PHI

Seed the Curiosity

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CHRIST UNIVERSITY
BENGALURU, INDIA

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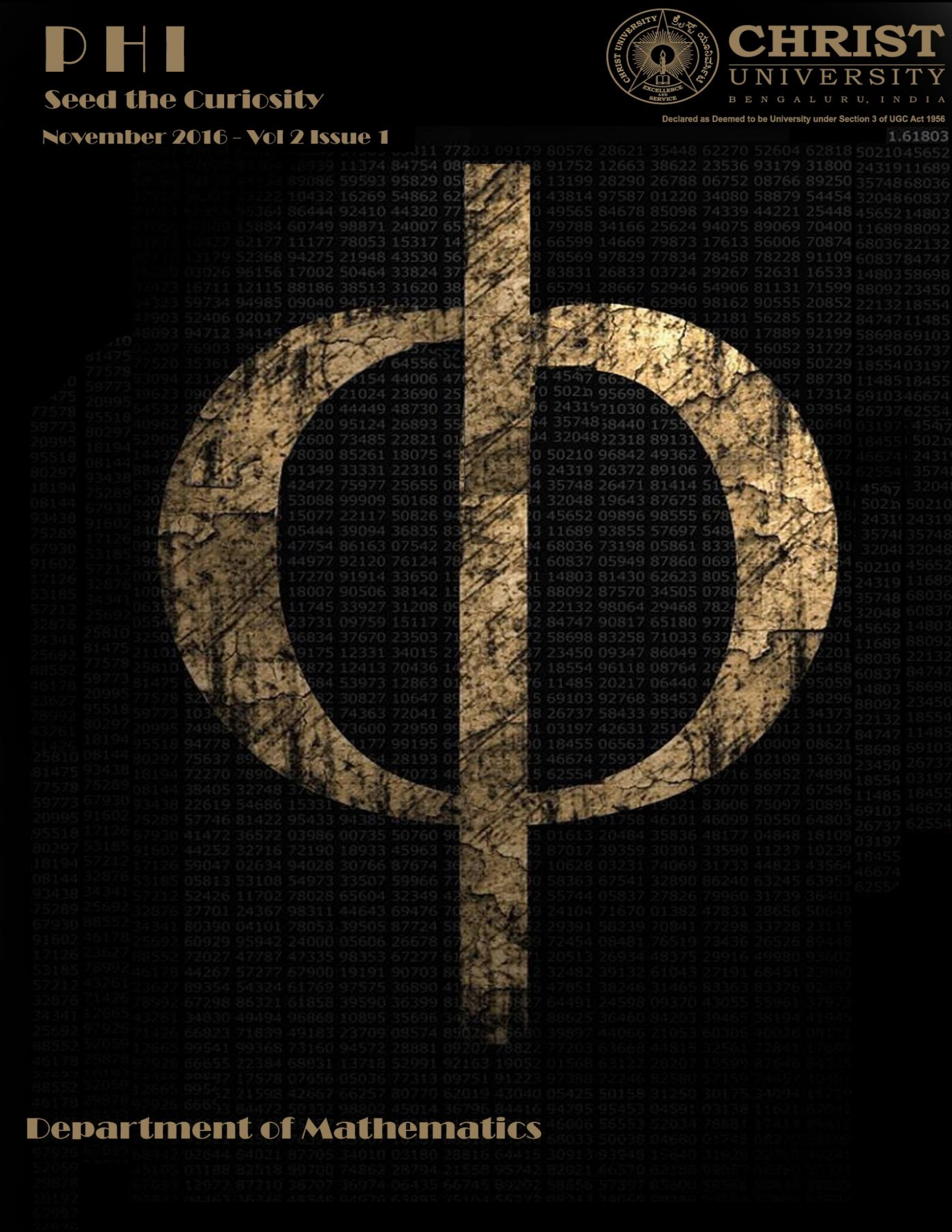


Department of Mathematics

FROM THE HOD'S DESK

"No human investigation can claim to be scientific if it doesn't pass the test of mathematical proof," a quote from Leonardo Da Vinci has been rightly beheld as this custom and convention has been in practice since centuries. This magnificent subject has entranced many people and has become the cause and focus of many scientific research outcomes. The Department Of Mathematics of Christ University has grown in magnitude and research. The Post Graduate course started in 2005 and now comprises of 85 students in M.Sc., 25 in M.Phil and 15 faculty including a few professor emeritus. The annual intercollegiate mathematics PG fest 2016 had seen the launch of the magazine PHI, aiming to sow the seeds of curiosity. Over the years mathematicians have been doing the same, by exploring the unexplored-results, theories, proofs, puzzles, conjectures so on and so forth. This magazine, is a showcase for the students to display their prowess in the subject as well as deal to give vent to their creative side.

I congratulate the team and wish them the very best.

MESSAGE FROM THE EDITORS

"I believe that the mathematical reality lies outside us. That our function is to discover or observe it, and that the theorems which we prove, and which we describe grandiloquently as our "creations," are simply the notes of our observations."

- G. H. Hardy

"Our mathematical Universe", a book by Max Tegmark states two hypothesis, one which states that there exists another reality that is completely independent of us, humans, and the other is that our external physical reality is mathematical structure. We know that the Greek letter Phi denotes the golden ratio, it has its pervading presence in nature and many areas of music, art and architecture. The occurrence of this number in nature is a clear representation of the fact that there exists an external physical reality which is a mathematical structure that is completely independent of us, humans. Like this ubiquitous number Phi, Mathematics also prevails everywhere, but it can only be unveiled by some.

Mathematician- turned -philosopher Bertrand Russell said, *"Mathematics, rightly viewed, possesses not only truth, but supreme beauty -- a beauty cold and austere, like that of sculpture, without appeal to any part of our weaker nature, without the gorgeous trappings of painting or music, yet sublimely pure, and capable of a stern perfection such as only the greatest art can show."*

We could always argue whether mathematics is an art or science, but it can be better said that it is the "Science behind the art" and the "Art of Science", the art which only a person with mathematical knowledge can agree or argue upon, unlike other forms of art for which we need not know the way it works.

