ANANTYA

....Beyond Infinity

DEPARTMENT OF MATHEMATICS, STATISTICS AND COMPUTER SCIENCE

MATA SUNDRI COLLEGE FOR WOMEN

(UNIVERSITY OF DELHI)

VOL II, APRIL 2018

MATA SUNDRI JI

Sikh women have played a constructive, significant and positive role in Sikh history, equal to men and yet they haven't won a whisper of recognition from the historians. One such woman was Mata Sundri ji, born on 23rd Dec., 1667 and was popularly known as "The Great Mother of Khalsa", amongst the Sikh masses. She was the daughter of Bhai Ram Saran, a Kumarav Khatri of Bijvara, in present day Hoshiarpur district of the Punjab. She was married to Guru Gobind Singh ji on 4th April 1684 at Anandpur.

Mata Sundri ji was recognized as a capable successor and leader of the *Panth*, as she took the responsibility of all the tasks after the demise of her husband, Guru Gobind Singh ji. Mataji established a Training Academy at Amritsar, headed by Bhai Mani Singh, and thereby played a commendable role in teaching of Sikh scriptures and religious values.

She completed a formidable challenge of compiling the works and writing of tenth Guru, entitled *Vidya Sagar*, which is now known as *Dasam Granth*. She had spent all her years in leading the *Sikh Panth*. She was the accepted mediator and judge for the Sikhs. She was a remarkable personality of strong principles and adhered to a strict code of conduct. Another achievement of Mata Sundari was the protection of the building of Gurdwara Rakab Ganj, the last resting place of Guru Tegh Bahadur.

All the Sikhs all over India were considered by Mata Sundari to be her children and she kept in constant touch with them through her edicts such as those addressed to the Sikhs in Patna (Bihar) and the Jamania Sikh assembly. Sikhs from Kabul and Kandahar came to visit her and receive her blessings.

She was wise, courageous and far-sighted, patient as well determined. She will always shine like a star and will guide the people to the right path. We bow our heads as a mark of respect before the greatness of her soul.

RESOURCES:

- http://www.searchsikhism.com/mata-sundari-a-multi-faceted-personality
- http://www.sikhiwiki.org/index.php/Mata_Sunder_Kaur

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PRINCIPAL'S DESK

I extend my heartiest wishes to the Department of Mathematics, Statistics and Computer Science for coming up with the second edition of their e-magazine, 'Anantya: Beyond Infinity'. It is indeed enchanting that our department has grown up with the addition of two more disciplines this year; Statistics and Computer Science. The department has taken up this initiative to showcase the diversity of the subjects in a very intriguing way.

Anantya has given a platform to the students and the faculty to express their thoughts freely and let everybody know their true potential. It is a commendable effort so as to develop valuable skills in the students and for them to become more confident in putting their opinions on the front. I would also like to thank our qualified and experienced teachers and the sincere students who have made our events and endeavours possible. This magazine is a compilation of the academic and the extra-curricular achievements of the department. It is a stage to show the laurels brought by the students to the college.

The work done by the editorial team is admirable. I wish the publication and its associates' all the luck and grand success.

Dr. Kawarjit Kaur
(Officiating Principal)

FROM THE EDITOR'S DESK

Welcome to the second edition of our Department magazine 'Anantya: Beyond Infinity'. Our magazine is designed in a mind-boggling way consisting of interesting facts and articles about Mathematics, Statistics and Computer Science. We want it to be entertaining and informative, at times contrary, but above all useful. Inside you'll find a mixture of news, features and fun columns on a wide range of topics.

Here at Mata Sundri College, our Department of Mathematics, Statistics and Computer Science has been very active and has played a magnificent role throughout these years. In order to gain the confidence of the students, our faculty is willingly working to make the process of learning as interactive as possible. Several competitions, talks, sessions etc. have been organized for all the students and participation is highly appreciated. Thereby, helping in shaping the bright future of the students.

It really proved to be a mammoth task to cover all the happenings in the college and the literary and creative talents of the students. This issue of Anantya is a collage of live memories and experiences imprinted in time. It sings of the poetic inspirational moments we have enjoyed.

Mathematics has taught us one thing, "**YOU HAVE TO BE ODD TO BE NUMBER ONE".** A positive energy of it embarks a union of Cultivated mind. We do not learn by interference and deduction and the application of mathematics to philosophy, but by direct intercourse and sympathy. Proper communication plays a vital role in institution's development. This issue will also serve to reinforce and allow increased awareness, improved interaction and integration among all of us.

Hope you like our efforts and get inspired for a new beginning!

Anmol Marwah
Simran Minocha

DEPARTMENT OF MATHEMATICS, STATISTICS AND COMPUTER SCIENCE

FROM THE DESK OF TEACHER IN-CHARGE

Mathematics was the only discipline till now in the Department of Sciences. Since its inception in 1967 with strength of only 5 students to the present strength of 167 students, the Department of Mathematics has developed and grown in several directions. This year Statistics and Computer science also got added in the department. It is our endeavour to provide an in-depth knowledge and understanding of the fundamental concepts of the subjects whereby students learn to think logically and critically, develop problem solving ability, apply their concepts and reasoning effectively, are encouraged to pursue challenges of research and become lifelong learners.

Each issue of our e-magazine- **'Anantya: Beyond Infinity'** is a milestone that marks our growth, unfolds our imaginations and gives life to our thoughts and aspirations. The 2nd edition is a combined effort of our Department Society- '**Asymptote**', dedicated teachers and hardworking students. It unleashes a wide spectrum of creative skills and deep knowledge of subject and aims at participation of students ranging from writing to editing and even in designing the magazine. We believe fundamental philosophy is not limited to produce skilful mathematicians but to encourage citizens who will contribute meaningfully to the growth and development of the country and excel in various disciplines of knowledge. The session 2017-2018 was indeed a special session for the Department as it conducted its first National Conference on "Advances in Applied Mathematics and Statistics" (NCAAMS2017) during September 07-08, 2017, organised the Alumni Meet on 3rd February 2018, the Annual departmental event- MASTACOM'18 was held on 21st February 2018 and moreover, career-oriented workshop was a part of MASTACOM'18.

I congratulate the students and faculty members who are associated to bring out the e-magazine in the present commendable form. I am sure the Department Society ASYMPTOTE will continue to bring out future editions periodically of the e-magazine for the latest development in the field of Mathematics, Statistics and Computer Science.

Ms. GURPREET KAUR
TEACHER In-charge

OUR FACULTY

- Ms. Gurinderjit Kaur (M.Sc.)
- Ms. Mandeep Walia (M.Sc., M.Phil.)
- Dr. Rama Verma (M.Sc., Ph.D.)
- Dr. Rashmi Verma (M.Phil., Ph.D.)
- Ms. Gurpreet Kaur (M.Sc., M.Phil.)
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- Dr. Karuna Mamtani (M.Sc., Ph.D.)
- Dr. Ramita Sahni (M.Sc., Ph.D.)
- Dr. Archana Verma (M.Phil., Ph.D.)
- Dr. Swati Kujal (M.Phil., Ph.D)
- Ms. Priyanka Gupta (M.Sc.)
- Ms. Vijaya Goel (M.Sc.)

MATHEMATICS SOCIETY- ASYMPTOTE

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ACHIEVEMENTS IN THE FIELD OF MATHEMATICAL SCIENCES

-Compiled by Simran Minocha and Anmol Marwah

1. Abel Prize 2017: Yves Meyer wins 'Maths Nobel' for work on wavelets.

French mathematician Yves Meyer was awarded the 2017 Abel Prize on 23rd May 2017 for his work on wavelets, a mathematical theory with applications in data compression, medical imaging and the detection of gravitational waves.

He was the visionary leader in the modern development of this theory, at the intersection of mathematics, information technology and computational science.

