Problem D. Special graph

Input file:	`specialg.in`
Output file:	`specialg.out`
Time limit:	1 second
Memory limit:	64 megabytes

You are given a directed graph with N vertices. The special thing about the graph is that each vertex has at most *one* outgoing edge. Your task is to answer the following two types of queries:

- 1 a — delete the only edge outgoing from vertex a. It is guaranteed that the edge exists. $1 \le a \le N$

- 2 a b — output the length of the shortest path from vertex a to vertex b, if the path exists. Otherwise output "-1" without quotes. $1 \le a, b \le N$

Input

First line of input contains a natural number $N \le 10^5$ — the number of vertices in the graph.

The following line contains N integer numbers, i-th number is $next_i$ ($0 \le next_i \le N$), meaning that there is an edge from vertex i to vertex $next_i$. If $next_i = 0$, assume that there is no outgoing edge from vertex i.

Third line contains a natural number $M \le 10^5$ — the number of queries.

The following M contain a query each. Queries are given in the manner described above.

Output

On the i-th line output the answer for the i-th query of type 2 a b.

Examples

specialg.in	specialg.out
6 3 3 4 5 6 4 6 2 1 6 2 1 4 2 1 2 1 3 2 1 6 2 1 4	4 2 -1 -1 -1
4 4 4 1 3 5 2 2 4 2 2 1 1 4 1 2 2 3 1	1 3 1

Note

In 50% testcases $N \le 2 \times 10^3$, $M \le 2 \times 10^4$.