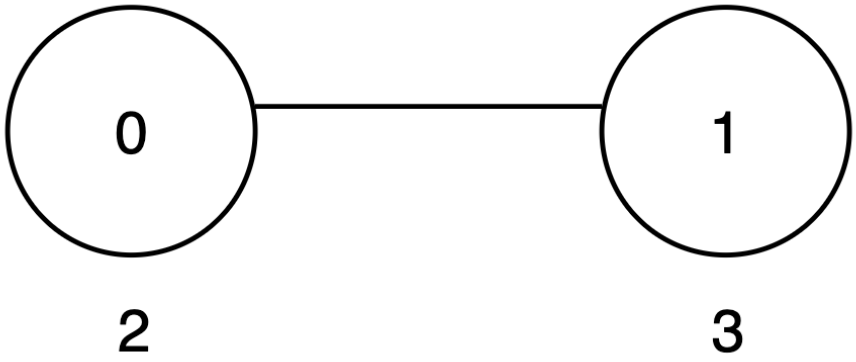
Input:

vals = [2,3], par = [-1,0]

Output:

8

Explanation:



The subtree rooted at node 0 includes nodes

{0, 1}

. The subset

{2, 3}

is

good as the digits 2 and 3 appear only once. The score of this subset is

2 + 3 = 5

.

The subtree rooted at node 1 includes only node

{1}

. The subset

{3}

is

good. The score of this subset is 3.

The

maxScore

array is

[5, 3]

, and the sum of all values in

maxScore

is

5 + 3 = 8

. Thus, the answer is 8.

Example 2:

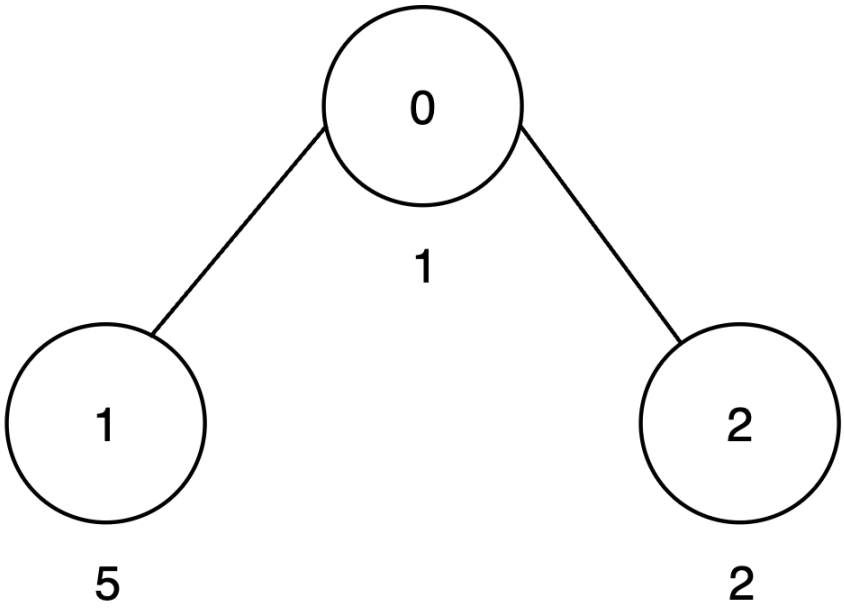
Input:

vals = [1,5,2], par = [-1,0,0]

Output:

15

Explanation:



The subtree rooted at node 0 includes nodes

{0, 1, 2}

. The subset

{1, 5, 2}

is

good as the digits 1, 5 and 2 appear only once. The score of this subset is

1 + 5 + 2 = 8

.

The subtree rooted at node 1 includes only node

{1}

. The subset

{5}

is

good. The score of this subset is 5.

The subtree rooted at node 2 includes only node

{2}

. The subset

{2}

is

good. The score of this subset is 2.

The

maxScore

array is

[8, 5, 2]

, and the sum of all values in

maxScore

is

8 + 5 + 2 = 15

. Thus, the answer is 15.

