

Observer Effect

Input file:	<code>standard input</code>
Output file:	<code>standard output</code>
Time limit:	0.25 seconds
Memory limit:	4 megabytes

It is known that a particle moves along a circular track of length n , although we cannot see it. Fortunately, there is an oracle that can answer at most n queries that will tell whether the particle is currently at a given track position. After each query, the particle advances one unit (always in the same direction).

Find out in which direction the particle is moving.

Input

The first line of the input contains a single integer, t ($1 \leq t \leq 10^3$) — the number of test cases.

The only line of each test case contains a single integer, n ($3 \leq n \leq 10^4$) — the length of the track.

It is guaranteed that the sum of n over all test cases does not exceed 10^4 .

Interaction Protocol

To make a query, output a line in the format “? p ” (without quotes), where p is a track position ($1 \leq p \leq n$).

After each valid query, read an integer — the answer to your query. The response will be 1 if the particle is currently at position p , or 0 otherwise.

After n queries have been made, the response to any other query will be -1 . Once you receive such a response, terminate the program to receive the “**Wrong Answer**” verdict.

For each test case, output the answer in the form “! d ”, where d is 1 if the particle is moving forwards (i.e., from 1 to n), or 0 otherwise.

After printing each line, do not forget to output the end of line and flush the output buffer. Otherwise, you will receive the “**Idleness limit exceeded**” verdict.

Hacks

For hacks, use the following format.

The first line of the input should contain a single integer, t ($1 \leq t \leq 10^3$) — the number of test cases.

The only line of each test case should contain exactly three integers, n , x , and d ($3 \leq n \leq 10^4$, $1 \leq x \leq n$, $0 \leq d \leq 1$) — the length of the track, the starting position, and the particle’s direction.

The sum of n over all test cases should not exceed 10^4 .

Example

standard input	standard output
2	
3	
	? 1
0	
	? 1
1	
	? 2
1	
	! 1
10	
	? 1
1	
	? 2
0	
	! 0

Note

In the first test case, the particle starts at position 3. It is found at position 1 after two queries. Then, with a third query, it can be concluded that it is moving forwards.

In the second test case, the particle starts at position 1, where it is found on the first query. Then, with an additional query, it can be concluded that it is moving backwards.