Roman numerals

"Latin numerals" redirects here. For counting in Latin, see Latin § Numbers.

The numeric system represented by **Roman numerals** originated in ancient Rome and remained the usual way of writing numbers throughout Europe well into the late Middle Ages. Numbers in this system are represented by combinations of letters from the Latin alphabet. The numbers 1 to 10 are usually expressed in Roman numerals as follows:

I, II, III, IV, V, VI, VII, VIII, IX, X.

Entrance to section LII (52) of the Colosseum, with numerals still visible

The use of Roman numerals continued long after the decline of the Roman Empire. From the 14th century on, Roman numerals began to be replaced in most contexts by the more convenient Hindu-Arabic numerals; however, this process was gradual, and the use of Roman numerals persists in some minor applications to this day.

Roman numeric system

Roman numerals, as used today, are based on seven symbols:[1]

Numbers are formed by combining symbols and adding the values, so II is two (two ones) and XIII is thirteen (a ten and three ones). Because each numeral has a fixed value rather than representing multiples of ten, one hundred and so on, according to *position*, there is no need for "place keeping" zeros, as in numbers like 207 or 1066; those numbers are written as CCVII (two hundreds, a five and two ones) and MLXVI (a thousand, a fifty, a ten, a five and a one).

Symbols are placed from left to right in order of value, starting with the largest. However, in a few specific cases,[2] to avoid four characters being repeated in succession (such as IIII or XXXX), subtractive notation is often used as follows:[3][4]

- I placed before V or X indicates one less, so four is IV (one less than five) and nine is IX (one less than ten)

- X placed before L or C indicates ten less, so forty is XL (ten less than fifty) and ninety is XC (ten less than a hundred)
- C placed before D or M indicates a hundred less, so four hundred is CD (a hundred less than five hundred) and nine hundred is CM (a hundred less than a thousand)[5]

For example, MCMIV is one thousand nine hundred and four, 1904 (M is a thousand, CM is nine hundred and IV is four).

Some examples of the modern use of Roman numerals include:

- 1954 as MCMLIV, as in the trailer for the movie *The Last Time I Saw Paris*[6]
- 1990 as MCMXC, used as the title of musical project Enigma's debut album *MCMXC a.D.*, named after the year of its release.
- 2014 as MMXIV, the year of the games of the XXII (22nd) Olympic Winter Games (in Sochi)

Alternative forms

The "standard" forms described above reflect typical modern usage rather than a universally accepted convention. Usage in ancient Rome varied greatly and remained inconsistent in medieval and modern times.[7]

Roman inscriptions, especially in official contexts, seem to show a preference for additive forms such as IIII and VIIII instead of (or even as well as) subtractive forms such as IV and IX. Both methods appear in documents from the Roman era, even within the same document. "Double subtractives" also occur, such as XIIX or even IIXX instead of XVIII. Sometimes V and L are not used, with instances such as IIIIII and XXXXXX rather than VI or LX.[8][9]

Such variation and inconsistency continued through the medieval period and into modern times, even becoming conventional. Clock faces that use Roman numerals normally show IIII for four o'clock but IX for nine o'clock, a practice that goes back to very early clocks such as the Wells Cathedral clock.[10][11][12] However this is far from universal: for example, the clock on the Palace of Westminster in London (aka "Big Ben") uses IV.[11] Similarly, at the beginning of the 20th century, different representations of 900 (commonly CM) appeared in several inscribed dates. For instance, 1910 is shown on Admiralty Arch, London, as MDCCCCX rather than MCMX, while on the north entrance to

the Saint Louis Art Museum, 1903 is inscribed as MDCDIII rather than MCMIII.[13]

History

Pre-Roman times and ancient Rome

Although Roman numerals came to be written with letters of the Roman alphabet, they were originally independent symbols. The Etruscans, for example, used Ⅰ, Ⅴ, Ⅹ, ↟, 8, and ⊕ for I, V, X, L, C, and M, of which only I and X happened to be letters in their alphabet.

