PROBLEM 3

Off the Track

Time and memory limits: 1 second, 256 MB

Your school has an L metre long running track and there are N students standing at different locations on the track. The ith student is standing P_i metres from the start of the track, where P_i is an integer between 1 and $L-1$ (inclusive).

You are playing a game with these students. You will yell one instruction each second, which will be either "forwards" or "backwards":

- If you yell "forwards", every student will step 1 metre towards the **end** of the track. Specifically, a student at location p will move to location $p+1$.
- If you yell "backwards", every student will step 1 metre towards the **start** of the track. Specifically, a student at location p will move to location $p-1$.

If a student reaches the start of the track (location 0) or the end of the track (location L), they are *off the track* and **stop participating in the game**. The game ends when all N students are off the track. Two example games are illustrated at the end of the problem statement.

If you strategically choose when to yell "forwards" and "backwards", what is the fewest number of seconds needed to end the game?

Subtasks and constraints

Your program will be graded using many secret tests. Every test follows some rules:

- $2 \leq N \leq 200\,000$.
- $N < L \leq 10\,000\,000$.
- $1 \leq P_i \leq L-1$ for all i.
- $P_i < P_{i+1}$ for all i. That is, the initial locations are all different and in ascending order.

The secret tests are divided into subtasks. Your program must correctly solve **every test** within a subtask to earn the marks for that subtask:

- For Subtask 1 (20 marks), the best solution involves yelling the same instruction over and over.[1]
- For Subtask 2 (40 marks), $N = 2$.
- For Subtask 3 (40 marks), no special rules apply.

Input

Your solution must read input and print output. We recommend using the solution templates (which you can find on the competition website) to help you with input and output.

The input follows a specific format:

- The 1st line contains the integers N and L.
- The 2nd line contains N integers describing the initial locations of the students. The ith of these is P_i.

Output

Your solution must print a single integer: the fewest number of seconds needed to end the game.

[1] Sample input 1 satisfies the rules of Subtask 1 but sample inputs 2 and 3 do not.

Sample input 1

```
2 5
1 3
```

Sample output 1

```
3
```

Sample input 2

```
2 7
2 6
```

Sample output 2

```
4
```

Sample input 3

```
4 15
1 3 11 14
```

Sample output 3

```
10
```

Explanation

- In the 1st sample case, there are $N = 2$ students at locations 1 and 3 on the $L = 5$ metre long track. You can end the game in 3 seconds by yelling "backwards" 3 times. It is impossible to end the game in fewer than 3 seconds, and so the answer is 3.
- In the 2nd sample case, there are $N = 2$ students at locations 2 and 6 on the $L = 7$ metre long track. You can end the game in 4 seconds by yelling "forwards" 1 time and then "backwards" 3 times. It is impossible to end the game in fewer than 4 seconds, and so the answer is 4.
- In the 3rd sample case, there are $N = 4$ students at locations 1, 3, 11 and 14 on the $L = 15$ metre long track. You can end the game in 10 seconds by yelling "backwards" 3 times and then "forwards" 7 times.

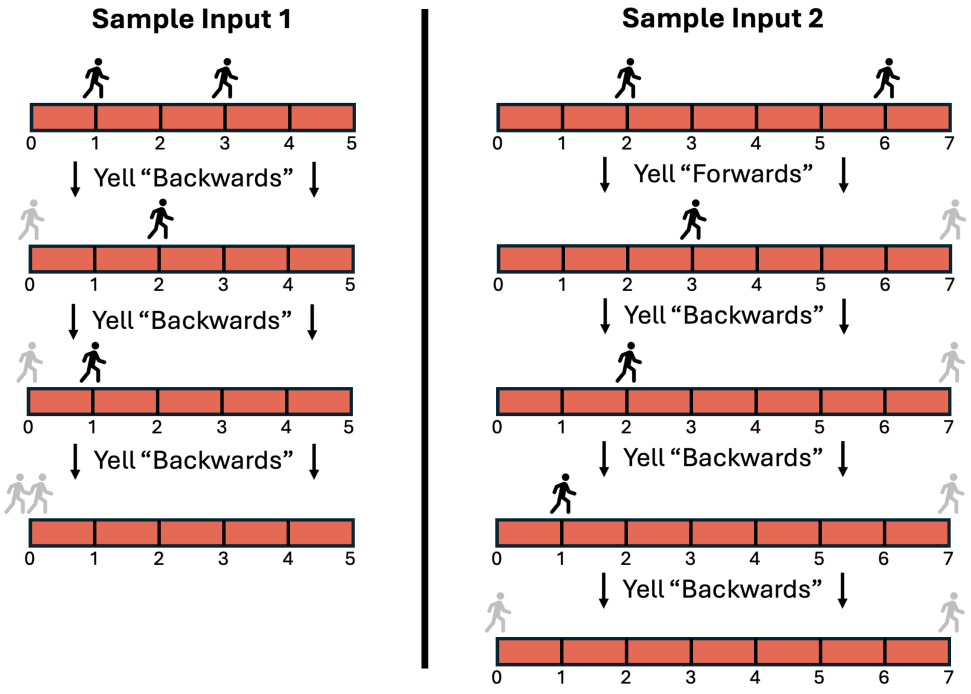

Figure 1: The solutions to sample inputs 1 and 2. The diagrams should be read from top to bottom.