EMERGENT CULTURE

August, 2011

Legend of 2012

Wednesday, August 31, 2011 11:43 - 4 Comments

Cosmic Time Meets Earth Time: The Numbers of Supreme Wholeness and Reconciliation Revealed

In the process of writing about the precessional cycle I fell down a rabbit hole of sorts and in the process of finding my way around I made what I think are 4 significant discoveries about cycles of time and the numbers that underlie and unify cosmic and earthly time .

Discovery number 1:

A painting by Salvador Dali. It turns that clocks are not as bad as we think them to be.

The units of time that segment the day into hours, minutes and seconds are in fact reconciled by the units of time that compose the Meso American Calendrical system or MAC for short. It was a surprise to me because one of the world's foremost authorities in calendrical science the late Dr.Jose Arguelles had vilified the numbers of Western timekeeping as a most grievious error. So much so that he attributed much of the worlds problems to the use of the 12 month calendar and the 24 hour, 60 minute, 60 second day, also known by its handy acronym 12-60 time.

I never bought into his argument that the use of those time factors was at fault for our largely miserable human-planetary condition. But I was content to dismiss mechanized time as nothing more than a convenient tool to facilitate the activities of complex societies. As mechanized time I assumed it was based on a relatively arbitrary assignment of numbers. And as a student of "natural time" I came to recognize the day-night cycle as the most basic unit of natural time. Anything less than a day-night cycle was a human invention I reasoned. I was aware that the units of clock time were based on numbering systems developed by the ancient Mesopotamians.

Arguelles had dismissed their numbering system as based on divisions of space and not as divisions of time, therefore they were not actually measuring time, but space so he reasoned. Arguelles referred to clock time as artificial time. But as I explored further I came to the realization that the base 60 and deudecimal (12) counting systems of the Mesopotamians and Egyptians respectively was not so arbitrary or artificial after all. Further down I'll get into the particulars of the Old World timing system and the examples that demonstrate discovery number 1.

Discovery number 2:
The discrepancy between a Maya precessional cycle account of 9,360,000 days and the solar year precessional account of 9,412,529 days is reconciled by what I refer to as the master numbers of supreme wholeness and reconciliation—the numbers 26 and 52. Further down I explain the specifics of this discovery and show examples.

Discovery number 3: The number of days in a unit of *precessional shift* or a 1 degree of shift every 70.56 years is equivalent to the number of years in a precessional cycle. Details further down.

Discovery number 4: Discovery number 4 is actually a confirmation of the hypothesis that plummeted me down the rabbit hole of time. Based on my study of the Tzolkin cycle and the MAC system in general I had come to recognize the numbers 26 and 52 as "very special numbers" that stood out from among the pantheon of key numbers associated with MAC. I have come to recognize 26 and 52 as the numbers representing supreme wholeness, symmetry and numerical reconciliation. Those descriptors as actually synonyms with varying nuances in connotation. My time travels have confirmed that those two numbers do indeed represent supreme wholeness, symmetry and numerical reconciliation at every level thus far mapped from 13 days to 26,000 years.

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Translation Feature

Quote of the Day

We are witnessing the collapse of what could very well be the last empire the planet will have to endure. Let's make it so.
- RS

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New Visitors since January 2011. EC.Com has been online since November 2008

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/20140624162612/wwwroot/remote
/iframe_renew.php:166:You have an error in
your SQL syntax; check the manual that
corresponds to your MySQL server version
for the right syntax to use near 'AND
twitterID != 28018958 AND `date` >
"2014-06-18" ORDER BY `date` DESC
LIMIT 0' at line 1

Numbers

This page contains the numerals that are used in Devanagari. Since thes are the basis of the Arabic number system, they should be quite familiar.

Sea

देवनागरी	IAST
१	1
२	2
३	3
४	4
५	5
६	6
७	7
८	8
९	9
०	0

These numbers are used as you would expect: 1000 is १०००, 2395 is २३९५, and so on.

Hindu–Arabic numeral system

The **Hindu–Arabic numeral system**[1] or **Hindu numeral system**[2] is a positional decimal numeral system, nowadays the most common symbolic representation of numbers in the world. It was invented between the 1st and 4th centuries by Indian mathematicians. The system was adopted, and developed, by Persian Muslim mathematicians (Al-Khwarizmi's c. 825 book *On the Calculation with Hindu Numerals*) and Arab mathematicians (Al-Kindi's c. 830 volumes *On the Use of the Indian Numerals*) by the 9th century. It later spread to the western world by the High Middle Ages.

Arabic and European numerals on a road sign in Abu Dhabi

The system is based upon ten (originally nine) different glyphs. The symbols (glyphs) used to represent the system are in principle independent of the system itself. The glyphs in actual use are descended from Indian Brahmi numerals or Arabic letters,[3] and have split into various typographical variants since the Middle Ages.

These symbol sets can be divided into three main families: the Indian numerals used in India, the Eastern Arabic numerals used in Egypt and the Middle East and the West Arabic numerals used in the Maghreb and in Europe.

Etymology

The Hindu-Arabic numerals were invented by Hindu mathematicians in India thus called "Indian numerals" by Persian mathematician Khowarizmi. They were later called "Arabic" numerals by Europeans, because they were introduced in the West by Arabized Berbers of North Africa.

Positional notation

Main articles: Positional notation and 0 (number)

The Hindu numeral system is designed for positional notation in a decimal system. In a more developed form, positional notation also uses a decimal marker (at first a mark over the ones digit but now more usually a decimal point or a decimal comma which separates the ones place from the tenths place), and also a symbol for "these digits recur *ad infinitum*." In modern usage, this latter symbol is usually a vinculum (a horizontal line placed over the repeating digits). In this more developed form, the numeral system can symbolize any rational number using only 13 symbols (the ten digits, decimal marker, vinculum, and an optional prepended dash to indicate a negative number).

Despite the numeral system being described as the "Hindu–Arabic numeral system", the system had been developed by Indian mathematicians and in use extensively throughout India, before being adopted by Persian mathematicians in India and passed on to the Arabs further west. The numeral system was transmitted to Europe in the Middle Ages. The use of Arabic numerals spread around the world through European trade, books and colonialism. Today they are the most common symbolic representation of numbers in the world.

Although generally found in text written with the Arabic abjad ("alphabet"), numbers written with these numerals also place the most-significant digit to the left, so they read from left to right. The requisite changes in reading direction are found in text that mixes left-to-right writing systems with right-to-left systems.

Symbols

Various symbol sets are used to represent numbers in the Hindu–Arabic numeral, all of which evolved from the Brahmi numerals.

