

## Number Systems

### Decimal System

- Decimal number system has 10 symbols and uses a "positional" weightage to represent larger numbers.

For ex:

$$\begin{array}{r} 852 = 800 + 50 + 2 \\ \begin{array}{ccc} / & / & \backslash \\ 10^2 & 10^1 & 10^0 \end{array} \end{array}$$

- The position has a weightage of "powers of 10". People

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- The position based with the introduction of the symbol for "Nothing", "Blank space" - namely zero ('0') made the system simpler and versatile.

- The decimal numerals may have originated in China around 1200 BC.

- However, the usage of "zero" was first used in a manuscript on mathematics called "Brahmasputa Siddhanta" by Aryabhata in ~~the~~ <sup>628</sup> AD. (but it was in usage <sup>much</sup> earlier)

"born" into decimal system can do the arithmetic "mentally" to get a feel for the larger numbers!

- Let us consider

$$506 \Rightarrow 5 \times 10^2 + 0 \times 10^1 + 6 \times 10^0$$

- Position based system have existed in various early civilizations
  - Sumerian/Babylonian (Middle East) (ca 5000 BC / 2000 BC, Base 60)
  - Aztec / Mayan (South America) (ca 2000 BC, Base 20)

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- The decimal system was introduced in the Middle East by Al-Khwarizmi in his book on "Calculation with Hindu Numerals" around 825 AD.

- The decimal system was introduced by Leonardo Fibonacci to Europe in his book "Liber Abaci - Modus Indorum" (Book of Calculation - Method of Indians) around 1200 AD.

- Note: The term for "Zero" in Sanskrit is "kha" or "shunya" which literally means "empty space".

### Egyptian Numerals

- developed around 3000 BC.
- The "numeral hieroglyphs" or "numeric symbols" are as below:

1	10	100	1000	10000	100000	1,000,000

- For 1 to 9 the symbol '1' is repeated as required.

- Examples:

276	⇒	
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The digits can be written left to right, right to left or even vertically.

### Home work - "Life span of the Universe"

As per Indian Astrology the life span of the universe is 100 divine years; where,

1 divine year = 360 divine days (Kalpa)

1 divine day = 14 Manus (Manvantara)

1 Manu = 71 Great Epochs

(Maha yuga(s))

1 Great Epoch consists of

Epoch 1 - 4x years

Epoch 2 - 3x years

Epoch 3 - 2x years

Epoch 4 - x years

Where x = 432,000 years!

### Mayan Numerals

- Earliest date is 32 BC, but inherited from 'Olmec' which is much older civilization.

- Base 20, numerals are

0	5	10	15
1	6	11	16
2	7	12	17
3	8	13	18
4	9	14	19

- Examples

20 <sup>2</sup> (400)	33	429	5125
20 <sup>1</sup> (20)			
20 <sup>0</sup> (1)			

- Numbers are written vertically.
- Zero was not explicitly used as a part of arithmetic!!

- There is a gap of Epoch 1 years between each of the 14 Manus (that is, a total of 15 gaps)

Calculate (in years)

(1) Span of Epochs 1, 2, 3 & 4

(2) Span of 1 divine day

(3) span of 1 divine year

(4) Life of the universe!

Notes:

- 1 divine year = 360 divine days + nights
- We are presently in 51<sup>st</sup> divine year (Kalpa), 1<sup>st</sup> divine day, 7<sup>th</sup> Manu, 28<sup>th</sup> Great Epoch and Epoch 4.
- Epoch 4 started approx. 10,000 years back!!