



CTU Open Contest 2026

Lanterns

`lanterns.(c|cpp|py), Lanterns.(java|kt)`

Míša is a passionate lover of gardening and also loves graph theory. That is why he grows trees in his modest garden. Recall that a *tree* is a connected undirected acyclic graph. He likes to decorate his trees with lanterns. However, each vertex of the tree must either be directly illuminated (have a lantern on it) or have a neighboring vertex with a lantern. Formally, the set of lanterns must form a *dominating set*. A vertex set $S \subseteq V$ of a tree $T = (V, E)$ is a *dominating set* if every vertex of T is either in S , or has a neighbor in S . He has a fixed budget k for all of his trees — every tree is illuminated with exactly k lanterns.

Lately, he noticed that his illuminating arrangements are not so uniform; depending on the night, he might want the garden to look completely different. He would like to transform one configuration of lanterns, represented by a dominating set $S_1 \subseteq V$, into a (possibly different) dominating set $S_2 \subseteq V$, using the following operations.

In one operation, Míša can take any positive number of lanterns from any vertex v (at most as many as there are on v) and move them to a neighbor of v . Note that it is possible for a vertex to be occupied by more than one lantern after some operations. In the beginning, exactly one lantern is placed on every vertex of S_1 , and the goal is to have exactly one lantern placed on every vertex of S_2 . After each operation, it must be ensured that the tree never falls into darkness: the set of vertices occupied by at least one lantern must always form a dominating set of T .

Help Míša determine the minimum number of lantern movements needed to achieve his goal, or tell him that it is impossible.

Input Specification

The first input line contains one integer n ($1 \leq n \leq 2 \cdot 10^5$), the number of vertices in the tree T . The vertices are labeled $0, 1, \dots, n-1$. Next, $n-1$ lines follow, each of them contains two integers u, v ($0 \leq u, v \leq n-1, u \neq v$), labels of endpoints of an edge of T . The next line contains an integer k ($1 \leq k \leq n$), the number of lanterns on Míša's tree. Next, there is a line describing the dominating set S_1 , followed by a line describing dominating set S_2 . Each of these lines contains k pairwise distinct labels of vertices in the respective dominating set. It is guaranteed that both S_1 and S_2 are dominating sets of T .

Output Specification

If no solution exists, i.e., there is no sequence of admissible operations transforming S_1 to S_2 , output a single line with the number -1 . Otherwise, output the following.

The first line of output contains an integer c , the number of commands. Next, there are c lines, each contains one command. A command is a triple u, v, ℓ , separated by spaces, where u, v are adjacent vertices of T and ℓ is a positive integer. The command represents moving

ℓ lanterns from u to v . Note that prior to the command execution, there must be at least ℓ lanterns available on u and after the movement, the set of vertices occupied by lanterns must form a dominating set of T . The total number of lantern moves is the sum of values ℓ over all c commands. This sum must be minimum possible. Note that there might exist different optimal solutions with different number of commands, but the sum of ℓ over the commands is the same. If there are multiple optimal solutions, you may output any of them.

It can be shown that if a solution exists, then there also exists a solution that uses at most $10 \cdot n$ commands. Your solution will be rejected if you output more than $10 \cdot n$ commands.

Sample Input 1

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

Output for Sample Input 1

```
2
0 1 1
1 2 1
```

Sample Input 2

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

Output for Sample Input 2

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

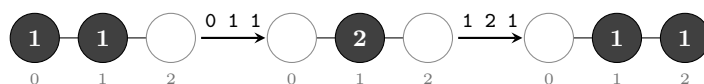


Figure 1: An optimal solution for Sample Input 1. The total number of lantern movements is $1 + 1 = 2$.

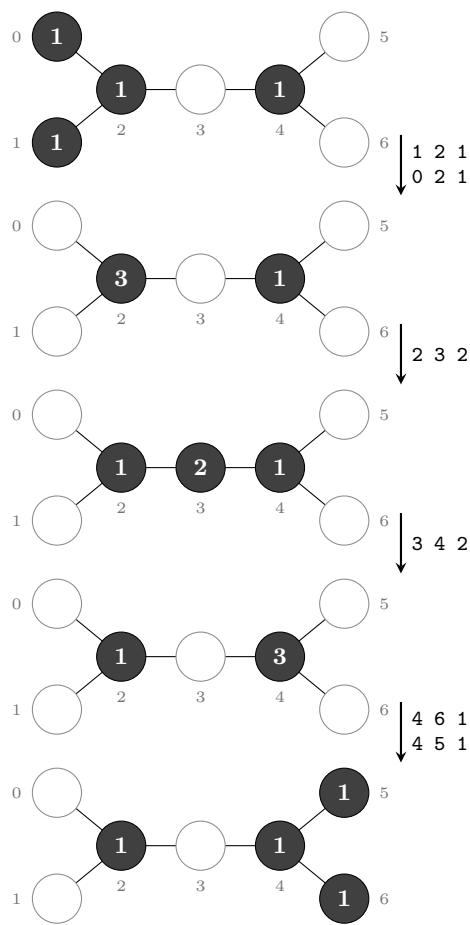


Figure 2: An optimal solution for Sample Input 2. The total number of lantern movements is $1 + 1 + 2 + 2 + 1 + 1 = 8$.