Problem E
Eradicative Expressions

Time limit: 2 seconds
Memory limit: 512 megabytes

Problem Description

Shiba Tatsuya lives in a universe where magic exists and has been evolving with the world along with technology. As a magician, Tatsuya is able to cast multiple magic spells with various effects. For instance, "Material Burst" (a.k.a. 質量爆散〈マテリアル・バースト〉) is one of his most famous spells due to its sheer destructive ability. It is never in one's best interest to use it without thorough planning, as a single careless cast can easily blast a planet into oblivion.

There are k characters in the alphabet of magicians, which happens to be a set of lowercase English letters, sorted in their usual order (`a` to `z`). In addition, there is a *dictionary* consisting of *words* that can be used for chanting. Each *word* is a string of length k and is a permutation of all k characters. The *dictionary* is a collection of all $k!$ possible words, sorted in lexicographical order. Recall that the lexicographical order is an ordering of strings such that for any two strings s and t, s appears before t if and only if:

- s is a prefix of t, or
- there is an index i such that $s_i < t_i$ and $\forall\, 1 \le j < i$, $s_j = t_j$.

In order to cast a magic spell, one has to construct an *activation sequence* by manipulating "psions", which, in short, are particles that can further start processes which overwrite or interfere with physical rules and therefore alter reality. Each *activation sequence* of Tatsuya's "Material Burst" is a permutation of n words $S_1, S_2, \ldots, S_n$, which all belong to the dictionary and are **not** necessarily distinct. For a word w, its potential $f(w)$ is defined as the index of w in the dictionary.

The destructive power of Tatsuya's "Material Burst" depends on the activation sequence he chooses. For each permutation $p_1, p_2, \ldots, p_n$ of integers from 1 to n, the sequence $S_{p_1}, S_{p_2}, \ldots, S_{p_n}$ is a valid activation sequence, and its "power" is given by the value

$$\sum_{i=0}^{n-1} (f(S_{p_{i+1}}) - f(S_{p_i})) \times W_i$$

where $W_1, W_2, \ldots, W_{n-1}$ are constants.

Tatsuya wants to control the power of the "Material Burst" he uses. For an integer x, he wants to know the x^{th} largest value among the powers of all $n!$ activation sequences (Note: there might be duplicate sequences! See the Hint section for an example.). Your task is to find out the answer for multiple x's.

Input Format

The first line contains three integers n, k, q, representing the number of characters, number of words and number of queries you have to answer.

Then n lines follow, the i^{th} of which contains the string S_i.

The next line contains $n-1$ space-separated integers, denoting the constants $W_1, W_2, \ldots, W_{n-1}$.

Then there are q lines: on the i^{th} line there is an integer x_i denoting a query.

Output Format

Print q lines. On the i^{th} line, you should print the answer of the i^{th} query, i.e. the x_i^{th} largest power of all activation sequences.

Technical Specification

- $2 \leq n, k \leq 8$
- $1 \leq q \leq n!$
- $1 \leq x_i \leq n!$
- $-10^9 \leq W_i \leq 10^9$
- Each string S_i consists of k different lowercase English letters.
- The strings $S_1, S_2, \ldots, S_n$ contain the same set of characters.

Sample Input 1

```
2 2 2
ab
ba
100
1
2
```

Sample Output 1

```
100
-100
```

Sample Input 2

```
3 4 4
abdc
dcba
abdc
-1 100
4
6
1
2
```

Sample Output 2

```
22
-2222
2200
2200
```

Hint

In the first sample, the alphabet is $\{\texttt{a}, \texttt{b}\}$ and the dictionary is $[\texttt{ab}, \texttt{ba}]$. The potentials are $f(\texttt{ab}) = 1$ and $f(\texttt{ba}) = 2$ respectively.

- The power of the activation sequence "`ab ba`" is $(2 - 1) \times 100 = 100$.
- The power of the activation sequence "`ba ab`" is $(1 - 2) \times 100 = -100$.

Therefore the 1^{st} largest power is 100 and the 2^{nd} largest power is -100.

In the second sample, the alphabet is $\{\texttt{a}, \texttt{b}, \texttt{c}, \texttt{d}\}$ and the dictionary has 24 words. The potentials are $f(\texttt{abdc}) = 2$, $f(\texttt{dcba}) = 24$ and $f(\texttt{abdc}) = 2$. There are $3! = 6$ possible activation sequences:

Permutation	Sequence	Power
S_1, S_2, S_3	"`abdc dcba abdc`"	-2222
S_1, S_3, S_2	"`abdc abdc dcba`"	2200
S_2, S_1, S_3	"`dcba abdc abdc`"	22
S_2, S_3, S_1	"`dcba abdc abdc`"	22
S_3, S_1, S_2	"`abdc abdc dcba`"	2200
S_3, S_2, S_1	"`abdc dcba abdc`"	-2222