Like the last edition of the magazine, this edition also entails an interview with Dr. G. Ravindra, Professor Emeritus, IIT Madras, who has shared his experiences of his journey through Mathematics and articles from the faculty and students of the Department of Mathematics. This magazine, a beautiful blend of articles, from experienced and budding mathematicians certainly highlights the importance of mathematics.

We hope that the creativity and thoughtful contemplation of mathematics contained in all the issues of this magazine is as unending as the digits of Phi.

The editors of this magazine are Rohini K M and N Soujanya from M.Sc. Mathematics along with Dr. S Pranesh, Coordinator, Department of Mathematics, and Fr. Joseph Varghese, Associate Professor, Department of Mathematics. Rohini, studying in the first year, has energetically worked on compiling this magazine. Soujanya, a second year student, has industriously edited. Dr. S. Pranesh and Fr. Joseph Varghese have constantly guided this endeavor and paved the way for its completion.

MATHEMATICS IS APPLIED BY EVERYONE EXCEPT BY APPLIED MATHEMATICIAN.

Aditi Sudhir Mohadarkar

Centuries before it was a misconception that mathematics was created by God, but as time passed people got to know more and more about its application and use. We use simple maths like counting, algebra while shopping grocery, buying products etc. In the scenario of under graduate studies students are mostly drawn away from pure mathematics either because it is too difficult or applied mathematics has more relevance of that equation. That in case of mathematical modelling it has another level of influential and changed ideas, policies and functions of science industry and society.

Many branches of maths like financial mathematics, business maths gives applications of mathematics but many of the concepts about these are taken from pure mathematics. Learning maths is comparatively easier than applying it.

Mathematicians are trained to stick with one problem until it is fully solved, but applied mathematician should know when and where to stop.

The application of mathematics has great influence in many spheres of science, industry, society for describing past, understand or analyzing present and predict the future. It is very important to remember that the emphasis in the phrase 'applied mathematics' is not a word 'mathematics' but in that it is 'applied'.

HEARTFELT MATH ☺

Shraddha Ramdas Bandekar

Doing something for a social cause is a beautiful deed and I realized our day to day learnings adds more to it. Well I don't go to bed without seeing my math book and yes it is part of my everyday learning which made me realize that I can use it to reach out people and help the needy, that math is not a problem to be solved and let rest, that math is more helpful than just finding the un knows, that math can be "heartfelt" and applied for a social cause.

The software named "ORIGIN" which provides powerful data analysis package and publication-quality graphing capabilities, then basic math along with the application of problem solving using "Calculus of Variation" helped in analyzing the best market place, time slots and various other strategies for the differently abled person selling pens for a living and providing him with a solution. Origin software is a versatile software application for interactive scientific graphing and data analysis. It is produced by Origin Lab Corporation. It helps create professional looking graphs which can yield variety of outputs. Origin is used in graphing, data analysis and programming.

The most important thing was through math, a subject considered to be the most challenging one there seemed an "AAROHAN" of priceless smiles on various faces. With basic math knowledge and a software like "ORIGIN" various researches can be started off. Education for a social cause is a beautiful concept and if I can use "MATH" for it then for me it is the future as it never lets one rest and keeps one keen to know more hidden facts.

THE STATE OF THE ART OF PROOF IN MATHEMATICS

Dr. Mayamma Joseph, Professor, Department of Mathematics

All of you would agree with me when I say that as human beings it is our duty to defend the truth. In fact there is an inner urge within us to defend the truth by placing our arguments for it in the best manner possible. In this sense, a mathematician can be an effective defender of truth as they deal all times with proofs which are nothing but arguments or justifications that something is true. So, is it not important for us to understand the art and craft of mathematical proofs?

In simple terms, a proof is an elegant and indisputable answer to the question, "Why?" It is an explanation that convinces the readers that a given statement is true and helps them understand why it is true. Theorems and proofs assume a significant place in the landscape of Mathematics. If validity of a truth in science is asserted through experiments, it is the flawless proof that asserts validity of mathematical assertions. As Vladimir Arnold puts it, "Mathematical works do consist of proofs, just as poems do consist of characters."

One of the most recurring questions that mathematics teachers receive is "Why should I learn these proofs, as I just can't understand it?" Let us look " How to learn Mathematical proofs" as a Mathematical problem and deal with it using four- fold principle beautifully depicted by George Polya as *"the list"* in his famous book "How to solve it."

1. Understand the problem

If you are misunderstanding the problem, everything might turn out to be wrong. So ask yourself: Do I know thoroughly each and every word in the statement of the given Theorem? If not refer some other resources; try stating the theorem alternatively in your own words. Are you very clear about what is given and what is to be proved? Try expressing the theorem in the diagrammatic form. Feel confident? Then go ahead.

2. Devising a plan

Identify an appropriate proof strategy. Spend quality time on this. You need to be familiar with the approaches explained to you by your teacher and need to have mastery over them. This is where regular practice will of help for you. Also ensure that you choose one strategy instead of getting numbed with the enormous options that might blind your thinking.

3. Carrying out the plan

Write the proof. Verify whether proper link is established from one argument to another and one step to the next. Go through the proof again, probably sometime after writing it for the first time. Make corrections and do modifications accordingly. Continue trying till you complete the task.

4. Looking back

Look at the proof from a new perspective. Try proving it differently, if possible. Verify with the reference books. Re-check yourself several times and check with your teachers' or peers who are thorough with the proof to see if your proof is correct. Appreciate the work of other mathematicians; love and enjoy the process instead of looking at it as an imposition.

Ultimately you need to remember that as you try hard to master the art of writing proofs in mathematics, your logical, analytical, critical and creative thinking skills will also be developed and you will have better life skills to deal with the problems of everyday life!

"Mathematical proof like diamonds are hard and clear and will be touched with nothing but strict reasoning."-John Locke

MATHEMATICS OF THE BLIND

Fr. Joseph Varghese, Associate Professor, Department of Mathematics

How does a blind know the other person is blind or not? One of the toughest explorations of humankind is the exploration for the truth. Human search for food ended with finding food. In some way, it is parallel to what other living beings also do. Hunger for food brings human beings, animal and plants on the same platform. They work towards getting good, sometimes good food. As a rational animal, human beings went further ahead. They searched for the truth behind it. They found that there is much more in the truth.

