

Village

0.7 s/256 MiB

There are N houses in a certain village. A single villager lives in each of the houses. The houses are connected by roads. Each road connects two houses and is exactly 1 kilometer long. From each house it is possible to reach any other using one or several consecutive roads. In total there are $N - 1$ roads in the village.

One day all villagers decided to move to different houses—that is, after moving each house should again have a single villager living in it, but no villager should be living in the same house as before. We would like to know the smallest and the largest possible total lengths in kilometers of the shortest paths between the old and the new houses for all villagers.

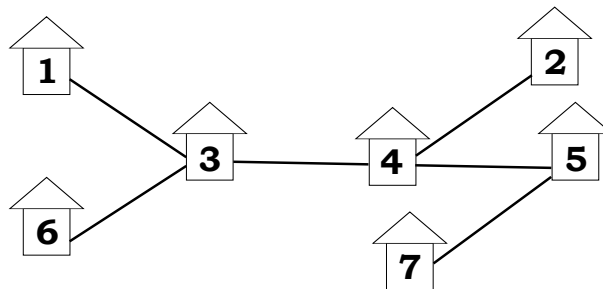


Figure 1: Example village with seven houses

For example, if there are seven houses connected by roads as shown in Figure 1, the smallest total length is 8 km (this can be achieved by moving $1 \rightarrow 6$, $2 \rightarrow 4$, $3 \rightarrow 1$, $4 \rightarrow 2$, $5 \rightarrow 7$, $6 \rightarrow 3$, $7 \rightarrow 5$), but the largest—18 km ($1 \rightarrow 7$, $2 \rightarrow 3$, $3 \rightarrow 4$, $4 \rightarrow 1$, $5 \rightarrow 2$, $6 \rightarrow 5$, $7 \rightarrow 6$).

Write a program that finds the smallest and the largest total lengths of the shortest paths in kilometers and an example assignment of the new houses to the villagers for each of the two cases.

Input

The first line contains an integer N ($1 < N \leq 10^5$). Houses are numbered by consecutive integers $1, 2, \dots, N$.

Then $N - 1$ lines follow that describe the roads. Each line contains two integers a and b ($1 \leq a, b \leq N$, $a \neq b$) denoting that there is a road connecting houses a and b .

Output

In the first line there should be two space-separated integers—the smallest and the largest total lengths of the shortest paths in kilometers.

In the second line describe one valid assignment of the new houses with the smallest total length: N space-separated distinct integers v_1, v_2, \dots, v_N . For each i , v_i is the house number where villager from the house i should move ($v_i \neq i$). If there are several valid assignments, output any of those.

The third line should contain the description of a valid assignment for the largest total length in the same format.

Examples

Input	Output
4	4 8
1 2	2 1 4 3
2 3	4 3 2 1
3 4	

Input	Output
7	8 18
4 2	6 4 1 2 7 3 5
5 7	7 3 4 1 2 5 6
3 4	
6 3	
1 3	
4 5	

Grading

Subtasks:

1. (12 points) $N \leq 10$
2. (38 points) $N \leq 1\,000$
3. (50 points) No further constraints

50% of points will be given if, for each test, the output will contain the correct length and an assignment for any one of the cases (with the smallest or the largest total length). However, the description for both cases should contain N space-separated integers between 1 and N . For the (potentially) incorrect case these may be any values in this range (for example, all 1s).