Meyer, 77, will receive 6 million Norwegian Krone (about £600,000) for the prize, which recognises outstanding contributions to mathematics and is awarded by the Norwegian Academy of Science and Letters. The Abel Prize has been awarded annually since 2003 and was last year won by Briton Andrew Wiles for his work on solving Fermat's Last Theorem. It is considered by many to be a maths equivalent of the Nobel Prize, which has no prize for mathematics.

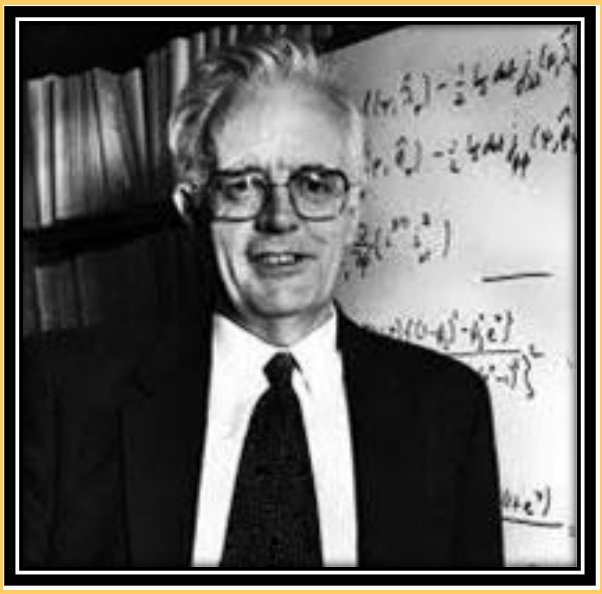
Meyer's work has a relevance extending from theoretical areas of mathematics to the development of practical tools in computer and information science. As such it is a perfect example of the claim that work in pure mathematics often turns out to have important and useful real-world applications.

Yves Meyer has inspired a generation of mathematicians who have gone on to make contributions in their own right. His collaborator on wavelet theory Stéphane Mallat calls him a "visionary" whose work cannot be labelled either pure or applied mathematics, nor computer science either, but simply "amazing".

In addition to this, In the 1970s Meyer made profound contributions to the field of harmonic analysis, which seeks to decompose complex functions and signals into components made of simple waves. Along with Ronald Coifman and Alan McIntosh, he solved a long-standing problem in the field in 1982 by proving a theorem about a construction called the Cauchy integral operator. This interest in harmonic

decomposition led Meyer into wavelet theory, which enables complex signals to be "atomized" into a kind of mathematical particle called a wavelet.

2. **International Prize in Statistics Awarded to Sir David Cox for Survival Analysis Model: Cox Model Applied in Medicine, Science, and Engineering.**



The first International Prize in Statistics was awarded in July, 2017, to David R. Cox. Cox is a giant in the field of statistics, but the International Prize in Statistics Foundation is recognizing him specifically for his 1972 paper in which he developed the proportional hazards model that today bears his name.

The Cox Model is widely used in the analysis of survival data and enables researchers to more easily identify the risks of specific factors for mortality or other survival outcomes among groups of patients with disparate characteristics. From disease risk assessment and treatment evaluation to product liability, school dropout, reincarceration and AIDS surveillance systems, the Cox Model has been applied essentially in all fields of science, as well as in engineering.

"Use of the 'Cox Model' in the physical, medical, life, earth, social and other sciences, as well as engineering fields, has yielded more robust and detailed information that has helped researchers and policymakers address some of society's most pressing challenges."

Successful application of the Cox Model has led to life-changing breakthroughs with far-reaching societal effects, some of which include the following:

- Demonstrating that a major reduction in smoking-related cardiac deaths could be seen within just one year of smoking cessation, not 10 or more years as previously thought.
- Showing the mortality effects of particulate air pollution, a finding that has changed both industrial practices and air quality regulations worldwide.

- Identifying risk factors of coronary artery disease and analysing treatments for lung cancer, cystic fibrosis, obesity, sleep apnea and septic shock.

3. Tim Berners-Lee wins $1 million Turing Award.

Tim Berners-Lee was honoured with the Turing Award in April, 2017. Berners-Lee was cited for inventing the World Wide Web, the first web browser, and the fundamental protocols and algorithms allowing the Web to scale. Considered one of the most influential computing innovations in history, the World Wide Web is the primary tool used by billions of people every day to communicate, access information, engage in commerce, and perform many other important activities.

The ACM Turing Award, often referred to as the "Nobel Prize of Computing," carries a $1 million prize, with financial support provided by Google, Inc. It is named for Alan M. Turing, the British mathematician who articulated the mathematical foundation and limits of computing.

Berners-Lee, who graduated from Oxford University with a degree in Physics, submitted the proposal for the World Wide Web in 1989 while working at CERN, the European Organization for Nuclear Research. He noticed that scientists were having difficulty sharing information about particle accelerators.

Resources:

- https://www.google.co.in/amp/s/amp.theguardian.com/science/alexs-adventures-in-numberland/2017/mar/21/abel-prize-2017-yves-meyer-wins-maths-nobel-for-work-on-wavelets
- http://magazine.amstat.org/blog/2016/11/01/international-prize-in-statistics-awarded-to-sir-david-cox-for-survival-analysis-model/
- http://news.mit.edu/2017/tim-berners-lee-wins-turing-award-0404
- https://awards.acm.org/about/2016-turing

LATEST NEWS IN COMPUTER SCIENCE

-Ms. Priyanka Gupta

New Algorithm Repairs Corrupted Digital Images in One Step: Researchers at the University of Maryland (UMD) and the University of Bern in Switzerland have developed new algorithm that incorporates artificial neural networks to simultaneously apply a wide range of fixes to corrupted digital images. The researchers tested the algorithm by taking high-quality, uncorrupted images, purposely introducing severe flaws, and using the algorithm to repair the damage. In many cases, the new algorithm outperformed other conventional methods, very nearly returning the images to their original state. The researchers trained the algorithm by exposing it to a large database of high-quality, uncorrupted images widely used for research with artificial neural networks. In Fig, top image is artificially degraded, deliberately introducing blur, noise and other imperfections. Bottom image is obtained by applying the new image repair algorithm.

Hackers could guess your phone PIN using its sensor data: Instruments in smart phones such as the accelerometer, gyroscope and proximity sensors represent potential security vulnerability, according to researchers from Nanyang Technological University, Singapore. Using a combination of information gathered from six different sensors found in smart phones and state-of-the-art machine learning and deep learning algorithms, the researchers succeeded in unlocking Android smart phones with 99.5 per cent accuracy within only three tries, when tackling a phone that had one of the 50 most common PIN numbers. Researchers used sensors in a smart phone to model which number had been pressed by its users, based on how the phone was tilted and how much light is blocked by the thumb or fingers.

The researchers believe their work highlights a significant flaw in smart phone security, as using the sensors within the phones require no permissions to be given by the phone user and are openly available for all apps to access. To keep mobile devices secure, Dr Bhasin, NTU Senior Research Scientist at the Temasek Laboratories @ NTU, advises users to have PINs with more than four digits, coupled with other authentication methods like one-time passwords, two-factor authentications, and fingerprint or facial recognition.

STATISTICS - AS A CAREER OPTION

-Dr. Swati Kujal

In recent years, "Statistics" has come among the one of the best choices among students to choose as their career.

Statistics is a term which relates to the study of the analysis, collection, presentation and organization of numerical data. Statistics can interpret aggregates of data which are too large to be understood by ordinary observation.

Statistics is indispensable in this modern age aptly termed as "the age of planning". The governments of most countries around the world are constantly researching to improve its economic development. Statistical data and techniques of statistical analysis are immensely useful in solving economic problems such as wages, price, time series analysis, demand analysis. It is an irreplaceable tool of production control. Business executives are relying more and more on statistical techniques for studying the preference of the customers. Industry statistics are widely used in equality control. In production engineering, statistical tools such as inspection plan, control chart etc. are extensively used to find out whether the product is confirming to the specifications or not. Statistics are useful to banker, insurance companies, social workers, labour unions, trade associations, chambers and to the politicians.