Among the three types of living beings, human beings and animals are superior to plants because of their capacity to change their positions. They find better positions, in the face of threats and sometimes for comfort. Hence we may say that plants live in the first dimension. Human beings are superior to animals because of their capacity to change their positions in thinking. Though animals think, their thinking is a very static thinking. Hence, we may say that animals live in the second dimension. They live according their instinct. Human beings live in the third dimension. They have life. They can move. They can remember the past and dream about the future. They can imagine.

Among the many capacities human beings have, the most important one is the capacity to reason. Reason is the reason for human beings to search for truth. Human beings, in general, are in an incessant search for truth. Some search for the truth of life. Some others search for the truth of the nature. There are some others who search for the truth of the truth itself. This search for truth is the basis of recording and documentation. Documentation is the backbone of all the developments in the world. As human beings change their styles and modes of living, a continuous progress is visible in the world. It is by encountering and polishing the truths of the nature, the truths of the truths, human beings progress towards better life. In this pursuit of progress, the most important and precise recording is in the form of Mathematics.

Many say, "Mathematics is the study of anything that has reason." Mathematics is about recognizing patterns in the world and contributing suggestions for its repetition and improving. In establishing the claims of what is right and what is good, mathematicians use a technique called "Proof." In fact, everyone with rationality does proving, in many different ways. Hence, in general everyone is a mathematician. However, academic mathematicians do more documented proving. There are various methods of Proof.

One without the capacity to see things using one's own eyes is termed as a blind. Of course, blindness is not a hindrance to reasoning. Hence, a blind person also does proving. But, can a blind person use a visual proof? To be precise, we come back to the initial question, "how does a blind know the other person is blind or not?" One can always bluff the blind by pretending to be blind or not. Here comes a beautiful mathematical proof method, named as "Zero Knowledge Proof." It is illustrated in the case a blind person (B) who tests the blindness of another (A).

B has two identical marbles of different colours. B knows that the marbles are of different colours. However, B cannot distinguish them by their colours. B holds the marbles in either of the palms. B asks A to identify the colours of the marbles. There is a possibility that A might come with the two colours correctly. But, B is still not sure if A is truthful. Hence, B keeps swapping the marbles quickly for some time between the palms with the perfect knowledge of the movement of the marbles.

"Blind folk see the fairies. Oh, better far than we, who miss the shining of their wings because our eyes are filled with things we do not wish to see." – Rose Fyleman

If A is blind, A has no clue whether the marble is exchanged or not. B then asks A to identify the location of the different colours. This procedure is repeated a couple of times more. If A is not blind, then A can never deviate from the initial identification of colours of the marbles.

In modern cryptography, Zero Knowledge Proof is efficiently utilized. It was initially conceived and published by the trio Shafi Goldwasser, Silvio Micali and Charles Rackoff.* The power of Zero Knowledge Proof is that the prover never passes the proof but a verifier can always test the prover of the knowledge of the proof and be satisfied.

*S. Goldwasser et al. *"The knowledge complexity of interactive proof systems,"* SIAM J. Comput. vol. 18, no. 1, pp. 186-208, Feb. 1989.

The interesting number paradox is a semi-humorous paradox which arises from the attempt to classify natural numbers as "interesting" or "dull". The paradox states that all natural numbers are interesting.

The "proof" is by contradiction: If there exists a non-empty set of uninteresting numbers, there would be a smallest uninteresting number – but the smallest uninteresting number is itself interesting because it is the smallest uninteresting number, producing a contradiction.

Once there was an old man searching for a South Indian Bank. Without knowing where to go he stood under the tree thinking what to do? Soon he saw a young boy coming across him. The old man thought to take the help of that young man in finding the address of the bank.

That young boy was a mathematics student...

Obviously being a mathematic student he would guide the old man in a mathematical way...

The boy started giving directions to the old man...as follows

1) Walk straight for 230 meters,
2) take a turn of about 211 degrees,
3) Now walk for another 119 meters,
4) Draw a parabolic curve and then walk for 334 meters on the curve
5) Now bisect the straight line road at an obtuse angle,
6) Take a turn at an angle 45 degrees,
7) Finally walk for 116 meters.

Thus there is the south Indian bank.

Vidyashri Appayya Kolavi

IN CONVERSATION WITH Dr. G. RAVINDRA

Interviewed by Chhavi Arora

Reverently honored is how I would describe the opportunity of interviewing Dr. G. Ravindra. A man with thoughts that could make the power of infinity shy away. There cannot be enough words that I could possibly use to talk about him. A man with a wide range of experience of teaching, research, educational planning, administration and leadership.

What was the first moment that struck a chord within you regarding Mathematics?

I still remember from the 2nd grade of how blessed I was to have the most excellent teachers of all times. Mathematics has always amazed me. Has not been easy, but I owe all of my interest to my teachers. I started liking geometry in 7th grade and loved both maths and science in PUC. So there wasn't really a moment that opened the doors of my mind and heart to mathematics. It was always there. Rooted deep inside somewhere.

Whom do you think you have idealized all along your life?

I have got motivation from a lot of directions. May be idealize wouldn't be the apt word. A teacher from 7th grade especially for mathematics and in 10th for physics. I remember vividly and would always cherish.

You have had your career period spread out in different phases. Which phase of your work-period makes you feel the most content in terms of contribution to Mathematics?

NCERT, to tell you the fact has nothing to do with higher level mathematics. I did not get any inspiration for research in 1976 while working in NCERT. Although, I somehow continued the flame of mathematics within me burn strong. I was doing things independently back then. Later to which I went to Paris and worked with the great Mathematician Berge and that was the major turning point for me.

You have travelled across the world for work. Which city or an institution in particular makes you feel is the most inclined towards the real portrayal of Mathematics?

