Mathematics: The Omnipresent Beauty around us

By

Vandana Bansal
Assistant Professor,
Dept. of Mathematics,
Ramgharia College, Phagwara,
Punjab.
Email: bansalvandana@yahoo.com

Mathematics has been the most important and prominent factor of the variegated stems of knowledge which has ever helped mankind in understanding the mysteries of our universe. Right from our easy-going daily life to the intriguing riddles which aim at tapping the secret of the formation of this world, Mathematics works as a pal and true mate for other areas like astronomy, physics, chemistry, biology, engineering, commerce, statistics and arts. The paper unveils the role of Maths in translating the vision of man to understand his universe in a better way. This paper endeavours to map out the omnipresent beauty of Mathematics around us while highlighting the dazzling impact it has exercised in shaping the present visage of our world.

Mathematics works in each & every facets of our daily life, starting from our daily course up to the highest level of technical, philosophical or aesthetical calculations. Mathematics always registers its presence. This is the reason
that Mathematics is always revered as “Queen of all Sciences” and “King of all Arts” The word ‘Mathematics’ has been derived from Greek word máthēma which means "knowledge, study, learning". Mathematics is the study of quantity, structure, space, and change. Mathematicians seek out patterns and formulate new conjectures. Galileo Galilei (1564-1642) has aptly remarked, “The universe cannot be read until we have learned the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which it is humanly impossible to comprehend a single word. Without these, one is wandering about in a dark labyrinth”.

MATHEMATICS has played a significant role in the development of various cultures for millennia. Mathematical ideas that originated in the Indian subcontinent have had a profound impact on the world. One of the most luminous savants of all ages Swami Vivekananda has commented on the importance of Maths: “you know how many sciences had their origin in India. Mathematics began there. You are even today counting 1, 2, 3, etc. to zero, after Sanskrit figures, and you all know that algebra also originated in India.”

In ancient time, mathematics was mainly used in an auxiliary or applied role. Thus, mathematical methods were used to solve problems in architecture and construction (as in the public works of the Harappan
(as in the words of the Jain mathematicians) and in the construction of Vedic altars (as in the case of the Shulba Sutras of Baudhayana and his successors). By the sixth or fifth century BCE, mathematics was being studied for its own sake, as well as for its applications in other fields of knowledge.

Lots of the outstanding innovations were introduced by Indian mathematics from ancient times to modern. As we shall see, there does not seem to have been a time in Indian history when mathematics was not being developed. Recent work has unearthed many manuscripts, and what were previously regarded as dormant periods in Indian mathematics are now known to have been very active. Even a small study of this subject leaves one with a sense of wonder at the depth and breadth of ancient Indian thought.

Apart from it

Place of Mathematics

❖ Mathematics is a tool, rather than a discipline.
❖ It occupies a key place in the school curriculum.
- It plays a vital role in technical professions and latest researches.

- It is the main ‘ingredient’ of any ‘finished good’ in Pure Sciences or in Applied Sciences.

Every moment in our life is absorbed with one sort of calculations or the other right from making budget of the home to that of the country. The knowledge of Mathematics becomes mandatory for each one of us. This materialistic world can never imagine to have existed without the support of Mathematics. In order to lead a comfortable life, it is very important for us to have knowledge of addition, subtraction, multiplication & division. A shopkeeper even if illiterate can do without the knowledge of art, language, music & science but never without Mathematics.

The purpose of all knowledge is to know about the nature and reason of existence of life on earth. This most complex question that has perplexed the mankind since time immemorial can never be solved without the help of Mathematics on material plane. The sheer beauty of Fibonacci series and the magical Golden ratio prove this point that all that is symmetrical is not accidently beautiful but it has a set pattern behind this and Mathematics helps in understanding this pattern. What do the pyramids in Egypt, the sunflowers, Da Vinci’s portrait of the Mona Lisa, the pine cone, your fingers- all have in common?

The answer to this question lies hidden in a series of numbers discovered by the Italian Mathematician Leonardo Fibonacci.
0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584 . . .

These numbers, known as the *Fibonacci numbers*, are characterized by the feature that each one is the sum of the preceding two numbers. 

\[
34 + 55 = 89 \\
55 + 89 = 144 \\
89 + 144 = 233 \\
144 + 233 = 377 \text{ and so on}
\]

[[ An interesting characteristic of these numbers is that if we divide one number in the series by the number just preceding it, we obtain numbers very close to one another. 

\[
34 / 21 = 1.619 \\
55 / 34 = 1.617 \\
89 / 55 = 1.618 \\
144 / 89 = 1.617
\]

As a matter of fact, this ratio is fixed after the *thirteenth* in the series. 

\[
233 / 144 = 1.618 \\
377 / 233 = 1.618 \\
610 / 377 = 1.618 \\
987 / 610 = 1.618 \\
1597 / 987 = 1.618 \\
2584 / 1597 = 1.618
\]

This ratio is known as the Golden *Ratio*.

