SANTOSH S DHAMONE
Mathematics Professor

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**My Inspiration
Late. Shivlal
Dhamone**

Subject Teacher
Santosh Dhamone

Lecture No. 2: Module 1: Arithmetic, Algebra and Combinatorics

Subject Teacher
Santosh Dhamone

Assistant Professor in Mathematics
Art's Commerce and Science College,Onde
Tal:- Vikramgad, Dist:- Palghar

ssdhamone@acscollegeonde.ac.in
www.santoshdhamone.com

July 5, 2025

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Introduction:

Indian mathematics is not only rich in concepts and applications but also in the linguistic and philosophical treatment of numbers. From the early Vedic texts to the classical works of Aryabhata, Mahaviracharya, and Bhaskaracharya, Indian mathematicians developed a profound understanding of numerals and place-value systems.
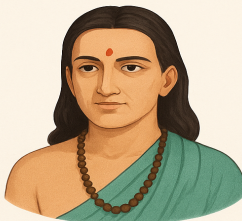
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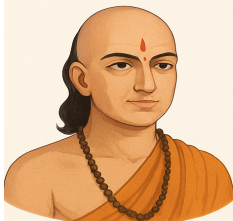

ARYABHATA
(c. 476–550)

Aryabhata was an ancien lin-
an mathematician and astronomer.
In his work 'Aryabhatiya,' he wrote
about mathematics, astronomy, and
the concept of zero. He introduced
the place value system in India and
made pioneering calculations of

MAHAVIRA
(c. 815–885)

Mahavira was an Indian mathe-
matician who made significant
contributions to algebra and
geometry. In his major work, 'Gan-
itasarasamgraha,' he presented
systematic rules for solving quad-
ratic, cubic, and quartic equations.
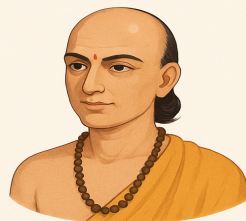
BHASKARACHARYA
(c. 1114–1185)

Bhaskaracharya was a talented
Indian mathematician and astrono-
mer. His renowned works. 'Siddhanta
Shiromani' and 'Lilavati,' cover topics
such as algebra, arithmetic, geomet-
try and planetary cnathematics. He
also made significant contributions

Terms for the multiples of ten like 10, 20, 30 etc. in Rigveda. Terms for the higher powers of 10, given by Aryabhat, Mahaviracharya and Bhaskaracharya :

Terms for Multiples of Ten in the Rigveda:

The **Rigveda** (composed around 1500 BCE) is one of the oldest known texts in human history and contains references to numbers and numerical systems. The Rigveda reveals that even during that early period, the decimal system and the concept of **multiples of 10** were already recognized and expressed using specific **Sanskrit terms**.

These terms show a clear decimal base and evidence of a place value system in its earliest form. Numbers were often used for describing sacrifices, poetic meters, and cosmological quantities.

Terms for Multiples of Ten:

Below is a list of common terms found in the Rigveda for decimal multiples:

Sanskrit Term	Modern Equivalent
Dasha	10
Dviṃshati	20
Triṃshat	30
Chatvāriṃshat	40
Pañchāśat	50
Shaṣṭi	60
Saptati	70
Aśīti	80
Navati	90
Shata	100

Higher Powers of Ten in Classical Indian Mathematics:

a) Aryabhata (476 CE): Aryabhata, in his work Aryabhatiya, made significant use of large numbers and had a keen understanding of the positional decimal system. He used names for powers of ten, suggesting a well-developed concept of very large numbers.

Powers of Ten and Terms (as inferred): Although Aryabhata didn't always name every power explicitly, his calculations and astronomical measurements involved extremely large numbers (such as the number of rotations of Earth).

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Higher Powers of Ten in Classical Indian Mathematics:

b) Mahaviracharya (9th century CE):

In his work **"Ganita Sara Sangraha"**, Mahaviracharya provided a clear and systematic list of terms for powers of ten, which demonstrates the advanced Indian system of naming large numbers.

Terms for Powers of Ten:

Power of 10	Sanskrit Term	Value
10^0	Eka	1
10^1	Dasha	10
10^2	Shata	100
10^3	Sahasra	1,000

Terms for Powers of Ten:

Power of 10	Sanskrit Term	Value
10^4	Ayuta	10,000
10^5	Laksha	100,000
10^6	Prayuta	1,000,000
10^7	Koti	10 million
10^8	Arbuda	100 million
10^9	Nyarbuda	1 billion
10^{10}	Samudra	10 billion
10^{11}	Madhya	100 billion
10^{12}	Antya	1 trillion
10^{13}	Parardha	10 trillion

These terms were used not only in mathematics but also in astronomy, cosmology and philosophy,

c) Bhaskaracharya (1114–1185 CE):

Bhaskaracharya, in his celebrated work Lilavati and Bijaganita, continued the tradition of large numbers and provided many examples of calculations involving high powers of ten.

He used the same terminology established by earlier mathematicians.

In Lilavati, Bhaskara uses poetic language to pose problems that include very large numbers.

The positional decimal numeral system (with a placeholder zero) was extensively applied.

Indian Mathematics

Philosophical Significance:

The use of large numbers also had philosophical implications in Indian thought. Concepts such as time cycles (Kalpas) and cosmic ages (Yugas) required numerical expression that went beyond the ordinary. The need for such vast numbers encouraged the development of precise terminology.

The Rigveda provides the earliest documented use of decimal-based number naming. This system was

significantly elaborated upon by later scholars like Aryabhata, Mahaviracharya, and Bhaskaracharya.

Their work laid the foundation for:

- Place-value system
- Decimal notation
- Use of zero
- Terminology for very large numbers

These contributions highlight the rich legacy of Indian mathematics, offering valuable insights into both scientific and linguistic innovations of ancient India.