beCP 2020

Task 2: Network planning (network)

Author: Victor Lecomte Preparation: Bruno Ploumhans
Time limit: 1.5 s Memory limit: 256 MB

The Belgian Olympiad in Informatics is setting up a new computer network. It will be made of n computers numbered from 0 to $n-1$, and there are various plans to connect them with $n-1$ cables.

You are asked to evaluate one such plan: we give you the connections between the computers, and you need to compute the quality of the plan.

As you may know, messages may be lost when they are sent through a network, and the highest the distance, the more data will be lost. Let d_{ij} be the distance between computers i and j along the cables, that is the number of cables connecting computers i and j. We need you to estimate how much data will be lost by computing the sum of $41^{d_{ij}}$ over all pairs of computers i, j.

Formally, we need you to calculate the following number:

$$\sum_{i=0}^{n-1} \sum_{j=0}^{n-1} 41^{d_{ij}}.$$

As this number may be very large, you will need to compute it modulo $10^9 + 7$.

Please note that some numbers may not fit in regular `int`*s for this problem. We recommend using* `long long`*s.*

Input

The first line of the input consists of a single integer n. Then $n-1$ lines follow, the i-th of which containing two integers u_i and v_i, meaning that there is a cable between the computers u_i and v_i.

Output

Print a single integer: the sum of $41^{d_{ij}}$ modulo $10^9 + 7$ over all pairs of computers i, j, where d_{ij} is the distance between computers i and j.

General limits

- $3 \leq n < 2 \cdot 10^5$, the number of computers;
- $0 \leq u_i, v_i < n$, the computers at the endpoints of i-th cable;
- for every two computers, there is a path that connects them.

Additional constraints

Subtask	Points	Constraints
A	10	$n < 100$
B	20	$n < 3000$
C	70	No additional constraint

Example 1

sample1.in

```
3
0 1
1 2
```

sample1.out

```
3529
```

In this sample, the distance is 0 for the pairs $(0,0), (1,1), (2,2)$, 1 for the pairs $(0,1), (1,0), (1,2), (2,1)$ and 2 for the pairs $(0,2), (2,0)$. The answer is thus $3 \cdot 41^0 + 4 \cdot 41^1 + 2 \cdot 41^2 = 3539$.

Example 2

sample2.in

```
4
0 1
1 2
1 3
```

sample2.out

```
10336
```

In this sample, the distance is 0 for 4 pairs, 1 for 6 pairs and 2 for 6 pairs. The answer is thus $4 \cdot 41^0 + 6 \cdot 41^1 + 6 \cdot 41^2 = 10336$.

Example 3

sample3.in

```
7
0 1
1 2
2 3
3 4
4 5
5 6
```

sample3.out

```
981156466
```

In this sample, the distance is 9981156529, but the result has to be printed modulo $10^9 + 7$. The answer is thus 981156466.