E. Blood Cousins

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Polycarpus got hold of a family relationship tree. The tree describes family relationships of n people, numbered 1 through n. Each person in the tree has no more than one parent.

Let's call person a a 1-ancestor of person b, if a is the parent of b.

Let's call person a a k-ancestor $(k > 1)$ of person b, if person b has a 1-ancestor, and a is a $(k - 1)$-ancestor of b's 1-ancestor.

Family relationships don't form cycles in the found tree. In other words, there is no person who is his own ancestor, directly or indirectly (that is, who is an x-ancestor for himself, for some x, $x > 0$).

Let's call two people x and y $(x \neq y)$ p-th cousins $(p > 0)$, if there is person z, who is a p-ancestor of x and a p-ancestor of y.

Polycarpus wonders how many counsins and what kinds of them everybody has. He took a piece of paper and wrote m pairs of integers v_i, p_i. Help him to calculate the number of p_i-th cousins that person v_i has, for each pair v_i, p_i.

Input

The first input line contains a single integer n $(1 \leq n \leq 10^5)$ — the number of people in the tree. The next line contains n space-separated integers $r_1, r_2, ..., r_n$, where r_i $(1 \leq r_i \leq n)$ is the number of person i's parent or `0`, if person i has no parent. It is guaranteed that family relationships don't form cycles.

The third line contains a single number m $(1 \leq m \leq 10^5)$ — the number of family relationship queries Polycarus has. Next m lines contain pairs of space-separated integers. The i-th line contains numbers v_i, p_i $(1 \leq v_i, p_i \leq n)$.

Output

Print m space-separated integers — the answers to Polycarpus' queries. Print the answers to the queries in the order, in which the queries occur in the input.

Examples

input
6 0 1 1 0 4 4 7 1 1 1 2 2 1 2 2 4 1 5 1 6 1

output
0 0 1 0 0 1 1