Problem 9 – Secret Messages

Professor Plum's wife enjoys reading "spy" novels. She likes to send him encoded messages. He hates it, but at least her encryption scheme is fairly simple. She uses a form of substitution cipher based on an integer key and the follow sequence of 78 characters: (Note: blank-space character between the "K" and "l")

```
aA0bB1cC2dD3eE4fF5gG6hH7iI8jJ9kK lL,mM.nN?oO/pP;qQ:rR'sS"tT!uU@vV$wW%xX&yY-zZ=
```

The integer key is used to encrypt **only the first letter** in the message by "shifting" down the above sequence by that amount. For example, shifting 5 from 'B' encrypts as 'd'. Shifting past the right end of the sequence wraps back to the beginning of the sequence. For example, shifting 5 from 'Z' encrypts as 'b'.

The sequence position of the first letter in the message is used as the shift amount for the second letter in the message. If the first letter was a 'B,' then 4 is used to shift the second letter in the message since 'B' is at position 4 (start with 'a' at position 0, 'A' at position 1, etc.). The sequence position of the second letter in the message is used as the shift amount for the third letter, etc. Any message character not in the above sequence (e.g., '<', '{') is copied to the encrypted message without modification with the previous shift amount carrying over to the next letter in the message that's in the above sequence. Consider the following example with key 5:

Four Line Message to Encrypt with Key = 5	Encrypted Message

`Be by the Union at 6 PM!`
 	
`<We'll plan MICS 2018...>`
`- Sam`
	`dF/,z83al/fHvwb& t3RRa1g`
	
	`<qA$2w$=aln&x@ @dNDCKVZZ>`
	`LJdSm`

Input

The first line contains the integer key used to encrypt the original message. The second line contains the sequence of 78 characters. The third line contains the number of lines in the message. The following lines contain an encrypted message.

```
5
aA0bB1cC2dD3eE4fF5gG6hH7iI8jJ9kK lL,mM.nN?oO/pP;qQ:rR'sS"tT!uU@vV$wW%xX&yY-zZ=
4
dF/,z83al/fHvwb& t3RRa1g

<qA$2w$=aln&x@ @dNDCKVZZ>
LJdSm
```

Output

The output will be the decrypted message. For the example input given above, the output is:

```
Be by the Union at 6 PM!

<We'll plan MICS 2018...>
- Sam
```