

# QUANTUM 2016

DEPARTMENT OF MATHEMATICS  
LADY SHRI RAM COLLEGE FOR WOMEN

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## Medicine and Math

Both doctors and nurses use Math every day while providing health care for people around the world. Doctors and nurses use math when they write prescriptions or administer medication. Medical professionals use Math when drawing up statistical graphs of epidemics or success rates of treatments. Math applies to x-rays and CAT scans. Numbers provide an abundance of information for medical professionals.

### Body Mass Index

In terms of medicine and health, a person's Body Mass Index (BMI) is a useful measure. Your BMI is equal to your weight in pounds, times 704.7, divided by the square of your height in inches. This method is not always accurate for people with very high muscle mass because the weight of muscle is greater than the weight of fat.

### CAT Scans

One of the more advanced ways that medical professionals use Mathematics is in the use of CAT scans. A CAT scan is a special type of x-ray called a Computerized Axial Tomography Scan. A regular x-ray can only provide a two-dimensional view of a particular part of the body. Then, if a smaller bone is hidden between the x-ray machine and a larger bone, the smaller bone cannot be seen. It is like a shadow.

It is much more beneficial to see a three dimensional representation of the body's organs, particularly the brain. CAT scans allow doctors to see inside the brain, or another body organ, with a three dimensional image. The three-dimensional view created by the CAT scan provides much more information to doctors than a simple two-dimensional x-ray.

Mathematics plays a crucial role in medicine and because people's lives are involved, it is very important for nurses and doctors to be very accurate in their Mathematical calculations. Numbers provide information for doctors, nurses, and even patients.

### Lithotripter

Another application of Mathematics to medicine involves a lithotripter. This is a medical device that uses a property of an ellipse to treat gallstones and kidney stones.

### Functional numeracy

Functional numeracy is as essential to an aspiring medical professional as functional literacy. As a physician, perhaps the most important Mathematical skills you will need are:

1. Basic Mathematical knowledge sufficient to calculate drug doses, concentrations, etc.
2. An understanding of the core statistical concepts most commonly represented in the medical literature.
3. Ability to appreciate whether or not results are Mathematically plausible.

The careful logical reasoning that is necessary for the study of Mathematics is an essential element of clinical reasoning.

### Mathematical literacy

Usual understanding of Mathematics for the people who do not deal with it professionally, is basic simple calculation which considers numbers and arithmetic operations.

Understanding of Mathematical science demands the knowledge of Mathematical language, its vocabulary and grammar. In order to understand the meaning of Mathematical words, one must comprehend Mathematical notions and objects, to which those words refer in the realm of Mathematics. Practically speaking, one should know how to conclude, derive and prove. Knowing basic Mathematical notions and concepts, and knowing so called Mathematical way of thinking, makes Mathematical literacy.

-SRISHTI BHOGAL  
3rd year



Deepika



Shailly

## From the Editors' Desk..

Dear Readers,  
The newsletter has been an integral part of our journey through these years. For it is through words alone that one could hope to express their best works. It is a herculean task to capture the creativity of each and every individual by this piece of writing but we have tried to achieve that task. We hope that you will enjoy as much as we have enjoyed in bringing you this newsletter and appreciate some of the best works of our students.

Love,  
Shailly Keshwani  
Deepika Saini

## Professor who solved Fermat's Last Theorem...

On March 15, the British mathematician Andrew Wiles was awarded the Abel Prize, the most prestigious among mathematicians, for solving a problem that at one point was considered the world's hardest. It comes with a purse of 6 million Norwegian kroner. Wiles is a number theorist, currently at the University of Oxford. He became famous in 1994 for developing a general proof of Fermat's Last Theorem, a deceptively simple problem that had remained unsolved since it was discovered in a book penned by Pierre de Fermat, a French lawyer, in 1667. With Fermat's death in 1665, the equation — now known as "Fermat's Last Theorem" — soon became famous as the most difficult mathematical problem ever conceived, spawning a plethora of unsuccessful proofs.

When Andrew Wiles was 10 years old, he had stumbled upon Fermat's Last Theorem in E.T. Bell's "The Last Problem" at his local library in Cambridge. He took almost a decade to prove the theorem, and drew on centuries of research to reach his conclusion. Wiles' methods to solve the theorem have had a lasting effect on the field of mathematics, and are still being used today. He actually took a different approach to solve the problem — by proving the 1950s Shimura-Taniyama conjecture, which proposes that two very different branches of mathematics are conceptually equivalent.



# ENIGMA 2016

Another year passed, another set of memories to be cherished and yet another day which will be looked back at. Enigma 2016 will certainly bring back a vivid picture of 19th February when the Department of Mathematics, like every year, celebrated its Annual Academic Meet.

