Problem I – Infinite Arrays

A subarray of an array B is a contiguous sequence of elements taken from B. For example, if $B = [3, 1, 4, 1, 5]$, then $[3, 1, 4]$, $[4, 1]$, the empty array $[\,]$ and the whole array B are subarrays of B (among others), while $[3, 4, 5]$ and $[1, 3]$ are not subarrays of B.

We also define C^m as the array obtained by the concatenation of m copies of the array C. For example, if $C = [3, 2]$ then $C^1 = [3, 2]$, $C^2 = [3, 2, 3, 2]$ and $C^\infty = [\ldots, 3, 2, 3, 2, 3, 2, \ldots]$.

In this problem you are given an array P containing no repeated numbers, and you have to process a sequence of events that occur in order. The events can be of three types:

- Delete: a number present in P must be deleted. For example, if $P = [2, 3, 4]$ and the number 3 has to be deleted, once the event is processed P will become $[2, 4]$.
- Insert: a number not present in P must be inserted into P before some other number present in P. For example, if $P = [4, 3, 2, 1]$ and the number 9 must be inserted before the number 1, once the event is processed P will become $[4, 3, 2, 9, 1]$.
- Query: the length of the longest common subarray between P^∞ and A^∞ must be computed, where A is an array given in the query. For example, if $P = [1, 2, 3, 4]$ and $A = [3, 2]$, then the longest common subarray between P^∞ and A^∞ is $[2, 3]$, so the answer to the query is 2.

Are you ready for this challenge?

Input

The first line contains an integer N ($1 \leq N \leq 5 \cdot 10^5$) indicating the initial length of P.

The second line contains N different integers $P_1, P_2, \ldots, P_N$ ($1 \leq P_i \leq 10^6$ for $i = 1, 2, \ldots, N$).

The third line contains an integer E ($1 \leq E \leq 5 \cdot 10^5$) representing the number of events that need to be processed.

Each of the next E lines describes an event, in the order they must be processed. The content of the line depends on the event, as follows:

- Delete: the line contains the character "`-`" (minus sign) and an integer X ($1 \leq X \leq 10^6$, and $X \in P$), denoting that X must be deleted from P. It is guaranteed that after the removal P does not become empty.
- Insert: the line contains the character "`+`" (plus sign) and two integers Y and Z ($1 \leq Y, Z \leq 10^6$, $Y \notin P$, and $Z \in P$), denoting that Y must be inserted into P immediately to the left of Z.
- Query: the line contains the character "`?`" (question mark), a positive integer K, and K integers $A_1, A_2, \ldots, A_K$ ($1 \leq A_i \leq 10^6$ for $i = 1, 2, \ldots, K$), indicating that the length of the longest common subarray between P^∞ and A^∞ must be computed. It is guaranteed that the input contains at least one query, and the sum of K across all the queries is at most 10^6.

Output

Output a line for each query, with an integer indicating the length of the longest common subarray between P^∞ and A^∞, or the character "`*`" (asterisk) if the length of the longest common subarray is larger than 10^{18}.

Sample input 1	Sample output 1
4 1 2 3 4 10 ? 2 3 2 ? 3 99 99 99 - 1 - 4 ? 2 3 3 ? 3 4 1 4 + 64 3 + 1 2 ? 4 1 2 64 3 ? 4 1 3 64 2	2 0 1 0 * 1

Sample input 2	Sample output 2
1 217 1 ? 1 314	0