Xorability   P43845_en
Vint-i-unè Concurs de Programació de la UPC - Semifinal (2023-06-28)

Consider a tree with n nodes numbered from 1 to n, rooted at 1. Each node i has a natural label ℓ_i. Given two nodes u and v, define $X(u, v)$ as the exclusive or (ˆ in C++) of all the ℓ_i in the path from u to v.

Let L be the set of leaves of the tree. Please compute $\sum_{v \in L} X(1, v)$.

Input

Input consists of several trees, each with the number of nodes n, followed by $\ell_1, \ldots, \ell_n$, followed by $n - 1$ pairs of nodes describing the edges of the tree. Assume $2 \le n \le 10^5$, and $0 \le l_i \le 10^9$.

Output

For each tree, print the required sum.

Sample input

```
3
2 7 3
1 2   2 3
6
18 6 9 12 15 3
1 6   6 5   3 6   2 3   3 4
7
1 2 3 4 5 6 7
1 4   1 5   2 1   4 6   2 3   2 7
4
1000000000 0 0 0
2 1   3 1   4 1
```

Sample output

```
6
80
11
3000000000
```

Problem information

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