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INDIAN KNOWLEDGE SYSTEM FOR STUDENTS

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Abstract

In this paper we are come to know about different facts about our indian mathematicians and astronomer that facilitate indian mathematics in different level.This focus on different concept of indian knowledge system as per the students level,here we are going to discuss about vedic mathematics,conversion of regular fravtion in to decimal form, different vedas using modus –opetandi'-chart

Concept of limit in IKS and in the view of modern mathematics further given about the calculas in ancient times explained by indian mathematicianhow they paved the way for other to think about it and make more development in the field of calculas.Later we see about Pythagorean theorem in the view of vedas.

Key Words: Upvedas and the six Vedangas , modus –opetandi'-chart,limit,calculus,Pythagorean theorem.

Vedic mathematics or sixteen simple mathematical formulae from Vedas was written by HIS HOLINESS JAGADGURU SANKARACHARAYA

Ii is not conceived and worked out in the case of other scientific work, but the result of the intuitional visualization of fundamental mathematics principles. It is mental mathematics appearing more than the usual approach of scientific work.

The word Vedas means the fountainhead and illimitable store house of knowledge. In effect it means it implies that the Vedas should contain within themselves all the knowledge needed by mankind relating not only to the spiritual matter but also to those worldly means required by the humanity for the achievement of all round complete and perfect success in all directions of human activity.

In other words it implies that our ancient Indian Vedic lore should be all round complete and perfect.

The Vedas are known as four in member RK, Yaju, Sama and Atharva but they have also the four Upvedas and the six Vedangas

The four Upvedas are as follows

Veda	Upaveda
Rugveda	Ayurveda
Samaveda	Gandharvaveda
Yajurveda	Dhanurveda
Atharvaveda	Sthapathyaveda

In this list the Upaveda of Sathapatya or engineering comprises all kinds of architectural and structural human endeavor and all visual arts.

Swamiji regarded mathematics fall

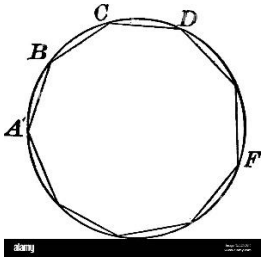
Conversion of Relgur fraction into their equivalent decimal form

For example consider a fraction(1/29) whose denominator end with 9 the method by means multiplication by which is the Ekdhika purva the number which is just more than penultimate digit in this case it is 2

The 'modus –opetandi'-chart is as follows
We put down I as the right hand most digit. It is because the product of the last digit of denominator and the last digit of decimal equivalent of the fraction must end in 9.
As the last digit of the denominator in this case it follows that last digit of the decimal equivalent is bound to be 1 so that the product of the multiplicand and the multiplier may be end with 9.
(1)We therefore start with 2 as the last digit of the answer.
(2)We proceed leftward continuously multiplying by 3 which is Ekadhika Purva one more than the penultimate digit of the denominator in this case

We multiply the last digit 2 by 3 and put 3 down as the immediately preceding digit	2
	32
We multiply that 3 by 3 and put 9 as the next previous digit	32
We multiply that 6 by 3 and get 18 as the product .But this has two digits .We therefore put the 8 down immediately to the left of the 6 and keep the	3268

CONCEPT OF LIMITS WITHOUT EXAMPLE
Consider a polygon inscribed in a circle as shown in fig it is obvoius that if we increase the sides of a polygon ,the area of polygon approaches closer and closer to that of s circle.In other words limit of a polygon ,as the number of sides of apolygon increases to infinty , is a circle.



MODERN DEFINITION OF LIMIT
A function f(x) is said to have limit l as x tends to a if for every € >0 there exists a positive number ∂such that $|\mathbf{f(x)} - \mathbf{l}| < \epsilon$ for $\mathbf{0} < |\mathbf{x} - \mathbf{a}| < \boldsymbol{\delta}$ Then $\lim_{\mathbf{x \to a}} \mathbf{f(x)} = \mathbf{l}$. **It** is denoted by L.
Thus L=$\lim_{\mathbf{x \to a}} \mathbf{f(x)} = \mathbf{l}$ We are not concerned with what happens to f(x) when x tends to a but only what happen to it when only x is closed to a we emphasize that theli mit of (x) must be same as x tends to a from both side. If there is a limit for fraction $\frac{p(x)}{q(x)}$ and we find by inspection that (x-a) is a factor of both polynomials p(x) and q(x) .To obtain the limit ,this common factor should be removed .This ccan be performed either by factorization or by simplification or by rationalization depending upon the nature.the function. If px) and q(x) both are zero then limit does not exist .

CALCULUS IN INDIAN KNOWLEDGE SYSTEM:(This discovery by INDIAN ASTRONOMERS)
The discovery of calculus as a formal mathematical discipline is credited to the European mathematician Sir Isaac Newton and Gottfried Wihlem Leibniz in the 17th century .Both independently developed the fundamental principles of calculus including the concept of limits,derivatives and integrals which revolutionized mathematics and paved the way for modern science and engineering.Calculus is the mathematical study of change and its essence is the use of infinitesimal and limis ,summing an infinite series .The concept of limit as given by Nilakanta in Aryabhatia-bhasya is the essence of calculus.Madhava seem to be the one who discovered many of the basic ideas of calculus.