The meet was full of enthralling events that saw participation of students in large numbers from various colleges. There were chiefly events, Integrating Minds, Mathematical Rangoli, Click-o-math, Twist in the Tale and the major attraction of the event, Sherlocked along with a brilliant performance by the LSR dancesoc team.

All these events truly lived up to their names, and added to the wonderful repertoire of events that ENIGMA offers every year. We can proudly say that ENIGMA 2016 has not only been the highlight of all the events held this year but has also been the best Academic Meet that our department has had in the last few years.

-Akshita Bhat, 1st year

## SHERLOCKED

"Sherlocked", the most awaited and exciting event of the Mathematics Meet witnessed huge participation. The very coherent event heads- Ankita Tulshyan, Rajenki Das and Shruti Kaushal made sure that the event was well organized. The enthusiasm in the participants was higher than the temperature of the burning Sun. The budding detectives were eager and charged. There was a lot of energy in the room to solve the murder mystery. The first round was "The game is on". This round consisted of brain-storming questions which they had to solve in an allotted time. This round saw the participants trying to solve the questions with absolute precision. The music was being played in the background which would act as a clue for the detectives to reach closer to the murderer.

The second round was "Where is the key". The teams which had succeeded were given codified true and false questions. Both the options had a certain digit attached to them. The teams had to use those digits to find the right key. This round saw the budding detectives at their best wherein each one of them was trying hard to get the right combination of the digits. And hence, the right key!

The third round was "Tick-Tock". One of the team members was blindfolded and had to walk according to the instructions given by his/her team-mate. The instructions given by them were based on the mind-boggling riddles given to them. It was interesting to see the co-ordination between the team-mates as some of them got confused while some of them managed to decipher the clues.

The fourth and final round was "Catch me if you can". The participants were given two cases to solve. The first case had two puzzles. The second case had a crossword with a few encircled boxes. Curiosity and eagerness took over the budding detectives as they fought against time to solve the mysteries.

"Team Anonymous" comprising of Samarth Gulyani and Ayush Agarwal from IIT Delhi bagged the prize and were declared the winners of "Sherlocked"! We hope each and every participant had an amazing time at the event! We are waiting to host you again at "Sherlocked" 2017!

-Sanya Rastogi, 2nd year



## CLICK O MATH

ENIGMA 2k16 brought to us a Mathematical photography competition Click-O-Math to capture the maths around us! "The world of numbers is beautifully blended with our world and it requires a special set of lenses to see that "

Symmetry being the theme, the Click-O-Math team received over 80 entries, out of which 55 entries were accepted. And out of those 55 entries, the team went on to shortlist 20 entries.

As a part of the event, on 19th February 2016, the 20 shortlisted photographs along with the captions, were put up for exhibition in the Exhibition Hall.

At 11:30am, Ma'am Neelam (Department of Economics) along with some of the department faculties judged the photographs to choose the winner. As a part of the judgement process, the participants were invited to explain their respective captions, and how their photographs expressed the theme- 'Symmetry'.

After much a tough decision, the name of the Winner was finally announced at about 12:00pm.

Arvind Tomar from Shaheed Bhagat Singh College bagged the Winner title of the Click-O-Math event, 2016!

- Click-o-Math event heads  
Shailly Keshwani  
Esther Darlong



"The most general law in nature is equity- the principle of balance and symmetry which guides the growth of forms along the lines of the greatest structural efficiency."

[Shutter Speed: 1/15 seconds, Aperture: f/22, ISO: 100]- by Arvind Tomar, Shaheed Bhagat Singh College.



## MATHEMATICAL RANGOLI

In its endeavour to celebrate ENIGMA- The annual academic meet of department of Mathematics, Lady shri ram college for women, Mathematical Rangoli, a rangoli competition was held in the Exhibition hall on 19th Feb'16 from 10:30 a.m.- 12:00 noon.

The competition received an overwhelming response. The participants etched out awe-inspiring creative designs based on Mathematical shapes and symbols. The rangolis were made using rangoli powder colours, rice, flowers and even waste materials (Like bottle caps).

The judges included Dr Asha Mathur, retired professor of Mathematics department, Lsr and Dr Uma Varsha Kakar, professor of Mathematics department, Lsr. In total fifteen teams participated in the competition. The Lsr team, of Mathematics department, constituting Shubhra Aggarwal, Himani and Rashi were declared winners.

As colours add life to everything they touch. Colours lend joy and celebration to even the slightest moment so, the event ended on a very colourful note successfully.



