Problem G. Ghost Rule

Time limit: 3 seconds
Memory limit: 1024 mebibytes

It is Halloween, and ghosts have appeared all over the KAIST campus! **cubic** has decided to go on a ghost hunt.

The campus is represented as an undirected tree with N vertices numbered from 1 to N. Each vertex represents a location on campus, and each edge represents a path between two locations. Initially, there are w_i ghosts at vertex i.

cubic starts at a vertex. Whenever he visits a vertex, including his starting vertex, he catches all remaining ghosts there. After catching the ghosts, he stops immediately if that vertex contains the RUN Club Room. Note that if his starting vertex contains the RUN Club Room, he catches all ghosts at that vertex and stops.

Otherwise, if his current vertex has any unvisited neighboring vertices, he checks the number of remaining ghosts at each of them and moves to one with the largest number. Only the ghosts at the neighboring vertex itself are counted, not the ghosts at any other vertex. If multiple unvisited neighbors are tied for the largest number, you may choose which one he moves to. He moves even if all unvisited neighbors have zero ghosts. If there are no unvisited neighboring vertices, he stops without reaching the RUN Club Room.

To help cubic reach the RUN Club Room, you may scare away some ghosts before he starts. More precisely, for each vertex i, you may scare away between 0 and w_i ghosts from that vertex, inclusive. These ghosts leave the campus and do not return. All other ghosts stay at their vertices until he catches them.

However, you must decide which ghosts to scare away before cubic's starting vertex is chosen. The same choice must make it possible for him to reach the RUN Club Room from every starting vertex. Your choices when breaking ties may differ for different starting vertices. Each starting vertex is considered independently, with the same arrangement of ghosts after you have scared some away. Ghosts caught during one walk do not affect any other walk. Note that if you scare away all the ghosts in the tree, cubic can always reach the RUN Club Room regardless of his starting vertex.

RUN needs to move to a new club room this year, and its new location has not been decided yet. For each i ($1 \le i \le N$), find the minimum total number of ghosts you must scare away if the RUN Club Room is located at vertex i.

Consider each possible location independently, using the initial ghost counts $w_1, w_2, \ldots, w_N$. You may choose different ghosts to scare away for different locations of the RUN Club Room.

Input

The first line contains an integer t — the number of test cases.

Each test case is described as follows.

The first line contains an integer N — the number of vertices in the tree.

The second line contains N integers $w_1, w_2, \ldots, w_N$, where w_i is the initial number of ghosts at vertex i.

Each of the next $N-1$ lines contains two integers u and v, describing an undirected edge between vertices u and v.

Output

For each test case, print N integers separated by spaces on a single line.

The i-th integer must be the minimum total number of ghosts you must scare away to make it possible for cubic to reach the RUN Club Room from every starting vertex when the RUN Club Room is located at vertex i.

Constraints

- $1 \le t \le 10^4$
- $2 \le N \le 2 \cdot 10^5$
- $0 \le w_i \le 10^9$ $(1 \le i \le N)$
- $1 \le u < v \le N$
- The given edges form a tree.
- The sum of N over all test cases does not exceed $2 \cdot 10^5$.

Example

standard input	standard output
1 5 20 16 1 8 27 1 2 1 3 1 4 4 5	7 7 29 8 8