Program of Activities
For the 95th Annual Meeting of the

Mathematical Association of America

Ohio Section

Spring 2011
Youngstown State University
Youngstown, Ohio
March 25-26, 2011

MAA Ohio Section

Program

Friday, March 25

12:00 – 4:00	Registration	Chestnut
12:00 – 1:20	Student Team Competition	Chestnut
12:00-1:00	Committee Meetings:	CONCUR 2036 CONSACT 2067 CONSTUM 2068 Centennial Committee 2069
1:00-4:00	Vendor and Book Exhibits	Chestnut
1:30-1:45	Welcome & Announcements	Chestnut
1:45-2:45	**Invited Address:** **"Combinatorialization of Linear Recurrences through Weighted Tilings"** *Jennifer Quinn, University of Washington, Tacoma*	Chestnut
2:45-3:10	Break	Chestnut
3:10-3:15	Centennial Minute	Chestnut
3:15-4:15	**Invited Address:** **"On Lines and Parabolas, Again and Again"** *Gordon Swain, Ashland University*	Chestnut
4:25 – 6:20	**Contributed Paper Sessions**	Coffelt, Gallery, Jones, Ohio
4:25 – 6:20	Executive Committee Meeting	2036
6:30- 8:00	Student Pizza Party	Ohio
6:30- 6:50	Social Time	Chestnut
6:50-8:00	Banquet	Chestnut
8:10-9:00	**After-Dinner Talk:** **"Invariants under Group Actions to Amaze Your Friends!"** *Douglas Ensley, Shippensburg University*	Chestnut
9:00	**Business Meeting and Presentation of the Teaching Award**	Chestnut

Saturday, March 26

8:00-10:15	Registration	Chestnut
8:00-10:15	Vendor and Book Exhibitions	Chestnut
8:00-8:50	Coffee and Pastries	Chestnut
8:05-8:40	Department Chairs' and Liaisons' Meeting	2069
8:05-8:40	Committee on Local Arrangements	2036
8:50-8:55	Announcements; Student Team Competition Results	Chestnut
8:55-9:55	**Invited Address: "Permutations in Graph Puzzles"** *Douglas Ensley, Shippensburg University*	Chestnut
9:55-10:15	**Break**	Chestnut
10:25-11:40	**Contributed Paper Sessions**	Coffelt, Gallery, Jones, Ohio
11:50-12:50	**Retiring President's Address: "Will it Go 'Round in Circles? Will it Ride Smoothly on Bumpy Ground? (YEAH)"** *Don Hunt, Ohio Northern University*	Chestnut
12:50	Closing Remarks	Chestnut

Abstracts of Invited Addresses

Friday, March 25

Speaker: Jennifer Quinn
Title: *Combinatorialization of Linear Recurrences through Weighted Tilings*

Abstract: Binet's formula for the nth Fibonacci number, $\frac{\phi^n - \bar{\phi}^n}{\sqrt{5}}$ is a classic example of a closed form solution for a homogenous linear recurrence with constant coefficients. Proofs range from matrix diagonalization to generating functions to strong induction. Could there possibility be a better way? A more visual approach? A combinatorial method?

Speaker: Gordon Swain
Title: *On Lines and Parabolas, Again and Again*
Abstract: We all know that the development of mathematics has been driven by difficult problems, for example: *solving polynomials, squaring the circle, planetary motion*, or *Fermat's Last Theorem*. We won't look at these, but instead at an "easy" problem, the squaring of the parabola, which was solved long ago but has persisted as a problem to be tackled by many mathematicians since.

Speaker: Douglas Ensley
Title: *Invariants under Group Actions to Amaze Your Friends!*
Abstract: By understanding invariant properties of a group action (a.k.a., shuffling) on a deck of cards, a magician can find order where the spectator believes he or she has created disorder, often resulting in a surprising (perhaps even magical) effect. This presentation will present some specific card tricks that illustrate the idea of invariance.

Saturday, March 26

Speaker: Douglas Ensley
Title: *Permutations in Graph Puzzles*
Abstract: This presentation will focus on permutations as they arise from some everyday situations; provided, that is, that you are the kind of person who plays with puzzles every day. We will start with the classic "fifteen puzzle" and work toward Wilson's seminal 1974 puzzle that neatly ties together some fundamental ideas from group theory and graph theory. Along the way, we will talk about other commercial puzzles based on the basic idea, other "recreational" sources of interesting questions about permutations, and some real-world applications of the ideas in Wilson's paper.

