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NEWS LETTER

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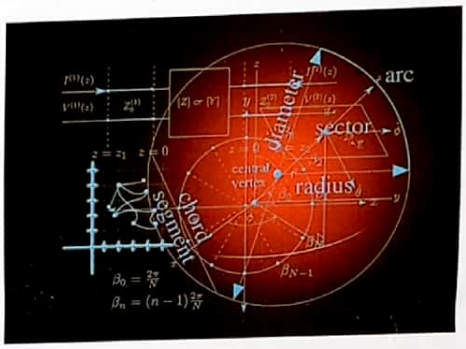
THE EXPANDING HORIZONS OF MATHEMATICAL SCIENCES

The mathematical sciences encompass areas often labelled as core & applied mathematics, statistics, operations research, and theoretical computer science. The discipline is expanding and the boundaries within it are beginning to fade as ideas cross over between subfields. In addition, the boundaries between the mathematical sciences and other subjects are also eroding. Many researchers in the natural sciences, social sciences, life sciences, computer science, and engineering are comfortable in mathematical sciences as they are in their own fields of expertise.



When applied scientists are working on some research problems it is not uncommon that they observe the required mathematics as already available. The required mathematical theory might be already generated by mathematicians for unrelated purposes.For example, the prime numbers and their factorization initially studied for aesthetic reasons, now provide the underpinnings of commerce. Riemann's notion of geometry and curvature later became the basis of Einstein's general relativity. Quaternions popularized by William Hamilton, are now used in video games and in tracking satellites. Operators on Hilbert space provided the natural framework for quantum mechanics. Eigen vectors are the basis for Google's famous Page Rank algorithm. Integral geometry makes possible MRI and PET scans.

We usually face questions from layman and even educated class on the relevance and utility of the mathematical theory we learn. As students, we must be well aware of the various applications when we study a topic in mathematics. This is imperative in knowledge perspective as well as for the better understanding of the concepts. Through this we will be able to establish links with other areas of knowledge and thus we will also be able to contribute towards expanding the horizons of mathematics.

PRINCIPAL'S MESSAGE

I am glad to observe that the Department of Mathematics is bringing out its annual newsletter for 2016-17. It is learned that this noble venture is accomplished with a commendable involvement of the student community, which shows that the Department is taking adequate efforts in carving out a total personality in each student. I wish the Department would continue its teamwork in the future as well which is indeed needed for promoting this Postgraduate Department to its next level of growth: A Research Department.

Dr. Saban K V
Principal

MESSAGE FROM HOD

An eventful and exciting college year has come to an end. It is with much pleasure and pride we present MASA, our newsletter with contribution from teachers and students of our department. I express my heartfelt gratitude to all students and faculty who assisted in bringing out the newsletter.

"Accept the challenges so that we can feel the exhilaration of victory".

Prof. KochuThresiamma Joseph
HOD

FROM THE EDITOR'S DESK

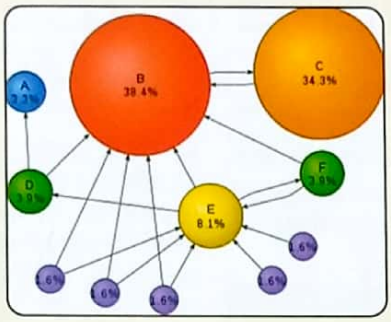
Welcome to the third issue of our newsletter. This issue focuses on the application side of mathematics, especially graph theory. It also reports various activities of the department which is the indispensable component of any newsletter. Any suggestions towards improving the newsletter content are welcome. I sincerely hope that you all will enjoy this issue of our annual newsletter.

Dr. Jubin Antony
Editor

masa
NEWS LETTER

MATHEMATICS BEHIND GOOGLE'S PAGE RANK ALGORITHM

Google is considered as the most accessed website and the best available search engine. It is interesting to note that Google is not the first search engine. Before Google, Yahoo and others were providing similar service. However, soon after Sergey Brin and Larry Page launched their search engine it shot up to the top position. Google's success derives in large part from its Page Rank algorithm, which ranks the importance of webpages according to an eigenvector of a weighted link matrix. The Page Rank formula is a wonderful application of linear algebra.



