

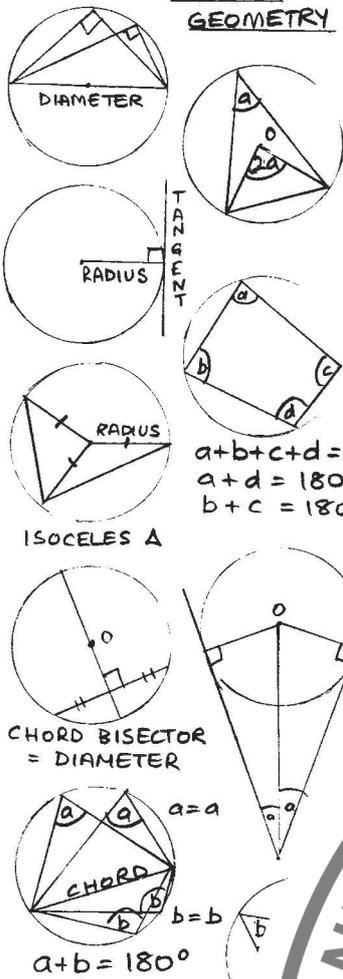
Mathletics

2017-2018

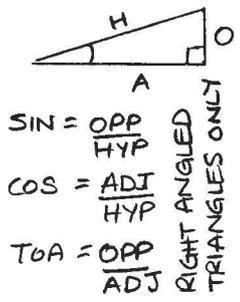
THE ANNUAL MATHEMATICS MAGAZINE

Department of Mathematics, Miranda House

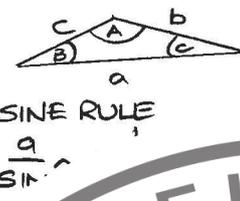
CIRCLE GEOMETRY



SOH CAH TOA



SINE + COSINE ANY OTHER Δ



CUMULATIVE FREQ GRAPHS

MEDIAN - FIND HALFWAY UP THEN READ OFF BOTTOM AXIS
QUARTILES - 1/4 and 3/4 WAY UP THEN READ OFF BOTTOM AXIS
INTERQUARTILE RANGE
DISTANCE BET 1/4 and 3/4 QUARTILES ON BOTTOM SCALE

PROBABILITY

$P(A \text{ and } B) = P(A) \times P(B)$
 $P(A \text{ or } B) = P(A) + P(B)$
 $P(\text{AT LEAST}) = 1 - P(\text{the other outcome})$

DATA

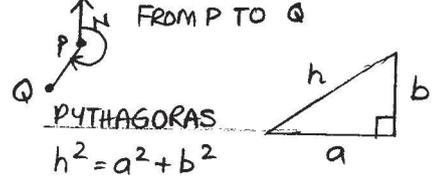
MODE = MOST COMMON
MEDIAN = MIDDLE VALUE
MEAN = $\frac{\text{TOTAL OF ITEMS}}{\text{NO OF ITEMS}}$
RANGE = HOW FAR FROM SMALLEST TO BIGGEST

PIE CHARTS

- ADD TOTAL OF ITEMS
- FIND MULTIPLIER TO GET TO 360°
- MULTIPLY EVERY TO

BEARINGS

FROM NORTHLINE CLOCKWISE
FROM P TO Q



SHIFTS + STRETCHES ON GRAPHS

$kf(x) > 1$ Squeeze < 1 Squash
 $+a$ moves a along y axis
 $+a$ moves -a along x axis
- multiplier scrunches divider spreads out

$\frac{\text{CHANGE}}{\text{ORIGINAL}} \times 100$

$\frac{\text{PROFIT}}{\text{ORIGINAL}} \times 100$

REST
 $o (\frac{1}{100} \times n)$ N=EXISTING AMOUNT

CHANGE
 $(1 + \frac{r}{100})^n$ N=no of days/yrs

$\sqrt[5]{b} = \sqrt{a \times b}$

$\frac{a}{\sqrt{b}} = \sqrt{a \div b}$

$\sqrt{a} + \sqrt{b} = !$ can't do it
 $(a + \sqrt{b})^2 = (a + \sqrt{b})(a + \sqrt{b})$ FOIL
 $= a^2 + 2a\sqrt{b} + b$

MIDPOINT OF LINE

- average of x co-ordinates
- average of y co-ordinates

FORMULA OF STRAIGHT LINE

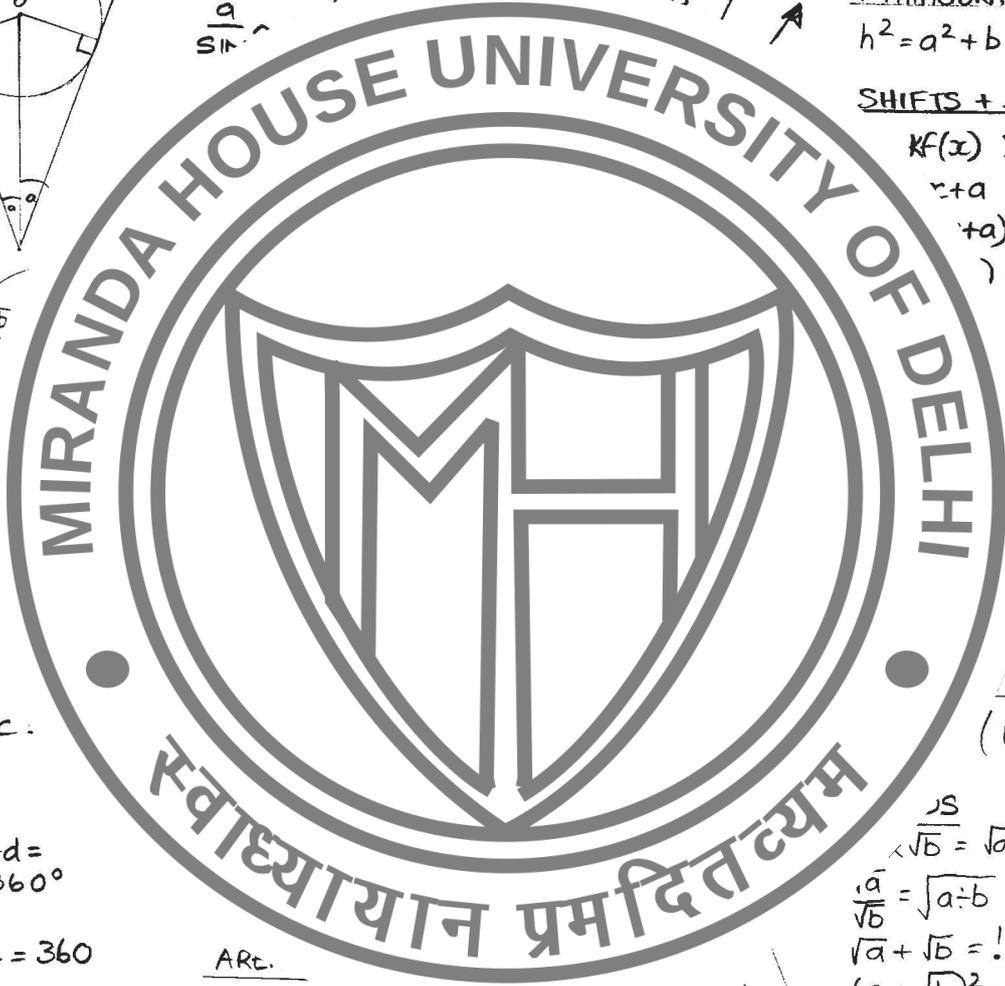
$y = mx + c$ m is gradient
c is y intercept

GRADIENT OF A LINE

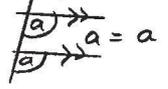
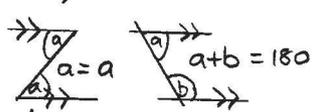
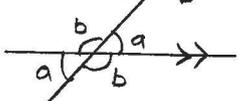
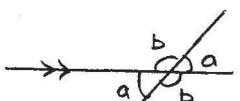
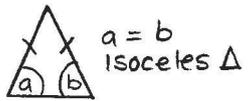
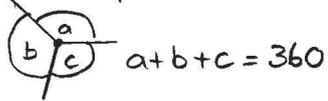
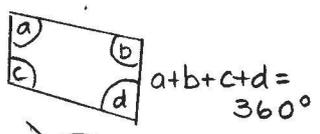
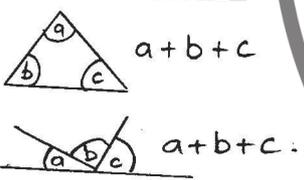
GRADIENT = $\frac{\text{CHANGE IN X}}{\text{CHANGE IN Y}}$

SPEED = DISTANCE ÷ TIME
 $S = \frac{D}{T}$

DENSITY = MASS ÷ VOL



GEOMETRY



ARE.

RECTANGLE: L X W
TRIANGLE: $\frac{1}{2} b \times h$
PARALLELOGRAM: $b \times h$ (vert height)
TRAPEZIUM:
 $\frac{1}{2} \times (a + b) \times h$
CIRCLE: πr^2
SECTOR: $\frac{\theta}{360} \times \text{Area of Circle}$

VOLUMES

CUBOID: L X W X H
PRISM: AREA OF X L
CS
PYRAMID: $\frac{1}{3} \times \text{BASE} \times \text{H}$
CONE: $\frac{1}{3} \times \pi r^2 \times h$
SPHERE: $\frac{4}{3} \pi r^3$

$x^a \times x^b = x^{a+b}$
 $(x^a)^b = x^{a \times b} = x^{ab}$
 $x^a \div x^b = x^{a-b}$

Nth term (common)

$n^{\text{th}} \text{ term} = dn + (a - d)$
a = 1st term
d = common difference

Nth term (changing diff)

$n^{\text{th}} = a + (n-1)d + \frac{1}{2}(n-1)(n-2)c$
where c is change between one difference and the next

Message from the Teacher in Charge

It gives me immense pleasure to introduce the first edition of our magazine 'MATHLETICS'. It started in the year 2012 as a newsletter by the enormous efforts of our students Nishika Bhatia, Neha Budhiraja and Ashima Sharma. This year also the magazine has been designed and conceptualised by the students. Our aim is to encourage creativity of thought among students so that they may learn and grow in every aspect.

In this publication, we offer a wide variety of articles which are contributions by the current students, with special write ups by alumnae Nishika Bhatia and Mahenoor Ali . The edition of Mathletics also provides a glimpse of the activities that have happened in this academic year. These include workshops, seminars, talks, trip to Shimla and Chandigarh, the annual departmental fest and associated activities.



I convey a word of thanks to Meghna Basu and Pankhuri Khare with their entire editorial team for their efforts with special mention to Lehak Narnauli for the very philosophical cover design. Mr. Manoj Rawal's inputs and his contribution deserve a notable mention. Our Student advisors Ms. Bhawna Bansal Gupta, Ms. Apeksha Verma and Dr. Rekha Gupta have been very forthcoming and that has enabled us to work as a team, and I extend my sincere thanks to them.

My best wishes to all.

Dr. Meetu Bhatia Grover
Teacher in Charge
Department of Mathematics
Miranda House

Message from the Staff Advisor

Print media has always been a means of promoting creativity. Although quick technological tools exist for expression of ideas in today's world, but significance of print media cannot be denied. Information, facts are full everywhere but analytical elucidation is developed when writing takes place that leads to self-satisfaction. Magazine is a means to provide platform for students to come forward, identify their talent, discover their potential and move on the path of progress. It is supposed to garner diverse thoughts and expressions altogether. I am delighted to see that creative capacity of our students has been transformed into a tangible way in form of 'Mathletics' as result of their tireless efforts and is presented for the feedback.



Ms. Apeksha

I sincerely thank our editors-in-chief Pankhuri and Meghna, and student union president Mahima whose diligent efforts and strong determination has made the dream of 'Mathletics' come true. I thank the entire editorial team for their commendable work.

I would like to extend my thanks to student union – Mahima, Diksha, Anjali and Vaishali for working as a good team and having accomplished set goals irrespective of many hurdles. I really admire their willingness to work at any time, be it late night or early morning. Many events like seminar, talks, Origin were organised and successfully completed by their efforts. All of this was very adventurous for me, which taught many lessons. There were many ups and downs during the advisor-ship but at the end everything was good, reaffirming my faith in that if we do our work honestly and give our best, outcomes are always positive. And this is my message to outgoing batch that wherever you go, whatever you do, do with interest and wholeheartedly. There may be circumstances when you feel that situations are not in your favour, but look at the positive side of every situation and keep doing your work with allegiance. Feelings are temporary; don't let them control you. You have infinite potential which you have to realize and explore.

My best wishes to all of you.

Our Union

President

Thoughts came rolling back and it seems as though it was just yesterday that I was entrusted with the responsibility of being the President of the Department of Mathematics, Miranda House. The, now seemingly, smooth end of the road had a wonky beginning filled with so much more than challenges and triumphs. It was an experience that could not be replaced by any other. We bade farewell to those who kept our ship going, welcomed the Freshers and celebrated Teachers' Day. These acted like my training programs into what was yet to come, and trust me, there was so much more to come, the least of which was the turbulent path to Shimla with its twists and turns, which is the most accurate description of my journey! The New Year firmed the Origins of a hardworking President in me, and it laid the Origins of a less patient President. If the above isn't laced with enough hints, I am referring to Origin 2018. It was the highlight of the session and greatest test and achievement for me. I am thankful to Diksha Gupta, Vaishali and Anjali Ranolia for their cooperation and support. I am grateful to the faculty members for their constant support and guidance. I am much obliged to my classmates and my juniors for their never-ending love and encouragement. And, to the passengers who kept my ship from sinking- my closest friends: Diksha Gupta (for making faces at whatever I used to say), Krati Morandani (for being a beacon of cuteness), Meghna Basu (for her ever-ready hugs) and of course, Aparna Brahma (for never showing up). A special thank you to my roommate Veronica Kashyap for always being there.



Mahima Arora

THANK YOU TO THE WALLS OF MIRANDA!!

Mitti ki hai jo khushboo, mai kaise mitaungi,
Mai chahe kahi bhi jau, mai laut kar aungi!

Vice President

I had to see things from the other side to actually live every moment here at Miranda House. After all, the experience is always better from behind the stage! This post is what gave me the opportunity to live the best of both worlds. From enjoying the fests and attending the workshops, to actually getting every bit together for a successful show, was a worthwhile journey. I am really thankful to my colleagues and my teachers for all the support, love and trust bestowed upon me. I hope I was able to do justice to my designation because I can say with firmness that it made my final year the best here at Miranda House.



Diksha Gupta

"There are no secrets to success.
It is the result of preparation, hard
work, and learning from failure."

