

The 2025-2026 ICPC Latin America Contests

Problem D – Hidden Treasure

This problem is interactive.

There is a hidden treasure at integer coordinates (r, c) on the square bounded by $(0, 0)$ and (N, N) , that is, $0 \leq r, c \leq N$. Your task is to find the coordinates of the treasure by asking questions to the interactor.

In each question, you may pick integer coordinates (x, y) ($0 \leq x, y \leq N$), and the interactor will respond with the Manhattan distance from (x, y) to the treasure, i.e. $|r - x| + |c - y|$.

You may ask at most 5 questions. When you have determined the coordinates of the treasure, output them in the format described below and terminate your program.

Interaction

First, read a single integer N ($1 \leq N \leq 10^5$), the upper bound for the coordinates of the treasure.

You may then ask at most 5 questions to the interactor. Each question must be asked in the format “? x y” (without quotes), where $0 \leq x, y \leq N$.

After each query, read a single integer d , the Manhattan distance from the queried point to the treasure.

When you have determined the coordinates of the treasure (r, c) , print “! r c” (without quotes) and terminate your program.

Exceeding the number of allowed questions or printing an invalid query will result in a **Wrong Answer** verdict.

The interactor is **not adaptive**, meaning the treasure’s position is fixed before the interaction starts and does not change based on your queries.

After each write to the output, remember to flush the output buffer. Otherwise, you may receive the verdict **Time Limit Exceeded**. To flush the buffer, use:

- `fflush(stdout)` in C.
- `cout.flush()` in C++.
- `sys.stdout.flush()` in Python.
- `System.out.flush()` in Java.
- `System.out.flush()` in Kotlin.

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Sample interaction 1

Read

Write

3	
	? 0 0
5	
	? 1 0
4	
	? 2 0
3	
	? 3 0
4	
	? 0 3
2	
	! 2 3

Explanation of sample 1:

First, the program reads $N = 3$, indicating that the treasure lies within coordinates $(0, 0)$ and $(3, 3)$.

The first four queries fix $y = 0$ and test $x = 0, 1, 2, 3$. The interactor's responses are 5, 4, 3, 4, indicating that the treasure is at coordinates $(2, y)$ for some y , since the distances decrease until $x = 2$ and then increase again.

The fifth query checks $(0, 3)$ and receives a response of 2. From this we deduce:

$$|2 - 0| + |c - 3| = 2 \Rightarrow |c - 3| = 0 \Rightarrow c = 3.$$

Hence, the treasure is at $(2, 3)$, and the program outputs:

! 2 3.