## TWIST IN THE TALE

The annual academic meet of the Mathematics department of Lady Shri Ram College for women witnessed a new, fun filled event this year : Twist in the tale- a game which tested the multitasking abilities of its participants in the most ingenious way. It involved four riveting rounds of quirky yet simple tasks that the teams had to perform, while simultaneously answering questions on basic logical reasoning and elementary Mathematics. The event began with the preliminary round, wherein teams of 2 had to balance a balloon between their heads and spin around in a circle while answering the questions. 26 teams participated out of which 18 moved on to the next round; where 3 teams competed in a rib tickling face off, their goal was to burst the other teams' balloons while having their legs tied together to their teammates. The next round involved 6 teams untying multiple knots while being blindfolded, while the final round tested the participants' mental agility with tangrams. The event saw enthusiastic participation from students of many colleges, who all seemed to be thoroughly enjoying themselves throughout. Event heads Sanskriti Agarwal and Bhavika Wadhawan competently compered the event. The winners of the event were Abhishek Tiwari from PGDAV college and Akash Srivastava from Deshabndhu. They were felicitated by Dr Mathur, an inspiring teacher and ex faculty member of the department, who has also served as the Vice Principal of the college and our very own Dr. Kakkar, an accomplished senior faculty member of the department.

## INTEGRATING MINDS

Out of the 13 registrations and 7 confirmations, 6 teams showed up and participated on the day of the event. The colleges represented in the debate were LSR, Motilal Nehru, PGDAV, ARSD and College of Vocational Studies. The debate was judged by Ms. Wafa Hamid (English dept.) and Ms. Anjana Singh (Economics dept.). The winners were as follows:

- Best Speaker (For) - Anjali Pathak (CVS)
  - Best Speaker (Against) - Shrey Jain (Motilal Nehru)
  - 2nd Best Speaker (For) - Devansh Choudhary (PGDAV)
  - 2nd Best Speaker (Against) - Somya Bhatia (CVS)
- The debate followed a conventional format. Each team had 2 speakers - 1 for the motion and 1 against the motion. Each speaker was allowed a maximum of 4 minutes to speak.

Event head - Vaani Chopra

## THE YEAR THAT WENT BY..

### Talk by Dr. Salem Nafiri: A Mathematical Stroll on Control Theory

A guest lecture was delivered by Dr. Salem Nafiri on Control Theory on 23 July 2015. Dr Nafiri is teaching Applied Mathematics and Analysis at the Cadi Ayyad University, Marrakesh, and was one of the organisers of the Research Working Group and the Internet Seminar Working Group in the Laboratory of Mathematics and Research Dynamics. Most of his work is concerned with uniform stability  $c_0$  semigroups, application to thermo- elastic systems and numerical study. He began the talk by stating that 'Mathematics is a beautiful garden that bore several kinds of flowers of which one was Control Theory'. He made the concept simple to understand for the budding mathematicians of our college by stating various examples to explain the functions, input and output, controllability, stability and observability. He related common mathematical problems to the topic to motivate and ignite the young minds. The talk concluded with a few questions posed to Dr. Nafiri regarding the theory and its related concepts. The talk was enlightening as the students learned about the diversity of mathematics and its application in various real life problems.

Anika Jain, 2nd year



## Department Fresher's party

To welcome the freshers, a 'Filmfare' themed fresher's party was organized which acted as an ice breaker between seniors and freshers. A formal event was organized in the college where students of the department performed as well as provided interesting topics of discussion for interaction among the seniors and the freshers. This was followed by an informal evening outside college with the rest of the students of the department.

## Teachers' day celebration

The Mathematics Department organised a small event straight from the heart for our dear teachers on 4 September. The event began with a melodious performance by Neha, Shubhra, Deepika, Himani, Sanya, Poonam and Depali on songs such as 'ye shaam mastani', 'give me some sunshine', 'kaisi paheli' and 'hai junoon'. This stellar performance gave way to an incredibly hilarious mimicry of our favourite teachers.

The Mathematics geniuses also portrayed typical classrooms scenes, depicting what life in an LSR classroom is like. Putting an end to the celebrations was the cake cutting ceremony. As a token of our love and appreciation we gifted our teachers beautifully made handmade diaries. -Aakshi malasi, 1st year

## LaTeX Workshop

The Editorial Board of the Mathematics Department of Lady Shri Ram College organized a two day workshop titled 'An Introduction to LaTeX' on 8 September and 11 September 2015. Mr. Mahesh Kumar, Assistant Professor, Mathematics Department successfully conducted the workshop. LaTeX is a high-quality typesetting system which includes features designed for the production of technical and scientific documentation. It was a very beneficial workshop for the budding writers and researchers. The workshop began by an introduction to LaTeX, and about the working and use of LaTeX. The students were taught to write mathematical symbols, sets and functions and use of the various user packages was explained. A detailed structure was laid out regarding the various commands and functions that are used starting with simple details and then slowly moving to higher technicalities.