-- Colin Powell

Our Achievers

Batch Of 2017

Aayushi Chaudhary, M.Sc. Mathematics, IIT Delhi
Charu Yadav, M.Sc. Mathematics, IIT Roorkee
Mayuri Saha, MCA, NIT Jamshedpur
Pooja Gautam, M.Sc. Mathematics, NIT Durgapur
Sheena Saini, M.Sc. Mathematics, IIT Delhi
Suman Kaswan, M.Sc. Mathematics, IIT Patna
Tanisha, M.Sc. Mathematics, IIT Gandhinagar
Trishita Nandi, MBA, IIM Ahmedabad
Upasana Kalra, M.Sc. Mathematics, IIT Bombay

Batch Of 2018 (SGPA 10)

Ankita	III & V Semester
Archana Bhoria	III Semester
Krupa Maria Jose	V Semester
Neha Joshi	III Semester
Priyanka Gupta	V Semester

Batch Of 2019 (SGPA 10)

Andin Kour	III Semester
Rythm Babbar	III Semester

Batch Of 2020 (SGPA 10)

Sudha Yadav	I Semester
-------------	------------

Jahanavi Godara (H1A): Received 1st prize in Baseline test (Mathematical Sciences) held in September 2017.
Got Best Interjector Award in Science Award (2017-18) presentation round organised by DS Kothari Center for undergraduate research

IIT JAM Rank Holders:

Baby Gill (H3A) - Rank 44

Diksha Gupta (H3A) - Rank 72

Priyanka Gupta (H3B) - Rank 91

From the Editors

All our lives we've been preconditioned to believe that Maths is all about formulas. But if there's one thing we've learnt within these red brick walls, as students of Mathematics, it is that Maths is far from that. The journey through the labyrinth of Mathematics is largely incomplete without sheer intuition and imagination. It's the ability to think outside the box and apply yourself creatively, while maintaining scientific integrity.

When we first entered college, we were told to unlearn all that we had learnt before and to look at the same problem from myriad perspectives and truly understand why we do what we do. The "formula" for living our lives is not very different; we must stop following rules blindly without understanding why they were put there in the first place. Keeping that in mind, we have made it a point to include articles that put emphasis on the relationship between our lives and Mathematics; articles that make you realise the all-pervasive nature of this subject and the fact that it is inherently present in all aspects of our lives.

Our experience as editors of this first edition of Mathletics has been truly gratifying. The whole process of mentoring our team and coordinating with our convenors has been a great lesson in responsibility, accountability and the corresponding authority that comes with it to get the job done effectively and efficiently. We sincerely hope that the legacy of Mathletics is carried on, with each edition being better than the last. We wish our readers have as great a time flicking through the pages of this magazine as we had creating it.

We would like to express our gratitude to our juniors for working tirelessly to make this magazine a success and our convenors for guiding us throughout. We would also like to especially thank Shireen Kaul and Lehak Narnauli for their contributions and the union for taking this wonderful initiative.



Meghna B.

Pankhuri

(Meghna Basu & Pankhuri Khare)

"In Mathematics the art of proposing a question must be held of higher value than solving it."

~ Georg Cantor

'Fun with Maths' series was conducted, which included 4 crosswords and one photography with Mathematical explanation competition. The winners were as follows:

Mathematical Crossword 1: Sweta 2nd year Maths(H) and Hanan Latheef P 1st year Physics(H)

Mathematical Crossword 3: Kalpana 1st year Physics(H)

Mathematical Crossword 4: Manya Singh 2nd year Maths(H)

Mathshot : Andin Kour Sason 2nd year Maths(H)

Almost everything happening around us can be explained mathematically, be it the landscapes or the rainbows. I have clicked two such pictures and tried to explain how mathematics can be linked to them .

Image 1:

This picture was clicked by me at Kargil , Ladakh in July 2017 . We can witness in the picture , the beautiful landscape out there. The average elevation is about 2,676 m . Before the development of fractal geometry , nature was regarded as noisy "Euclidean geometry". A mountain is primarily a roughened cone for example. Indeed this view was modified by Paul Czanne's statement about painting - " Everything in nature can be viewed in terms of cones, cylinder and sphere".

The word "fractal" was coined less than 30 years ago by one of the history's most creative mathematicians , Benoit Mandelbort, father of fractal geometry . In his book ,The Fractal Geometry Of Nature, he explained the concepts underlying this new vision. To realise a fractal mountain we can take an elastic string , then a random vertical displacement is applied to its middle point . This process is repeated recursively to the middle point of every new segment . To realise 3D mountains is more difficult than 2D . Some approaches are based on midpoint displacement method which can work with a triangle , square and hexagonal grids .

Image 2:

This picture was taken in Kashmir on an evening in June 2017. Rainbow is a meteorological phenomenon that is caused by reflection, refraction and dispersion of light appearing in the sky. However if we look on the inside of the principal violet arc we find several pale violet arcs interspersed with some paler greenish bands . Cambridge mathematician , George Biddel Airy applied the wave theory of Fresnel to explain this.

Ps: Every shot is a mathematical shot , we just need to be curious enough to find the correct mathematical reasoning and explanation for it.



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WOMEN OF MATHEMATICS

HISTORICAL NOTE FOR SETS AND FUNCTIONS

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GOD'S PLAN

NO NOBEL FOR MATHEMATICIANS

THE DIVINE PROPORTION

LAUREL FOR THE LOGICIAN

WHEN MATHS TURNS GOLDEN

WHY DO WE STUDY MATHEMATICS?

THE MAN WHO KNEW INFINITY

A TOUCH OF MADNESS, THE STROKE OF GENIUS

KUMMER'S CONTRIBUTION

BRANCHING THROUGH THE MIRANDA ROOTS

MATHEMATICS IS EVERYWHERE

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DIVYA JOSHI 16

ESHA AWASTHI 18

HIMANI THAKUR 20

KRITIKA BANSAL 20

KOMAL YADAV 21

ASHMITA RANA 22

RITIKA VERMA 22

KARTHIKA R 23

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BATCH
OF 2018

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Timeline of Events

**Mathematics Department
Miranda House**



Presents a Talk on
**Problem Solving
made easy**

By Dr. K.V. Shantha



TIME: 2PM - 3PM
DATE: SEPT 08

Venue : Lecture Theatre (Room No. 145)

For Enquiries, Contact :
Mahima (President) : 9643210163

A two-hour talk delivered by D.R. K.V. Shantha, on the 8th of September 2017, broadly covered the topics: journey of Mathematics from numbers to alphabets and careers in Mathematics. She also discussed the hacks to some of the trickiest problems of Mathematics. One of the examples she gave was that of Russell's paradox which is, 'who will shave the barber' if the barber is the one who shaves all those, and those only, who do not shave themselves. Answering this question results in a contradiction. The barber cannot shave himself as he only shaves those who do not shave themselves. As such, if he shaves himself he ceases to be the barber. Conversely, if the barber does not shave himself, then he fits into the group of people who would be shaved by the barber, and thus, as the barber, he must shave himself. Her determination and passion towards Mathematics acted in her favour to gather the interests of the audience. The attendees were actively involved in the talk and it turned out to be an interactive and fruitful session.

-Diksha Gupta
Mathematics (Hons.) H3A



Mr. Nick Wood was invited for an interactive session which took place on the 14th of September 2017. He discussed with students the future prospects of actuarial science as a profession. He talked about not only the curriculum but also told about the broad scope of actuarial science in the future and the current job scenarios in the market. He gave students an idea about how the system of actuarial works seeing as how it is still a new field and is lesser known. The session was extremely successful with all students as was witnessed by the appreciation conveyed by the audience at the end of the talk.

-Vaishali Goel
Mathematics (Hons.) H2B

DEPARTMENT OF MATHEMATICS
MIRANDA HOUSE



PRESENTS TO YOU AN
INTERACTIVE SESSION ON

**Thursday
Sept.
14, 2017
at 11 A.M.**

ACTUARIAL SCIENCE

BY PROFESSOR NICK WOODS
(UNIVERSITY OF KENT)



VENUE : ROOM NO. 260

For further details, contact:
Mahima Arora (President) : 9643210163
Diksha Gupta (Vice President) : 9560220300

An Open Interaction with Ira Singhal



The Department of Mathematics, Miranda House witnessed the Seminar Hall filled to the brim with an exuberant audience when Ira Singhal was invited for an Open Interaction on the afternoon of 23rd of March 2018.

Amongst a roar of applause, Ira Singhal was introduced, by Department President Mahima Arora, as the first differently abled woman to become an IAS topper through the Civil Services Examination; Arunachal Pradesh, Goa, Mizoram and Union Territory's home cadre IAS Officer from the year 2015 and a B.Tech undergraduate of NSIT and an MBA graduate of Faculty of Management Studies, New Delhi.

With an amalgamation of wit, astuteness, humour and an exceptional connect with her starry-eyed audience, Ira Singhal started her talk by first covering basic concepts of what an IAS officer acting as a Sub Divisional Magistrate does, which is a multi-dynamic alloy of responsibilities regarding public health, sanitation, law, education, environment protection, government schemes and many other areas. She then moved on to talking about her adventures as a Strategy Manager at Cadbury in Mumbai before she stumbled upon her moment of epiphany that inspired her to put her talent and efforts into a platform that would impact people's lives in a positive manner at a larger magnitude.

She talked about gender discrimination and ways to break those barriers through positive self-image and empowerment. She then narrated her journey of becoming an IAS officer which turned out to be a four year long grueling legal battle at the Central Administrative Tribunal despite her clearing the examination in the first attempt in 2010. Her story inspired the audience to have grit and perseverance and to never take no for an answer. She emphasised the importance of the right amount of effort at the right time and gave smart hacks to being a better leader personally and professionally.

This was then followed by a question-answer round where the students asked her various questions regarding IAS examination prep formulas and her experience at the Lal Bahadur Shastri National Academy of Administration. Safe to say, everyone, walked out dazzled, with a fresh zeal towards their aims and ambitions. It was truly a day to remember.

-Pankhuri Khare
Mathematics (Hons.) H3B

Workshop: Probability and Statistics using R



From the past two years, the Department of Mathematics, Miranda House has conducted many workshops for the benefit of the students who want to boost their academic skills and not just limited to classroom learning. This year, our department organized a three day workshop from the 4th of April '18 to the 6th of April '18 focussing on the topic “Probability and Statistics using R” under the guidance of Dr. Ritu Gupta and Dr. Jyoti Talwar. We hosted many eminent speakers like Professor Seema Jaggi from ICAR, IASRI; Dr. Abhay G Bhatt from ISI Delhi and Dr. Antar Bandyopadhyay from ISI Delhi.

The first day of the workshop, on 4th April '18, commenced with a 9:15 am session with Professor Seema Jaggi, who is currently a principal scientist at ICAR. She began her session by introducing the students to ICAR, following which she discussed various ways of testing a hypothesis in order to check whether a given problem is significant or not. She ended her session by telling us about ANOVA after which we had a small break. Resuming the workshop, Ms. Barnali Deka from Weekendr, which offers hands-on learning engagement in Data Analysis, Data science and Placement preparation - joined us. Currently, she is teaching as an assistant professor at Ramjas College, University of Delhi. She began her session with the basics of R and then followed it up with statistical knowledge about plotting and testing of hypotheses in R.

On the 5th of April, the second day of the workshop, Dr. Abhay G Bhatt who is currently head of ISI Delhi, started the session by showing us how we are surrounded by statistics everywhere. He explained the concept of pattern of races and later discussed Brownian motion, which he connected to stock price modelling. The session was quite interesting and we all gained significant knowledge. Later in the day, Ms. Barnali Deka took a session and continued with R.

On 6th April, the last day of the workshop, Dr. Antar Bandyopadhyay started his session with the basics of probability and made us genuinely doubt whether or not a random experiment can really exist. He continued his session by discussing Garisson Distribution, Central Limits Theorem and so on. After the break, Ms. Barnali Deka resumed her part of the workshop, at the end of which the students were left with significant programming knowledge regarding R.

All the students found the workshop greatly interesting and worthy of their time. We are extremely grateful to our department which provided us this platform to gain knowledge and enhance our skills relating to Mathematics in a more practical sense, in contrast to the academic learning we do every day.

-Aarti
Mathematics (Hons.) H3A

In Conversation With

Ms. Lalita Dhar



Ms. Lalita Dhar joined the Mathematics Department of Delhi University as a Research Scholar in 1970 after doing her Masters in Mathematics from J & K University. She has published seven research papers in Indian and foreign journals. She joined the Department of Mathematics, Miranda House in 1974 and taught here for forty one years. She has also revised the book 'Differential Calculus' by Shanti Narayan along with another faculty member of the Department, Mrs. Nilima. Ms. Dhar retired in April, 2015. She had an illustrious career and even held the post of College Bursar.

1. **What/Who inspired you to be a Professor and how exactly did you stumble upon Mathematics as your chosen field?**

You will be surprised to know that my ambition was to become a Doctor but fate willed otherwise. Not that I didn't like Mathematics. I was good in the subject since my childhood and scoring good marks motivated me to pursue the subject. Also my father persuaded me to go in for higher studies in Mathematics. Those days teaching was supposed to be a very noble profession for ladies and my teachers were also a role model for me to take up this profession.

2. **You are well known in our college as a connoisseur of Analysis, a subject that's notorious amongst the masses for being daunting. What are your views on that perceived fear and what is your personal perception of this subject?**

Analysis was a subject which I always loved to study even though when I was introduced to the subject, it went over my head. When I was preparing for the interview for joining as a research student in the Department of Mathematics, Delhi University, I studied Analysis only, and lo and behold my guide Late Prof U.N. Singh formerly Dean Faculty Of Mathematics asked me questions from Analysis only. That is destiny. Had I prepared Algebra or any other subject, perhaps I would not be in Delhi University and hence in Miranda House.

Regarding the subject Analysis, when students join 1st year Maths (Hons) they are exposed to an abstract subject and there is a sudden jump in the standard from class 12 Mathematics. If the basics are not clear at that stage, they develop a fear of it. When I was a student, Statics and Dynamics appeared daunting to me but as a teacher I taught Dynamics for a number of years to 3rd year Hons students and I loved teaching that subject also. So what appears difficult today may not be so tomorrow, if you make an effort.

3. **What were your most memorable moments as a professor of Mathematics at Miranda House? What positively surprised you most during your career at Miranda House? Who is/are the most inspiring or influential person/people you had come across over here?**

I had a long stint of 41 years in the college and so many good memories are etched in my mind that it is difficult to put them on paper in a few sentences. In a nutshell Miranda House gave me an identity and I am proud to be a part of this institution. I enjoyed teaching here and had an opportunity to interact with so many students who came to study here from different corners of the country. Some of them were so bright that I learnt a few things from them and evolved as a teacher. Sometimes they would ask such basic questions that I had to study to satisfy them. They were also full of respect and love for the teachers. I was also impressed by the role of our senior teachers who groomed us to become better persons, better teachers and they tried to draw out the hidden talents of junior ones. On Founder's Day they would literally drag us on the stage to sing or put up a skit. I also learnt a lot from colleagues and friends in the Department and had their support whenever needed. The senior teachers in the Department left an everlasting impression on me and we tried to imbibe the great traditions established by them. It was a privilege to work as a Bursar with Dr. Pratibha Jolly. That gave me an opportunity to know about administrative problems in the college and I learnt a lot from her. She has a vision for the college and she has worked hard for taking Miranda House to new heights. Being convener of Work Load committee gave me a chance to interact with colleagues from all other Departments of the college and that was a wonderful experience.