Hypotheses about the origin of Roman numerals

Tally marks

One hypothesis is that the Etrusco-Roman numerals actually derive from notches on tally sticks, which continued to be used by Italian and Dalmatian shepherds into the 19th century.[14]

Thus, ⟨I⟩ descends not from the letter ⟨I⟩ but from a notch scored across the stick. Every fifth notch was double cut i.e. ∧, ∨, ≻, ≺, *etc.*), and every tenth was cross cut (X), IIIIΛIIIIXIIIIΛIIIIXII...), much like European tally marks today. This produced a positional system: *Eight* on a counting stick was eight tallies, IIIIΛIII, or the eighth of a longer series of tallies; either way, it could be abbreviated ΛIII (or VIII), as the existence of a Λ implies four prior notches. By extension, *eighteen* was the eighth tally after the first ten, which could be abbreviated X, and so was XΛIII. Likewise, number *four* on the stick was the I-notch that could be felt just before the cut of the Λ (V), so it could be written as either IIII or IΛ (IV). Thus the system was neither additive nor subtractive in its conception, but *ordinal*. When the tallies were transferred to writing, the marks were easily identified with the existing Roman letters I, V and X.

The tenth V or X along the stick received an extra stroke. Thus 50 was written variously as N, И, K, Ψ, ↟, etc., but perhaps most often as a chicken-track shape like a superimposed V and I: Ѱ. This had flattened to ⊥ (an inverted T) by the time of Augustus, and soon thereafter became identified with the graphically similar letter L. Likewise, 100 was variously Ж, ⋉, ⋈, H, or as any of the symbols for 50 above plus an extra stroke. The form Ж (that is, a superimposed X and I like: Ӿ) came to predominate. It was written variously as >I< or ↃIC, was then abbreviated to Ↄ or C, with C variant finally winning out because, as a letter, it stood for *centum*, Latin for "hundred".

The hundredth V or X was marked with a box or circle. Thus 500 was like a Ↄ superimposed on a ↼ or ⊢, becoming Ɒ or Ð by the time of Augustus, under the graphic influence of the letter ⟨D⟩. It was later identified *as* the letter D; an alternative symbol for "thousand" was (I) (or CIↃ or CIↃ), and half of a thousand or "five hundred" is the right half of the symbol, I) (or IↃ or IↃ), and this may have been converted into ⟨D⟩.[15] This at least was the etymology given to it later on.

Meanwhile, 1000 was a circled or boxed X: Ⓧ, ⊗, ⊕, and by Augustinian times was partially identified with the Greek letter Φ *phi*. Over time, the symbol changed to Ψ and ⊕. The latter symbol further evolved into ∞, then ⋈, and eventually changed to M under the influence of the Latin word *mille* "thousand".

Hand signals

Alfred Hooper has an alternative hypothesis for the origin of the Roman numeral system, for small numbers.[16] Hooper contends that the digits are related to hand gestures for counting. For example, the numbers I, II, III, IIII correspond to the number of fingers held up for another to see. V, then represents that hand upright with fingers together and thumb apart. Numbers 6–10, are represented with two hands as follows (left hand, right hand) 6=(V,I), 7=(V,II), 8=(V,III), 9=(V,IIII), 10=(V,V) and X results from either crossing of the thumbs, or holding both hands up in a cross.

Intermediate symbols deriving from few original symbols

A third hypothesis about the origins states that the basic ciphers were I, X, C and Φ (or ⊕) and that the intermediary ones were derived from taking half of those (half a X is V, half a C is L and half a Φ/⊕ is D).[17]

Middle Ages and Renaissance

Minuscule (lower-case) letters were developed in the Middle Ages, well after the demise of the Western Roman Empire, and since that time lower-case versions of Roman numbers have also been commonly used: i, ii, iii, iv, and so on.

Since the Middle Ages, a "j" has sometimes been substituted for the final "i" of a "lower-case" Roman numeral, such as "iij" for 3 or "vij" for 7. This "j" can be considered a swash variant of "i" (see example [1]). The use of a final "j" is still used in medical prescriptions to prevent tampering with or misinterpretation of a number after it is written.[18][19]

Numerals in documents and inscriptions from the Middle Ages sometimes include additional symbols, which today are called "medieval Roman numerals". Some simply substitute another letter for the standard one (such as "A" for "V", or "Q" for "D"), while others serve as abbreviations for compound numerals ("O" for "XI", or "F" for "XL"). Although they are still listed today in some dictionaries, they are long out of use.[20]

