

Problem G. Jujutsu Kaisen 呪術廻戦

Problem Description



Recently, deadly curses have caused numerous tragedies, and many innocent people have been hurt and killed. Today, Yuji, a student of Jujutsu High School (呪術高専), has been sent to eliminate the vicious curses that are lingering on a street to rescue the survivors. However, Yuji doesn't know how to use any jujutsu (呪術) yet, so he decided to seek Satoru Gojō for help. After thinking for a while, Satoru asks Yuji to put jubutsus (呪物s) on several **distinct** positions to attract curses so that he can kill them all at once.

However, to prevent Ryomen Sukuna, the most notorious curse that is currently hiding in Yuji's body from getting out of control, **in the beginning**, Yuji will place a jubutsu at the **begin** and the **end** of the street respectively. Meanwhile, every time Yuji places a jubutsu, Satoru will summon a new shikigami (式神) as well. In order to maximize the protection, each shikigami has to be placed as far as possible to its closest jubutsu.

Now, given the length of the road and the target position of the jubutsu to be placed, figure out the location that the shikigami should be put and output the maximum distance between the newly summoned shikigami and its closest jubutsu after each placement of the jubutsu. In this problem, you can treat the road as a 1-dimension line of length L with the position numbered $0, 1, 2, 3, \dots, L$ in this problem. Also the begin and the end of the road means position 0 and position L , individually.

In case of confusing, the distance between shikigami and jubutsu on the position p_1 and p_2 is defined as $|p_1 - p_2|$.

Input Format

The first line contains two integers L and n , which stand for the length of the street and the

number of jubutsu.

The second line contain n integers p_1, p_2, \dots, p_n , where p_i ($1 \leq i \leq n$) denotes the position of the i^{th} jubutsu being placed.

Output Format

Print the the longest distance of the newly summoned shikigami to its closest jubutsu in a single line every time Satoru add a shikigami.

Constraints

- $1 \leq L \leq 10^9$.
- $1 \leq n \leq 200\,000$.
- $1 \leq p_i \leq L - 1$ for $i = 1, 2, \dots, n$.
- $p_i \neq p_j$ for $i \neq j$.
- All the inputs are integers.

Subtasks

1. (100 points) No additional constraints.

No.	Testdata Range	Time Limit (ms)	Memory Limit (KiB)
Samples	1	1000	262144
1	1-8	1000	262144

Samples

Sample Input 1

```
8 3
6 3 1
```

Sample Output 1

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3
1
1
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In the sample input, at the beginning, two jubutsu are placed at 0 and 8.

First, Yuji places a jubutsu at position 6, so the positions of the placed jubutsus are $\{0, 6, 8\}$. The position that Satoru can place a shikigami at is 3, with this placement, the distance between the new shikigami and the nearest jubutsu will be $|3 - 0| = |6 - 3| = 3$.

Then, Yuji places a jubutsu at position 3, so the positions with jubutsu are $\{0, 3, 6, 8\}$. This time, the positions that Satoru can place shikigamis are $\{1, 2, 4, 5, 7\}$, with these placements, the distance between the new shikigami and the nearest jubutsu will be 1. Take the placement 2 for example, $|2 - 0| = 2$ and $|3 - 2| = 1$, and $\min(2, 1) = 1$.