Problem L. Donuts (8MiB ML!)

Input file:	*standard input*
Output file:	*standard output*
Time limit:	30 seconds
Memory limit:	**8** mebibytes

Please note an exceptionally low memory limit (8MB) for this problem.

A set S of integer coordinate points in a plane is a *donut*, if there exists a midpoint (a, b) and two radii L and R (with integer a, b, L, R and non-negative radii) such that S is precisely the set of all points whose distance from (a, b) is in the interval $(L, R]$. Formally, $S = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : L < dist((x, y), (a, b)) \leq R\}$, where $dist$ denotes standard plane distance.

We begin with an empty set and add points one by one. Determine, after every added point, if the set is currently a donut.

Input

The first line of input contains the number of points n ($2 \cdot 10^7 \leq n \leq 2.5 \cdot 10^7$). Each of the next n lines describes a single added point, giving its coordinates separated by a single space. The coordinates are integers of absolute value not greater than 5000. All the given points are distinct.

Output

For every point output (in a separate line) "`TAK`", if after adding this point the set is a donut, and "`NIE`", if it isn't.

Example

standard input	standard output
12 4 1 3 2 3 0 2 3 1 0 0 1 1 2 2 -1 2 2 3 1 2 0 1 1	NIE NIE NIE NIE NIE NIE NIE TAK NIE NIE NIE TAK

Note

The example is given only for explaining the input format, and it obviously does not satisfy the $n \geq 2 \cdot 10^7$ condition (though it satisfies all the others). Your program will not be checked on the example test.