PIB '20 P4 - Ninjaclasher the Perfect Man

Time limit: 0.5s **Memory limit:** 256M

Ninjaclasher, MCPT's self-proclaimed President, has an obsession with all things perfect. One day, while he was working on a tree problem, he began wondering how many perfect trees existed in the problem. As such, he has hired you to find the number of perfect trees on a given tree.

More specifically, he wants to know the number of non-empty subset of nodes in the tree that form a perfect tree, modulo $10^9 + 7$. A subset of nodes is a perfect tree if there is a root of that subset of nodes that satisfies these properties:

1. The subset of nodes forms a connected tree.
2. Every non-leaf node in the tree has the same amount of children k ($k \geq 2$).
3. Every leaf is equidistant to the root node.

Input Specification

The first line will contain the integer N ($1 \leq N \leq 2000$), the number of nodes in the tree.

The next $N - 1$ lines will each contain two integers, u_i and v_i ($1 \leq u_i, v_i \leq N$), indicating that nodes u_i and v_i are connected by an edge.

Output Specification

The number of subset of nodes of the tree that form a perfect tree, modulo $10^9 + 7$.

Subtasks

Subtask 1 [27%]

$N \leq 100$

Subtask 2 [73%]

No additional constraints.

Sample Input for Subtask 1

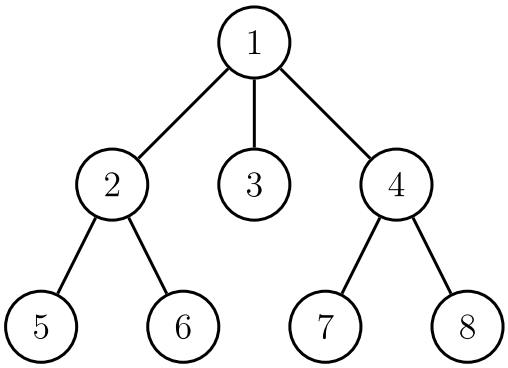
```
8
1 2
1 3
1 4
2 5
2 6
4 7
4 8
```

Sample Output for Subtask 1

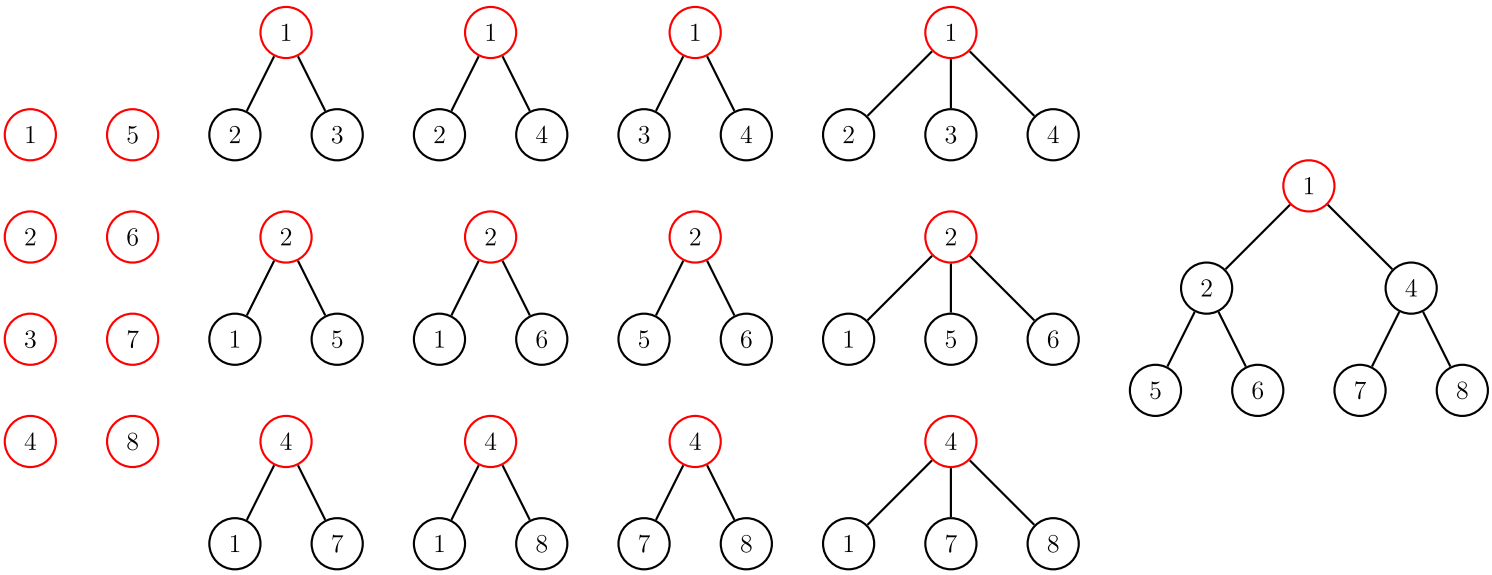
```
21
```

Explanation for Sample for Subtask 1

The following tree is given:



The following are the 21 perfect trees, with the roots in red:



Sample Input for Subtask 2

```
15
1 2
1 3
1 4
1 5
1 6
2 7
2 8
2 9
2 10
6 11
6 12
6 13
6 14
11 15
```

Sample Output for Subtask 2

```
130
```