

## Problem K. Knights of Light and Darkness

Input file:            standard input  
Output file:           standard output  
Time limit:            1 second  
Memory limit:         1024 mebibytes

*This is an interactive problem*

There are  $N$  knights on the island. Each knight at any moment of time is either Knight of Light or Knight of Darkness. Knights of Light answer truth on any question, while Knights of Darkness lie on any question, i.e. answer “Yes” instead “No” and “No” instead of “Yes”.

When **any** knight answers “Yes”, he **changes** his align immediately after the answer, i.e. the Knight of Light become the Knight of Darkness and the Knight of Darkness become the Knight of Light.

You are sent to the island with the important secret mission: tell the number of Knights of Light at the moment of your **departure** from the island.

To get the information, you may ask any person about any **other** person (the knights are enumerated by the sequential integers between 1 and  $N$ ) in the form “Is knight  $Y$  the Knight of Light?” or “Is knight  $Y$  the Knight of Darkness?”. You cannot ask the knight about himself, because it will look too suspiciously.

Can you finish this task for the finite number of questions? If yes, ask the **minimal possible** number of questions and then tell current number of the Knights of Light.

Note that the jury have the proof that for any position where the solution exists defined some optimal number of questions to solve this task.

### Interaction Protocol

At the beginning of the interaction, you receive one integer  $N$  ( $1 \leq N \leq 1000$ ) — the number of the knights on the island.

Then you may ask the questions.

If you want to ask the knight  $X$ , is the knight  $Y$  the Knight of Light, use the query in form “? L  $X$   $Y$ ”.

If you want to ask the knight  $X$ , is the knight  $Y$  the Knight of Darkness, use the query in form “? D  $X$   $Y$ ”.  $X$  and  $Y$  are the integers between 1 and  $N$ .

The answer will be 1 for “Yes” and 0 for “No”.

If you after several questions (or immediately) decided that it was impossible to perform your mission, print the message “! -1” and exit.

If you in some moment decided that you know the current number of the Knights of Light, print the message “!  $N_l$ ”, where  $N_l$  is the current number of Knights of Light, and exit.

Note that interactor is **adaptive**, i.e. it may generate the initial distribution accordingly with your questions.

In case when you decide that the mission is impossible, you can ask no more than  $4N/3$  questions before you do that. If you are going to tell the answer, you shall ask the **minimal possible** number of the questions.

## Example

standard input	standard output
3	? L 1 2
0	? D 1 2
1	? D 3 1
0	! 0

## Note

Do not forget to print end-of-line after last integer in each query or in the final answer, and flush the output buffer after each query/final answer. Otherwise your solution may have the WTL error.

Note that the sample interaction in the statement is **only for the illustration of format** — the person who asked questions may have no reasons to answer and he is succeed (if he is) only on the blind luck.