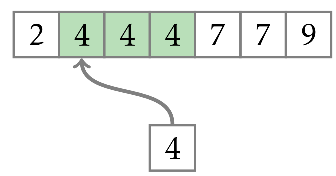
4.2.2 Binary Search with Duplicates

Donald Knuth, the author of *The Art of Computer Programming*, famously said: "Although the basic idea of binary search is comparatively straightforward, the details can be surprisingly tricky." He was referring to a modified classical Binary Search Problem:

Binary Search with Duplicates Problem
Find the index of the first occurrence of a key in a sorted array.

Input: A sorted array of integers (possibly with duplicates) and an integer q.
Output: Index of the first occurrence of q in the array or "-1" if q does not appear in the array.



When Knuth asked professional programmers at top companies like IBM to implement an efficient algorithm for binary search with duplicates, 90% of them had bugs — year after year. Indeed, although the binary search algorithm was first published in 1946, the first bug-free algorithm for binary search with duplicates was published only in 1962!

Similarly to the previous problem, here we ask you to search for m integers rather than a single one.

Input format. The first two lines of the input contain an integer n and a sequence $k_0 \le k_1 \le \cdots \le k_{n-1}$ of n positive integers in non-decreasing order. The next two lines contain an integer m and m positive integers $q_0, q_1, \ldots, q_{m-1}$.

Output format. For all i from 0 to $m-1$, output the index $0 \le j \le n-1$ of the first occurrence of q_i (i.e., $k_j = q_i$) or -1, if there is no such index.

Constraints. $1 \le n \le 3 \cdot 10^4$; $1 \le m \le 10^5$; $1 \le k_i \le 10^9$ for all $0 \le i < n$; $1 \le q_j \le 10^9$ for all $0 \le j < m$.

Sample.

Input:

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7
2 4 4 4 7 7 9
4
9 4 5 2
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Output:

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6 1 -1 0
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