Num.	Medieval abbr.	Notes and etymology
5	A	Resembles an upside-down V. Also said to equal 500.
6	ↄ	Either from a ligature of VI, or the Greek numeral 6: stigma (ϛ).[21]
7	S, Z	Presumed abbreviation of *septem*, Latin for 7.
11	O	Presumed abbreviation of *onze*, French for 11.
40	F	Presumed abbreviation of English *forty*.
70	S	Also could stand for 7, with the same derivation.
80	R	
90	N	Presumed abbreviation of *nonaginta*, Latin for 90. (N.B. N is also used for "nothing" (*nullus*)).
150	Y	Possibly derived from the lowercase y's shape.
151	K	Unusual, origin unknown; also said to stand for 250.[22]
160	T	Possibly derived from Greek *tetra*, as 4 × 40 = 160.
200	H	Could also stand for 2 (see also ↂ, the symbol for the dupondius). From a barring of two I's.
250	E	
300	B	
400	P, G	
500	Q	Redundant with D, abbreviates *quingenti*, Latin for 500.
2000	Z	

Chronograms, messages with numbers encoded into them, were popular during the Renaissance era. The chronogram would be a phrase containing the letters I, V, X, L, C, D, and M. By putting these letters together, the reader would obtain a number, usually indicating a particular year.

Modern use

By the 11th century, Hindu–Arabic numerals had been introduced into Europe from al-Andalus, by way of Arab traders and arithmetic treatises. Roman numerals however

proved very persistent, remaining in common use in the West well into the 14th and 15th centuries, even in accounting and other business records (where the actual calculations would have been by abacus). Their eventual, *almost* complete replacement by their more convenient "Arabic" equivalents happened quite gradually; in fact Roman numerals are still sometimes used today, especially in certain niche contexts. A few examples of their current use are:

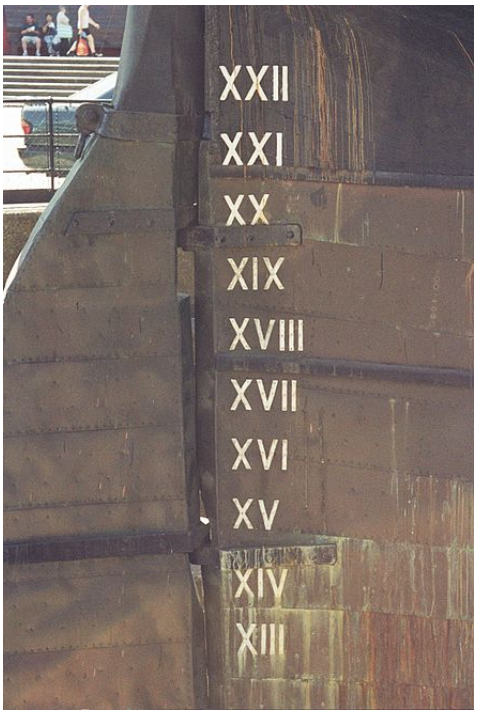
Spanish Real using "IIII" instead of IV

- Names of monarchs and popes, e.g. Elizabeth II of the United Kingdom, Pope Benedict XVI. These are referred to as regnal numbers; e.g. II is pronounced "the second". This tradition began in Europe sporadically in the Middle Ages, gaining widespread use in England only during the reign of Henry VIII. Previously, the monarch was not known by numeral but by an epithet such as Edward the Confessor. Some monarchs (e.g. Charles IV of Spain and Louis XIV of France) seem to have preferred the use of IIII instead of IV on their coinage (see illustration).
- Generational suffixes, particularly in the US, for people sharing the same name across generations, for example William Howard Taft IV.
- The year of production of films, television shows and other works of art within the work itself. It has been suggested – by BBC News, perhaps facetiously – that this was originally done "in an attempt to disguise the age of films or television programmes."[23] Outside reference to the work will use regular Hindu–Arabic numerals.
- Hour marks on timepieces. In this context, 4 is usually written IIII.
- The year of construction on building faces and cornerstones.
- Page numbering of prefaces and introductions of books, and sometimes of annexes, too.
- Book volume and chapter numbers, as well as the several acts within a play (e.g. Act

iii, Scene 2).