The symbols used to represent the system have split into various typographical variants since the Middle Ages, arranged in three main groups:

- the widespread Western "Arabic numerals" used with the Latin, Cyrillic, and Greek alphabets in the table below labelled "European", descended from the "West Arabic numerals" which were developed in al-Andalus and the Maghreb (There are two typographic styles for rendering European numerals, known as lining figures and text figures).
- the "Arabic–Indic" or "Eastern Arabic numerals" used with Arabic script, developed primarily in what is now Iraq. A variant of the Eastern Arabic numerals is used in Persian and Urdu. There is substantial variation in usage of glyphs for the Eastern Arabic-Indic digits, especially for the digits four, five, six, and seven.[4]
- the Indian numerals in use with scripts of the Brahmic family in India and Southeast Asia. Each of the roughly dozen major scripts of India has its own numeral glyphs (as one will note when perusing Unicode character charts). This table shows two examples:

European (descended from the West Arabic)	0	1	2	3	4	5	6	7	8	9
Arabic-Indic	٠	١	٢	٣	٤	٥	٦	٧	٨	٩
Eastern Arabic-Indic (Persian and Urdu)	۰	۱	۲	۳	۴	۵	۶	۷	۸	۹
Devanagari (Hindi)	०	१	२	३	४	५	६	७	८	९
Tamil		க	உ	ங	சு	ரு	சூ	எ	அ	கூ

- Kannada and Telugu have their own numerical system, as shown below.

0	1	2	3	4	5	6	7	8	9
೦	೧	೨	೩	೪	೫	೬	೭	೮	೯

- The Assamese and Bengali languages also have their own numeral system, as shown below.

Main article: Bengali-Assamese numerals

0	1	2	3	4	5	6	7	8	9
০	১	২	৩	৪	৫	৬	৭	৮	৯

- Numerical system in Malayalam:

0	1	2	3	4	5	6	7	8	9
൦	൧	൨	൩	൪	൫	൬	൭	൮	൯

As in many numbering systems, the numbers 1, 2, and 3 represent simple tally marks. 1 being a single line, 2 being two lines (now connected by a diagonal) and 3 being three lines (now connected by two vertical lines). After three, numbers tend to become more complex symbols (examples are the Chinese/Japanese numbers and Roman numerals). Theorists believe that this is because it becomes difficult to instantaneously count objects past three.[5]

History

Main article: History of the Hindu–Arabic numeral system

Predecessors

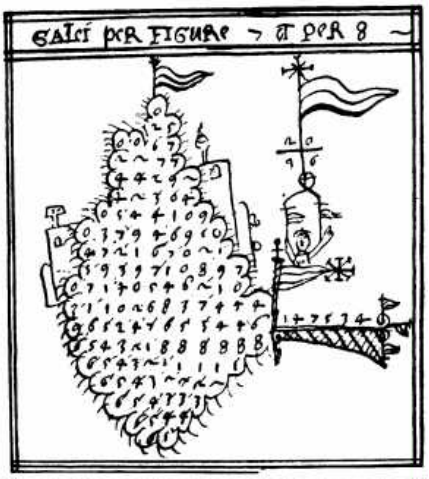
The Brahmi numerals at the basis of the system predate the Common Era. They replaced the earlier Kharosthi numerals used since the 4th century BC. Brahmi and Kharosthi numerals were used alongside one another in the Maurya Empire period, both appearing on the 3rd century BC edicts of Ashoka.[6]

Buddhist inscriptions from around 300 BC use the symbols that became 1, 4 and 6. One century later, their use of the symbols that became 2, 4, 6, 7 and 9 was recorded. These Brahmi numerals are the ancestors of the Hindu–Arabic glyphs 1 to 9, but they were not used as a positional system with a zero, and there were rather separate numerals for each of the tens (10, 20, 30, etc.).

The actual numeral system, including positional notation and use of zero, is in principle independent of the glyphs used, and significantly younger than the Brahmi numerals.

Development

The place-value system is used in the Bakhshali Manuscript. Although date of the composition of the manuscript is uncertain, the language used in the manuscript indicates that it could not have been composed any later than 400. The development of the positional decimal system takes its origins in Indian mathematics during the Gupta period. Around 500, the astronomer Aryabhata uses the word *kha* ("emptiness") to mark "zero" in tabular arrangements of digits. The 7th century *Brahmasphuta Siddhanta* contains a comparatively advanced understanding of the mathematical role of zero. The Sanskrit translation of the lost 5th century Prakrit Jaina cosmological text *Lokavibhaga* may preserve an early instance of positional use of zero.[7]



The "Galley" method of division.

These Indian developments were taken up in Islamic mathematics in the 8th century, as recorded in al-Qifti's *Chronology of the scholars* (early 13th century).[8]

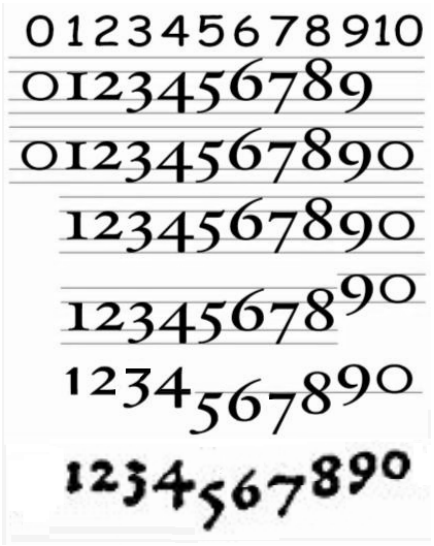
The numeral system came to be known to both the Persian Muslim mathematician Khwarizmi, who wrote a book, *On the Calculation with Hindu Numerals* in about 825, and the Arab mathematician Al-Kindi, who wrote four volumes, *On the Use of the Indian Numerals* (كتاب في استعمال العداد الهندي [*kitāb fī isti'māl al-'adād al-hindī*]) around 830. These earlier texts did not use the Hindu numerals. Kushyar ibn Labban who wrote *Kitab fi usul hisab al-hind (Principles of Hindu Reckoning)* is one of the oldest surviving manuscripts using the Hindu numerals.[9] These books are principally responsible for the diffusion of the Indian system of numeration throughout the Islamic world and ultimately also to Europe [10].

The first dated and undisputed inscription showing the use of a symbol for zero appears on a stone inscription found at the Chaturbhuja Temple at Gwalior in India, dated 876.

In 10th century Islamic mathematics, the system was extended to include fractions, as recorded in a treatise by Syrian mathematician Abu'l-Hasan al-Uqlidisi in 952–953.

