Problem 4: Enigma

Overview
In the 2014 movie, The Imitation Game, Alan Turing and others “crack” the German Enigma machine, leading to Allied success (albeit at a price) in World War II. Prior to their success, the Axis powers were quite successful at hiding their plans even as their radio broadcasts could be received as easily by the British as by their own troops. Part of the success of the Enigma machine was that it was easy to configure and then to use although it was incredibly difficult to decode a message unless one knew the configuration that had been used to send that message.

Problem
An Enigma machine used interchangeable rotors to create different coding patterns. A configuration consisted of a selection of rotors that could then be used to encode a single letter. So as not to reveal the coding via repeated letters, after encoding each letter, the rotors would “rotate” a bit, effectively creating a new code for each subsequent letter.

An image of a simple, two-rotor Enigma machine is shown at the left.

To encrypt a character using such a machine, one finds the character on the innermost rotor (say ‘A’). One then considers the corresponding character on the backplate, i.e. the outer circle (so, in this case ‘H’). One then finds that character on the second (middle) rotor and outputs the character corresponding to it from the backplate (so we output ‘N’). The inner rotor then rotates one step clockwise. As with an odometer, when the inner rotor returns to its original position, the middle rotor moves one step clockwise. In this case, a second encryption of an ‘A’ would result in a ‘D’.

Your problem is to encrypt a message, given the rotors (and backplate) configuration.

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1 Thanks to David Reed of Creighton University for this image.
Input

The input to this problem consists of four lines of text. Each of the first three lines consists of 27 characters representing the inner rotor, the middle rotor, and the backplate, respectively. Each of these lines will be a permutation of the 26 uppercase letters and the ‘#’ symbol. (Though not relevant to your code, the latter symbol is often used as a space character.) The fourth line contains the characters to be encrypted and will also consist solely of the 27 characters that the machine has on its rotors. The fourth line will have fewer than 10,000 characters.

Output

The output consists of a single line of text containing the encoded message.

Example

Input

#GNUAHOVBIPWCJQXDKRYEJSZFMT
#EJOTYCHMRWAFKPUZDINSXBGDLQV
#BDFHJLNPRTVXZACEGIKMOQSUWY
AAA#ALAN#TURING#RULES

Output

NDUXAJHRAAEGFLLLKPOOL