Hence considering its wide scope students these days enthusiastically opt for Undergraduate Statistics course like BSc Hons (Statistics). Postgraduate study in the subject improves career prospects all the more. There are many educational institutions, renowned central and state universities like Delhi university, Aligarh Muslim University, Banaras Hindu University, Lucknow university, Allahabad University, Agra University etc and IIts and NITs which provide Masters course in Statistics. This article makes you aware of many other untraditional rather new courses which national level specialised institutions provide. Here are some:

i) INDIAN STATISTICAL INSTITUTE (ISI): ISI is one of the oldest and most prestigious institutions focused on statistics. The major objectives of the ISI are to facilitate research and training of Statistics, to indulge in development of statistical theory and in application of statistical techniques – in the scenarios of planning at national level and in theoretical development of natural and social sciences, to participate in the process of data collection and analysis, to operate related projects in planning and improvement of efficiency of management and production.

The Headquarters of ISI is located in the northern fringe of the metropolis of Kolkata. Additionally, there are four centres located in Delhi, Bangalore, Chennai and Tezpur. Research in Statistics and related disciplines is the primary activity of the Institute. Teaching activities are undertaken mainly in Kolkata, Delhi and Bangalore.

ISI offers seven graduate programs, viz. Master of Statistics (M. Stat), Master of Mathematics (M. Math), Master of Science in Quantitative Economics (MSQE), Master of Science in Library and Information Science (MSLIS), Master of Science in Quality Management Science (MSQMS), Master of Technology in Computer Science (MTech–CS) and Master of Technology in Quality, Reliability and Operations

Research (MTech– QROR),three PG Diploma programs, viz Post Graduate Diploma in Computer Applications (PGDCA) and P.G. Diploma in Statistical Methods and Analytics and research fellowships towards obtaining a PhD degree. The third PG diploma program being in collaboration with IIM Calcutta and IIT Kharagpur - Post Graduate Diploma in Business Analytics (PGDBA) with an aim to nurture and develop highly skilled business analytical professionals. ISI students are not required to pay any tuition fees. Conditional to performance beyond a threshold, all students and research fellows receive stipends, fellowships and contingency/book grants. Students demonstrating outstanding performances are rewarded at the end of the semesters. ISI campuses provide hostel accommodations with recreational facilities and limited medical facilities available free of cost. Applicants of all degree courses are required to go through written admission tests and interviews. Indian Statistical Institute, Kolkata is ranked 2nd in Computer Science research by mean citation rate, p-Index, h-index among all universities in India.

ii) Indian Agricultural Statistics Research Institute (IASRI): IASRI has been and continues to be a premier Institute of the ICAR with glorious tradition of carrying out research, teaching and training in the areas of Agricultural Statistics and Computer Application. The institute is affiliated with and is located in the campus of the Indian Agricultural Research Institute, a deemed university, at Pusa in New Delhi.

The Institute conducts the following degree courses in collaboration with PG School of Indian Agricultural Research Institute (IARI), New Delhi which enjoys the status of Deemed University.

M.Sc. (Agricultural Statistics)

M.Sc. (Computer Application)

M.Sc.(Bioinformatics)

If you want to pursue a career in research you can go for Agriculture Research Services abbreviated as ARS. ARS is the research services of the Indian Council of Agricultural Research (ICAR), [1] organization under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture, Government of India. [2] The Agricultural Scientists Recruitment Board (ASRB) conducts all India competitive examination for ARS examination, to recruit entry level posts in the Agricultural Research Services of ICAR.

iii) Indira Gandhi Institute of Development Research (IGIDR): IGIDR, Mumbai is an advanced research institution established by The Reserve Bank of India in 1987 on the occasion of its golden jubilee. The Institute's mission is to carry out research on developmental issues from a multi-disciplinary point of view. It has one of the largest Social Sciences libraries in Asia. The institute has an M.Phil./Ph.D. programme in Development Studies and also an MSc programme in Economics. Starting as a purely research-oriented institution, the Institute quickly developed into a full-fledged teaching cum research organisation when in 1990 it launched a Ph.D. programme in the field of development studies. IGIDR also has a full-fledged M.Sc. programme which draws applicants from all over India. This programme offers

only 25 seats. M.Sc. students from IGIDR get decent placement in the corporate sector. It is a good option for those who study Economics at undergraduate level.

iv) MSC FROM CENTRAL UNIVERSITIES:

The University Departments impart rigorous training and exposure to the students in computer education by way of introducing the latest state-of-the-art in the programming language and computer software to enable to the students to perform statistical data analysis and open wide career opportunities for them in corporate firms.

After completing post-graduation from any of these prestigious institutions you will surely get a good placement in corporate sector or if you like government sector you can also go for Indian Statistical Services. The ISS Exam is an important step for those planning a career as an officer in statistics in government service. This exam is a combined competitive examination conducted yearly as part of recruitment for Grade IV vacancies in Indian Statistical Services (ISS). Without the slightest doubt it is one of the most competitive examinations in the country as it aims at recruiting the best with no place for second bests. If you are interested in education sector than you need to qualify NET Exam and enhance your knowledge further by pursuing Ph.D.

Good Luck! Plan your career. This subject has immense scope.

CAREER IN ACTUARIAL SCIENCE

-Dr. Karuna Mamtani

Are you extremely numerate and proficient in mathematics and statistics?

Yes!
Then Actuarial Science is a good career opportunity for you. It is one of the demanding fields where career prospects are abundant and fast growing.

What Actuaries Do

Actuaries Actuaries analyze the financial costs of risk and uncertainty. They use mathematics, statistics, and financial theory to assess the risk of potential events, and they help businesses and clients develop policies that minimize the cost of that risk.

Duties of Actuaries

Actuaries typically:

- Compile statistical data and other information for further analysis
- Estimate the probability and likely economic cost of an event such as death, sickness, an accident, or a natural disaster
- Design, test, and administer policies, investments, pension plans, and other business strategies to minimize risk and maximize profitability
- Produce charts, tables, and reports that explain proposals
- Explain their findings and proposals to company executives, government officials, shareholders, and clients.

Actuaries use advanced statistics and modeling software to forecast the probability of occurrence of an event, the potential costs involved if it does occur, and whether the insurance company has enough money to pay for any future claims in such circumstances.

They typically work on teams that often include managers and professionals in other fields, such as accounting, underwriting, and finance. For example, some actuaries work with accountants and financial analysts to set the price for security offerings or with market research analyst to forecast demand for new products or at insurance companies, where they help design policies and determine the premiums that should be charged for each policy. They must ensure that the premiums are profitable yet competitive with other insurance companies.

Actuaries in the insurance industry typically specialize in a specific field of insurance, such as:

Health insurance actuaries help develop long-term care and health insurance policies by predicting expected costs of providing care under the terms of an insurance contract.

Life insurance actuaries help develop annuity and life insurance policies for individuals and groups by estimating, on the basis of risk factors such as age, gender, tobacco use, etc., how long someone is expected to live.

Property and casualty insurance actuaries help develop insurance policies that insure policyholders against property loss and liability resulting from accidents, natural disasters, fires, and other events.

Pension and retirement benefits actuaries design, test, and evaluate company pension plans to determine if the expected funds available in the future will be enough to ensure payment of future benefits.

Enterprise risk actuaries identify any risks, including economic, financial, and geopolitical risks that may affect a company's short-term or long-term objectives. They help top executives determine how much risk the business is willing to take, and they develop strategies to respond to these issues.

Actuaries also work in the public sector. In the federal government, actuaries may evaluate proposed changes to Social Security or Medicare or conduct economic and demographic studies to project future benefit obligations. At the state level, actuaries may examine and regulate the rates charged by insurance companies.

