(Modern) Roman Numerals
MAT 142 – RSCC – Scott Surgent

Roman Numerals date from the Roman Empire, and are still used today in certain settings. The symbols are:

I = 1
V = 5
X = 10
L = 50
C = 100
D = 500
M = 1000

The Roman Numerals I, X, C and M may be repeated at most three times consecutively:

II = 2
III = 3
XX = 20
XXX = 30
CC = 200
CCC = 300
MM = 2000
MMM = 3000

The symbols V, L and D are not repeated in this manner.

There are special concatenations of the Roman Numeral symbols:

IV = 4 (one before five)
IX = 9 (one before ten)
XL = 40 (ten before fifty)
XC = 90 (ten before one hundred)
CD = 400 (one hundred before five hundred)
CM = 900 (one hundred before one thousand)

Roman Numerals always are written in descending order of value, from left to right, except in the six special cases IV, IX, XL, XC, CD and CM. Thus, the "number" MIMCVIMC makes no sense as it does not follow the rule of descending orders of value. However, a number like MCMIX is acceptable, because CM and IX are accepted concatenations of the Roman Numbers. In this case, MCMIX is M, CM, IX, or 1000 + 900 + 9 = 1909.

All modern numbers represented in the Hindu-Arabic 0-9 can be represented in Roman Numerals by using the above 21 "syllables" as a translation guide.

If you wanted to write 492 using Roman Numerals, you use the syllable for 400 (CD), the syllable for 90 (XC) and the syllable for 2 (II), and piece them together: CDXCII.

Examples of Writing Modern Numbers in Roman Numerals

Modern Number	"Break it apart"	Roman Numeral "syllables"	Final Result
38	10 + 10 + 10 + 5 + 1 + 1 + 1	X, X, X, V, I, I, I	XXXVIII
46	40 + 5 + 1	XL, V, I	XLVI
79	50 + 10 + 10 + 9	L, X, X, IX	LXXIX
124	100 + 10 + 10 + 4	C, X, X, IV	CXXIV
587	500 + 50 + 10 + 10 + 10 + 5 + 1 + 1	C, L, X, X, X, V, I, I	CLXXXVII
1234	1000 + 100 + 100 + 10 + 10 + 10 + 4	M, C, C, X, X, X, IV	MCCXXXIV
1967	1000 + 900 + 50 + 10 + 5 + 1 + 1	M, CM, L, X, V, I, I	MCMLXVII
2018	1000 + 1000 + 10 + 5 + 1 + 1 + 1	M, M, X, V, I, I, I	MMXVIII

Examples of writing Roman Numerals into Modern Numbers

Reading left to right, break apart a Roman Numeral "sentence" into its constituent "syllables". For example:

MCDXLVIII

Looking at our list, the above sentence can be broken apart into individual syllables as

M, CD, XL, V, I, I, I

Thus, we have 1000 + 400 + 40 + 5 + 3, or 1448.

You might be thinking that we could split it as

MC, DX, LV, I, I, I.

The first is not a syllable in our vocabulary. Thus, this "split" is not valid.

Practice:

Roman Numeral	Its "syllables"	Modern Numbers	Final Result
XLVII	XL, V, I, I	40, 5, 1, 1	47
LXXXIV	L, X, X, X, IV	50, 10, 10, 10, 4	84
CLIX	C, L, IX	100, 50, 9	159
CDIII	CD, I, I, I	400, 1, 1, 1	403
MDCCCXLV	M, D, C, C, C, XL, V	1000, 500, 100, 100, 100, 40, 5	1845
MMMXXXIII	M, M, M, X, X, X, I, I, I	1000, 1000, 1000, 10, 10, 10, 1, 1, 1	3033

The following Roman Numeral is not "legal". Can you explain why?

MXMVV

Splitting this up, we get M, XM, V and V. There is no such syllable as "XM". Furthermore, X never precedes M. Lastly, we don't repeat V's. If we were to "force" this, we could say that we have M = 1000, XM = 990 (ten before one thousand) and 10 (two fives), or 1000 + 990 + 10 = 2000. However, the "legal" way to express 2000 in Roman Numerals is simply MM.

Arithmetic with Roman Numerals

There is no easy way to perform basic arithmetic using Roman Numerals. You might consider converting each number into modern numbers, performing the arithmetic, then converting back to Roman Numerals.

Example: Find DCCXXIV + CCCLXVIII.

Solution: Convert DCCXXIV as D, C, C, X, X, IV = 500 + 100 + 100 + 10 + 10 + 4, or 724. Then convert CCCLXVIII as C, C, C, LX, V, I, I, I, or 100 + 100 + 100 + 40 + 5 + 1 + 1 + 1, or 348. Summing 724 and 348, we get 1062. To convert this back into Roman Numerals, write it as 1000 + 50 + 10 + 1 + 1, or M, L, X, I, I, or MLXII.

Roman Numerals are fine if all we want to do is express a number, but if we want to perform any sort of basic arithmetic, they are difficult. Perhaps the lesson being learned here is that this type of numbering is very difficult to handle for any actual mathematical pursuit.

It is interesting to note that the Roman Numeral system has no symbol for 0, and no easy way to express fractions. They work well for telling us which Super Bowl is coming up, or what year a movie was made, but that's about it.