Cut the Tree

Anna loves graph theory! She has an n-vertex tree, t, where each vertex u:

- Is indexed with a unique integer from 1 to n.
- Contains a data value, $data_u$.

Anna observes that *cutting* any edge, $u \leftrightarrow v$, in t results in the formation of two separate trees denoted by t_1 and t_2. She also defines the following:

- The *sum* of a tree is the sum of the $data_u$ values for all vertices in the tree.
- The *difference* between two trees created by cutting edge $u \leftrightarrow v$ is denoted by $d_{u \leftrightarrow v} = |sum(t_1) - sum(t_2)|$.

Given the definition of tree t, remove some edge $u \leftrightarrow v$ such that the value of $d_{u \leftrightarrow v}$ is minimal. Then print the value of the minimum possible $d_{u \leftrightarrow v}$ as your answer.

Note: The tree is *always* rooted at vertex 1.

Input Format

The first line contains an integer, n, denoting the number of vertices in the tree.
The second line contains n space-separated integers where each integer u denotes the value of $data_u$.
Each of the $n-1$ subsequent lines contains two space-separated integers, u and v, describing edge $u \leftrightarrow v$ in tree t.

Constraints

- $3 \leq n \leq 10^5$
- $1 \leq data_u \leq 1001$, where $1 \leq u \leq n$.

Output Format

A single line containing the minimum $d_{u \leftrightarrow v}$ possible for tree t.

Sample Input

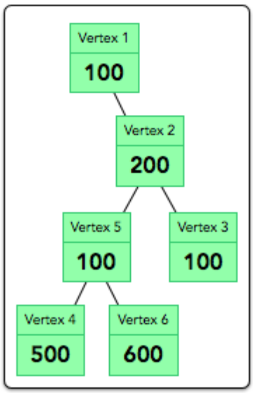
```
6
100 200 100 500 100 600
1 2
2 3
2 5
4 5
5 6
```

Sample Output

```
400
```

Explanation

We can visualize the initial, uncut tree as:



There are $n-1=5$ edges we can cut:

1. Edge $1 \leftrightarrow 2$ results in $d_{1 \leftrightarrow 2} = 1500 - 100 = 1400$
2. Edge $2 \leftrightarrow 3$ results in $d_{2 \leftrightarrow 3} = 1500 - 100 = 1400$
3. Edge $2 \leftrightarrow 5$ results in $d_{2 \leftrightarrow 5} = 1200 - 400 = 800$
4. Edge $4 \leftrightarrow 5$ results in $d_{4 \leftrightarrow 5} = 1100 - 500 = 600$
5. Edge $5 \leftrightarrow 6$ results in $d_{5 \leftrightarrow 6} = 1000 - 600 = 400$

We then print the minimum of 1400, 1400, 800, 600, and 400 as our answer, which is 400.