


Problem E

Is-A? Has-A? Who Knowz-A?

Problem ID: isahasa
CPU Time limit: 3 secor
Memory limit: 1024 ME

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Two familiar concepts in object oriented programming are the is-a and has-a relationships. Given two classes A and B, we say that A is-a B if A is a subclass of B; we say A has-a B if one of the fields of A is of type B. For example, we could imagine an object-oriented language (call it ICPC++) with code like that in Figure 1, where the class Day is-a Time, the class Appointment is both a DateBook and a Reminder, and class Appointment has-a Day.

```
class Day extends Time    class Appointment extends Datebook, Reminder
{
    ...
}
{
    private Day date;
    ...
}
```

Figure 1: Two ICPC++ classes.

These two relationships are transitive. For example if A is-a B and B is-a C then it follows that A is-a C. This holds as well if we change all the is-a's in the last sentence to has-a's. It also works with combinations of is-a's and has-a's: in the example above, Appointment has-a Time, since it has-a Day and Day is-a Time. Similarly, if class DateBook has-a Year then Appointment has-a Year, since Appointment is-a DateBook.

In this problem you will be given a set of is-a and has-a relationships and a set of queries of the form A is/has-a B. You must determine if each query is true or false.

Input:

Input starts with two integers n and m , ($1 \leq n, m \leq 10\,000$), where n specifies the number of given is-a and has-a relationships and m specifies the number of queries. The next n lines each contain one given relationship in the form $c_1 \ r \ c_2$ where c_1 and c_2 are single-word class names, and r is either the string “is-a” or “has-a”. Following this are m queries, one per line, using the same format. There will be at most 500 distinct class names in the $n + m$ lines, and all class names in the last m lines will appear at least once in the initial n lines. All is-a and has-a relationships between the given classes can be deduced from the n given relationships. Is-a relationships can not be circular (apart from the trivial identity “ x is-a x ”).

Output

For each query, display the query number (starting at one) and whether the query is true or false.

Sample Input 1

```
5 5
Day is-a Time
Appointment is-a Datebook
Appointment is-a Reminder
Appointment has-a Day
Datebook has-a Year
Day is-a Time
Time is-a Day
Appointment has-a Time
Appointment has-a Year
Day is-a Day
```

Sample Output 1

```
Query 1: true
Query 2: false
Query 3: true
Query 4: true
Query 5: true
```