Program of Activities
For the 89th Annual Meeting of the

Mathematical Association of America

Ohio Section

Spring 2005
Miami University
Oxford, Ohio
April 1-2, 2005

MAA Ohio Section

Program

Friday, April 1, 2005

12:00 – 4:30	Registration	115 Bachelor Hall
	Book exhibits	118 & 120 Bachelor Hall
12:00 – 1:20	Student problem-solving team competition	Shriver Center Multi-Purpose Room C
12:15 – 1:15	Committee Meetings:	
	CONCUR	122 C Bachelor Hall
	CONSAC	122 D Bachelor Hall
	CONSTUM	Multi-Purpose Room C in Shriver Center
	CONTEAL	343 Bachelor Hall
1:30 – 1:45	Welcome and Announcements	101 Bachelor Hall
1:45 – 2:45	Invited Address: **"The Probability an Amazing Card Trick is Dull"** Christopher N. Swanson, Ashland University	101 Bachelor Hall
2:45 – 3:10	Break and Refreshments	Hallway adjacent to 115 Bachelor Hall
3:10 – 4:10	Invited Address: **"Understanding Lies, Damned Lies, and Statistics: A Look at Why So Many People Find Statistics Frustrating"** John P. Holcomb, Cleveland State University	101 Bachelor Hall
4:15 – 6:30	**Contributed Paper Sessions**	110, 112, 114, 201, 219 Bachelor Hall
4:15 – 6:15	Executive Committee Meeting	337 Bachelor Hall
6:30 – 7:00	Social Time with Cash Bar	Shriver Center—Heritage Room
6:45 – 8:00	Student Pizza Party	Bachelor Hall Courtyard
7:00 – 8:15	Banquet	Shriver Center—Heritage Room
8:15 – 9:00	After-dinner Talk: **"The Discrete Mathematics of a Card Trick"** Christopher N. Swanson, Ashland University	Shriver Center—Heritage Room
9:00 –	Business Meeting and Presentation of Teaching Award	Shriver Center—Heritage Room

Saturday, April 2, 2005

8:00 – 10:30	Registration	115 Bachelor Hall
	Book exhibits	118 & 120 Bachelor Hall
8:00 – 8:50	Coffee and Doughnuts	Hallway adjacent to 115 Bachelor Hall
	Meeting of Student Leaders	122 C Bachelor Hall
8:05 – 8:45	Executive Committee Meeting continuation (if necessary)	337 Bachelor Hall
	Department Liaisons Meeting	219 Bachelor Hall
8:50 – 8:55	Announcements	101 Bachelor Hall
8:55 – 9:55	Retiring President's Address: **"Arc Length and Surface Area – What's Up with Calculus Textbooks?"** Mark A. Smith, Miami University	101 Bachelor Hall
9:55 – 10:20	Break and Refreshments	Hallway adjacent to 115 Bachelor Hall
10:20 – 11:35	**Contributed Paper Sessions**	110, 112, 114, 201, 219 Bachelor Hall
11:40 – 12:10	CONCUR Presentation on CUPM	101 Bachelor Hall
12:15 – 1:15	Invited Address: **"What are Hidden Markov Models and Who Cares?"** Daniel Maki, Indiana University	101 Bachelor Hall
1:15	Closing Remarks	101 Bachelor Hall

Abstracts of Invited Addresses
Friday, April 1, 2005

Speaker: **Christopher N. Swanson, Ashland University**
Title: **The Probability an Amazing Card Trick is Dull**
Abstract: The Ashland University student chapter of the MAA holds biweekly meetings. In Fall 2002, I told students that I would perform a new mathematical card trick at each of these meetings. While performing one of these card tricks, an unlikely event occurred that made the card trick quite dull. In this talk, we will find the probability that this unlikely event occurs after discussing the more general problem of counting permutations with restricted positions.

Speaker: **John P. Holcomb, Cleveland State University**
Title: **Understanding Lies, Damned Lies, and Statistics: A Look at Why So Many People Find Statistics Frustrating**
Abstract: This expository talk will discuss some of the issues that cause the field of statistics to invoke such strong feelings from citizens, students, and even mathematicians. A main point will examine the differences between experiments and observational studies with examples of the role of confounding and lurking variables. A second theme will point to the main ways in which statistics differs from mathematics. Lastly, I will plea for peace arguing that mathematics programs need to develop and inspire students to study statistics as much as statistics programs need students to study as much mathematics as possible.

Speaker: **Christopher N. Swanson, Ashland University**
Title: **The Discrete Mathematics of a Card Trick**
Abstract: While attending the Project NExT activities at the 2000 Joint Meetings, I met Colm Mulcahy of Spelman College who was performing a card trick with my fellow Brown Dot Derek Smith of Lafayette College. I selected 5 cards from a standard deck. Colm looked at them, returned one card to me, and laid down the remaining four cards with their faces showing. Derek would tell me the card I was holding. During MathFest 2000, Colm presented how to perform this card trick, and he has also written a paper on it that appeared in the February 2003 Math Horizons. I will share the secrets of this card trick with you, as well as review some basic concepts of discrete mathematics that explain why it works.

