

## E. Noble Knight's Path

time limit per test: 4 seconds

memory limit per test: 256 megabytes

input: standard input

output: standard output

In Berland each feudal owns exactly one castle and each castle belongs to exactly one feudal.

Each feudal, except one (the King) is subordinate to another feudal. A feudal can have any number of vassals (subordinates).

Some castles are connected by roads, it is allowed to move along the roads in both ways. Two castles have a road between them if and only if the owner of one of these castles is a direct subordinate to the other owner.

Each year exactly one of these two events may happen in Berland.

1. The barbarians attacked castle  $c$ . The interesting fact is, the barbarians never attacked the same castle twice throughout the whole Berlandian history.
2. A noble knight sets off on a journey from castle  $a$  to castle  $b$  (provided that on his path he encounters each castle not more than once).

Let's consider the second event in detail. As the journey from  $a$  to  $b$  is not short, then the knight might want to stop at a castle he encounters on his way to have some rest. However, he can't stop at just any castle: his nobility doesn't let him stay in the castle that has been desecrated by the enemy's stench. A castle is desecrated if and only if it has been attacked after the year of  $y$ . So, the knight chooses the  $k$ -th castle he encounters, starting from  $a$  (castles  $a$  and  $b$  aren't taken into consideration), that hasn't been attacked in years from  $y + 1$  till current year.

The knights don't remember which castles were attacked on what years, so he asked the court scholar, aka you to help them. You've got a sequence of events in the Berland history. Tell each knight, in what city he should stop or else deliver the sad news — that the path from city  $a$  to city  $b$  has less than  $k$  cities that meet his requirements, so the knight won't be able to rest.

### Input

The first input line contains integer  $n$  ( $2 \leq n \leq 10^5$ ) — the number of feudals.

The next line contains  $n$  space-separated integers: the  $i$ -th integer shows either the number of the  $i$ -th feudal's master, or a 0, if the  $i$ -th feudal is the King.

The third line contains integer  $m$  ( $1 \leq m \leq 10^5$ ) — the number of queries.

Then follow  $m$  lines that describe the events. The  $i$ -th line (the lines are indexed starting from 1) contains the description of the event that occurred in year  $i$ . Each event is characterised by type  $t_i$  ( $1 \leq t_i \leq 2$ ). The description of the first type event looks as two space-separated integers  $t_i c_i$  ( $t_i = 1$ ;  $1 \leq c_i \leq n$ ), where  $c_i$  is the number of the castle that was attacked by the barbarians in the  $i$ -th year. The description of the second type contains five space-separated integers:  $t_i a_i b_i k_i y_i$  ( $t_i = 2$ ;  $1 \leq a_i, b_i, k_i \leq n$ ;  $a_i \neq b_i$ ;  $0 \leq y_i < i$ ), where  $a_i$  is the number of the castle from which the knight is setting off,  $b_i$  is the number of the castle to which the knight is going,  $k_i$  and  $y_i$  are the  $k$  and  $y$  from the second event's description.

You can consider the feudals indexed from 1 to  $n$ . It is guaranteed that there is only one king among the feudals. It is guaranteed that for the first type events all values  $c_i$  are different.

### Output

For each second type event print an integer — the number of the castle where the knight must stay to rest, or -1, if he will have to cover the distance from  $a_i$  to  $b_i$  without a rest. Separate the answers by whitespaces.

Print the answers in the order, in which the second type events are given in the input.

Examples

input
3 0 1 2 5 2 1 3 1 0 1 2 2 1 3 1 0 2 1 3 1 1 2 1 3 1 2
output
2 -1 -1 2

input
6 2 5 2 2 0 5 3 2 1 6 2 0 1 2 2 4 5 1 0
output
5 -1

Note

In the first sample there is only castle 2 on the knight's way from castle 1 to castle 3. When the knight covers the path 1 - 3 for the first time, castle 2 won't be desecrated by an enemy and the knight will stay there. In the second year the castle 2 will become desecrated, so the knight won't have anywhere to stay for the next two years (as finding a castle that hasn't been desecrated from years 1 and 2, correspondingly, is important for him). In the fifth year the knight won't consider the castle 2 desecrated, so he will stay there again.