Cut the Tree ☆

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Problem Solving ******

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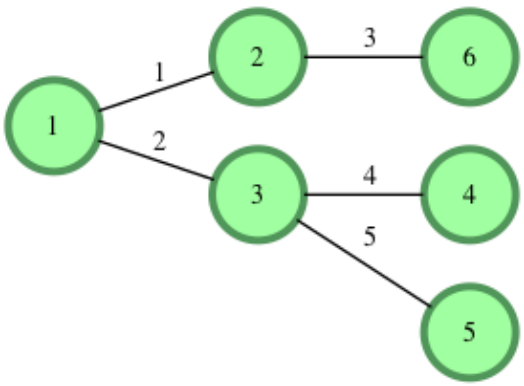
Anna loves graph theory! She has a tree where each vertex is numbered from 1 to n, and each contains a data value.

The sum of a tree is the sum of all its nodes' data values. If she cuts an edge in her tree, she forms two smaller trees. The difference between two trees is the absolute value between their sums.

Given a tree, determine which edge to cut so that the resulting trees have a minimal difference between them, then return that difference.

For example, your tree's nodes have weights of $[1, 2, 3, 4, 5, 6]$. In this case, node numbers match their weights for convenience. In the diagram below, you have the following edges: $[(1, 2), (1, 3), (2, 6), (3, 4), (3, 5)]$.



The values are calculated as follows:

Edge Cut	Tree 1 Sum	Tree 2 Sum	Absolute Difference
1	8	13	5
2	9	12	3
3	6	15	9
4	4	17	13
5	5	16	11

The minimum absolute difference is 3.

Note: The tree is always rooted at vertex 1.

Function Description

Complete the cutTheTree function in the editor below. Return an integer that represents the minimal absolute difference

achievable between the resultant two trees.

cutTheTree has the following parameter(s):

- data: an array of integers that represent node values
- edges: an 2 dimensional array of integer pairs where each pair represents an edge in the graph

Input Format

The first line contains an integer n, 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 difference possible for tree t.

Sample Input

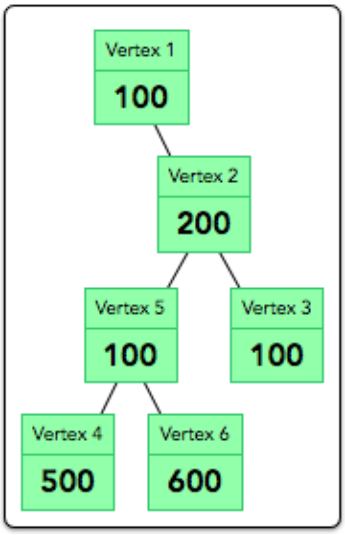
```
6
100 200 100 500 100 600
1 2
2 3
2 5
4 5
5 6
```

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

The minimum difference is 400.