CCC '19 J5 - Rule of Three

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

Canadian Computing Competition: 2019 Stage 1, Junior #5

A substitution rule describes how to take a sequence of symbols and convert it into a different sequence of symbols. For example, $ABA \to BBB$, is a substitution rule which means that ABA can be replaced with BBB. Using this rule, the sequence $A\mathbf{ABA}A$ would be transformed into the sequence $ABBBA$ (the substituted symbols are in **bold**).

In this task, you will be given three substitution rules, a starting sequence of symbols and a final sequence of symbols. You are to use the substitution rules to convert the starting sequence into the final sequence, using a specified number of substitutions.

For example, if the three substitution rules were:

1. $AA \to AB$
2. $AB \to BB$
3. $B \to AA$

we could convert the sequence AB into $AAAB$ in 4 steps, by the following substitutions:

$$\mathbf{AB} \to \mathbf{B}B \to AA\mathbf{B} \to AA\mathbf{AA} \to AAAB,$$

where the symbols to be replaced are shown in **bold**. More specifically, from the initial sequence AB, substitute rule 2 starting at position 1, to get the result BB. From BB, substitute rule 3, starting at position 1, to get the result AAB. From AAB, substitute rule 3, starting at position 3, to get the result $AAAA$. From $AAAA$, substitute rule 1, starting at position 3, to get the result $AAAB$, which is the final sequence.

Input Specification

The first three lines will contain the substitution rules. Each substitution rule will be a sequence of `A`'s and `B`'s, followed by a space, followed by another sequence of `A`'s and `B`'s. Both sequences will have between one and five symbols.

The next line will contain three space separated values, S, I and F. The value S $(1 \leq S \leq 15)$ is an integer specifying the number of steps that must be used, and the values I (the initial sequence) and F (the final sequence) are sequences of `A`'s and `B`'s, where there are at least one and at most 5 symbols in I and at least one and at most 50 symbols in F.

For 7 of the 15 marks available, $S \leq 6$.

For an additional 7 of the 15 available marks, $S \leq 12$.

Due to the official test data being weak, an additional subtask worth 15 marks has been added that consists of tests constructed to break solutions that are incorrect but AC on the official test data. Data are provided by d.

Output Specification

The output will be S lines long and describes the substitutions in order.

Line i of the output will contain three space-separated values, R_i, P_i, and W_i:

- R_i is the substitution rule number (either 1, 2 or 3) that will be used.
- P_i is the starting position index of where the substitution rule will be applied in the sequence. Notice that the string is 1-indexed (i.e., the first character of the string is at index 1).
- W_i is the sequence that results from this substitution. Specifically, W_i is the sequence of symbols that results by applying substitution rule R_i starting at position P_i from the previous sequence of symbols, W_{i-1}, where we define W_0 to be the initial sequence I. Note that $W_S = F$, the final sequence.

There will always be at least one sequence of S substitutions that will convert I into F. If there is more than one possible sequence of substitutions, any valid sequence will be accepted.

Sample Input

```
AA AB
AB BB
B AA
4 AB AAAB
```

Possible Output for Sample Input

```
2 1 BB
3 1 AAB
3 3 AAAA
1 3 AAAB
```

Explanation of Output for Sample Input

This is the example outlined in the problem description. Note that the following is another possible valid substitution sequence:

```
2 1 BB
3 2 BAA
1 2 BAB
3 1 AAAB
```

Specifically, showing the substitutions in **bold**, we get

$$\mathbf{AB} \to B\mathbf{BB} \to B\mathbf{AA} \to \mathbf{B}AB \to AAAB.$$