Sum only the same color

(2 secs / 256 MB)

You are given a tree data structure with N vertices and $N-1$ edges. Each vertex i has two important values: c_i, which represents the color of vertex i, and a_i, which represents the value of vertex i. You need to answer Q independent queries of the form $k_j\ h_1\ h_2\ h_3 \ldots h_{k_j}$. For each query, you are given k vertices, and you must compute the value of:

$$\prod_{d \in C_j} \left(\sum_{u^d \in S_j} \sum_{v^d \in S_j} \sum_{w^d \in P(u,v)} \right) mod\ \ (10^9 + 7)$$

- $C_j = \{c_{h_1}, c_{h_2}, c_{h_3}, \ldots, c_{h_{k_j}}\}$
- $S_j = \{h_1, h_2, h_3, \ldots, h_{k_j}\}$
- $u^d \in S_j \equiv (c_u = d) \wedge (u \in S_j)$
- $v^d \in S_j \equiv (c_v = d) \wedge (v \in S_j)$
- $w^d \in P(u,v) \equiv (c_w = d) \wedge\ w\ is\ on\ the\ simple\ path\ from\ u\ to\ v$

Input :

N

$a_1\ a_2\ a_3 \ldots a_n$

$c_1\ c_2\ c_3 \ldots c_n$

$u_1\ v_1$

$u_2\ v_2$

$u_3\ v_3$

…

$u_{n-1}\ v_{n-1}$

Q

$k_1\ h_1\ h_2\ h_3 \ldots h_{k_1}$

$k_2\ h_1\ h_2\ h_3 \ldots h_{k_2}$

$k_3\ h_1\ h_2\ h_3 \ldots h_{k_3}$

…

$k_q\ h_1\ h_2\ h_3 \ldots h_{k_q}$

Output :

Output Q lines: the answer for each query

Constraints :

$1 \le N, Q \le 10^5$

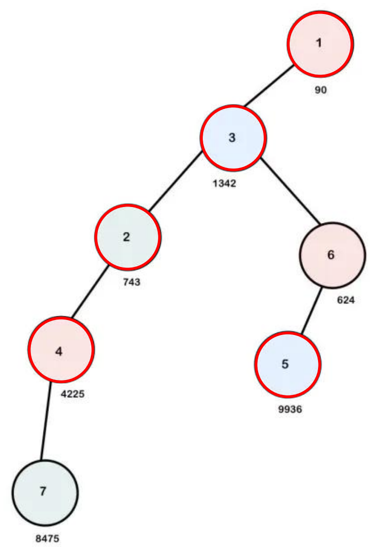
$1 \le a_i \le 10^9; 1 \le i \le N$

$1 \le c_i, u_i, v_i \le N; 1 \le i \le N$

$1 \le \sum_{j=1}^{Q} k_j \le 10^5; 1 \le j \le Q$

Sample testcase 1 :

```
7
90 743 1342 4225 9936 624 8475
1 3 2 1 2 1 3
1 3
3 2
2 4
4 7
3 6
6 5
1
5 3 4 1 2 5
```



In the first query, we are given five interesting vertices, $S_1 = \{3, 4, 1, 2, 5\}$. We assign color 1 to red, color 2 to blue, and color 3 to green, as illustrated in the picture. We can compute the answer as shown in the table below.

u \ v	1	2	3	4	5
1	90	-	-	90 + 4225 = 4315	-
2	-	743	-	-	-
3	-	-	1342	-	1342 + 9936 = 11278
4	4225 + 90 = 4315	-	-	4225	-
5	-	-	9936 + 1342 = 11278	-	9936

The answer to the first query is calculated as follows:

$[answer\ for\ color\ 1\ (red)] \times [answer\ for\ color\ 2\ (blue)] \times [answer\ for\ color\ 3\ (green)] = (90 + 4315 + 4315 + 4225) \times (1342 + 11278 + 11278 + 9936) \times (743) = 325419979590$. We need to provide the answer modulo $10^9 + 7$, the final answer is 419977315.