Speaker: Don Hunt
Title: *Will it Go 'Round in Circles? Will it Ride Smoothly on Bumpy Ground? (YEAH)*
Abstract: The circle is nature's perfect wheel! By that I mean that on an even roadway a circular wheel provides a perfectly smooth ride.

But what about other shapes for wheels? For example, if the roadway had just the right bumps in it, a square wheel would provide a smooth ride. We'll examine the mathematics behind such a road surface. We'll also look at other regular polygonal shaped wheels, and then generalize to any convex shaped wheel.

Along our smooth ride we will investigate a particular circle-like wheel shape known as a pseudo-circle. There is an interesting story associated with pseudo-circles involving a tragic event in America's past. The talk will finish with a brief discussion of this event.

Brief Biographies of Invited Speakers

Jennifer Quinn, University of Washington, Tacoma

Jennifer Quinn (jjquinn@u.washington.edu) earned her BA, MS, and PhD from Williams College, the University of Illinois at Chicago, and the University of Wisconsin, respectively. She is currently the Associate Director for Interdisciplinary Arts & Sciences at the University of Washington Tacoma (UWT), where she is working to build a mathematics curriculum on the expanding campus. Prior to joining UWT, she served as Executive Director of the Association for Women in Mathematics and before that spent more than a decade as a faculty member at Occidental College in Los Angeles. She was co-editor of MAA's *Math Horizons* from 2004-2009 and co-authored the Beckenbach Award winning book *Proofs That Really Count*, both with Arthur Benjamin. Winner of the MAA's Haimo Award for Distinguished Teaching, Jenny thinks that beautiful proofs are as much art as science and, as such, should be enjoyed by everyone.

Gordon Swain, Ashland University

Gordon Swain is a Professor of Mathematics at Ashland University, where he has been teaching for 17 years, as well as dabbling in department leadership and campus troublemaking. While still interested in noncommutative rings, he finds himself often distracted by his growing collection of random material about mathematicians who were fond of parabolas. When he isn't trying to enrich his students' lives, he runs, reads, and hangs out with his fabulous wife and two boys.

Douglas Ensley, Shippensburg University

Doug Ensley is Professor of Mathematics at Shippensburg University, where he has been on the faculty since 1993. His first leadership position in mathematics came as co-captain of the Grissom High School Math Team under legendary faculty advisor Mrs. Dorothy Wendt. From there, Doug proceeded to receive his BS in Mathematics from the University of Alabama at Huntsville and his MS and PhD (model theory) from Carnegie Mellon under the direction of Michael Albert. He taught for many summers at the Pennsylvania Governor's School for the Sciences and he served as Visiting Mathematician at the MAA headquarters in 2000. His primary academic interests are in discrete mathematical topics and the use of technology in teaching mathematics.

Doug has been PI on an NSF grant to develop technology-based learning material for the student-centered teaching of mathematical proof, which is incorporated in his textbook, *Discrete Mathematics: Mathematical Reasoning and Proof with Puzzles, Patterns and Games*, co-authored with Dr. Winston Crawley of Shippensburg. More recently he co-founded (with Dr. Barbara Kaskosz of the University of Rhode Island) the website,www.flashandmath.com, which received the 2009 ICTCM Award for Excellence and Innovation with the Use of Technology in Collegiate Mathematics.

Doug is a proud member of the inaugural 1994-95 class of Project NExT and a chronic organizer of paper sessions, minicourses, and summer workshops. He is a big fan of the MAA PREP program, and he is immediate past chair of the WebSIGMAA special interest group. Within the Eastern Pennsylvania-Delaware section, Doug has worn many hats including Section NExT coordinator, Vice Chair, Chair, and Governor. Doug was the first (and only) editor of the MathDL Digital Classroom Resources and saw its transition to its current state as Loci Resources. In addition, he has served on the Advisory Board of MathDL for as long as it has existed.

