Piggy on the Track

Input file:	`standard input`
Output file:	`standard output`
Time limit:	0.25 seconds
Memory limit:	4 megabytes

Piggy runs continuously along a circular track of length n, although we cannot see it. There is an oracle that can answer at most n queries that will tell whether Piggy is currently at a given track position. After each query, Piggy advances one unit.

Find out in which direction Piggy 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.

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 Piggy 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 Piggy 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.

Example

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

Note

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

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