Adoption in Europe

Main article: Arabic numerals



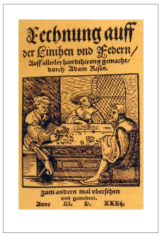
The bottom row shows the numeral glyphs as they appear in type in German incunabula (Nicolaus Kesler, Basle, 1486)

In Christian Europe, the first mention and representation of Hindu-Arabic numerals (from one to nine, without zero), is in the Codex Vigilanus, an illuminated compilation of various historical documents from the Visigothic period in Spain, written in the year 976 by three monks of the Riojan monastery of San Martín de Albelda. Between 967 and 969, Gerbert of Aurillac discovered and studied Arab science in the Catalan abbeys. Later he obtained from these places the book *De multiplicatione et divisione* (*On multiplication and division*). After becoming pope Sylvester II in the year 999, he introduced a new model of abacus, the so-called Abacus of Gerbert, by adopting tokens representing Hindu-Arab numerals, from one to nine.

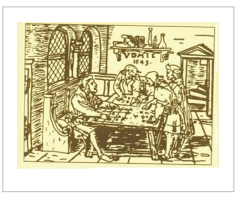
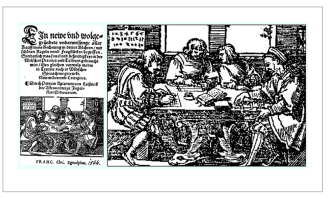
Leonardo Fibonacci brought this system to Europe. His book Liber Abaci introduced Arabic numerals, the use of zero, and the decimal place system to the Latin world. The numeral system came to be called "Arabic" by the Europeans. It was used in European mathematics from the 12th century, and entered common use from the 15th century to replace Roman numerals. Robert Chester translated the Latin into English.Wikipedia:Citation needed

The familiar shape of the Western Arabic glyphs as now used with the Latin alphabet (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) are the product of the late 15th to early 16th century, when they enter early typesetting. Muslim scientists used the Babylonian numeral system, and merchants used the Abjad numerals, a system similar to the Greek numeral system and the Hebrew numeral system. Similarly, Fibonacci's introduction of the system to Europe was restricted to learned circles. The credit for first establishing widespread understanding and usage of the decimal positional notation among the general population goes to Adam Ries, an author of the German Renaissance, whose 1522 *Rechenung auff der linihen und federn* was targeted at the apprentices of businessmen and craftsmen.








Adoption in East Asia

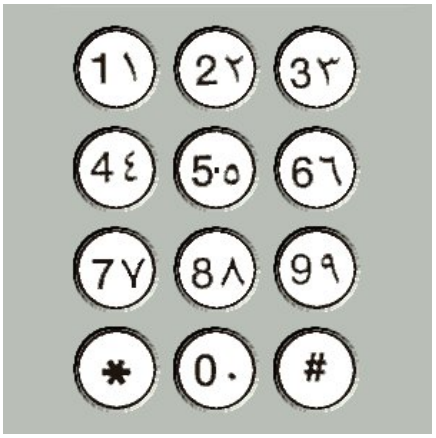
In China, Gautama Siddha introduced Indian numerals with zero in 718, but Chinese mathematicians did not find them useful, as they had already had the decimal positional counting rods.

In Chinese numerals, a circle (〇) is used to write zero in Suzhou numerals. Many historians think it was imported from Indian numerals by Gautama Siddha in 718, but some think it was created from the Chinese text space filler "□".

Chinese and Japanese finally adopted the Hindu–Arabic numerals in the 19th century, abandoning counting rods.

Spread of the Western Arabic variant

The "Western Arabic" numerals as they were in common use in Europe since the Baroque period have secondarily found worldwide use together with the Latin alphabet, and even significantly beyond the contemporary spread of the Latin alphabet, intruding into the writing systems in regions where other variants of the Hindu–Arabic numerals had been in use, but also in conjunction with Chinese and Japanese writing (see Chinese numerals, Japanese numerals).



An Arab telephone keypad with both the Western "Arabic numerals" and the Arabic "Arabic–Indic numerals" variants.

Notes

[1] David Eugene Smith and Louis Charles Karpinski, The Hindu–Arabic Numerals (http://www.gutenberg.org/etext/22599), 1911

[2] Collier's encyclopedia, with bibliography and index (http://books.google.co.in/books?id=5b8JAAAAIAAJ) William Darrach Halsey, Emanuel Friedman - 1983. "When the Arabian empire was expanding and contact was made with India, the Hindu numeral system and the early algorithms were adopted by the Arabs"

[3] On the Origin of Arabic Numerals (http://xxx.lanl.gov/ftp/math/papers/0304/0304219.pdf) - A. Boucenna - Université Ferhat Abbas Setif

[4] The Unicode Standard 5.0 – Electronic edition, Chapter 8 Middle Eastern Scripts (http://unicode.org/versions/Unicode5.0.0/ch08.pdf)

[5] Language may shape human thought (http://www.newscientist.com/article.ns?id=dn6303), NewScientist.com news service, Celeste Biever, 19:00 19 August 2004.

[6] Flegg (2002), p. 6ff.

[7] Ifrah, G. The Universal History of Numbers: From prehistory to the invention of the computer. John Wiley and Sons Inc., 2000. Translated from the French by David Bellos, E.F. Harding, Sophie Wood and Ian Monk

[8] al-Qifti's account does not pertain to the numerals explicitly, but to the reception of Indian astronomy (http://www-groups.dcs.st-and.ac.uk/~history/HistTopics/Arabic_numerals.html):

> *... a person from India presented himself before the Caliph al-Mansur in the year 776 who was well versed in the siddhanta method of calculation related to the movement of the heavenly bodies, and having ways of calculating equations based on the half-chord [essentially the sine] calculated in half-degrees ... Al-Mansur ordered this book to be translated into Arabic, and a work to be written, based on the translation, to give the Arabs a solid base for calculating the movements of the planets ...* The book presented by the Indian scholar was probably the *Brahmasphuta Siddhanta* itself.

