Thunderstorm

Time Limit: 2 seconds
Memory Limit: 512 MB

Problem Statement

Physicist S is going home after December Training Final Contest! There is a very long road of length N metres, with SoC at one end and his home at the other. Usually, he would walk home leisurely along the road, but not today, as a thunderstorm is currently brewing.

As a result of the thunderstorm, some parts of the road are no longer safe to walk on. We may approximate the road as being comprised of N segments, with SoC (and Physicist S) at segment 1 and his home at segment N. Some of those segments are "clear", while others are "cloudy". The storm clouds will shift Q times in total. The i^{th} shift of the storm clouds will cause all "clear" segments in the range $[L_i, R_i]$ to become "cloudy" and vice versa.

Physicist S wants to be as close to home as possible after all Q shifts of the storm clouds. However, it is extremely dangerous to walk from a "clear" segment to a "cloudy" segment due to high risk of lightning strike when doing so, thus Physicist S cannot do such a thing.

After each shift of the storm clouds, Physicist S will be told which range the shift has affected. Help him to reach his home safely by telling him how he should move!

Input Format

The first line of input will contain two integers, N and Q.

The next line of input will contain N integers, either 0 or 1. 0 indicates a "cloudy" segment while 1 indicates a "clear" segment.

The next Q lines of input will contain 2 integers each. The $(i+2)^{th}$ line will contain L_i and R_i for that shift of storm clouds.

Output Format

Your output should consist of $Q+1$ lines. The i^{th} line should contain a single integer X_i, denoting the segment of the road Physicist S should move to before the i^{th} shift of storm clouds. The $(Q+1)^{th}$ line should contain X_{Q+1}, the final position of Physicist S after all shifts. If there are multiple solutions with the same X_{Q+1}, output any one.

Limits

For all test cases, $2 \leq N \leq 10^6$ and $0 \leq Q \leq 10^6$. It is guaranteed that $1 \leq L_i \leq R_i \leq N$ and that segments 1 and N on the road are always "clear".

Subtask 1: $Q = 0$ (15 marks)
Subtask 2: $N, Q \leq 10^3$ (15 marks)
Subtask 3: $L_i = R_i$ for all $1 \leq i \leq Q$. (10 marks)
Subtask 4: $N, Q \leq 5 \times 10^4$ (8 marks)
Subtask 5: $N, Q \leq 2 \times 10^5$ (20 marks)
Subtask 6: There are no more constraints. (32 marks)

Sample Input 1

This sample input satisfies the constraints of subtasks 2, 4, 5 and 6.

```
8 4
1 0 1 1 1 1 1 1
2 5
2 6
3 7
7 7
```

Sample Output 1

```
1
2
4
5
8
```

Sample Input 2

This sample input satisfies the constraints of all subtasks.

```
6 0
1 1 1 0 0 1
```

Sample Output 2

```
3
```

Explanation of Sample Cases

For sample input 1, we cannot move initially. However, after the first shift, we can move to 2, after the second shift we can move to 4, after the third shift we can move to 5 and after the final shift we can move to 8. This is the furthest we can go.

For sample input 2, we can move to 3 without any shifts. This is the furthest possible.