List of numeral systems

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See also: List of types of numbers

This is a **list of numeral systems**, that is, writing systems for expressing numbers.

Contents [hide]

By culture / time period [edit]

Numeral systems

0123456789
٠١٢٣٤٥٦٧٨٩
I II III IV V VI VII VIII IX X
০১২৩৪৫৬৭৮৯
൦൧൨൩൪൫൬൭൮൯
〇一二三四五六七八九

Hindu–Arabic numeral system

Western Arabic · Eastern Arabic
Bengali · Gurmukhi · Indian · Sinhala · Tamil
Balinese · Burmese · Dzongkha · Gujarati ·
Javanese · Khmer · Lao · Mongolian · Thai

East Asian

Chinese (Suzhou) · Hokkien · Japanese ·
Korean · Vietnamese
Counting rods

Alphabetic

Abjad · Armenian · Āryabhaṭa · Cyrillic · Ge'ez ·
Georgian · Greek · Hebrew · Roman

Former

Aegean · Attic · Babylonian · Brahmi · Chuvash
· Egyptian · Etruscan · Inuit · Kharosthi · Mayan
· Muisca · Quipu
Prehistoric

Positional systems by base

2 · 3 · 4 · 5 · 6 · 8 · 10 · 12 · 16 · 20 · 60

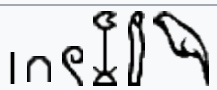
Non-standard positional numeral systems

Bijective numeration (1) ·
Signed-digit representation (Balanced ternary) ·
factorial · negative · Complex-base system (2*i*) ·
Non-integer representation (φ) · mixed ·
Asymmetric numeral systems

List of numeral systems

V · T · E

Name	Base	Sample	Approx. first appearance

Prehistoric numerals			35,000 BC
Babylonian numerals	60	𒐕 𒐖 𒐗 𒐘 𒐙 𒐚 𒐛 𒐜 𒐝 𒐞	3100 BC
Egyptian numerals	10	 or 	3000 BC
Aegean numerals	10		c1500 BC
Chinese numerals , Japanese numerals , Korean numerals (Sino-Korean)	10	〇/零 一/壹 二/貳 三/叁 四/肆 五/伍 六/陸 七/柒 八/捌 九/玖 十/拾	
Roman numerals	10	I II III IV V VI VII VIII IX X L C D M	1000 BC
Hebrew numerals	10	א ב ג ד ה ו ז ח ט י כ ל מ נ ס ע פ צ	800 BC
Indian Numerals	10	Tamil Devanagari 0	750 BC – 690 BC
Greek numerals	10	ō α β γ δ ε ϝ ζ η θ ι ο Α′ Β′ Γ′ Δ′ Ε′ Ϛ′ Ζ′ Η′ Θ′	Before 5th century BC
Ge'ez numerals	-	፩ ፪ ፫ ፬ ፭ ፮ ፯ ፰ ፱ ፲ ፳ ፴ ፵ ፶ ፷ ፸ ፹ ፺	very old
Chinese rod numerals	10		1st century
Phoenician numerals	10	[1]	Before 250 AD[2]
Thai numerals	10	๐ ๑ ๒ ๓ ๔ ๕ ๖ ๗ ๘ ๙	7th century [3]
Abjad numerals	10	غ ظ ض ذ خ ث ت ش ر ق ص ف ع س ن م ل ك ي ط ح ز و ه د ا ب ج	before 8th century
Eastern Arabic numerals	10	٠ ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩	8th century
Western Arabic numerals	10	0 1 2 3 4 5 6 7 8 9	9th century
Burmese numerals	10		11th century [4]
Maya numerals	20		<15th century

