Problem I. Ivan Smirnov

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	512 mebibytes

https://stackoverflow.com/questions/45658828/number-of-ways-to-merge-2-parenthesis-sequences. Now you can solve a strictly harder problem in about 10^{18} years. This almost fits in the time limit. All you have to do is some minor optimizations.

Two sequences of parentheses s and t **mergeable** if they can be interleaved to form a balanced parentheses sequence. Formally, if s has length n and t has length m they are mergeable if and only if there exists a balanced parentheses sequence p of length $n+m$, and two disjoint sequences of indices a and b of length n and m respectively, such that:

1. $0 \le a_1 < a_2 < \ldots < a_n < n + m$
2. $0 \le b_1 < b_2 < \ldots < b_m < n + m$
3. For all i $p_{a_i} = s_i$
4. For all i $p_{b_i} = t_i$

The **RLE** (Run Length Encoding) of some string is a list of pairs (c_i, a_i) where c_i is a character and a_i is a positive integer and $\forall_i\ c_i \neq c_{i+1}$, the length of the encoding (i.e. number of pairs in the list) is called the **run length** of the string. The original string of RLE $[(c_1, a_1), (c_2, a_2), \ldots, (c_n, a_n)]$ consists of a_1 repetitions of character c_1, followed by a_2 repetitions of character c_2, and so on, and ends with a_n repetitions of character c_n. It can be shown that RLE is unique.

You are given an RLE of a parentheses sequence s and RLEs of m other parentheses sequences candidates t_i.

For each i find out if t_i and s are mergeable.

Input

The input starts with a description of the sequence s. The first line contains a single integer n ($1 \le n \le 3 \cdot 10^5$), the run length of s.

n lines follow. i-th of them describes a single pair in the RLE of s and contains a character c_i and an integer a_i separated by a single space ($c_i \in \{(,)\}, c_i \neq c_{i+1}, 1 \le a_i \le 10^{12}$).

The next line contains a single integer m ($1 \le n \le 3 \cdot 10^5$), the number of sequences t to check.

The remaining lines describe those sequences one by one, using the same format as the description of s. If this isn't clear you should take a look at the samples.

It is guaranteed that the sum of run lengths of those m sequences doesn't exceed $3 \cdot 10^5$.

Output

Print m lines.

The i-th of those lines should contain `1` if t_i and s are mergeable and `0` if they are not.

Examples

standard input	standard output
4 (1) 3 (3) 1 1 2 (1) 1	0
2 (2) 1 4 1 (1 1) 1 2) 2 (1 2) 4 (3	0 1 1 0
4) 2 (3) 5 (100 3 1) 96 2 (132) 228 4 (2) 3 (5) 100	0 1 1
1) 1000000000000 2 1) 1000000000000 1 (1000000000000	0 1