DMOPC '21 Contest 8 P6 - Castle Building

Time limit: 3.0s **Memory limit:** 256M

Billy is playing with his newly bought Lego set containing N blocks with distinct heights from 1 to N. He would like to build a castle with these blocks, which involves arranging the blocks in a row where the heights from left to right are $h_1, h_2, \ldots, h_N$ such that there is some index i $(1 \le i \le N)$ where the heights are strictly increasing from 1 to i and strictly decreasing from i to N. Formally, $h_1 < h_2 < \cdots < h_i > \cdots > h_{N-1} > h_N$.

To help guide him, Billy found an old, worn out instruction manual from the bottom of his bed. The instructions give the required heights of each building block $a_1, a_2, \ldots, a_N$ from left to right. However, some of these numbers are so smudged that he cannot determine what they are! These are denoted with $a_i = 0$. Furthermore, Billy revises his interpretation of the instructions Q times, where he assumes that the number at index q_i is actually v_i.

Perplexed, Billy runs to you for help. Initially and after each of the Q revisions, tell Billy if there exists a castle consistent with the instructions.

Constraints

$1 \le N \le 2 \times 10^5$

$0 \le Q \le 2 \times 10^5$

$0 \le a_i \le N$

$1 \le q_i \le N$

$0 \le v_i \le N$

Initially and after each of the Q revisions, the instructions contain no duplicates of positive values.

Subtask 1 [30%]

$Q = 0$

Subtask 2 [40%]

$a_{\lfloor \frac{N+1}{2} \rfloor} = N$

$q_i \ne \left\lfloor \frac{N+1}{2} \right\rfloor$

Subtask 3 [30%]

No additional constraints.

Input Specification

The first line contains 2 integers N and Q.

The next line contains N integers, the initial instructions $a_1, a_2, \ldots, a_N$.

Each of the next Q lines contains the description of a revision, 2 integers q_i and v_i.

Output Specification

Initially and after each of the Q revisions, output `YES` if there exists a castle consistent with the instructions and `NO` otherwise.

Sample Input

```
9 3
1 0 0 5 0 0 8 0 2
5 9
7 0
5 0
```

Sample Output

```
YES
NO
YES
YES
```

Explanation

Initially, `1 3 4 5 7 9 8 6 2` is a possible castle.

After the first revision, the instructions are `1 0 0 5 9 0 8 0 2`, which has no consistent castle.

After the second revision, the instructions are `1 0 0 5 9 0 0 0 2`, and `1 3 4 5 9 8 7 6 2` is a possible castle.

After the third revision, the instructions are `1 0 0 5 0 0 0 0 2`, which has a few possible castles.