- Sequels of some movies, video games, and other works (as in *Rocky II*).
- Outlines that use numbers to show hierarchical relationships.
- Occurrences of a recurring grand event, for instance:
  - The Summer and Winter Olympic Games (e.g. the XXI Olympic Winter Games; the Games of the XXX Olympiad)
  - The Super Bowl, the annual championship game of the National Football League (e.g. Super Bowl XXXVII; Super Bowl 50 is a one-time exception[24])
  - WrestleMania, the annual professional wrestling event for the WWE (e.g. WrestleMania XXX). This usage has also been inconsistent.

Specific disciplines



In astronomy, the natural satellites or "moons" of the planets are traditionally designated by capital Roman numerals appended to the planet's name. For example, Titan's designation is Saturn VI.

In chemistry, Roman numerals are often used to denote the groups of the periodic table. They are also used in the IUPAC nomenclature of inorganic chemistry, for the oxidation number of cations which can take on several different positive charges. They are also used for naming phases of polymorphic crystals, such as ice.

In computing, Roman numerals may be used in identifiers which are limited to alphabetic characters by syntactic constraints of the programming language. In LaTeX, for instance, `\labelitemiii` refers to the label of an item in the third level iii of a nested list environment.

In military unit designation, Roman numerals are often used to distinguish between units at different levels. This reduces possible confusion, especially when viewing operational or strategic level maps. In particular, army corps are often numbered using Roman numerals (for example the American XVIII Airborne Corps or the WW2-era German III Panzerkorps) with Hindu-Arabic numerals being used for divisions and armies.

In music, Roman numerals are used in several contexts:

- Movements are often numbered using Roman numerals.
- In music theory, the diatonic functions are identified using Roman numerals. (See: Roman numeral analysis)
- Individual strings of stringed instruments, such as the violin, are often denoted by Roman numerals, with higher numbers denoting lower strings.

In pharmacy, Roman numerals are used in some contexts, including S to denote "one half" and N to mean "nothing".[25] (See the sections below on "zero" and "fractions".)

In photography, Roman numerals (with zero) are used to denote varying levels of brightness when using the Zone System.

In seismology, Roman numerals are used to designate degrees of the Mercalli intensity scale of earthquakes.

In tarot, Roman numerals (with zero) are used to denote the cards of the Major Arcana.

In theology and biblical scholarship, the Septuagint is often referred to as *LXX*, as this translation of the Old Testament into Greek is named for the legendary number of its translators (*septuaginta* being Latin for "seventy").

Modern non-English use

Capital or small capital Roman numerals are widely used in Romance languages to denote **centuries**, e.g. the French *xviii*e *siècle*[26] and the Spanish *siglo XVIII* mean "18th century". Slavic languages in and adjacent to Russia similarly favour Roman numerals (XVIII век). On the other hand, in Slavic languages in Central Europe, like most Germanic languages, one writes "18." (with a period) before the local word for "century".

In many European countries, mixed Roman and Hindu-Arabic numerals are used to record dates (especially in formal letters and official documents, but also on tombstones). The **month** is written in Roman numerals, while the day is in Hindu-Arabic numerals: 14.VI.1789 is 14 June 1789.

Sample hours-of-operation sign

I	9:00–17:00
II	10:00–19:00
III	9:00–17:00

In parts of Europe it is conventional to employ Roman numerals to represent the **days of the week** in hours-of-operation signs displayed in windows or on doors of businesses,[27] and also sometimes in railway and bus timetables. Monday, taken as the first

IV	9:00–17:00
V	10:00–19:00
VI	9:00–13:00
VII	—

day of the week, is represented by I. Sunday is represented by VII. The hours of operation signs are tables composed of two columns where the left column is the day of the week in Roman numerals and the right column is a range of hours of operation from starting time to closing time. In the sample chart (left), the business opens from 9 AM to 5 PM on Mondays, Wednesdays, and Thursdays; 10 AM to 7 PM on Tuesdays and Fridays; and to 1 PM on Saturdays; and is closed on Sundays.

In several European countries Roman numerals are used for floor numbering.[28][29] For instance, apartments in central Amsterdam are indicated as *138-III*, with both a Hindu-Arabic numeral (number of the block or house) and a Roman numeral (floor number). The apartment on the ground floor is indicated as '138-huis'.

In Italy, where roads outside built-up areas have kilometre signs, major roads and motorways also mark 100-metre subdivisionals, using Roman numerals from I to IX for the smaller intervals. The sign "IX | 17" thus marks kilometre 17.9.

