

J. Zayin and Tree

Zayin gives you a tree with n nodes (numbered from 1 to n). For each node i , there is a value a_i .

You could choose a simple path on the tree. Suppose that P is the number of nodes on the path, R is the maximum value on the path, L is the minimum value on the path.

Please choose a path so that $P - R + L$ is minimal. Output the minimum value of $P - R + L$.

Input

The first line contains an integer T , the number of test cases.

For each test case, the first line contains an integer n , denoting the number of nodes.

The next line contains n integers, the i -th integer is a_i . ($0 \leq a_i \leq 10^6$)

The following $n - 1$ lines describe the edges of the tree. Each line contains two integers u_i and v_i , denoting that there is an edge between node u_i and v_i .

The sum of n in all test cases won't exceed 10^6 .

Output

For each test case, output the minimum value of $P - R + L$.

Sample

Input	Output
2	0
5 4 5 3 4 2 1 2 2 3 3 4 3 5 5 4 4 1 1 2 1 2 2 3 3 4 3 5	-1

Hint

In the first example, you can choose path (2,5).

In the second example, you can choose path (2,3).