-Anika Jain, 2nd year

## Department Assembly

The Mathematics Department of Lady Shri Ram College conducted an engaging assembly on 28 September 2015, Tuesday. The assembly commenced by a melodious music performance quickly followed by a session of fun facts. The students left no stone unturned to allow the audience to connect and reflect. An inspiring real life story about Mr. Anand Kumar was presented. This was shortly followed by a short talk on ways to overcome fear which haunts humans now and then. The students of the Mathematics department put forth an enthralling dance performance appreciated by one and all. Lastly, two of the most beautiful singers from the department presented a soothing song that filled the auditorium with a relaxing euphony.

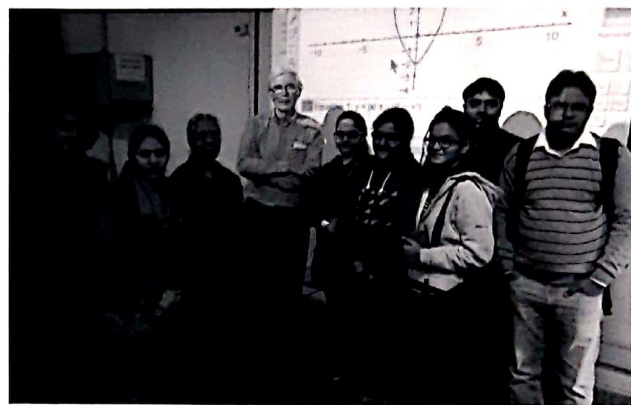
Our principal Dr. Suman Sharma congratulated the students for a wonderful assembly and wished them luck for future endeavours. The assembly concluded by the vote of thanks presented by the union members.

-Anika Jain, 2nd year

## A Talk with Douglas Butler

In collaboration with the Department of Elementary Education, the Mathematics Department conducted a workshop titled 'Exploring Mathematics through AUTOGRAPH' on 9th of December, 2015. It was led by the renowned Mathematics educator and the chief designer of Autograph, Prof. Douglas Butler. The talk was attended by teachers and students from various schools and colleges, along with respected Dr. Asha Mathur. The workshop essentially focussed on the use of this technology in transforming shapes and functions, handling data, calculus, vectors and probability distributions. With a straightforward and friendly user interface, it helps transform mathematics into a dynamic learning process where the learner can develop a deeper understanding of the subject. For younger students, the interface gives time to explore and investigate the plotting using the 'slow plot' feature and effective animations with possibilities of exploring 2D and 3D topics as well. These recent trends in Mathematics education show that the emphasis in Mathematics classroom has finally shifted from developing manipulative skills and memorisation of procedures to learning concepts through visualization and exploration.

-Akshita Bhat, 1st year



A Talk with Douglas Butler

## Talk on Higher Dimensions in Mathematics

On 17th March, 2016, the Department of Mathematics organized a talk on "Higher Dimensions in Mathematics and Career in mathematics" and the speaker was our prestigious alumnae, Dr. Devika Sharma, Mathematics Batch of 2007, who did Masters from IIT Bombay, and PhD from TIFR Bangalore.

It was a golden opportunity for our students to meet Dr. Devika and to learn about her experiences. The talk went in two phases; firstly she talked about the, Higher Dimensions in Mathematics, relating excerpts from the book "The fourth dimension" by Rudy Rucker. In the later half, she went on to discuss career options in the field of Mathematics. All the students of our department thoroughly enjoyed the talk.

-Ankita, 3rd year





## HISTORY OF MEASUREMENTS IN INDIA

The earliest trace of Mathematical knowledge in the Indian subcontinent goes as far back as the 4th millennium BC. Topics of paramount importance like Algebra, calculus, number system, units and measurements had already originated here with utmost accuracy at the time when other cultures were only nomadic forest dwellers. In the lieu of above it is interesting to note that the SI unit system (MKS or CGS) that we follow even today was developed meticulously and without any error by ancient Indian mathematicians about 5000 years ago during the Harappan civilisation (3300 – 1300 BC).

