Query Jungle

Input file: `standard input`
Output file: `standard output`
Time limit: 3 seconds
Memory limit: 1024 megabytes

Oner is a jungler — a role where you hunt monsters in a jungle. Given the number of trees he sees in a jungle, it's no surprise that he is addicted to tree query problems.

You are given a tree of n vertices, rooted at vertex 1. Each vertex either contains a monster or does not.

You want to find the minimum integer k such that there exist k paths that satisfy the following conditions:

- Each path must start at the root (vertex 1).
- Every vertex with a monster must be included in at least one of these paths. A vertex is considered included in a path if it is one of the path's vertices, including its endpoints.

To make this problem more challenging, you must also answer q queries. For each query, you are given a vertex v. For each vertex w in the **subtree** of v, its status is inverted — the one containing a monster starts to not contain one, and the one not containing a monster starts to contain one. After each query, you must solve the original problem again with the updated status.

Note that queries are **cumulative**, so the effects of each query carry on to future queries.

Input

Each test contains multiple test cases. The first line contains the number of test cases t ($1 \le t \le 20\,000$). The description of the test cases follows.

The first line contains a single integer n ($2 \le n \le 250\,000$) — the number of vertices in the tree.

The next line contains n integers $a_1, a_2, \ldots, a_n$ ($a_i \in \{0, 1\}$), representing the initial status. If $a_i = 1$, vertex i contains a monster; if $a_i = 0$, it does not.

The next $n - 1$ lines each contain two integers u and v ($1 \le u, v \le n, u \ne v$), describing an edge between vertices u and v. It is guaranteed that these edges form a tree.

The next line contains a single integer q ($0 \le q \le 250\,000$) — the number of queries.

The next q lines each contain a single integer v_i ($1 \le v_i \le n$) — the vertex given for the i-th query.

It is guaranteed that the sum of n over all test cases does not exceed $250\,000$.

It is guaranteed that the sum of q over all test cases does not exceed $250\,000$.

Output

Print $q+1$ lines. The first line should contain the minimum number of paths k for the initial status. Each subsequent line should contain the answer after each query.

Example

standard input	standard output
2	2
7	1
0 1 0 1 1 0 0	1
1 6	2
1 7	3
7 3	1
3 2	0
7 5	1
5 4	
4	
2	
4	
6	
7	
2	
0 1	
1 2	
2	
2	
1	

Note

Test Case 1:

Initial State: The monsters are in vertex $\{2, 4, 5\}$. We need two paths: $1 \to 7 \to 3 \to 2$ and $1 \to 7 \to 5 \to 4$. The answer is 2.

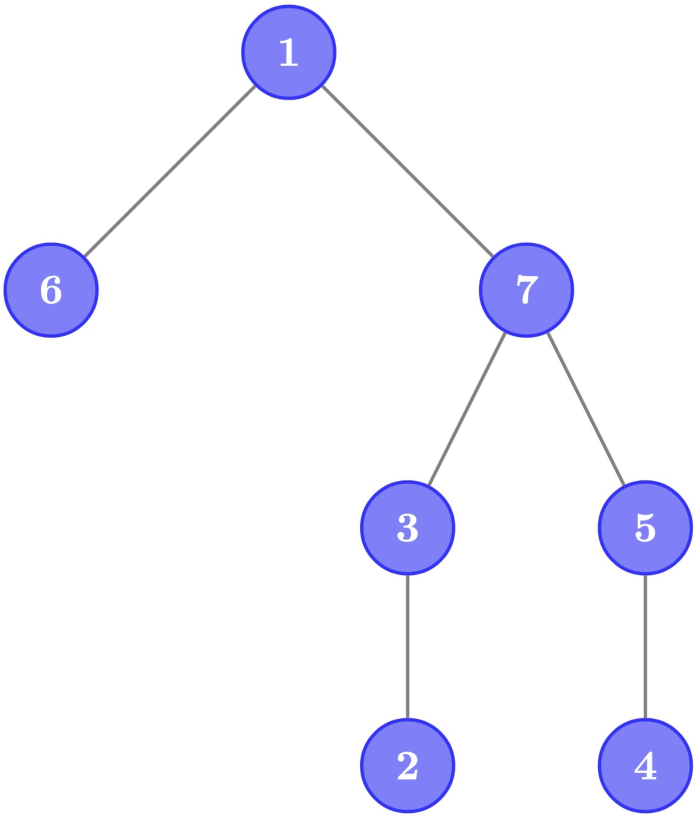
After Query 1 ($v = 2$): The monsters are in vertex $\{4, 5\}$. We only need one path, $1 \to 7 \to 5 \to 4$. The answer is 1.

After Query 2 ($v = 4$): The monsters are in vertex $\{5\}$. We only need one path, $1 \to 7 \to 5$. The answer is 1.

After Query 3 ($v = 6$): The monsters are in vertex $\{5, 6\}$. We need two paths, $1 \to 7 \to 5$ and $1 \to 6$. The answer is 2.

After Query 4 ($v = 7$): The monsters are in vertex $\{2, 3, 4, 6, 7\}$. We need three paths, $1 \to 6$, $1 \to 7 \to 5 \to 4$, and $1 \to 7 \to 3 \to 2$. The answer is 3.

The following figure denotes the tree in the example input.



Test Case 2:

Initial State: The monsters are in vertex $\{2\}$. We need one path: $1 \to 2$. The answer is 1.

After Query 1 ($v = 2$): There are no monsters. We need zero paths. The answer is 0.

After Query 2 ($v = 1$): The monsters are in vertex $\{1, 2\}$. We need one path: $1 \to 2$. The answer is 1.