Abstracts of Invited Addresses
Saturday, April 2, 2005

Speaker: **Mark A. Smith, Miami University**
Title: **Arc Length and Surface Area–What's Up with Calculus Textbooks?**
Abstract: For over thirty years, I taught arc length and surface area in calculus classes without much thought to why we naturally connect dots in one case and do some funny tangential thing in the other case. Calculating arc length and surface area are really the same problem, just in different dimensions. A couple of years ago, I posed this curiosity to an undergraduate student (Mark T. Walters), who investigated the circumstance under my supervision as a Dean's Scholar here at Miami University. In this talk, I shall report Mark's findings (so we'll review and do a lot of calculus), as well as some of his adventures as he traveled to present these findings. Hopefully, this will be a fun talk for mathematicians of all ages and experience in the audience.

Speaker: **Daniel Maki, Indiana University**
Title: **What are Hidden Markov Models and Who Cares?**
Abstract: Hidden Markov Models have become an important tool for both speech recognition and in bioinformatics. In this talk we give the basics of Markov Chains, the basics of Hidden Markov Models, and we give examples of how they are being used in speech research and in genetics.

Brief Biographies of Invited Speakers

Christopher N. Swanson, Ashland University

Christopher N. Swanson is an Assistant Professor of Mathematics in his 6th year of teaching at Ashland University. He received his B.S. from Denison University in 1994 and his Ph.D. from the University of Michigan (GO BLUE!) in 1999 under the direction of Thomas F. Storer. His research interests are combinatorics and probability. He enjoys doing research with undergraduates and has directed four Ashland University students in the completion of their honors theses.

Chris is a national Project NExT Fellow (Brown dot) and is Program Co-chair of Ohio NExT. He served on CONCUR for two years and is currently a member of CONSTUM. He initiated the founding of the Ohio Rho chapter of Pi Mu Epsilon at Ashland University and introduced its students to the Putnam Mathematical Competition. He creates solutions for the OCTM contest which are published on the OCTM web site. He has delivered 11 scholarly talks since returning to the Ohio Section, including six at Ohio Section meetings. He hopes you will enjoy his 7th and 8th Ohio Section talks as much as he will.

Chris and his wife Linda (also a graduate of Denison University) celebrated their 10th anniversary this year by attending the Rose Bowl. Their son Parker is 5 years old and will pay his opponents large sums of money for the yellow Monopoly properties. Their daughter Paige is 3 years old and enjoys doing jigsaw puzzles on either parent's lap when she isn't pretending to be Fluffy the Cat.

John P. Holcomb, Cleveland State University

John Holcomb majored in mathematics at St. Bonaventure University and then continued at the State University of New York at Albany (SUNY). He began studying pure mathematics, and after four years finally saw the light and began concentrating on statistics. He spent the first five years of his career at Youngstown State University where he learned as much as possible from the outstanding faculty and program there. Now at Cleveland State University, Dr. Holcomb devotes himself to teaching and research as an applied statistician. A National Project NExT Fellow, he was a co-director of Ohio NExT's program for three years. He is currently president of the Cleveland Chapter of the American Statistical Association. He has also served as an associate editor for the Journal of Statistics Education for six years, a member of the Advisory Board for the Assessment Resource Tools for Improving Statistical Thinking (ARTIST) project, and a Research Advisory Board member for the Consortium for the Advancement for Undergraduate Statistics Education (CAUSE). Named a Carnegie Scholar in 2000, Dr. Holcomb received the Waller Education Award from the ASA Section on Statistical Education in 2003 for outstanding teaching of introductory statistics by a junior faculty member.

Brief Biographies of Invited Speakers
(continued)

Mark A. Smith, Miami University

Mark A. Smith received his Ph.D. in Mathematics at the University of Illinois under the direction of Mahlon M. Day. His research area is the geometry of Banach spaces. His original work in this area concerned rotundity and smoothness properties of general Banach spaces. He then focused on the geometry and extreme point structure of various classes of function spaces and their duals. He has published 23 research journal publications. Mark has spent most of his career teaching at Miami University where he is currently serving as the chair in addition to his teaching duties. He has taught a variety of undergraduate and graduate courses ranging from business mathematics and precalculus to measure theory and functional analysis.

Mark has served on the national MAA Committee on Industrial and Government Mathematicians. He served as co-coordinator of Ohio Project NExT from 2001 to 2004. He was President-Elect of the Ohio Section of the MAA in 2003-2004 and is currently President of the Section.

Mark has been married to his high school sweetheart, Linda, for 35 years. They have two children, Matt, 31, and Susan, 29. Matt is a single businessman living in downtown Chicago. Susan lives and works in Cincinnati while her husband, Barry, goes to University of Cincinnati law school. All three of the "kids" are Miami University grads. Linda and Mark live on fairway #5 at Walden Ponds Golf Club just north of Hamilton, Ohio, about 15 miles from Oxford.