### UNITS ( Length ) MEASURE

1 Angula (one finger) 1.5 to 2cms  
4 Angulas (bow grip) 15cms  
12 Angulas or 1 Vitasti (handspan) 20 to 25cms  
2 Vitastis or 1 Aratni (cubit) 50cms  
4 Aratnis or 1 Danda 2mts  
2 Dandas or 1 Dhanu 4mts  
5 Dhanus or 1 Rajju 20mts  
2 Rajjus or 1 Paridesha 40mts  
25 Parideshas 1km

These units were used for a great deal of purposes like cosmology, cartography, navigation; typically for measuring land and for architectural plans. Proper tools like rulers which had been made out of ivory were also excavated from these sites in the 19th century.

Mathematicians and astrologists from that time used these units in the field of cosmology in order to find out the distance of stars from the Earth. For example, a separate unit Yojana was used to define the exact radius of the earth i.e. 6400 km.

### UNITS ( Time ) MEASURE

1 Talpara 1.85 mircoseconds  
1 Para or 60 Talpara 111.11 milliseconds  
1 Viliptam or 60 Para 6.67 milliseconds  
100 Viliptam or 1 eyelid blink 0.67 seconds  
1 Kaashta or 18 eyelid blinks 12 seconds  
1 Kshanam or 10 Kaashta 120 seconds  
1 Nazhigai or 12 Kshanam 24 minutes  
2.5 Nazhigai 60 minutes

Scientist and astrologist Bhaskaracharya had rightly calculated the time taken by the earth to orbit the Sun thousands of years before Leibniz and Newton introduced Differential or Integral Calculus and forces of gravity in 1114AD. According to his calculation, the time taken by the Earth to orbit the Sun was 365.258756484 days. His predecessor Aryabhata wrote that 1,582,237,500 rotations of the Earth equal 57,753,336 lunar orbits which is the exact fundamental astronomical ratio. There are several other great theories in the field of mathematics, physics, astronomy and other sciences put forward by India and it is still unknown what technologies these men had used to find out about complex figures with such precision.  
-Akshita Bhat, 1st year

**Relations between pure & applied mathematicians are based on trust & understanding. Namely, pure mathematicians do not trust on applied mathematicians, & applied mathematicians do not understand pure mathematicians.**  
-Sheetal Bhati, 2nd year

### Opening the otherwise locked doors...

This is going to be one of those redundant (hopefully not) letter from a senior to a freshman, but I'll try - try to give you a more insightful perspective perhaps.

Delhi was always a dream, a lovely one as a matter of fact. The idea of moving to a new city, a city of the working class, one that engulfed the intellectual and the modest with its subtlety, had its own charm and I without any doubt was drawn to this. I knew moving out of home was going to be a big deal, but even with my innate mathematical wit (ha-ha), calibrating this to suit me was not possible! This inherently meant a new life filled with a plethora of new and uncensored-by-mom uncertainties. This also meant doomsday for the procrastinator in me. Life now called for "independence and leaving the confines of your comfort zone to achieve your goals". I've always romanticized the idea of being a strong independent woman and it only seems fitting that I should end up, in this college. I must confess that college initially seemed dull and rigid but now, that image is slowing fading away. A sense of learning and growing everyday is overtaking the boredom I initially envisaged.

The ability to question myself at every step, the conscience to make the right decisions, the humility to seek help and the gratifying seniors who are more than willing to help you - all grew. Yes, college quite literally is an extrapolation of a real time conducive environment, but this still is not the best part about it. There are days when I whine on my bed thinking about ghar-ka-khaana or the general pampering and the undue attention that one receives at home, but you eventually get over the feeling of having been cast adrift to swim the social seas of late-adolescence alone. You make friends, those who will eventually stay back in college to spend an extra hour or two to gossip with you, you will never realize when this gossip will turn into discussions about meaningful and enlightening conversations and slowly, very naturally these friends will become your family, they will be the ones to handle you when you're acting all lunatic and they will be the ones you brood to before your semester exams.

For example, I now have a friend from every part of India, and I take immense pride in that. I have learnt so much about their culture, loved their food and was present at all possible moments to binge on their food, heard stories of a diverse kind, shared memories of a life time, made to-do-lists for an entire semester and failed miserably at the time of execution but succeeded in impromptu trips that blew my mind! I've converted India Gate to the perfect chill destination and chicken tandoori momos' to the most coveted menu option. I implore you all to have crazy days. Sing at the top of your lungs to bad 80's music and stumble around until your feet hurt.

So here goes the only advice that I have to give: be fun and be smart. Only in these moments will you experience life as an opportunity.