[9] Martin Levey and Marvin Petruck, Principles of Hindu Reckonging, translation of Kushyar ibn Labban Kitab fi usul hisab al-hind, p3, University of Wisconsin Press, 1965

[10] http://www-gap.dcs.st-and.ac.uk/%7Ehistory/HistTopics/Indian_numerals.html

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- The Arabic numeral system (http://www-history.mcs.st-and.ac.uk/HistTopics/Arabic_numerals.html)

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Hindu–Arabic numeral system *Source*: http://en.wikipedia.org/w/index.php?oldid=613300780 *Contributors*: 84user, 8ty3hree, Addshore, Adhominem, Ahoerstemeier, Aidilfbk, Ak007, Alanhaggai, Angrymutant, Animum, AnonyLog, Arab Hafez, Arjun024, Arthur Rubin, Aua, Aursani, Austriacus, Becky Sayles, Behrad18n, Betterusername, Bharatveer, Bkell, Bogdan Nagachop, Boing! said Zebedee, Brisvegas, C. A. Russell, Calliopejen1, Camw, Cfsenel, Clarince63, Coasterror, Cremepuff222, Csssclll, Cyrusace, D.M. from Ukraine, DaGizza, Dalf, Daltron Force, DavidFarmbrough, Dbachmann, DePiep, Debresser, Deeptrivia, DerBorg, Discospinster, Dmcq, Dravidianhero, Dsz4, Ego White Tray, El C, Elockid, Emahms, Emmanuel Vallois, Epbr123, ErisDiscord, Faizhaider, FayssalF, FilipeS, Findjoshg, Finell, Foreverknowledge, Francis Schonken, Future Perfect at Sunrise, GSMR, Gabby Merger, Gallusgallus, Giftlite, Gisling, Hairy Dude, Hakeem.gadi, Hallows AG, Hcanon, Henning Makholm, Hmains, Hroðulf, I am One of Many, Imyourfoot, Incnis Mrsi, Inka 888, Irisrune, J.delanoy, JSR, Jagged 85, Jeffrd10, Jidanni, Jim.belk, Joanakestlar, Johncamus, Joseph Solis in Australia, Joshua Issac, KHamsun, Kabanaman, Kanags, Kato2k6, Kaveh, Kdar, Keenan Pepper, Khazar, Kukini, LOTRrules, LakeHMM, Leinad925, Liontooth, Loew Galitz, MECU, Maahmaah, Malaiya, Maurice Carbonaro, Mel Etitis, Mhaitham.shammaa, Michael Hardy, Miguel, Miracle dream, Mnmazur, Mogism, Mreditoringada, Mulan2, New World Man, NewEnglandYankee, Nikevich, Noe, Nosedown, Numeralhistory, Ohnoitsjamie, Onef9day, Patrick, Patrick Browne, Paul August, Paxse, PericlesofAthens, Peyna, Phgao, Pingveno, Piyush Sriva, Quicksilvre, R'n'B, RTPking, Ralf Roletschek, RaviC, Rmashhadi, Robertolyra, Rocketrod1960, RoyBoy, ST47, Salgueiro, Salt Yeung, Satnath, ScythedRunner, Seifabdoun, Shreevatsa, Sligocki, SmilingOrangeYak, Snowcream, Someguy1221, Sopholatre, Sophus Bie, Spundun, Sreekanthv, Srnec, Starstylers, Stevertigo, Sukh, TAKASUGI Shinji, Tbhotch, Tempodivalse, The Thing That Should Not Be, The wub, The1337gamer, TheThingy, Thegreenj, Thingg, Thisthat2011, Toby Bartels, Towhid81, Vice regent, Voidvector, WestwoodMatt, Widr, Wikky Horse, Wlgrin, Woohookitty, Xpai, Yogesh Khandke, Zararsiz, Zocky, Zundark, ZxxZxxZ, বজিয়. চক্রবর্তী, 292 anonymous edits

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Roman numerals

Roman numerals, the numeric system used in ancient Rome, employs combinations of letters from the Latin alphabet to signify values. The numbers 1 to 10 can be expressed in Roman numerals as follows:

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

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

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

Reading Roman numerals

MMXIV

"2014" as a Roman numeral

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

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

Numbers are formed by combining symbols and adding the values. So II is two ones, i.e. 2, and XIII is a ten and three ones, i.e. 13. There is no zero in this system, so 207, for example, is CCVII, using the symbols for two hundreds, a five and two ones. 1066 is MLXVI, one thousand, fifty and 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, to avoid four characters being repeated in succession (such as IIII or XXXX) these can be reduced using subtractive notation as follows:

- the numeral I can be placed before V and X to make 4 units (IV) and 9 units (IX respectively)
- X can be placed before L and C to make 40 (XL) and 90 (XC respectively)
- C can be placed before D and M to make 400 (CD) and 900 (CM) according to the same pattern[2]

An example using the above rules would be 1904: this is composed of 1 (one thousand), 9 (nine hundreds), 0 (zero tens), and 4 (four units). To write the Roman numeral, each of the non-zero digits should be treated separately. Thus 1,000 = M, 900 = CM, and 4 = IV. Therefore, 1904 is MCMIV.

Below are some examples of the modern use of Roman Numerals.

- 1954 as MCMLIV (Trailer for the movie *The Last Time I Saw Paris*)
- 1990 as MCMXC (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, Winter) Olympiad (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.

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.[3]

A typical clock face with Roman numerals in Bad Salzdetfurth, Germany

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,[4] a practice that goes back to very early clocks such as the Wells Cathedral clock. This is far from being an unvarying convention; the clock in Elizabeth Tower on the Palace of Westminster in London (aka "Big Ben"), for example, uses IV.

An inscription on Admiralty Arch, London. The number is 1910, for which MCMX would be more usual

At the beginning of the twentieth century, confusion over the correct representation of 900 (conventionally CM) was reflected in several inscribed dates: for instance 1910 is shown on Admiralty Arch, London, as MDCCCCX rather than MCMX. On the north entrance to the Saint Louis Art Museum 1903 was inscribed as MDCDIII rather than MCMIII.

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, Λ, X, 𐌡, 8, ⊕, 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.

Thus, ⟨I⟩ descends not from the letter ⟨I⟩ but from a notch scored across the stick. Every fifth notch was double cut i.e. Λ, V, 𐌡, 𐌡, *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, 𐌡, *etc.*, but perhaps most often as a chicken-track shape like a superimposed V and I: 𐌡. 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, 𐌡, ⋈, H, or as any of the symbols for 50 above plus an extra stroke. The form Ж (that is, a superimposed X and I) 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 𐌡 or ⊢ — that is, like a ⟨Þ⟩ with a cross bar,— becoming Ð–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 CIↃor C𐌡Ↄ), and half of a thousand or "five hundred" is the right half of the symbol, I) (or IↃor 𐌡Ↄ), and this may have been converted into ⟨D⟩. This at least was the etymology given to it later on.

Meanwhile, 1000 was a circled or boxed X: 𐌡, ⊗, ⊕, and by Augustinian times was partially identified with the Greek letter Φ *phi*. Over time, the symbol changed to Ψ and 𐌡. 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.[5] Hooper contends that the digits are related to hand signals. 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).