Daniel P. Maki, Indiana University

Daniel P. Maki received his Ph.D. in Mathematics from the University of Michigan. He has been a visiting professor at the University of Michigan and Claremont Graduate School. He received a Fulbright Research Fellow in 1968 at the University of Helsinki. He has received several awards for teaching, including the Presidential Award for Excellence in Teaching in 2004. He is currently professor and has served as chair at Indiana University where he most enjoys teaching mathematical modeling. His research interests are mathematical modeling with special emphasis on digital signal processing and mathematical aspects of simulation. Daniel has participated in over one hundred interdisciplinary doctoral studies at Indiana University and has received numerous grants from NSF and NIH. He has been an invited speaker on more than sixty occasions, giving presentations and workshops at universities and national meetings.

Contributed Paper Sessions for Friday, April 1, 2005

	Room 110	Room 112	Room 114	Room 201	Room 219
Time	Session Chair: Mary Bergs	Session Chair: Tom Farmer	Session Chair: Eric Wingler	Session Chair: Wiebke Distelkamp	Session Chair: Bob Schaefer
4:15 – 4:30	***An Introduction to Knot Theory*** Abstract 1 Maria E Salcedo Youngstown State Univ	***Are There Really a Lot of Primes?*** Abstract 2 Thomas Dence Ashland University	***Let Us Teach Nim*** Abstract 3 Jon Stadler Capital University	***Queues with Time Varying Arrival and Departure Rates*** Abstract 4 Barbara Margolius Cleveland State Univ	***Trisecting an Angle with the Help of Origami*** Abstract 5 David Nassar Denison University
4:35 – 4:50	***The Brouwer Fixed Point Theorem*** Abstract 6 Chelsea MacNealy Denison University	***The "Saturated Assessment Model" in Mathematics Service Courses*** Abstract 7 Gary S Nonnemacher Bowling Green State U	***What is the Problem with Triangular Numbers*** Abstract 8 Ryan R Shearer Ashland University	***Some Computer Explorations in Number Theory*** Abstract 9 Nathan Baxter and Justin Gieseler Ohio Northern University	***Sampling Some Sizzling Sweeties from Smullyan's Sensational Stash*** Abstract 10 Sean A Plymire Ashland University
4:55 – 5:10	***Investigating Spirolaterals*** Abstract 11 Leesa Folkerth Miami University	***Fun with Roller Coasters*** Abstract 12 Evan Starr Denison University	***Exploring Continued Fractions*** Abstract 13 Jeremy M Hamilton Youngstown State Univ	***On Factoring n with the b-algorithm*** Abstract 14 Matt Means Ashland University	***Mathematics, Psychology and Factor Analysis*** Abstract 15 Danielle L Cisler Marietta College
5:15 – 5:30	***A Mathematician's Guide to Cutting Cake*** Abstract 16 Melissa L Marshall Youngstown State Univ	***A Natural Generalization of the Win-Loss Rating System*** Abstract 17 Stefanie Y Thompson Ashland University	***Exploring Groups with Rubik's UFO Puzzle*** Abstract 18 Bill Higgins Wittenberg University	***Probability Analysis of Abused Women and Common Ailments*** Abstract 19 Amanda Ostrowski and Casie Sowell Cleveland State Univ	***Small Orders Modulo p*** Abstract 20 Mihai Caragiu Ohio Northern University

Contributed Paper Sessions for Friday, April 1, 2005 (continued)

	Room 110	Room 112	Room 114	Room 201	Room 219
Time	Session Chair: Mary Bergs	Session Chair: Tom Farmer	Session Chair: Eric Wingler	Session Chair: Wiebke Distelkamp	Session Chair: Bob Schaefer
5:35 – 5:50	***Determining Your Gas Mileage*** Abstract 21 Katie M Graham Ashland University	***Che-Math: A Cool Chemical Application of Mathematics*** Abstract 22 Megan Warner Denison University	***Quadratic Reciprocity*** Abstract 23 Charles Greathouse Miami University	***Classification Using Support Vector Machine Technology*** Abstract 24 Darcy Davis Youngstown State Univ	***Symmetric Polynomials in the Work of Newton*** Abstract 25 Christine Truesdell Ashland University
5:55 – 6:10	***Platonic and Archimedean Solids*** Abstract 26 Elizabeth Aldrich Miami University	***Deriving Planetary Orbits from Scratch*** Abstract 27 John D Davenport Wittenberg University	***Benjamin Franklin ~ Inventor, Statesman, ... Magician*** Abstract 28 Jenise A Smalley Ashland University	***Efficient Domination on (t, k)-prisms*** Abstract 29 Casey D Trail Marietta College	***Arc Length Surprise*** Abstract 30 Erin Donovan Denison University
6:15 – 6:30	***Probability Analysis of Abused Women and Common Ailments*** Abstract 31 Rachel M. Smith and Nicole Brady Cleveland State Univ	***The Pell Sequence*** Abstract 32 Chris S Stoffer Ashland University	***Freeze-tag*** Abstract 33 Dan Bucatanschi Denison University	***So You Want to be a Slide-Guitar Star*** Abstract 34 Alan Horwitz Marshall University	***Pseudoprimes*** Abstract 35 Jennifer Nickell Miami University

