

Cut on a tree

A path of rooted tree is a "straight-chain" iff for each node pair (u, v) on the path, either u is the ancestor of v , or v is the the ancestor of u .

Given a rooted tree with weighted nodes, decompose it into several "straight-chain",so that the quadratic sum of all "straight-chain" is minimum. The weight of a "straight-chain" is the sum of the weights of all the nodes on this chain.

Input

The first line contains an integer $N(N \leq 1200000)$,the number of nodes.

The second line contains n integers w_1, w_2, \dots, w_n . w_i represents i th-node's weight.

The following $n-1$ lines, each line describes an edge of the tree.

The nodes are numbered from 1 to n , and 1 is the root.

Output

An integer,the minimum quadratic sum.

It's guaranteed that the answer will not exceed 10^{14} .

Example

Input:

```
7
-4 -10 5 4 1 -1 -5
1 2
2 3
1 4
2 5
5 6
5 7
```

Output:

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42
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