



Xylophone

Xylophone is a musical instrument which is played by striking wooden bars. A single wooden bar will always sound the same pitch, so a xylophone consists of bars with various pitches.

JOI-kun bought a xylophone consisting of N wooden bars. The bars are lined up in a row and numbered from 0 through $N - 1$ from left to right. The bar with number i ($0 \leq i \leq N - 1$) sounds a pitch of height A_i ($0 \leq A_i \leq N - 1$). Different bars sound different pitches. He knows that the bar with the lowest pitch has a smaller number than the bar with the highest pitch.

Because JOI-kun does not know which bar sounds which pitch, he is going to study the pitch of the bars.

JOI-kun has a peculiar sense of sound; when he hears multiple sounds simultaneously, he can tell the difference between the heights of the highest pitch and the lowest pitch. He can strike a lump of bars at a time and hear their sounds. That is, for integers s and t ($0 \leq s \leq t \leq N - 1$), he can strike the bars with numbers s through t simultaneously, to know the difference between the maximum and the minimum among A_s, A_{s+1}, \dots, A_t .

He wants determine the pitches of the bars within 10 000 tries of striking.

Implementation details

You should implement the following procedure:

```
detect_pitch(int N)
```

- N : the number of bars.

The procedure `detect_pitch` can make calls to the following function:

```
int ask(int s, int t)
```

- s and t : s is the first number and t is the last number in the interval of bars to strike. That is, you strike all the bars with number at least s and at most t .
- It must hold that $0 \leq s \leq t \leq N - 1$.
- You cannot call `ask` more than 10 000 times.
- This function returns the difference between the maximum and the minimum among the sounds of bars in the specified interval.

`detect_pitch` should make calls to the following procedure to answer the pitches of the bars:

```
answer(int i, int a)
```

- i and a : These mean that you answer A_i is a , where A_i is the height of the pitch of bar i .
- It must hold that $0 \leq i \leq N - 1$.
- You cannot call this procedure for the same value of i more than once.
- You must call this procedure exactly N times before the procedure `solve` terminates.
- If some of the above conditions are not satisfied, your program will be judged **Wrong Answer**.
- If some of the pitches you answered are different from the actual ones, your program will be judged **Wrong Answer**.

Example

An example of communication for $N = 5$, $[A_0, A_1, A_2, A_3, A_4] = [1, 0, 4, 2, 3]$ is shown below.

Call	Return
<code>ask(0, 4)</code>	4
<code>answer(0, 1)</code>	
<code>ask(2, 3)</code>	2
<code>answer(1, 0)</code>	
<code>answer(2, 4)</code>	
<code>answer(4, 3)</code>	
<code>answer(3, 2)</code>	

The maximum among A_0, A_1, A_2, A_3, A_4 is 4 and the minimum among A_0, A_1, A_2, A_3, A_4 is 0, so the value of `ask(0, 4)` is $4 - 0$, being 4. The maximum among A_2, A_3 is 4 and the minimum among A_2, A_3 is 2, so the value of `ask(2, 3)` is $4 - 2$, being 2.

The file `sample-01-in.txt` in the zipped attachment package corresponds to this example.

Constraints

- $0 \leq A_i \leq N - 1$ ($0 \leq i \leq N - 1$)
- $A_i \neq A_j$ ($0 \leq i < j \leq N - 1$)
- For i and j with $A_i = 0$ and $A_j = N - 1$, it holds that $i < j$.

Subtasks

1. (11 points) $2 \leq N \leq 100$
2. (36 points) $2 \leq N \leq 1\,000$
3. (53 points) $2 \leq N \leq 5\,000$

Sample grader

The sample grader reads the input in the following format:

- line 1: N
- line $2 + i$ ($0 \leq i \leq N - 1$): A_i

If your program wasn't judged wrong answer, the sample grader prints `Accepted : q`, with q the number of calls to the function `ask`.