How to Become an Actuary

Actuaries need a bachelor's degree, typically in mathematics, actuarial science, statistics, or some other analytical field. Students must complete coursework in economics, applied statistics, and corporate finance, and must pass a series of exams to become certified professionals. Coursework in computer science, especially programming languages, and the ability to use and develop spreadsheets, databases, and statistical analysis tools, are valuable. Classes in writing and public speaking also improve students' ability to communicate in the business world.

Important Qualities for Actuaries

Analytical skills. Actuaries use analytical skills to identify patterns and trends in complex sets of data to determine the factors that have an effect on certain types of events.

Communication skills. Actuaries must be able to explain complex technical matters to those without an actuarial background. They must also communicate

clearly through the reports and memos that describe their work and recommendations.

Computer skills. Actuaries must know programming languages and be able to use and develop spreadsheets, databases, and statistical analysis tools.

Interpersonal skills. Actuaries serve as leaders as well as members of teams, so they must be able to listen to other people's opinions and suggestions before reaching a conclusion.

Math skills. Actuaries quantify risk by using the principles of calculus, statistics, and probability.

Problem-solving skills. Actuaries identify risks and develop ways for businesses to manage those risks.

How to become an Actuary: Actuarial Courses in India

The Institute of Actuaries of India (IAI) regulates the education & training of actuaries in India. To becomes a member of IAI a student needs to clear the ACET exam (Visit: http://www.indiaeducation.net/acet/ for more details)

Following are the **eligibility criteria** to become an actuary:

- 10+2(H.S.C) or equivalent **or**
- Graduate or Post Graduate in Mathematics, Statistics, Economics, Computer Science, Engineering, MBA (Finance) and other similar qualifications **or**
- Fully qualified members of professional bodies such as:
    - The Institute of Chartered Accountants of India
    - The Institute of Cost and Works Accountants of India
    - Certified Institute of Financial Analysts of India
    - Fellow of Insurance Institute of India
- Highly proficient in **mathematics & statistics**

After clearing ACET, you can apply online to become a student member of IAI, (http://www.actuariesindia.org/Admission_login.aspx).

To become an actuary, you need to pass all actuarial exams (15 of them!) and have 3 years of practical work experience. Visit the following site for list of papers: http://www.indiaeducation.net/careercenter/professional-courses/actuarial-science/. Once you clear all the 9 CT papers & all the 3 CA papers, you are eligible to become an Associate Member of the IAI. And once you clear all the 15 papers you can become a Fellow Member of the IAI. However, there are job opportunities even if you've cleared 2-3 papers of the IAI!

Top Recruiters:

Some of the companies that hire actuaries in India include E&Y, PwC Actuarial Services India, Milliman, Max Bupa Health Insurance, IDBI, Mercer, Directorate of Postal Life Insurance.

Salary **"***Sky is the limit for an Actuary***"**

As a fresher, your income should be ₹3-5 Lacs p.a. Candidates who have a 5-6 years' experience as an actuary can earn ₹10-15 Lacs p.a. After becoming a fellow of IAI, the salary is ₹20-30 Lacs p.a. It is a fact that today, actuaries are amongst the highest paid professionals.

VEDIC MATHEMATICS

-Kamna Mamgain and Deeksha Aashri

Born in the Vedic Age but buried under centuries of debris, a remarkable system of calculation was deciphered towards the beginning of the 20th century, when there was a great interest in ancient Sanskrit texts, especially in Europe. However, certain texts called *Ganita Sutras*, which contained mathematical deductions, were ignored, because no one could find any mathematics in them. These texts, it's believed, bore the seeds of what we now know as Vedic Mathematics.

BHARATI KRISHNA TIRTHAJI'S DISCOVERY

Vedic mathematics was rediscovered from the ancient Indian scriptures between 1911 and 1918 by Sri Bharati Krishna Tirthaji (1884-1960), a scholar of Sanskrit, Mathematics, History and Philosophy. He studied these ancient texts for years, and after careful investigation was able to reconstruct a series of mathematics formulae. His pioneering work -- *Vedic Mathematics* (1965), is considered the starting point for all work on Vedic mathematics.

Interest in Vedic mathematics is growing in the field of education where teachers are looking for a new and better approach to the subject. "Vedic Mathematics" refers to a technique of calculation based on a set of 16 Sutras, or aphorisms, as algorithms and their upa-sutras or corollaries derived from these Sutras. Its enthusiasts advance the claim that any mathematical problem can be solved mentally with these sutras. The sutras are as follows:

- Ekadhikena Purvena (By one more than the previous one)
- Nikhilam Navatashcaramam Dashatah (All from 9 and the last from 10)
- Urdhva-Tiryagbyham (Vertically and crosswise)
- Paraavartya Yojayet (Transpose and adjust)
- Shunyam Saamyasamuccaye (When the sum is the same that sum is zero)
- Anurupye Shunyamanyat (If one is in ratio, the other is zero)
- Sankalana-vyavakalanabhyam (By addition and by subtraction)
- Puranapuranabyham (By the completion or non-completion)
- Chalana-Kalanabyham (Differences and Similarities)
- Yaavadunam (Whatever the extent of its deficiency)
- Vyashtisamanstih (Part and Whole)
- Shesanyankena Charamena (The remainders by the last digit)
- Sopaantyadvayamantyam (The ultimate and twice the penultimate)
- Ekanyunena Purvena (By one less than the previous one.)
- Gunitasamuchyah (The product of the sum is equal to the sum of the product)
- Gunakasamuchyah (The factors of the sum is equal to the sum of the factors)

Given below are a few examples to elucidate the application of these sutras :

1. **EKADHIKENA PURVENA SUTRA:**

Ekadhikena Purvena is used to find square of number which end with 5.

- *Square of 45.*

1. Divide the number into two parts with part 1 containing just 5 and the other part having the rest of the digits. For example in case of 45 the parts will be 4 and 5.
2. The squares of the numbers ending with 5 always end with 25. For the remaining part add one to the number (4+1=5) and multiply these two (4x5=**20**).
3. Write the number gotten in step 2 followed by 25 (**20**25) and you get the required square.

- Square of 355

1. 355
2. 35+1=36 so 36x35=**1260**
3. **1260**25

2. **NIKHILAM NAVATASHCARAMAM DASHATAH**

Can you find a answer when you subtract 53689 from 10000?

The sutra Nikhilam Navatashcaramam Dashatah, also called as "All from 9 and the last from 10" can be used to solve the above question. **Subtract each digit of 53689 from 9 and the last digit from 10, you get the result as 46311.This holds true for any given numbers to be subtracted from 10, 100, 1000, etc.**

3. **YAVADUNAM SUTRA:**

- *Find square of a number which is closer to power of 10.*

- 93^2 = (93-7)/7^2= 86/49 = 8649
- 89^2 = (89-11)/11^2= 78/121 = 7921
- 113^2 = (113+13)/13^2 = 126/169 = 12769
- 1002^2 = (1002+2)/2^2 = 1004/004 = 1004004

Yavadunam can be used find cube of a number but condition remains same i.e. number should be closer to power of 10.

➢ *Square root of a perfect square:*

- *Square root of 2209*

1. Number ends with 9, Since it's a perfect square, square root will end with 3 or 7.
2. Need to find 2 perfect squares (In Multiplies of 10) between which 2209 exists. Numbers are 1600(402) and 2500(502).
3. Find to whom 2209 is closer. 2209 is closer to 2500. Therefore square root is nearer to 50.
4. Now from Step 2, possibilities are 43 or 47 out of which 47 is closer to 50

Hence square root = 47.

- *Square root of 7056*

1. Number ends with 6, So square root ends with 4 or 6.
2. Perfect squares (In Multiplies of 10) between which 7056 exists are 6400(802) and 8100(902).
3. 7056 is closer to 6400. Therefore, square root is nearer to 80
4. Now from Step 2, possibilities are 84 or 86 out of which 84 is closer to 80.

