CSULB
CECS 174

Project 5

**Assignment Objectives:** You will practice the usage of:
1. strings
2. selection statement
3. loops (for, while)

**Background**

In 1937 Claude Shannon of Petoskey, MI wrote the seminal
work for computing that showed how Boolean logic could be
expressed in electronic circuits leading to computers as we
know them.  For fun he created Throbac (THrifty ROman-
numerical BAckward-looking Computer), a calculator that did
arithmetic with Roman numerals (in the picture —a useless,
but whimsical device.
In this project, you will write a program that performs
addition with Roman numerals, just like Throbac.



**Project Specification**

Roman numerals have values, but are not positional like our number system, and there is no
zero (zero arrived in the west circa 1000 AD).
To keep things simpler, we will use five of the seven symbols:
I = 1, V = 5, X = 10, L = 50, and C = 100.
See http://en.wikipedia.org/wiki/Roman_numerals Numbers are formed by combining symbols
together and adding their values—only whole numbers.
For example, CLXVII is 100+50+10+5+1+1 = 167.
Generally, symbols are placed in **order of value**, starting with the largest values. When smaller
values precede larger values, the smaller values are subtracted from the larger values, and the
result is added to the total.
For example, in XLIV the smaller X before L means subtract X from L as 50-10 to get 40, and the
I before V means subtract I from V as 5-1 to get 4, so the final number is 44.  Some call that the
"subtraction rule."  A useful restriction of the subtraction rule is that there can never be more
than one smaller value.  That is, XL is valid, but XXL is not: thirty is represented by XXX.

The table below shows the base values up to three hundred—to keep things simpler we will
assume that our values will stay less than 380 (but we will not check).

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Ones | I | II | III | IV | V | VI | VII | VIII | IX |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Tens | X | XX | XXX | XL | L | LX | LXX | LXXX | XC |
| Hundreds | C | CC | CCC | | | | | | |

Your program will output a menu to ask the user to select a letter to perform a specific action:

A- Add two Roman Numerals.
S- Subtract two Roman Numerals
M- Multiply two Roman Numerals
D- Divide two Roman Numerals
Q- Quit

Select A, S, M, D or Q only.

The user's entry could be lower or upper case. You need to use the lower or upper string method to validate your entry without the checking for both cases.

You need to have at least the following functions:
1. **getRomanN()**: Prompt the user for a Roman Numerals, and returns the valid number only. (Keep asking for a valid value).
2. **isValidRoman(roman)**: takes a Roman Numerals and return True if it is valid, False otherwise.
3. **romanToArabic(roman)**: takes a Roman Numerals, and returns the number in Arabic symbols
4. **arabicToRoman(arabic)**: takes the number in Arabic symbols and returns its equivalent Roman Numerals.
5. **add(roman1, roman2)**: Takes two Roman Numerals and returns the result of their summation in Roman Numerals
6. **sub(roman1, roman2)**: Takes two Roman Numerals and returns the result of their difference in Roman Numerals
7. **mul(roman1, roman2)**: Takes two Roman Numerals and returns the result of their product in Roman Numerals
8. **div (roman1, roman2)**: Takes two Roman Numerals and returns the result of their integer division, and the remainder in Roman Numerals.
9. **menu():** Outputs the menu only.
10. **main():** The main code that calls other functions.

You should output a menu asking the user of your code to select from and after every entry, you either go to a sub menu to get the values or you show the menu again to select another option.
You need to validate your entry.
Your code should repeat until the user chooses to exit.
The user entry for the menu letter and for the Roman Numerals can be upper of lower case
The Roman Numerals should be output in upper case only.

After every operation you should output the complete operation and the result in Roman Numerals and Arabic symbols.

https://cacm.acm.org/blogs/blog-cacm/235492-calculating-with-roman-numerals-is-not-so-difficult/fulltext

**Notes and Hints:**
You should start with this program, as with all programs, by breaking the program down into parts.
Here is some of that breakdown to help you
1. **First, play with Roman numerals with pencil and paper** to get familiar with them and their rules, especially conversion to and from integers. Notice how the "subtraction rule" requires you to look at pairs of symbols. The restriction that only one smaller value can precede a larger value will be quite helpful in developing your algorithm.
2. Simplify! Inside of every problem is a simpler one.
   a. The most obvious simplification is to handle the four steps individually—I did steps 2 and 4 as separate programs while developing my solution.
3. There is another simplification. Solve the problem for Roman Numerals that don't use the subtraction rule, e.g. assume input is something like LXXII and not numbers like XLIV. After you get that working, introduce the subtraction rule.
4. You will be using a large number of *if-elif-else* statements.
5. Your final result should be in proper form, e.g. IV instead of IIII.

**Assignment Deliverables**

You are to upload 2 files:
1. Your complete documented (.py) Python file
2. A word document that has a **link to a video** explaining your code with multiple runs. You can

keep your video unlisted, but make sure it is public, a copy of your code and a screenshot of the

output of different run that has all cases including invalid Roman Numerals.
3. Be ready to demonstrate your code in the lab. -you will be informed by your lab instructor-

**Example Output** Red-input, Blue output

**Example Output:**

```
Welcome to the Roman Numerals Calculator
Please select from the following:

A- Add two Roman Numerals.
```

S- Subtract two Roman Numerals
M- Multiply two Roman Numerals
D- Divide two Roman Numerals
Q- Quit

Select A, S, M, D or Q only. H

Invalid entry. Please try again.

Please select from the following:

A- Add two Roman Numerals.
S- Subtract two Roman Numerals
M- Multiply two Roman Numerals
D- Divide two Roman Numerals
Q- Quit

Select A, S, M, D or Q only. a

Enter First Roman Number (no spaces): xliv
Value of XLIV :   44
Enter Second Roman Number (no spaces): CCLXV
Value of CCLXV :   265

XLIV + CCLXV = C C C I X
44 + 265 = 309

Please select from the following:

A- Add two Roman Numerals.
S- Subtract two Roman Numerals
M- Multiply two Roman Numerals
D- Divide two Roman Numerals
Q- Quit

Select A, S, M, D or Q only. Q

Good Bye.