The Joy of Reading (libraries)

Three good friends – Albert, Botond, and Csaba – share two passions: they all love ~~visiting night clubs~~ reading books and spending time together. Over the years, they have visited nearly every ~~night club~~ library in the city and ~~tried all the available cocktails~~ read all the available books there.

Figure 1: Who would not want to visit this library?

The city has N **libraries**, numbered from 0 to $N-1$, connected by $N-1$ bidirectional **roads**. Each road connects two libraries, U_i and V_i, with a length of W_i. It is possible to travel between any two libraries by following some sequence of roads.

Let $d(u, v)$ represent the **distance** between libraries u and v, defined as the sum of road lengths along the shortest path connecting them.

Each friend has a set of favorite libraries, which is a nonempty subset of all libraries:

- Albert has P favourite libraries: $A_0, \ldots, A_{P-1}$.
- Botond has Q favourite libraries: $B_0, \ldots, B_{Q-1}$.
- Csaba has R favourite libraries: $C_0, \ldots, C_{R-1}$.

Tonight, the three friends are planning a meet-up. Each of them will first select one of their favourite libraries as their starting point and go there to set their moods. Then, they will leave the selected libraries simultaneously and travel to a library t that minimizes the **total distance** they need to travel.

Formally, they:

- Start at libraries x, y, and z, where $x = A_k$, $y = B_l$ and $z = C_m$ for some k, l, m.
- Meet at a library t that minimizes $d(x, t) + d(y, t) + d(z, t)$.

The chosen meeting point t does not need to be a favorite library of any of them. If multiple libraries satisfy the minimum distance condition, they may meet at any of those.

Your task is to determine, for each library t, how many triplets (x, y, z) exist such that the friends can meet at t when starting from x, y, and z, respectively.

☞ Among the attachments of this task you may find a template file `libraries.*` with a sample incomplete implementation.

Input

The first line contains the only integer N, the number of libraries.

Each of the next $N-1$ line contains three integers U_i, V_i, and W_i, describing a road.

The next line contains the positive integer P, the number of Albert's favourite libraries, followed by a line consisting of the P integers $A_0, \ldots, A_{P-1}$.

The next line contains the positive integer Q, the number of Botond's favourite libraries, followed by a line consisting of the Q integers $B_0, \ldots, B_{Q-1}$.

The next line contains the positive integer R, the number of Csaba's favourite libraries, followed by a line consisting of the R integers $C_0, \ldots, C_{R-1}$.

Output

You need to write a single line with N integers: the number of suitable triplets for each $t = 0, \ldots, N-1$.

Constraints

- $3 \leq N \leq 100\,000$.
- $0 \leq U_i, V_i < N$ for each $i = 0 \ldots N-2$.
- $1 \leq W_i \leq 10\,000$ for each $i = 0 \ldots N-2$.
- $1 \leq P, Q, R \leq N$.
- $0 \leq A_k < N$ for each $k = 0 \ldots P-1$.
- Each A_k is distinct.
- $0 \leq B_l < N$ for each $l = 0 \ldots Q-1$.
- Each B_l is distinct.
- $0 \leq C_m < N$ for each $m = 0 \ldots R-1$.
- Each C_m is distinct.

Scoring

Your program will be tested against several test cases grouped in subtasks. In order to obtain the score of a subtask, your program needs to correctly solve all of its test cases.

– **Subtask 1** (0 points) Examples.

– **Subtask 2** (11 points) $P = Q = R = 1$. That is, each friend has exactly 1 favourite library.

– **Subtask 3** (22 points) $U_i = i$ and $V_i = i + 1$ for each $i = 0 \ldots N-2$. That is, the road network is a line graph.

– **Subtask 4** (10 points) $N \leq 50$.

– **Subtask 5** (13 points) $N \leq 200$.

– **Subtask 6** (18 points) $N \leq 2000$.

– **Subtask 7** (26 points) No additional limitations.

Examples

input	output
6 0 2 1 1 2 2 2 3 4 3 4 2 3 5 3 1 0 2 1 3 2 3 5	0 0 2 2 0 0
8 0 1 7 1 2 6 2 3 7 3 4 4 4 5 8 5 6 2 6 7 8 2 3 4 4 0 2 4 7 3 2 4 6	0 0 4 6 12 0 2 0

Explanation

In the **first sample case**, there are 4 different starting configurations:

- Albert starts at library 0, Botond starts at library 1 and Csaba starts at library 3. In this case, library 2 is the only library where they can meet after travelling 7 units of distance in total.
- Albert starts at library 0, Botond starts at library 1 and Csaba starts at library 5. In this case, library 2 is the only library where they can meet after travelling 10 units of distance in total.
- Albert starts at library 0, Botond starts at library 3 and Csaba starts at library 3. In this case, library 3 is the only library where they can meet after travelling 5 units of distance in total.

- Albert starts at library 0, Botond starts at library 3 and Csaba starts at library 5. In this case, library 3 is the only library where they can meet after travelling 8 units of distance in total.

The map of the city is displayed in the following figure.