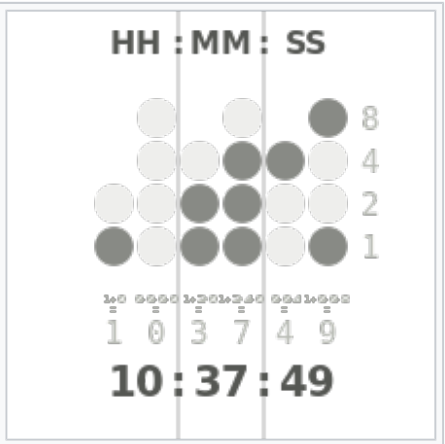
Muisca numerals	20		<15th century
Aztec numerals	20		16th century
John Napier 's Location arithmetic	2	a b ab c ac bc abc d ad bd abd cd acd bcd abcd	1617 in Rabdology , a non-positional binary system

By type of notation [edit]

Numeral systems are classified here as to whether they use positional notation (also known as place-value notation), and further categorized by radix or base.

Standard positional numeral systems [edit]

The common names are derived somewhat arbitrarily from a mix of Latin and Greek , in some cases including roots from both languages within a single name.[5] There have been some proposals for standardisation.[6]



A binary clock might use LEDs to express binary values. In this clock, each column of LEDs shows a binary-coded decimal numeral of the traditional sexagesimal time.

Base	Name	Usage
2	Binary	Digital computing
3	Ternary	Cantor set (all points in [0,1] that *can* be represented in ternary with no 1s); counting Tasbih in Islam ; hand-foot-yard and teaspoon-tablespoon-shot measurement systems; most *economical* integer base
4	Quaternary	Data transmission and Hilbert curves ; Chumashan languages , and Kharosthi numerals
5	Quinary	Gumatj , Nunggubuyu , Kuurn Kopan Noot , and Saraveca languages; common count grouping e.g. tally marks
6	Senary	Diceware , Ndom , Kanum , and Proto-Uralic language (suspected)

7	Septenary	weeks timekeeping
8	Octal	Charles XII of Sweden , Unix-like permissions , Squawk codes , DEC PDP-11, compact notation for binary numbers, Xiantian (I Ching , China)
9	Nonary	Base9 encoding
10	Decimal	Most widely used by modern civilizations [7][8][9]
11	Undecimal	Jokingly proposed during the French Revolution to settle a dispute between those proposing a shift to duodecimal and those who were content with decimal; check digits in ISBN
12	Duodecimal	Languages in the Nigerian Middle Belt Janji , Gbiri-Niragu , Piti, and the Nimbia dialect of Gwandara ; Chepang language of Nepal , and the Mahl dialect of Maldivian ; dozen -gross -great gross counting; 12-hour clock and months timekeeping; years of Chinese zodiac ; foot and inch ; Telephone number
13	Tridecimal	Conway base 13 function
14	Tetradecimal	Programming for the HP 9100A/B calculator [10] and image processing applications[11]; pound and stone
15	Pentadecimal	Telephony routing over IP, and the Huli language
16	Hexadecimal	Base16 encoding; compact notation for binary data ; tonal system ; ounce and pound
18	Octodecimal	Base18 encoding
20	Vigesimal	Basque , Celtic , Maya , Muisca , Inuit, Yoruba , Tlingit, and Dzongkha numerals; Santali , and Ainu languages
23	Trivigesimal	Kalam language , Kobon language
24	Tetravigesimal	24-hour clock timekeeping; Kaugel language
26	Hexavigesimal	Base 26 encoding; sometimes used for encryption or ciphering. [12]
27	Heptavigesimal	Telefol and Oksapmin languages. Mapping the nonzero digits to the alphabet and zero to the space is occasionally used to provide checksums for alphabetic data such as personal names, [13] to provide a concise encoding of alphabetic strings,[14] or as the basis for a form of gematria .[15]
30	Trigesimal	The Natural Area Code
32	Duotrigesimal	Base32 encoding and the Ngiti language
33	Tritrigesimal	Use of letters (except I, O, Q) with digits in vehicle registration plates of Hong Kong
36	Hexatrigesimal	Base36 encoding; use of letters with digits
40	Quadragesimal	DEC Radix-50 8 encoding used to compactly represent file names and other symbols on Digital Equipment Corporation computers. The character set is a subset of ASCII consisting of space, upper case letters, the punctuation marks “$”, “.”, and “%”, and the numerals.
52	Duoquinquagesimal	Base52 encoding, a variant of Base62 without vowels [16]

