

Special Graph

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. $1 \leq a \leq N$

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. $1 \leq a, b \leq N$

Input

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

The following line contains N integer numbers, i -th number is $\text{next}[i]$ ($0 \leq \text{next}[i] \leq N$), meaning that there

is an edge from vertex i to vertex $\text{next}[i]$. If $\text{next}[i] = 0$, assume that there is no outgoing edge from vertex

i .

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

The following M lines 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.

Example

Input:

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

Output:

4
2
-1
-1
-1