"At the school level mathematics teaching, even today doesn't have a protocol. The major aspect of Mathematics- proofs usually take a back seat. Proofs are important. They are the hallmark of Mathematics. And the fact that our system do not focus on them much makes it the biggest setback in teaching at school level. Although at graduation, post-graduation levels there are institutes in India who do good work. Their work is mostly individualistic. Like in TIFR, a lot of good work is done but just few areas. Mathematics is in pockets here and there spread across various institutes. IISc, universities and IITs produce great

results, but there are selectively good people scattered. I do not think any particular institution mechanism that promote mathematics exist. Whereas in other countries like France, there are groups who put in efforts collectively. For an instance, when I visited France in 1979 there as a group of around 20-22 people and they used to meet invariably on every Monday religiously. A lot of discussion used to be the agenda for the group. A cup of coffee and Mathematics go a long way together", he chuckled with a shimmer in his eyes. "It was like an institution. Like a system established. We lack such set-ups in our country. A devoted progress towards a subject doesn't happen much here", he added.

Mathematics has always been a topic that caused trepidation in the students' minds. How far do you think the approach of the education system is the reason for it and what according to you can be done to make the air around Mathematics lighter?

The psychological mindset around the subject is something to be blamed the most. It is indeed difficult but not scary. As the nature of maths is precision which leaves its pursuits with just two options to choose from- true or false. There is no in between. The only path to step on to in the hope of improvement is to alter the way the subject is dealt with or rather taught. There is a tendency that we work on the concepts by doing examples. That is proving a theorem by examples. It will never lead to clarity. One has to work. Proof is fundamental. It is the nature of maths. An example would help me here to explain my point better, though. We say 3 is a prime number, 5 is a prime number, and 7 is a prime number... so every odd number is prime. But no. That's not how it's done. Generalizations make the subject scary. Mathematics has a different way of looking at things. All subjects have their own nature. We must enlighten students about the beauty that Mathematics work upon. The blissful aura that it has. This comes in by infinite sets. Infinite sets are easily available in mathematics but not in real life. Mathematics has abundant infinite sets which sets in the beauty. We as teachers need to showcase this side of the subject. Beauty attracts. And this could be the solution to the existent scary aspects of the paper. Mathematics connect different points in a way that nobody can think of. This was the real reason for me to pursue this subject. And this would attract students to get into real side of the subject.

There is a lot of feelings in maths too. Conjectures happen. Conjecturing is intuition. Ramanujan's intuition was a hallmark. He had this strong power.

Further, we need to see it as subject in depth.

I was in a very ordinary school. But back then our teachers held our hands and helped us walk towards the depth of what we studied. I was in 9th grade and my teachers used to give 10th, 11th grade English medium books while it was a Kannada medium school and asked us to solve. It doesn't happen now. I would also like to add that knowledge has two levels- general and specific. We need to acquire both. I was in a school in Gulbarga surrounded by mutton market, fish market and a lot of distraction. But it never was a problem, because teachers matter. Surroundings come later. Facilities come later.

Do you think the budding teachers, if given training on the methods of showcasing Mathematics in schools would help?

It would certainly do. But training has to depend upon the needs of the people who are attending it and shouldn't be one sided. The needs of the people should be taken care of. Generally, in schools they have problem solving as the main agenda. I can think of one good approach which I have tried myself. You go with a problem sheet. You proceed a chapter through problems. The chapter can be dealt faster and the concept would have a stronger impact too. Another add-on is the participation analysis. We have to see whether the learning is happening. That can be done by jotting down the number of questions asked by the different students in class. Suppose there are 5 distinct students who ask questions. Make it a point to list the numbers down for a month and analyze it in the end by taking an average. If that rounds up to 5 or 6, good. If not, you need to realize that it's time to bring in a change in the approach.

Any book that holds a special place for you?

It is a difficult question as I am not much of a reader. Although, great books on algebra interest me the most. I don't browse much too. If I get an idea, I will keep thinking about it.

I quite agree. Our generation and the upcoming ones probably lack

this attribute. We have shortcuts for everything. Internet however, has speeded up everything but has put an active thought-process to the back seat. What is your take on it?

Creativity is must. Computers will not help you to create new things. You have to be serious and go deep down to be truly profound. Computers will not do that for you. Computer has limited advantage. From the teacher's context too, digitalization does not hide away the fact that backboard teaching is the most impactful. Like the smarter versions of boards be it smart classes or anything in the area should have supportive roles. They should be the catalysts. Computers reflect very clearly that they can't replace human mind but the common mind isn't clear about it. Regular mechanism and self-learning should be the ideal path to be chosen.

Mathematics and real life. How connected do you think they are?

Mathematicians and non-mathematicians do not gel up easily. People think Mathematics is logic although, that is not true. Too many paradoxes run around in society regarding Mathematics. We work within constraints. Mathematical models are there, but the impression that it can solve everything is wrong. We need to combine other fields or areas too.

What would the one most essential advice that you would like to give to all the students who are working or are yet to begin work in enriching themselves and adding contributions in the world of Mathematics?

The only way to enter maths is to research in the subject. I am of a strong opinion that one can see immense beauty through mathematics. The only advice I have is that they need to try to build a bridge that would hold mathematics and society together. Just the way it should be. The world would surely change. For the good.