The idea that Page Rank brought up was that, the importance of any web page can be judged by looking at the pages that link to it.The first step in understanding Page Rank is to view the Web as a giant graph. Each webpage is a node in the graph and each hyperlink is a directed link connecting two nodes. This graph is represented as a stochastic matrix. This matrix is customized and is called Google matrix. Now the dominant eigenvector of Google matrix is the Page Rank. The matrix computation involved here is considered as the world's largest matrix computation. The dimension of google matrices exceeds 11.5 billion and the dimension changes quite often as it is estimated that 250,000 new domains are added every day to the web.

Amazing Number Relationships

Ms. Christy Varghese, 1st MSc

$5 + 1 + 2 = 8$	$8^3 = 512$
$4 + 9 + 1 + 3 = 17$	$17^3 = 4913$
$5 + 8 + 3 + 2 = 18$	$18^3 = 5832$
$1 + 7 + 5 + 7 + 6 = 26$	$26^3 = 17576$
$9 + 9 = 18$	$9 \times 9 = 81$
$24 + 3 = 27$	$24 \times 3 = 72$
$47 + 2 = 49$	$47 \times 2 = 94$
$497 + 2 = 499$	$497 \times 2 = 994$

MS. IRENE MARY MATHEW MEMORIAL ELOCUTION COMPETITION FOR +2 STUDENTS

This year too Mathematics Association and Debating Club jointly organized Ms. Irene Mary Mathew memorial elocution competition for higher secondary students of the nearby schools. Fifteen students from 11 nearby schools participated in the event. Prof Jerome P.V., the Vice Principal inaugurated the meeting. Sri.Nandakumar P.S spoke on the occasion. Master Mebil Thomas of St. Mary's HSS, Champakulam bagged the first prize in the competition. Ms. Ashby Varghese of NS HSS Nedumudy and Ms. Kessia Elizabeth Thomas of Lourdes Matha HSS, Pacha received 2nd and 3rd prizes respectively. Principal Dr. Saban K.V. presented the cash award and certificates to the winners. The award is instituted by the parents of Ms. Irene Mary Mathew in memory of their daughter.

Euler's Number... 'e'

Mr. Akhil S., 1st BSc

The number é'is an important mathematical constant which is the base of natural algorithm. It is defined as; $e = \lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n$. The constant is discovered by Swiss mathematician Jacob Bernoulli while studying about compound interest. Another Swiss mathematician Leonhard Euler chose the symbol é'to the constant and thus to his honour it is also called as Euler's number. It can be calculated as the sum of infinite series, $\sum_{n=0}^{\infty}\frac{1}{n!} = 1 + \frac{1}{1} + \frac{1}{1X2} + \frac{1}{1X2X3} + \cdots$

The constant can be defined in many ways. For example, 'e' can be defined as the unique positive number 'a' such that the graph of the function $y = a^x$ has unit slope at x = 0. The function $f(x) = e^x$ is called the exponential function and its inverse is the natural logarithm. Like constant π, 'e' is irrational and transcendental.

HAPPY AND UNHAPPY NUMBERS!

Ms. Janet Mary James, 2nd MSc

Can the numbers be happy or unhappy? Here is the math behind the old saying.

First let us take the number 32. The sum of squares of 3 and 2 is $3^2 + 2^2 = 9 + 4 = 13$. Now repeating the same process on the number 13 we get, $1^2 + 3^2 = 1 + 9 = 10$. And now on 10 we get $1^2 + 0^2 = 1$. Like this the numbers which give 1 as the final answer are commonly called happy numbers. 1, 7, 10, 13, 19, 23, 28, 31, 32, 44, 49, 68, 70, 79, 82, 86, 91, 94, 97 and 100 are such happy numbers between 1 and 100.
Now let us take the number 20.

$20 \rightarrow 2^2 + 0^2 = 4 \rightarrow 4^2 = 16 \quad 16 \rightarrow 1^2 + 6^2 = 37 \rightarrow 3^2 + 7^2 = 58$ etc.

Even if we repeat the process like above the final answer will not be 1. Such numbers are called unhappy numbers.

masa
NEWS LETTER

Department Quiz Competition

Mathematics Association conducted an inter-class quiz competition for UG students. Two teams from each class participated in the competition. Mr. Jobin Varghese and Mr. Joseph Antony of 3rdBSc secured first place. Mr. Akhil S. and Mr. SreejithS. of 1st BSc and Mr. Thomas P. Varghese and Mr. Bijo Gregory of 2ndBSc secured 2ndand 3rdplaces respectively.