Although you keep hearing that college will be the best years of your life. Don't worry; as Taylor Swift says, "Take a deep breath as you walk through the doors." You have three years in this building - you might as well calm down and "get on with the program."  
-Arunima Raavi, 2nd year



## Cooking is to Math as Math is to Logic as Logic is to Rules, as Everything is to Reading!

What is Math? And how exactly does it work? In the book 'How to Bake Pi :An Edible Exploration of the Mathematics of Mathematics', Eugenia Cheng, math professor at the University of Sheffield in the UK and the University of Chicago, provides an accessible introduction to the logic of Mathematics - Sprinkled throughout with recipes for everything from crispy duck to cornbread that illustrates to the general reader the beauty of Math. Rather than dwelling on the Math of our high school classes with formulas to memorize and confusing symbols to decipher, Cheng takes us into a world of abstract Mathematics, showing us how Math can be so much more than we ever thought possible. She starts with the basic question 'What is Math?' to explain concepts like abstraction, generalization, and idealization. She tries to explain that math is actually designed to make difficult things easier. From there, she introduces us to category theory, explaining how it works to organize and simplify the whole discipline of Mathematics.

In the book each chapter begins with a recipe, which the author then uses to motivate the Mathematics that follows. For example - One of the chapters discuss how some Mathematics is created in order to solve a particular problem while other Mathematics is developed on its own and applications are searched for after the fact. She refers to this as Internal-v/s-External motivation and leans heavily on the analogy with how sometimes a chef goes shopping for ingredients for the recipe they want to cook and other times a dish is developed to use the ingredients one has in their pantry.

Another discusses- 'What is an ingredient'? Maths ingredients are axioms. It's okay to choose different axioms, but you might get a different product or use a different method in the end.

While the first two-thirds of the book introduce many different topics in Mathematics and discuss Cheng's general philosophy of Mathematics, the last third zeroes in category theory, which the author describes as "the process of working out exactly which parts of Math are easy, and the process of making as many parts of Math easy as possible." She describes category theory as being more about the relationships between objects than about the objects themselves, which she compares to the idea that a Lasagne is a certain relationship between noodles, sauces, and cheese despite the fact that your specific sauce recipes may be different from mine. She goes on to discuss various notions of sameness, structure, and universal properties, and manages to do so while keeping the book quite readable and light in tone even as the actual content gets increasingly technical.

It is almost certainly the first book ever written about Baking and Category theory. Also is the best book imaginable to introduce someone who doesn't think they are interested in Mathematics at all to some of the deep ideas of category theory, especially if they like to bake.  
- Mitali Singh - IInd Year

## DON'T 'WHISPER'. SHOUT IT OUT LOUD!

Basking in early morning sunlight and sipping chaiduring winters is a luxury. Today is just another perfect morning. Well, near to perfect. My mother, who otherwise is cheerful, is sullen and grumpy. Ask her why? It is 11 and the maid is still not here. After a good 15 minutes, our maid appears finally. With her back arched, hands on stomach, she admits reluctantly that she has fever and would not be able to do today's chores.

The moment she leaves I ask my mother, "Why does she hold her stomach even though she has fever?"

"That's because she has stomach ache and not fever", says my mother.

"Then why does she say otherwise?"

"Because she is menstruating and cannot publically announce that."

I give my mother a disgusted look. She gives me one of hers requesting me not to start off with another 'feminist' lecture.

The above incident is a sample of the magnitude to which menstruation is associated with shame. Even the 21 century Indian society witnesses a menstruating woman being banished from the kitchen, confined to some corner of the house, prevented from worshipping, and in some communities not allowed even to bathe or wash her hair. Like seriously? When you try to reason it out with society, some people would be quick to point out sorts of validation every time. For them each taboo would have a spiritual validation (menstruating women tend to absorb energies around them, and thus, deplete the pickle or yogurt of its vital energy, causing it to be spoiled when touched), a religious one (a menstruating woman is a living goddess. If she goes to a temple, the energy of the god in the idol would move to her, making the idol lifeless), or a practical one (seclusion gives privacy, space and rest to a menstruating woman). These explanations are disturbing because they lend the taboos an impenetrable aura of wisdom and legitimize the contempt towards a menstruating woman. But do these taboos hold significance in today's world? I guess not.

Ayurveda advises women against consuming pickles and yogurt during periods because they are acidic and can cause heartburn and bloating. So effectively, it is the pickle or yogurt that has an adverse impact on menstruating women and not the other way round. Likewise, menstrual blood is indeed powerful because it contains stem cells that can be harvested to create any kind of cells and tissues and can be used to treat ailments like diabetes and arthritis. And if the argument that women are isolated so as to allow them rest were true, they should be treated with respect. The blatant truth is that such menstrual taboos suppress the freedom of women. We should not feel ashamed of it. These taboos must be challenged; they must be broken. It is time that instead of 'whispering' our choices, we shout them out loud.

WE BLEED, AND WE ARE PROUD OF THAT.

