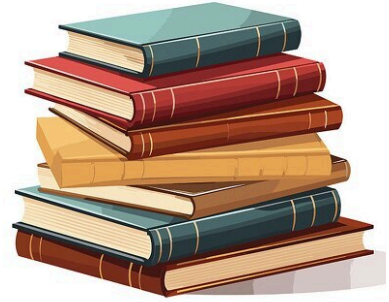# Library Catalog

A mysterious person has donated their private library collection to you. With all these books, you have decided to start a small community library. Over time, more people contribute their books, and your library grows tremendously! However, there are now plenty of books at your disposal, and it is becoming difficult to track all of them. To help patrons find books more easily, you need to implement a catalog system that can search and retrieve relevant titles based on the keyword search.

Write a program that, given a list of book titles in the library and a list of keywords to search for, determines which book titles are relevant to your search.

In addition, patrons may wish to add additional keywords to their search at any time, so your catalog system should efficiently handle new keywords as they come in.

Input

The first line of input is the number of books $B \leq 2 \times 10^4$. The next B lines will each contain the title for one book in the catalogue, each of which will be at most 512 characters long. Note that the titles may contain letters, numbers, spaces, and basic punctuation (commas, periods, question marks, exclamation points, hyphens, colons, and semicolons) but WILL NOT contain any other characters (thus, these symbols may be used as delimiters if you wish).

On the following line will be a number $K \leq 10^3$ representing the number of initial search keywords. The next K lines will each contain one search keyword, which are also guaranteed to be at most 256 characters long. These keywords may contain letters and numbers but will not contain spaces or punctuation. In addition, each keyword is guaranteed to be at least one character long.

Finally, on the following line will be a number $N \leq 10^4$ such that N represents the number of 'actions' taken. As above, each of the following N lines represent one action. Each action will be in one of the following formats:
  - `A [keyword]` should add `[keyword]` to the dictionary of search keywords if it is not already present
  - `S` should search the catalogue for all titles that match at least one of the search keywords along with the number of matches for each (note that keywords can be contained within other words, such as 'economics' in the title *Macroeconomics Essentials*, and that keyword matches may overlap). All keyword searches should be case-insensitive.

Output

For each search, output a space-separated ordered pair in the format `(index, matches)` for each title that matches at least one keyword. The first title is always index 0.

Sample Input	Sample Output

Sample Input

```
8
Home Kitchen Recipes
Gusteau's Cookbook
Homeowners Guide, Volume 10: Ovens and
Stoves
Underwater Basket-Weaving
Making Venison and Steaks
Dancing for Beginners
Free-Range Farming: Chickens
Shopping for Appliances: All About
Stovetops
3
stove
kitchen
oven
6
S
A cook
S
A venison
A chicken
S
```

Sample Output

```
(0,1) (2,2) (7,1)
(0,1) (1,1) (2,2) (7,1)
(0,1) (1,1) (2,2) (4,1) (6,1) (7,1)
```