Sign at km. 17·9 on route SS4 Salaria, north of Rome

A notable exception to the use of Roman numerals in Europe is in Greece, where Greek numerals (based on the Greek alphabet) are generally used in contexts where Roman numerals would be used elsewhere.

Special values

Zero

The number zero does not have its own Roman numeral, but the word *nulla* (the Latin word meaning "none") was used by medieval computists in lieu of 0. Dionysius Exiguus was known to use *nulla* alongside Roman numerals in 525.[30][31] About 725, Bede or one of his colleagues used the letter N, the initial of *nulla*, in a table of epacts, all written in Roman numerals.[32]

Fractions

Though the Romans used a decimal system for whole numbers, reflecting how they

counted in Latin, they used a duodecimal system for fractions, because the divisibility of twelve ($12 = 2^2 \times 3$) makes it easier to handle the common fractions of 1/3 and 1/4 than does a system based on ten ($10 = 2 \times 5$). On coins, many of which had values that were duodecimal fractions of the unit *as*, they used a tally-like notational system based on twelfths and halves. A dot (•) indicated an *uncia* "twelfth", the source of the English words *inch* and *ounce*; dots were repeated for fractions up to five twelfths. Six twelfths (one half) was abbreviated as the letter *S* for *semis* "half". *Uncia* dots were added to *S* for fractions from seven to eleven twelfths, just as tallies were added to V for whole numbers from six to nine.[33]

Each fraction from 1/12 to 12/12 had a name in Roman times; these corresponded to the names of the related coins:

Fraction	Roman numeral	Name (nominative and genitive)	Meaning
1/12	•	*uncia, unciae*	"ounce"
2/12 = 1/6	•• or :	*sextans, sextantis*	"sixth"
3/12 = 1/4	••• or ∴	*quadrans, quadrantis*	"quarter"
4/12 = 1/3	•••• or ::	*triens, trientis*	"third"
5/12	••••• or :•:	*quincunx, quincuncis*	"five-ounce" (*quinque unciae* → *quincunx*)
6/12 = 1/2	S	*semis, semissis*	"half"
7/12	S•	*septunx, septuncis*	"seven-ounce" (*septem unciae* → *septunx*)
8/12 = 2/3	S•• or S:	*bes, bessis*	"twice" (as in "twice a third")
9/12 = 3/4	S••• or S:•	*dodrans, dodrantis* **or** *nonuncium, nonuncii*	"less a quarter" (*de-quadrans* → *dodrans*) **or** "ninth ounce" (*nona uncia* → *nonuncium*)
10/12 = 5/6	S•••• or S::	*dextans* ***or*** decunx, decuncis	"less a sixth" (*de-sextans* → *dextans*) **or** "ten ounces" (*decem unciae* → *decunx*)
11/12	S••••• or S:•:	*deunx*	"less an ounce" (*de-uncia* → *deunx*)
12/12 = 1	I	*as, assis*	"unit"

The arrangement of the dots was variable and not necessarily linear. Five dots arranged like (⁙) (as on the face of a die) are known as a quincunx, from the name of the Roman fraction/coin. The Latin words *sextans* and *quadrans* are the source of the English words *sextant* and *quadrant*.

Other Roman fractional notations included the following:

- 1/8 *sescuncia, sescunciae* (from *sesqui-* + *uncia*, i.e. 1½ uncias), represented by a sequence of the symbols for the semuncia and the uncia.
- 1/24 *semuncia, semunciae* (from *semi-* + *uncia*, i.e. ½ uncia), represented by several variant glyphs deriving from the shape of the Greek letter Sigma (Σ), one variant resembling the pound sign (£) without the horizontal line(s) (ℒ) and another resembling the Cyrillic letter Є.
- 1/36 *binae sextulae, binarum sextularum* ("two sextulas") or *duella, duellae*, represented by a sequence of two reversed Ss (ƧƧ).
- 1/48 *sicilicus, sicilici*, represented by a reversed C (Ↄ).
- 1/72 *sextula, sextulae* (1/6 of an uncia), represented by a reversed S (Ƨ).
- 1/144 = 12^{-2} *dimidia sextula, dimidiae sextulae* ("half a sextula"), represented by a reversed S crossed by a horizontal line (Ƨ).
- 1/288 *scripulum, scripuli* (a scruple), represented by the symbol Ɜ.
- 1/1728 = 12^{-3} *siliqua, siliquae*, represented by a symbol resembling closing guillemets (»).