His website: http://webspace.ship.edu/deensley/

Don Hunt, Ohio Northern University

Don Hunt holds a B.S. in Mathematics from Baldwin-Wallace College and a M.S. in Statistics from Case Western Reserve University. He earned his Ph.D. at the Ohio State University in complex variable theory under Frank Carroll. Don joined the Ohio Northern University faculty in fall 1999, where he currently serves as chairman of the Department of Mathematics and Statistics. Since 2000 he has been the faculty advisor to the Ohio Eta chapter of Kappa Mu Epsilon, the mathematics honor society at Ohio Northern. He is also a two-time holder of the Reichelderfer Endowed Chair in Mathematics. In addition to his normal duties, Don coordinates the school's high school outreach events, The Mathematics Shootout and Math Awareness Day. Don has been active in the Ohio Section over the past dozen years, serving as local arrangements coordinator for the 2004 summer short course, and serving on and chairing both CONSACT and the Program Committee. He currently serves as president of the section. Don enjoys his peaceful existence in the beautiful rolling flatlands near Ada, living in his barn and trying to make it into house and home.

Contributed Paper Sessions

Friday, March 25 *= student speaker

Time	Coffelt Session Chair: Thomas Dence	Gallery Session Chair: Drew Pasteur	Jones Session Chair: Adam Parker	Ohio Session Chair: David Singer
4:25-4:40	**Niko Blankenship *** **Ashland University** "A Different Look at March Madness"	**M B Rao** **University of Cincinnati** "Discrete Deconvolution Problems"	**Alex Griffith *** **Wittenberg University** "Stream Cipher Security and Register Taps"	**Patrick Haggerty *** **Oberlin College** "Intro to Ternary Transposition Sorting"
4:45-5:00	**Thomas Dence** Ashland University "Quadratic, cubic, and quartic residues modulo a prime"	**Shelly McGee** The University of Findlay "Error analysis of a 2 domain FD model"	**Brian Harrison II *** John Carroll University "From Primes to Polygons"	**Benjamin Jakubowski*** Oberlin College "Ternary Transposition Sorting Lower Bounds"
5:05-5:20	**Donald Dottei *** Ashland University "Baseball's Record Breaking Math"	**Mohammad Ahmad *** College of Wooster "NFL predictions using Artificial Neural Netw	**Bob Short *** John Carroll University "Generalizing the Collatz Conjecture"	**Rebecca Uhlman *** Oberlin College "Ternary Transposition Sorting Upper Bound"
5:25-5:40	**Nikki Peterson *** Ashland University "Sequences and Balanced Distributions"	**Dustin Eisele *** College of Wooster "Modeling Juror Decisions with Neural Network"	**Mahmoud Rawashdeh** Jordan University of Science and Technology "Minimal Matrix Representations of Turkowski's Six-dimensional Lie Algebras"	**Ann Triplett** Mount Union College "Mathematical Curiosities of the 24 Game"
5:45-6:00	**Alayna Ruggles *** Ashland University "Weird Dice"	**Bridget Kraynik *** College of Wooster "How The Human Population Boom Affects Us"	**Kevin Stoll *** **Baldwin Wallace College** "Estimating Variance-Mean Mixtures of Normals"	**Mark de Saint-Rat** Miami University "Mars Hill or Katahidin Sunrise?"
6:05-6:20	**Polly Widmer *** Ashland University "To Be, or Not to Be, Dry!"	**Jason Van Houten *** College of Wooster "Neural Network Enzyme Specificity Prediction"	**Ryan Yoder *** Defiance College "Pythagorean Triangles and Differences"	**David Cusick** Marshall University "No Matter How You Slice It, ..."

