E. Blood Cousins Return

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Polycarpus got hold of a family tree. The found tree describes the family relations of n people, numbered from 1 to n. Every person in this tree has at most one direct ancestor. Also, each person in the tree has a name, the names are not necessarily unique.

We call the man with a number a a 1-ancestor of the man with a number b, if the man with a number a is a direct ancestor of the man with a number b.

We call the man with a number a a k-ancestor $(k > 1)$ of the man with a number b, if the man with a number b has a 1-ancestor, and the man with a number a is a $(k - 1)$-ancestor of the 1-ancestor of the man with a number b.

In the tree the family ties do not form cycles. In other words there isn't a person who is his own direct or indirect ancestor (that is, who is an x-ancestor of himself, for some x, $x > 0$).

We call a man with a number a the k-son of the man with a number b, if the man with a number b is a k-ancestor of the man with a number a.

Polycarpus is very much interested in how many sons and which sons each person has. He took a piece of paper and wrote m pairs of numbers v_i, k_i. Help him to learn for each pair v_i, k_i the number of distinct names among all names of the k_i-sons of the man with number v_i.

Input

The first line of the input contains a single integer n $(1 \le n \le 10^5)$ — the number of people in the tree. Next n lines contain the description of people in the tree. The i-th line contains space-separated string s_i and integer r_i $(0 \le r_i \le n)$, where s_i is the name of the man with a number i, and r_i is either the number of the direct ancestor of the man with a number i or 0, if the man with a number i has no direct ancestor.

The next line contains a single integer m $(1 \le m \le 10^5)$ — the number of Polycarpus's records. Next m lines contain space-separated pairs of integers. The i-th line contains integers v_i, k_i $(1 \le v_i, k_i \le n)$.

It is guaranteed that the family relationships do not form cycles. The names of all people are non-empty strings, consisting of no more than 20 lowercase English letters.

Output

Print m whitespace-separated integers — the answers to Polycarpus's records. Print the answers to the records in the order, in which the records occur in the input.

Examples

input
6 pasha 0 gerald 1 gerald 1 valera 2 igor 3 olesya 1 5 1 1 1 2 1 3 3 1 6 1

output

```
2
2
0
1
0
```

input

```
6
valera 0
valera 1
valera 1
gerald 0
valera 4
kolya 4
7
1 1
1 2
2 1
2 2
4 1
5 1
6 1
```

output

```
1
0
0
0
2
0
0
```