ANDman

Time limit: *1500 ms*
Memory limit: *256 MB*

And-man is found in a tree with N nodes numbered 1 to N represented by apples. Each apple has a specific weight W_i. Steve Rangers wants to see how reliable And-man is at completing missions, so he gives him various operations to calculate the multiplication of the weights of the apples associated with nodes in a simple path from u to v. But to see if he is really working on each mission, at certain times he will take an apple associated with node u and exchange it for another with the same or different weight. In short, there will be Q operations given by Steve Rangers. Each operation is one of the two following types:

- Type 1: u, v: We change the apple of node u for another one with a weight v.
- Type 2: u, v: Calculate the multiplication of all the weights of the apples associated with nodes in unique single path from u to v, print this number modulo 1000000007 $(10^9 + 7)$.

Standard input

The first line is T, the number of testcases. Then T testcases follow.

Each test consists of several lines.

- The first line contains a single integer N - the number of nodes in tree.
- The second line contains N integers $W_1, W_2, .., W_N$ where W_i is the weight of the apple associated with node i.
- Then $N - 1$ lines, each line contains two integers u and v $(1 <= u, v <= N)$ denoting there is a direct edge between node u and node v. It is guaranteed that these edges form a tree.
- Then Q on a single line - the number of operations.
- Q lines follow, each line contains 3 integers t, u, v in which t is 1 or 2 denoting type of this operation described in the statement. If $t = 1$ then $1 <= u <= N, 1 <= v <= 10^9$. If $t = 2$ then $1 <= u, v <= N$.

Standard output

For each operation of type 2, print the answer on a single line.

Constraints and notes

- $1 <= T <= 10$
- $1 <= N <= 10^5$
- $1 <= Wi <= 10^9$
- $1 <= Q <= 10^5$

Input	Output	Explanation
1 5 9 11 11 13 13 1 2 1 3 2 4 2 5 6 2 4 5 1 1 15 2 1 4 2 3 5 1 2 10 2 4 3	1859 2145 23595 21450	The list of operations is: • operation 1: Calculate from node 4 to node 5, 13*11*13 = 1859 • operation 2: Change the apple in node 1 for other with weight 15 • operation 3: Calculate from node 1 to node 4, 15*11*13 = 2145 • operation 4: Calculate from node 3 to node 5, 11*15*11*13 = 23595 • operation 5: Change the apple in node 2 for other with weight 10 • operation 6: Calculate from node 4 to node 3, 13*10*15*11 = 21450
1 6 500000 6 5 7 300000 400000 3 1 2 5 3 6 4 3 4 2 5 2 3 4 2 1 6 2 1 5 1 4 100000 2 6 5	35 999993007 999779507 480000021	The list of operations is: • operation 1: Calculate from node 3 to node 4, 5*7 = 35 • operation 2: Calculate from node 1 to node 6, (500000*5*400000)%1000000007 = 999993007 • operation 3: Calculate from node 1 to node 5, (500000*5*7*6*300000)%1000000007 = 999779507 • operation 4: Change the apple in node 4 for other with weight 100000 • operation 5: Calculate from node 6 to node 5, (400000*5*100000*6*300000)%1000000007 = 480000021