L14 — 26/09/2024

Jain Mathematics

According to Prof. Iyengar, Math was an integral part of Jainism.

- A section of their literature is called 'Ganitanuyoga' which is a system of calculations.

- Mahavir (24th Tirthankar) ~ 600 BCE was well-versed in Math.

- Not much is known about Math in the original Jain texts & is a topic for search-research.

- Current knowledge is based on commentaries.

Mathematically significant Jain texts

1. Surya prajyapati   ~ 500 BCE
2. Jambudweep prajyapati   ~ 500 BCE
3. Sthanang sutra   ~ 300 BCE
4. Uttaradhyaman sutra
5. Bhagwati sutra
6. Anuyog dwar sutra   ~ 300 BCE

Authors

1. <u>Bhadrabahu</u>
   - Born in Magadha
   - Moved to Shravanbedgoda ~ 313 BCE
   - Commentary on Surya prajyapati
   - Astronomical work Bhadrabahu samhita

2. <u>Umaswati</u>
   - Born in Nyogrodhika ~ 150 BCE
   - Moved to Kusumapura ←
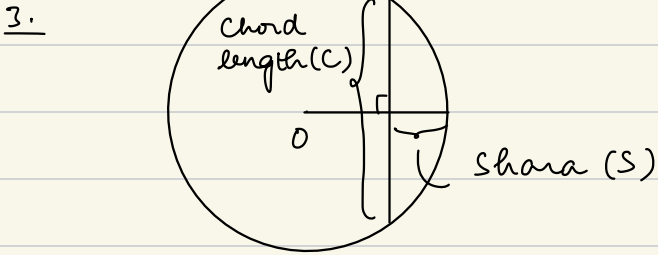   - Known more on his work on Jain metaphysics.

   (Aryabhatta was also here ~ 476AD)

- Prof. Iyengar concludes that the Math in his work were taken from other texts from the times.

<u>Samples from Jain Math</u>

1. Circumference of Circle $= \sqrt{10} \times$ Diameter

2. Area of circle $= \frac{1}{4}$ Circumference $\times$ Diameter

3.

Chord length (C)

O

Shara (S)

$$C = \sqrt{4\ S(D-S)}$$

↳ Diameter

4. $$S = D - \sqrt{D^2 - C^2/4}$$
$$S = \frac{1}{2}\left(D - \sqrt{D^2 - C^2}\right)$$

5. Area of segment $= \sqrt{6S^2 + C^2}$
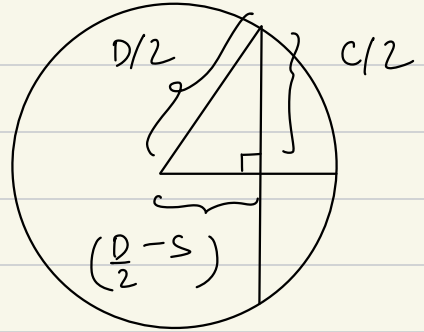
6. $D^2 = S^2 + C^2/4$

Pf (3,4,6)

$(D/2)^2 = (C/2)^2 + (D/2 - S)^2$

$\Rightarrow \quad D^2 = C^2 + (D - 2S)^2$

$\Rightarrow \quad D^2 = C^2 + D^2 - 4DS + 4S^2$

$\Rightarrow \quad C = \sqrt{4S(D-S)}$

Context

- Surya prajyapati uses 2 approximations
  for π - 3 & $\sqrt{10}$.

- Circular model of Jambudweep (Earth)
  Diameter = 100,000 Yojana
  (1 Yojana ~ 3.5 to 15 km)

- Circumference = 316, 227 Yojana

- This led them to large nos. and to infinity.

- Types of Infinities
    - Samshriya (Enumerable)
    - Shrasamshriya (Unenumerable)
    - Shrananta (Infinite)