Example 3:

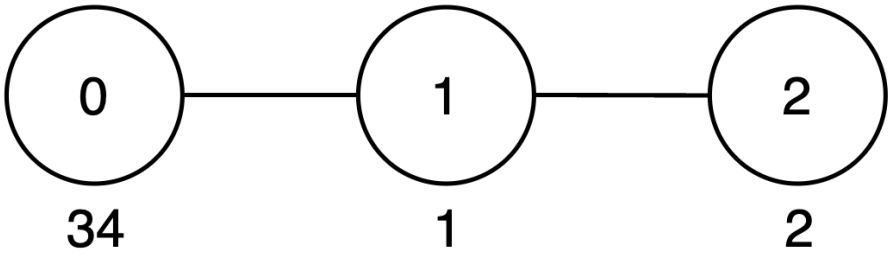
Input:

vals = [34,1,2], par = [-1,0,1]

Output:

42

Explanation:



The subtree rooted at node 0 includes nodes

{0, 1, 2}

. The subset

{34, 1, 2}

is

good as the digits 3, 4, 1 and 2 appear only once. The score of this subset is

34 + 1 + 2 = 37

.

The subtree rooted at node 1 includes node

{1, 2}

. The subset

{1, 2}

is

good as the digits 1 and 2 appear only once. The score of this subset is

1 + 2 = 3

.

The subtree rooted at node 2 includes only node

{2}

. The subset

{2}

is

good. The score of this subset is 2.

The

maxScore

array is

[37, 3, 2]

, and the sum of all values in

maxScore

is

37 + 3 + 2 = 42

. Thus, the answer is 42.

Example 4:

Input:

vals = [3,22,5], par = [-1,0,1]

Output:

18

Explanation:

The subtree rooted at node 0 includes nodes

{0, 1, 2}

. The subset

{3, 22, 5}

is

not good, as digit 2 appears twice. Therefore, the subset

{3, 5}

is valid. The score of this subset is

3 + 5 = 8

.

The subtree rooted at node 1 includes nodes

{1, 2}

. The subset

{22, 5}

is

not good, as digit 2 appears twice. Therefore, the subset

{5}

is valid. The score of this subset is 5.

The subtree rooted at node 2 includes

{2}

. The subset

{5}

is

good. The score of this subset is 5.

The

maxScore

array is

[8, 5, 5]

, and the sum of all values in

maxScore

is

8 + 5 + 5 = 18

. Thus, the answer is 18.

Constraints:

1 <= n == vals.length <= 500

1 <= vals[i] <= 10

9

par.length == n

par[0] == -1

0 <= par[i] < n

for

i

in

[1, n - 1]

The input is generated such that the parent array

par

represents a valid tree.

Code Snippets

C++:

```
class Solution {
public:
int goodSubtreeSum(vector<int>& vals, vector<int>& par) {

}
};
```

Java:

```
class Solution {
public int goodSubtreeSum(int[] vals, int[] par) {

}
}
```

Python3:

```
class Solution:
def goodSubtreeSum(self, vals: List[int], par: List[int]) -> int:
```

Python:

```
class Solution(object):
def goodSubtreeSum(self, vals, par):
"""
:type vals: List[int]
:type par: List[int]
:rtype: int
"""
```

JavaScript:

```
/**
* @param {number[]} vals
* @param {number[]} par
* @return {number}
*/
var goodSubtreeSum = function(vals, par) {

};
```

TypeScript:

```
function goodSubtreeSum(vals: number[], par: number[]): number {

};
```

C#:

```
public class Solution {
public int GoodSubtreeSum(int[] vals, int[] par) {
```

```
}
}
```

C:

```
int goodSubtreeSum(int* vals, int valsSize, int* par, int parSize) {

}
```

Go:

```
func goodSubtreeSum(vals []int, par []int) int {

}
```

Kotlin:

```
class Solution {
fun goodSubtreeSum(vals: IntArray, par: IntArray): Int {

}
}
```

Swift:

```
class Solution {
func goodSubtreeSum(_ vals: [Int], _ par: [Int]) -> Int {

}
}
```

Rust:

```
impl Solution {
pub fn good_subtree_sum(vals: Vec<i32>, par: Vec<i32>) -> i32 {

}
}
```

Ruby:

```
# @param {Integer[]} vals
# @param {Integer[]} par
# @return {Integer}
def good_subtree_sum(vals, par)

end
```

PHP:

```
class Solution {

/**
* @param Integer[] $vals
* @param Integer[] $par
* @return Integer
*/
function goodSubtreeSum($vals, $par) {

}
}
```

Dart:

```
class Solution {
int goodSubtreeSum(List<int> vals, List<int> par) {

}
}
```