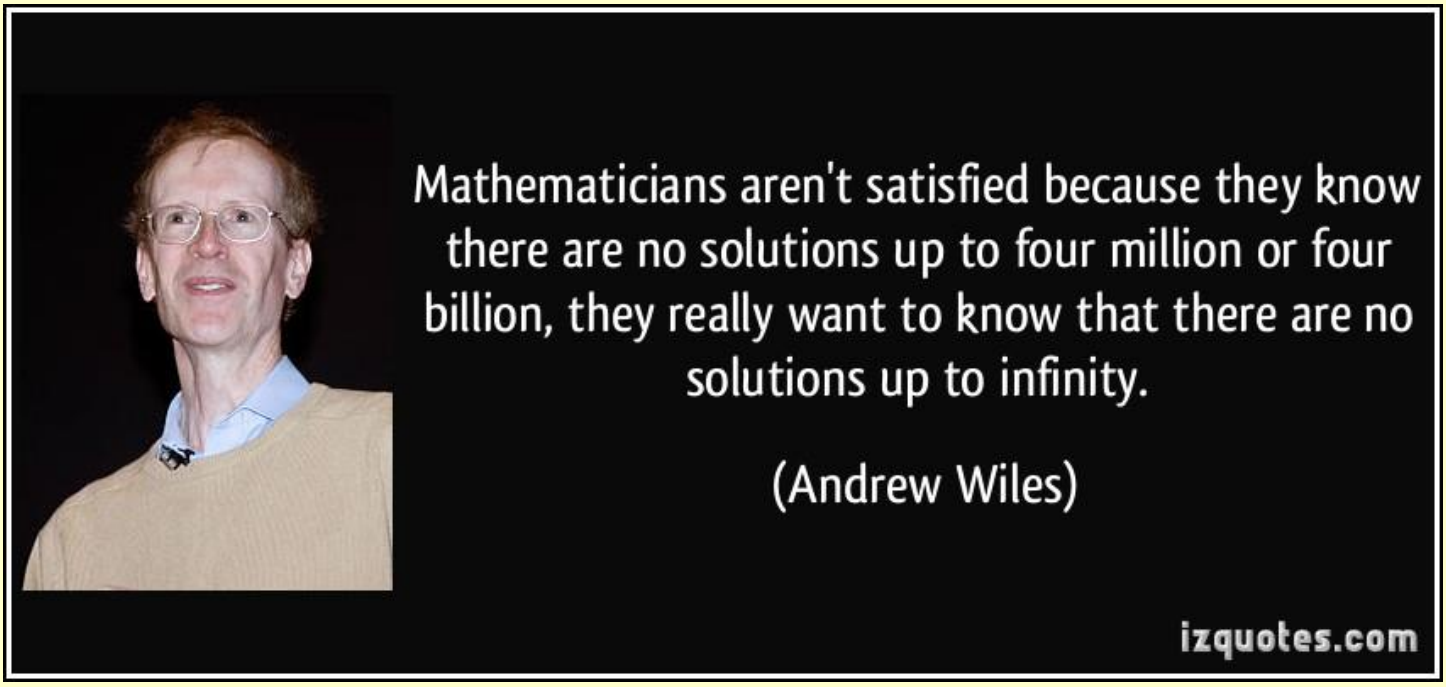


Image Courtesy: izquotes.com

40 YEAR MATHEMATICAL ENIGMA AND 4 GENERATIONS OF DECODING

Jesslin Ann Mammen

Ever heard of the Kelmans-Seymour Conjecture?

If the answer is no, well then you saved yourself a huge amount of trouble as arriving at the proof itself took mental toil that spanned four decades until this year, when mathematicians at the Georgia Institute of Technology finally announced a proof of that conjecture in Graph Theory.

Graphs come up everywhere in nature. Graph Theory is a field of mathematics that's instrumental in complex tangles. It helps you make more connecting flights, helps get your GPS unstuck in traffic, and helps manage your Facebook posts. To picture a graph, draw some cities as points on a whiteboard and lines representing inter-state highways connecting them.

But the resulting drawings are not geometrical figures like squares and trapezoids. Instead, the lines, called "edges," are like wires connecting points called "vertices."

So, what is the Kelmans-Seymour Conjecture, anyway?

The Kelmans–Seymour conjecture states that if a graph G is 5-connected and non-planar, then G has a TK5. It is named for Paul Seymour and Alexander Kelmans, who independently described the conjecture; Seymour in 1977 and Kelmans in 1979.

The devil called 'TK5'

You could call a TK5 the devil in the details. TK5s are larger relatives of K5, a very simple formation that looks like a 5-point star fenced in by a pentagon. It resembles an occult or Anarchy symbol, and that's fitting. A TK5 in a "graph" is guaranteed to thwart any nice, neat "planar" status.

The men behind it

The human chain that led to the proof of the Kelmans-Seymour Conjecture are equally interesting, if less complicated.

Seymour had a collaborator, Robin Thomas, a Regent's Professor at Georgia Tech who heads a program that includes a concentration on Graph Theory.

His team has a track record of cracking decades-old math problems. One was even more than a century old.

"I tried moderately hard to prove the Kelmans-Seymour conjecture in the 1990s, but failed," Thomas said.

"Yu is a rare mathematician, and this shows it. I'm delighted that he pushed the proof to completion."

Yu, once Thomas' postdoc and now a professor at the School of Mathematics, picked up on the conjecture many years later.2007 was the year he became completely convinced about working on the proof after years of working on same concepts. He planned to involve graduate students but waited a year.

Then he brought in graduate student Jie Ma in 2008, and together they proved the conjecture part of the way.

Two years later, Yu brought graduate students Yan Wang and Dawei He into the picture who were very hard working and efficient.

Together they delivered the rest of the proof quicker than they expected and currently have two submitted papers and are in the process of submitting two more.

In addition to the six mathematicians who made and proved the conjecture, others tried but didn't complete the proof but left behind useful cues.

Nearly four decades after Seymour had his idea, the fight for its proof is still not over as other researchers look for ways to break and tear the proof. Not until they've thoroughly failed to destroy it, will the proof officially stand.

Source: phys.org

Pi = 3.14?
A BRIEF HISTORY OF Pi

Shilpa Paul

Pi -The mathematical constant that we all are quite familiar with. Think about a science text book without this constant, nearly impossible isn't it?

Pi is commonly defines as the ratio of the circumference to its diameter, but it's this ratio that's driving computers geeks crazy making super computers to estimate the digits in this number. So Mr. is not as simple as the definition stands, equally grandeur is his origin. Many great mathematicians have tried to understand pi, but never was cent percent successful.

Pi got his name from the Greek word 'perimetos' meaning circumference. So is Pi a Greek? No, the first mention if this ratio is found in the early scriptures of Egypt and Babylonia dating back to 2000 BC. We also find early mentions of pi mentioned in the Book of Kings and even in the Sanskrit scriptures of the 4th BC that has value 3.139 as close to 3.14.

