



Construction of Highway

There are N cities in JOI Kingdom, which are indexed by the numbers from 1 to N . City 1 is the capital city. Each city has a value called **liveliness** and the initial value of liveliness of city i ($1 \leq i \leq N$) is C_i .

Road in JOI Kingdom connects two different cities bidirectionally. Initially, there is no road in JOI Kingdom. You have planned $N - 1$ constructions of roads. The j -th construction ($1 \leq j \leq N - 1$) is planned to be done in the following way.

- Two cities, A_j and B_j , are appointed, when one can go from city 1 to city A_j and cannot go from city 1 to city B_j by using only roads constructed at that time.
- You construct a road connecting city A_j and city B_j . The cost of this construction is the number of pairs of cities (s, t) satisfying the following conditions:

City s and City t lie on the shortest path between city 1 and city A_j , and when one goes from city 1 to city A_j he arrives city s before city t , and the value of liveliness of city s is strictly larger than that of city t .

Here, cities lying on the path between city 1 and city A_j include city 1 and city A_j . Notice that the shortest path between city 1 and city A_j is unique.

- The values of liveliness of all cities lying on the path between city 1 and city A_j change to the value of liveliness of city B_j .

You want to know the cost of each construction.

Task

Given the data of cities and constructions of roads, write a program which calculates the cost of each construction.

Input

Read the following data from the standard input.

- The first line of input contains a integer N . This means there are N cities in JOI Kingdom.
- The second line of input contains N space separated integers C_1, C_2, \dots, C_N . This means the initial value of liveliness of city i ($1 \leq i \leq N$) is C_i .
- The j -th line ($1 \leq j \leq N - 1$) of following $N - 1$ lines contains two space separated integers A_j, B_j . This means city A_j and city B_j are appointed for the j -th construction of road.



Output

Write $N - 1$ lines to the standard output. The j -th line ($1 \leq j \leq N - 1$) of output contains the cost of the j -th construction of road.

Constraints

All input data satisfy the following conditions.

- $1 \leq N \leq 100\,000$.
- $1 \leq C_i \leq 1\,000\,000\,000$ ($1 \leq i \leq N$).
- $1 \leq A_j \leq N$ ($1 \leq j \leq N - 1$).
- $1 \leq B_j \leq N$ ($1 \leq j \leq N - 1$).
- By using roads constructed before the j -th construction, one can go from city 1 to city A_j and cannot go from city 1 to city B_j ($1 \leq j \leq N - 1$).

Subtask

There are 3 subtasks. The score and additional constraints of each subtask are as follows:

Subtask 1 [7 points]

- $N \leq 500$.

Subtask 2 [9 points]

- $N \leq 4000$.

Subtask 3 [84 points]

There are no additional constraints.



Sample Input and Output

Sample Input 1	Sample Output 1
5	0
1 2 3 4 5	0
1 2	0
2 3	2
2 4	
3 5	

In Sample Input 1, constructions are done as follows:

- In the first construction, there are no pairs (s, t) satisfying the conditions, so the cost is 0. A road connecting city 1 and city 2 is constructed and the value of liveliness of city 1 changes to 2.
- In the second construction, there are no pairs (s, t) satisfying the conditions too, so the cost is 0. A road connecting city 2 and city 3 is constructed and the values of liveliness of city 1 and city 2 change to 3.
- In the third construction, there are no pairs (s, t) satisfying the conditions too, so the cost is 0. A road connecting city 2 and city 4 is constructed and the values of liveliness of city 1 and city 2 change to 4.
- In the fourth construction, two pairs $(s, t) = (1, 3), (2, 3)$ satisfy the conditions, so the cost is 2. A road connecting city 3 and city 5 is constructed and the values of liveliness of city 1, city 2 and city 3 change to 5.

Sample Input 2	Sample Output 2
10	0
1 7 3 4 8 6 2 9 10 5	0
1 2	0
1 3	1
2 4	1
3 5	0
2 6	1
3 7	2
4 8	3
5 9	
6 10	