

Aryabhata Biography, Contributions, Life History, Inventions

July 1, 2026 • vajiramandravi.com



Aryabhata (**476-550 CE**) is regarded as a pioneer of **mathematical astronomy** in ancient India whose work is available to modern scholars. His works include the **Aryabhatiya** and the **Arya Siddhanta**. Among other things, Aryabhata calculated the closest approximate **value of 'pi'** and he was the first to explain that the moon and planets shine due to reflected sunlight and made major contributions to the fields of trigonometry and algebra.

Aryabhata Early Life

Aryabhata (476-550 CE) was the first of the major mathematician-astronomers from the classical age of Indian mathematics and astronomy.

Aryabhata Education and Career

Aryabhata studied at Kusumapura (Patliputra) for advanced studies.

- Given that **Nalanda University** was located in Pataliputra and had an astronomical observatory, it is possible that Aryabhata was the head of Nalanda University at that time.

- Aryabhatta is also said to have established an observatory at the Sun Temple in Taregana, Bihar.

Literary Works of Aryabhatta

Aryabhatta wrote several treatises on mathematics and astronomy, some of which have since been lost.

- **Aryabhatiya (5th century AD): It is a detailed text on mathematics and astronomy.**
- The **mathematical part of the Aryabhatiya covers** arithmetic, algebra, plane trigonometry, spherical trigonometry, fractions, quadratic equations, sums-of-power series, and a table of sines.
- **Khagol-shastra:** The part of Aryabhatiya which deals with astronomy is known as Khagol-shastra. Khagol was the famous astronomical observatory at Nalanda, where Aryabhatta studied.
- **Arya Siddhanta:** It deals with **astronomical calculation** and it contains a description of several astronomical instruments like:
 - The gnomon (shanku-yantra)
 - A shadow instrument (chhaya-yantra)
 - Semicircular and circular angle-measuring devices (dhanur-yantra/ chakra-yantra)
 - A cylindrical stick called the yastiyantira
 - An umbrella-shaped device (chhatra-yantra)
 - Bow-shaped as well as cylindrical water clocks

Aryabhatta Contribution in Astronomy

Aryabhatta's system of astronomy was called the audAyaka system (days are reckoned from uday, dawn at Lanka, equator).

- **Principle of Rotation:** The discovery, recorded in the Aryabhatiya, that the **Earth rotates around its own axis** from **west to east** is significant.
 - Aryabhatta also declared that the Earth rotates around the sun and the moon moves round the earth.
- **Eclipses:** In Aryabhatiya he introduces the **idea of shadows**, cast by and falling on earth, moon, and planets, and states that the lunar eclipse is caused by the entering of the moon into the earth's shadow.
 - Aryabhatta gives formulas for the length and diameter of the earth's shadow, the timing and duration of the eclipses, and or the size of the **eclipsed** part of the sun or moon.
- **Circumference of the Earth:** Aryabhatta also revealed that the **circumference of the Earth is 39,968km.**
 - It is 40,072 km according to modern scientific calculations.

Aryabhatta Contribution in Mathematics

A few of the Aryabhata's contributions to mathematics includes following:

- **Decimal places:** Aryabhatta invented the **decimal system** and **used zero as a placeholder.**
 - He names the first 10 decimal places and gives algorithms for obtaining square and cubic roots, using the decimal.

- **Value of 'pi':** He treats **geometric measurements** employing $62,832/20,000 (= 3.1416)$ for π , very close to the **actual value of 3.14159**.
 - Aryabhata's value of 'pi' is very close to the modern value and the most accurate among the ancients.
 - Furthermore, it is also considered that Aryabhata knew that the value of 'pi' is irrational.
- **Area of Triangle:** Aryabhata correctly calculated the areas of a triangle and of a circle.
 - For example, in **Ganitapadam**, he mentioned that "for a triangle, the result of a perpendicular with the half-side is the area."
- **Table of sines:** Using the **Pythagorean theorem**, he obtained one of the two methods for constructing his table of sines.
- **Other contributions:** Mathematical series, quadratic equations, compound interest (involving a quadratic equation), proportions (ratios), and the solution of various linear equations among the arithmetic and algebraic topics included.

Legacy of Aryabhata

The calendrical calculations introduced by Aryabhata and his followers have been in continuous use in India for the practical purposes of preparing the **Panchangam** (Hindu calendar).

- **Aryabhata Award: An annual award, instituted by the Astronautical Society of India.**
- The award is presented to individuals with notable lifetime contributions in the field of **astronautics and aerospace technology** in India.
- **India's first satellite Aryabhata** and the lunar crater Aryabhata were named to honour this great Indian scientist.
- **The Aryabhata Research Institute of Observational Sciences (ARIES)** as a centre for research and training in astrophysics, astronomy, and atmospheric sciences was set up near Nainital (Uttarakhand).
- **Bacillus Aryabhatai**, is a bacterial species discovered in 2009 by ISRO scientists.

Source: <https://vajiramandravi.com/upsc-exam/aryabhata/>

© Vajiram & Ravi. For personal use only.