Find Strings

You are given n strings w_1, w_2, ..., w_n. Let S_i denote the set of strings formed by considering all unique substrings of the string w_i. A substring is defined as a contiguous sequence of one or more characters in the string. More information on substrings can be found here. Let $S = \{S_1 \cup S_2 \cup .... S_n\}$ .i.e S is a set of strings formed by considering all the unique strings in all sets S_1, S_2, ... S_n. You will be given many queries, and for each query, you will be given an integer 'k'. Your task is to display the lexicographically k^{th} smallest string from the set S.

Input:

The first line of input contains a single integer n, denoting the number of strings. Each of the next n lines consists of a string. The string on the i^{th} line ($1<=i<=n$) is denoted by w_i and has a length m_i. The next line consists of a single integer q, denoting the number of queries. Each of the next q lines consists of a single integer k.

Note: The input strings consist only of lowercase english alphabets 'a' - 'z'.

Output:

Output q lines, where the i^{th} line consists of a string which is the answer to the i^{th} query. If the input is invalid (i.e., $k >$ size of S), display "INVALID" for that case.

Constraints:

$1<= n <=50$
$1<= m_i <=2000$
$1<= q <=500$
$1<= k <=1000000000$

Sample Input:
2
aab
aac
3
3
8
23

Sample Output:
aab
c
INVALID

Explanation:

For the sample test case, we have 2 strings "aab" and "aac".
S1 = {"a", "aa", "aab", "ab", "b"} . These are the 5 unique substrings of "aab".
S2 = {"a", "aa", "aac", "ac", "c" } . These are the 5 unique substrings of "aac".
Now, S = {S1 U S2} = {"a", "aa", "aab", "aac", "ab", "ac", "b", "c"}. Totally, 8 unique strings are present in the set S.
The lexicographically 3rd smallest string in S is "aab" and the lexicographically 8th smallest string in S is "c".
Since there are only 8 distinct substrings, the answer to the last query is "INVALID".