

# Renowned Mathematicians of India

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India has a long-standing tradition of fundamental developments in Mathematics. A brief account is presented here, confined to the work of some famous mathematicians based on available references.

Studies indicate that the first use of mathematics in India was during the Indus Valley Civilisation. It was concerned mainly with weights and measures and a basic knowledge of geometry.

There were seven famous ancient mathematicians among whom Baudhyana is the best known. They formulated the four major Shulba Sutras or rules. One of the rules was later formulated by Pythagoras as a theorem.

In addition to advanced

geometry, they had simple ways of doing different mathematical operations. For example, to multiply a two-digit number by 11, say,  $45 \times 11$ , it can be calculated by writing down numbers 4 and 5 and inserting between them their sum: 4 (4+5) 5 or 495.

Another interesting rule was for calculating the square of two-digit numbers ending with five. For example, to find the square of 35 you write down 25 and before it, the product of  $3 \times 4$ . The result is 1225.

### Classic Period

The period between 400 CE and 1500 CE was the golden age of Indian Mathematics and was called the Classic Period. There were outstanding mathematicians such as Aryabhata, Varahamihira, Brahmagupta, Bhaskara I, Mahavira and Bhaskara II.

#### Aryabhata

Aryabhata was born in 476 CE in Patna, Bihar. Some say he was born in Kerala. He is famous for his work on lunar eclipse and solar eclipse, rotation of Earth on its axis, reflection of light by moon, value of pi correctly to 4 decimal places and calculating the circumference of Earth with 99.8 per cent accuracy. He wrote the famous *Aryabhatiya* when he was just 23 years old.

#### Varahamihira

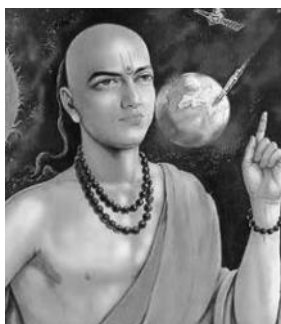
He was born in the 6th century CE in Ujjain. Varahamihira's most

notable works were *Panchasiddhantika* and *Brihat Samhita*. He improved the accuracy of the sine tables of Aryabhata. He was among the first mathematicians to discover a version of what is now known as the Pascal's triangle and binomial coefficients. He invented the first known 4x4 magic square.

#### Brahmagupta

Brahmagupta was born in 598 CE in Ujjain. His book *Brahmasphutasiddhanta* is the first text that mentions zero as a number. He gave many algebraic and arithmetic concepts and formulae.

Brahmagupta advocated observation and use of instruments. He dedicated an entire chapter to *yantras*, or simple devices to observe the sky. He explained negative numbers and their properties.



Aryabhata



Varahamihira



Brahmagupta



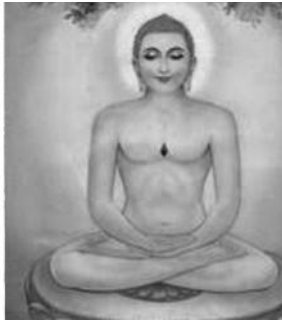
**Bhaskara I**

**Bhaskara I**

He was born in Parbhani district, Maharashtra in the 7th century CE. He was the first to write Hindu-Arabic numerals and zero with a circle. He gave a unique and remarkable rational approximation of the sine function in his commentary on Aryabhata's work, *Aryabhatiyabhashya*, written in 629 CE. It is among the oldest known prose works in Sanskrit on mathematics and astronomy. He also wrote *Mahabhaskariya* and *Laghubhaskariya*.

**Mahavira**

He was a Jain Mathematician born in Gulbarga, Karnataka. His work was *Ganithasarasangraha*. The work comprises more than 1,130 versified rules and examples divided in nine chapters on basic operations, reductions of fractions, and problems involving a linear or quadratic equation with one



**Mahavira**

unknown. He devised a formula for the area and perimeters of ellipses and found methods to calculate the square and cube roots of a number.

**Bhaskara II**

Bhaskara II was born in 1114 CE in Bijapur, Karnataka. He is known as the greatest mathematician of medieval India. His work *Siddhanta Shiromani* has laid the foundations for many theories in arithmetic, algebra, mathematics of the planets, and spheres. He conceived differential coefficient and differential calculus, way before Newton and Leibniz. He also wrote a treatise named *Karana Kautuhala*.

**Modern Era**

There are outstanding contributions to mathematics, during the last century, by scholars such as P C Mahalanobis, Narendra Karmarkar, D R Kaprekar, Harish Chandra, C R Rao, C S Seshadri,



**Bhaskara II**

Hemachandra and C P Ramanujan. Well-known women mathematicians include T. A. Sarasvati Amma, Vasanti N. Bhat-Nayak, Ushadevi Bhosle, Vyjayanthi Chari, Nilanjana Datta, Shakuntala Devi, and many, many more.

#### **Srinivasa Ramanujan**

Srinivasa Ramanujan was born on December 22, 1887 in Tamil Nadu. He is one of the most recognised Indian mathematicians although he had almost no formal training in pure mathematics. He sent a set of 120 Theorems to Prof. Hardy at Cambridge University and was invited to work there. He is known for mathematical analysis, number theory, infinite series, and continued fractions.



**Srinivasa Ramanujan**



#### **Shakuntala Devi**

Shakuntala Devi was known as the human computer. In Dallas, USA, she calculated the cube root of 188138517 faster than a computer. She also competed against a UNIVAC, then the world's fastest computer to solve the 23rd root of a 201-digit number and won. She had outstanding talent and set world records.

#### **Satyendra Nath Bose**

Satyendra Nath Bose was born on January 1, 1894 in Kolkata. He was a theoretical physicist, known for his work on quantum mechanics in the early 1920s, providing the foundation for Bose-Einstein statistics and the theory of the Bose-Einstein condensate. He was awarded the Padma Vibhushan in 1954. The class of particles that obey Bose-Einstein statistics are called Bosons. ●