Hence square root = 84

APPLICATIONS OF COMPLEX ANALYSIS

-Compiled by Dr. Preeti Luthra

"*The shortest path between two truths in the real domain passes through the complex domain.*"

--J. Hadamard

INTRODUCTION

Complex Analysis is calculus done on the complex numbers. The name “complex analysis” is unfortunate. It is called complex because it studies functions of complex numbers, which are also unfortunately named. Although, at first it bears superficial resemblance to ordinary calculus, it quickly assumes a much different character. Complex Analysis is one of the most beautiful parts of mathematics. Many of the theorems seem almost too good to be true, especially in comparison with the situation in Real Analysis. Complex Analysis is also extraordinarily important throughout mathematics, with applications ranging from number theory to geometry to mathematical physics (and almost everything else).

HISTORY OF COMPLEX NUMBERS

A complex number is a number of the form $z = x + i\,y$, where x and y are real numbers, and i is the standard imaginary unit with the property $i^2 = -1$. Complex numbers were first conceived and defined by the Italian mathematician *Gerolamo Cardano*, who called them "fictitious", during his attempts to find solutions to cubic equations. This ultimately led to the fundamental theorem of algebra, which shows that with complex numbers, a solution exists to every polynomial equation of degree one or higher. Complex numbers thus form an algebraically closed field, where any polynomial equation has a root. The rules for addition, subtraction and multiplication of complex numbers were developed by the Italian mathematician *Rafael Bombelli*. A more abstract formalism for the complex numbers was further developed by the Irish mathematician *William Rowan Hamilton*.

APPLICATION OF COMPLEX ANALYSIS

Complex analysis has all sorts of applications. The following list, not exhaustive by any means, suggests some uses within the field of Mathematics:

- Liouville's theorem (complex analysis) leads to one of the standard proofs of the Fundamental theorem of algebra.
- Studying the Riemann zeta function is an important way to understand the primes: it leads to the Prime number theorem, the Riemann hypothesis, and more generally to a major part of Analytic number theory.
- Similarly, Elliptic functions are closely related both to the study of Elliptic curves and the study of modular forms.
  - Theta functions are related to both elliptic functions and modular forms, but they also have other applications. For example, they can be used to

prove both Fermat's theorem on sums of two squares and Lagrange's four-square theorem.

- Analytic continuation leads naturally to the study of Riemann surfaces, which is in turn a gateway to many other beautiful parts of mathematics, including but not limited to Galois theory, Algebraic geometry, Algebraic topology, Hyperbolic geometry, Teichmüller spaces, String theory.
- Complex analysis is used in Analytic combinatorics to analyze the asymptotic behavior of combinatorially defined sequences.
- Complex analysis has several applications to the study of Banach algebras in Functional analysis; see, for example, Holomorphic functional calculus.
- The residue theorem in complex analysis is a powerful tool to evaluate path integrals of meromorphic functions over closed curves and can often be used to compute real integrals as well. It generalizes the Cauchy and Cauchy's integral formula.
- Another common application of complex analysis is conformal mapping, using the magical properties of analytic functions to map a region of one shape into a region of another shape in a way that has lots of nice mathematical properties. You might, for example, want to transform a mechanical problem on a complicated domain into an equivalent problem on a circular disk.
- The solution of physical equations is often made simpler through the use of complex numbers. To solve equations like $a\,y'' + b\,y' + c\,y = 0$ (*) for the unknown function y. State that there's a way to get the solutions provided one can solve the quadratic equation $a\,r^2 + b\,r + c = 0$ for the variable r. In the real numbers, there may not be any solutions. However, in the complex numbers there are, so one can find all complex-valued solutions to the equation (*), and then finally restrict oneself to those that are purely real-valued. The starting and ending points of the argument involve only real numbers, but one can't get from the start to the end without going through the complex numbers. Since equations like (*) need to be solved all the time in real-life applications such as engineering, complex numbers are needed.
- Fractals start with a complex number. Each complex number produced gives a value for each pixel on the screen. The higher the number of iterations, the better the quality of the image. Common fractals are based on the Julia Set and the Mandelbrot Set. The design ensures performance improvements in antennae used in wireless, microwave, RFID (Radio Frequency Identification) and telecommunications.

Because complex functions have such incredible properties, they are useful even for problems that at first don't seem to involve complex numbers. Far from wanting to *avoid* complex functions because they are "complex," applied mathematicians look for ways to *introduce* complex functions because they simplify analysis. Few are listed below:

Control Theory

In control theory, systems are often transformed from the time domain to the frequency domain using the Laplace transform. The system's poles and zeros are then analyzed in the complex plane. The root locus, Nyquist plot, and Nichols plot techniques all make use of the complex plane.

Signal analysis

Complex numbers are used in signal analysis and other fields for a convenient description for periodically varying signals. For given real functions representing actual physical quantities, often in terms of sines and cosines, corresponding complex functions are considered of which the real parts are the original quantities. For a sine wave of a given frequency, the absolute value $|z|$ of the corresponding z is the amplitude and the argument $arg\,(z)$ the phase.

Quantum mechanics

Another particularly important application of complex numbers is in quantum mechanics where they play a central role representing the state, or wave function, of a quantum system. The complex number field is relevant in the mathematical formulation of quantum mechanics, where complex Hilbert spaces provide the context for one such formulation that is convenient and perhaps most standard. The original foundation formulas of quantum mechanics - the Schrödinger equation and Heisenberg's matrix mechanics - make use of complex numbers. The quantum theory provides a quantitative explanation for the phenomena that classical mechanics and classical electrodynamics cannot account for.

Computer Sciences

Arithmetic and Logic in Computer Systems provides a useful guide to a fundamental subject of computer science and engineering. The entire field of analytic combinatorics explores how to analyze the *combinatorial* complexity of structures (or even algorithm running times) by writing down an appropriate generating function and analyzing the structure of the complex solutions. Barvinok gave a omplex-based algorithm for approximating the permanent Polynomial time algorithms to approximate permanents and mixed discriminants within a simply exponential factor. Also, complex operators are important in quantum computing. Fast Fourier Transform, for example are used in polynomial multiplication. Although the implementation can be done with modulo arithmetic or floating point (and some arithmetic analysis), the proof is best understood in terms of complex numbers and their roots of unity. In general, equipping the RAM model with the ability to handle complex numbers in constant time (the real and imaginary parts still have finite precision) allows one to cleverly encode problems and exploit properties of the complex numbers that might reveal a solution (see also the comments why this won't allow you to be faster).

Electrical Engineering

In order to analyze AC circuits, it became necessary to represent multi-dimensional quantities. In order to accomplish this task, scalar numbers were abandoned and complex numbers were used to express the two dimensions of frequency and phase shift at one time. In electrical engineering, the Fourier transform is used to analyze varying voltages and currents. The treatment of resistors, capacitors, and inductors can then be unified by introducing imaginary, frequency-dependent resistances for the latter two and combining all three in a single complex number called the impedance. This approach is called phasor calculus. This use is also extended into digital signal processing and digital image processing, which utilize digital versions of Fourier analysis (and wavelet analysis) to transmit, compress, restore, and otherwise process digital audio signals, still images, and video signals. Complex numbers are used a great deal in electronics. The main reason for this is they make the whole topic of analyzing and understanding alternating signals much easier.

Relativity

In special and general relativity, some formulas for the metric on space time become simpler if one takes the time variable to be imaginary. Complex numbers are essential to spinors, which are a generalization of the tensors used in relativity.

Electromagnetism

Instead of taking electrical and magnetic part as two different real numbers, we can represent it as in one complex number

Civil and Mechanical Engineering:

The concept of complex geometry and Argand plane is very much useful in constructing buildings and cars. This concept is used in 2-D designing of buildings and cars. It is also very useful in cutting of tools. Another possibility to use complex numbers in simple mechanics might be to use them to represent rotations.