Pi was studied by many scientist and mathematicians some indeed are greatest of all times. The first recorded algorithm for the computation of the decimals of pi was given by Archimedes using geometry. He drew a 96 sided polygon inside and outside a circle to obtain the lower and upper bounds of pi.

$3.1408 < \pi < 3.1429$

Astonishing, the range was later proved to be correct based on the modern era computer techniques. Pi a.k.a Archimedes constant was later explored using the polygonal approach by Ptolemy, Chinese mathematician Li Hui, the great Indian mathematician Aryabhata, Fibonacci and many talents from across the globe. However the calculation of value of pi was revolutionized by the development of infinite series. It was first discovered by an early Indian mathematician, Madhava of Sangamagrama. But it was later published by European mathematicians James Gregory and Gottfried Wilhelm Leibnitz.

A simple infinite series that gives the digits of pi to five decimal places is

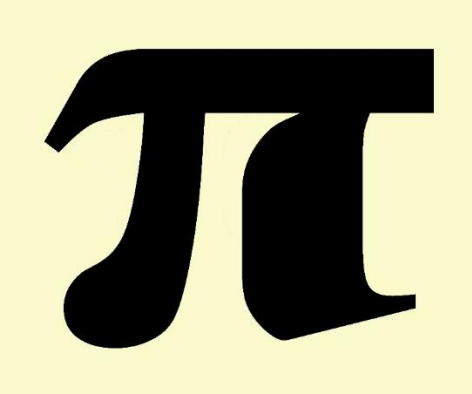
$$\pi = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} \ldots.$$

Another equation that converges faster than the above Gregory-Leibnitz series was given by Madhava,

$$\pi = 3 + \frac{4}{2*3*4} - \frac{4}{4*5*6} + \frac{4}{6*7*8} \ldots.$$

Several other fast converging series was discovered by Sir Isaac Newton and John Machin. The British mathematician, William Shanks used the Machin's series to obtain 528 decimals of pi.

Pi is one great mathematical entity that even paved way for piphilogy. Today the decimal digits of pi have been improved to the trillionth place and still the quest continues using super computers and algorithms to obtain its value.



Source:
www.todayifoundout.com/index.php/2014/07/history-pi
https://en.wikipedia.org/wiki/Pi

REACHING OUT THROUGH MATHEMATICS

Joyce John

One may often wonder why math seems to be so difficult in life, but the beauty about that question is the assurance Math gives to people that no matter how difficult a question seem to be but there's always a solution to it. Life is a math equation. In order to gain the most, we have to know how to convert the negatives into positives. I realized it through the most cherishing experience of teaching mathematics to a small group of VIIIth standard students.

I take this opportunity to thank the department of mathematics along with the CSA (Centre for Social Action) group for providing me with such a beautiful experience. The kind of curiosity and interest shown by the students in this subject was just simply appreciable. Use of teaching aides, conducting activities and mathematical games created a new vigor and passion among them for this subject. Also they were inspired to learn and perceive mathematics in a new way.

This gave immense joy to me as a teacher and this experience taught me a lot not just about mathematics but also about the mathematics of life that says 'Mathematics is not only for solving numbers but also for dividing sorrows, subtracting sadness, adding happiness and multiplying love and forgiveness.'

Life is an integration of all emotions, difficulties and problems one faces. At last I would like to convey the significance of mathematics in one's life through these beautiful words of Dean Schlicter which says "go deep into anything and you will find mathematics."

THE MAGICAL - NUMBER 7

Ashlin Theres Stany

7 is the natural number succeeding 6 and preceding 8. It is the fourth prime. Of the first 10 numbers, seven is the most prime. It cannot be multiplied or divided within the group. It is unique. The most popular favorite number is 7.The number 7 has many significances.

Seed of life

The number seven is considered to be one of the most significant figure in the Bible. It is coined as completeness or perfection by scholars and it is also believed that god rested on the seventh day after creating the whole world which is called seed of life. It is described as seven circles form the symbol called "The Seed of Life". The Seed of Life symbolizes the six days of creation. The days of rest are symbolized by the central circles.

7 in human culture.

The deadly sins, the wonders of the World, the rainbow colours and the pillars of wisdom-all are 7. This is how the significance of the number 7 is perceived in human culture.

Number 7 Numerology

According to numerology, the number 7 is the seeker, the thinker, the searcher of Truth, notice the capital "T". Number 7 doesn't take anything at face value. It always tries to understand the underlying, hidden truths. The 7 knows that nothing is sharply as it seems and reality is mostly hidden behind myths.

Astrological sign in the zodiac

Libra is the seventh astrological sign in the zodiac. (September 22 – October 24). Number seven is the number of Neptune. The luckiest zodiac signs cancer and Pisces is also denoted by number 7.

7 in Tarot

The Chariot's card is represented by the number 7. The Chariot symbolizes the need to focus. When it is reversed, it signifies the inabilities to see things through.

Birthday of Everyone

In china, the seventh day of the New Year is known as "All Men's Day" or the birthday of everyone.

The Hindu Wedding

In Hindu weddings the bride and groom walk around the holy fire seven times during the wedding ceremony. A priest will read mantras as they are walking around the fire. After they have walked around the fire seven times, they take seven steps together. For each of the seven steps they give a vow.

7 has bad luck too

The number 7 is characterized by bad lucks as well. Players refer to the number seven as "it". Some players may even refer to seven as "the devil". It is considered equally bad luck if the stickman gives a player dice with a total of seven face up. According to an old superstition, breaking a mirror will bring you seven years of bad luck.

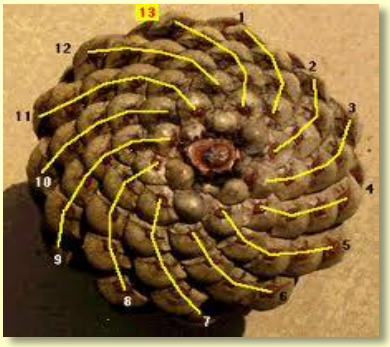
Source:
https://en.wikipedia.org/wiki/7_(number
www.patheos.com
https://gotquestions.org/number-7-seven.html

FIBONACCI NUMBERS AND NATURE

Anjumol

Fibonacci Numbers Pine Cone and Vatican

Fibonacci discovered a series of numbers that seemed to have magical predictive powers. The formula is extremely simple. Start with zero, add the next number, and you have the next number in the series. Continue the progression and you get 0,1,1,2,3,5,8,13,21,34,55.... And so on. Not surprisingly, the sequence became known as the "Fibonacci Sequence" or "Fibonacci Ratios.