-Aakash Malasi, 1st year

## President Speaks

Another amazing session has come to an end. The session 2015-2016 has been extremely special for me, not only because it is my third and final year at LSR, but more so because I got to serve the Department of Mathematics as the President, along with Srishti as the Secretary and Juhi as the Treasurer.

In April 2015, the three of us embarked on the journey to make every event in the Department successful, and today when I think about how we have done, forgetting about all the missed lunches and tons of messages and missed calls from each other, I am filled with a sense of gratitude and accomplishment. We were blessed to receive continuous advice from all the faculty members of the Department. We are grateful to have worked with our TIC, Bhavneet Ma'am, and Association Incharge, Mahesh Sir, who have constantly guided and supported us in all our endeavors and forgiven us for all our behind the scenes errors.

I have to say that we have had the opportunity to work with the best team ever. Be it the Committee Heads, the Editorial Board members for Quantum and Éclat or the Event Heads and Infra, Food and Publicity Heads for Enigma, they were always ready to take up new responsibilities and to plunge into the unknown along with the three of us. Kudos to them all!

I am proud to share that together we have managed to make Enigma 2016 a huge success with almost 200 participants from various colleges. This, along with other initiatives that we took, would not have been possible without the unending support that we got from the student volunteers, class representatives and the student body of the Department. Thank you all for your encouragement!

Hoping to see the Department doing even better in the years to come!

-Surbhi Sood  
President



## DID YOU KNOW?

The number 40, when written as 'forty', is the only number having letters in alphabetical order, while 'one' is the only number with letters in reverse order.



## Can We Imagine Life Without Mathematics?

Mathematics is a subject that is applied to every field and profession. Had it not been for math, we would still be figuring out each and everything in life, which in turn would create chaos. Still not convinced? Take a look at the section below. It might just bring you closer to it, or at least remove your fear of Mathematics.

### In Daily Life

Imagine that you go to a store and want to buy the latest version of your favourite video game. But since we are living in a world sans Math, how will you know how much it costs? You wouldn't know how many apples or strawberries you bought from the store. If you want to buy some medicine, how will you know how strong it is, or in what quantity the ingredients are present in it? If you want to bake your favourite cake, you won't be able to measure the ingredients. Moreover, there would be no calculators to calculate your share of the contribution for pizza that you ordered. All of this is possible only because Mr. Algebra is there to help you out with the help of our beloved Mr. X.

### In Economics

The economic sector would be hit the hardest if there wouldn't have been any numbers in this world. There wouldn't be any way to measure the value of goods and services. There wouldn't be any trading, and people would often end up with either too much or too little of everything. Without a budget, you'd never realize when you run out of money. Day-to-day transactions would be chaotic. You wouldn't have been able to analyze market trends, which are the main elements of any business. There would be no GDP, no interests, and no shares to invest in.

Had it not been for Mathematics, you wouldn't have stumbled upon this article as well! Okay, jokes apart! So now you know that life without Mathematics is actually impossible and unimaginable. You just need to get your basics right, and know how to play with numbers. Hope you have fallen in love with it by now! If you haven't, then it's about time we accept the fact that we are destined to live with Mathematics for the rest of our lives. This is how much it loves everyone. So, the best way to make peace with it would be to accept it and love it back.

After all, it was made to make our lives easier, not difficult.

- Yasmeen Khan, 1st year

### In Technology

Moreover, there wouldn't be any advancements in technology. The cell phones and high-end gadgets that you use everyday wouldn't exist, since the mechanism and working involves complex algorithms, which are possible because of Mathematics. Imagine living in a world without computers, televisions, laptops, cell phones, and even electricity. We're sure most of you couldn't even imagine living without all these.

### In Sports

Do you love sports? Well, if it wasn't for numbers, how would you know the scores? How would you have come to know how much distance you ran. There would be no competitions and tournaments. Don't you think it would get a bit boring?

### In Education

If there were no numbers, then there wouldn't be any Math, Physics, or Chemistry to study. And there would be no examinations or tests, the results of which would freak you out! We can see the wide, devilish grin on your face, looking here! But come to think of it, would you be so much educated and well-learned if you didn't have Math in your life at all?

Hi, I'm Esha Saha, a second year Mathematics Hons student of LSR. I was interested for an academic oriented internship during the summer. So while searching online, I found the Visiting Students Research Program in TIFR CAM. It's a paid internship with a stipend of ₹7000 p.m. TIFR Centre for Applicable Mathematics is a centre of the school of Mathematics of TIFR Mumbai. It is based in Bangalore and research is on Applied Maths. The internship aims at an independent research project under the guidance of any one professor.

