Magical Stones I

Time limit: *5000 ms*
Memory limit: *256 MB*

You are practicing your alchemy skill over a pile of magical stones. A magical stone has N possible states numbered from 1 to N. In the beginning, you have exactly one magical stone that is in each state i.

You know one magic spell. When you cast the spell, a stone that is in state i will transform into a stone in state S_i. Whenever two stones are in a same state i, they will purify each other, and combine into a single more powerful stone in state i. Multiple stones in a same state will combine at the same time.

You would like to obtain exactly K magical stones in the end. What is the minimum number of spells you have to cast to achieve that? Since you are not sure which K best satisfies your needs, you are going to answer this question for many choices of K.

Standard input

The input has a single integer N on the first line.

The second line has N integers. The i-th is S_i.

The next line has a single integer Q.

Each of the next Q lines has a single integer K as a query, for which you need to determine the minimum number spells required to obtain exactly K magical stones.

Standard output

For each query, output the minimum number of spells required on a single line. If it is impossible to obtain exactly K stones, output -1.

Constraints and notes

- $2 \leq N \leq 10\text{\textasciicircum}5$ $2 \leq N \leq 10^5$
- $1 \leq S\_i \leq N$ $1 \leq S_i \leq N$. It is possible that $S\_i = i$ $S_i = i$.
- $1 \leq Q \leq 10\text{\textasciicircum}5$ $1 \leq Q \leq 10^5$
- In all queries $1 \leq K < N$ $1 \leq K < N$
- For 50% 50% of the test data, $N \leq 1\text{,}000, Q \leq 1\text{,}000$ $N \leq 1000, Q \leq 1000$.

Input	Output	Explanation
5 3 3 2 3 1 4 3 2 1 4	1 2 -1 -1	Initially, you have one stone in each of the 5 5 states $\{1,2,3,4,5\}$ $\{1,2,3,4,5\}$. When you cast the first spe[...] stone in state 5 5 transforms to state 1 1 ($S\_5=1$ $S_5=1$). The stones in state $1, 2, 4$ $1,2,4$ transform to state 3 [...] one stone in state 3 3. Therefore after one spell, you will have three stones in states $\{1,2,3\}$ $\{1,2,3\}$. After [...] will not be able to combine the last two stones into one. You also cannot obtain four stones.