



Problem I: Same Level

Time limit: 1s; Memory limit: 256 MB

A guild in a role-playing game consists of N characters, numbered from 1 to N . The i -th character is currently at level a_i .

There are $N - 1$ direct connections between characters, each connecting two characters, such that between any two characters there is exactly one path (the characters and connections form a tree).

Two directly connected characters can complete a pair quest together. Each pair quest increases the level of both participating characters by exactly 1. A character's level never decreases, and pair quests can only be performed between directly connected characters.

The guild leader wants all characters in the guild to reach the same level. Determine the minimum number of pair quests required, or report if it is impossible.

Constraints

- $1 \leq T \leq 10^4$.
- $1 \leq N \leq 2 \times 10^5$; the sum of N over all test cases does not exceed 2×10^5 .
- $0 \leq a_i \leq 10^8$.
- $1 \leq u, v \leq N$, $u \neq v$; the connections form a tree.

Input

The first line contains an integer T — the number of test cases. T test cases follow, each presented as below:

- The first line contains an integer N .
- The second line contains N integers $a_1, a_2, \dots, a_N$.
- The next $N - 1$ lines, each contains two integers u and v indicating a connection between character u and character v .

Output

For each test case, print on a single line the minimum number of pair quests required, or -1 if it is impossible to make all characters in the guild reach the same level.

Sample

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



1 2	
4	
0 3 3 2	
1 2	
1 3	
1 4	
4	
2 0 1 3	
1 2	
2 3	
3 4	

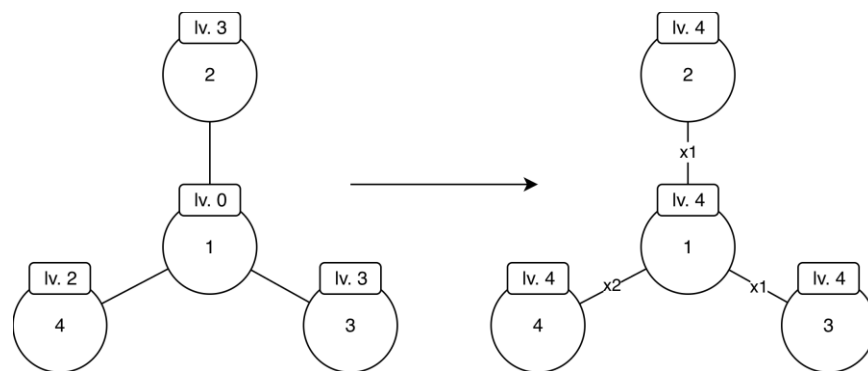


Figure 1: Illustration for test case 3.

Sample Explanation

- Test case 1: Character 1 and character 2 complete one quest, character 2 and character 3 complete one quest; all three characters reach level 2.
- Test case 2: The two characters always level up together, so the level difference of 2 can never be eliminated.
- Test case 3: Character 1 completes one quest with character 2, one quest with character 3, and two quests with character 4; all four characters reach level 4.
- Test case 4: Pair 1-2 completes one quest, pair 2-3 completes two quests; all four characters reach level 3.

Figure 1 illustrates test case 3. The number on each connection represents the number of pair quests completed by the two characters at its endpoints.