Contributed Paper Sessions

Saturday, March 26 ***= student speaker**

Time	Coffelt Session Chair: Matt Metzel	Gallery Session Chair: Brian Shelburne	Jones Session Chair: Phil Blau	Ohio Session Chair: Jay Kerns
10:25-10:40	**Molly Eickholt *** Ohio Northern University "Simplifying Ford Links"	**Gregory Urbanski *** Cleveland State University "An Intuitive Look at the Poincare Conjecture"	**Jonathan Bartles *** Case Western Reserve University "On a conjecture of Erdos and Straus about Egyptian Fractions"	**Matthew Alexander *** Youngstown State University "Not The Usual Triangle Inequality"
10:45-11:00	**Kristin Elix *** Ohio Northern University "Maximizing The Product of Two Multi-Digit Numbers"	**Thomas Hern** Bowling Green State University "Now I Understand Exhaustion!"	**Kara Biltz *** Ashland University "Probability and the Platonic Solids in Yahtzee"	**David Bertleff *** Youngstown State University "Modeling PGA Golfer Earnings"
11:05-11:20	**David Mangus *** Ohio Northern University "Ways in Which I was Wrong"	**Joseph Glaser *** Cleveland State University "Intro to Tensors in Physics"	**Robert Fraser * & Michael Steward *** Case Western Reserve University "A Banding Result for Totally Nonnegative Matrices of Class 3."	**Lisa Curll *** Youngstown State University "A Differential Equation Model for Stochastic Riparian Ecosystems"
11:25-11:40	**Kristine Rosendale** **Ohio Northern University** "Development of a First-Semester Transition Course for Freshmen"	**David Meel** **Bowling Green State University** "Projects in Elementary Linear Algebra"	**Kevin Johns *** Xavier University "Frieze Groups"	**Alyssa Krumpak *** **Youngstown State University** " Gender Differences In High School Students' Drug Use"

Abstracts of Contributed Papers

Friday 4:25 – 4:40 PM

"A look at two different styles of non-traditional NCAA Tournament Pools"

Niko Blankenship
Ashland University

Abstract 1: " On the second Sunday in March when the NCAA announces its tournament field (this will mark the first year the number of teams is 68), many businesses, or groups of friends get together in a pool of who can predict the bracket most accurately. Based on the statistics of the previous 26 tournaments, this talk will take a look at who you should pick in some of the non-traditional pools to give you the best chance to win. This talk will also take a look at a study published in Math Horizons in 2000, and see if the suggested picks remain the same based on the statistics of the last ten tournaments."

"Discrete Deconvolution Problems"

M B Rao
University of Cincinnati

Abstract 2: "Suppose X and Y are two independent Bernoulli random variables, each taking values 0 and 1. We can determine the distribution of X + Y on 0, 1, and 2. We look at the converse problem. Suppose we know a distribution on 0, 1, and 2. Are there Bernoulli random variables X and Y such that the distribution of X + Y is precisely the one given? This is the focus of my talk. Some applications will be outlined."

"The Effect of Register Taps in the SAT-Based Cryptanalysis of Stream Ciphers"

Alex Griffith
Wittenberg University

Abstract 3: "Crypto1 and Hitag2 are two well-known stream ciphers that are quite similar in structure. Despite their similar designs, they differ in their resistance to algebraic attacks. Both have been broken using SAT-solvers, but the fastest published attack against Hitag2 is over 6 hours, while Crypto1 has been broken in under a minute. In this talk we examine experimentally how register taps and non-linear functions (NLFs) affect the security of stream ciphers against algebraic cryptanalysis, using modified versions of Crypto1 and Hitag2 as test subjects. Additionally, using data from manually created and random tap configurations, we create a metric that relates three characteristics of a tap configuration (distance, regularity, and inclusion) to cipher security."

"Transposition Sorting of Ternary Strings, I: Introduction"

Patrick Haggerty
Oberlin College

Abstract 4: "The problem of sorting permutations has been extensively studied, in part because of its applications in genomics. Here we study parallel questions for strings allowing repeated characters. We examine several types of moves that can sort strings, but focus on transposing adjacent blocks: for example, one transposition can take 012012020 to 001122020. We are interested in determining the exact minimum number of transpositions required to sort a given string. The binary case is fully understood (Christie and Irving), so we look at strings containing 3 distinct characters. We expect the ternary case to be more difficult, and indeed it is. In this talk we show how to put strings into standard form and classify the effects that transpositions can have on block and transition counts. (Joint work with Ben Jakubowski and Rebecca Uhlman.)"

Friday 4:45 – 5:00 PM

"Residues modulo a prime"

Thomas Dence
Ashland University

Abstract 5: "Numbers A, where 0 < A <m, which satisfy the congruence x^k congruent A (mod m) are known as kth order residues modulo m. In the talk I will examine the cases where m is an odd prime, and k = 2,3,4 and give some results, some of which are common to most number theory textbooks."