The great thing about this series is that if you divide any number in it by the next one, you get a product that has become known as the "Golden Ratio." This number is 1:1.618, or 0.618 to one. Fibonacci's original application for this number was that it could be used to predict the growth rate of a population of breeding rabbits. I guess that was a valuable skill back then.

The definition of the Fibonacci series is:

$F_{N+1} = F_{N-1} + F_N$,

If N>1

$F_0 = 0$

$F_1 = 1$

Pine cones themselves being the seed of pine trees, exhibit the Fibonacci sequence when looked at from the bottom, exhibiting sacred geometry.

The pineal gland is a raisin sized, pine cone shaped gland located between the eyes and in the center of your brain

The symbol of the pineal gland is the pine cone. It is so revered by the Vatican that a special Vatican court was built called the 'Court of the Pine Cone' where the world's largest pineal gland symbol is on display! The symbol is also found on the Egyptian god Osiris.

Renee Descartes called the pineal gland "the seat of consciousness" and it is the gateway to spirituality; being,

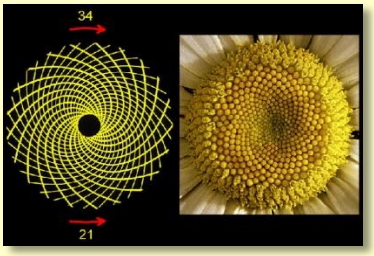
higher realms of consciousness and tuning into higher frequencies beyond those available through the 5 senses. By awakening the pineal gland, we can speed up our learning and our memory, enhance wisdom,

intuition and creativity, and even awaken our psychic abilities.

Flower petals

The number of petals in a flower consistently follows the Fibonacci sequence. Famous examples include the lily, which has three petals, buttercups, which have five (pictured at left), the chicory's 21, the daisy's 34, and so on. Phi appears in petals on account of the ideal packing arrangement as selected by Darwinian processes; each petal is placed at 0.618034 per turn (out of a 360° circle) allowing for the best possible exposure to sunlight and other factors.

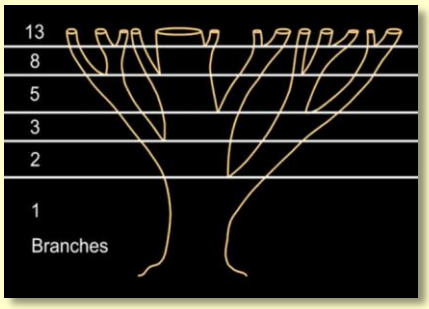
Seed heads



The head of a flower is also subject to Fibonaccian processes. Typically, seeds are produced at the center, and then migrate towards the outside to fill all the space. Sunflowers provide a great example of these spiraling patterns.

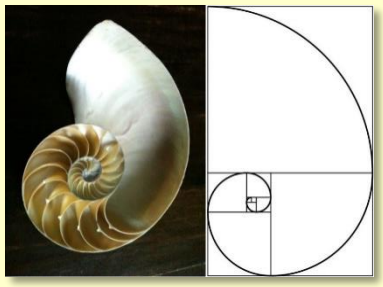
In some cases, the seed heads are so tightly packed that total number can get quite high — as many as 144 or more. And when counting these spirals, the total tends to match a Fibonacci number. Interestingly, a highly irrational number is required to optimize filling namely one that will not be well represented by a fraction. Phi fits the bill rather nicely.

Tree branches



The Fibonacci sequence can also be seen in the way tree branches form or split. A main trunk will grow until it produces a branch, which creates two growth points. Then, one of the new stems branches into two, while the other one lies dormant. This pattern of branching is repeated for each of the new stems. A good example is the sneezewort. Root systems and even algae exhibit this pattern.

Shells

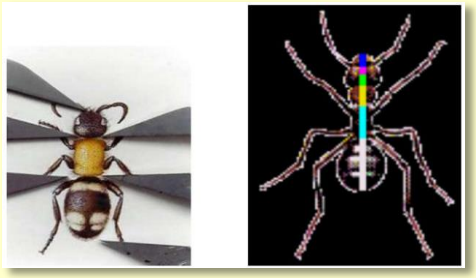


The unique properties of the Golden Rectangle provides another example. This shape, a rectangle in which the ratio of the sides a/b is equal to the golden mean (phi), can result in a nesting process that can be repeated into infinity and which takes on the form of a spiral. It's called the logarithmic spiral, and it abounds in nature.

Snail shells and nautilus shells follow the logarithmic spiral, as does the cochlea of the inner ear. It can also be seen in the horns of certain goats, and the shape of certain spider's webs.

Animal bodies

Even our body's exhibit proportions that are consistent with Fibonacci numbers. For example, the measurement from the navel to the floor and the top of the head to the navel is the golden ratio. Animal bodies exhibit similar tendencies, including dolphins (the eye, fins and tail all fall at Golden Sections), starfish, sand dollars, sea urchins, ants, and honey bees.



Source:
http://io9.gizmodo.com/5985588/15-uncanny-examples-of-the-golden-ratio-in-nature
http://personal.maths.surrey.ac.uk/ext/R.Knott/Fibonacci/fibnat.html#golden
http://www.mathematicsmagazine.com/Articles/FibonacciNumbersPineConeandVatican.php#.WBtYdS197IU

HOW TO REDUCE MATH TEST ANXIETY

Ellumkalayil Merlin Thomas

It's not usual for a child to struggle with math during their school years. As a child's brain develops, they start to learn how to solve logic problems and apply analytical reasoning-a development that is part nurtured through their ability to solve mathematical problems. Their brains want to find the answer-their brains know that an answer is there, but while they are starting to make those connections, solving math problems can provide considerable stress and anxiety.

