



Main Round
23 Dec. 2021

Christmas Tree

Time limit: 3 s

Memory limit: 512 MB

Having so many "Fuzzy" stuff may get you tired and since it is New Year's Eve, Jury decided to give you a Christmas Tree. Now it is up to you to make this tree as beautiful as you can.

A Christmas Tree is a tree consisting of N nodes connected by $N - 1$ edges. At each node of the Christmas Tree there is a bulb. The more lightful the tree, the more beautiful it is. So why not just to light up all the bulbs? The problem is that you have only one socket.

You will choose a subset of bulbs to be lit up, and a *source* node where you will put the socket. The *intensity* of light at the socket is N , and it decreases by 1 unit when it travels through an edge. On top of this, each bulb has a heat rate h_i , which negatively affects the beauty of the tree. So, the beauty of your Christmas tree will decrease by $\max(h_x)$ (maximum of all h_x , where x is any bulb from your chosen subset).

Formally the beauty value of the Christmas tree will be $(\sum \text{intensity}(x)) - \max(h_x)$ where x is any bulb from your chosen subset, and *intensity* is defined as aforementioned.

Find maximum possible beauty of the given Christmas Tree.

Input

In the first line, you are given an integer N – the number of nodes (as well as bulbs) in the Christmas Tree. The second line consists of N integers, h_1, h_2, \dots, h_N – the heat rates of the bulbs. In each of the next $N - 1$ lines you will be given two integers u_i and v_i – the edges of the tree.

Output

Print the maximum possible beauty of the given Christmas Tree.

Constraints

- $1 \leq N \leq 2 \cdot 10^5$
- $0 \leq h_i \leq 10^{18}$
- $1 \leq u_i, v_i \leq N$, the given edges form a tree.

Examples

Input	Output	Explanation
7 1 1 1 1 1 1 1 1 2 1 3 2 4 2 5 3 6 3 7	38	<p>It is optimal to include all the bulbs in your chosen subset, and to choose node 1 as <i>source</i> node to put the socket at.</p> <p>Then the <i>intensity</i> at node1 = 7, node2 = 6, node3 = 6, node4 = 5, node5 = 5, node6 = 5, node7 = 5 and $\max(h_x) = 1$.</p> <p>So, the maximum beauty is: $7 + 6 + 6 + 5 + 5 + 5 + 5 - 1 = 38$</p>
7 100 1 1 100 100 100 100 1 2 1 3 2 4 2 5 3 6 3 7	11	<p>It is optimal to include the bulbs on nodes 2 and 3 in your chosen subset, and to choose node 1 as <i>source</i> node to put the socket at.</p> <p>Then the <i>intensity</i> of node2 = 6, node3 = 6, $\max(h_x) = 1$.</p> <p>So, the maximum beauty is: $6 + 6 - 1 = 11$</p>

Subtasks

This task contains 5 subtasks as described below:

Subtask	Additional constraints	Scoring
1	$N \leq 16$	11 points
2	$N \leq 2000$	17 points
3	Each node has at most 2 neighbors.	17 points
4	The given tree is a perfect binary tree with root node at 1. That is $N = 2^k - 1$ for some k and all the edges are of the form $(i, 2i)$ or $(i, 2i + 1)$.	23 points
5	No additional constraints	32 points