"Error analysis for a two-domain advection-diffusion finite difference model in cylindrical coordinates with a permeable membrane"

Shelly McGee
The University of Findlay

Abstract 6: "Chemical transport in blood flow allows for a discontinuous concentration across a selectively permeable membrane. The model discussed herein models chemical transport in two cylindrically defined domains, where continuity of the concentration is not enforced at the interface, however, the continuity of the velocities across the domains is enforced at the interface. The advection-diffusion equation in cylindrical coordinates with radial symmetry is applied to both domains and solved combining finite difference methodology with the Additive Schwarz domain decomposition method, where the interface between the two domains is modeled as a permeable membrane. The error for the two domains is investigated. Numerical results will be presented."

"From Primes to Polygons"

Brian Harrison II
John Carroll University

Abstract 7: "While I was trying to discover my own proof that there are infinitely many primes, I noticed a pattern in the multiplication table. This pattern is that, if a rhombus, specifically

oriented, is overlaid on the table, the sum of the values along one diagonal, and of those along the other, are equal. I will explore a generalization of this property in the Cartesian plane, and present a related result about regular polygons in the plane."

"Transposition sorting of ternary strings, II: Lower Bounds"

Benjamin Jakubowski
Oberlin College

Abstract 8: "A transposition of a string exchanges two consecutive substrings of characters: for example, one transposition can take 012012020 to 001122020. We present two lower bounds for transposition sorting of ternary strings. First, we prove a naive lower bound, then demonstrate its inadequacy by producing a family of strings for which the difference between the length of the optimal sorting path and the lower bound is itself unbounded. This failure motivates development of an improved lower bound, which uses the structure of allowed transitions in a more careful way. (Joint work with Pat Haggerty and Rebecca Uhlman.)"

Friday 5:05 – 5:20 PM

"Baseball's Record Breaking Math"

Donald Dottei
Ashland University

Abstract 9: "Henry Aaron passed Babe Ruth's Major League Baseball Home Run Record by hitting his 715th homerun on April 8th, 1974. Soon after Carol Nelson, David E. Penney, and Carl Pomerance noticed the summation of the prime factorization of the consecutive integers 714 and 715 are equal. The consecutive integer pairs that are like (714,715) became known as Ruth-Aaron pairs. On August 7th, 2007 Barry Bonds passed Aaron's homerun mark by hitting his 756th home run. Like the Ruth-Aaron pairs, the integers 755 and 756 prime factorizations summations are equal but only when you consider each digit of the prime factors as a separate integer. Numbers similar to (755,756) were referred to as Aaron-Bonds pairs by Douglas E. Iannuacci. This presentation will investigate these two groups of numbers and how they change when only distinct prime factors are used."

"NFL predictions using Artificial Neural Networks"

Mohammad Ahmad
College of Wooster

Abstract 10: "Using statistical data such as passing yards, rushing yards, and fumbles lost, a model was created to investigate the effectiveness of artificial neural networks in NFL predictions. Analysis was conducted on the model to determine the effects of each individual offensive and defensive statistic. To refine the accuracy of the model in predicting future games, a committee of machines was created, using aggregate results of many simulations to make a pick. The project presented an opportunity to learn about the design and application of neural networks and also to consider several aspects of statistical analysis. This talk is based on joint work with Michael Janning, John David, and R. Drew Pasteur."

"Generalizing the Collatz Conjecture"

Bob Short
John Carroll University

Abstract 11: "In number theory, the Collatz Conjecture is an unsolved problem which states that for a very specific function, there is a unique result. About a year ago, I came across the conjecture and it immediately captured my attention. However, when I had immense difficulty proving it, I decided to generalize the function which generates the problem and look for qualities common to all such functions. Here, I will be discussing the basis of my ideas and how to prove at least one of my results."

"Transposition sorting of ternary strings, III: A Nearly Sharp Upper Bound"

Rebecca Uhlman
Oberlin College

Abstract 12: "A transposition of a string exchanges two consecutive substrings of characters: for example, one transposition can take 012012020 to 001122020. We introduce a simple greedy algorithm for transposition sorting ternary strings and show that it uses at most two more moves than a known lower bound. This allows us to determine, within two, the exact minimal number of transpositions required to sort a given ternary string. (Joint work with Pat Haggerty and Ben Jakubowski.)"

