Company

2023/2024 SEASON – SIXTH ROUND

The gala dinner celebrating the anniversary of Lazar's two companies is approaching. As a result, an appropriate restaurant is to be chosen.

The two companies have a hierarchical structure where the bosses are above their subordinates. There are N workers, working in both companies. However, the structures of the two organizations are different.

Somebody will be given the task to choose the restaurant. Therefore, he will ask his direct subordinates, as well as their direct subordinates and etc. in the first company for their opinion. The worker wouldn't ask a person that is not also below him in the second firm.

As constantly enhancing, Lazar's two companies are hiring new employees. They receive a position in both companies as direct subordinates to given workers. Mind that these direct bosses might differ.

You will be given the two hierarchies and the count of queries which you have to process. Every query is one of the two types:

1) A new employee with index N+cnt_q is hired as a direct subordinate to the employees with indices x_q and y_q in respectively the first and the second company. cnt_q shows the total count of queries of type 1) until the current moment inclusively.
2) For a given employee with index p find the count of employees which are below him in the first organization, but the same are not below him in the second organization.

Input

The first line of the file **company.in** contains a single integer N – the count of workers in the two companies. The next line reads N-1 integers: $par_2, par_3 \dots par_N$ – the indices of the direct bosses of the 2nd, 3rd… Nth employees describing the structure of the first hierarchy. The next line similarly describes the second company: $par\_sec_2, par\_sec_3 \dots par\_sec_N$. The next line comprises of Q – the count of queries. Q lines follow, consisting of the queries which are one of the two types:

- $1, (N + cnt_q), x_q, y_q$ – hiring of a new employee.
- $2, p_q$ – query for the employee with index p_q.

Output

In the file **company.out** print as many numbers as there have been queries from type 2).

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Constraints

$1 \leq N \leq 10^5$

$N \leq N_{total} \leq 1.5 * 10^5, N_{total}$ *denotes the total count of workers after all queries*

$Q = 7 * 10^4$ *with the exception of a single test where* $Q = 500$

$1 \leq par_i \leq N$

$1 \leq x_q, y_q < N + cnt_q$

$1 \leq p_q \leq N + cnt_q$

Time limit: 1.4 sec.

Memory limit: 256 MB

Sample test

Input (company.in)	Output (company.out)
6 1 2 2 1 5 1 2 5 6 1 7 2 1 2 5 2 2 2 3 1 7 3 2 2 2 2 3	0 1 1 0 1 1

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Sample test explanation

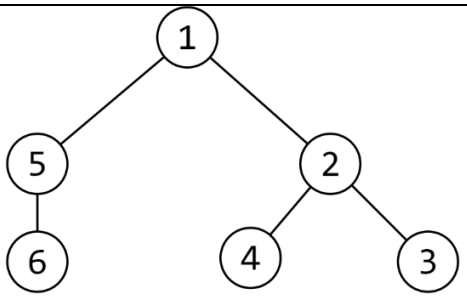
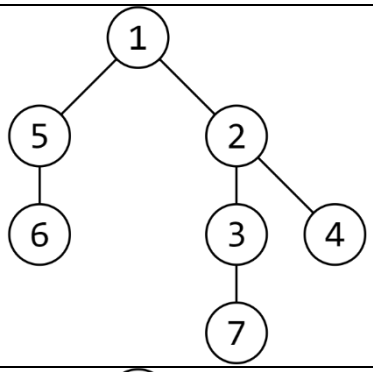
In the tables below you can see the two hierarchies.

The answer of the second query is 1 because the 5th employee will not ask the 6th.

In the third query the 2nd employee will not ask the 4th.

In the sixth query the 2nd employee will not ask the 4th.

In the seventh query the 3rd employee will not ask the 7th.

	Until the 5th query	After the 5th query
First company		
Second company