4. **If there is something you could change about higher education in India, what would it be?**

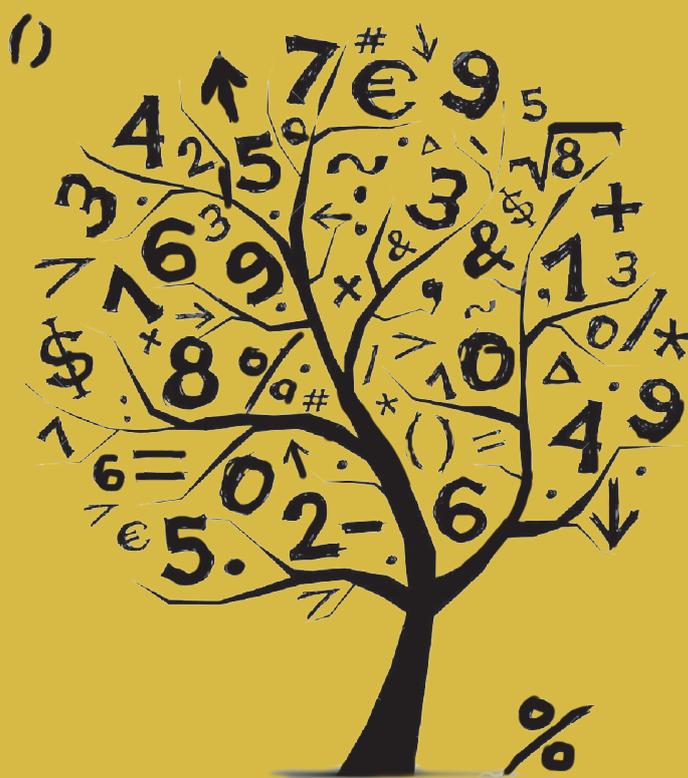
The emphasis should be on application of knowledge and experiential learning, instead of rote system. I would also like that students are given a free choice to decide their courses of study and for that they should be exposed to the different fields in the first one or two years of college.

5. **Globally, interest in Mathematics has been waning. Why do you think that is?**

I do not think that interest in Mathematics is waning. So many different branches of this subject are coming up, be it Statistics or Actuarial Sciences or Application in Defense Systems. But the curriculum has to be evolved in such a way that people are able to apply the subject in other fields. In 1986 our Department organized a Seminar on 'Importance of Mathematics in Social Sciences' under a scheme funded by UGC where we were exposed to so many applications of Mathematics. You people are lucky as at this stage so many avenues for application of this subject have opened up and students are more aware of the happenings around, thanks to internet.

6. **Any words of advice for us?**

Be sincere in whatever you do. Dedication and hard work will give you rewards. It is important to be independent thinking women and have a career. But the most important thing is to be a good human being and have compassion for others.



Life Through the Eyes of a Mathematician

Mathematics is in every aspect of our lives; from a mother-child relationship to a person's every needs. The emotional distance between a mother-child can be minimised, i.e. there exists a $\Delta > 0$ for which we have $\text{Epsilon} > 0$. A mother always tends to a child, who is a limit to her.

Every person has ∞ desires to fulfill despite knowing the fact that ∞ is not a real number. Human beings generally behave like a modulus function as they react positively or negatively according to the circumstances or people around them; whenever a person is looking forward to a positive outcome from a situation he takes the positive values otherwise he chooses to remain indifferent by taking the negative values.

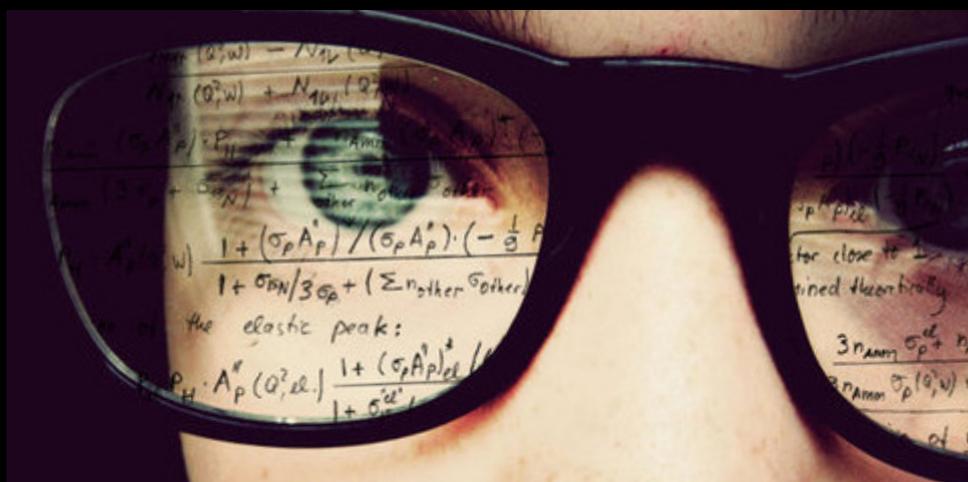
Friends are like limitless functions separately but together they become a constant function. College students resemble 'unlike terms' of algebra, that is, until the lunch break. The Cafeteria then becomes their limit point of enjoyment as there exists a lot of points in that interval of time.

A group of friends is like an integral domain because of the absence of zero divisors which implies there exists two friends such that $(1\text{st friend} \times 2\text{nd friend}) = 0$ as their love for each other makes them an identity together.

Teachers are synonymous with integration as they increase the capabilities of a constant student with their knowledge and magnify a student's capabilities.

The most important lesson Mathematics teaches us is the will to never give up as every problem has a solution.

By: Renu
Mathematics (Hons.) H2A



Inauspicious Number 13?

There is a popular maxim which states that the best way to predict the future is to look into the past. History has time and again proven the number 13 to be a diabolical entity, sneaking in corners, ready to cause bad omens and accidents, so much so that the fear of this number over the centuries has compounded manifold to the point of causing looks of horrors at the prospect of residing at the "13th floor" of a building.

The fear of this number has its own personalised jargon known as “Triskaidekaphobia”. It is a combination of Greek words “tris”, meaning “three”, “kai”, meaning “and”, “deka” meaning “ten” and “phobia” meaning “fear”.

- Apollo 13 was launched on 11 April and it underwent explosion on 13th of April (2 thirteens).
- Zoroastrian tradition predicts chaos in the 13th millennium.
- Another example is the Columbia Space Shuttle. This one went into space on 1/16/2003. Add all the numbers and you will get the number 13. During its re-entry into Earth, it exploded. All the crew members died.
- Many hotels in China and America don't have a 13th floor. After 12th, either they have 12 and a half or 14th. Same goes for the number of houses too.
- Even Microsoft considers the number 13 very unlucky and that is the reason why there is no version 13 of Microsoft office. The version 12 is Microsoft Office 2007 and the next version Microsoft Office 2010 is actually version 14. Thus, the company skipped number 13 altogether.

But just because some superstition is blindly acknowledged, does it make it true? Does this number really deserve this notoriety?

I beg to differ.

- In ancient Greece, Zeus is considered as the thirteenth and the most powerful God. This thirteenth God seems to be associated with totality, completion, and attainment.
- The ladder to eternity has thirteen steps, on reaching the 13th step, it is assumed that your soul attains spiritual completion.
- 13 is a prime number, which means it cannot be divided by any number other than itself. Hence, symbolizes qualities of incorruptible nature and purity.
- In one of the most powerful civilizations of history, the Aztecs decided to have 13 days in a week as they considered 13 to be an extremely lucky number. Each day was ruled by one God. And the God who ruled the thirteenth day was associated with mystery, psyche, and magic.
- As we all know, 13 is the age of change or transition for every girl or boy. It is the age when children officially become teenagers.
- The US flag has 13 strips, that represent the union of 13 colonies to fight the British rule, later these 13 colonies became the first thirteen states of United States of America.
- The Thai New Year (Songkran Day) is celebrated on the 13th April. It is considered to be a day of washing away all the bad omens, by splashing water on people, friends, and relatives.
- In Hindu mythology, Maha Shivratri is celebrated on the thirteenth night of the Magha month, which is very sacred and a holy night for all the Shiva devotees.
- In the sacred book of the Sikhs, the “Guru Granth Sahib”, the word “Waheguru” which means eternal guru appears 13 times.

The list goes on.

Being a student of Mathematics, the first thing I learnt was that for a phenomenon to be true, there must be no exceptions. The phenomenon must be proved for every single condition. The fact that we are able to find numerous exceptions to this phenomenon is proof enough for it to be baseless superstition.

By: Divya Joshi
Mathematics (Hons.) H1A

Women of Mathematics

Until very recently society dictated that it wasn't very respectable for women to be Mathematicians. In a patriarchal society where the world was dictated by the likes of men, women were oppressed if they had an opinion. Obviously, a woman establishing a theorem was unheard of. However, there were a few women who dared to go against the flow and their achievements demonstrate that women have as much to contribute to Mathematics as any of their male counterparts.

It is hard to perceive who the first female Mathematician was. Hypatia was certainly one of the earliest. She was born in 370 AD. She was the daughter of Theon, the last known member of the famed library of Alexandria. She followed his footsteps in the study of Mathematics and Astronomy. She collaborated with her father on commentaries of classical Mathematical works, translating them and incorporating explanatory notes, as well as creating commentaries of her own and teaching a succession of students from her home. A philosopher, a follower of Neoplatonism, a belief system in which everything emanates from the One, Hypatia was highly popular among crowds who listened to her public lectures about Plato and Aristotle.

Born in an Era of revolt and revolution, Sophie Germain was born in the year 1776. Paris was exploding with the revolution when young Sophie retreated to her father's study and began reading. After learning about Archimedes' death, she began a lifelong study of Mathematics and Geometry, even teaching herself Latin and Greek so that she could read classic works. Unable to study at the École Polytechnique because she was female, Germain obtained lecture notes and submitted papers to Joseph Lagrange, a faculty member, under a false name. When he learned she was a woman, he became a mentor and Germain soon began corresponding with other prominent Mathematicians at the time. She became the first woman to win a prize from the French Academy of Sciences, for work on a theory of elasticity despite not having formal training and access to resources that male Mathematicians had at that time. Her proof of Fermat's Last Theorem, though unsuccessful, was used as a foundation for work on the subject well into the twentieth century.

Augusta Ada Byron, born on December 10, 1815, (later Countess of Lovelace) was brought up single-handedly by her mother after her father, poet Lord Byron was forced to leave England due to a scandal shortly after her birth. Her overprotective mother, who wanted her to grow up to be unemotional and unlike her father, encouraged her study of Science and Mathematics. As an adult, Lovelace began to correspond with the inventor and Mathematician Charles Babbage, who asked her to translate an Italian Mathematician's memoir analyzing his Analytical Engine (a machine that would perform simple Mathematical calculations and be programmed with punchcards and is considered one of the first computers). Lovelace went beyond completing a simple translation, however, and wrote her own set of notes about the machine and even included a method for calculating a sequence of Bernoulli numbers; this is now acknowledged as the world's first computer program.

Because Russian women could not attend university, Sofia Vasilyevna (1850-1891) contracted a marriage with a young paleontologist, Vladimir Kovalevsky, and they moved to Germany. There she could not attend university lectures due to societal norms, but she was tutored privately and eventually received a doctorate after writing treatises on partial differential equations, Abelian integrals, and Saturn's rings. Following her husband's demise, Kovalevskaya served as a lecturer in Mathematics at the University of Stockholm and later became the first woman in that region of Europe to receive a full professorship. 'She continued to make great strides in Mathematics, winning the Prix Bordin from the French Academy of Sciences in 1888 for an essay on the rotation of a solid body as well as a prize from the Swedish Academy of Sciences the next year.'

In 1935, Albert Einstein wrote a letter to the New York Times, praising profusely the recently deceased Emmy Noether as “the most significant creative Mathematical genius thus far produced since the higher education of women began.” Noether had overcome many hurdles before she could collaborate with the famed physicist. She was brought up in Germany and her Mathematics education suffered a great deal because of rules against women matriculating at universities. ‘After she finally received her Ph.D., for a dissertation on a branch of abstract algebra, she was unable to obtain a university position for many years, eventually receiving the title of “unofficial associate professor” at the University of Göttingen, only to lose that in 1933 because she was Jewish.’ And so she moved to America and became a lecturer and researcher at Bryn Mawr College and the Institute for Advanced Study in Princeton, New Jersey. There she developed many of the Mathematical foundations for Einstein’s general theory of relativity and made significant advances in the field of algebra.

Despite being bound by the backward, orthodox societal norms, these women showed remarkable progress in the field of Mathematics and Science. It is noteworthy how they achieved excellence in their respective fields despite lack of resources and a prevalent chauvinistic society. It is undoubtedly true that we would have never achieved the milestones of success in the field of Mathematical Science if it hadn’t been for these and hundreds of other strong-headed women who decided to defy the society for good and push the world of Science into a more progressive stage.

By: Esha Awasthi
Mathematics (Hons.) H2A

"The best way for us to cultivate fearlessness in our daughters and other young women is by example. If they see their mothers and other women in their lives going forward despite fear, they'll know it's possible."

~ Gloria Steinem

Historical Note on Sets and Functions

The concept of function has evolved over a long period of time starting from R. Descartes (1596-1650), who used the word 'function' in his manuscript "Geometrie" in 1637 to mean some positive integral power x^n of a variable x while studying geometrical curves like hyperbola, parabola, and ellipse. James Gregory (1636-1675) in his work "Vera Circuli et Hyperbolae Quadratura" (1667) considered function as a quantity obtained from other quantities by successive use of algebraic operations or by any other operations. Later G.W. Leibnitz (1646-1716) in his manuscript "Methodus tangentium inversa, seu de functionibus" written in 1673 used the word 'function' to mean a quantity varying from point to point on a curve such as the coordinates of a point on the curve, the slope of the curve, the tangent and the normal to the curve at a point. However in his manuscript "Historia" (1714), Leibnitz used the word 'function' to mean quantities that depend on a variable. He was the first to use the phrase 'function of x '. John Bernoulli (1667-1748) used the notation $\Phi(x)$ for the first time in 1718 to indicate a function of x . But the general adoption of symbols like f, F, Φ, ψ, \dots to represent functions was made by Leonhard Euler (1707-1783) in 1734 in the first part of his manuscript "Analysis Infnitorium". Later on, Joseph Louis Lagrange (1735-1813) published his manuscripts "Theorie des fonctions analytiques" in 1793, where he discussed the analytic function and used the notion $f(x), F(x), \Phi(x)$, etc. for a different function of x . Subsequently, Lejeune Dirichlet (1805-1859) gave the definition of function which was being used till the set theoretic definition of function presently used, was given after set theory was developed by Georg Cantor (1845-1918). The set theory known to us is given by Cantor and Dirichlet.

By: Himani Thakur
Mathematics (Hons.) H1A

0!

