
I Before E

English spelling has a lot of rules and a lot of exceptions. For instance “I before E except after C or ...”. Martians find these very quaint and have made up a game involving variations on the rules. The game is to identify from a set of rules, which of a list of words are correctly spelled according to the rules. More advanced players are asked to figure out how many possible words there are of a given length.

In a particularly simple version of the game the alphabet used consists of the three characters `i`, `c`, and `e`, and there is only one rule – “`i` before `e` except after `c`”. In this version of the game, all of the words `ice`, `iiiiiiiiiii`, `iiiiieeeeecei` are valid, but the words `eic`, `ieceiei`, and `apple` are not. The number of valid words of length three is 22 – of the 27 unrestricted words of length three using only the allowed characters there are three invalid ones beginning `ei`, and two ending `ei`. Note that scientists have observed that just because `ei` is permitted after `c` (while otherwise forbidden) this does not imply that `ie` is forbidden after `c`.

More complex versions of the game also exist – and the whole family of them are referred to as “the ice game”. Since eight day old Martians seem to play the game pretty well, you should be able to write a program that does so too.

Task

Write a program `PlayIce` which takes as input from `stdin` a specification of a particular version of the ice game. The format of this specification is as follows:

- A single line containing the alphabet (always a subset of the lower case letters `a` through `z`).
- Zero or more lines consisting of forbidden substrings, followed by lists of zero or more exceptions. An exception is always a prefix after which the forbidden substring may occur. The forbidden substrings and the prefixes are never more than three characters long.
- A blank line.
- Zero or more lines consisting of instances of the game. An instance is either a string of letters (from `a` through `z`) or a positive integer.

The program should output to `stdout` the result of each instance of the game, one result per line. For strings of letters the output should be either the word `Valid` or the word `Invalid`. For positive integers the output should be the number of strings of that length which are valid. This value is guaranteed to not be larger than the maximum value that can be stored in a 64-bit `long`, i.e., 9,223,372,036,854,775,807.

Sample Data

The output below is aligned to the input only for illustrative purposes – there should be no blank lines at the beginning of the output.

Input	Output
ice	
ei c ee	
iii	
ice	Valid
iiiiiii	Invalid
acei	Invalid
cie	Valid
ciei	Invalid
eic	Invalid
apple	Invalid
eei	Invalid
eeei	Valid
3	21

Objectives

1.1-1.4, 2.2, 2.7, 2.9, 2.10, 3.3-3.6, 4.1-4.4.

(Group)