Contributed Paper Sessions for Saturday, April 2, 2005

	Room 110	Room 112	Room 114	Room 201
Time	Session Chair: Bill Higgins	Session Chair: John Tynan	Session Chair: Lew Ludwig	Session Chair: John Davenport
10:20 – 10:35	***Squaring the Circle with the Greeks*** Abstract 36 William E Froehlich Denison University	***Polya Rides Again*** Abstract 37 Philip Blau Shawnee State University	***The Distribution of Prime Numbers*** Abstract 38 Andrew Giegler Miami University	***Probabilities and Statistics in Baseball*** Abstract 39 Mike Klauss Cleveland State Univ
10:40 – 10:55	***Cellular Automation and Traffic Flow*** Abstract 40 Anthony Macko Cleveland State Univ	***It Appears That Four Colors Suffice*** Abstract 41 Mark Walters Miami University	***Four Squares Problem and its Solution*** Abstract 42 Ralph W Stikeleather Xavier University	***Prime Generating Functions*** Abstract 43 Darren D Wick Ashland University
11:00 – 11:15	***Kuhn-Tucker Conditions in Multiobjective Optimization*** Abstract 44 Jonathan Hauenstein Miami University	***A Proof of the Kraft/McMillan Theorem*** Abstract 45 Tim A Smith Cleveland State Univ	***Another Method for Extracting Cube Roots*** Abstract 46 Brian J Shelburne Wittenberg College	***Geometric Characterizations of Algebraic Systems*** Abstract 47 Patricia Garmirian Denison University
11:20 – 11:35	***Getting to the Square Root of the Problem*** Abstract 48 Timothy J Brintnall Ashland University	***The Bus Driver Sanity Problem*** Abstract 49 Jennifer M Swank Denison University	***An Arithmetic Intermediate Value Theorem*** Abstract 50 Laurence Robinson Ohio Northern University	***How SMART is Your Geometry?*** Abstract 51 Tom Cochran Youngstown State Univ

Presentation by CONCUR for Saturday, April 2, 2005

	101 Bachelor Hall
Time	Session Chair: Darren Wick
11:40 – 12:10	***The CUPM Curriculum Guide 2004*** Abstract 52 Roger Marty Faculty, Cleveland State University Darren Parker Faculty, University of Dayton Cathy Stoffer Faculty, Ashland University Michelle Wiggins Faculty, Ursuline College

Abstracts of Contributed Papers

Friday 4:15 – 4:30

An Introduction to Knot Theory

Maria E Salcedo
Student, Youngstown State University

Abstract Number: 1. Ever wonder what knot theory is all about? This talk will give a concrete introduction to why mathematicians study knots. This includes classification of knots, ties between knots and other fields, and an overview of research of knotted ribbons that I conducted at a Research Experience for Undergraduates at California State San Bernardino.

Are There Really a Lot of Primes?

Thomas Dence
Faculty, Ashland University

Abstract Number: 2. Some subsets of the natural numbers are plentiful, and some are not, but this depends on what definition you use. With one particular definition in hand, we investigate whether the set of primes is plentiful. In so doing, some elementary calculus and number theory produces a striking result (though not new) accessible to all undergraduate students.

Let Us Teach Nim

Jon Stadler
Faculty, Capital University

Abstract Number: 3. Nim is a simple game in which players alternate removing coins from piles. The last player to remove a coin wins. Charles Bouton published a clever winning strategy over 100 years ago. We will discuss how Bouton may have devised his solution and look at how Nim can be used in the classroom to motivate concepts discussed in Discrete Mathematics. In the meantime, students will get a glimpse of the process mathematicians use to solve research problems.

Queues with Time Varying Arrival and Departure Rates

Barbara Margolius
Faculty, Cleveland State University

Abstract Number: 4. We present generalizations of a variety of formulae related to queues with Poisson arrivals and exponential service to the case of time-varying arrival and departure rates and time-varying number of servers.

Trisecting an Angle with the Help of Origami

David Nassar
Student, Denison University

Abstract Number: 5. Trisecting an angle with a compass and unmarked straight edge is an age-old problem. Nearly 300 hundred years ago it was proved impossible. Come trisect the angle via the ancient art of origami and see if this is bending the rules. This talk is suited for all audiences.

Friday 4:35 – 4:50

The Brouwer Fixed Point Theorem

Chelsea MacNealy
Student, Denison University

Abstract Number: 6. We prove an amazing result that most mathematicians do not see until their second year of graduate school. Take two sheets of paper, one lying directly above the other. Crumple the top sheet and place it on top of the other sheet, then Brouwer's theorem says that there must be at least one point on the top sheet that is directly above the corresponding point on the bottom sheet! Suitable for a general audience.

The "Saturated Assessment Model" in Mathematics Service Courses

Gary S Nonnemacher
Faculty, Bowling Green State University

Abstract Number: 7. I will briefly discuss some of the results on frequency of assessment and types of assessment. Some data will be presented regarding the number of assessment activities in recent pre-calculus and calculus courses and the student success rates in those courses. I will discuss what I have coined the "Saturated Assessment Model" and some of its organizational and pedagogical implications. Questions and comments will be welcomed.