Maths - an incredible tale of numbers full of thrilling combinations, engrossing ideas, and musing questions. I believe Maths is gripping because it reveals its cards when they are least expected. A few days back, I came to know the story of $0!$. This may not sound very tempting to Maths wizards reading this but believe me, I was totally in love with Maths once again with this simple yet not so simple question. So this exclamation looking symbol is a Mathematical operation factorial which means to multiply a series of descending natural numbers. For example $4! = 4 \times 3 \times 2 \times 1 = 24$. Now we take it as a fact that $0! = 1$ but what's funny is that how can we decrease a number till 1 which is already less than 1. So to decode this cipher let us all do a mental exercise. So let's calculate what is $5!, 4!, 3!, 2!, 1!$

So $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$
 $4! = 4 \times 3 \times 2 \times 1 = 24$
 $3! = 3 \times 2 \times 1 = 6$
 $2! = 2 \times 1 = 2$
 $1! = 1$

and now if we look closely $4!$ is nothing but $5!/5$ and $3!$ is $4!/4$. Going on $2! = 3!/3$ and $1! = 2!/2$ and leaping one step forward we can get $0!$ that is $1!/1$ and yes it results in 1. Isn't it baffling that multiplying no numbers together results in 1? But this is how Maths is. Beautiful.

By: Kritika Bansal
Physics (Hons.) H1A

God's Plan



We heard them say, "science and faith cannot co-exist; the voice of reason or the voice of faith, must drown out the other". So, what to choose and what to abandon? Well, I will not discard either. Instead I will say that I need both science and religion, the former to help me invent wonders and the latter to bequeath me with moral conscience to not misuse those inventions.

What is the largest number your mind can conceive? What is the size of the universe? The answer to both these questions is the same. The answer is not infinity, it is zero. Yes! The size of the universe is zero, and so is the largest number!

I know it's difficult to comprehend but let me explain. For every positive number there exists a negative number in Mathematics. For every matter there exists an anti-matter in nature. This is the bigger picture. Therefore, when you put everything together, the size of the universe is zero. Zero is thus simultaneously everything as well as nothing. That's why it's called a whole number. You add or remove anything from this whole, it still remains a whole.

So, this is where I am reminded of a famous quote by Albert Einstein,
"Science without religion is lame, religion without science is blind."

The history of zero satisfies this quote brilliantly. In India, the Sanskrit word for "empty" or "blank" is sunya. This sunya is transliterated, within the Indian system of numerology, as the idea of zero and indeed the symbol "0" as we know it today. If we think about this circle "0", it suddenly takes on an appropriateness to the notion of nothing, even pictographically. For, at the centre of its circumference is a blank similar to the void in the centre of the sky. This profound correlation between Mathematics and nature can be used to explain the evolution of religion. Math and religion are fundamentally similar, as they both try to seek truth and use faith to find it. Maths proofs have always lent a helping hand to explore nature allowing us to procure reasons behind religious beliefs. Therefore creating more belief in both Math and religion. Progress in each allows a person to be more patient and faith to discover more about unsolved mysteries of nature.

"AN EQUATION MEANS NOTHING TO ME UNLESS IT EXPRESSES A THOUGHT OF GOD."

- Srinivas Ramanujan

By: Komal Yadav
Physics (Hons.) H1A

No Nobel for Mathematics

Alfred Nobel's last will stated that his fortune is used to create a series of prizes for those whose contributions in the fields of physics, chemistry, physiology or medicine, literature, and peace were the "greatest benefit to mankind." However, no Nobel Prize was designated for Mathematics. There are various speculations on the possible reasons for this exclusion. Some of them are worth going through.

It is often discussed that Nobel found Maths too theoretical. Since he believed that only practical inventions or discoveries could benefit mankind, he might have disregarded this subject whose practical applications are often obscure. The other (and the more dramatic) theory is an unfounded one. Rumours have it that Nobel disliked a contemporary Mathematician, Gosta Mittag-Leffler, with whom his partner allegedly cheated him. This made him detest the subject too and moreover, he didn't wish Leffler to win this prize (and the probability of this happening was quite high). The other reason can be linked with an already existing Math award. King Oscar II of Sweden and Norway had already established a prestigious award for Mathematicians and Nobel felt that instead of duplicating it, other fields should be given their due.

Whatever the reason be, there is no Nobel Prize in Mathematics. However, there is another prestigious award which is considered a parallel to the Nobel. It is the Abel Prize. It was proposed by a Norwegian Mathematician Sophus Lie when he learned that Noble had omitted Mathematics in his series of awards.

By: Ashmita Rana
Mathematics (Hons.) H1A

The Divine Proportion

Do you consider Mathematics to be a subject just to pass examinations, having no relevance to the natural world? Well, think again!

A Fibonacci series is a group of numbers in which the sum of the preceding two numbers is the next number but what is special about this series is the quotient of consecutive numbers which always turn out to be the same i.e. 1.618.

Have we ever calculated the ratio of our height to the length from our bellybutton to toes or the ratio of the number of female bees to the number of male bees in a beehive or the ratio of consecutive spirals on a nautilus?

Well, surprisingly all these ratios are the same i.e. about 1.618! This ratio is called PHI (Φ) in Mathematical terms but in religion and occultism, it is called THE DIVINE PROPORTION! This ratio has a lot of occurrences in nature, symbolism, and art.

PHI is generally considered as the most beautiful number in the universe and perhaps this is the reason that the pentagram star which is based on the same ratio has always been a symbol of beauty and perfection. PHI has some special properties-

$$\Phi^2 = \Phi + 1 \quad \text{i.e. } 2.618$$

$$1/\Phi = \Phi - 1 \quad \text{i.e. } 0.618$$

Supposedly, these magnificent instances of Maths in nature led to our ancestors worship it. Perhaps they were aware of these intriguing Mathematics in nature and we are still far away from them!!

By: Ritika Verma
Mathematics (Hons.) H1A

Laurel for the Logician – Million dollar Prize for the Solution to a Maths Problem

Take a standard chessboard and try to place two queens on it so that they aren't attacking each other. Easy, right? You just have to make sure they aren't in the same row, column or diagonal. Now try to place another queen on said board. Keep adding queens till you have placed 8 such pieces, that conform to the given constraint. If you have just found a method to achieve this, how many more methods can you find? How many methods exist? This is an example of a puzzle from 1850, called the eight-queen completion problem. In spite of it being more than a century old, we have only recently discovered the inherent complexity of the riddle when it was scaled up allowing boards of any size with any number of queens pre-placed on them – giving us a much harder version of the puzzle known as n-queens completion. A paper by Chris Jefferson, Peter Nightingale and Ian P Gent published in the Journal of Artificial Intelligence Research are what brought this to the world's attention. Sadly, the solution to this isn't the one up for a million dollars.

The n-queens completion puzzle is a type of Mathematical problem that is common in computer science and known as "NP-Complete". These are an interesting bunch because if we can find a solution to one NP-Complete problem we can use it to find all of them. That is simply their nature. Lucky for us, the n-queens complete is one of the simplest NP-complete problems to explain, especially to people familiar with the rules of chess. The others are not so easily ingrained into the minds of laymen.

The underlying issue though, is that nobody knows, even roughly, just how difficult NP-Complete problem is. To put it simply, they could be as easy as alphabetically organizing a list of names or exponentially harder. Figuring out which of the two it is, is the "P vs. NP" problem – one of the greatest Mathematical problems that have been left unsolved. The significance of this problem is mirrored in the fact that the Clay Mathematics Institute is offering a prize of 1 million dollars for the solution of P vs. NP.

The paper by Chris J, Peter N, and Ian P.G shows that the n-queens completion problem is NP-complete. Anyone able to show whether it's an easy or difficult problem could then in turn potentially win a million dollars. Try not to be under the impression that the difficulty of P vs. NP problem is less than or equal to the n-queens one. P vs. NP is far harder and potentially unsolvable. We can have hope though because the word 'impossible' has never stuck quite right with humankind.

Check out <http://www.claymath.org/millennium-problems> for more information about P vs. NP, or to find 6 more questions, the answers to whom can make you a millionaire.

**By: Karthika R
Mathematics (Hons.) H1A**

The Fibonacci Sequence: When Maths Turns Golden

Learn how to see, and realize that everything connects to everything else: Leonardo Da Vinci Fibonacci Sequence has captivated Mathematicians, artists, designers, and scientists for centuries. Wondering what's so special about it?

Let us begin with the history.

The original problem that Leonardo Fibonacci investigated (in the year 1202) was about how fast rabbits could breed in ideal circumstances.

Suppose a newly-born pair of rabbits, one male, and one female are put in a field. Rabbits are able to mate at the age of one month so that at the end of its second month, a female can produce another pair of rabbits. Suppose that our rabbits never die and that the female always produces one new pair (one male, one female) every month from the second month on. The puzzle that Fibonacci posed was...

How many pairs will there be in one year? Think!

No?

Let me help you.

At the end of the first month, they mate, but there is still one only 1 pair.

At the end of the second month, the female produces a new pair, so now there are 2 pairs of rabbits in the field.

At the end of the third month, the original female produces a second pair, making 3 pairs in all in the field.

At the end of the fourth month, the original female has produced yet another new pair, the female born two months ago produces her first pair also, making 5 pairs.

Can you see the pattern here?

1, 1, 2, 3, 5, 8, 13, 21, 34.....

The solution, generation by generation, was a sequence of numbers later known as Fibonacci numbers.

Fibonacci Sequence is a set of numbers that start with a one, followed by a one, and proceeds based on the rule that each number is equal to the sum of the preceding two numbers.

The Fibonacci numbers can be thought of as Nature's numbering system. They appear everywhere in Nature, from the leaf arrangement in plants to the pattern of the florets of a flower, the bracts of a pinecone, or the scales of a pineapple. The Fibonacci numbers are therefore applicable to the growth of every living thing, including a single cell, a grain of wheat, a hive of bees, and even all of mankind.

In the seeming randomness of the natural world, we can find many instances of a Mathematical order involving the Fibonacci numbers themselves and the closely related "Golden" elements.

Let's add one more interesting thing here:

If we take the ratio of two successive numbers in Fibonacci's series, (1, 1, 2, 3, 5, 8, 13, ..) and we divide each by the number before it, we will find the following series of numbers:

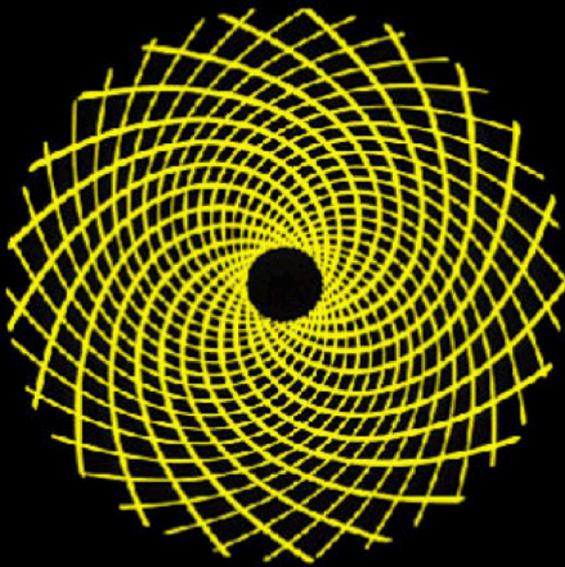
$1/1 = 1$, $2/1 = 2$, $3/2 = 1.5$, $5/3 = 1.666...$, $8/5 = 1.6$, $13/8 = 1.625$, $21/13 = 1.61538...$

The ratio seems to be settling down to a particular value, which we call the 'golden ratio' or 'the golden number'. It has a value of approximately 1.618034 and we denote it by "Phi".

Now, let's get acquainted with some of the endless examples that make Fibonacci a wonder or 'Golden' sequence. 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, the chicory's 21, the daisy's 34, and so on. 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 Fibonacci processes. Typically, seeds are produced at the centre and then migrate towards the outside to fill all the space. Sunflowers provide a great example of these spiraling patterns.

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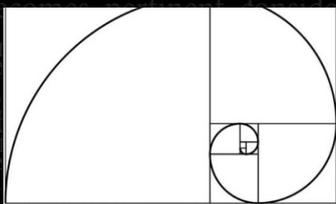


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Likewise, similar spiraling patterns can be found on fruits and vegetables like pineapples and cauliflower. Snail shells and nautilus shells follow the Fibonacci pattern, as does the cochlea of the inner ear. It can also be seen in the horns of certain goats, and the shape of certain spider's webs.

tribunal's adjudication process is a key discussion point. This is because the Indian government has been providing LPG subsidies since late 1970s, in order to make clean cooking fuel affordable for all. The subsidies have led to regional imbalances and prices, the government has to intervene from INR 10.2 crore to be made between 2015). In order to ensure that the market trading mechanism of subsidy and



Expert Group, An immediate infrastructure. The PaHAL (Distribution due to union on 1st June 2014) modification of these on modified on 1st January 2014. After we have effect from 15th



In totality, we need to make a conscious effort to shift to a scheme where the subsidy is directed to their bank accounts on the purchase of cylinders at market price and only those who enter the

Not surprisingly, spiral galaxies also follow the familiar Fibonacci pattern. Faces, both human and nonhuman, abound with examples of the Golden Ratio. The mouth and nose are each positioned at golden sections of the distance between the eyes and the bottom of the chin for a supposedly perfect face.

Also, looking at the length of our fingers, each section — from the tip of the base to the wrist — is larger than the preceding one by roughly the ratio of phi.

Speaking of honey bees, they follow Fibonacci in other interesting ways. The male bees develop from unfertilised eggs of the queen bee. The male bee technically has only a mother and no father. The first generation has one member (the male). One generation back also has one member (the mother). Two generations back are two members (the mother and father of the mother). Three generations back are three members. Four back are five members. That is, the numbers in each generation going back are 1,1,2,3,5,8...]. Hence, we see that the ubiquity and astounding functionality of Fibonacci in nature suggests its importance as a fundamental characteristic of the Universe.

1. Meaning, a rich household benefits more from the subsidy than a poor household (97% of LPG is consumed by the richest 30% of households; only 9% of the subsidies go to the poor). Fascinating, isn't it?

By: Shivani Hooda
Mathematics (Hons.) H2B

Why do we Study Mathematics?

Because it is the base of all sciences, it is the tool which helps us in understanding the world. In this world around us, wherever we see, in whatever we see, we find Mathematics-fractals in nature, Fourier transforms in mobile phone signals, linear algebra in search engines, banking, finance, computing and the works. So yeah, basically the base of everything is Mathematics.

“You go deep down into anything and you will find Mathematics”

Yes. That is true. But why do YOU need to study Mathematics?

Are all of you going to become engineers, scientist, researchers or teachers? Are all of you going to take up science in 11th, 12th and even if you do; are all of you going to use Mathematics everywhere?

No.

