Identify Chord

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

This is an interactive problem.

Grammy has an undirected cyclic graph of n $(4 \le n \le 10^9)$ vertices numbered from 1 to n. An undirected cyclic graph is a graph of n vertices and n undirected edges that form one cycle. Specifically, there is a bidirectional edge between vertex i and vertex $((i \bmod n) + 1)$ for each $1 \le i \le n$.

Grammy thinks that this graph is too boring, so she secretly chooses a pair of *non-adjacent* vertices and connects an undirected edge (called a chord) between them, so that the graph now contains n vertices and $(n + 1)$ edges.

Your task is to guess the position of the chord by making no more than 40 queries. Each query consists of two vertices x and y, and Grammy will tell you the number of edges on the shortest path between the two vertices.

Note that the interactor is *non-adaptive*, meaning that the position of the chord is pre-determined.

Input

There are multiple test cases. The first line of the input contains an integer T $(1 \le T \le 10^3)$ indicating the number of test cases. For each test case:

The first line contains an integer n $(4 \le n \le 10^9)$ indicating the number of vertices.

Interaction Protocol

To ask a query, output one line. First output `?` followed by a space, then output two vertices x and y $(1 \le x, y \le n)$ separated by a space. After flushing your output, your program should read a single integer indicating the number of edges on the shortest path between the two vertices.

To guess the position of the chord, output one line. First output `!` followed by a space, then output two vertices u and v $(1 \le u, v \le n)$ separated by a space, indicating that the chord connects vertices u and v. After flushing your output, your program should read a single integer r $(r \in \{1, -1\})$ indicating the correctness of your guess. If $r = 1$ then your guess is correct, and your program should continue processing the next test case, or exit immediately if there are no more test cases. Otherwise if $r = -1$ then your guess is incorrect, and your program should exit immediately to receive a `Wrong Answer` verdict. Note that your guess does not count as a query.

To flush your output, you may use:

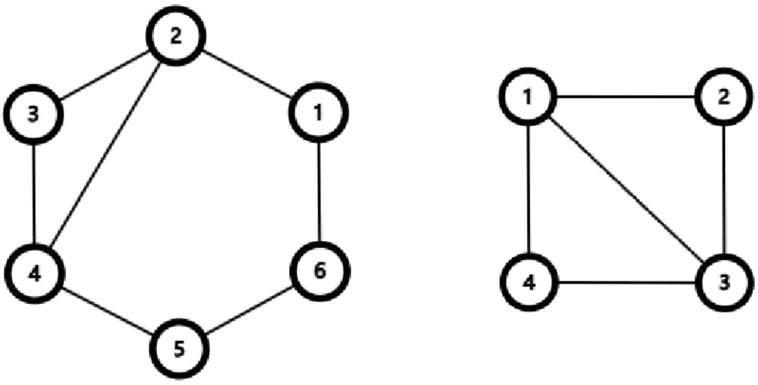
- `fflush(stdout)` (if you use `printf`) or `cout.flush()` (if you use `cout`) in C and C++.
- `System.out.flush()` in Java.
- `stdout.flush()` in Python.

Example

standard input	standard output
2	
6	
	? 1 5
2	
	? 2 4
1	
	! 4 2
1	
4	
	? 2 4
2	
	! 1 3
1	

Note

The graphs in the sample test cases are illustrated as follows:


2
3
1
4
6
5
1
2
4
3