RMQ

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	256 megabytes

This is an interactive problem.

Busy Beaver has a secret array $a_1, a_2, \ldots, a_N$ of **distinct** positive integers between 1 and 10^9. For $1 \le l \le r \le N$, Busy Beaver defines $f(l, r)$ to be equal to $\min(a_l, a_{l+1}, \ldots, a_r)$.

Busy Beaver allows you to ask some queries to uncover information about the array. In a query, you can specify l and r ($1 \le l \le r \le N$), and Busy Beaver will tell you the value of $f(l, r)$ for a cost of $\frac{1}{r-l+1}$. You must ensure that the total cost of all queries is at most 1.

After making all your queries, you report to Busy Beaver a list of pairs (l, r) for which you determined the value of $f(l, r)$. If any of your answers are wrong, Busy Beaver will be displeased and award you 0 points. Otherwise, your score will depend on the fraction of the $\frac{N(N+1)}{2}$ pairs (l, r) with $1 \le l \le r \le N$ where you determined a value for $f(l, r)$ (see the Scoring section for more details).

To reduce the size of the output, you report your knowledge using k tuples of the form $(l_{min}, l_{max}, r_{min}, r_{max}, v)$, where $1 \le l_{min} \le l_{max} \le r_{min} \le r_{max} \le N$ and $1 \le v \le 10^9$. Each tuple declares that $f(l, r) = v$ for all $l_{min} \le l \le l_{max}$ and $r_{min} \le r \le r_{max}$. Any pairs (l, r) that do not correspond to any tuple are treated as unspecified. It is allowed to have multiple tuples that describe the same pair (l, r), but you will receive 0 points if these tuples indicate inconsistent values.

Interaction Protocol

The first line of input contains a single integer N ($1 \le N \le 10^5$), the length of Busy Beaver's secret array.

You may repeatedly ask queries by outputting a line of the form "`? l r`", where $1 \le l \le r \le N$. Then, the judge will respond with a single integer, denoting the value of $f(l, r)$. If you exceed a total cost of 1, the judge will instead respond with -1, and you should terminate your program immediately to receive a `Wrong Answer` verdict.

After you are finished with your queries, first output a line of the form "`! k`" ($0 \le k \le 2N$), representing that you will describe your knowledge of f using k tuples $(l_{min}, l_{max}, r_{min}, r_{max}, v)$.

Then, the next k lines should each contain 5 space-separated integers l_{min}, l_{max}, r_{min}, r_{max}, and v, specifying a tuple.

The interactor is **not** adaptive, meaning that Busy Beaver will not change the entries of his secret array a in response to your queries.

Scoring

For all test cases used for scoring, $N = 10^5$.

If you exceed a cost of 1 or any of the values you claim for $f(l, r)$ are incorrect, you will receive 0 points and a `Wrong Answer` verdict.

Otherwise, let x be the fraction of the $\frac{N(N+1)}{2}$ values of $f(l, r)$ that you specified a value for. Your score for the test case will be equal to

$$\left\lfloor \min\left(100, 100 \cdot \frac{x}{0.8}\right) \right\rfloor.$$

In particular, if $x \ge 0.8$, then you will receive full points for the test case.

Your final score will be the minimum score over all test cases.

Example

standard input	standard output
6 31 26 53	 ? 1 3 ? 1 6 ? 5 6 ! 4 1 1 3 3 31 1 4 4 6 26 2 3 5 5 26 5 5 6 6 53

Note

Note that the sample does not satisfy $N = 10^5$, so it will not be included in the actual test cases. It is provided only to illustrate the interaction format.

In the sample, Busy Beaver's secret array is $a = [31, 41, 59, 26, 53, 58]$. You decide to make the following queries:

- $l = 1$, $r = 3$: Busy Beaver calculates $f(1, 3) = \min(31, 41, 59) = 31$ and tells you the value 31.
- $l = 1$, $r = 6$: Busy Beaver calculates $f(1, 6) = \min(31, 41, 59, 26, 53, 58) = 26$ and tells you the value 26.
- $l = 5$, $r = 6$: Busy Beaver calculates $f(5, 6) = \min(53, 58) = 53$ and tells you the value 53.

Note that the total cost of all your queries is $\frac{1}{3} + \frac{1}{6} + \frac{1}{2} = 1$, which does not exceed 1 as required.

From this information, you report to Busy Beaver the following values of $f(l, r)$ you have deduced:

- $f(l, r) = 31$ for all $1 \le l \le 1$, $3 \le r \le 3$.
- $f(l, r) = 26$ for all $1 \le l \le 4$, $4 \le r \le 6$.
- $f(l, r) = 26$ for all $2 \le l \le 3$, $5 \le r \le 5$. This overlaps with the information in the previous line, but is a valid output.
- $f(l, r) = 53$ for all $5 \le l \le 5$, $6 \le r \le 6$.

After removing overlaps, you reported 14 of the values of $f(l, r)$ out of the $\frac{N(N+1)}{2} = 21$ distinct pairs (l, r). Therefore, Busy Beaver will calculate $x = \frac{14}{21}$ and give you a score of

$$\left\lfloor 100 \cdot \frac{14/21}{0.8} \right\rfloor = \lfloor 83.\bar{3} \rfloor = 83$$

for this interaction.