Christmas Tree

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	1024 mebibytes

There is a Christmas Tree in your room. A Christmas Tree is a connected undirected graph with n vertices and $n-1$ edges. Each vertex of the tree has a light bulb in it. The *luminance* (or *brightness*) of the bulb in vertex v is a_v units.

The tree is lovely, and it shines really strong. However, you feel rather tired and want to take a nap. It would be nice to dim the lights a bit, but there is no such option. Instead, you can direct the edges to make the tree less illuminated. For each edge (u, v), choose exactly one direction, $u \to v$ or $u \leftarrow v$, in which the light can pass. For a vertex v, define its *contrast* as the sum of a_u over all vertices u such that there exists a directed path from u to v.

What is the minimum possible sum of contrasts of all the vertices over all possible ways to direct the tree edges?

Input

The input contains several test cases. The first line contains a single integer t ($1 \le t \le 250$), the number of test cases. The description of the test cases follows.

The first line of each test case contains an integer n ($2 \le n \le 500$), the number of vertices in the tree.

The second line contains n integers $a_1, \ldots, a_n$ ($0 \le a_i \le 10^{12}$): the luminances of the light bulbs in the vertices.

Each of the next $n-1$ lines contains two integers u_i and v_i ($1 \le u_i \ne v_i \le n$), representing an undirected edge between nodes u_i and v_i. The edges form a tree.

The sum of all n across all test cases does not exceed 500.

Output

For each test case, output a line with an integer: the minimum possible sum of contrasts.

Example

standard input	*standard output*
2 2 10 20 1 2 4 10 30 60 100 1 2 2 3 2 4	40 290

Note

In the first test case, you should direct the edge as $1 \to 2$. Then the contrast of vertex 1 is 10 (it is lit only by itself, and $a_1 = 10$), and the contrast of vertex 2 is 30 (it is lit by vertices 1 and 2, and $a_1 + a_2 = 30$).

In the second test case, you can direct the edges as $1 \to 2$, $2 \to 3$, and $2 \to 4$.