

# [B3] Shine the Light on the Rogue Veth (150 pts)

Time Limit: 1s  
Memory Limit: 512MB

## Problem Description

After over 40 weeks of searching, Agent Blanc Ette has found a lead on the notorious N.E.L.O.C. spy Veth! Veth was supposed to be a triple agent going undercover as “Nott Aspy”, until Blanc Ette uncovered evidence that she was quadruple crossing. She then fled to the trenches past No Man’s Land, and the brave Agent has to go to Hell and back and to Hell and back again to finally find that the rogue Veth has been hiding in one of possible  $N$  crevices and cracks scattered on the wasteland.

The No Man’s Land is a wide, empty place — so much that a complete map hasn’t been made yet and only points of interest are listed along with their  $x$  and  $y$  coordinates. Our good agent has found the locations of Veth’s  $N$  possible hiding places and marked each of them in  $(x_i, y_i)$  coordinates. Of course, she can’t possibly go inside each and every one of these hiding places, as the trenches are dangerous and the No Man’s Land is unforgiving - who knows what the rogue Veth has prepared if she dives in alone?

To help her search, she has also marked  $M$  ultra-powerful spotlights scattered in the wasteland that can illuminate an entire quadrant of the No Man’s Land. Each spotlight can be pointed to exactly one coordinate quadrant with respect to its position. Each quadrant is assigned a number between 1-4, as seen in the figure below:

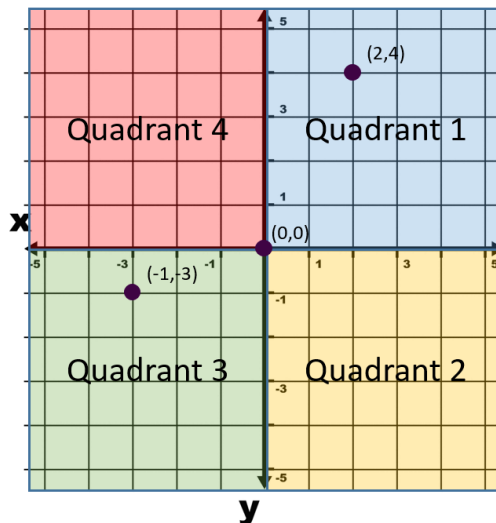


Figure 1: A spotlight situated at coordinate (0, 0)

As in the figure above, if the spotlight at (0, 0) is pointed to quadrant 1, it will illuminate the point (2, 4). If pointed to quadrant 3, it will illuminate the point (-1, -3). Note that the light emitted will continue *throughout the entire quadrant*, and will illuminate/reveal all points covered by that quadrant. This includes points having the same x/y coordinates along the quadrant. Blanc Ette can rotate each of these spotlights to face any quadrant before turning them on, but they cannot be moved/rotated once they are activated.

These are very powerful spotlights, handle with care!

Given  $N$  hiding spots and  $M$  spotlights, can you determine if Blanc Ette will be able to uncover all  $N$  hiding spots by rotating each spotlight in any specific way? If possible, output HULI KA ROGUE VETH!. If not, output THE ROGUE VETH IS LOOSE AGAIN!.

## Input Specification

Input will begin with an integer  $T$  denoting the number of test cases.  $T$  test cases follow.

Each test case begins with two integers  $N$  and  $M$ , separated by a space, denoting the number of Veth's hiding spots.  $N$  hiding spots then follow. Each hiding spot  $i$  consists of a line containing a two integers  $x_i$  and  $y_i$  denoting the coordinates  $(x_i, y_i)$  of the  $i^{\text{th}}$  hiding spot.

$M$  spotlights then follow, each also represented as two integers  $x_i$  and  $y_i$  denoting the coordinates of the  $i^{\text{th}}$  spotlight.

## Output Specification

There is one line of output for each test case.

Output HULI KA ROGUE VETH! if Blanc Ette can find a configuration that can cover all of Veth's hiding spots. Otherwise, output THE ROGUE VETH IS LOOSE AGAIN! if there is no such configuration.

## Constraints

$$1 \leq T \leq 50$$

$$1 \leq N, M \leq 5000$$

$$-10^9 \leq x_i, y_i \leq 10^9$$

No spotlight or hiding spot will be on the same coordinate as another spotlight/hiding spot.

## Sample Input

```
2
3 1
1 1
12345 12345
19720921 25021986
0 0
4 3
2 2
2 -2
-2 -2
-2 2
1 1
-1 -1
-1 1
```

## Sample Output

```
HULI KA ROGUE VETH!
THE ROGUE VETH IS LOOSE AGAIN!
```

## **Explanation**

In the first test case, there is only one spotlight at  $(0,0)$ . Pointing this spotlight to quadrant 1 will cover all of Veth's hiding spots. In the second test case, no configuration of the three spotlights will cover all four hiding spots.