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

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

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 states $\{1, 2, 3, 4, 5\}$. When you cast the first spell, the stone state in 3 transforms to state 2 ($S_3 = 2$). The stone in state 5 transforms to state 1 ($S_5 = 1$). The stones in state $1, 2, 4$ transform to state 3 ($S_1, S_2, S_4 = 3$). They purify each other and become one stone in state 3. Therefore after one spell, you will have three stones in states $\{1, 2, 3\}$. After a second spell, you will have two stones in states $\{2, 3\}$. You will not be able to combine the last two stones into one. You also cannot obtain four stones.