I had applied according to the procedure given on their website. This year I applied by sending my CV to the given email address. In the email I had to mention the name of any three professors with whom I would like to work. Then a letter of recommendation was to be sent to them by any teacher. Then they announced the selected students on their website by the first week of March along with the professor allotted. Finally, once I was selected I confirmed my period of stay. I'll be doing my internship for 7 weeks between May and July with Prof. V Murthy at TIFR CAM, Bangalore. His research interest is on partial differential equations and atmospheric modelling. I'll get to know the details of my project only when I get there.



## Some tales witness madness!

Pythagoras of Samos, the man responsible for the first golden age of Mathematics, was one of the most influential and yet mysterious figures in Mathematics. Because, there are no first-hand accounts of his life, he is shrouded in myth and legend, making it difficult for historians to separate fact from fiction.

Pythagoras travelled for twenty years to assimilate all the Mathematical rules in the world and came to his home island with the intention of founding a school. However, by then tyrant Polycrates had turned once liberal Samos into an intolerant and conservative society. Pythagoras refused to join Polycrates court, left the city in favor of a cave in a remote part of the island, where he could contemplate without fear of persecution.

Pythagoras did not relish his isolation and eventually resorted to bribing a young boy to be his first pupil. He would pay his student three colli for each lesson he attended. In time, the boy developed interest and offered to pay for his education. Pythagoras' views on social reform were unacceptable so he was forced to flee the colony with his mother and one and only disciple to southern Italy. With a partnership with Milo, the wealthiest man in Croto, Pythagoras founded the Pythagoras Brotherhood – a band of six hundred followers. Each member of the school was forced to swear an oath never to reveal to the outside world any of their Mathematical discoveries.

For Pythagoras, the beauty of Mathematics was the idea that rational numbers could explain all the natural phenomena. This guiding principle blinded Pythagoras to the existence of irrational numbers and may even have led to the execution of one of his pupils. One story claims that a young student by the name of Hippasus was idly toying with the number  $\sqrt{2}$ , attempting to find the equivalent fraction. Eventually he came to realize that no such fraction existed, i.e. that  $\sqrt{2}$  is an irrational number. Hippasus must have been overjoyed by his discovery, but his master was not. Pythagoras had defined the universe in terms of rational numbers, and the existence of irrational numbers brought his ideals into question. The consequence of Hippasus' insight would have been a period of discussion and contemplation during which Pythagoras ought to have come in terms with this new source of numbers. However, Pythagoras was unwilling to accept that he was wrong, but at the same time he was unable to destroy Hippasus' argument by the power of logic. To his eternal shame he sentenced Hippasus to death by drowning.

The father of logic and the Mathematical method had resorted to force rather than admit he was wrong. Pythagoras' denial of irrational numbers is his most disgraceful act and perhaps the greatest tragedy of Greek Mathematics. It was only after his death that irrationals could be safely resurrected.

-Anika Jain, 2nd year



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## Shakuntala Devi

Popularly known as "The Human Computer", Shakuntala Devi was born on 4th November in 1929, to a very poor family. She dropped out of her school because her father, a circus worker, could not afford the monthly school fee Rs 2. Despite all the hurdles and hardships, Shakuntala Devi made India proud by displaying her extraordinary mental skills in calculating complex mathematical problems within seconds all around the globe.

Shakuntala Devi was three years old when her father observed the first sight of her Mathematical brilliance. To his surprise, he found that the three-year-old was memorizing the card sequence and calculating the next move. At the age of 6, she gave her first major show at Mysore University and there was no turning back after that. In 1944, Shakuntala moved to London with her father. She demonstrated her skills at various institutes until the English media recognized her. On October 5, 1950, BBC hosted a show with Shakuntala. During the show, host Leslie Mitchell gave her a complex Math problem to solve. Shakuntala solved it in seconds but according to Mitchell, the answer was not correct. However, after rechecking the answer, the host confessed that Shakuntala was correct and the original answer was wrong. This news spread across the world and Shakuntala earned the title of the 'Human Computer'.

The University of Philippines awarded her the title of the 'Most Distinguished Woman of the Year' in 1969. She has also received the 'Ramanujan Mathematical Genius' Award in Washington D.C. from the then Ambassador of India in 1988. On the social front, she started "Shakuntala Devi Education Foundation Public Trust" with a mission to provide quality education for children of deprived sections of the society. Also, she encouraged research in Vedic mathematics and helped spread global awareness about India's contribution towards mathematics.

She was a Math evangelist, human computer, social worker & role model, and India is indeed proud to be a home to such an inspirational personality.

-Avantika Banerjee, 2nd year