Seminar on Vedic Mathematics

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Ancient Indian Mathematics

- Sulba Sutras (700 BC) – rational approximation to $\sqrt{2}$, proof to Pythagoras theorem etc.
- Pingala's Chandas (300 BC) – combinatorics
- Jain Mathematicians (300 BC) – concept of infinity and zero (shunya)
- Classical period (400 AD – 1600 AD)
  - Aryabhata – sine table, trigonometry, π
  - Brahmagupta – cyclic quadrilateral, indeterm Equ.
  - Bhaskara II – *Lilavati, Bijaganita*
  - Madhava – infinite series for π
- Excellent source : Wikipedia (Indian Mathematics)

Vedic Mathematics

- What is Vedic Mathematics?
  - "Vedic Mathematics" is the name given to a work in Indian Mathematics by Sri Bharati Krsna Tirthaji (1884-1960). Vedic Math is based on sixteen Sutras or principles
- What it is not?
  - It is not from the Vedas
  - It is not ancient
- Why Vedic Mathematics?
  - Gives an insight into the structure of numbers
  - Very much amenable to mental calculations

Decimal Number System in Ancient India

- The decimal number system – representing numbers in base 10, was a contribution to the world by Indians
- The Place Value System was also a contribution of India

Name	Value	Name	Value
Eka	10^0	Arbudam	10^7
Dasa	10^1	Nyarbudam	10^8
Shatam	10^2	Samudra	10^9
Sahasram	10^3	Madhyam	10^{10}
Ayutam	10^4	Anta	10^{11}
Niyutam	10^5	Parardha	10^{12}
Prayutam	10^6		

Maths in day-to-day life of a vendor in India

1	11	21	31	41
2	12	22	32	42
3	13	23	33	43
4	14	24	34	44
5	15	25	35	45
6	16	26	36	46
7	17	27	37	47
8	18	28	38	48
9	19	29	39	49
10	20	30	40	50

- You buy some stuff from a vendor for Rs 23
- You pay a 50-rupee note
- He pays you back
  - A 2-rupee note
  - A 5-rupee note
  - A 20-rupee note
- In that order!!

It is the reverse when you input the numbers into a machine!

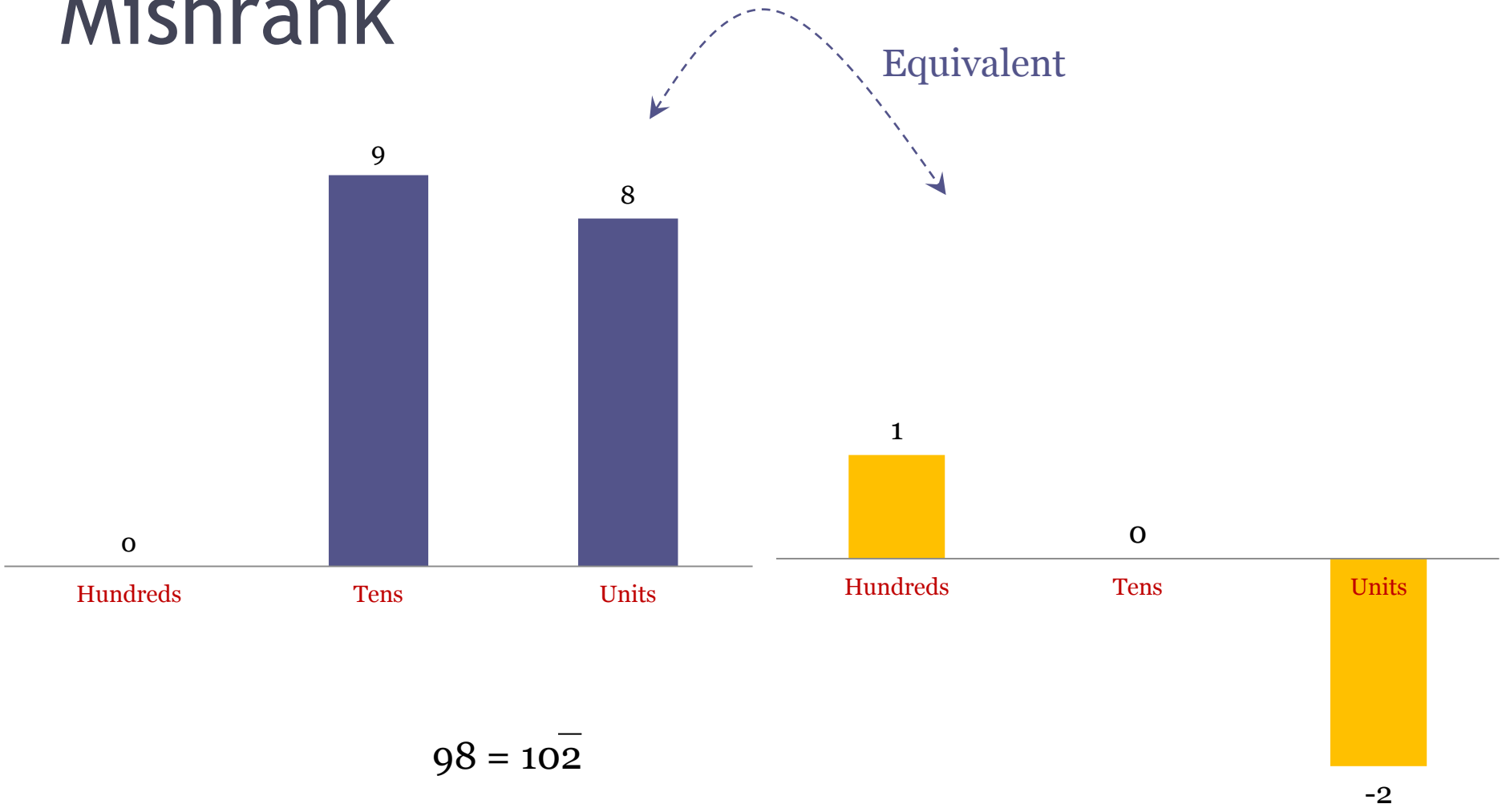
Complementary Arithmetic

- 100's complement of 64 = 36
  (All from 9, last from 10)

Use of Complementary Arithmetic

- Computer Systems use 2's complement as a way to *represent* negative numbers!
  - Make use of binary numbers, hence base = 2
- In decimal number systems too, complement numbers can be used to represent negative numbers
- Forms the **heart** of Vedic Math Techniques!
- EXAMPLE
  - 96 x 4
  - $10\bar{4} \times 4 = 4\bar{1}6 = 384$

Mishrānk



$$98 = 10\overline{2}$$

Polynomial representation

- Consider the number 36428
  - $3 \times 10^4 + 6 \times 10^3 + 4 \times 10^2 + 2 \times 10 + 8$
- 10 → x (replacing the base with variable x)
  - $3x^4 + 6x^3 + 4x^2 + 2x + 8$
- Every number can be represented as a polynomial in the base of the system
- Useful to use algebra to explain some of the working methods of techniques