Some of you are born to become artist, dancers, singers, actors, lawyers and ‘n’ number of non-Maths professions. Of course, you need to know your basic fractions and arithmetic to calculate your bills or do your taxes. But why should you bang your head with integration, differentiation, trigonometry-sin theta and cos theta?

Well, maybe you don’t have to!

That is why we have the option of not taking Mathematics in 11th and 12th. So cool! Don’t take Mathematics after 10th. BUT it is compulsory until the 10th standard. Why?

I mean the basic Mathematics used by any human to do taxes and bills involved basic arithmetic operation which can be done by a calculator right? Then if you to buy groceries you need to know fractions and conversions say from kilo gram to gram, while doing taxes you need to know percentage and ratios.

So: arithmetic, fractional, decimals, ratios. All this is taught to you by the time you reach the 4th-5th standard. That still leaves 5 years of compulsory Mathematics, Why has our education board kept it compulsory for kids to solve linear equations, find roots of quadratic equation, learn the basic trigonometry? Why?

I used to believe that these years help us in choosing our career path. But, now that I see kids so afraid of Mathematics, I feel why put these little kids under so much stress? Maths anxiety has become such a big word, it scares me and makes me curious. Why does a potential 12-year-old Tendulkar or Mary Kom have to scratch his/her head with Math problems and get stressed?

There has to be a reason.

There is a reason.

Imagine a small kid, who goes up to his mom and this is the conversation he has:

Kid: “Mummmmaa Mujhe khelna jaaanaa h” (I want to go to play outside)

Mom: “Kahan khelne jaana h?” (where do you want to go to play?)

Kid: “bahaaaaaar” (Outside)

Mom: “Acha jaa!” (Okay, go)

Try asking this kid why does he want to go outside to play, he may not have had any reasons, or even if he does they will be the funniest ones, little kids are so cute when you ask them why to anything they want to do. They cannot reason with you that well, can they?

Now, imagine a 5th class kid going up to his mum:

Kid: “Ma! I am going out”

Mom: “Where? With whom?”

Kid: “With friends to play cricket”

(now his mom is going to ask why)

Mum: Why?

Kid: I have done my homework, my friend got a new bat and the weather is so good.

You see the reasons you give after you grow up a little. Logical reasoning becomes a part of your system.

Who taught you the art of reasoning?

Did you have any special classes for that?

No.

You might think that you learnt this all on your own, with time, but your brain was taught the art of reasoning,

way back in your 1st and 2nd standard.

Those classes were none other than “Mathematics classes”.

Now, hey! Don't get shocked, I will explain my point in detail.

Do you remember the time when the variable x was introduced in Math classes,

Now look at this:

“If I don't go outside to play,

Then I will be at home

Then I will play Xbox”

“If $2x = 10$

Then $x = 10/2$

Then $x = 5$ ”

The “If-then” function in your brain has been taught to you by these simple Math equations. The logical part of the brain interprets both these reasonings in a similar manner.

Now, let me get a little more crazy:

So as you went to a higher class, a variable y was also introduced and we used to solve equations in 2 variables:

$2x + y = 10$, given $y = 2$

Then $2x + y = 10$

Since $y = 2$, then $2x + 2 = 10$

Then $2x = 10 - 2$

Then $2x = 8$, then $x = 4$

If I don't go out to play, given my mom is at home.

Then I will stay at home

Since my mom is at home, then I won't play Xbox.

Then I will have to study.

The given value of variable y is similar to the given fact that your mom is at home. The brain took the same message.

So you see as a new variable was introduced in Math or life, the result changed.

As you go ahead in your life, these variables are going to increase, you will be facing one problem but you have a thousand things to consider before you make a decision.

I am not asking you to model them and solve Math equations to solve your problems. No! That is not how it goes. But your brain has to be trained for such problem-solving. This training of your logical brain is done by Mathematics.

Do you exercise to keep your body fit right? How to keep that logical part of your brain fit? Mathematics.

Do you realize, in lower classes, with all the other subjects you have to learn but in Math classes, you have to understand, interpret and then apply.

So Mathematics has helped you since your junior classes to become the logical person you are, but why should you study ahead?

I am not saying that if you don't study Mathematics, you will be making the worst decisions in life. Oh no no! I know a lot of successful people who hate Mathematics but are doing extremely well. All I am trying to say is it has helped you very importantly in your life in those junior classes, if you give it a chance, it might help you in a beautiful manner.

Being a Mathematics student, I can say with full confidence, studying Mathematics does affect your thought process. It has brought clarity to my thinking; it has made me practical and probably a better person also.

Again I want to stress, not everyone needs Mathematics to become better decision makers or smart, it is just a tool because I know not all people are meant for studying Mathematics. I am not meant for singing or dancing, a dancer is not meant for solving a differential equation but of course, if I give a chance to dancing or singing I might and probably will discover a “feel-good” happiness. Similarly, if I request that dancer or singer to give Mathematics a

We personally interviewed the students and prepared a comprehensive questionnaire for the same. Interviewees were asked about their awareness of the scheme, whether the payment of subsidy was regular and whether they had any difficulties in accessing it, among other questions. The questionnaire was designed to capture their perspective and their experience of the scheme, as well as the issues they faced. We also tried to elicit the users' views on how the scheme has affected them.

IV. Financial Inclusion and Literacy

V. The LPG Market in India

a chance, of course, it might scare them a bit but if they are taken through the beauty of Mathematics with easy and interest, I hope that one day they also realize how beautiful it is and that is much more than just numbers, that it is an art which is as beautiful as any other art and hence doesn't need comparison, that it is equally important for mankind as any other subject we study or it is equally beautiful and amazing as the art we see, feel or express to make ourselves and the world happy. So in the mixed words of John Lennon and Nishika Bhatia: "All we are saying is, is give Maths a chance!"

By: Nishika Bhatia
Mathematics (Hons.) Alumna, Batch of 2014
First Published in: Sciensation

The Man Who Knew Infinity

This is the story of a mathematical prodigy and his proclivity towards the subject despite having a life of poverty and neglect. His amazing ability to understand messages and meaning lying in numbers and his genius and extraordinary brilliance in number theory and pattern of the number brought the focus of entire world towards India.

The effect that words have on a poet and emotions on a lyricist, was the same that the Principles of Mathematics had on S. Ramanujan. According to him-

"Mathematics is not about numbers, equations, computation or algorithms: it is about understanding."

Let's begin the life story of this legendary being. S. Ramanujan was a largely self-taught pure Mathematician hindered by poverty and ill-health. His highly original work has considerably enriched number theory. December 22nd is celebrated as National Mathematics Day as he was born on that day in 1887. He lived a short life of only 32 years as he died on 26 April 1920.

We can't control everything that happens to us. But we can control how we respond to things that we can't control. He is recognized as one of the greatest Mathematicians of his time. However, S. Ramanujan had no formal training in Maths. He used to always write on a slate with chalk and when one of his friends asked him to write on paper. He replied-

"When food is the problem, how can I find money for paper? I may require four reams of paper every month."

He was the second Indian to be inducted as a fellow of the royal society, which is a fellowship of some of the world's most eminent scientist. For him education was not just a preparation of life, education is life itself.

It is said that the numbers 1-10,000 were his best "personal friends". He could effortlessly tell their factors, divisors, how the number can be split & each part of number can be squared / cubed etc. to produce interesting numbers, and much more. One time, G.H. Hardy (professor of Mathematics at Cambridge University) was paying a visit to Ramanujan, who was ill and undergoing treatment. Hardy mentioned to him that he rode a taxi cab, whose number was 1729. Hardy said to Ramanujan, "the number seems to me rather a dull one". Ramanujan on this comment replied, "No Sir, this is the smallest number expressible as the sum of two cubes in two different ways-
 $1729 = 1^3 + 12^3 = 9^3 + 10^3$ "

Later, 1729 came to be known as RAMANUJAN NUMBER. He discovered many other interesting facts. viz a viz, a solution of infinite root equations and the sum of positive numbers is a negative number-

$1 + 2 + 3 + 4 + 5 + \dots = -1/12$

It was his insight into algebraic formulae, the transformation of infinite series and so forth, that was amazing. In his short lifetime, he prepared almost 4000 proofs, identities, conjectures and equations in pure Mathematics. His theta function lies at the heart of string theory in physics. He used to say-

"An equation for me has no meaning unless it represents a thought of GOD"

One more interesting thing about Ramanujan is- he discovered so much, and yet he left so much in his garden for other people to discover.

"SUCCESS IS NOT JUST A MEASURE OF HOW BIG YOU CAN DREAM. IT IS ALSO A MEASURE OF HOW MUCH YOU CAN DO"

By: Alka Yadav
Physics (Hons.) H1A

A Touch of Madness, The Stroke of Genius



Throughout history, the greatest scientific minds have not only demystified the world with their discoveries but helped shape it too with their ingenious inventions. John Nash, one of the great Mathematicians of the 20th century, has made influential contributions to pure Mathematics and Economics. In 1994, he received Nobel Prize for Economics for his landmark work, first begun in the 1950s, on the Mathematics of game theory. In 2015 Nash won the Abel Prize for his contributions to the study of partial differential equations.

In addition to his hard work in Mathematics, what makes him so inspiring is the strength with which he coped his mental illness on his own and won a notable award for his work despite it.

In 1959, Nash began showing clear signs of mental illness ‘schizophrenia’. Nash was certainly delusional and evidently hallucinated as well. He filled the blackboards of Fine Hall at Princeton with indecipherable scribbling and wandered about the campus in an apparent daze. He became known as “The Phantom of Fine Hall.” Over the next several decades, he was hospitalized several times and was on and off anti-psychotic medications. After 1970, he was never committed to a hospital again, and he refused any further medication. His condition improved when he stopped listening to the “voices” in his head.

Dr. Nash died in car accident while returning from a trip along with his wife. His death comes over two decades after he won the Nobel Prize, and just a week after he received the Abel Prize. It was a tragic end to a very tragic yet beautifully meaningful life.

“People are always selling the idea that people with mental illness are suffering. I think madness can be an escape. If things are not so good, you maybe want to imagine something better.”

By: Komal Yadav
Physics (Hons.) H1A

The Origin of Algebraic Number Theory: Kummer's Contribution

The theory of complex integers (Gaussian integers) is a step in the direction of a vast subject, the theory of algebraic numbers

Neither Euler nor Lagrange envisioned the rich possibilities which their work on complex integers opened up, neither did Gauss. The theory grew up out of the attempts of proving Fermat's assertion of the equation $x^n + y^n = z^n$. The theorem asserts that the above equation has no non-trivial integral solutions for $n \geq 3$, where $n \in \mathbb{N}$.

Many people tried it for different values of n . It was taken up by Ernst Edward Kummer who turned from theology to Mathematics, became a student of Gauss and Richlet and later served as a professor in Berlin. Kummer took $x^p + y^p$ where p is a prime and factored it into $(x+y)(x+\zeta y) \dots (x+\zeta^{p-1}y)$ where ζ is an imaginary p th root of unity which means ζ is a root of $x^{p-1} + x^{p-2} + \dots + x + 1 = 0$. This led him to extend Gauss' theory of complex integers to algebraic numbers as numbers of the form

$f(\zeta) = a_0 + a_1\zeta + \dots + a_{p-2}\zeta^{p-2}$ where a_i is ordinary (rational) integer. In algebraic number theory, an algebraic integer is just called an integer whereas elements of \mathbb{Z} are called ordinary integers.

By 1843, Kummer made appropriate definitions of integers, prime integers, divisibility and then made a mistake of assuming that unique factorization holds in the class of algebraic numbers that he had introduced. He pointed out while transmitting his manuscript to Richlet that this assumption was necessary to prove Fermat's theorem. Richlet informed him that unique factorization holds only for certain primes. Incidentally Cauchy and Lamé assumed the same for algebraic numbers. In 1844, Kummer recognized the correctness of Richlet's criticism. To restore unique factorization Kummer created a theory of Ideal numbers in a series of papers. However, Kummer's ideal numbers do not belong to the class of algebraic numbers he had introduced. Moreover, these ideal numbers were not defined in any general way (an Ideal number is an algebraic integer which represents an ideal in the ring of integers of a number field). As far as Fermat's theorem is concerned, with his ideal numbers, Kummer succeeded in showing that it was correct for a number of prime numbers. In the first hundred integers only 37, 59 and 67 were not covered by Kummer's demonstration. Then in a paper in 1857 he extended his results to these exceptional primes.

These are really great contributions of Kummer in algebraic number theory. Later on Mirimanoff, Dedekind and many other Mathematicians continued to work further and algebraic number theory was developed and nurtured in this way.

By: Mahenoor Ali
Mathematics (Hons.) Alumna, Batch of 2016

Branching Through the Miranda Roots!

The clock strikes 6:30, snooze, 6:40, snooze, 6:50, snooze again! A voice in my head spoke, “Can’t miss the 8:40 class again, get up, you need to board the 7:30 metro!” Reaching for the 8:40 class on time always gave me a sense of achievement. I have gotten late for lectures so many times that rushing through the Miranda corridors or lawns created some of my most treasured memories. But, without a doubt, the most precious moment is the day I understood and fully comprehended my first Mathematical proof.

Alon Smith, a famous Math educator once said, “When you find, or compose, or are moonstruck by a good proof, there’s a sense of inevitability, of innate truth. You understand that the thing is true, and you understand why, and you see that it can’t be any other way. It’s like falling in love. How do you know that you’ve fallen in love? You actually just do it”. I resonated with Alon Smith’s thoughts for the first time during my first year at Miranda Library, just before a Real Analysis tutorial - and this memory has always helped me sail through difficult times during my studies. Particularly, when it took days, weeks and sometimes months to understand some Mathematical concepts, this memory made me patiently wait for that moment of eternal bliss when I finally understood it. These are just one of the many memories from Miranda House that have strengthened me and prepared me for the world outside. Another memorable moment is - when I was first introduced to the application of Mathematics in the real world.

We discussed the use of calculus and differential equation in computer programs to solve problems in an automobile, infrastructure, healthcare and more. Miranda house always gave us the freedom to explore, but with an insurance of carefully providing us with just the right nudge. The regular Mathematics-related seminars conducted at the university were very helpful in enhancing a broader knowledge. Around the second year, in a seminar, we got to know about optimization theory. Optimization theory uses Mathematical tools to devise best possible decisions to solve the most complex problems. The science of decision-making has many synonyms such as - “Operational Research”, “Operational Management”, “Industrial Engineering” or the lately famous “Data Sciences”. Data is increasingly becoming the most important asset and to manage it efficiently we need strong computational tools. Strong computations are developed through elegant Mathematics. These are just some of the many influential subjects whose roots lie in the field of Mathematics. And likewise, even though I study management science, my roots lie strongly in the Mathematics department of Miranda House. Had it not been for the three years at Miranda House, I would have never discovered the power a Mathematician holds, to not change, but better the world. Field medalist Michael Atiyah said once, “People think Mathematics begins when you write down a theorem followed by a proof- That’s not the beginning, that’s the end.

