

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 (\wedge 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 ℓ_1, \dots, ℓ_n , followed by $n - 1$ pairs of nodes describing the edges of the tree. Assume $2 \leq n \leq 10^5$, and $0 \leq \ell_i \leq 10^9$.

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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