Problem G. Permutation and Queries

Input file:	*standard input*
Output file:	*standard output*
Time limit:	10 seconds
Memory limit:	512 mebibytes

You are given a permutation $p_1, p_2, \ldots, p_n$ of size n. Calculate the value

$$f(p) = \min_{i \neq j} |i - j| \cdot |p_i - p_j|.$$

You are also given q queries. The i-th query consists of two indices a_i and b_i. You should swap the elements at these positions (swap p_{a_i} and p_{b_i}), and then recalculate the value $f(p)$. Note that the changes persist between queries: after i-th query, there are i swaps made.

A permutation of size n is a sequence of n distinct integers from 1 to n.

Input

The first line contains two integers: the permutation size n ($2 \le n \le 10^5$) and the number of queries q ($1 \le q \le 10^5$).

The second line describes the permutation p.

Each of the next q lines describes a query. The i-th of these lines contains two integers a_i and b_i ($1 \le a_i, b_i \le n$; $a_i \neq b_i$): the indices of elements you should swap.

Output

Print $q + 1$ lines: the value $f(p)$ before all queries and after each of the q queries.

Example

standard input	*standard output*
6 5 2 4 1 6 3 5 1 2 3 5 1 2 5 3 5 6	2 1 1 1 2 1