

Assignment #2

Purpose

Practicing on Graph traversing algorithms BFS and DFS.

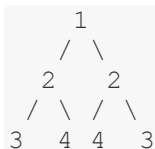
Description

Assignment consists of 4 problems you have to solve all of them and follow the function signature as mentioned to you, attached Tree class you can use it to solve the tree problems.

Problem 1

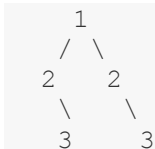
Given a binary tree t , determine whether it is symmetric around its center, i.e. each side mirrors the other.

For the following tree:



`isSymmetric(t) = true`

For the following tree:



`isSymmetric(t) = false`

[input] `tree.integer t`

A binary tree of integers.

Guaranteed constraints:

$0 \leq \text{tree size} < 5 * 10^4$, $-1000 \leq \text{node value} \leq 1000$.

[output] boolean

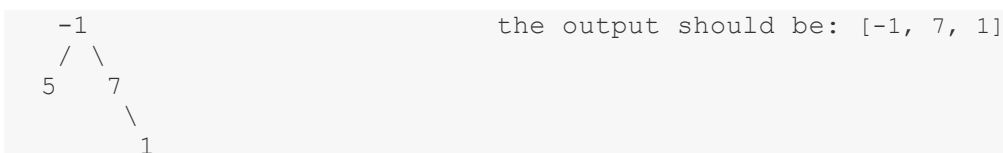
Return true if t is symmetric and false otherwise.

Function Signature is => boolean isSymmetric (Tree<Integer> t)

Problem 2

You have a binary tree t. Your task is to find the largest value in each row of this tree. In a tree, a row is a set of nodes that have equal depth. For example, a row with depth 0 is a tree root, a row with depth 1 is composed of the root's children, etc.

Return an array in which the first element is the largest value in the row with depth 0, the second element is the largest value in the row with depth 1, the third element is the largest element in the row with depth 2, etc.



In the row with depth 0, there is only one vertex - the root with value -1;

In the row with depth 1, there are two vertices with values 5 and 7, so the largest value here is 7;

In the row with depth 2, there is only one vertex with value 1.

[input] tree.integer t

A binary tree of integers.

Guaranteed constraints: $0 \leq \text{tree size} \leq 5 \cdot 10^4$, $-1000 \leq \text{node value} \leq 1000$.

[output] array.integer

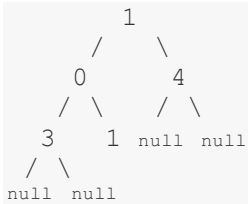
An array of the largest values in each row of t.

Function Signature is => `int[] largestValues (Tree<Integer> t)`

Problem 3

We're going to store numbers in a tree. Each node in this tree will store a single digit (from 0 to 9), and each path from root to leaf encodes a non-negative integer.

Given a binary tree t, find the sum of all the numbers encoded in it.



the output should be: 218
 Path 1->0->3 encodes 103
 Path 1->0->1 encodes 101
 Path 1->4 encodes 14

[input] tree.integer t

A tree of integers. It's guaranteed that the sum of encoded integers won't exceed 2^{52} .

Guaranteed constraints: $1 \leq \text{tree size} \leq 2000$, $1 \leq \text{tree depth} \leq 9$, $0 \leq \text{node value} \leq 9$.

[output] integer64

The sum of the integers encoded in t, as described above.

Function Signature is => `long digitSum(Tree<Integer> t)`

Problem 4

There are N countries {1, 2, 3, 4, ..., N} and N-1 roads (i.e. depicting a tree). Salah lives in the Country 1 so this can be considered as the root of the tree.

Now there are Q Football clubs in various countries (not equal to 1) .All of them want to Salah to join them .But Salah has some condition.

He will accept the proposal of the club which located at minimum distance from his country.

Now the distance between two countries is the number of roads between them.

If two or more clubs are at the same minimum distance then he will accept the proposal of the club which is in a country with minimum id.

No two clubs are at same country.

Input: First line consists of N, i.e number of countries Next N-1 lines follow the type u v which denotes there is a road between u and v. Next line consists of Q Next Q lines consists of x the clubs locations.

Output: Print the id of the country of the club which will be accepted.

Help Him!!!!

constraints: $2 \leq N \leq 1000$ $1 \leq u, v \leq N$ $1 \leq Q \leq (N-1)$

SAMPLE INPUT

6
1 2
1 3
1 4
2 5
2 6
4
5
6
3
4

SAMPLE OUTPUT

3

Instructions

- 1- The Assignment is group of 4.
- 2- You can solve assignment with **C++** or **Java**
- 3- At least one team member should submit the compressed group solution as zip file containing the program under Acadox => tasks (name your assignment file "Group#_Assignment2_ID1_ID2_ID3_ID4.zip"). There is a penalty for not following this naming style.
- 4- The deadline for submitting the solution is 1 March. 2020 @ 11:59 PM.
- 5- Cheating could lead to serious consequences
- 6- No submissions after deadline.

Use this tree class in your solution

```
class Tree<T> {  
    Tree(T x) {  
        value = x;  
    }  
    T value;  
    Tree<T> left;  
    Tree<T> right;  
}
```