This is especially true while taking a math test .Tests always bring anxiety and fear in every child's mind, and when it is a math test the level of fear , tension and anxiety increases, because the test gives them the result of how successful are they in their learning and how much is their understanding. And these pressure leads to anxiety and it's not uncommon for the child taking test to feel these following effects:

Cloudy mind:

Anxiety has a tendency to reduce focus and clarity. This can be troublesome when the child is trying to figure out complex problems, and that, lead to more anxiety.

Physical stress:

Math anxiety during a test can also cause physical discomfort. Children that are attempting to sit and focus on solving problem often find this discomfort to be overwhelming, and may prevent them from putting all of their efforts on the test.

Time perception:

Scientists are mixed on whether or not anxiety alters the perception of time. But subjectively, many people report that time can feel like its passing too slowly or too quickly, and both can affect the student's ability to complete the test in time.

Self-doubt:

You need confidence to solve math problems. Doubt yourself, and it becomes much harder to find the right answer, because you will worry that another answer is out there. Anxiety is often a FUEL for self-doubt.

What Can Be Done?

Math anxiety is a tricky thing which cannot be avoided very easily. Sometimes lack of confidence or over confidence may lead math anxiety.

The best way to avoid this anxiety and stress is to study well and get clarified with the problems, before appearing the tests. Because when one is prepared well it would certainly not affect one's confidence level and more the preparation less is the time taken by one in solving the problems.

Create a personal test taking strategy:

Some students mostly are not well prepared and have no knowledge about the test so when they start doing a problem they get worried about the question and get confused about the answers and they then start to struggle and they have no idea what to do next. To overcome this what should be done is teach students some strategy "such as, if they don't know a problem then ask them to leave that problem and step to another problem and solve some simple problems and then come back to the older one".

Teach personal relaxation timing:

If one feels tensed and worried then it's better to have some relaxation like taking a deep breath or progressive muscle relaxation. It won't completely reduce the stress but can make one feel comfortable and stop one from overwhelming.

Don't rely on memory:

Attempt to understand why and when you use a certain math procedure. Think about and try to define its particular context or application. Memorization is a trap. When you are nervous, short-term memory is the first thing to go.

Conclusion:

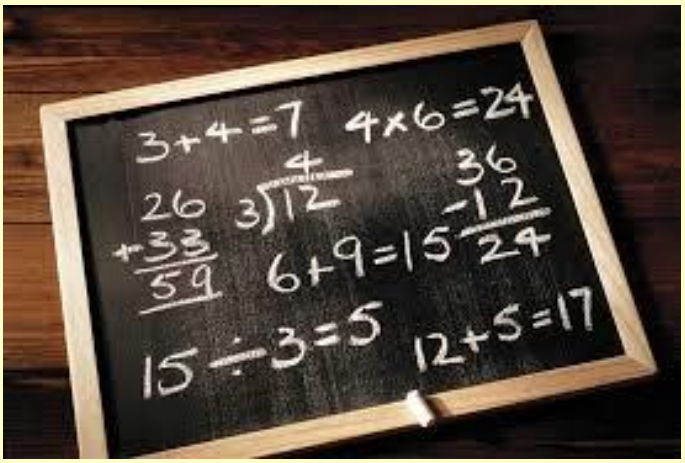
The best way to reduce anxiety and stress regarding any subject is that be well prepared for the test. Lack of preparation is mainly the key reason for anxiety and stress. In case of mathematics it's better to practice math problems daily, this will not only reduce ones anxiety during stress time but also make one perfect in that particular subject. Math is a subject which need lot of hard-work and daily practice and many in this world are worried about math so the best thing a student or any learner can do is to start liking the subject and work on it daily, and such daily work would help them in their future test, as its said "**PRACTICE MAKES MAN PERFECT**".

Source: http://www.mathgoodies.com/articles/how-to-reduce-math-test-anxiety.html

MATH IN MY EYES

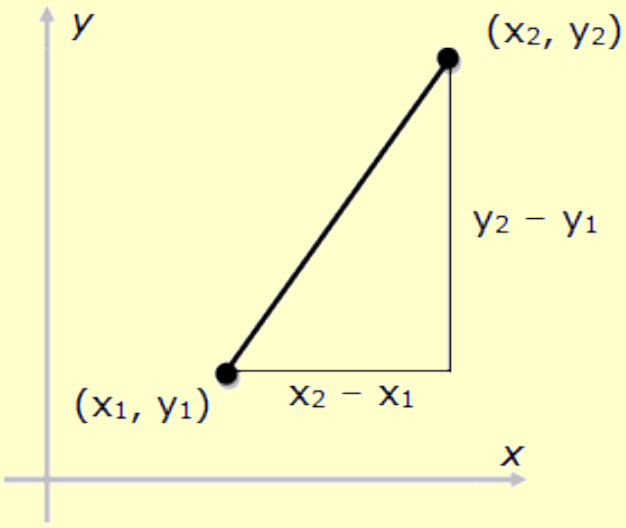
Brizlyn Tanya

First it was the balls and beads
And then I learned to count at speed.
Then it was to trace and write
Which made me grimace and my mom contrite.
But then there was the cutest line
To add, subtract - the number line!



When in came add and subtract,
Math was favorite, it's a fact!
The tables, oh so long and many
Made my memory go zany!
Ratios and fractions, I don't detest,
Cause many a cake have I easily messed!

Length and breadth and height and weight
Square, rectangle, oval, wait!!
Angles, triangles, oh, how many??
Obtuse, acute, right, complementary!
The theorems of geometry...
A world of arcs and mystery.



And in the world of algebra
Where 'a' and 'b' were formula
Equations were in xyz
To find the things I couldn't see!
But when we came to trigonometry
Sine, cosine and tan oh my!!

Compound or simple, interested I wasn't
Until the day of matrimony pleasant.
Then all the profit and the loss, the principal and interest
Oh! We became buddies best!
And now I'm mommy, it brings me glee
To teach my babe 1,2,3!!!

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