The Kerela mathematician and astronomer like Madhava developed some amazing facts of calculus and laid the fundamental stone of modern science which is developed from Europe, Newton mentioned in his book Magnum Opus that calculus was written around 1700 CE . Thus orthodox historian and scientist now agree that Kerela calculus pre dated that of Newton and Leibnitz by at least 200 years.Madhava laid the foundation of development of calculus which were further developed by his successor at Kerela schools of astronomy and mathematics. Certain ideas of calculus were known to earlier mathematician of ancient Indian times.

Calculus reach to deals with limits of numbers as they approach to zero has revolutionized the scientific approach leading to significant advances in physics, engineering, economics statistics and finance basically. Calculus provide a

framework for modelling and control system based on the effects of changing conditions on these system.Ancient Indian mathematicians made remarkable areas as evident in the works of scholars like Arya Bhata,Brahmguptas,Bhaskara and others. Their contribution were mainly focused on algebraic technique number system solution to in determine equation and Trigonometry for astronomical and mathematical purpose.

The concept of infinitesimal calculus, as developed by Newton and Leibnitz, was a unique and revolutionary approach to studying rates of change and accumulation using limits and infinitesimals. While there might have been some precursor ideas or protocalculus concepts in different cultures, the formalization of a mathematical discipline is attributed to Newton and Leibnitz in the 17th Century.

It is important to avoid making unfounded historical claims and instead acknowledge the significant contributions of ancient Indian mathematicians in the areas of expertise. The development of calculus by Newton and Leibnitz remains one of the most pivotal moments in the history of mathematics and science

Calculus in Indian knowledge system: optimization of in sulaba sutras

The Sulaba Sutras are a collection of Indian texts that date back to around 800 BCE. They are a part of the larger body of texts known as Vedas, which are some of the oldest sacred scriptures of Hinduism. The Sulaba Sutras focus on various aspects of Geometry and provide practical rules and techniques for constructing altars and sacrificial structures used in Vedic rituals.

While Sulaba Sutras primarily deal with geometric constructions, they do contain elements of optimization. The main objective of these texts was to ensure the accurate the construction of altars with specific geometric properties for performing sacrificial rituals. In this context, optimization refers to finding the best or most appropriate dimensions or configurations for these altars to achieve certain desired outcomes.

One notable aspect of optimization found in the Sulaba Sutras in the construction of fire-altars with specific shapes, such as circular, square, rectangular,etc. These altars were designed to represent different deities and perform specific rituals and their shapes and dimensions had symbolic and ritualistic significance. The text provided guidelines for finding the ideal dimensions and proportions for these altars, which involved optimization principles to achieve the desired geometrical properties and symmetry.

The Sulaba Sutras also contain mathematical rules for constructing altars of different sizes while keeping the area constant. This is an early form what we now call “isoperimetric” optimization, where a specific quantity [in this case, the area] is kept constant while trying to maximize or minimize another quantity [for example, the perimeter].

Sulaba Sutras do not cover the concept of calculus. Calculus as a formal mathematical discipline, emerged much later in the history and was independently developed in Europe during the 17th Century much later in the history and was independently developed in Europe during the 17th Century. The contributions of ancient Indian mathematicians are still remarkable and have significantly influenced various areas of mathematicians and other scientific fields

Overall optimization techniques found in the Sulaba Sutras were centered round achieving precise and meaningful geometrical properties for the construction of sacrificial altars. These ancient texts provide valuable insights into early development of mathematical and geometric concepts in India and their practical applications in Vedic rituals.

Trigonometry in Indian knowledge system: Pythagorean triples in Sulaba Sutras

The Sulaba Sutras are ancient mathematical texts that provide rule and procedures for constructing altars used in Vedic rituals. These texts also contain geometric and mathematical insights, including the generation of Pythagorean triples, which are sets of three positive integers [a, b, c] that satisfy the

Pythagorean Theorem [$a^2 + b^2 = c^2$] The most well known Pythagorean triple is [3, 4, 5], where $3^2 + 4^2 = 5^2$

In the context of the Sulaba Sutras, these triples were used for constructing altars with specific dimensions that had symbolic and ritual significance.Here are some example of Pythagorean triplets found in different sulaba sutras.

1)Manava sulaba sutra:

This text provides the earliest known explicit satements of the Pythagorean theorem it presents the Pythagoras triplets (3,4,5) and (5,12,13)

2)Baudhayana Sulaba Sutra:

This text present the pythagorean triples (3,4,5)(5.12.13)(7,24,25) and others.It gives a procedure for constructing a square that is equivalent in area to a given rectangle effectively describing the Pythagorean theorem.

3)Apastamba Sulaba Sutra:

Apastamba rules for constructing right angle in fire altars use the following Pythagorean triplets (3,4,5)(5,12,13)(8,15,17)(12,35,37)

This text present a general method for generating Pythagorean triples based on a parameter which is asolution of certain quadratic equation.

CONCLUSIONS

IKS helps knowledge from ancient india and its achievement and challenges and gives sense of Indians mathematician and astronomer hard work in the field of education particular in mathematics field.

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BIOGRAPHIES

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