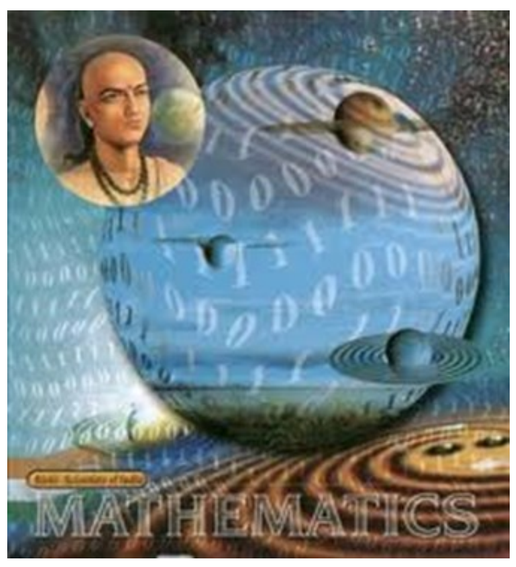
INDIA'S CONTRIBUTION TO MATHEMATICS

The earliest traces of mathematical knowledge in the Indian subcontinent appear with the Indus Valley Civilization (c. 4th millennium BC ~ c. 3rd millennium BC). They designed a ruler—the *Mohenjo-daro ruler*—whose unit of length (approximately 1.32 inches or 3.4 centimetres) was divided into ten equal parts.This shows that the maths was quite advanced even at that time but later on the inventions of some mathematicians revolutionized the world.



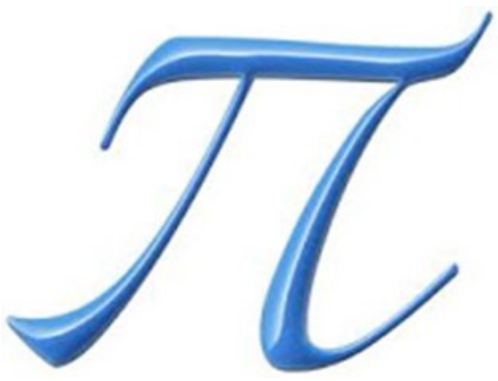
The decimal number system and the place value system in use today was first recorded in Indian mathematics. The concept itself was one of the most significant inventions in the ascent of Man for the growth of culture and civilization. To it must be credited the enormous usefulness of its counterpart, the place value system of expressing all numbers with just ten symbols. And to these two concepts we owe all the arithmetic and mathematics based upon them, the great ease which it has lent to all computations for two millennia and the binary system which now lies at the foundation of communicating with computers.

Already in the first three centuries A.D... The Hindu ancients were using a decimal positional system, that is, a system in which numerals in different positions represent different numbers and in which one of the ten symbols used was a fully functional zero. They called it 'Sunya'. The word and its meaning 'void' were obviously borrowed from its use in philosophical literature. Though the Babylonians used a special symbol for zero as early as the 3rd century B.C. , they used it only as a place holder; they did not have the concept of zero as an actual value. It appears the Maya civilization of South America had a zero in the first century A.D but they did not use it in a fixed base system. The Greeks were hampered by their use of letters for the numbers.

Before zero was invented, the art of reckoning remained an exclusive and highly skilled profession. It was difficult to distinguish, say, 27, 207, 270, 2007, because the latter three were all written 2 7, with a 'space' in between. The positional system is not possible in the Roman numeral system which had no expression or symbol for zero. A number, say, 101,000, would have to be written only by 101 consecutive M's. The Egyptians had no zero and never reached the idea of expressing all numbers with ten digits.

INDIA'S CONTRIBUTION TO MATHEMATICS

2. Value of PI



The value of pi was first calculated by Budhayana, & he explained the concept of what is now known as the Pythagorean Theorem. British scholars had in the year (1999) officially published that Budhayan's works date back to the 8th Century BC, which is long before the European mathematicians like Pythagoras.

3. Algebra

In ancient India conventional mathematics termed Ganitam was known before the development of algebra. This is borne out by the name - Bijaganitam, which was given to the algebraic form of computation the inference that Bijaganitam was the original form of computation is derived. Credence is lent to this view by the existence of mathematics in the Vedic literature which was also shorthand method of computation. It is certain that this technique of

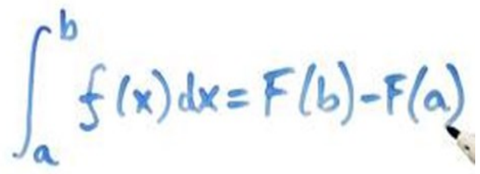
Aryabhatta has referred to Bijaganitam in his treatise on Mathematics, Aryabhattiya. An Indian mathematician - astronomer, Bhaskaracharya has also authored a treatise which is dated around the 12th century A.D. is entitled 'Siddhanta-Shiromani' of which one section is entitled Bijaganitam.

