E. Kirei Attacks the Estate

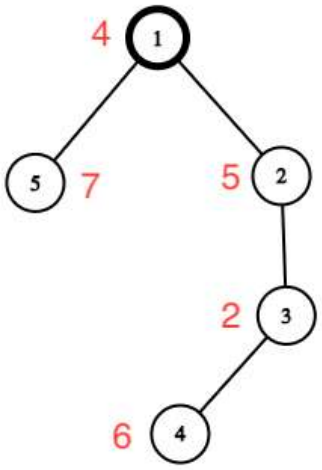
time limit per test: 2 seconds
memory limit per test: 256 megabytes

Once, Kirei stealthily infiltrated the trap-filled estate of the Ainzbern family but was discovered by Kiritugu's familiar. Assessing his strength, Kirei decided to retreat. The estate is represented as a tree with n vertices, with the **root** at vertex 1. Each vertex of the tree has a number a_i recorded, which represents the *danger* of vertex i. Recall that a tree is a connected undirected graph without cycles.

For a successful retreat, Kirei must compute the *threat* value for each vertex. The *threat* of a vertex is equal to the **maximum** *alternating* sum along the vertical path starting from that vertex. The *alternating* sum along the vertical path starting from vertex i is defined as $a_i - a_{p_i} + a_{p_{p_i}} - \ldots$, where p_i is the parent of vertex i on the path to the root (to vertex 1).

For example, in the tree below, vertex 4 has the following vertical paths:

- $[4]$ with an alternating sum of $a_4 = 6$;
- $[4, 3]$ with an alternating sum of $a_4 - a_3 = 6 - 2 = 4$;
- $[4, 3, 2]$ with an alternating sum of $a_4 - a_3 + a_2 = 6 - 2 + 5 = 9$;
- $[4, 3, 2, 1]$ with an alternating sum of $a_4 - a_3 + a_2 - a_1 = 6 - 2 + 5 - 4 = 5$.



The *dangers* of the vertices are indicated in red.

Help Kirei compute the *threat* values for all vertices and escape the estate.

Input

The first line contains an integer t ($1 \le t \le 10^4$) — the number of test cases.

The following describes the test cases.

The first line contains an integer n ($2 \le n \le 2 \cdot 10^5$) — the number of vertices in the tree.

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 10^9$) — the *dangers* of the vertices.

The next $n - 1$ lines contain the numbers v, u ($1 \le v, u \le n, v \ne u$) — the description of the edges of the tree.

It is guaranteed that the sum of n across all test cases does not exceed $2 \cdot 10^5$. It is also guaranteed that the given set of edges forms a tree.

Output

For each test case, output n integers — the *threat* of each vertex.

Example

input Copy

```
2
5
4 5 2 6 7
1 2
3 2
4 3
5 1
6
1000000000 500500500 900900900 9 404 800800800
3 4
5 1
2 5
1 6
6 4
```

output Copy

```
4 5 2 9 7
1000000000 1500500096 1701701691 199199209 404 800800800
```

Note

The tree from the first test case is depicted in the statement, and the maximum *variable-sign* sums are achieved as follows:

1. $a_1 = 4$;
2. $a_2 = 5$;
3. $a_3 = 2$;
4. $a_4 - a_3 + a_2 = 6 - 2 + 5 = 9$;
5. $a_5 = 7$.