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COMPUTER SCIENCE IS EVERYWHERE

-Dr. Ramita Sahni

The field of computer science has made a shift from unapproachable to accessible, from nerdy to cool, from fluorescent-lit basement labs to trendy workplaces. This shift toward computational thinking is ushering in a new way of understanding and reimagining the entire world. Earlier, this discipline was confined to tech experts, programmers and number crunchers but today it is permeating everywhere from social sciences to the arts.

Katie Zhu rightly said "In computer science there are rules and syntax, but within that framework there is a much room for creativity." Computer science is not just programming, it is a broad academic field that deals with taming complexity in both the real world and the abstract mathematical world. On the other hand, programming is the act of writing code to instruct a computer to perform a sequence of actions.

Math is one of the foundations of computer sciences. It's also one of the more crucial elements in computer sciences. Despite *advanced* mathematics not applied frequently, basic mathematics, most importantly algebra, is the main ingredient for a successful computer scientist. Many of the functions and operators in all programming languages require some knowledge in mathematics. For example, these operators include arithmetic, comparison, logical, assignment and conditional operators. All of the above-mentioned tasks need mathematics for them to be used and properly applied, specially the arithmetic and conditional operators. Computer sciences heavily rely on algorithms, which the latter in turn heavily relies on mathematics.

Thus, different concepts of computer science involve different concepts of mathematics. While watching an animation movie or playing a video game, one of the most monumental mathematical feats in computer science is seen. Linear algebra and calculus are used in computer vision, graphics and image processing with the help of which animation world is created. Data structures uses graph theory, they are basically abstractions that allow us to manipulate how objects are stored and accessed. Data Compression Schemes uses probability and statistics - a lot. These schemes are used to *compress* files by exploiting patterns in the data.

In addition to this, computer science has lot of applications in real life. For anything in the world, we surf the net, this concept is highly based on search algorithms and parallel computing. Sound computer science phenomena such as computer graphics, artificial intelligence, networking, error detection, error correction, software reliability, program analysis, user interface etc. are used for downloading music and movies, using latest mobile phones, used in air-travelling, neurotically updating your Myspace and Facebook pages and stalking other people's profiles, shopping online, playing video games and the list is endless.

Thus, this phenomenal field of computer science has become a boon for everybody, benefiting the society in every possible manner.

PI: AN AMAZING RATIO

-Dr. Ramita Sahni

Pi's story is probably as old as the story of mathematics. It is one of the most important and ubiquitous numbers in mathematics. This mathematical constant, which is used to compute areas of circles and other crucial life questions, is being celebrated with increasing frequency on March 14th as National Pi Day.

In high school, it is learned that all circles are similar and the ratio of the circumference to the diameter is always the same number. This ratio is known as pi (π). The digits of pi never end and never show a pattern. They go on forever. Like e (the base of natural logarithms) and the square root of two, pi is an irrational number. Though it is an irrational number, some use rational expressions to estimate pi, like 22/7 of 333/106. These rational expressions are only accurate to a couple of decimal places. The beauty of pi, in part, is that it puts infinity within reach. It is also a transcendental number i.e. number that cannot be reduced algebraically.

It is impossible to find the exact value of pi. Several mathematicians proposed different values of pi over the period of time. The Babylonians were the first to find the value of pi as 3 whereas the Egyptian mathematicians in 1700 BC used 3.16 as the value of pi. In the third century BC Archimedes approximated this value to 3.14. A century later, the Greek astronomer Ptolemy improved the value to 3.1416. Pi began being symbolized by the symbol (π) in the 1706 by the British mathematician William Jones. He used 3.14159 as the calculation for pi. Presently, in all calculations pi is taken to be 3.14 or 22/7.

Initially, early astronomers such as Copernicus and Galileo used pi heavily in calculations to approximate information like the sizes, distances from Earth, and orbits of various stars and planets. In addition to this, it is widely used for calculations in advanced engineering and computing projects dealing with cutting-edge technology at extremely high speeds. Pi also appears in research in physics, higher math, and other laboratory sciences. Sociologists, statisticians, and demographers use it in intense quantitative analysis of given populations. It is used to get the value of trigonometric function like sine, cosine, tangent etc. For solving mathematics problems in Geometry like finding the area of circle etc. pi plays a prominent role. Some of the formulae used in Mathematics that include pi are

- The circumference of a circle with radius r is $2\pi r$.
- The area of a circle with radius r is πr^2.
- The volume of a sphere with radius r is $\frac{4}{3}\pi r^3$.
- The surface area of a sphere with radius r is $4\pi r^2$.

Moreover, pi has enormous applications in real life. Aircraft designers use it to calculate areas of the skin of the aircraft. Clock designers use pi for the designing of clock pendulums. Communication from any corner of the world is possible due to the Sine wave and thus pi plays important role in signal processing and spectrum

analysis. Thus, Constanda rightly said, "It's an everyday occurrence, it’s there and it's used all the time".

In a nutshell, pi has taken on a life of its own. It represents one of the enduring challenges of mathematics. It took over four thousand years of constant searching to gain the understanding of pi that humanity has today. No matter how good people become at calculating pi, its complete mystery has yet to unravel.

MATHEMATICAL PARADOXES

-Amisha Mishra

A mathematical paradox is any statement (or a set of statements) that seems to contradict itself (or each other) while simultaneously seeming completely logical. Paradox (at least mathematical paradox) is only a wrong statement that seems right because of lack of essential logic or information or application of logic to a situation where it is not applicable. There are many fascinating paradoxes in mathematics. There are many proofs that use proof by contradiction, where you make a statement and then prove that it is wrong by producing a contradiction.

Here are some interesting mathematical paradoxes:

- **Galileo's Paradox**

Galileo's paradox is a demonstration of one of the surprising properties of infinite sets. In his final scientific work, Two New Sciences, Galileo Galilei made apparently contradictory statements about the positive integers. First, some numbers are squares, while others are not; therefore, all the numbers, including both squares and non-squares, must be more numerous than just the squares. And yet, for every square there is exactly one positive number that is its square root, and for every number there is exactly one square; hence, there cannot be more of one than of the other.

Galileo concluded that the ideas of less than, equal to, and greater than apply to (what we would now call) finite sets, but not to infinite sets. In the nineteenth century Cantor said that this restriction is not necessary. Cantor said that it is possible to define comparisons amongst infinite sets in a meaningful way by defining the cardinality of a set.

- **The Infinite Hotel Paradox**

In a lecture, given in 1924, German mathematician David Hilbert introduced the idea of the paradox of the Grand Hotel that wraps around the concept of infinity and illustrates a counterintuitive property of infinite sets.

The paradox is demonstrated by assuming that there exists a hypothetical hotel with a countable infinite number of rooms, all of which are occupied by infinitely many guests. Now, suppose a new guest arrives, so the hotel owner asks the guest in room number 1 to move to room number 2, and the guest in room number 2 to move in number 3, and so on, moving every guest from his current room n to room n+1. After this, room 1 is empty and the new guest can be moved into that room. By repeating this procedure, it is possible to make room for any finite number of new guests. The paradox further proposes that it is also possible to accommodate a countably infinite number of new guests by moving the guest in room 1 to room 2, the guest occupying room 2 to room 4, and, in general, the guest occupying room n to room $2n$ (2 times n), and all the odd-numbered rooms (which are countably infinite) will be

free for the new guests. The paradox states that you can still fit another infinite number of guests in the hotel because of the infinite number of rooms.

- **The Horse Paradox**

The horse paradox is a falsidical paradox that arises from flawed demonstrations, which purport to use mathematical induction, of the statement – ***"all horses are the same color"***. There is no actual contradiction, as these arguments have a crucial flaw that makes them incorrect.