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, *etc.* In the Middle Ages, a *j* was sometimes substituted for the final *i* of a number, such as *iij* for 3 or *vij* for 7. This *j* was considered a swash variant of *i.* 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.[6][7]

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, and are mentioned here only in passing.[8]

Modern number	Medieval abbreviation	Notes
5	A	Resembles an upside-down V. Also said to equal 500.
6	Ϛ	Either a ligature of VI, or the Greek numeral stigma (Ϛ), having the same numerical value.[9]
7	S, Z	Presumed abbreviation of *septem*, Latin for 7.
11	O	Presumed abbreviation of (e.g.) *onze*, French for 11.
40	F	Presumed abbreviation of English *forty*.
70	S	Also could stand for 7, and has same etymology.
80	R	
90	N	Presumed abbreviation of *nonaginta*, Latin for 90.
150	Y	Possibly derived from the lowercase y's shape.
151	K	This unusual abbreviation's origin is unknown; it has also been said to stand for 250.[10]
160	T	Possibly derived from Greek *tetra*, as 4 x 40 = 160.
200	H	
250	E	
300	B	
400	P, G	
500	Q	Redundant with D, abbreviation for *quingenti*, Latin for 500.
2000	Z	

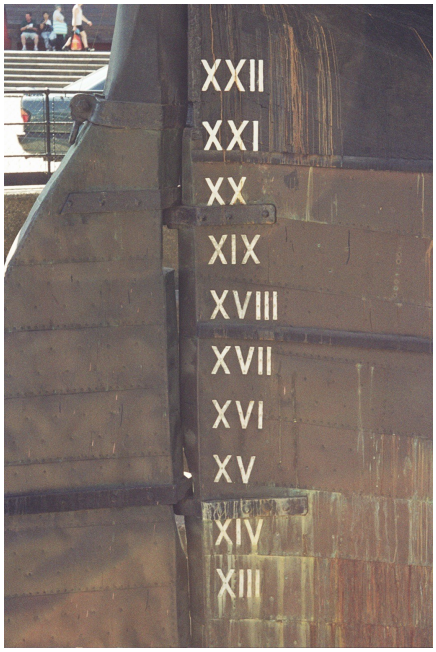
Chronograms, messages with a numbers encoded into them, were popular during the Renaissance era. The chronogram would be a phrase containing the letters I, V, X, L, C, D, and M. By putting these letters together, the reader would obtain a number, usually indicating a particular year.

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 used today in several niche contexts. A few examples of their current use are:

- 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 seen in the USA, for people who share 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." 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.
- Sequels of movies, video games, and other works (as in Jaws IV).
- Outlines, which 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 XLVIII)
  - WrestleMania, the annual professional wrestling event for the WWE (e.g. the forthcoming WrestleMania XXX)



Roman numbers on stern of *Cutty Sark*, Greenwich, showing draft in feet.

In astronomy, the natural satellites or "moons" of the planets are traditionally designated by capital Roman numerals appended to the planet's name.

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

In music theory, the diatonic functions are identified using Roman numerals. See: Roman numeral analysis.

In musical performance practice, 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". (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 Tarot, Roman numerals (with zero) are also used to denote the cards of the Major Arcana.

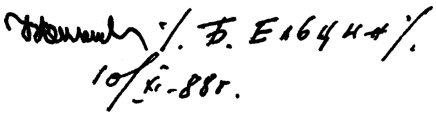
In theology and biblical scholarship, the Septuagint is often referred to as *LXX* (this translation of the Old Testament into Greek is named for the legendary number of its translators, *septuaginta* being Latin for seventy).

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.

Modern non-English-speaking use

Capital Roman numerals are still occasionally used to denote **centuries** (e.g., *XVIII* refers to the eighteenth century) in English. This style is much more widely followed in continental Europe.

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.



Boris Yeltsin's signature, dated 10 November 1988. The month is specified by "XI" rather than "11".

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,[11] and also sometimes in railway and bus timetables. Monday is represented by I, which is the initial day of the week. Sunday is represented by VII, which is the final day of the week. 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. The following example hours-of-operation table would be for a business whose hours of operation are 9:30 AM to 5:30 PM on Mondays, Wednesdays, and Thursdays; to 7 PM on Tuesdays and Fridays; and to 1 PM on Saturdays; and which is closed on Sundays.

I	9:30–17:30
II	9:30–19:00
III	9:30–17:30
IV	9:30–17:30
V	9:30–19:00
VI	9:30–13:00
VII	—

In several European countries Roman numerals are used for floor numbering.[12][13] For instance, apartments in central Amsterdam are indicated as *138-III*, with both an 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 kilometer 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

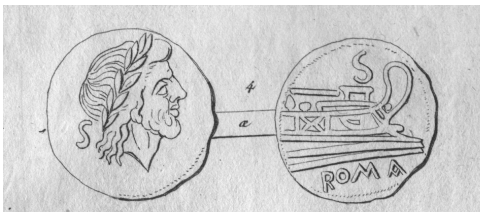
Special values

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.[14][15] 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.[16]

Fractions

A *triens* coin (1/3 or 4/12 of an *as*). Note the four dots •••• indicating its value.



A *semis* coin (1/2 or 6/12 of an *as*). Note the S indicating its value.

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 = 3 × 2 × 2) makes it easier to handle the common fractions of 1/3 and 1/4 than does a system based on ten (10 = 2 × 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.[17]

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, dextantis* **or** *decunx, decuncis*	"less a sixth" (*de-sextans* → *dextans*) **or** "ten ounces" (*decem unciae* → *decunx*)
11/12	S••••• or S**:·:**	*deunx, deuncis*	"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) and another resembling the Cyrillic letter (Є).
- 1/36 *binae sextulae, binarum sextularum* ("two sextulas") or *duella, duellae*, represented by (Ƨ), a sequence of two reversed Ss.
- 1/48 *sicilicus, sicilici*, represented by (Ↄ), a reversed C.
- 1/72 *sextula, sextulae* (1/6 of an uncia), represented by (Ƨ), a reversed S.
- 1/144 = 12^{-2} *dimidia sextula, dimidiae sextulae* ("half a sextula"), represented by (Ƨ), a reversed S crossed by a horizontal line.
- 1/288 *scripulum, scripuli* (a scruple), represented by the symbol (℈).
- 1/1728 = 12^{-3} *siliqua, siliquae*, represented by a symbol resembling closing guillemets (»).

