You are given an unrooted tree of n nodes numbered from 1 to n. Each node i has a color, c_i.

Let $d(i, j)$ be the number of different colors in the path between node i and node j. For each node i, calculate the value of sum_i, defined as follows:

$$sum_i = \sum_{j=1}^{n} d(i, j)$$

Your task is to print the value of sum_i for each node $1 \le i \le n$.

Input Format

The first line contains a single integer, n, denoting the number of nodes.
The second line contains n space-separated integers, $c_1, c_2, \ldots, c_n$, where each c_i describes the color of node i.
Each of the $n - 1$ subsequent lines contains 2 space-separated integers, a and b, defining an undirected edge between nodes a and b.

Constraints

- $1 \le n \le 10^5$
- $1 \le c_i \le 10^5$

Output Format

Print n lines, where the i^{th} line contains a single integer denoting sum_i.

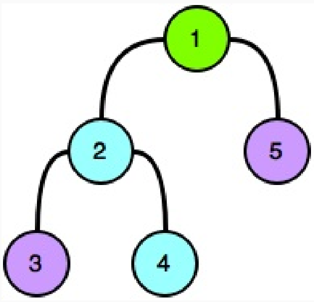
Sample Input

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

Sample Output

```
10
9
11
9
12
```

Explanation

The *Sample Input* defines the following tree: 

Each sum_i is calculated as follows:

1. $sum_1 = d(1,1) + d(1,2) + d(1,3) + d(1,4) + d(1,5) = 1 + 2 + 3 + 2 + 2 = 10$
2. $sum_2 = d(2,1) + d(2,2) + d(2,3) + d(2,4) + d(2,5) = 2 + 1 + 2 + 1 + 3 = 9$
3. $sum_3 = d(3,1) + d(3,2) + d(3,3) + d(3,4) + d(3,5) = 3 + 2 + 1 + 2 + 3 = 11$
4. $sum_4 = d(4,1) + d(4,2) + d(4,3) + d(4,4) + d(4,5) = 2 + 1 + 2 + 1 + 3 = 9$

5. $sum_5 = d(5,1) + d(5,2) + d(5,3) + d(5,4) + d(5,5) = 2 + 3 + 3 + 3 + 1 = 12$