We prove by induction, that for any set of n horses, every horse in that set has the same color. Suppose n =1, this is obviously true because If there is only one horse in the "group", then clearly all horses in that group have the same color. Now suppose for all sets of n horses, every horse in the set has the same color. Consider any set H of n+ 1 horses. We may pick a horse at random, h1, and remove it from the set, getting a set of n horses. By the inductive hypothesis, all of the n remaining horses are the same color. The argument above makes the implicit assumption that the two subsets of horses to which the induction assumption is applied have a common element. This is not true when the original set (prior to either removal) only contains two horses.

- **Zeno's Paradoxes**

These are the paradoxes dealing with counterintuitive aspects of continuous space and time. **Dichotomy Paradox**: Before an object can travel a given distance **d**, it must travel a distance **d/2**. In order to travel **d/2**, it must travel **d/4**, etc.

The resulting sequence can be represented as:
{... , 1/16,1/8,1/4,1/2,1}

This description requires one to complete an infinite number of tasks, which Zeno maintains is an impossibility.

This sequence also presents a problem in that it contains no first distance to run, for any possible (finite) first distance could be divided in half, and hence would not be first after all. Hence, the trip cannot even begin. The paradoxical conclusion then would be that travel over any finite distance can neither be completed nor begun, and so all motion must be an illusion.

- **The Potato Paradox**

Fred brings home 100 pounds of potatoes, which (being purely mathematical potatoes) consist of 99 percent water. He then leaves them outside overnight so that they consist of 98 percent water. What is their new weight? The surprising answer is 50 pounds.

One explanation begins by saying that initially the non-water weight is 1 pound, which is 1% of 100 pounds. Then one asks: 1 pound is 2% of how many pounds? In order for that percentage to be twice as big, the total weight must be half as big.

After the evaporating of the water, the remaining total quantity, x, contains 1 lb pure potatoes and (98/100) x water. The equation becomes:
$1+(98/100)\ x = x$
Resulting in $x = 50$ lb.

Thus, Mathematical Paradoxes present very interesting side of Mathematics and provide an excellent mental exercise!!!!

ANNUAL REPORT

ASYMPTOTE

SOCIETY FOR MATHEMATICS, STATISTICS AND COMPUTER SCIENCE

The Department of Mathematics, Statistics and Computer Science of Mata Sundri College for Women is having a very dynamic Society named "Asymptote", which is very enthusiastically handled by the students and teachers. Asymptote has been actively organizing events all-round the year. Members of the society are:

- President: KAMNA MAMGAIN (Maths (H) III Year)
- Vice-President: PRIYANKA PANWAR (Maths (H) II Year)
- Secretary: PRIYANKA SHARMA (Maths (H) II Year)
- Joint-Secretary: VANDANA SUKHIJA (Maths (H) I Year)
- Executive committee members: ARADHNA SHARMA (Comp. Sc. (H) I Year)
  TANYA NARANG (Comp. Sc. (H) I Year)
  GEETIKA PAPREJA (Statistics (H) I Year)
  ANMOL MARWAH (Maths (H) II Year)
  MEHAK SHARMA (Maths (H) III Year)

Continuing with the tradition that started last year, this year on 7th January 2018, 10 students from 3rd yr and 2nd yr of Mathematics department participated in the NBHM funded a National Mathematics Competition for Undergraduate Students "**Madhava Mathematics Competition**" organized by S.P. College, Pune and T.I.F.R., Mumbai held at Deen Dayal Upadhyay College, DU. The competition is named after Madhava, who introduced in the fourteenth century, profound mathematical ideas that are now part of Calculus. It is heartening to see our girls enthusiastically competing among students from all over India and getting exposed to latest trends in mathematics.

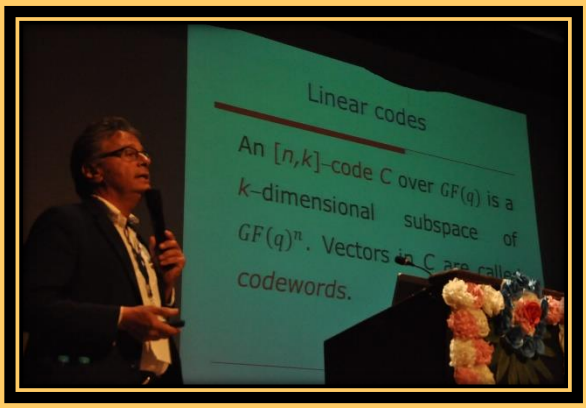
NATIONAL CONFERENCE ON ADVANCES IN APPLIED MATHEMATICS AND STATISTICS {NCAAMS- 2017}

The session July-Nov 2018 was indeed a special session for the Department of Mathematics, Statistics and Computer Science as another feather was added on its cap by organizing its very first National Conference on "Advances in Applied Mathematics and Statistics" (NCAAMS2017) during September 07-08, 2017. The conference was sponsored by Science and Engineering Research Board (DST-SERB) and Defence Research and Development Organization (DRDO).

The inauguration ceremony was held on 7th September at Mata Sahib Kaur Auditorium in the college premises. The principal Dr. Kawarjit Kaur welcomed the esteemed guests: the chief guest- Dr. (Mrs) Pankaj Mittal, Additional Secretary-I (UGC), the guests of honour Prof. Sudhir R. Ghorpade, IIT Mumbai and Prof. B.K. Dass, University of Delhi, the other distinguished guests- Dr.Preeti Ahuja, the honorable Members of Governing Body, and Dr. Manmohan Kaur, Principal of GNDU Khalsa College (DU).

The two-day event was attended by over 150 research scholars and delegates from renowned institutions of India including Central/State universities such as University of Delhi, Jamia Millia Islamia University, South Asian University, Amity University (Noida), University of Allahabad, IIT's, NIT's and several others. Due to the presence of two speakers from Italy and another one from U.A.E., the conference had international participation as well. The keynote address was delivered by Prof. Ayman Badawi, American University of Sharjah, U.A.E and the plenary talk was delivered by Prof. Stefano Innamorati, University of L'Aquila, Italy. Nine invited talks, three on 7th September and six on 8th September, were delivered by experts in various fields of Applied Mathematics- Prof. Madhu Raka, Punjab University, Prof. C. S. Lalitha, University of Delhi, Prof. Indivar Gupta, DRDO, Prof. Fulvio Zuanni, University of

L'Aquila (Italy), Prof. Prajneshu, IASRI (Delhi), Prof. Sudhir R. Ghorpade, IIT Mumbai, Dr. Samrith Ram, IIT Delhi, Dr. S.S. Raghuvanshi, AMD Hyderabad and Dr. Dhiraj Kumar Singh, Zakir Husain Delhi College (DU). There were ten paper presentation sessions, two sessions on Statistics and one session each on Applied Mathematics, Applied Algebra and Optimization/Analysis on 7th September and three sessions on Applied Mathematics and two sessions on Statistics on 8th September, in which 48 delegates and research scholars presented their research work.



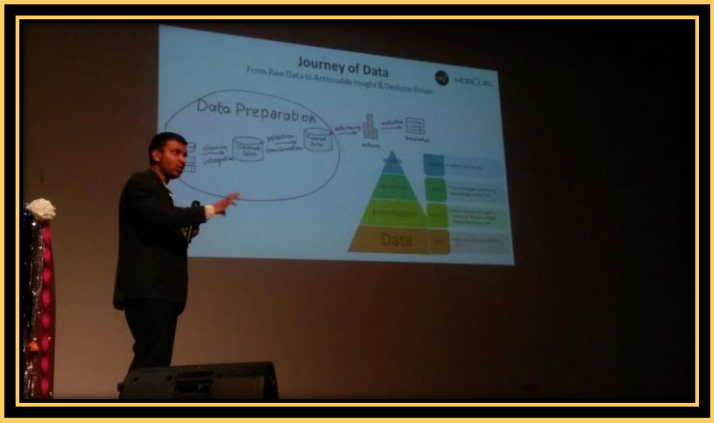
The conference concluded with the valedictory function held on 8th September where the speakers and the participants shared their personal experiences over the past two days. This was followed by certificates distribution ceremony and the vote of thanks. Overall, it was an enriching and motivating experience that will definitely contribute to further research in various disciplines of mathematical sciences.

