Problem E. Free Roman Numerals

Input file:	*standard input*
Output file:	*standard output*
Time limit:	2 seconds
Memory limit:	256 mebibytes

Little Masha can count already, and now studies Roman numerals. As used today, Roman numerals are usually denoted by strings of capital letters which have the following values: "I" is 1, "V" is 5, "X" is 10, "L" is 50, "C" is 100, "D" is 500, "M" is 1000.

We read a Roman numeral from left to right. In simple cases, the letters follow from greater to lesser values, and the number is equal to the sum of the values of all its letters. Furthermore, sometimes a lesser value stands before a greater one, and then the lesser value is not added to the result but subtracted from it: for example, the value of "IV" is 4, and the value of "IX" is 9. Unfortunately, the rules also set various limits: for example, the number 4 is denoted by "IV" but not by "IIII". And the number 999 is denoted by "CMXCIX" but not by "IM"...

Masha did not like the restrictions of the common Roman numerals, so she invented her own notation: *free Roman numerals*. These numbers are also denoted by strings of the same letters having the same values, and are processed as follows. Consider the letters from left to right. Each letter adds its value to the result. Furthermore, if a letter c has a letter with lesser value immediately before it, do the following. Find the closest letter b to the left such that its value is no less than the value of c. After that, consider the string S between b and c; if there was no such letter b, the string S starts from the beginning of the whole string. Find the value of S as an individual number in free Roman notation. Note that, at the moment, the value of S is added to the result, and subtract it instead (so that, in fact, the current result is decreased by double the value of S).

Free Roman numerals, as their common counterparts, are used for positive numbers only. Because of this, a string is a valid free Roman numeral only if the value of string S in the algorithm above is, in all cases, strictly less than the value of letter c.

As an example, consider the free Roman numeral "XIIXL". The first three letters, "XII", just add 10, 1, and 1 to the result. The next letter "X" also adds 10, but then replaces the addition of "II" (which is 2) with subtraction, so the result is now $10 + 10 - 2 = 18$. Finally, the letter "L" adds 50 to the result, and then replaces the addition of "XIIX" (which is 18) with subtraction, so the final result is $50 - 18 = 32$.

Masha is proud of her invention: she devised a system with less restrictions than the common Roman numerals, but still, every common Roman numeral can be correctly read by Masha's rules. She began to translate numbers from decimal notation to free Roman notation and back, and then wondered: how to find the shortest possible free Roman notation for a given number? Masha put the pen on the table, thinking.

Solve a generalized version of Masha's problem. Translate the given numbers in free Roman notation into decimal notation, and the given numbers in decimal notation into their **shortest** free Roman notation.

Input

The input contains from 1 to 10 000 lines. Each line denotes one integer from 1 to 3000 inclusive. Each number is given either in decimal notation with no leading zeroes, or in free Roman notation: in such case, the notation is valid and contains from 1 to 20 letters, but is **not necessarily** the shortest possible.

Output

For each line of input, print a single line with the same number but in the other notation. Specifically, if the number is given in free Roman notation, print it in decimal notation with no leading zeroes. If the number is given in decimal notation, print its **shortest** free Roman notation. In case there are several possible shortest notations, print any one of them.

Example

standard input	standard output
IIII 4 CMXCIX 999 XIIXL 32	4 IV 999 IM 32 IIXXL