What is the Problem with Triangular Numbers?

Ryan R Shearer
Student, Ashland University

Abstract Number: 8. Triangular numbers have many applications in problem solving. Throughout this talk I will discuss several applications of triangular numbers in problem solving. There will also be a brief generalization of how triangular numbers are formulated. In general, this talk will give a new perspective on triangular numbers and how they might be used.

Some Computer Explorations in Number Theory

Nathan Baxter and Justin Gieseler
Students, Ohio Northern University

Abstract Number: 9. We will share with the audience some nice computer generated pictures of "islands", "lakes" and "mountains" reflecting the distribution of primes in arithmetic progressions, as well as the distribution of quadratic residues and non residues. We will then try to explore the sounds that can be heard in these universes.

Sampling Some Sizzling Sweeties from Smullyan's Sensational Stash

Sean A Plymire
Student, Ashland University

Abstract Number: 10. Discover some logic problems that will make your head spin. Raymond Smullyan is the mastermind behind many different brain-teasers. He has published several logic puzzle books that anyone can read and enjoy. His cast of characters include Inspector Craig of Scotland Yard, ladies, tigers, and crooked politicians We will take a few of his best problems and examine them.

Friday 4:55 – 5:10

Investigating Spirolaterals

Leesa Folkerth
Student, Miami University

Abstract Number: 11. Frank C. Odds was one of the first mathematicians to investigate spirolaterals. Deriving from two Latin roots, a spirolateral refers to square spirals on a flat surface. This geometric figure is defined by three basic factors including the turning angle, the total number of line segments or turns, and the number of repetitions that need to be performed in order to close the figure. A simple mathematical formula can predict which spirolaterals will be closed and which will repeat infinitely depending on certain factors. By looking at different spirolaterals created using LOGO, the patterns determing a closed or open spirolateral will emerge.

Fun with Roller Coasters

Evan Starr
Student, Denison University

Abstract Number: 12. This presentation describes the physics behind roller coaster loop-to-loops. Specifically, this presentation will answer the questions: What is the minimum height you must start a roller coaster at so it barely makes it around a perfectly circular, frictionless loop? Why do roller coasters use tear drop loops instead of circular loops? This talk does not assume any math and/or physics background.

Exploring Continued Fractions

Jeremy M Hamilton
Student, Youngstown State University

Abstract Number: 13. In this talk, we will investigate the representation of real numbers as continued fractions and some elementary measure-theoretic properties that emerge from the initial results.

On Factoring n with the b-algorithm

Matt Means
Student, Ashland University

Abstract Number: 14. It will be shown that the *b*-algorithm is an excellent method for factoring an integer n that is the product of two relatively close prime numbers, and in most cases, is superior to Fermat's factoring method.

Mathematics, Psychology and Factor Analysis

Danielle L Cisler
Student, Marietta College

Abstract Number: 15. People often wonder how mathematics is applied in the real world. Psychology is a field which utilizes mathematical techniques in many types of data analysis. Factor analysis is a method of data reduction which uses many mathematical techniques. A few mathematical techniques in factor analysis will be reviewed, as well as how it is been pertinent in my research of the Bar-On Emotion Quotient Inventory.

Friday 5:15 – 5:30

A Mathematician's Guide to Cutting Cake

Melissa L Marshall
Student, Youngstown State University

Abstract Number: 16. Have you ever been caught in a situation where you must divide something fairly, making sure everyone is satisfied? Whether it be cutting cake, or dividing up an estate, everyone wants their fair share if not more. I will discuss three different procedures of fair division, and show which of these procedures satisfy certain fair division properties.

A Natural Generalization of the Win-Loss Rating System

Stefanie Y Thompson
Student, Ashland University

Abstract Number: 17. Most tournament placings are based on the team's winning percentage; however, this placing system is inaccurate because it assumes that the tournament is a round robin tournament where all teams entering the tournament have played each other. This talk will consider the tournament that is not a round-robin and discuss the calculations of tournament placing based on each team's individual performance.

Exploring Groups with Rubik's UFO Puzzle

Bill Higgins
Faculty, Wittenberg University

Abstract Number: 18. The Rubik's UFO Puzzle is an alien cousin of Rubik's Cube. Twelve pieces are arranged in two "hexagons" forming the top and bottom of the spaceship and may be scrambled by using twists and rotations. Adventures in solving this puzzle (a Christmas gift given to our son), and modeling the puzzle on a TI-89 calculator will be described. Perhaps you can employ the puzzle to enhance your abstract algebra class.

Probability Analysis of Abused Women and Common Ailments

Amanda Ostrowski and Casie Sowell
Students, Cleveland State University

Abstract Number: 19. Discussing probabilities, relative risks, and odds ratios to analyze the relationship between women experiencing abuse and common health ailments such as headaches, insomnia, and chest pains. The data involves a total of 182 women. Of that, 146 women were abused and 36 were never abused.