The beginning is to create a picture of various things, turn them over in your mind. You’re trying to create, just as a musician is trying to create music or a poet. There are no rules laid down. You must do it your own way. But at the end, just as a composer must put it down on paper, you must write things down in forms of theorems. But the most important stage is understanding. A proof of a theorem by itself doesn’t give you understanding. You can have a long proof and no idea at the end of why it works. But to understand why it works, you must have a kind of gut reaction to the thing. You’ve got to feel it!” And trust me! the day a Mathematician feels this super-power within her, she can model the harshest problems of the world with just her pen, paper and most importantly, her beautiful mind. Cheers to all the beautiful Mathematical minds at Miranda House!

By: Nishika Bhatia
Mathematics (Hons.) Alumna, Batch of 2014

Mathematics is Everywhere!

By: Mr. Manoj Rawal

Mathematics has been around us from the beginning of the time and it enters in our lives as soon as we enter in this world, for instance, we get our date of birth first and also get a mandatory Aadhaar Card with a number having a dozen digits. Since our birth, we have lived surrounded by numbers and wherever there are numbers, there is Mathematics and numbers are everywhere, Mathematics is also everywhere. To support it let's recall Galileo Galilei's quote that "Mathematics is the language in which God has written the universe." The planets go around the sun in a precise orbit and sun goes around the universe in a precise orbit. Days becomes nights and nights becomes days in a precise order of time.

Is Mathematics being used only by people who have eyesight? No, of course not. Let me share with you my own experience, during my college days my chess captain who was visually impaired used to identify chess pieces by touching and distinguishing them geometrically within seconds. In fact chess game involves Mathematics at every move of its pieces and chessboard is an 8×8 matrix with 64 squares. Chess originated in India in the 6th century by none other than Mathematician Sessa who gave the very famous series problem to Mathematically unaware king "The wheat and chessboard problem" which states that If a chessboard is to have wheat placed upon each square such that one grain is placed on the first A1 square, double on the second square A2, four on the third square A3 and all the way to 2^{63} on last square H8 .How many grains of wheat would there be on the chessboard at the end? In fact, no sports can be imagined or played without the help of Mathematics.

Coming back to specially abled, did you ever think about how we communicate with our deaf friends, yes with the orientation of fingers which is not possible without the help of Mathematics. Therefore Mathematics plays a vital role in communication for deaf people as their language. Also if you notice, an ordinary person walks keeping the Cartesian Coordinate into the mind as he can see and knows the exact location but on the other side a specially-abled who cannot see walks keeping Polar Coordinate into the mind where he always keeps direction and distance in his mind at every step with his hand stick.

It is Mathematics only which gives sense of comparing or sense to distinguish and it is not only in human being but it can be noticed even among animals, for example suppose in a forest an animal has five children and suddenly one of them is missing, then do not you think the mother will start searching for the child? Does it mean the mother knows counting? No of course not but certainly she has the sense to distinguish. Animals also have the sense of distance and numbers, suppose in a forest there is a lion and a bunch of deer, then lion may not hunt deer but if there is only a deer, then lion must run towards deer so understanding Mathematics is the difference between life and death! Similarly, if you ever closely look at a sequence of ants, they walk in perfect harmony with equidistant. So if animals were to have any language then it would be Mathematics only!

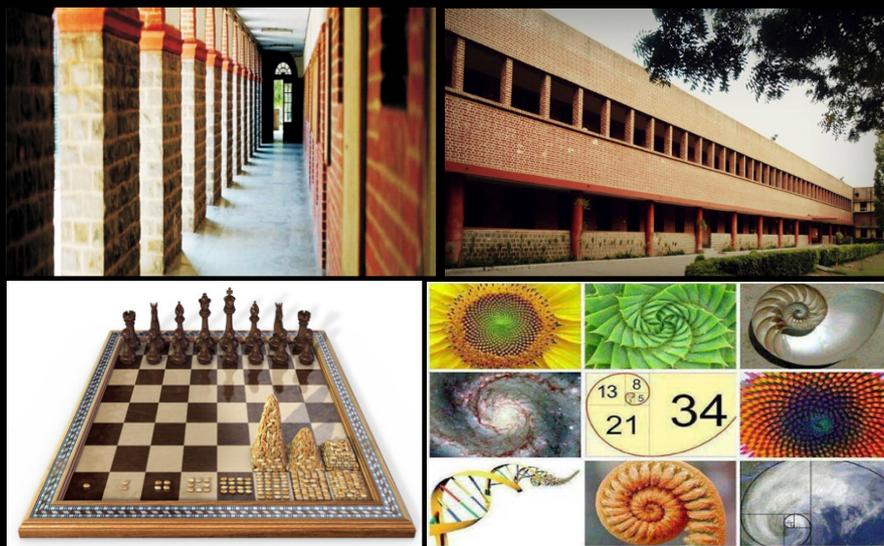
Mathematicians do amazing things. They discover hidden beauty in the natural world. Mathematics can also be seen in nature, we like flowers so much and Mathematics can be seen around them as we know through polar transformation the number of petals. In Mathematics Fibonacci sequence is one of the most famous and useful sequences of integers. Fibonacci Spiral is the spiral when in polar coordinate both angle and radial distance vary simultaneously. Now question worth asking is do we find Fibonacci Spiral in nature, yes in the sunflower, the display of its florets are always in a perfect spiral of 55,34 and 21. The fruit lips of the pineapple make the same.

Next time when you visit the ocean and if current moves through it and the tide rolling to the shore, then you can visualize that the waves that bring in the dyed turn into a Fibonacci Spiral only.

In this digital era, internet banking is becoming more and more common but there is a chaos with regard of safe transactions and there we fully depend on Cryptology, the study of protecting our information using the codes. The reality of instant loan would not have been possible without Mathematics enabled mobile apps. These mobile apps quickly analyze our aadhaar number with pan card number and bank statement. Therefore, reducing time and effort and delivering public service quickly. We all have mobile and every day we love to take pictures but do you know your picture is nothing but your homomorphic image whereas if there is an identical twin of you then it is going to be your isomorphic image.

GPS has become very important in our lives as it tells us routes with the exact location which is just possible due to the geometry of relativity with help of four satellites. We easily get to know about weather report of the world at home through TV with the use of level curves.

Mathematics helps a lot in policy formulation. The government collects data about its citizens and statisticians analyze it to formulate the right policy. Right calculation can lead to positive results like job creation and growth rate in our GDP but a wrong calculation can result in negative. Similarly, a good knowledge of prime numbers can equip a Mathematician for hacking. So Mathematics is like a double-edged sword. It can cut both ways. Therefore we need "Well Defined" Mathematicians in policy-making team everywhere.



Have you ever imagined that what would be life like without Mathematics? It is going to be impossible and unimaginable, in fact without it life is not going to be systematic and it is going to be full of chaos. So it makes our life easier by preventing chaos. Mathematics in life is as important as music to songs or internet facility to digital India. It is needed at every step of life and without it, we cannot move even an inch be it be knowing that how many alphabets are there in the word "Mathematics" itself. Everyone needs Mathematics in their day to day life without realizing it ,be it an astronaut, a farmer, an army man, a sportsman, a shopkeeper or tea vendor, an economist or was it the architect Walter Sykes George who designed the beautiful red bricks buildings of the two colleges Miranda House and St. Stephen's College which had a collaboration till Stephen's became coed in 1928. Whenever Stephen's would need women actors, they would get them from Miranda House, whenever MH would need male actors, they would come from Stephen's. It means relationship was "Symmetric". Could Walter George imagine this beautiful structure of Miranda House without the use of symmetry or can we feel even today the beauty of building without having the symmetry in its pillars or stairs? Life without Mathematics would be like the building of Miranda House without students!

"I see it but I don't believe it" Georg Cantor

Origin 2018



This edition of Origin on 19th March 2018 saw a plethora of events ranging from The Principal Argument (a debating competition) to the most awaited Scavenger Hunt. It was an opportunity for the “Maths Whizz” enthusiasts who got their grey cells to work as they pushed themselves “Off Limits” and used their “Principal Argument” before they got an adrenaline rush for the “60 Seconds Dimension”; they raced against time for “Maths Relay” and embarked upon a journey as they unraveled mysteries for the “Scavenger Hunt”.

We had the honor of hosting Dr. Aparna Mehra (Professor, IIT Delhi) for our inaugural lecture. She assisted us in expanding our horizon of knowledge and made us dwell deeper into the fascinating world of Linear Algebra as we explored its applications in statistical learning.



Maths Whizz

Mathematics is truly an exercise for our left-brain. Maths Whizz required the Maths enthusiasts to get their grey cells to work. It comprised of 3 rounds of quizzing, at the end of which the winners were declared. Teams did their best to prove their worth and grab the first position. Finally, the team from St.Stephens grabbed the first position while the students from IIT Delhi came second.

Off-Limits

The game, played in pairs, was about guessing the Mathematical jargons with a list of Taboo words, the use of which was forbidden. It was a treat to watch people use their skills to play the game. We received a great response and the winners were from our own department. It was very well executed. All the volunteers had put a great amount of energy in the event.

The Principal Argument

Give your brain a chance to fight
Try to prove what you think is right
The Principal Argument, a debating competition, witnessed enthusiastic participation from numerous colleges. Debates took place on various social issues as well as Mathematical and scientific matters. This 3 round event concluded with two finalists taking the podium to battle and win the final prize. Accolades were also given to the best interjector. Our judges as well as all the participants enjoyed immensely.



60-Second Dimension

60 seconds dimension comprised of completing given tasks within 60 seconds. Each game was played in groups of 3 or 4 and one winner was selected from each group. There were 15 games in all among which the best 3 games were: Draw on the balloon, Maths charades and Scissors and Coins. The event was a success since participants liked the games and enjoyed them very much.

Maths Relay

A team game, with participants in groups of 3, Maths Relay consisted of each member having to solve a question and pass the answer to the next member in order for them to solve their question, and so on. The final answer and time taken is then noted and the team who solved the questions correctly in the shortest amount of time wins. The game was thrilling with enthusiastic participation by all.

Scavenger Hunt

This year the theme for the scavenger hunt was JUMANJI. Various Mathematical puzzles and logical riddles were used as the key to unlock the subsequent levels in the game. The teams consisting of 5 members were each given a character to play resembling those in the real Jumanji movie. The teams had to first decode the clue and identify various areas of the college and then solve a puzzle to get the next clue. Origin 2k18 witnessed a huge turnout for the game. Around 20 teams participated, and gave their best to win.

Contributions by: Aparajita S, Aishwarya K, Akansha S, Bhagyansha J, Diksha, Inayat C, Ishani C, Jhankaar D, Kaushiki B, Krati M, Meghna B, Mitul C, Mrityika D, Niyati S, Priyanka, Snigdha B, Tanya J, Vanshika S

Department Trip



Shimla, a destination everyone was excited to explore. It was after several requests and lot of persuasion for more students to join us, that the trip got finalised, but it was all worth for in the end. It was an overnight journey. We did everything that we could to keep ourselves entertained for the whole night. Singing together, playing games and gossiping about everything under the sun kept us busy the whole time. Little did we know that this would be a journey to remember.

The picturesque location, lush green surroundings and less population was worth witnessing as the disturbing heat of Delhi was left far behind. All were really charmed by the beauty of Shimla. We headed straight to Sankat Mochan Temple located amid the lush green and tranquil locals of Himachal Pradesh. Our next destination was The Mall, which is lined with shops and restaurants. We walked around and enjoyed the scenic views of nature while slurping ice creams in that nippy weather.

The next day we visited Kufri, a small hill station and rode horseback to Mahasu Peak (the highest peak in that region) that restores your faith in God. The ride was no less than an adventure because the track was all muddy and swampy. The funny part was that horses started competing with each other and pushed other horses to get ahead. Once we reached the peak, it gave us majestic views of the entire surroundings. The walk along the thick forests and deodars felt amazing. Adventurous rides, yaks, amusement park sum up this amazing land.

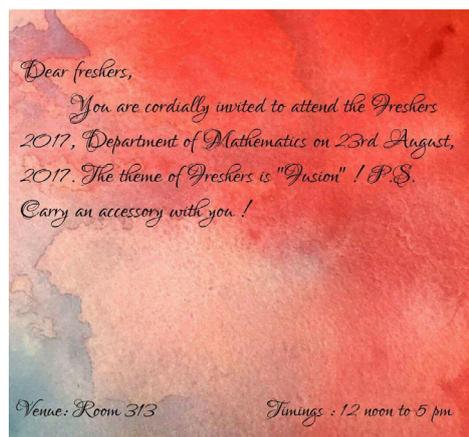
The unforgettable memories, infinite pictures, horse rides, DJ party at the hotel, delicious food, these countless moments will always be with us. The whirling zig-zag road gave us a chance to observe nature through different angles and to feel it in full length. Shimla is indeed a queen of hill stations.

-Krati Morandani
Mathematics (Hons.) H3A

Freshers

Most fuchchas (as freshers are commonly called in DU) are victims of acute homesickness in the initial days of the college. Having just left home, parents, family, friends and a lot more, it is hard for most of them to overcome nostalgia and get on with college. Freshers party comes as a nirvana as it makes a great ice breaker.

Our freshers did much more than that. It not only gave us a delightful glimpse of what these 3 years have in store for us but also bounded the new members of the Mathematics Department closely with everyone. The theme of our freshers held on 23rd August 2017 was 'fusion'. The freshers came dressed in sync with the theme. From pairing kurtas with shorts to wearing crop tops with ghagras, the freshers did everything to fuse. Our seniors welcomed us very warmly. The CRs from first year cut the welcome cake. Seniors presented dances, songs, games and short enactments which kept us entertained throughout. Interesting awards like 'highest heels', 'longest hair' and 'maximum hair pins' were given as well. The Miss Freshers title competition was the most awaited segment of the party. The contestants had to participate in 4 rounds in which only the top scorers proceeded to the subsequent rounds. The first round demanded the participants to introduce themselves in an audience engaging way. The participants which qualified for the second round had to showcase their talents. It was amazing to see the talented girls of our department at their best. The third round was an interesting one. In this round the girls had to advertise an accessory and convince the buyers turned audiences. The fourth and final round was a question-answer round.



The results were as follows :

Miss Freshers : Ashmita Rana

Miss Talented : Aparajita Shah

Miss Well Dressed : Ujjwala Kaushik

The day concluded when all the students took to the dance floor and enjoyed each moment to the fullest. The first years were extremely grateful to their seniors for this cordial welcome.

-Ashmita Rana

Mathematics (Hons.) H1A

Teacher's Day



Teachers are the cornerstone of students' future and there's nothing worth enough to gratify them for their selfless service and commitment.

Department of Mathematics, Miranda House celebrated Teachers' day with great gusto and gaiety this year. The celebration commenced with the cake cutting ceremony by the faculty members of the department. The day continued with songs, dance and mimicry performances by students to denote their love and respect towards the hard work put in by the teachers towards their development. The celebration came to an end with the student council presenting token of thanks to all the faculty members on behalf of the students of the department. All teachers enjoyed and appreciated the program.