Large numbers

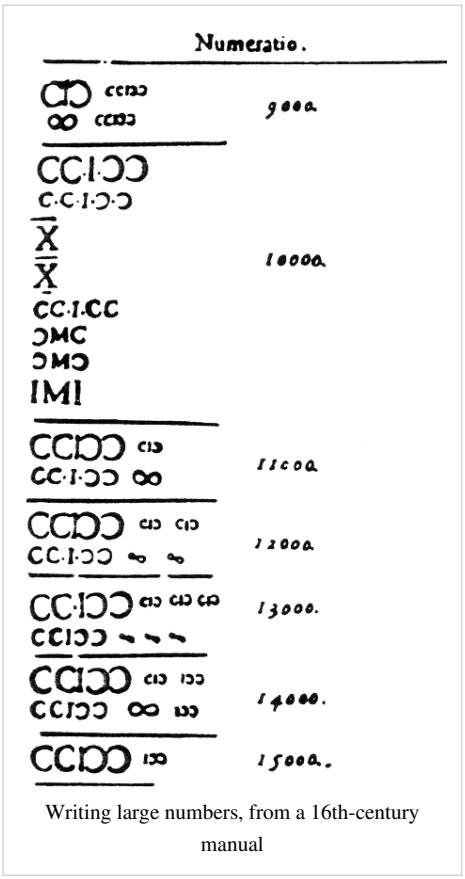
Modern use of Roman Numerals involves relatively small numbers (theoretically, up to 3,999); in historical times a systematic method was obviously needed for representing much larger numbers. There were at least two such systems. In one, a horizontal overline line was used above a particular numeral (or part of it) to multiply the number concerned by one thousand times; thus:

- I for 1000
- VI for 6000

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.



Writing large numbers, from a 16th-century manual

In the second system, 500 (usually written as "D") was written as |Ↄ, while 1,000, was written as CIↃ instead of "M". This is a system of encasing numbers to denote thousands (imagine the Cs and Ↄs as parentheses), which has its origins in Etruscan numeral usage. The D and M used to represent 500 and 1,000 were most likely derived from IↃ and CIↃ, respectively, and subsequently influenced the adoptions of "D" and "M" in convertional Roman numerals.

In this system, an extra Ↄ denoted 500, and multiple extra Ↄs are used to denote 5,000, 50,000, etc. For example:

Base number		CIↃ = 1,000	CCIↃↃ = 10,000	CCCIↃↃↃ = 100,000
1 extra Ↄ	IↃ = 500	CIↃↃ = 1,500	CCIↃↃↃ = 10,500	CCCIↃↃↃↃ = 100,500
2 extra Ↄs	IↃↃ = 5,000		CCIↃↃↃↃ = 15,000	CCCIↃↃↃↃↃ = 105,000
3 extra Ↄs	IↃↃↃ = 50,000			CCCIↃↃↃↃↃↃ = 150,000

1630 on the Westerkerk in Amsterdam

Sometimes CIↃ was reduced to ⅭⅠ 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, IↃↃ for 5,000 was reduced to ⅭⅠⅠ; CCIↃↃ for 10,000 to ⅭⅭⅠⅠ; IↃↃↃ for 50,000 to ⅭⅭⅭⅠⅠ; and CCCIↃↃↃ for 100,000 to ⅭⅭⅭⅭⅠⅠ.

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- Child friendly roman numerals webquest (http://www.greatmathsgames.com/roman_numerals/roman_numerals.htm)
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Indian numerals

For the international version of Indian numerals, see Arabic numerals and Hindu-Arabic numerals.

This article is about the symbols used to write digits in India. For digit grouping of numbers in India, see Indian numbering system.

Indian numerals are the symbols representing numbers in India. These numerals are generally used in the context of the decimal Hindu-Arabic numeral system, and are distinct from, though related by descent to Arabic numerals.

Devanagari numerals and their Hindi names

Below is a list of the Indian numerals in their modern Devanagari form, the corresponding European (Indo-Arabic) equivalents, their Hindi and Sanskrit pronunciation, and translations in some languages.[1]

Modern Devanagari	Hindu-Arabic	Hindi word for the cardinal numeral	Sanskrit word for the cardinal numeral (wordstem)	Translations in some languages
०	0	śūnya (शून्य)	śūnya (शून्य)	sifr (Arabic)
१	1	ék (एक)	eka (एक)	echad (Hebrew)
२	2	do (दो)	dvi (द्वि)	dva (Russian)
३	3	tīn (तीन)	tri (त्रि)	traṇ (Gujarati)
४	4	cār (चार)	catúr (चतुर्)	katër (Albanian)
५	5	pā̃c (पाँच)	pañca (पञ्च)	penki (Lithuanian)
६	6	chaḥ (छः)	ṣáṣ (षष्)	seis (Spanish)
७	7	sāt (सात)	saptá (सप्त)	şapte (Romanian)
८	8	āṭh (आठ)	aṣṭá (अष्ट)	astoņi (Latvian)
९	9	nau (नौ)	náva (नव)	naw (Welsh)

Since Sanskrit is an Indo-European language, it is obvious (as also seen from the table) that the words for numerals closely resemble those of Greek and Latin. The word "Shunya" for zero was translated into Arabic as "صفر" "sifr", meaning 'nothing' which became the term "zero" in many European languages from Medieval Latin, *zephirum*.[2]

South Indian language(s)

For numerals in Tamil language see Tamil numerals. For numerals in Telugu language see Telugu numerals.

Arabic numerals	0	1	2	3	4	5	6	7	8	9	Used In
Telugu numerals	౦	౧	౨	౩	౪	౫	౬	౭	౮	౯	Telugu language
Kannada numerals	೦	೧	೨	೩	೪	೫	೬	೭	೮	೯	Kannada language
Tamil numerals	௦	க	உ	ங	ச	ரு	சூ	எ	அ	கூ	Tamil language
Malayalam numerals	൦	൧	൨	൩	൪	൫	൬	൭	൮	൯	Malayalam language

Other modern Indian languages

See also: Glyphs used with the Arabic numeral system

The five Indian languages (Hindi, Marathi, Konkani, Nepali and Sanskrit itself) that have adapted the Devanagari script to their use also naturally employ the numeral symbols above; of course, the names for the numbers vary by language. The table below presents a listing of the **symbols** used in various modern Indian scripts for the numbers from zero to nine:

For numerals in Bengali language and Assamese languages see Bengali-Assamese numerals.

Arabic Numerals	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Used in**
Bengali-Assamese numerals	০	১	২	৩	৪	৫	৬	৭	৮	৯	Bengali and Assamese languages
Gujarati numerals	૦	૧	૨	૩	૪	૫	૬	૭	૮	૯	Gujarati language
Nepali numerals	०	१	२	३	४	५	६	७	८	९	Nepali language (Nepal, Bhutan, Darjeeling district and Sikkim of India)
Gurmukhi numerals	੦	੧	੨	੩	੪	੫	੬	੭	੮	੯	Punjabi language
Oriya numerals	୦	୧	୨	୩	୪	୫	୬	୭	୮	୯	Oriya language
Lepcha numerals	᱀ 0	᱁ 1	᱂ 2	᱃ 3	᱄ 4	᱅ 5	᱆ 6	᱇ 7	᱈ 8	᱉ 9	Nepal, Sikkim and Bhutan

History

Main article: History of the Hindu-Arabic numeral system

A decimal place system has been traced back to ca. 500 in India. Before that epoch, the Brahmi numeral system was in use; that system did not encompass the concept of the place-value of numbers. Instead, Brahmi numerals included additional symbols for the tens, as well as separate symbols for *hundred* and *thousand*.

