PROBLEM 2

Conformity

Time and memory limits: 1 second, 256 MB

Hey, it's me, Conformity! Ask me anything!

Your friend Conformity is an eccentric architect who specialises in helping people build smooth and level structures. Today, a client approaches Conformity with a structure built from N pillars arranged in a line, with the ith pillar boasting a height of H_i metres.

Conformity's job is to fix their design by suggesting a sequence of *modifications*. However, strange as he is, he only modifies the structure by increasing or decreasing the heights of a **contiguous range** of pillars by one.[1]

Conformity is expected to answer Q questions from the client of the following form:

> "What's the minimum number of modifications required to make all the pillars from L_i to R_i the same height?"

Each question should be answered independently, using the original pillar heights. Unfortunately, Conformity has spent all of his time learning the capital cities of the world, so he doesn't actually know the answers to these questions. Can you help him answer them?

Subtasks and Constraints

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

- $2 \leq N \leq 200\,000$.
- $1 \leq Q \leq 200\,000$.
- $1 \leq H_i \leq 1\,000\,000\,000$ for all i.
- $1 \leq L_i \leq R_i \leq N$ for all i.

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 (15 points), $H_i < H_{i+1}$ for all $1 \leq i < N$.
- For Subtask 2 (20 points), $H_i < H_{i+1}$ for all $1 \leq i \leq \lfloor \frac{N}{2} \rfloor$ and $H_i > H_{i+1}$ for all $\lfloor \frac{N}{2} \rfloor < i < N$.[2]
- For Subtask 3 (25 points), $Q = N$, $L_i = 1$ for all i, $R_i = i$ for all i, and $H_1 = 1$.
- For Subtask 4 (25 points), $Q = N$, $L_i = 1$ for all i, $R_i = i$ for all i.
- For Subtask 5 (15 points), 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 first line contains two integers N and Q.
- The second line contains N integers $H_1, H_2, \ldots, H_N$, denoting the heights of each pillar.
- The next Q lines each contain two integers L_i and R_i, representing the ith question.

[1] Specifically, Conformity picks two pillars i and j, and either increments H_x for all $i \leq x \leq j$, or decrements them all.
[2] Note that $\lfloor x \rfloor$ denotes the largest integer no greater than x. For instance, $\lfloor 2 \rfloor = \lfloor 2.5 \rfloor = 2$.

Output

Your program must output Q lines, each with a single integer corresponding to each question's answer.

Sample Input 1

```
5 2
3 5 4 4 2
1 5
2 4
```

Sample Output 1

```
3
1
```

Sample Input 2

```
6 3
5 6 6 4 3 3
1 6
1 3
3 3
```

Sample Output 2

```
3
1
0
```

Explanation

- In the 1st sample case, Conformity has two questions to answer.

  For the first question, Conformity can make all five pillars have height 3: decrement the range $[2 \dots 4]$ twice, then increment the range $[3 \dots 5]$ once. This takes 3 modifications.

  For the second question, Conformity can make pillars 2 to 4 all have height 5 by incrementing the range $[3 \dots 4]$ once. This takes 1 modification.

- In the 2nd sample case, Conformity has three questions to answer.

  For the first question, Conformity can make all six pillars have height 4: decrement the range $[1 \dots 3]$ once, decrement the range $[2 \dots 4]$ once, then increment the range $[4 \dots 6]$ once. This takes 3 modifications.

  For the second question, Conformity can make pillars 1 to 3 all have height 5 by decrementing the range $[2 \dots 3]$ once. Alternatively, Conformity can increment the range $[1 \dots 1]$ once, making pillars 1 to 3 all have height 6. Either option takes 1 modification.

  The third question contains only pillar 3, so no modifications are needed.