MADHAVA MEMORIAL SCHOLARSHIP

Our department is the regional centre for students intended to write Madhava Scholarship examination. The scholarship examination is conducted by NBHM and Tata Institute of Fundamental Research (TIFR). This year 62 Mathematics UG students from 4 different colleges attended the examination. Dr. Indulal G. is the local coordinator of the programme.

SPORTS

Our boys became champions in the inter-departmental Cricket tournament. Our students also came 2nd in the inter-departmental boys' volleyball tournament.

Mr. Preveen P. Kumar, 2nd BSc

EXTRACURRICULAR ACHIEVEMENTS

Harikuttan B. of 1st BSc got first prize in college level pencil drawing competition. Andria Noronha and Lakshmi Babu of 2nd BSc got 3rd prize in the college level debate competition.

Do you know?

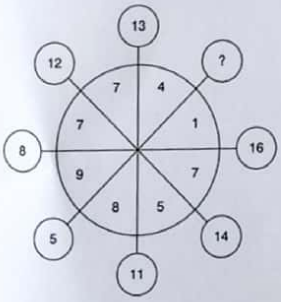
1. 2,520 is the smallest number that can be exactly divided by all the numbers 1 to 10.
2. Palindrome Number is a number that reads the same backwards and forward, e.g. 12421
3. 12,345,678,987,654,321 is the product of 111,111,111 x 111,111,111. Notice the sequence of the numbers 1 to 9 and back to 1.
4. If you multiply a number with 9, and add all the digits of the resulting number, the sum would always come out to be 9.

Math and Logic Puzzles

Mr. Jobin Varghese, 3rd BSc

Fill the cell containing question mark with correct number.

			14	
	22			
			34	
41				
		53		?



Answers :

1. 0 - multiply each row with 8, ie: 9x8, 72 x8, 576 x 8
2. 17-sum of the numbers in the opposite cells
3. 55- 5th row, 5thcolumn

Final year degree students with Dr. Indulal G. and Prof. Kochu Thressiamma Joseph during their customary study/ pleasure trip!

CHRISTMAS CELEBRATION

Students of the department together celebrated the Christmas by making a beautiful Christmas crib. Also, our students generously contributed towards the college level charity activity of collecting useful articles for donating to the nearby old age home.

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NEWS LETTER

ഗ്രാഫ് തിയറിയെന്ന സുഹൃത്തും വഴികാട്ടിയും

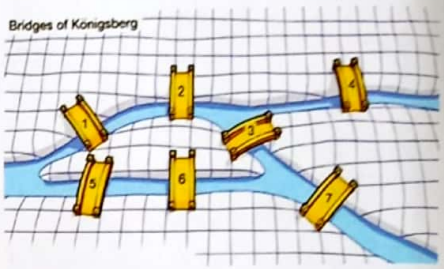
ഡോ. ഇന്ദുലാൽ ജി.

ആധുനിക ഗണിതശാസ്ത്രത്തിന്റെ നവീനമേഖലകൾ പരിചയപ്പെടുന്നത് ഗണിതസ്നേഹികൾക്ക് സഹായകരമാവും, ഗണിതത്തിന് പ്രായോഗികതയുണ്ടോ എന്ന് പഠിക്കുന്നവരും പഠിപ്പിക്കുന്നവരും എതാണ് ഒന്നുപോലെ സംശയം കൂറുന്ന സാഹചര്യത്തിൽ ആ പരിചയപ്പെടുത്തലിനു സാംഗത്യമേറെയുണ്ടുതാനും. ലോകം ഇരുകൈകളും നീട്ടി സ്വീകരിച്ച ഗണിതശാഖയായ ഗ്രാഫ് തിയറിയെക്കുറിച്ചാണ് ഈ ലേഖനം. എത്ര സങ്കീർണ്ണമെന്ന് തോന്നാവുന്ന പഠനശാഖയും ലളിതമായ, അതീവരസകരമായ ചില പ്രശ്നങ്ങളിലൂടെയും അതിന്റെ പരിഹാരനിർവഹണത്തിലൂടെയും ആയിരിക്കും ആവിർഭവിക്കുക. ഗ്രാഫ് തിയറിയുടെ പിറവിക്കു പിന്നിലും അത്തരം രസാവഹമായ ഒരു കഥയുണ്ട്. അതിന്റെ രസമറിയാൻ കാലത്തിനു പിന്നിലേയ്ക്ക് നാം അല്പം സഞ്ചരിക്കേണ്ടിയിരിക്കുന്നു.

