Tally marks and Roman numerals

Clocks, book chapters and old buildings show numbers like XII and MCMXC. How do you read them, how do you write them, and how are they different from our digits?

WORDS TO KNOW

Tally marks: one mark for each thing you count. Every fifth mark is drawn slanting across the four before it, making a **bundle of five**.

Roman numerals: numbers written with the seven symbols I, V, X, L, C, D and M.

Subtractive pair: a small symbol written just before a bigger one. The small one is taken away from the big one.

Standard form: the one way of writing each number that follows today's rules.

KEY IDEAS

1. Count a tally by fives, then by ones

Each bundle holds exactly five marks, so count the bundles by fives and then the single marks by ones. A tally with 7 bundles and 1 single mark shows 5, 10, 15, 20, 25, 30, 35, then 36.

bundles $\times$ 5 + single marks

2. Seven symbols, and you add them

Symbol	I	V	X	L	C	D	M
Value	1	5	10	50	100	500	1,000

A Roman numeral is written from largest to smallest, and you add the values (Key idea 3 shows the one exception). A symbol is worth the same wherever it sits.

I, X, C and M may repeat, at most three times in a row. V, L and D never repeat.

3. Six subtractive pairs

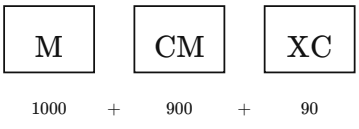
When a smaller symbol comes just before a bigger one, subtract it. Only these six pairs are allowed:

IV	IX	XL	XC	CD	CM
4	9	40	90	400	900

So XC is 100 − 10 = 90, but CX is 100 + 10 = 110.

4. Write a number one place at a time

Split the number into thousands, hundreds, tens and ones. Write each part with its own pattern, largest part first. A place holding 0 writes nothing, because Roman numerals have no zero and no place value.



Ones use I, V, X. Tens use X, L, C. Hundreds use C, D, M. Thousands use only M, so the standard form stops at 3,999.

WATCH OUT

- **Only the six pairs subtract.** Do not write 95 as VC. By places, 95 = 90 + 5, which is XC then V: XCV.
- **Never four in a row.** In standard form 400 is CD, not CCCC.

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WORKED EXAMPLES

Example 1. A book has chapter CCLXVIII. Which chapter is it?

1. The symbols go from largest to smallest, with no small symbol before a bigger one. So add them all.
2. CC is 200, LX is 60 and VIII is 8.

Answer: chapter 268. **Check:** 100 + 100 + 50 + 10 + 5 + 1 + 1 + 1 = 268.

Example 2. A cornerstone shows MCMXLVII. Which year is it?

1. Look for a small symbol just before a bigger one. C comes before M, and X comes before L.
2. Read in chunks: M is 1,000, CM is 1,000 − 100 = 900, XL is 50 − 10 = 40, and VII is 7.
3. Add the chunks: 1,000 + 900 + 40 + 7.

Answer: the year 1947.

Example 3. Write 2,749 in Roman numerals.

1. Split by places: 2,749 = 2,000 + 700 + 40 + 9.
2. 2,000 is MM. 700 = 500 + 200 is DCC.
3. 40 is ten less than fifty, the pair XL. 9 is one less than ten, the pair IX.
4. Put the parts side by side, largest first.

Answer: 2,749 is MMDCCXLIX. **Check:** 2,000 + 700 + 40 + 9 = 2,749.

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