Small Orders Modulo p

Mihai Caragiu
Faculty, Ohio Northern University

Abstract Number: 20. The Artin's conjecture suggests that every positive integer x that is not a square has maximal order, p-1, modulo infinitely many primes p. In the present talk we will explore the problem of SMALL orders. Namely, given an integer $x > 1$ we will show that for every $e > 0$ there are infinitely many primes with the property that the order of x modulo p is less than ep. This has a surprising logical consequence.

Friday 5:35 – 5:50

Determining Your Gas Mileage

Katie M Graham
Student, Ashland University

Abstract Number: 21. By using the least squares method, both city and highway mileage can be calculated. How to arrive at the explicit formulas for gas mileage will be shown, along with how close this method's results are to the actual gas mileage.

Che-Math: A Cool Chemical Application of Mathematics

Megan Warner
Student, Denison University

Abstract Number: 22. We will explore the world of fullerenes, an important chemical structure with many real world applications and the mathematics that dictate their construction – specifically that of the buckyball. This talk does not assume any math and/or chemistry background.

Quadratic Reciprocity

Charles R Greathouse
Student, Miami University

Abstract Number: 23. Many congruences can be reduced to the simple case $x^a = b \pmod{p}$ with a, b, and p integers. Deciding whether such equations have solutions is called reciprocity and are classified by a, the degree of the equation. The three parts of the full Quadratic Reciprocity Theorem allow any equation in the form $x^2 = b \pmod{p}$ to be decided by following simple rules. The history and application of this theorem is presented. This favorite number-theoretic theorem of Gauss was originally given by Euler, with Gauss later giving many proofs of his own devising.

Classification Using Support Vector Machine Technology

Darcy Davis
Student, Youngstown State University

Abstract Number: 24. Support vector machine (SVM) technology is a machine learning technique that has greatly increased the scope of pattern recognition and data classification. Given a training set of data with a binary decision, SVM software "learns" the pattern that defines the classification. With proper data and use, the software should then be able to predict the proper classification (or decision) of other instances of the same type of data with high accuracy. I will present the basic concepts and mathematics behind this amazing technology, as well as explaining how applications of SVM research can change the world we live in.

Symmetric Polynomials in the Work of Newton

Christine M Truesdell
Student, Ashland University

Abstract Number: 25. When do two quadratic equations share a common root? Newton shows that symmetric polynomials can play a part in answering this question. Rather than actually finding the root, a function of only the coefficients, called the resultant, can be used to determine whether the quadratics share a root.

Friday 5:55 – 6:10

Platonic and Archimedean Solids
Elizabeth Aldrich
Student, Miami University
Abstract Number: 26. A discussion of the Platonic Solids as well as the Archimedean Solids and star-polyhedra. References to the contributions of Euclid, Archimedes, Pacioli, Keplar and Euler. Modern examples and tangible models will be shown.

Deriving Planetary Orbits from Scratch
John D Davenport
Faculty, Wittenberg University
Abstract Number: 27. This talk presents a two-week project I have implemented in our 200-level Differential Equations course. Students use Runge-Kutta methods to solve non-linear systems of ODEs to model planetary motion, using Mathematica. After successfully modeling a single planet, they develop their own extensions to the project.

Benjamin Franklin ~ Inventor, Statesman, ... Magician?
Jenise A Smalley
Student, Ashland University
Abstract Number: 28. Who was Benjamin Franklin? Many would argue that he was a scientist, an inventor, a printer, or one of our Founding Fathers. I suggest adding "mathematician" to the list, though he would certainly be reluctant to agree with such a title. Perhaps, then, he may comply with the moniker, "magician." His study of magic squares and construction of what are now known as "Franklin Squares" will be discussed in this presentation, as will his creation of a magic circle.

Efficient Domination on (t, k)-prisms
Casey D Trail
Student, Marietta College
Abstract Number: 29. In this presentation we examine a class of semi-regular graphs which serve as an extension of the common notion of prisms. A (t, k)-prism is a graph consisting of two t-cycles joined by t disjoint k-paths. Specifically we consider the problem of dominating these graphs with 2-packings (any such 2-packing is aid to provide an efficient domination). Our results lead to the following theorem:

Let G be a (t, k)-prism. G can be efficiently dominated if and only if either:

$k \equiv 1 \bmod 3$ or $k \equiv 0 \bmod 3$ and $t \equiv 0 \bmod 4$.

The presentation involves the proof of this theorem in addition to other properties of (t, k)-prisms.

Arc Length Surprise
Erin Donovan
Student, Denison University
Abstract Number: 30. Thought you could never score even one point on the Putnam? We will present a problem from 1998 that is not only a counterintuitive result dealing with arc length on the unit circle, but it can be solved with nothing more than a clever application of pre-calculus.

Friday 6:15 – 6:30

Probability Analysis of Abused Women and Common Ailments

Rachel M. Smith and Nicole Brady
Student, Cleveland State University

Abstract Number: 31. Discussing probabilities, relative risks, and odds ratios to analyze the relationship between women experiencing abuse and common health ailments such as headaches, insomnia, and chest pains. The data involves a total of 182 women. Of that, 146 women were abused and 36 were never abused.

