

Task: ODW

Visits



XXII OI, Stage III, Day trial. Source file `odw.*` Available memory: 128 MB.

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Byteasar is a remarkable man – over the last 21 years he was a postman, a banker, an ice-skater, and even a king! No wonder he has many friends. Or had, as his chronic profession and workplace changes unfortunately made him lose touch with many of the old friends. . . The time has come to change that! Byteasar is to start a grand tour of Byteotia to renew the old friendships.

There are n towns in Byteotia, connected via a network of $n - 1$ bidirectional roads. Our protagonist wants to visit each and every town, and has already fixed the order of these visits. From each town to the next on his itinerary, he will drive a car rented from BMW (Byteotian Motor Wagons). Each rental is completely free, but the cars have to be refueled – a car with a tank of capacity k has to be tanked in the very beginning and then refueled after every k traversed roads. BMW is well aware of Byteasar's plan and the fact that he intends to complete his journey as soon as possible. Therefore, they have cunningly chosen the tank capacities of their rentals so that in every town, Byteasar has to (re-)fuel two cars: the one he arrives in and the one he leaves in (with the exception of the initial and final towns, where only one car has to be tanked).

Knowing Byteasar's itinerary, the fuel prices and the tank capacities, determine how much each segment of the route will cost.

Input

In the first line of the standard input, there is a single integer n ($2 \leq n \leq 50\,000$) that specifies the number of towns in Byteotia. The towns are numbered from 1 to n . In the next line, there is a sequence of n integers c_1, \dots, c_n ($1 \leq c_i \leq 10\,000$), separated by single spaces, that specify the fuel prices in all the towns of Byteotia: the number c_i is the cost of filling the tank of any car in the town no. i (this is a “buffet tanking”, i.e. “tank all you can for only c_i ”).

The $n - 1$ lines that follow describe the road network of Byteotia. Each of those lines contains two integers a and b ($1 \leq a, b \leq n$), separated by a single space, which indicate that there is a two-way road connecting the towns no. a and b .

Following those, there is a line with a sequence of n integers t_1, \dots, t_n , separated by single spaces, that specify the order in which Byteasar is going to visit the towns (each of the numbers from 1 to n appears exactly once in this sequence). Finally, the last line of the input contains a sequence of $n - 1$ integers k_1, \dots, k_{n-1} , separated by single spaces, which specify the tank capacities of the rental cars: the number k_i indicates that on the ride from town no. t_i to the town no. t_{i+1} , Byteasar has to refuel his car after every k_i roads traversed. You may assume that k_i always divides the distance between those towns.

In tests worth 36% of the total score, the condition $n \leq 10\,000$ holds. Moreover, in a subset of those, worth 28% of the total score, a stronger condition $n \leq 1000$ holds.

Output

Your program should print $n - 1$ lines to the standard output, each containing a single integer. The number in the i -th line should be the total cost of refueling on the way from the town no. t_i to the town no. t_{i+1} .

Example

For the input data:

```
5
1 2 3 4 5
1 2
2 3
3 4
3 5
4 1 5 2 3
1 3 1 1
```

the correct result is:

```
10
6
10
5
```