1700 കളുടെ ആദ്യകാലം. അന്ന് കിഴക്കൻ ജർമ്മനിയുടെ ഭാഗമായിരുന്ന കോണിഗ്സ്ബെർഗ് (ഇപ്പോൾ റഷ്യയിലെ കലിനിൻഗ്രാദ്) എന്ന സ്ഥലത്തേക്കാണ് യാത്ര. അന്നത്തെ അവിടുത്തെ ഒരു പ്രധാന നദിയായിരുന്നു പ്രീഗൽ. ആ നദിയിൽ രണ്ട് ചെറുതുരുത്തുകളുണ്ട്. ആ തുരുത്തുകളും നദിയുടെ കരകളും ബന്ധിപ്പിക്കുന്ന ആകെ ഏഴ് പാലങ്ങളും. തുരുത്തുകൾ തമ്മിൽ ഒന്നും ഒരു തുരുത്തിൽ നിന്ന് ഇരുകരകളിലേക്കും രണ്ടുവീതവും മറ്റൊന്നിൽ നിന്ന് ഓരോന്നും. ഏതെങ്കിലും കരപ്രദേശത്തു നിന്ന് യാത്ര തുടങ്ങുന്ന ഒരാളിന് എല്ലാ പാലവും ഒരു തവണമാത്രം ഉപയോഗിച്ച് യാത്ര തുടങ്ങിയ കരയിൽ തന്നെ വന്നെത്താൻ സാധിക്കുമോ എന്ന് എതോ ഒരു കുസൃതി ചോദിച്ചതിൽ നിന്നായിരുന്നു പ്രശ്നങ്ങളുടെ തുടക്കം.

ഈ ചോദ്യം അതീവലളിതമാണെന്ന് ആരും സമ്മതിക്കുമല്ലോ? ഇത്തരമൊരു യാത്ര സാധ്യമാണോയെന്ന് പരിശോധിച്ച എല്ലാവർക്കും എതെങ്കിലും ഒരു പാലത്തിൽ കൂടെ ഒരു തവണയിൽ കൂടുതൽ സഞ്ചരിക്കേണ്ടി വന്നു. വർഷങ്ങൾ കടന്നുപോയി 1736 ൽ അക്കാലത്തെ ഏറ്റവും പ്രതിഭാധനനായ ഗണിതശാസ്ത്രജ്ഞൻ ലിയോനാർഡ് ഓയ്ലർ ഈ പ്രശ്നത്തിൽ ഇടപെട്ടു. അദ്ദേഹം കരകളെ ബിന്ദുക്കളായും കരകളെ യോജിപ്പിക്കുന്ന പാലങ്ങളെ രേഖകളായും ചിത്രീകരിച്ച് രണ്ടു കരകൾ തമ്മിൽ എത്ര പാലങ്ങളുണ്ടോ അത്രയും രേഖകൾ ഉപയോഗിച്ച് അവകൾക്ക് തത്തുല്യമായ ബിന്ദുക്കളെ തമ്മിൽ യോജിപ്പിച്ചു. ഈ ചിത്രത്തെയാണ് നാം ഇന്ന് ഗ്രാഫ് എന്നു വിളിക്കുന്നത്. കോൺഗ്സ്ബെർഗിലെ മേൽപ്പറഞ്ഞ പ്രശ്നം പഠിക്കാൻ ഓയ്ലർ ഈ ഗ്രാഫ് ഉപയോഗിച്ചു.

മേൽപ്പറഞ്ഞ യാത്ര സാധ്യമാകണമെങ്കിൽ ഓരോ കരയിലും വന്നുചേരുന്ന പാലങ്ങളുടെ എണ്ണം ഒരു ഇരട്ടസംഖ്യയായിരിക്കണമെന്ന് അതിലളിതമായ സാധൂകരണത്തിലൂടെ അദ്ദേഹം തെളിയിച്ചു. ഇത്തരം യാത്രകൾ സാധ്യമാകുന്ന ഗ്രാഫുകളുടെ പഠനം ഓയ്ലേറിയൻ ഗ്രാഫുകൾ എന്ന ശാഖയ്ക്ക് പിന്നീട് കാരണമായി.