MASTACOM'18

Department of Mathematics, Statistics and Computer Science of Mata Sundri College for Women, University of Delhi organized the annual departmental event- MASTACOM'18 on 21st February 2018.

MASTACOM'18 had been planned incorporating several events including – career-oriented talks and various co-curricular activities. The registration for the events had begun almost a week earlier and was open for all the courses.

The programme commenced at 09:30 AM in Mata Sahib Kaur Auditorium with inauguration, followed by the talks. The first talk was on "Career Opportunities and Prospects in Mathematical Sciences", presented by Dr. Babita Goyal, Associate Professor at Ramjas College, University of Delhi. The second talk was presented by Mr. Vibhor Gupta, founder and director at Weekendr and Mobiquel on "Decision Making using Data Sciences". The talks concluded with the interactive round between the students and the speakers.



Succeeding the tea and refreshment break for the students and the teachers, Mastacom'18 proceeded with several fun and skills-based activities. There were six activities that were conducted, with two running as parallels. The activity- "Play-a-Gig" conducted at the Tut Area examined the dramatic and theatrical skills of the students; whereas the quiz- "Q-Fiesta" organized at Mata Gujri Hall tested the IQ and general awareness of the students. Where on one hand, the "JAM" session was all about the perspicacity and quick-wit of the students; on the other hand, the "Doodle Battle" was conducted to encourage the artistic skills amongst the students. The "Treasure Hunt" and "Click Your Hunt" were the activities that were designed to test the presence of mind and vigilance of the students. They were tested only on their observations skills but also on their attentiveness and agility.

Each event was individually followed by the prize distribution ceremony, to keep up the spirit of healthy competition amongst students. Mastacom'18 was indeed a grand success in terms of inculcating a sense of skill-based learning in over 200 students from various courses and departments.

ALUMNAE MEET 2018

To talk a walk down the corridors of nostalgia the Department of Mathematical Science of Mata Sundri College for Women, University of Delhi organized the Alumnae Meet on 3rd February 2018. The event commenced at 02:00 PM in Mata Gujri Hall. The alumnae from all the batches up till 2017 attended the meet. The teachers from the Department of Mathematics, Statistics and Computer Science graced the occasion by their presence.

Beginning with the college prayer followed by a classical dance on Guru Mantra, the students of the various departments presented several cultural activities in honor of their super seniors. In form of a presentation a movie was prepared highlighting all the memories of them associated with the college which brought in an emotional outlook. There were a variety of events including various song and dance performances

There was also a presentation of instrumental piece on xylophone. The icing on the cake was a skit that was prepared by the students that depicted the journey at a women's college - highlighting experiences that one encounters there. May it be certain prejudices and stereotypes, or the unity and long-lived friendships; the skit was one whole package of giggles, gossips and satire at the gender biases.

The environment was full of enthusiasm and excitement and all were really anxious to hear the experience of the alumnae. The alumnae shared their stories of success and college life, adding a feather to the college's cap.

Ms. Gurpreet Kaur, then concluded the programme by presenting the vote of thanks and inviting everyone for light refreshments. Succeeding with the refreshments they all bid a see off with a lot more memories and experience.

GREAT MATHEMATICIANS

-Compiled by Anmol Marwah

Pythagoras (circa 570-495BC)

Vegetarian mystical leader and number-obsessive, he owes his standing as the most famous name in mathematics due to a theorem about right-angled triangles, although it now appears it probably predated him. He lived in a community where numbers were venerated as much for their spiritual qualities as for their mathematical ones. His elevation of numbers as the essence of the world made him the towering primogenitor of Greek mathematics, essentially the beginning of mathematics as we know it now. And, famously, he didn't eat beans.

Hypatia (cAD360-415)

Women are under-represented in mathematics, yet the history of the subject is not exclusively male. Hypatia was a scholar at the library in Alexandria in the 4th century CE. Her most valuable scientific legacy was her edited version of Euclid's *The Element*s, the most important Greek mathematical text, and one of the standard versions for centuries after her particularly horrific death: she was murdered by a Christian mob who stripped her naked, peeled away her flesh with broken pottery and ripped apart her limbs.

Leonhard Euler (1707- 1783)

The most prolific mathematician of all time, publishing close to 900 books. When he went blind in his late 50s his productivity in many areas increased. His famous formula $e^{i\pi} + 1 = 0$, where e is the mathematical constant sometimes known as Euler's number and i is the square root of minus one, is widely considered the most beautiful in mathematics. He later took an interest in Latin squares – grids where each row and column contain each member of a set of numbers or objects once. Without this work, we might not have had sudoku.

RESOURCE-https://www.theguardian.com/culture/2010/apr/11/the-10-best-mathematicians

FUN WITH NUMBERS

-Pooja and Tanu Tyagi

1. To show: All numbers are equal to zero.

Proof: Let a be any arbitrary element such that $a = b \; \forall \; b \epsilon R$

Now, $a = b$

Pre-multiplying both sides by a,

$$a^2 = ab$$

Subtract b^2 from both the sides,

$$a^2 - b^2 = ab - b^2$$

$$\Rightarrow (a + b)(a - b) = b(a - b)$$

Divide both the sides by $(a - b)$,

$$\Rightarrow (a + b) = b$$

Subtract b from both the sides,

$$a = 0$$

Since, a was arbitrary, therefore all the numbers are equal to zero.

2. Ramanujan's mathematical friendship

Mathematician Ramanujan didn't have any close friends- someone asked him the reason. He replied that although he wanted to have close friends -nobody was up to his expectations. When asked how he expected his friend to be - he replied – "like numbers **220** and **284**!"

The person got confused and asked "what is the connection between friendship and these numbers!" Ramanujan asked him to find the divisors of each number.

With much difficulty - the person derived and listed them

220 → 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, 220

284 →1, 2, 4, 71, 142, 284

Ramanujan then asked the person to exclude the numbers 220 and 284 and asked the sum of the remaining divisors

The person was astonished to find:

220 → 1+2+4+5+10+11+20+22+44+55+110=284

284 →1+2+4+71+142=220

Ramanujan explained that an ideal friendship should be like these numbers- to complement each other - even when one is absent - the other should represent the friend!

The person thought – "no wonder this genius is on the world's top list of mathematicians!!"

MATHEMATICAL RIDDLES

-Dr. Ramita Sahni and Simran Minocha

1. A selfish average-_____ (4)
2. A boring function- _____ (10)
3. An all-round perimeter- _____ (13)
4. Sum mixed up a lot- _____ (5)
5. Number spelled in alphabetical order-_____ (5)
6. A Sci-Fi fiction- _____ (6)
7. Population survey-_____ (6)
8. Mathematics of chance-_____ (11)
9. Amount of space taken up by 3d object-_____ (6)
10. Resting Eight-_____ (8)
11. The Da Vinci Code-_____ (9)
12. A series of steps-_____ (9)
13. Take away-_____ (8)
14. Number not represented in Roman numerals-_____ (4)
15. An irrational cousin of pi-_____ (11)
16. Sum of opposite sides of a die-_____ (5)
17. To provide evidence-_____ (7)
18. Variables that cannot change- _____ (8)

ANSWERS OF MATHEMATICAL RIDDLES

1. Mean
2. Monotonous
3. Circumference
4. Total
5. Forty
6. Matrix
7. Census
8. Probability
9. Volume
10. Infinity
11. Fibonacci
12. Algorithm
13. Subtract
14. Zero
15. Exponential
16. Seven
17. Justify
18. Constant

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