4. Geometry

Even in the area of Geometry, Indian mathematicians had their contribution. There was an area of mathematical applications called **Rekha Ganita (Line Computation**).

The Sulva Sutras, which literally mean 'Rule of the Chord' give geometrical

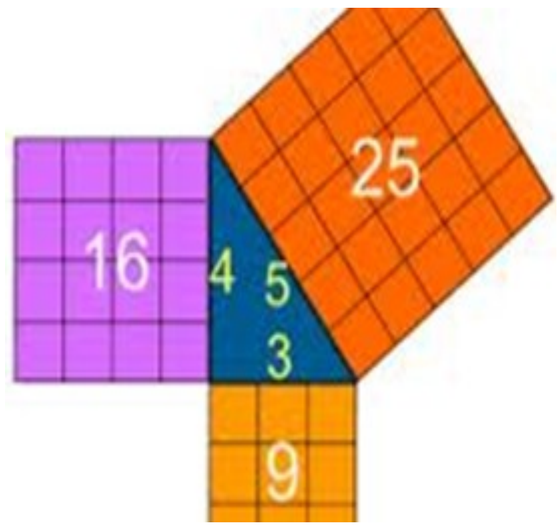
5. Calculus



Calculus, an Indian invention, was picked up by the Jesuit priests from Kerala in the second half of the 16th century and taken to Europe. This is how the Westerners got their calculus. Over time, people forgot this link and the Europeans began to claim calculus as their own invention. This myth still persists despite calculus texts existing in India since thousands of years.

INDIA'S CONTRIBUTION TO MATHEMATICS

6. Pythagoras Theorem/Geometry



The famous Pythagoras theorem is explained several centuries before in the **shulva sutras** of the Vedas. It is believed that the much travelled **Pythagoras** was a student at the **Takshashila University** in undivided India and he carried with him the knowledge of mathematics to the west-

7. The Largest Number

The largest numbers the Greeks and the Romans used were 10**6(10 to the power of 6) whereas Hindus used numbers as big as 10**53(10 to the power of 53) with specific names as early as 5000 BCE during the Vedic period Even today, the largest number used in general is Peta 10**15(10 to the power of 15)

8. Astronomy

The contribution to Astronomy by ancient Indians is so great that it does not befit it to include it as one of the contributions of Indian Mathematics to the rest of the world. It needs a separate forum all for itself. We shall leave it right there except to add a note on the ancient contribution to the problem of telling time at night by a look at the stars on the meridian. This part is usually not emphasized.

The ancients of India have passed on to us 27 mathematical formulae coded in the Sanskrit language, but not very difficult to remember. In fact, very possibly it has mostly come down to us by oral transmission from generation to generation. For instance, the formula.

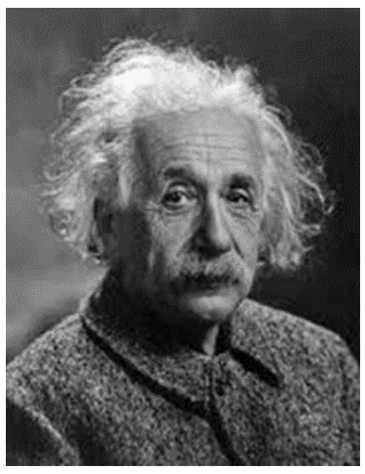
9. Srinivasa Ramanujan

The second decade of the 20th century compulsorily turned the attention of the mathematical world to India and the Number Theory genius, Srinivasa Ramanujan. The ideas and innovative genius of Ramanujan have not been surpassed ever before or even 100 years after him. His birth, his super-activity in Madras and Cambridge, his glorious rise to international fame and unfortunate death - all happened almost in a flash. But ever since, India has remained on the mathematical map of the world more and more prominently.

Quotes…What did they say?

We owe a lot to the Indians, who taught us how to count, without which no worthwhile scientific discovery could have been made

- Albert Einstein



It is India that gave us the ingenious method of expressing all numbers by means of ten symbols, each symbol receiving a value of position as well as an absolute value; a profound and important idea which appears so simple to us now that we ignore its true merit.

But its very simplicity and the great ease which it has lent to computations put our arithmetic in the first rank of useful inventions; and we shall appreciate the grandeur of the achievement the more when we remember that it escaped the genius of Archimedes and Apollonius, two of the greatest men produced by antiquity

19th century mathematician Pierre-Simon Laplace