-Diksha Gupta

Mathematics (Hons.) H3A

Faculty of the Department



1st row (L-R): Dr. Jyoti T, Dr. Rekha G, Ms. Bhawna B.G, Dr. Shashi A, Dr. Sunila S, Dr. Manjari S, Dr. Ritu G, Ms. Apeksha V
2nd row (L-R): Dr. Meetu B.G, Mr. Bikram S, Dr. Durvesh K. V, Mr. Manoj R, Mr. Naveen G, Mr. Mohit K.M, Mohd. Sarik I,
Ms. Shweta G

Batch of 2020



1st row (L-R): Kirti, Nidhi, Manisha, Neha R, Preeti, P.Samanvitha, Priya, Kanchan, Ashmita, Ayushi, Chitra

2nd row (L-R): Rajni, Parul, Preeti, Neha Y, Nitika, Seema, KM Jyothi , Lata, Aparajita, Manisha, Kriti

3rd row (L-R): Ritika, Shagun, Shriya, Ujjwala, Vidhi, Sneha, Roopali, Rashi, Rachana, K. Sai Vyshnavi, S. Sai Jyothi, Bhawna, Babe, Aripa, Karthika

Batch of 2019



1st row (L-R): Sweta, Priyanka, Supriya, Nikita, Nidhi, Andin, Khushboo, Sonal, Bidyalxmi, Shivani, Rakshita, Renu, Yashwi, Shikha Y, Nirmala, Ayushi, Nikita, Khushboo, Anjali, Roli, Shubhi, Prashasti

2nd row (L-R): Rashmi, Arpita, Bidhushi, Anisha, Khansa, Mahima, Gulshan, Radha K, Vanshika, Swati, Shivani , Sanjana, Shikha, Shikha, Geetika, Swikriti, Vaishali, Ritu, Rhythm

3rd row (L-R): Radhika, Zainab, Esha, Divya, Hena, Radha, Shivani, Jhanvi, Simran, Bedkaur, Kanika, Anjali, Asmita, Arushi

Batch of 2018



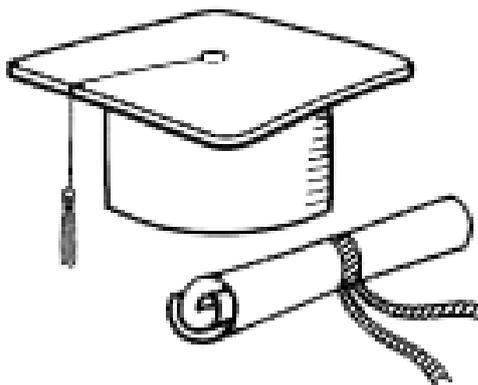
1st row (L-R): Lehak, Akansha, Baby, Diksha, Aditi, Archana, Anuradha, Tanu, Uplabdhii, Komal, Kalpana, Kavita, Priyam, Kaushiki, Akansha S

2nd row (L-R): Inayat, Jigmet, Ankita S, Aarti, Kaushal, Himanshi, Rajnee, Neha, Shivani, Srishti, Kirti, Akansha D, Neetika K, Neetika S, Anita, Mrityika

3rd row (L-R): Vanshika, Tanya J, Niyati, Tanya K, Rupashi, Sanskriti, Neha P, Sapana, Pooja, Priyanka G, Rachna, Shweta, Prerna S, Kalpana J, Krupa, Ankita, Jhankaar, Aishwarya

4th row (L-R): Neelam, Pankhuri, Stuti, Kavya, Ishani, Neha J, Uditia, Snigdha, Priyanka, Divya, Divya S, Kanchan, Aparna, Diksha G, Meghna, Mahima, Krati, Bhagyansha

"Education is the most powerful weapon
which you can use to change the world."



~ Nelson Mandela

Try it Out in Mathematica

Spiral into the Wonder of Mathematica:

```
With[{f = {Cos[3 x] + .3 x Sin[2 x] , .3 x Cos[2 x] - Sin[3 x]}},  
Graphics[Table[{Hue[t/(Pi), 1, .9],  
  Arrow[{f, Normalize[D[f, x]] + f}] / . x -> t, {t, -4,  
  3 Pi, .06}], Background -> Black]]
```

Spread Some Love with this 3D Heart:

```
ContourPlot3D[ (-1/10) x^2 z^3 - y^2 z^3 + (2 x^2 + y^2 + z^2 - 1)^3 == 0, {x, -1.7, 1.7}, {y, -1.7, 1.7}, {z, -1.7,  
1.7}, PlotPoints -> 60 , Boxed -> False, Ticks -> None, ContourStyle -> Directive[Opacity[0.9], Red],  
Background -> GrayLevel[.9],  
AxesEdge -> {{-1, 4}, {-1, -3}, {-1, 2}}, AxesLabel -> Automatic ,  
LabelStyle -> Directive[Blue, Bold],  
AxesStyle -> Arrowheads[{1, 1, 1}]]
```

Keep the Doctor Away with this 3D Apple:

```
ParametricPlot3D[{Cos[u]*(4 + 3.8*Cos[v]),  
  Sin[u]*(4 + 3.8*Cos[v]),  
  (Cos[v] + Sin[v] - 1)*(1 + Sin[v])*Log[1 - Pi*v/10] + 7.5*Sin[v]},  
{u, 0, 2 Pi}, {v, -Pi, Pi},  
Mesh -> None, Boxed -> False, Axes -> False, PlotPoints -> 100 ,  
PlotStyle -> {Green}]
```

Turn that Frown Upside Down:

```
ParametricPlot[ {2 {1 + Cos[t], 1 + Sin[t]}, {2 - Cos[t/2],  
  2 - Sin[t/2]}, {1 + Cos[t]/10, 3 + Sin[t]/10}, {3 + Cos[t]/10,  
  3 + Sin[t]/10}}, {t, 0, 2 Pi}, PlotStyle -> Thick,  
AxesLabel -> (Style[#, 14, Bold] & /@ {x, y}), Axes -> False]
```

Let the Butterfly Spread its Wings:

```
PolarPlot[  
  E^Sin[θ] - 2.4 Cos[4 θ] + Sin[θ/12]^5, {θ, 0, 24 Pi},  
  PlotStyle -> {Thickness[0.004], Black}, PlotPoints -> 150]
```

Watch the Colours Blend:

```
LineIntegralConvolutionPlot[{{Cos[x^2 + y], Sin[x - y^2]}, {"noise",  
  500, 500}}, {x, -3, 3}, {y, -3, 3}, ColorFunction -> "BeachColors",  
  LightingAngle -> 0, LineIntegralConvolutionScale -> 3,  
  Frame -> False]
```

Careers in Mathematics

Statistician careers

Statisticians are specialists in statistics – that is, the collation, analysis, interpretation and presentation of statistics and quantitative data. Statisticians' skills are required in numerous industries, ranging from healthcare to government and from finance to sport. You'll be tasked with managing, collecting and arranging data by means of surveys, experiments and contextual analysis. With your findings, you may then be called upon to create reports and advise clients/colleagues on possible strategies, for example in order to make good financial decisions to further business goals. As a statistician, you'll have expert analytical skills as well as solid communication and IT skills

Careers in banking

Opportunities in banking range from the world of retail banking to corporate investment banking. Both arenas deal with financial assessment – public and private – with opportunities to specialize in areas such as mergers and acquisitions, bonds and shares, privatization, lending and IPOs (initial public offerings). Duties can include market research, creating new business opportunities, and developing financial models and solutions to present to clients. Math careers in banking can be lucrative, but, professional qualifications in finance will be needed for some roles.

Actuarial careers

As an actuary, you will be evaluating financial risk in order to manage and advise clients. Combining risk analysis skills with in-depth knowledge of economics and business, actuaries are at the heart of business strategy, ensuring sound investments are made and commercial/business goals fulfilled. New actuaries will most likely be working within pensions and insurance, a relatively low-risk area, while in the future you may get to work in banking, healthcare or investment. Actuarial roles can be client-facing, as with consultancies and pensions/insurance companies, and all actuaries will require the skill of communicating complex data and analyses to non-specialists.

Careers in academia and research

While it's now clearly understood that careers in Maths go far beyond the realms of academia and research, these sectors are still very popular among Mathematics students. This route may appeal to those who want the challenge of driving forward the next series of discoveries, theories and applications of the field – as well as the prestige of following some of history's greatest Mathematical minds. Academic and research-based careers in Maths can be incredibly wide-ranging, and will depend on what area you wish to specialize in.

Teaching

In addition to academic roles with a research focus, many rewarding Maths careers can be found in teaching. Numeracy is always a high priority within primary and secondary education systems, making highly numerate graduates with an interest in teaching highly sought-after. In order to teach in most countries, you'll require a formal teaching qualification. To teach at university level, a postgraduate degree is often required, in a relevant specialism. If you choose this path, you may also get the chance to pursue your own academic research.

Other common Maths careers include; intelligence analysis, operational research, statistical research, logistics, financial analysis, market research (for business), management consultancy, IT (systems analysis, development or research), software engineering, computer programming, the public sector (advisory capacity as a scientist or statistician), scientific research and development (e.g. biotechnology, meteorology or oceanography).

Numeracy, the ability to understand and work with numbers, is extremely sought after and high in demand.

Activity

This is a crossword puzzle without words -- numbers are the answers instead (a single digit for each square in the grid). Unlike a crossword puzzle, deductive logic based on a knowledge of Math is needed to work out the answers from information provided in the clues. A little trial and error solving may also be necessary. (Bold black lines in the puzzle grid separate entries in the same way as black squares.) Additional clue: there are no zeros in the completed grid.

ACROSS

- 1 The first two digits are a prime number; the second two are the next lower prime number
- 5 A perfect cube
- 6 A multiple of the cube root of 4 DOWN; sum of digits is 6
- 8 The sum of the first two digits equals the sum of the last two digits equals the middle digit
- 9 A perfect cube
- 11 The square of the cube root of 4 DOWN
- 12 The product of 10 DOWN times 6 ACROSS

DOWN

- 1 A number in which each digit is one lower than the preceding digit
- 2 The sum of the digits is two-thirds the product of the digits
- 3 The product of three primes; the first 10 larger than the second; the second 10 larger than the third
- 4 A perfect cube
- 7 All even digits; each different
- 9 A perfect cube
- 10 A prime number

1	2	3	4	
5			6	7
8				
		9	10	
11		12		

Riddle Me This

What is the smallest number that, when divided successively by 45, 454, 4545 and 45454, leaves the remainders 4, 45, 454, and 4,545 respectively.

Buns were being sold at three prices: one for a penny, two for a penny, and three for a penny. Some children (there were as many boys as girls) were given seven pennies to spend on these buns, each child to receive exactly the same value in buns. Assuming that all buns remained whole, how many buns, and of what types, did each child receive? There are several books on a bookshelf. If one book is the 4th from the left and 6th from the right, how many books are on the shelf?

What number composed of nine figures, if multiplied by 1,2, 3,4, 5, 6, 7, 8, 9, will give a product with 9, 8, 7, 6, 5, 4, 3, 2, 1 (in that order), in the last nine places to the right?

On a clock, how many times a day do the minute and hour hand overlap?

Corner

Did You Know?

Abacus is considered the origin of the calculator.

12,345,678,987,654,321 is the product of 111,111,111 x 111,111,111. Notice the sequence of the numbers 1 to 9 and back to 1.

Plus (+) and Minus (-) sign symbols were used as early as 1489 A.D.

An icosagon is a shape with 20 sides.

From 0 to 1,000, the letter "A" only appears in 1,000 ("one thousand").

A 'jiffy' is an actual unit of time for 1/100th of a second.

'FOUR' is the only number in the English language that is spelt with the same number of letters as the number itself

In a group of 23 people, at least two have the same birthday with the probability greater than 1/2 .

Among all shapes with the same perimeter a circle has the largest area.

Among all shapes with the same area circle has the shortest perimeter .

In 1995 in Taipei, citizens were allowed to remove '4' from street numbers because it sounded like 'death' in Chinese. Many Chinese hospitals do not have a 4th floor.

The word "FRACTION" derives from the Latin " fractio - to break".

Laugh Out Loud

After a talking sheepdog gets all the sheep in the pen, he reports back to the farmer: "All 40 accounted for."

"But I only have 36 sheep," says the farmer.

"I know," says the sheepdog. "But I rounded them up."

Q: What happened to the plant in Math class?

A: It grew square roots.

Q: Why wasn't the geometry teacher at school?

A: Because she sprained her angle!!

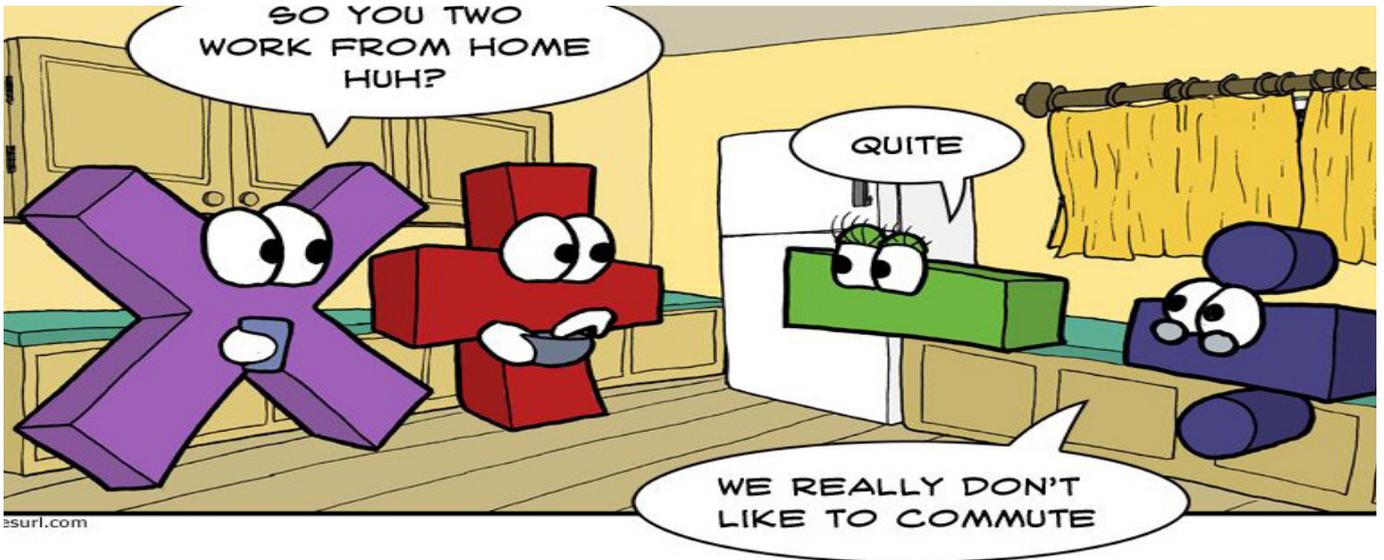
Q: How do you make seven an even number? A: Take the s out!

Q: Why did I divide sin by tan? A: Just cos

Q: Why did the mutually exclusive events break up? A: They had nothing in common.

