Problem A. Domains

Description

Vivy finds that some domains can be visited faster using different VPNs (Virtual Private Network). So she decides to set up a system to automatically transfer requests to different VPNs.

First of all, she has to set up configurations.

There are multiple rules in the configurations. The format of a rule is: [domain pattern] [VPN name]. If a domain matches the [domain pattern] of a rule, we say that the domain matches the rule, and all visits to this domain should be transferred to [VPN name].

To make the configurations short, Vivy decided to use two kinds of wildcards which are "*" and "#". Both "*" and "#" matches any strings consisting of lowercase alphabets, digits, dots and hyphens (‘-‘). But a domain matches the rules with "#" wildcard only if it doesn't match any other rules.

A domain pattern is legal, if and only if it satisfies all the following conditions:

1. The domain pattern consists of wildcards, lowercase alphabets, digits, dots and hyphens.

2. The domain pattern does not start with a dot, and does not end with a dot.

3. Any two dots in the domain pattern are not adjacent.

4. If there is a wildcard, the wildcard must be at the beginning of the domain pattern. And the wildcard must precede a “.”, or no character follows it.

5. A hyphen in the domain pattern must be between two lowercase alphabets.

A VPN name is legal, if and only if it satisfies all the following conditions:

1. The VPN name consists of lowercase alphabets, digits and hyphens.

2. The VPN name starts with lowercase alphabets.

3. A hyphen in the VPN name must be between two lowercase alphabets.

Two rules are considered conflict, if it satisfies any one of the following conditions:

1. There exist a domain without wildcards which can match both of them at the same time. For example, if the domain pattern of rule A is "*.cn" and the domain pattern of rule B is "a.cn", then rule A and rule B are conflict because domain “a.cn” can match both of them.

2. One of them can never be matched because of the other one. For example, "#.pku.cn" can never be matched if the other one is "*.cn".

A rule is considered invalid, if it satisfies any one of the following conditions:

1. The has an illegal domain pattern.

2. The rule has an illegal VPN name.

3. The rule is conflict with a valid rule that appears before it.

Now she wants to write a program to parse the configurations and determine how many rules are invalid.

And she wants to know more things. A valid domain pattern without wildcard "#" can represent a set of domains. She wants to know, given a set of domains, how many valid rules matches the set, ie. how many rules satisfy that there exists a domain without wildcards in the

set which matches the rule.

Input

The input consists of multiple test cases, up to 10.

For each test case:

The first line contains an integer N, indicating the number of rules. (1 <= N <= 50000)

Then N lines followed, each line contains two strings separated by a space, indicating domain pattern and VPN name of a rule.

The total length of the strings in rules will not exceed 1100000.

The next line contains an integer M, indicating the number of queries. (1 <= M <= 50000)

Then M lines followed. Each line contains a domain pattern representing a set of domains. For each query, you should answer how many valid rules matches the given set. It is guaranteed that the given domain pattern is legal, and does not contain wildcard "#".

The total length of the strings in queries will not exceed 1100000.

Output

For each test case:

The first line contains an integer, indicating the number of invalid rules.

Then M lines followed, each line is an integer, indicating the number of matched valid rules for the corresponding query.

Sample Input

```
11
a.c a.c
poj.org vpn-china
www.pku.edu.cn vpn-pku1
mail.pku.edu.cn vpn-pku1
*.test.pku.edu.cn vpn-pku2
*.test.pku.edu.cn vpn-pku2
*.a.test.pku.edu.cn vpn-pku2
*.test2.pku.edu.cn vpn-pku2
*.pku.edu.cn vpn-pku2
#.pku.edu.cn vpn-pku0
#.www.pku.edu.cn vpn-pku0
5
a.c
mail.pku.edu.cn
*.test.pku.edu.cn
*.pku.edu.cn
*
```

Sample Output

```
5
0
1
1
5
6
```

Explaination

There are five invalid rules in total:

1. "a.c a.c" is invalid because "a.c" is not a legal VPN name.
2. The second "*.test.pku.edu.cn vpn-pku" is invalid because it is conflict with "*.test.pku.edu.cn".
3. "*.a.test.pku.edu.cn vpn-pku" is invalid because it is conflict with "*.test.pku.edu.cn".
4. "*.pku.edu.cn vpn-pku" is invalid because it is conflict with many valid rules.
5. "#.www.pku.edu.cn vpn-pku0" is invalid because it is conflict with "#.pku.edu.cn".

For the queries:

1. "a.c" matches no rule.
2. "mail.pku.edu.cn" does not match "#.pku.edu.cn" because it matches "mail.pku.edu.cn".
3. "*.test.pku.edu.cn" only matches "*.test.pku.edu.cn".
4. "*.pku.edu.cn" may matches all valid rules except "poj.org". More specifically, "*.pku.edu.cn" contains "www.pku.edu.cn", "mail.pku.edu.cn", "a.test.pku.edu.cn", "a.test2.pku.edu.cn" and "a.pku.edu.cn". And they matches "www.pku.edu.cn", "mail.pku.edu.cn", "*.test.pku.edu.cn", "*.test2.pku.edu.cn" and "#.pku.edu.cn" correspondingly.
5. "*" may matches all valid rules.