Piggy

Input file:	**standard input**
Output file:	**standard output**
Time limit:	1 second
Memory limit:	256 megabytes

Piggy is speeding along a circular track of length n at a constant speed of 1. There is an oracle that can answer at most n queries of the form "**? p**", where p is a track position. It will answer 1 if Piggy is currently at that position, or 0 otherwise.

Find out the direction in which Piggy is moving.

Input

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

The only line of each test case contains a single integer, n ($3 \le n \le 10^5$) — the length of the track.

Output

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.

Example

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

Note

In the first test case, Piggy's starting position is 3. Piggy 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's starting position is 1. Piggy is found at that position on the first query. Then, with an additional query, it can be concluded that Piggy is moving backwards.