56	Hexaquinquagesimal	Base56 encoding, a variant of Base58 [17]
57	Heptaquinquagesimal	Base57 encoding, a variant of Base62 excluding I, O, l, U, and u [18]
58	Octoquinquagesimal	Base58 encoding
60	Sexagesimal	Babylonian numerals ; NewBase60 encoding, similar to Base62, excluding I, O, and l, but including _(underscore);[19] degrees -minutes-seconds and hours -minutes -seconds measurement systems; Ekari and Sumerian languages
61	Unsexagesimal	NewBase61 encoding, variant of NewBase60 with a space [20]
62	Duosexagesimal	Base62 encoding, using 0-9, A-Z, and a-z
64	Tetrasexagesimal	Base64 encoding; I Ching in China
85	Pentoctogesimal	Ascii85 encoding. This is the minimum number of characters needed to encode a 32 bit number into 5 printable characters in a process similar to MIME-64 encoding, since 85^5 is only slightly bigger than 2^{32}. Such method is 6.7% more efficient than MIME-64 which encodes a 24 bit number into 4 printable characters.
91	Unnonagesimal	Base91 encoding, using all ASCII except "-" (0x2D), "\" (0x5C), and "" (0x27); one variant uses "\" (0x5C) in place of "" (0x22).
92	Duononagesimal	Base92 encoding, using all of ASCII except for "`" (0x60) and "" (0x22) due to confusability.[21]
93	Trinonagesimal	Base93 encoding, using all of ASCII printable characters except for "," (0x27) and "-" (0x3D) as well as the Space character. "," is reserved for delimiter and "-" is reserved for negation.[22]
94	Tetranonagesimal	Base94 encoding, using all of ASCII printable characters. [23]
95	Pentanonagesimal	Base95 encoding, a variant of Base94 with the addition of the Space character.[24]

Non-standard positional numeral systems [edit]

Bijective numeration [edit]

Base	Name	Usage
1	Unary (Bijective base-1)	Tally marks
10	Bijective base-10	
26	Bijective base-26	Spreadsheet column numeration. Also used by John Nash as part of his obsession with numerology and the uncovering of "hidden" messages. [25]

Signed-digit representation [edit]

Base	Name	Usage

2	Balanced binary (Non-adjacent form)	
3	Balanced ternary	Ternary computers
5	Balanced quinary	
9	Balanced nonary	
10	Balanced decimal	John Colson Augustin Cauchy

Negative bases [edit]

The common names of the negative base numeral systems are formed using the prefix *nega-*, giving names such as:

Base	Name	Usage
−2	Negabinary	
−3	Negaternary	
−10	Negadecimal	

Complex bases [edit]

Base	Name	Usage
2*i*	Quater-imaginary base	
$-1 \pm i$	Twindragon base	Twindragon fractal shape

Non-integer bases [edit]

Base	Name	Usage
φ	Golden ratio base	Early Beta encoder [26]
e	Base □	Lowest radix economy

Other [edit]

- Mixed radix
- Quote notation
- Redundant binary representation
- hereditary base-n notation
- Asymmetric numeral systems optimized for non-uniform probability distribution of symbols

Non-positional notation [edit]

All known numeral systems developed before the Babylonian numerals are non-positional. [27]

See also [edit]

- List of numbers in various languages (cardinal number names)
- List of numeral system topics
- Numeral prefix

- Radix
- Radix economy
- Table of bases

References [edit]

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Categories: Numeral systems