Note that in the above calculations, the ratios have been rounded to the third decimal place.]] The Golden Ratio is indeed an irrational number, having an infinite number of decimal places and never repeats itself. However, we take the
Golden Ratio as 1.618, rounded to the third decimal place. The Golden ratio is represented by the Greek letter \( \phi \). The Golden ratio is also known by the names **Golden Mean, Golden Section & The Divine Proportion**. A lot many interesting features are hidden in the womb of this Golden Section. An Interesting Fact is that

\[
\frac{1}{\text{Golden ratio}} = 0.618
\]

i.e. \( (1.618.\ldots)^{-1} = 0.618.\ldots \)

Also \( 1/0.618.\ldots = 1.618.\ldots \)

God's most startling feature of the Golden Ratio is the human body. Apparently everyone has distinct looks, but if you take the average proportions for several people, you will start to discover a pattern. When the distance between the navel and the foot is taken as one unit, the height of the human being is equivalent to 1.618 units. The distance between the navel and knee and the distance between the knee and the end of the foot are in golden proportion. The distance between the navel and top of the head and the distance between the shoulder line and top of the head are also in golden proportion. The human head forms a golden rectangle i.e. \( \text{width} : \text{height} = \phi \) whereas in Human Arm, it too exists i.e. \( \text{Length of Forearm} : \text{length of hand} = \phi \)

Mathematics is not only associated with Science but with arts, philosophy & the practices of spirituality. Mathematics can be a medium to travel beyond the periphery of the material world. Maths is a bridge of both the disciplines
Science & Arts. The paper also brings forth the point that the universal acceptance of this subject is undisputable. It has helped in creating the most influential and impressive religious and cultural monuments all over the world. The geometrical Hindu and Buddhistics mandals and yantras, the structure of South Indian temples, construction of pyramids in Egypt, the remnants of Maya and Inca civilization and the unsolved mystery of the famous Nazca lines are some examples which significantly throw light on the role of Mathematics in translating the vision of mankind in different ways. If we go deep into the secrets of Mandals & Yantras, we will be surprised to see the different geometrical figures like circle, triangle, rectangles, squares embedded into each other for a certain purpose of evoking power and the power is sure to be released if the disciple or student knows about the secrets of unleashing that power. It means that Science & Arts cannot reach their culmination without the help & support of Maths.

Today we must ponder over the role of Maths in people’s and nation’s life.

What is our AIM of Mathematics Teaching? Is it

- To complete the CURRICULUM by the end of session?
- To make sure that students pass the exam?
- To score good marks in the exams?
- To get the degree only?
- To make students mere ‘Cramming Parrots’?
Our education system is based on the orthodox pedagogical method of learning and teaching. Because of this method, our students remain incapable of learning new secrets this subject can reveal to them. Unless & until there is a change in the perspective of teachers as well as students, there can be no hope for the discovery of new areas that this subject can unravel. The minds of the students remain focused on getting good percentage of marks. As a result they don’t get any stimulation for diverting their mind to the other untouched innovative methods of learning. The example of Golden Ratio proves that even nature can teach us the secrets of nature. Euclid has rightly remarked: “The laws of nature are but the mathematical thoughts of God.”

It is interesting to notice what theology and religious philosophy propagates. They opine that this universe is not only constructed using mathematical laws but also governed according to mathematical karma theory. Paul Dirac (1902-1984) British physicist who worked on quantum mechanics said:

“A theory with mathematical beauty is more likely to be correct than an ugly one that fits some experimental data. God is a mathematician of a very high order, and He used very advanced mathematics in constructing the universe”.

This paper also focuses on making this wonderful subject interesting for young students. Instead of the practice of some stereotype repetition of certain formulas and theories, students should be encouraged to use innovative
techniques and methods. They must understand that Maths is not something dreadful but one of the most beautiful revelations of knowledge on earth. The rules of Maths are not invented but discovered by the true appreciators of this subject. If we have to crack the code in which the script of this universe is written then we will have to emulate and apply the rules of maths to the brim. Like this eternal galaxy time & space, Maths is also eternal, universal & omnipresent. Whenever we go, we are sure to find Maths in each & every particle of this Universe.

References

- http://www.ibe.unesco.org
- The Problem of Mathematic Education in India GeekNextDoor.htm
- By Thomas J. Cooney: Making sense of mathematics teacher education
- www. wikipedia.goldenratio
- http://www.science.edu.sg/exhibitions/Pages/Mathematics.aspx
- http://en.wikipedia.org/wiki/Maya_civilization
- Donald A. Proulx; The Nasca Culture: An Introduction ,University of Massachusetts
- http://www.esamskriti.com/essay-chapters/ A brief history of Indian Mathematics