Scala:

```
object Solution {
def goodSubtreeSum(vals: Array[Int], par: Array[Int]): Int = {

}
}
```

Elixir:

```
defmodule Solution do
@spec good_subtree_sum(vals :: [integer], par :: [integer]) :: integer
def good_subtree_sum(vals, par) do
```

```
end
end
```

Erlang:

```
-spec good_subtree_sum(Vals :: [integer()], Par :: [integer()]) -> integer().
good_subtree_sum(Vals, Par) ->
.
```

Racket:

```
(define/contract (good-subtree-sum vals par)
(-> (listof exact-integer?) (listof exact-integer?) exact-integer?)
)
```

Solutions

C++ Solution:

```
/*
* Problem: Maximum Good Subtree Score
* Difficulty: Hard
* Tags: array, tree, dp, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* Space Complexity: O(n) or O(n * m) for DP table
*/

class Solution {
public:
int goodSubtreeSum(vector<int>& vals, vector<int>& par) {

}
};
```

Java Solution:

```
/**
* Problem: Maximum Good Subtree Score
```

```
* Difficulty: Hard
* Tags: array, tree, dp, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* Space Complexity: O(n) or O(n * m) for DP table
*/

class Solution {
public int goodSubtreeSum(int[] vals, int[] par) {

}
}
```

Python3 Solution:

```
"""
Problem: Maximum Good Subtree Score
Difficulty: Hard
Tags: array, tree, dp, search

Approach: Use two pointers or sliding window technique
Time Complexity: O(n) or O(n log n)
Space Complexity: O(n) or O(n * m) for DP table
"""

class Solution:
def goodSubtreeSum(self, vals: List[int], par: List[int]) -> int:
# TODO: Implement optimized solution
pass
```

Python Solution:

```
class Solution(object):
def goodSubtreeSum(self, vals, par):
"""
:type vals: List[int]
:type par: List[int]
:rtype: int
"""
```

JavaScript Solution:

```
/**
* Problem: Maximum Good Subtree Score
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* Time Complexity: O(n) or O(n log n)
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*/

/**
* @param {number[]} vals
* @param {number[]} par
* @return {number}
*/
var goodSubtreeSum = function(vals, par) {

};
```

TypeScript Solution:

```
/**
* Problem: Maximum Good Subtree Score
* Difficulty: Hard
* Tags: array, tree, dp, search
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* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* Space Complexity: O(n) or O(n * m) for DP table
*/

function goodSubtreeSum(vals: number[], par: number[]): number {

};
```

C# Solution:

```
/*
* Problem: Maximum Good Subtree Score
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* Tags: array, tree, dp, search
```

```
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
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*/

public class Solution {
public int GoodSubtreeSum(int[] vals, int[] par) {

}
}
```

C Solution:

```
/*
* Problem: Maximum Good Subtree Score
* Difficulty: Hard
* Tags: array, tree, dp, search
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
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*/

int goodSubtreeSum(int* vals, int valsSize, int* par, int parSize) {

}
```

Go Solution:

```
// Problem: Maximum Good Subtree Score
// Difficulty: Hard
// Tags: array, tree, dp, search
//
// Approach: Use two pointers or sliding window technique
// Time Complexity: O(n) or O(n log n)
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func goodSubtreeSum(vals []int, par []int) int {

}
```

Kotlin Solution:

```
class Solution {
fun goodSubtreeSum(vals: IntArray, par: IntArray): Int {

}
}
```

Swift Solution:

```
class Solution {
func goodSubtreeSum(_ vals: [Int], _ par: [Int]) -> Int {

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Rust Solution:

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// Problem: Maximum Good Subtree Score
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// Approach: Use two pointers or sliding window technique
// Time Complexity: O(n) or O(n log n)
// Space Complexity: O(n) or O(n * m) for DP table

impl Solution {
pub fn good_subtree_sum(vals: Vec<i32>, par: Vec<i32>) -> i32 {

}
}
```

Ruby Solution:

```
# @param {Integer[]} vals
# @param {Integer[]} par
# @return {Integer}
def good_subtree_sum(vals, par)

end
```

PHP Solution:

```
class Solution {

/**
* @param Integer[] $vals
* @param Integer[] $par
* @return Integer
*/
function goodSubtreeSum($vals, $par) {

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