Task: MID
Midas

Olimpiada Informatyczna

XXIV OI, Stage III, Day one. Source file `mid.*` Available memory: 256 MB. *11.04.2017*

Byteasar, king Midas's royal engineer, was commissioned to construct a maze. The maze was supposed to be a museum, its chambers holding valuable exhibits. In practice, it is a ripoff tourist trap, whose sole purpose is supplying the already enormous royal treasury.

The maze consists of chambers and corridors that connect them. One of the chambers is an entrance to the maze, and is accordingly marked. In each chamber, the corridor that enters it forks, so that there are two exit corridors, left and right; each of these may be blocked, in which case it is impossible to follow it. Curiously, though the corridors fork, they never meet. Every visitor to the maze is given a device that charges them for each corridor they follow. The fee depends on the amount already paid and the current choice of left or right. Specifically, taking the left corridor costs exactly the total amount paid thus far, whereas taking the right corridor costs the total amount paid thus far plus one ducat.

Clearly, the purpose of such sophisticated fee structure was obfuscating the true cost. But this was so cumbersome to the visitors, that eventually the Hellenic Commission forced King Midas to ease this burden. Ever cunning, the king has agreed to provide visitors only with answers to the following queries: is the minimum number of ducats sufficient to reach chamber x from the entrance also sufficient to reach chamber y from the entrance?

Input

The first line of the standard input contains a single positive integer n, which specifies the number of chambers in the maze. These are numbered from 1 to n, where chamber no. 1 is the entrance. The following n lines describes the maze; the i-th such line contains two integers l_i, r_i ($0 \leq l_i, r_i \leq n$), separated by a single space. If $l_i > 0$, then the left corridor leaving chamber no. i leads to the chamber no. l_i. If however $l_i = 0$, then the left corridor leaving chamber no. i is blocked. The meaning of r_i is analogous but it concerns the right corridor leaving chamber no. i. Starting in chamber 1, it is possible to reach any other chamber.

The next line holds a single positive integer z, which specifies the number of queries to be answered. The following z lines specify these queries; the i-th line contains two integers x_i, y_i ($1 \leq x_i, y_i \leq n$), separated by a single space. These encode the query "Is the minimum number of ducats sufficient to reach the chamber no. x_i from the entrance also sufficient to reach the chamber no. y_i from the entrance?"

Output

Exactly z lines should be written to the standard output, the i-th one containing a single word: `TAK` (Polish for *yes*) if the answer to the i-th input query is positive and `NIE` (Polish for *no*) otherwise.

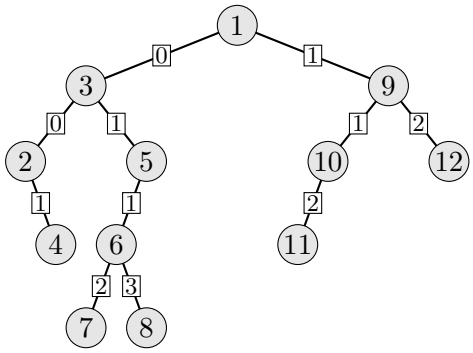
Example

For the input data:

```
12
3 9
0 4
2 5
0 0
6 0
7 8
0 0
0 0
10 12
11 0
0 0
0 0
6
11 8
8 6
11 7
1 2
4 10
3 3
```

the correct result is:

```
NIE
TAK
TAK
TAK
NIE
TAK
```



Explanation. The figure depicts the maze from above example: the chambers are marked with circles, and the number of ducats required to follow a given corridor is inscribed in a square in its middle. The possible routes through the maze go top-down, whenever possible choosing the left or the right exit corridor. For example, reaching chamber no. 11 requires $1 + 1 + 2 = 4$ ducats; this number is insufficient to reach chamber no. 8, which requires $0 + 1 + 1 + 3 = 5$ ducats (note that this is the very first query in the example).

Sample grading tests:

- `1ocen:` $n = 7$ chambers forming a complete binary tree, $z = 49$ queries for all possible pairs of chambers;
- `2ocen:` $n = 2^{19} - 1$ chambers forming a complete binary tree, $z = n + 1$ queries for pairs of adjacent leaves (two queries per pair of leaves, one with a `TAK` answer and one with a `NIE` answer);
- `3ocen:` $n = 1\,000\,000$; a path of length $\frac{n}{2}$ that only ever goes left; each chamber of this path has a corridor exiting to the right; $z = 10$ random queries.

Grading

The set of tests consists of the following subsets. Within each subset, there may be several test groups.

Subset	Property	Score
1	$n \leq 50$, $z \leq 10$	15
2	$n \leq 1000$, $z \leq 10$	9
3	$n \leq 1000$, $z \leq 1\,000\,000$	14
4	$n \leq 1\,000\,000$, $z \leq 10$	11
5	$n \leq 1\,000\,000$, $z \leq 1\,000\,000$	51