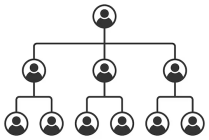
Task Hijerarhija



Krešimir has started studying corporate structures, including *hierarchies*. He observed employees and their relationships within a company. In this case, we are only looking at *superior–subordinate* relationships, meaning relationships where one employee is directly superior to another employee in the company.

A hierarchy is a structure with N employees and $N-1$ superior–subordinate relationships, where there is one person who is directly or indirectly superior to all employees. In the observed company, there are also N employees and $N-1$ such relationships, but it is not certain whether this is a valid hierarchy or not.

Krešimir has asked you to help answer this question. He has recorded all the data in his notebook. Additionally, in his notebook, he will make Q permanent changes by reversing one superior–subordinate relationship such that the subordinate becomes superior to their former superior. After each such change, it is necessary to answer the same question: is the current state a valid hierarchy?

Input

In the first line, there is a positive integer N ($2 \leq N \leq 3 \cdot 10^5$).

In the next $N-1$ lines, for each $i = 1, 2, \ldots, N-1$, there is a pair of integers p_i and e_i ($1 \leq p_i, e_i \leq N$, $p_i \neq e_i$), indicating that p_i is directly superior to e_i.

In the next line, there is a non-negative integer Q ($0 \leq Q \leq 10^6$).

In the following Q lines, there are pairs a_i, b_i ($1 \leq a_i, b_i \leq N$, $a_i \neq b_i$). It is guaranteed that at that moment, a_i will either be directly superior to b_i or vice versa.

In the test data, it is **guaranteed** that it will be possible to achieve at least one hierarchy with some sequence of reversals.

Output

In the next $Q+1$ lines, for each of the given scenarios, it is necessary to output whether the current structure is a hierarchy, i.e., `"DA"` if it is, or `"NE"` if it is not (without quotation marks).

Scoring

Subtask	Points	Constraints
1	7	$N \leq 300, Q = 0$
2	12	$N, Q \leq 300$
3	16	$N, Q \leq 1000$
4	15	$Q = 0$
5	23	For each $i = 1, 2, \ldots, N-1$, it will hold that i is directly superior to $i+1$ or vice versa.
6	17	No additional constraints.

Examples

input

```
3
1 2
1 3
3
1 2
1 2
1 3
```

output

```
DA
DA
DA
DA
```

input

```
4
2 1
2 3
1 4
4
4 1
4 1
3 2
1 4
```

output

```
DA
NE
DA
DA
NE
```