The Indian place-system numerals spread to neighboring Persia, where they were picked up by the conquering Arabs. In 662, a Nestorian bishop living in what is now called Iraq said:

> I will omit all discussion of the science of the Indians ... of their subtle discoveries in astronomy — discoveries that are more ingenious than those of the Greeks and the Babylonians - and of their valuable methods of calculation which surpass description. I wish only to say that this computation is done by means of nine signs. If those who believe that because they speak Greek they have arrived at the limits of science would read the Indian texts they would be convinced even if a little late in the day that there are others who know something of value.

The addition of zero as a tenth positional digit is documented from the 7th century by Brahmagupta, though the earlier Bakhshali Manuscript, written sometime before the 5th century, also included zero. But it is in Khmer numerals of modern Cambodia where the first extant material evidence of zero as a numerical figure, dating its use back to the seventh century, is found.

As it was from the Arabs that the Europeans learned this system, the Europeans called them *Arabic numerals;* the Arabs refer to their numerals as *Indian numerals*. In academic circles they are called the *Hindu-Arabic* or *Indo-Arabic* numerals.

The significance of the development of the positional number system is probably best described by the French mathematician Pierre Simon Laplace (1749–1827) who wrote:

> It is India that gave us the ingenious method of expressing all numbers by the means of ten symbols, each symbol receiving a value of position, as well as an absolute value; a profound and important idea which appears so simple to us now that we ignore its true merit, but its very simplicity, the great ease which it has lent to all computations, puts our arithmetic in the first rank of useful inventions, and we shall appreciate the grandeur of this achievement when we remember that it escaped the genius of Archimedes and Apollonius, two of the greatest minds produced by antiquity.

Tobias Dantzig, the father of George Dantzig had this to say in *Number*:

> This long period of nearly five thousand years saw the rise and fall of many civilizations, each leaving behind a heritage of literature, art, philosophy, and religion. But what was the net achievement in the field of reckoning, the earliest art practiced by man? An inflexible numeration so crude as to make progress well nigh impossible, and a calculating device so limited in scope that even elementary calculations called for the services of an expert [...] Man used these devices for thousands of years without contributing a single important idea to the system [...] Even when compared with the slow growth of ideas during the dark ages, the history of reckoning presents a peculiar picture of desolate stagnation. When viewed in this light, the achievements of the unknown Hindu, who some time in the first centuries of our era discovered the principle of position, assumes the importance of a world event.

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Hebrew numerals

The system of **Hebrew numerals** is a quasi-decimal alphabetic numeral system using the letters of the Hebrew alphabet.

In this system, there is no notation for zero, and the numeric values for individual letters are added together. Each unit (1, 2, ..., 9) is assigned a separate letter, each tens (10, 20, ..., 90) a separate letter, and the first four hundreds (100, 200, 300, 400) a separate letter. The later hundreds (500, 600, 700, 800 and 900) are represented by the sum of two or three letters representing the first four hundreds. To represent numbers from 1,000 to 999,999, the same letters are reused to serve as thousands, tens of thousands, and hundreds of thousands. Gematria (Jewish numerology) uses these transformations extensively.

In Israel today, the decimal system of Arabic numerals (ex. 0, 1, 2, 3, etc.) is used in almost all cases (money, age, date on the civil calendar). The Hebrew numerals are used only in special cases, such as when using the Hebrew calendar, or numbering a list (similar to a, b, c, d, etc.), much as Roman numerals are in the West.

Main table

Decimal	Hebrew	Glyph	Cardinal (ex. one, two, three)		Ordinal (ex. first, second, third)	
			Masculine	Feminine	Masculine	Feminine
0	N/A		efes (אֶפֶס)		N/A	
1	*Aleph*	א	echad (אֶחָד)	ahat (אַחַת)	rishon (רִאשׁוֹן)	rishona (רִאשׁוֹנָה)
2	*Bet*	ב	shnayim (שְׁנַיִם)	shtayim (שְׁתַּיִם)	sheni (שֵׁנִי)	shniya (שְׁנִיָה)
3	*Gimel*	ג	shlosha (שְׁלוֹשָׁה)	shalosh (שָׁלוֹשׁ)	shlishi (שְׁלִישִׁי)	shlishit (שְׁלִישִׁית)
4	*Dalet*	ד	arba'a (אַרְבָּעָה)	arba' (אַרְבַּע)	revi'i (רְבִיעִי)	revi'it (רְבִיעִית)
5	*Hei*	ה	hamisha (חֲמִשָׁה)	hamesh (חָמֵשׁ)	hamishi (חֲמִישִׁי)	hamishit (חֲמִישִׁית)
6	*Vav*	ו	shisha (שִׁשָׁה)	shesh (שֵׁשׁ)	shishi (שִׁשִׁי)	shishit (שִׁשִׁית)
7	*Zayin*	ז	shiv'a (שִׁבְעָה)	sheva' (שֶׁבַע)	shvi'i (שְׁבִיעִי)	shvi'it (שְׁבִיעִית)
8	*Het*	ח	shmona (שְׁמוֹנָה)	shmone (שְׁמוֹנֶה)	shmini (שְׁמִינִי)	shminit (שְׁמִינִית)
9	*Tet*	ט	tish'a (תִּשְׁעָה)	tesha' (תֵּשַׁע)	tshi'i (תְּשִׁיעִי)	tshi'it (תְּשִׁיעִית)
10	*Yud*	י	'assara (עֲשָׂרָה)	'eser (עֶשֶׂר)	'asiri (עֲשִׂירִי)	'asirit (עֲשִׂירִית)
20	*Kaf*	כ	'esrim (עֶשְׂרִים)			
30	*Lamed*	ל	shloshim (שְׁלוֹשִׁים)			
40	*Mem*	מ	arba'im (אַרְבָּעִים)			

