Problem B. Adjusting Scores

Time limit 1000 ms
Memory limit 256MB

Problem Description

This is an interactive problem.

In the course Introduction to Algorithm, the final exam became unexpectedly difficult because the TAs were not well controlled and designed questions that were far too hard. To ensure fairness, the professor decides to adjust the scores based on their distribution.

There are totally N students. All students' exam scores are recorded in a sorted list $a_1, a_2...a_N$ in non-decreasing order (lowest to highest, but duplicates are allowed). Each student has a unique ID corresponding to their position in this list.

To decide how to adjust the grading, the professor asks the following question:

Given a target score x, which is the first student (smallest ID) whose score is greater than or equal to x?

It is possible that no such a student exist. (x is greater than all students' score).

Input format

The first and the only line contains two integers $N(1 \leq N \leq 2 \times 10^5)$ and $x(1 \leq x \leq 10^9)$ – the number of students and the target score.

Interactive

The interaction begins with reading the integer N and x, which is the number of students and the target score.

To make a query, output a line in the following format:

- ? i : asks for the value of a_i. The jury will respond with a single integer a_i.

Once you have determined the answer, output it in the following format:

- ! i: a_i is the first student's score which is greater than or equal to x. If no such student exists, output -1 (i.e., print "! -1").

It is guaranteed that $1 \leq a_i \leq 10^9$ for all $1 \leq i \leq N$. And a is sorted in not decreasing order.

You may use at most 20 queries. Printing the final answer does not count as a query. After printing a query, do not forget to end the line and flush the output. To do this, you may use:

- fflush(stdout) in C, or

- endl or cout.flush() in C++

The interactor is not adaptive, which means the hidden array remains fixed and consistent during the whole test.

Subtask score

Subtask	Score	Additional Constraints
1	13	$N \leq 20$
2	87	No Constraints

Sample

Sample Input 1

```
5 7

1

3

4

7

10
```

Sample Output 1

```
? 1

? 2

? 3

? 4

? 5

! 4
```

Sample Input 2

```
5 3

1

1

3

3

3
```

Sample Output 2

```
? 1

? 2

? 3

? 4

? 5

! 3
```