Problem A. Senseless and Merciless

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	512 mebibytes

Yandex has a well-defined subordination structure in the form of a tree with a designated root. Each of the N employees has a corresponding vertex in that tree and an integer identification number v ($0 \le v < N$). The root is a vertex with identifier 0.

Since this organizational tree grows bigger from year to year, Yandex need experts in algorithms and data structures in the field of trees. As a test, all candidates are asked to complete the following senseless and merciless task.

Given a tree of employees, where for each person (except the head of the company), that person's boss is known, you need to sequentially answer M queries. Each query consists of two vertices u and v.

Assume that the shortest path between u and v is $p_1, p_2, \ldots, p_k$, where $p_1 = u$ and $p_k = v$. In order to find the answer for the query (u, v), you are supposed to compute the sum

$$\sum_{w=0}^{N-1} \min\left(d(w, p_1), \ldots, d(w, p_k)\right) \cdot w,$$

where $d(w, p_i)$ is the distance in edges between vertices w and p_i, and—yes, you got it correctly—the $\min(\ldots)$ in the summation is weighted by the vertex identification number itself.

Input

The first line of the input contains a single integer N, the number of vertices in the tree ($2 \le N \le 100\,000$).

The next line contains $N - 1$ integers separated by spaces, where i-th number (counting from 1) is the identifier of parent vertex for vertex i. It is guaranteed that the given graph is a tree rooted at vertex 0.

On the third line, there is a single integer M, the number of queries ($0 \le M \le 100\,000$).

Then M lines follow. Each of them consists of two integers u and v: pairs of vertex identifiers for which the aforementioned sum must be computed.

Output

For each query in the input, write a single integer on a separate line that is the answer to this query.

Example

standard input	standard output
10 0 0 1 1 1 1 1 3 1 3 1 6 5 0 8 7	48 47 28