Highway Patrol Distribution

Difficulty: Easy

Tagline: Splitting the Roads Fairly: A Traffic Balancing Challenge

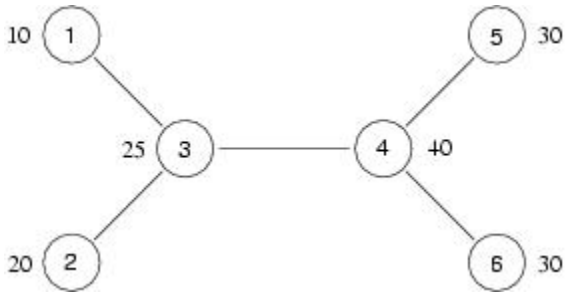
Problem Statement:

A key feature of the Deltaway highway system is that there is exactly one direct route between any pair of towns.

The government has hired three security agencies to patrol the highways connecting the towns. To avoid conflicts between the agencies, it has been decided that if two towns, say T1 and T2, are connected by a direct highway, then all towns along the path between T1 and T2 will be assigned to the same security agency.

The government wants to assign towns to each agency in such a way that the maximum number of cars patrolling through any one agency's assigned roads is minimized. They have traffic data that shows how many cars pass through each town annually. They want to assign towns to agencies so that the maximum number of cars assigned to any one agency is as small as possible.

For example, consider the highway system below where the number of cars passing through each town is indicated:



In one possible assignment, towns 1 and 3 are assigned to one agency (with a total traffic of 35 cars), town 2 to the second agency (traffic of 20), and towns 4, 5, and 6 to the third agency (traffic of 100). In this assignment, the maximum traffic for any agency is 100 cars. However, if the towns are assigned

differently, such as towns 1, 2, and 3 to one agency, and towns 4 and 6 to another agency, the maximum traffic can be reduced to 70 cars. The goal is to find the best possible assignment to minimize the maximum traffic.

Input Format:

- The first line of the input contains an integer N, indicating the number of towns in the highway system. The towns are numbered 1, 2, ..., N. This is followed by N lines of input, each containing one integer, representing the number of cars that pass through each town annually. The next N-1 lines contain pairs of integers representing direct highways between two towns.

Output Format:

- The output should be a single integer representing the minimum possible maximum traffic assigned to any one agency.

Constraints:

- The highway system is always a tree, with one unique path between any pair of towns.
- The maximum number of cars passing through any town does not exceed 10^6.