Tree Queries 2

Time limit: *4000 ms*
Memory limit: *256 MB*

You are given a tree with N vertices and $N - 1$ edges. Vertex i has value w_i and edge i has a multiplier m_i. Your task is to process Q operations of the following types:

- Type 1: Change the value of vertex x_i to a_i,
- Type 2: Change the multiplier of edge e_i to b_i.

A *directed* path from vertex u to vertex v is considered correct if the values w_i of consecutive vertices of this path are non-decreasing. In particular, the path from vertex v to v is also considered correct. The score of a path is defined as a product of multipliers of its edges. In particular, the path from vertex v to v has a score of 1. After every operation, your task is to print the sum of scores of all correct paths between every pair of vertices in the tree. Paths from vertex u to v and from v to u are considered different, and if they are both correct, they should be counted separately. Since the sum may be large, output it modulo 998244353.

Standard input

The first line contains two integers N and Q. The next line contains N integers, where the i-th of them is w_i. The next $N - 1$ lines describe the edges of the tree, where the i-th of them contains three integers u_i, v_i and m_i representing an edge between vertices u_i and v_i with the multiplier of m_i. The next Q lines contain descriptions of the operations. Each description starts with one number t_i representing the type of operation. If $t_i = 1$, then two numbers x_i and a_i follow. If $t_i = 2$, then two numbers e_i and b_i follow. Both cases were described above.

Standard output

Output Q lines, where the i-th of these lines contains the sum of scores of all correct paths after the first i operations, modulo 998244353.

Constraints and notes

- $1 \leq N \leq 500\,000$,
- $1 \leq Q \leq 100\,000$,
- $1 \leq u_i, v_i, x_i, w_i, a_i \leq N$,
- $1 \leq e_i \leq N - 1$,
- $0 \leq m_i, b_i \leq 10^6$,

- $1 \le t_i \le 2$

The given graph is a tree.

In some of the testcases, the tree is a path.

Input	Output
4 3 2 2 1 3 1 2 2 1 3 3 1 4 4 1 1 3 1 2 4 2 3 1	37 43 22