പല യാത്രാമാർഗ്ഗങ്ങളും നിരുമാനിക്കുന്നതിൽ ഇത്തരം ഗ്രാഫുകൾ നിർണ്ണായക ഗണിതസഹായികളായി. ആധുനികലോകം ഉറ്റുനോക്കുന്ന ഡി.എൻ.എ അപഗ്രഥനത്തിലും ജനിതക പഠനങ്ങളിലും ഇത്തരം ഗ്രാഫുകൾ മാർഗ്ഗനിർദ്ദേശകങ്ങളാകുന്നു.

ചരിത്ര പ്രസിദ്ധമായ മേൽപ്രശ്നം 'കോണിഗ്സ്ബെർഗിലെ സപ്തസേതു പ്രശ്നം' എന്നാണറിയപ്പെടുന്നത്. യഥാർത്ഥത്തിൽ ഈ സംഭവമാണ് ഇന്നത്തെ ലോകത്തിന്റെ ഗതിവിഗതികൾ നിർണ്ണയിക്കുന്നതിൽ സാരമായ പങ്കുവഹിക്കുന്ന ഗ്രാഫ് തിയറി എന്ന ഗണിതശാസ്ത്രശാഖയുടെ ജനനത്തിനു പിന്നിൽ.

MATHEMATICS ASSOCIATION

The activities of the Mathematics Association for the year 2016-17 were inaugurated by Dr. Antony Mathews, Head of the Department of Mathematics, SB College Changanacherry. Principal Dr. Saban K.V. presided over the meeting. Staff Advisor Prof. Jogy Joseph welcomed the gathering. Head of the department Prof. Kochu Thressiamma Joseph spoke on the occasion. Student representative Ms. Manupriya M. Pillai proposed the vote of thanks. Mr. Salu S., our former student who cleared JRF NET examination was felicitated in the meeting.

Higher Education in Mathematics

If you are a BSc graduate you can join 2 year MSc programme or an integrated MSc-PhD programme. After completing your MSc you can join for PhD programme in Mathematics. Below are some of the prestigious institutes in India offering MSc, MTech and PhD programme in Mathematics.

- Chennai Mathematical Institute (MSc, PhD) Chennai
- Indian Statistical Institute (M.Math, PhD) Delhi, Bangalore, Kolkata, Tezpur, Chennai
- The Institute of Mathematical Sciences (Integrated MSc-PhD, PhD) Chennai
- Tata Institute of Fundamental Research (Int MSc-PhD, PhD) Mumbai, Bangalore
- Harish-Chandra Research Institute (Int MSc-PhD, PhD) Allahabad
- Indian Institute of Science (Int MSc-PhD, PhD) Bangalore
- Indian Institutes of Science Education and Research (Int MS, Int MS-PhD, PhD) Mohali, Pune, Thiruvananthapuram, Bhopal, Kolkata
- National Institute of Science Education Research (Int MS, PhD) Bhubaneshwar
- Indian Institutes of Technology (MSc, MTech, Int MSc-PhD, PhD) Madras, Bombay, Delhi, Kharagpur, Guwhati, Kanpur, Patna, Varanasi, Roorkee
- Institute of Mathematics and Applications (MA/MSc) Bhubaneshwar

Congratulations!

Our MSc student (2013 – 15), Mr. Salu S. has cleared JRF NET Examination conducted by CSIR. The department is very proud of his achievement. We sincerely hope and wish that many students from our department will clear the exam in the coming years.

BABYLONIAN MATHEMATICS

Prof. KochuThresiamma Joseph

Babylonian Mathematics is the mathematics practised by the people of Mesopotamia, from early 3000 BC to 539 BC. Our knowledge of Babylonian mathematics is derived from some 400 clay tablets written in Cuneiform script unearthed since the 1850s. The recovered clay

tablets indicate that Babylonians had the knowledge of fractions, algebra, quadratic and cubic equations and the Pythagorean theorem.

The Babylonian system of mathematics was sexagesimal (base 60) numeral system. From this we derive the modern day usage of 60 seconds in a minute, 60 minutes in an hour, and 360 degrees in a circle. Perhaps the most amazing aspect of the Babylonians' calculating skills was their construction of tables to aid calculation. Two tablets found at Senkerah on the Euphrates give squares of the numbers up to 59 and cubes of the numbers up to 32. The table gives $8^2 = 1,4$ which stands for $8^2 = 1, 4 = 1 \times 60 + 4 = 64$ and so on up to $59^2 = 58, 1 (= 58 \times 60 + 1 = 3481)$.

Ultimately, their knowledge was passed to the Greeks and it formed the basis of pure mathematics.

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