The Pell Sequence

Chris S Stoffer
Student, Ashland University

Abstract Number: 32. In this talk we will discuss the Pell sequence: 1, 2, 5, 12, 29, 70, 169, 408, ... where each term, after the second, is the sum of double the previous one and the one before that. The Pell sequence has many interesting properties, which are similar to that of the Fibonacci sequence. We will show the relationship between the Pell sequence and Pell's equation. We will also show a way to produce primitive Pythagorean triples using consecutive terms in the sequence. Additional patterns in the sequence will be shown and proven. This talk is appropriate for anyone who has taken an undergraduate mathematics course.

Freeze-tag

Dan Bucatanschi
Student, Denison University

Abstract Number: 33. In the Freeze-Tag Problem (FTP), we have a set of n-1 sleeping robots and 1 active robot which awakens other sleeping robots by physically touching them. Afterwards both robots continue to awaken the remaining robots. The goal of the problem is to minimize the total time required to awaken all robots. We discuss the intractability of exhaustively searching for an optimal solution by showing the relation of awakening schedules to various tree structures.

So You Want to be a Slide-Guitar Star

Alan Horwitz
Faculty, Marshall University

Abstract Number: 34. We could play a 440 Hz note by listening to $f(t) = \sin(2\pi \cdot 140t)$. If we wanted to slide the frequency up by two half tones to 493.883 Hz over a 1 sec period, that should be as simple as replacing the "440" with "$440(1-t)+493.883t$",.....right??? Find out the real story.

Pseudoprimes

Jennifer Nickell
Student, Miami University

Abstract Number: 35. This presentation will examine composite numbers that pass certain primality tests, which are known as pseudoprimes. The discovery, properties and different classifications of pseudoprimes will be explained and some proofs will be shown.

Saturday 10:20 – 10:35

Squaring the Circle with the Greeks
William E Froehlich
Student, Denison University
Abstract Number: 36. What can you do with a compass and an unmarked straightedge of infinite length? The ancient Greeks tried just about everything, but there were a few things they could not construct. Back in the day, ancient Greek mathematicians unsuccessfully strived to draw a square and circle with the same area only using a compass and a straightedge. If the Greeks could not construct a square with the same area as a circle, were they able to construct a square with the same area as a rectangle, triangle, or any other polygon? We will discover which numbers are constructible and how the ancient Greeks constructed lengths and shapes with only a compass and a straightedge. This talk is designed for math undergraduate students and requires little mathematical knowledge.

Polya Rides Again
Philip Blau
Faculty, Shawnee State University
Abstract Number: 37. In this talk I will discuss a writing assignment about Polya's four-step approach to problem solving that I give students in a quantitative reasoning course.

The Distribution of Prime Numbers
Andrew Giegler
Student, Miami University
Abstract Number: 38. Prime numbers are among the most widely studied topics in mathematics. The ancient Greeks began investigating prime numbers, and new discoveries and applications are being made everyday. For example, prime numbers are at the center of secure internet transactions. This talk will give a brief history of these truly fascinating numbers, focusing on their distribution among the whole numbers.

Probabilities and Statistics in Baseball
Mike Klauss
Student, Cleveland State University
Abstract Number: 39. This presentation will focus on three aspects of statistics and probability in America's pastime: 1) How statistics can be deceiving, involving Simpson's Paradox; 2) The likelihood of streaks; and 3) A model for predicting how many games a World Series will last.

Saturday 10:40 – 10:55

Cellular Automation and Traffic Flow

Anthony Macko
Student, Cleveland State University

Abstract Number: 40. Cellular automation is a way of looking at complex systems in nature by breaking down these systems into discrete cells which all obey the same simple rules. By using this idea, it is possible to create a computational model that describes steady state traffic flow. Using this idea, traffic can be modeled without using complex differential equations, which would bog down a computers ability to give quick predictions of the flow of traffic given certain situations. We can use discrete mathematics to do the work of Differential Equations and Fourier Analysis.

It Appears That Four Colors Suffice

Mark Walters
Graduate Student, Miami University

Abstract Number: 41. The Four-Color Theorem is one of the most famous theorems of modern-day mathematics. It is likely the only mathematical theorem in which the origin can be traced to a specific event and it is not useful in the field of its original intent, namely cartography. The proof of the four-color theorem in the summer of 1976 satisfied only a portion of the mathematical community because the proof entailed too much computation for a human to verify. This paper traces the historical progress of the theorem and the work of its contributors over a span of roughly 150 years.

Four Squares Problem and its Solution

Ralph W Stikeleather
Student, Xavier University

Abstract Number: 42. The talk outlines a proof that every natural number is the sum of four squares. The proof is presented in 3 parts: Section A. Proof: $x^2 = -1 - y^2 \pmod{p}$ has a solution. Section B. Proof: Every prime is the sum of 4 squares. Section C. Proof: The statement that each prime is the sum of four squares implies that every natural number is the sum of four squares.

Prime Generating Functions

Darren D Wick
Faculty, Ashland University

Abstract Number: 43. In this expository talk, we present and discuss various functions that produce prime numbers.

