

CCO '12 P3 - Mhockskian Languages

Time limit: 1.0s **Memory limit:** 1G

Canadian Computing Competition: 2012 Stage 2, Day 1, Problem 3

Linguists are currently studying Mhockskian, the language of the native inhabitants of Mhocksky island. The linguists have found a description of how the natives construct words in Mhockskian, and a list of words. The linguists would now like to know which of the words in the list are **valid** Mhockskian words.

Rules

Words in Mhockskian are constructed according to a set of **rules**. These rules involve two types of components: **variables** and **terminals**. A variable is an uppercase letter used in the description of the rules. A terminal is a lowercase letter that is part of a Mhockskian word. Variables and terminals are just **uppercase** and **lowercase** letters, respectively, of the English alphabet.

There are two types of rules. The first type of rule allows you to replace a variable V by two variables V_1V_2 in that order, and we write $V \rightarrow V_1V_2$ as a short form for this type of rule. The second type of rule allows you to replace a variable V by a terminal t , and we write $V \rightarrow t$ as a short form for this type of rule.

One of the variables is the start variable. A word w is composed of lowercase letters from the English alphabet. It is a **valid** Mhockskian word if, starting from the start variable, it is possible to follow a sequence of rules to obtain w .

Example

Suppose we have variables $\{S, A, B\}$, terminals $\{a, b\}$, and rules

$$\{S \rightarrow AB, S \rightarrow a, A \rightarrow a, B \rightarrow b\}.$$

The word "ab" is a valid Mhockskian word because it can be constructed in the following way: $S \rightarrow AB \rightarrow aB \rightarrow ab$. The word "a" can be constructed simply by $S \rightarrow a$. The word "b" cannot be constructed.

Input

On the first line, two integers V and T in that order, denoting the number of variables and terminals, respectively, in Mhockskian.

On the second line, V space separated uppercase letters, the variables. The **first** variable on the line is always the start variable.

On the third line, T space separated lowercase letters, the terminals.

On the fourth line, there is an integer R_1 . R_1 lines follow, each of which is of the form $V t$, representing a rule $V \rightarrow t$.

On the next line, there is an integer R_2 . R_2 lines follow, each of the form $V V_1 V_2$, representing the rule $V \rightarrow V_1V_2$.

On the next line, there is an integer W . W lines follow, each contains a single word made entirely of lowercase letters.

Output

The output must contain W lines. On line i , output a 1 if the i^{th} word is a valid Mhocsian word, and 0 otherwise.

Constraints

$$1 \leq V, T \leq 26$$

$$1 \leq R_1 + R_2 \leq 30$$

$$1 \leq W \leq 20$$

Each of the words in the linguists' list will have length between 1 and 30.

Sample Input

```
5 2
I S A B C
a b
2
A a
B b
7
I A B
I A C
C S B
S A B
S A C
I S S
S S S
4
abababaaabbbbaabbaabb
abab
bbaa
aaabababbbaabbbb
```

Sample Output

```
1
1
0
1
```