50	*Nun*	נ	hamishim (חֲמִשִּׁים)
60	*Samech*	ס	shishim (שִׁשִּׁים)
70	*Ayin*	ע	shiv'im (שִׁבְעִים)
80	*Pei*	פ	shmonim (שְׁמוֹנִים)
90	*Tsadi*	צ	tish'im (תִּשְׁעִים)
100	*Kuf*	ק	mea (מֵאָה)
200	*Resh*	ר	matayim (מָאתַיִם)
300	*Shin*	ש	shlosh meot (שְׁלוֹשׁ מֵאוֹת)
400	*Tav*	ת	arba' meot (אַרְבַּע מֵאוֹת)
500	*Tav Kuf*	ת״ק	hamesh meot (חֲמֵשׁ מֵאוֹת)
600	*Tav Resh*	ת״ר	shesh meot (שֵׁשׁ מֵאוֹת)
700	*Tav Shin*	ת״ש	shva meot (שְׁבַע מֵאוֹת)
800	*Tav Tav*	ת״ת	shmone meot (שְׁמוֹנָה מֵאוֹת)
900	*Tav Tav Kuf*	תת״ק	tsha' meot (תְּשַׁע מֵאוֹת)
11: ahad 'asar/ahat 'esre, 12: shneim asar/shteim esre, 13: shlosha asar/shlosh esre, 14: arba'a asar/arba' esre, 15: hamisha asar/hamesh esre, 16: shisha asar/shesh esre, 17: shiv'a asar/shva' esre, 18: shmona asar/shmone esre, 19: tish'a asar/tsha' esre			
1000: elef, 2000: alpaim, 10 000: 'aseret alafim/revava, 100 000: mea elef, 1 000 000: miliyon, 1 000 000 000: milliard, 1 000 000 000 000: trillion			

Note: For ordinal numbers greater than 10, cardinal numbers are used instead.

Speaking and writing

Cardinal and ordinal numbers must agree in gender (masculine or feminine; mixed groups are treated as masculine) with the noun they are describing. If there is no such noun (e.g. a telephone number or a house number in a street address), the feminine form is used. Ordinal numbers must also agree in number and definite status like other adjectives. The cardinal number precedes the noun (ex. shlosha yeladim), except for the number one which succeeds it (ex. yeled ehad). The number two is special - shnayim (m.) and shtayim (f.) become shney (m.) and shtey (f.) when followed by the noun they count. For ordinal numbers (numbers indicating position) greater than ten the cardinal is used.

Calculations

The Hebrew numeric system operates on the additive principle in which the numeric values of the letters are added together to form the total. For example, 177 is represented as קעז which corresponds to 100 + 70 + 7 = 177.

Mathematically, this type of system requires 27 letters (1-9, 10-90, 100-900). In practice the last letter, *tav* (which has the value 400) is used in combination with itself and/or other letters from *kof* (100) onwards, to generate numbers from 500 and above. Alternatively, the 22-letter Hebrew numeral set is sometimes extended to 27 by using 5 *sofit* (final) forms of the Hebrew letters.

Key exceptions

By convention, the numbers 15 and 16 are represented as 6 + 9) ט״ו) and 7 + 9) ט״ז), respectively. This is done in order to refrain from using the two-letter combinations י–5 + 10) ה) and י–6 + 10) ו) (which are alternate written forms for the Name of God) in everyday writing. In the calendar, this manifests every full moon, since all Hebrew months start on a new moon.

Combinations which would spell out words with negative connotations are sometimes avoided by switching the order of the letters. For instance, תשמ״ד (meaning "you/it will be destroyed") might instead be written as תשד״מ or תמש"ד (meaning "end to demon").

Gershayim

Gershayim (U+05F4 in Unicode, and resembling a double quote mark) (sometimes erroneously referred to as *merkha'ot*, which is Hebrew for double quote) are inserted before (to the right of) the last (leftmost) letter to indicate that the sequence of letters represents a number rather than a word. This is used in the case where a number is represented by two or more Hebrew numerals (*e.g.,* 28 → כ״ח).

Similarly, a single Geresh (U+05F3 in Unicode, and resembling a single quote mark) is appended after (to the left of) a single letter to indicate that the letter represents a number rather than a (one-letter) word. This is used in the case where a number is represented by a single Hebrew numeral (*e.g.,* 100 → ק׳).

Note that Geresh and Gershayim merely indicate "*not a (normal) word.*" Context usually determines whether they indicate a number or something else (such as "*abbreviation*").

Decimals

In print, Hindu-Arabic numerals are employed in Modern Hebrew for most purposes. Hebrew numerals are used nowadays primarily for writing the days and years of the Hebrew calendar; for references to traditional Jewish texts (particularly for Biblical chapter and verse and for Talmudic folios); for bulleted or numbered lists (similar to *A*, *B*, *C*, *etc.*, in English); and in numerology (gematria).

Thousands and date formats

Thousands are counted separately, and the thousands count precedes the rest of the number (to the *right*, since Hebrew is read from right to left). There are no special marks to signify that the “count” is starting over with thousands, which can theoretically lead to ambiguity, although a single quote mark is sometimes used after the letter. When specifying years of the Hebrew calendar in the present millennium, writers usually omit the thousands (which is presently 5 [ה]), but if they do not this is accepted to mean 5 * 1000, with no ambiguity. The current Israeli coinage includes the thousands.Wikipedia:Please clarify

Date examples

“Monday, 15 Adar 5764” (where 5764 = 5(×1000) + 400 + 300 + 60 + 4, and 15 = 9 + 6):

In full (with thousands): “Monday, 15(th) of Adar, 5764”

יום שני ט״ו באדר ה׳תשס״ד

Common usage (omitting thousands): “Monday, 15(th) of Adar, (5)764”

יום שני ט״ו באדר תשס״ד

“Thursday, 3 Nisan 5767” (where 5767 = 5(×1000) + 400 + 300 + 60 + 7):

In full (with thousands): “Thursday, 3(rd) of Nisan, 5767”

יום חמישי ג׳ בניסן ה׳תשס״ז

Common usage (omitting thousands): “Thursday, 3(rd) of Nisan, (5)767”

יום חמישי ג׳ בניסן תשס״ז

To see how *today's* date in the Hebrew calendar is written, see, for example, Hebcal date converter [1].

Recent years

5780 (2019–20) = תש״פ

5779 (2018–19) = תשע״ט

...

5772 (2011–12) = תשע״ב

5771 (2010–11) = תשע״א

5770 (2009–10) = תש״ע

5769 (2008–09) = תשס״ט

...

5761 (2000–01) = תשס״א

5760 (1999–00) = תש״ס

Similar systems

The Abjad numerals are equivalent to the Hebrew numerals up to 400. The Greek numerals differ from the Hebrew ones from 90 upwards because in the Greek alphabet there is no equivalent for *Tsadi* (צ).

External links

- Gesenius' Hebrew Grammar, §97, §98, §134
- Gematria Chart on inner.org [2]

References

[1] http://www.hebcal.com/converter/

[2] http://www.inner.org/gematria/gemchart

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