Numeral systems. Transfer numeral from one numeral system to another. Arithmetic in the numeral systems.

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Numeral system

(or system of numeration) is a writing system for expressing numbers; that is, a mathematical notation for representing numbers of a given set, using digits or other symbols in a consistent manner

The number the numeral represents is called its value.

- Ideally, a numeral system will:
- Represent a useful set of numbers (e.g. all integers, or rational numbers)
- Give every number represented a unique representation (or at least a standard representation)
- Reflect the algebraic and arithmetic structure of the numbers

Main numeral systems

The most commonly used system of numerals is the Hindu–Arabic numeral system. Two Indian mathematicians are credited with developing it. Aryabhata of Kusumapura developed the place-value notation in the 5th century and a century later Brahmagupta introduced the symbol for zero.

Decimal Numbers

- Decimal numbers (base 10)
 - Represented using 10 numerals: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
- Each position represents a power of 10:
 - \circ 401= 4*102+ 0*101 + 1*100 = 400+ 1
 - \circ 130= 1*102 + 3*101+0*100 = 100 + 30
 - 9786= 9*103 + 7*102 + 8*101 + 6*100=
 - = 9*1000 + 7*100 + 8*10 + 6*1

Binary Numeral System

- Binary numbers are represented by sequence of bits (smallest unit of information – 0 or 1)
 - Bits are easy to represent in electronics
- 1 0 0 1 0 0 1 0
- 1 0 0 1 0 0 1 1
- 1 0 1 1 0 0 1 0

Binary Numbers

- Binary numbers (base 2)
 - Represented by 2numerals: 0and 1
- Each position represents a power of 2:
 - \circ 101b= 1*22 + 0*21 + 1*20 = 100b + 1b = 4+1= 5
 - 110b = 1*22 + 1*21 + 0*20 = 100b + 10b = 4+2=6
 - ∘ 110101b= 1*25 + 1*24 + 0*23 + 1*22 + 0*21+ 1*20=
- = 32 + 16 + 4 + 1 = 53

How ComputersRepresent Text Data?

- A text encoding is a system that uses binary numbers (1 and 0) torepresent characters
 - Letters, numerals, etc.
- In the ASCII encoding each character consists of 8 bits (one byte) of data
 - ASCII is used in nearly all personal computers
- In the Unicode(UTF-16) encoding each character consists of 16 bits (two bytes)
 - Can represent many alphabets