Saturday 11:00 – 11:15

Kuhn-Tucker Conditions in Multiobjective Optimization

Jonathan D Hauenstein
Graduate Student, Miami University

Abstract Number: 44. In order to find necessary Kuhn-Tucker conditions for multiobjective optimization problems, a discussion on particular Theorems of the Alternative will be presented. Some of these include the Farkas Lemma, Motzkin's Theorem and Tucker's Theorem. An introduction to the idea of an optimal (efficient) solution in multiobjective optimization problems will also be discussed. This will allow the presenter to relate some of the Theorems of the Alternative to optimal solutions in order to derive necessary Kuhn-Tucker conditions.

A Proof of the Kraft/McMillan Theorem

Tim A Smith
Student, Cleveland State University

Abstract Number: 45. The author will present a non-original proof of the Kraft/McMillan Inequality theorem. This proof was discovered after finishing a team paper on Claude Shannon's entropy theory, Huffman encoding and approaching the limits imposed by entropy, and breaking those limits with arithmetic encoding. One of the paper's weak points was its inadequate proof of Kraft/McMillan. This proof, discovered on the internet at the suggestion of Dr. Brian Scott, is much superior to what we found and used in the paper. This proof is based on showing that, if the Theorem was not true, raising it to the nth power would cause it to grow exponentially. As well, a proof is presented that there must be a set of codewords satisfying the Inequality from which a prefix code can be built. A very short introduction to entropy and data compression will be given. No mathematics beyond simple summations and logarithms are assumed.

Another Method for Extracting Cube Roots

Brian J Shelburne
Faculty, Wittenberg College

Abstract Number: 46. Probably the easiest way (?) to compute the cube root of a is to use the iteration formula $x_{n+1} = (2x_n^3 + a)/(3x_n^2)$. However while checking the December 1958 issue of CACM (Communications of the ACM) I ran across a paper that demonstrated another method for extracting cube roots. The method was useful (?) since it was done using fixed point arithmetic, it required no division, and could be modified so only minimal multiplication was needed (both "expensive" operations for computers in the 1950's). It's similar to the method of extracting a square root by hand.

Geometric Characterizations of Algebraic Systems

Patricia Garmirian
Student, Denison University

Abstract Number: 47. We will discuss the basic theory of my senior research in functional analysis. I determined what geometric, quantum mechanically justifiable axioms can be placed on a Banach Space Z so that Z^* is a JB^*-triple. Assuming facial linear complementation as our main axiom, we successfully proved a bijection between tripotents of Z^* and faces of the unit ball of Z, an ordering on tripotents, and a polar decomposition theorem.

Saturday 11:20 – 11:35

Getting to the Square Root of the Problem
Timothy J Brintnall
Student, Ashland University
Abstract Number: 48. Many modern mathematics students rely on their calculators to approximate the square root of a number. However, before the development of modern technology, the problem of approximating the square roots was a difficult task. This talk will focus on the history of the problem, and the origins of the successful algorithms used to approximate the square root of a non perfect square. I will also be exploring some of the many representations of a square root. So, come and enjoy the history of one of the world's oldest problems.

The Bus Driver Sanity Problem
Jennifer M Swank
Student, Denison University
Abstract Number: 49. The Bus Driver Sanity Problem, proposed by Todd Will attempts to determine the best route for the drop off of kids after school as to minimize total time spent with the kids. Thus, the fastest route is not necessarily the best route. Dr. Will investigated this problem using recursion techniques and dynamic programming. Along with Dr. Will's solution, current progress of ongoing research and future work will be presented.

An Arithmetic Intermediate Value Theorem
Laurence D Robinson
Faculty, Ohio Northern University
Abstract Number: 50. We prove an intermediate value theorem involving the consecutive averages of sequences with terms in a given finite set.

How SMART is Your Geometry?
Tom Cochran
Student, Youngstown St University
Abstract Number: 51. Technologies available to educators are beginning to change the way many people teach. SMART Boards are becoming more common in all classrooms and coupling them with the right software can add life to any lesson. In a talk geared toward mathematics education, I will demonstrate different geometry programs on a SMART Board and show the advantages and disadvantages of each.

Saturday 11:40 – 12:10

The CUPM Curriculum Guide 2004
Roger Marty, Faculty, Cleveland State University
Darren Parker, Faculty, University of Dayton
Cathy Stoffer, Faculty, Ashland University
Michelle Wiggins, Faculty, Ursuline College
Abstract Number: 52. This discussion and PowerPoint presentation gives an overview of the CUPM Curriculum Guide for undergraduate programs and courses in the mathematical sciences.

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Calendar of Coming Events

The Ohio Section Summer Short Course is scheduled for **June 27-29, 2005**, at John Carroll University in Cleveland, Ohio. **Sr. Barbara Reynolds**, of Cardinal Stritch University, will lead the participants in ***Making the Math Visible: A Workshop Exploring Geometry and its Connections to Algebra, Trigonometry, and Art***.

The Fall Section Meeting will be **October 21-22, 2005** at Ashland University in Ashland, Ohio.