Knights

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2.5 seconds
Memory limit:	512 megabytes

There are N knights labeled 1 to N standing in a row. The i-th knight has power P_i.

The knights are competing in a jousting tournament. To do so, each knight will hold a sword pointing either to the left or to the right. The i-th knight will point their sword to the left if $S_i = 0$ and to the right if $S_i = 1$ where S is a binary string of length N.

A joust is defined as the following process:

1. Initially all knights are alive.
2. Let A be the list of knights still alive arranged in increasing order of label and m be the size of A.
3. For each i from 1 to m. If the A_i-th knight has an adjacent knight with bigger power pointing their sword at the A_i-th knight's direction, then mark the A_i knight as **dead.** Formally the A_i-th knight will be marked as dead if one of the following condition is true.
   - $i - 1 > 0$ and $P_{A_{i-1}} > P_{A_i}$ and $S_{A_{i-1}} = 1$
   - $i + 1 \leq m$ and $P_{A_{i+1}} > P_{A_i}$ and $S_{A_{i+1}} = 0$
4. Return to step 2 if there is at least one knight in A marked as dead.

Now you are given Q queries, each query are of the form:

- Given integer x ($1 \leq x \leq n$), change S_x to $1 - S_x$.

After each query, find the number of knights alive after a joust is performed.

Do note that knights do not stay dead after a joust.

Input

The first line contains two space-separated integers N and Q ($1 \leq N, Q \leq 10^6$) – the size of P and the number of queries.

The second line contains N space-separated integers $P_1, P_2, \ldots, P_n$ ($1 \leq P_i \leq N$).

The third line contains a binary string S of length N.

Then Q lines follow. Each of the Q lines contains a single integer x ($1 \leq x \leq N$) denoting a query to change S_x to $1 - S_x$.

Output

Output Q integers $q_1, q_2, \ldots, q_n$ in order on Q lines, where q_i is the number of knights alive after performing a joust after the i-th query.

Scoring

Subtask 1 (6 points): $N, Q \leq 500$

Subtask 2 (9 points): $P_i \leq P_{i+1}$ for $1 \leq i < N$

Subtask 3 (17 points): $P_i \neq P_j$ if $i \neq j$ and the answer for each query is guaranteed to be at most 50.

Subtask 4 (19 points): $P_i \neq P_j$ if $i \neq j$

Subtask 5 (19 points): $N, Q \leq 10000$

Subtask 6 (30 points): No additional constraints

Examples

standard input	standard output
5 3 2 1 3 4 3 11011 1 3 4	2 4 2
10 5 10 1 2 3 8 9 4 5 7 6 0111100110 10 5 6 5 1	5 5 3 6 1

Note

In the first sample input, after the first query, S becomes 01011.

Initially, the (labels of) the knights alive are $\{1, 2, 3, 4, 5\}$. After one iteration, the knights remaining are $\{1, 3, 4\}$. After the second iteration, the knights remaining are $\{3, 4\}$. After the third iteration, no new knight dies, so 2 knights remain after a joust.

After the second query, S becomes 01111.

After one iteration, the knights remaining are $\{2, 3, 4, 5\}$. After the second iteration, no new knight dies, so 4 knights remain after a joust.