E Undercover Pirate

Problem

Panic in the dojo! An empty bottle of rum has been found inside the dojo of the Beat All Pirates Clan. This can mean only one thing: a pirate has gone undercover as a ninja of the clan! Clearly, this issue must be resolved immediately, so clan leader Hanzo gathers all ninjas in one place. The pirate has no intention to reveal himself, so Hanzo needs to come up with a clever way to expose the pirate.

It is well known that ninjas of the Beat All Pirates Clan are trained to have a perfect weight W. It is very unlikely that the pirate also has this weight[3], so Hanzo can expose the pirate by weighing all ninjas. Next to exposing him, Hanzo would also like to know whether the pirate is lighter or heavier than W, purely out of curiosity. However, weighing the ninjas one by one will take all day, so he needs a better way to do this. Luckily the clan owns a huge scale which can hold an arbitrary number of ninjas on each side. Hanzo knows that, for n ninjas including the pirate, he needs to use the scale only $\lceil \log_3(2n+3) \rceil$ times to expose the pirate, where $\lceil x \rceil$ is the smallest integer larger than or equal to x. Unfortunately he does not remember how to do it. Can you help him out?

Input and output

This is a problem with dynamic input and output, read the following description very carefully.

The first line of the input contains a single number: the number of test cases to follow. Then, for every test case you get one line with an integer n ($3 \leq n \leq 10^6$): the number of ninjas including the pirate. Ninjas are numbered from 1 to n. Then your program can make at most $\lceil \log_3(2n+3) \rceil$ queries.

Query: A query must be formatted as follows. You first describe the ninjas on the left side of the scale. This description can contain at most 4 ranges of numbers, written as $a-b$ (no spaces) separated by spaces[4]. Then follows a '`+`', followed by the description of the ninjas on the right side of the scale.

Answer: The answer of the query consists of a single character, either '`L`' (left side is heavier), '`R`' (right side is heavier) or '`E`' (both sides have the same weight).

After at most $\lceil \log_3(2n+3) \rceil$ queries your program must expose the pirate by outputting the string "`Ninja` i `is a heavy pirate`" or "`Ninja` i `is a light pirate`", depending on whether the pirate is heavier or lighter than W, where i is the number of the pirate. This ends the sequence of input and output for this test case.

If your program exceeds the number of allowed queries, or if your program outputs an invalid query (ranges are not disjoint and/or include ninjas outside of the range $[1, n]$), you will receive a Wrong Answer.

[3] Therefore you can assume that the pirate does not have weight W.

[4] Singleton ranges can be written as $a-a$ or simply a. Ranges $a-b$ where $b < a$ are handled as empty ranges. However, negative values for a or b are never allowed

Notes

C/C++ users:

- Do `fflush(NULL);` after you print output.
- If you use `scanf` to read the input, then do not read newline characters. So, to read an integer n with `scanf`, use `scanf("%d", &n);`.

Java/C# users:

- Do not use *buffered* output, `System.out.println`/`System.Console.WriteLine` will do fine.

In case you read the query answers as characters, note that every query answer is followed by a newline character.

Examples

Note that there might be multiple ways to find the correct answer, the sequence below is just an example. Extra newlines in the example below are for clarity only; you should print exactly one newline character after each line of output.

Input	Output
3 3	
	1 + 2
L	
	1 + 3
L	
	Ninja 1 is a heavy pirate
12	
	1-4 + 5-8
E	
	9-11 + 1-3
L	
	9 + 10
R	
	Ninja 10 is a heavy pirate
12	
	1-4 + 5-8
R	
	5-6 1 + 7-8 2
L	
	5 + 6
E	
	Ninja 2 is a light pirate

