

Round 3 2009

[A. EZ-Sokoban](#)**B. Alphabetomials**[C. Football Team](#)[D. Interesting Ranges](#)[Contest Analysis](#)[Questions asked](#)

## Submissions

## EZ-Sokoban

7pt	Not attempted <b>231/262 users</b> correct (88%)
10pt	Not attempted <b>158/219 users</b> correct (72%)

## Alphabetomials

4pt	Not attempted <b>186/225 users</b> correct (83%)
20pt	Not attempted <b>37/71 users</b> correct (52%)

## Football Team

8pt	Not attempted <b>36/138 users</b> correct (26%)
19pt	Not attempted <b>16/36 users</b> correct (44%)

## Interesting Ranges

9pt	Not attempted <b>24/41 users</b> correct (59%)
23pt	Not attempted <b>1/3 users</b> correct (33%)

## Top Scores

bmerry	77
qizichao	77
winger	68
Ahyangyi	68
misof	50
rem	50
kia	50
mystic	50
marek.cygan	50
dzhulgakov	50

## Problem B. Alphabetomials

This contest is open for practice. You can try every problem as many times as you like, though we won't keep track of which problems you solve. Read the [Quick-Start Guide](#) to get started.

Small input  
4 points

Solve B-small

Large input  
20 points

Solve B-large

## Problem

As we all know, there is a big difference between polynomials of degree 4 and those of degree 5. The question of the non-existence of a closed formula for the roots of general degree 5 polynomials produced the famous Galois theory, which, as far as the author sees, bears no relation to our problem here.

We consider only the multi-variable polynomials of degree up to 4, over 26 variables, represented by the set of 26 lowercase English letters. Here is one such polynomial:

```
aber+aab+c
```

Given a string  $s$ , we evaluate the polynomial on it. The evaluation gives  $p(S)$  as follows: Each variable is substituted with the number of appearances of that letter in  $S$ .

For example, take the polynomial above, and let  $S = \text{"abracadabra edgar"}$ . There are six a's, two b's, one c, one e, and three r's. So

```
p(S) = 6 * 2 * 1 * 3 + 6 * 6 * 2 + 1 = 109.
```

Given a dictionary of distinct words that consist of only lower case letters, we call a string  $S$  a  $d$ -phrase if

```
S = "S1 S2 S3 ... Sd",
```

where  $S_i$  is any word in the dictionary, for  $1 \leq i \leq d$ . i.e.,  $S$  is in the form of  $d$  dictionary words separated with spaces. Given a number  $K \leq 10$ , your task is, for each  $1 \leq d \leq K$ , to compute the sum of  $p(S)$  over all the  $d$ -phrases. Since the answers might be big, you are asked to compute the remainder when the answer is divided by 10009.

## Input

The first line contains the number of cases  $T$ .  $T$  test cases follow. The format of each test case is:

A line containing an expression  $p$  for the multi-variable polynomial, as described below in this section, then a space, then follows an integer  $K$ .

A line with an integer  $n$ , the number of words in the dictionary.

Then  $n$  lines, each with a word, consists of only lower case letters. No word will be repeated in the same test case.

We always write a polynomial in the form of a sum of terms; each term is a product of variables. We write  $a^t$  simply as  $t$  a's concatenated together. For example,  $a^2b$  is written as  $aab$ . Variables in each term are always lexicographically non-decreasing.

## Output

For each test case, output a single line in the form

```
Case #X: sum1 sum2 ... sumK
```

where  $X$  is the case number starting from 1, and  $\text{sum}_i$  is the sum of  $p(S)$ , where  $S$  ranges over all  $i$ -phrases, modulo 10009.

## Limits

$1 \leq T \leq 100$ .

The string  $p$  consists of one or more terms joined by '+'. It will not start nor end with a '+'. There will be at most 5 terms for each  $p$ . Each term consists at least 1 and at most 4 lower case letters, sorted in non-decreasing order. No two terms in the same polynomial will be the same.

Each word is non-empty, consists only of lower case English letters, and will not be longer than 50 characters. No word will be repeated in the same

dictionary.

Small dataset

$1 \leq n \leq 20$

$1 \leq K \leq 5$

Large dataset

$1 \leq n \leq 100$

$1 \leq K \leq 10$

Sample

Input	Output
2	Case #1: 15 1032 7522 6864 253
ehw+hww 5	Case #2: 12 96 576
6	
where	
when	
what	
whether	
who	
whose	
a+e+i+o+u 3	
4	
apple	
orange	
watermelon	
banana	

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