Large numbers

A number of systems were developed for the expression of larger numbers that cannot be conveniently expressed using the normal seven letter symbols of conventional Roman numerals.

Apostrophus

One of these was the *apostrophus*,[34] in which 500 (usually written as "D") was written as |Ↄ, while 1,000 was written as C|Ↄ instead of "M".[15] This is a system of encasing numbers to denote thousands (the Cs and Ↄs functioned in this case as the Roman equivalent of parentheses), and has its origins in Etruscan numeral usage. The D and M used to represent 500 and 1,000 in conventional Roman numerals were probably derived from |Ↄ and C|Ↄ, respectively.

In this system, an extra |Ↄ denoted 500, |ↃↃ 5,000 and |ↃↃↃ 50,000. For example:

Base number		C|Ↄ = 1,000	CC|ↃↃ = 10,000	CCC|ↃↃↃ = 100,000
with |Ↄ	|Ↄ = 500	C|Ↄ|Ↄ = 1,500	CC|ↃↃ|Ↄ = 10,500	CCC|ↃↃↃ|Ↄ = 100,500
with |ↃↃ	|ↃↃ = 5,000		CC|ↃↃ|ↃↃ = 15,000	CCC|ↃↃↃ|ↃↃ = 105,000
with |ↃↃↃ	|ↃↃↃ = 50,000			CCC|ↃↃↃ|ↃↃↃ = 150,000

Sometimes C|Ↄ was reduced to ↀ for 1,000. John Wallis is often credited for introducing the symbol for infinity (modern ∞), and one conjecture is that he based it on this usage, since 1,000 was hyperbolically used to represent very large numbers. Similarly, |ↃↃ for 5,000 was reduced to Ɗ; CC|ↃↃ for 10,000 to ↀ; |ↃↃↃ for 50,000 to ; and CCC|ↃↃↃ for 100,000 to .[14]

Vinculum

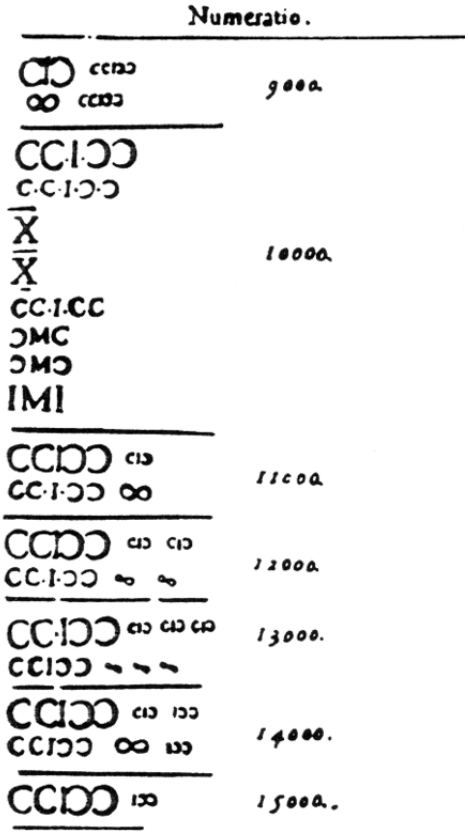
Another system is the *vinculum*, where a conventional Roman numeral is multiplied by 1,000 by adding an overline.[14] For instance:

- I for 1,000
- XXV for 25,000

Adding further vertical lines before and after the numeral might also be used to raise the multiplier to (say) one hundred thousand, or a million. thus:

- |VIII| for 800,000
- |XX| for 2,000,000

This needs to be distinguished from the custom of adding both underline and overline to a Roman numeral, simply to make it clear that it IS a number, e.g. MCMLXVII. Certain (serif) typefaces, for example Times New Roman, are designed with serifs that simulate the appearance of the under/over bar, e.g. MCMLXVII.



Page from a 16th-century manual, showing a mixture of apostrophus and vinculum numbers (see in particular the ways of writing 10,000).

See also

- Etruscan numerals
- Kharosthi
- Roman abacus
- Roman numerals in Unicode
- Urnfield culture numerals

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External links

- FAQ: Why do clocks with Roman numerals use "IIII" instead of "IV"?