		7						8
				9		5		
		3	1		5	9	7	
	8			1	6		3	
	6		8	3				2
	3	8	7		1	4		
		9		6				
1							8	

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When your teacher already asked you to use an iterative formula to find the roots but then they ask you to use interval bisection

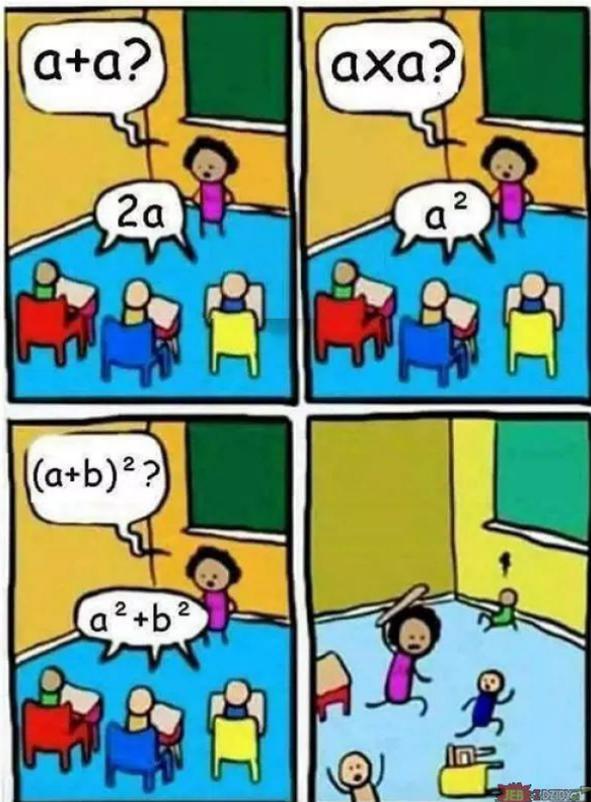


Answers To The Riddles:

The smallest number that fulfills the conditions is 35,641,667,749. Other numbers that will serve may be obtained by adding 46,895,573,610 or any multiple of it.

There must have been three boys and three girls, each of whom received two buns at three for a penny and one bun at two for a penny, the cost of which would be exactly 7¢.

989,010,989 multiplied by 123,456,789 produces 122,100,120,987,654,321, where the last nine digits are in the reverse order.





Isaac Newton

One like and I'll steal calculus from Leibniz.

Like · Comment · October 24, 1665

Isaac Newton likes this.



Isaac Newton Say no more

October 24, 1665 · Like

22 times: 12:00:00, 1:05:27, 2:10:55, 3:16:22, 4:21:49, 5:27:16, 6:32:44, 7:38:11, 8:43:38, 9:49:05, 10:54:33. Each twice a day.

Answers To The Puzzles:

5	9	7	6	4	3	2	1	8
8	1	6	2	9	7	5	4	3
4	2	3	1	8	5	9	7	6
9	8	2	5	1	6	7	3	4
3	4	1	9	7	2	6	8	5
7	6	5	8	3	4	1	2	9
6	3	8	7	5	1	4	9	2
2	7	9	4	6	8	3	5	1
1	5	4	3	2	9	8	6	7

1	8	9	8	3			
5	7	2	9	6	4	7	2
8	6	1	7	3	4		
	5		9	2	10	1	6
11	4	9	12	7	9	8	

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So what do you do besides solving differential equations



And don't say vector calculus



Or memorizing common Taylor expansions



Batch of 2018

*Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;*

*Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,*

*And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.*

*I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference.*



Aarti



Aditi Shukla



Aishwarya Kukrety

Always push yourself to bask in new opportunities, explore and identify yourself in that process and evolve everyday; however to face life's dilemmas, going back to your authentic self and your roots keeps you strong and grounded.

"It's your life you decide, make your own way. Don't wait around looking for some magic to happen, Get your sparkle on, show this world where you belong, all it takes is a little faith and believe."

They hate us coz they ain't us.

Akanksha



Every morning when you wake up, say to yourself looking into the mirror - "Only I can change my life, no one can do it for me "

Akanksha Dixit



If the feelings of farewell could have moulded in a word then it would have got no sound at all.

Akanksha Singh



Look for the opportunities around you, they are all yours to seize!
In this world of black and white, Be your own color of beige!

Anita Yadav



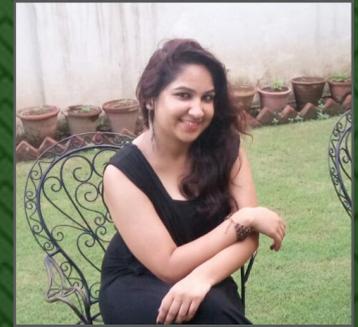
You understand how much you have changed with the time spent in college. 3 Crazy years and you stand out as a completely different person, you are today..I'll always miss these memories..

Ankita



College is the best place to enjoy life Happily .The friends You Make here will be the friends forever in your life and You will love them

Ankita Singh



There is nothing either good or bad but thinking makes it so

Anuradha



One funny thing about college is that: Teachers make you sleep during day and friends don't let you sleep at night. Now I understand why they say the friends you make in college are your friends for life.

Aparna Brahma



If you don't do wild things while you're young, you'll have nothing to smile about when you're old.

Archana Bhorla



Miranda House became the turning point of my life. The wavering steps in my first year were followed by a confident stride in the next two years where I realised the value of the friends turned to family and the amazing faculty.

Baby Gill



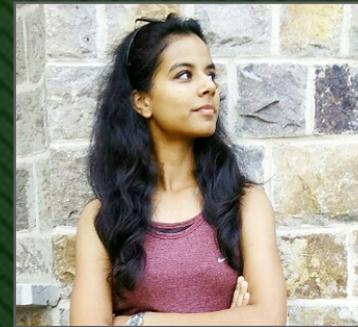
When writing the story of your life.. don't let anybody else hold the pen

Bhagyansha Jain



B.Sc.(Hons) Mathematics, Miranda House- A short journey of life that ended with great decisions and precious friends.

Bhavna Singh



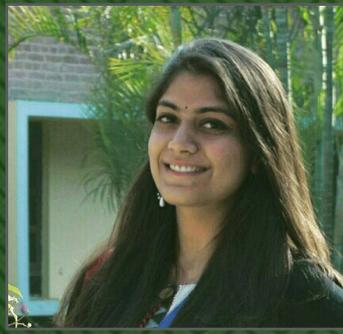
Learning is not attained by chance, it must be sought for with ardor and diligence.. Thank you MIRANDA!

Diksha



Working hard is important, but there is something that matters even more; believing in yourself.

Diksha Gupta



Being from a Co-Ed school, I was skeptical about an all-girls college but Miranda shed all my doubts and gave me an amazing journey and tonnes of memories

Divya



Life is the art of drawing without an eraser, so live yours in colors.

Divya Singh



When life changes your centre of gravity, just find a new way to stand.

Himanshi



This red bricked institution has given me the dearest friends I know I'll cherish for life. I'll miss our department and everything about it.

Inayat Chaudhary



"Shoot all the bluejays you want, if you can hit 'em, but remember it's a sin to kill a mockingbird."

Ishani Choudhary



You're mad. Bonkers.. Off your head... but I'll tell you a secret... all of the best people are .

Jhankaar



Success is never final, failure is never fatal. It's courage that counts.

Jigmet Ladol



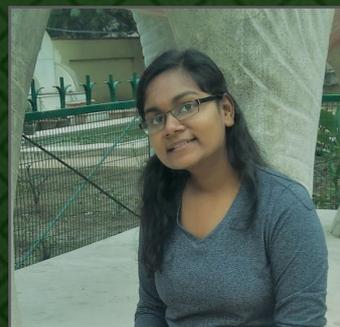
Source of strength and satisfaction lies in the eyes of gratitude and appreciation, rather than in the eyes of desire and expectations.

Kalpna



"All the real education is the architecture of the soul"- William Bennett

Kalpna Jaiswal



Only I Can Change My Life. No One Can Do It For Me.

Kanchan Tiwari



Do things out of your way. Come out of your limited shell and shock everyone by discovering yourself.

Kaushal



Everything about Miranda House is wonderful; from its canteen and our department to my friends. This place has most importantly taught me that staying true to myself will let me cross all my hurdles.

Kaushiki Bansal



Be loyal to the royal within you

Kavya Chandra



If I can graduate with over 150 absences throughout college, you can too.

Kirti



Who says that stones don't have feelings? I bet these walls will cry in lonely nights, and surely I will also be missing everyone.

Kavita



How lucky I am to have something that makes saying goodbye so hard..

Komal Chhabra



Learning Mathematics is really fun in the beautiful atmosphere of Miranda. I love and will miss all my teachers. All are superb.

Krati Morandani



From freshers party to farewell, we made thousands of memories that I hold so dear in my heart. How lucky am I to have something that makes saying goodbye so hard.

Krupa Maria Jose



"Be happy for this moment. This moment is your life."
- Omar Khayyam

Lehak Narnauli



Let's have a toast to the good life

Mahima Arora



Chalo ab jaane bhi do,
Kya karoge dastan sunkar!

Meghna Basu



Meme Queen Extraordinaire
Chandler Bing is my Patronus
#FingerGunsAndPuns

Mitul Chawla



When I stumbled, stumbled not backward, but forward. So when I fell, I fell into grace. Thank you MH, for the transformation.

Mrittika Das



Among all the things that Miranda has offered me, the best thing is that it didn't change me a bit in all these 3 years. This is the best since I love the way I am and hope to remain the same cheerful always.

Neelam Bista



When the going gets tough, just remember that if p divides the order of G , then G has an element of order p .

Neeti Saxena



Thanks to Miranda House College for making me brave enough to cope up with the crucial situations and to live life to the beat of my own drums.

Neetika Kaushal



Wish to go back in life again, not to change anything but to enjoy couple of things again. #MirandaHouse

Neetika Sagar



There is no regrets, only learning.

Neha



Thank you Miranda House for transforming me, thank you for giving me such good friends and such a lovely family.. I will never forget this journey of my life.

Neha Joshi



Not all your college memories will be phenomenal, but at the end of the day, you are who you are because of all of them.

Neha Patawari



You can't go back and change the beginning, but you can start where you are and change the ending. - C.S. Lewis

Niyati Srivastava



It is MH I have to thank, for the woman I am today. Thank you, for the love, bonds and Pam cheese burgers. <3

Pankhuri Khare



"The days we spent within thy walls, our hearts with memories fill, and when we're gone where duty calls, those thoughts will linger still!" Thankyou Miranda House for filling me up with the optimism and confidence to look ahead and succeed in my endeavours.

Pooja Prajapati



My Experience was very good at Miranda House. I learned a lot from here. Viva La Miranda!

Pragati



Best three years of my life!

Prerna Goswami



"College is not just a place where we'll learn answers to a lot of life's problems, but also a phase which will make you question a lot of life's answers..."

Prerna Sodhi



The circumstances of one's birth are irrelevant, it is what you do with the gift of life that determines who you are.

Priyam Yadav



Smile! Because you have the most amazing smile. Smile! Because there are many reasons to worry about. Smile! Because life is too short. Smile and spread smiles.

Priyanka



Proud to be a Mirandian. I just love this college, the lavish green atmosphere, discipline, and the positive vibes. The teachers are very hard working and friendly. Miranda, you will be missed a lot.

Priyanka Gupta



A big thank you to majestic red bricks, teachers and friends for giving me the most enthusiastic, bubbly and dynamic three years of life!

Rachana Yadav



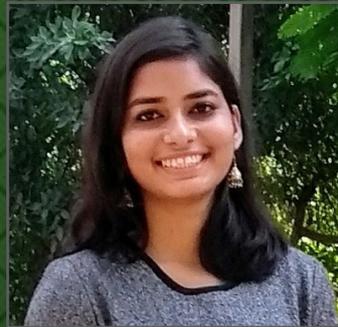
Now I can prove that zero is smaller than one.

Rajnee Shikha



I m heartly thankful to miranda house for building up my self confidence and giving me so many frnds and uncountable memories...

Richa Sharma



We love to do what's easiest of all. Never let the 'smaller you' become the veil for the 'bigger you'. Don't just fly, soar high.

Rupashi



When the last bell rings, I might actually miss this place.

Sanskriti Bhakumi



"You have three years to be irresponsible here. Relax. Work is for people with jobs. You will never remember class time but you'll remember the time wasted hanging out with your friends. The work never ends, but college does."

Sapana Jaiswal



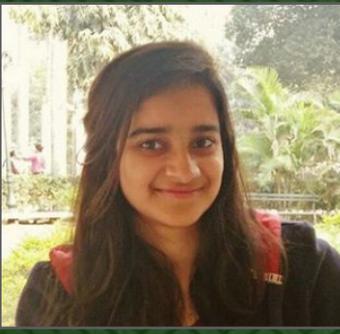
I stand at a dichotomy between the grief of ending this beautiful journey and the joy of starting another on towards my career. Miranda has give me values I'll remember for life. Thankyou

Shivani Awasthi



Beginnings are usually scary and endings are usually sad, but it's everything in between that makes it all worth living

Shweta Vashisth



It it be a sin to covet honour, I am the most offending soul

Snigdha Bhansali



Thank you Miranda House for all the wonderful experiences and friends.

Srishti Patel



Sometimes it's the journey that teaches you a lot about your destination! The three years in MH have passed in the blink of an eye and the journey has indeed been an exciting one. Glad to be a part of it.

Stuti Sinha



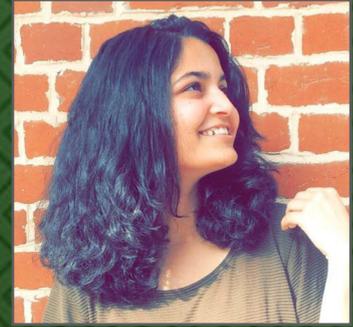
"Believe in love. Believe in magic. Hell, believe in Santa Clause. Believe in others. Believe in yourself. Believe in your dreams. If you don't, who will?"
- Jon Bon Jovi

Tanu Yadav



"We didn't realise we were making memories. We just knew we were having fun". I am grateful that I got the opportunity to be a part of Miranda House

Tanya Jain



Came here as I was good but now I'm much improved. Mathematics made me fall for beauty of small things, Can't thank enough for the treasure this home has given me.

Tanya Kapoor



If there's one thing that you know you can do, then spare no time in doing it!

Udita Rawat



"Sometimes you will never know the value of a moment until it becomes a memory." After 2 or 3 years may be this is what i will think about my college life.

Uplabdhii Daubhiya



Birds fly, Planes fly, Miranda lets women fly.

Vaishali Yadav



One thing that made me stronger in the past three years was learning the truth that everything here has a purpose, it's all about knowing and acknowledging it. It's already half done if we know the 'why' of everything that we do.

Vanshika Sharma



I am almost the same as you, except I can rock the dance floor, own you in a meme competition and beat you in almost every grub fest. (And no, I won't teach you how to do any of those, so don't ask)

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