Friday 5:25 – 5:40 PM

"Sequences and Balanced Distributions"

Nikki Peterson
Ashland University

Abstract 13: "Imagine that you are standing in front of a finitely numbered row of boxes, B1, B2, B3, ... , Bm, and there exists k = (m)(n) objects. These k objects have been distributed into the boxes randomly, with no particular goal in mind. Depending on a restricted sequence of moves, this presentation will examine whether or not it is possible to redistribute these objects equally among the boxes, so that n objects are in each box. Varying subscript sequences, such as the squares and the Fibonacci sequence, will also be applied to the boxes, in order to observe what effect they may have on the allowable moves a person can make and the successful redistribution of the objects."

"What Factors Really Affect Jurors' Decisions:
A Mathematical Modeling Approach to a Psychological Question"

Dustin Eisele
College of Wooster

Abstract 14: "A limitation of psychological law is that psychologists are only able to examine a few variables at a time, before the analysis becomes too complex. Research has shown eyewitness testimony, DNA testimony, and expert testimony, as well as that the race and gender of the plaintiff, defendant and juror all affect the outcome of a criminal case and the effects are

not necessarily independent. This study involved 750 participants, each seeing a different combination of case information. To examine the interactions among all of the variables, a committee of artificial neural networks is used to make mock-juror guilt predictions in a mock trial, given a certain set of parameters. Evidence is a key driver in the guilt predictions, but there are still some differences when examining other variables. This talk is based on joint work with R. Drew Pasteur and Gary Gillund. "

"Minimal Matrix Representations of Turkowski's Six-dimensional Lie Algebras"

Mahmoud Rawashdeh
Jordan University of Science and Technology

Abstract 32: "Ado's Theorem asserts that every real Lie algebra g of dimension n has a finite-dimensional faithful representation as a subalgebra of gl(p;R) for some p. The theorem over no practical information about the size of p in relation to n and in principle p may be very large compared ton. Burde defines the invariant to be the minimum value of p. In general, except in some special cases, it is hard to decide the exact $m(g)$. It is not easy to give a suitable estimation on $m(g)$, either, especially in the cases of solvable and nilpotent Lie algebras. This thesis forms part of a series devoted to the problem of finding minimal matrix representations for low-dimensional Lie algebras. We are bconcerned with finding a faithful representation with a minimal dimension for every Turkowski's Lie algebra in dimension six. More precisely, a matrix Lie group is given whose Lie algebra corresponds to each Lie algebra in Turkowski's list. In addition, a basis for the right-invariant vector fields that are dual to the Maurer-Cartan forms are given thereby providing an effective realization of Lie's third theorem."

"Mathematical Curiosities of the 24 Game"

Ann Triplett
Mount Union College

Abstract 16: "The 24 Game is a commercially available game that is made by Nasco. You are given a card with four digits taken from the digits 1-9. The object is to add, subtract, multiply and/or divide to get a result of 24. The rules state that you must use all four digits on a card and you must use each digit only once. The game sounds easy, but most people find it very challenging. The only mathematics used is at a basic level. Why would a mathematician get so interested in this game? Here are a few questions about the 24 game that I would like to discuss: Are some cards more difficult to solve than others? If so, what makes one card more difficult than another card? How many cards could you make using the four digits? Which cards are impossible? What does impossible really mean? Why is the number 24 used?"

Friday 5:45 – 6:00 PM

"Weird Dice"

Alayna Ruggles
Ashland University

Abstract 17: "Rolling doubles with an ordinary set of dice is a challenge, but what if the dice were numbered differently, or what if the dice had less than six sides, or more than six sides? This presentation will analyze how altering the dice, the way the dice are numbered and the number of sides, could be advantageous. Looking at dice with different numbers of sides and different digits on each face, we can see whether these properties will affect the probability of rolling various sums and, actually, which digits would be best to have on the dice to keep the probabilities the same. Could there be multiple ways to label dice so they will always have the same probability for various sums?"

"Boom! How The Human Population Explosion Affects Our Future"

Bridget Kraynik
College of Wooster

Abstract 18: "Mathematics is an important tool for scientifically analyzing aspects of our daily lives. I focus my research on that of human population growth and how it will affect our world. I use mathematical models and real population data to analyze human population growth and incorporate factors such as development status, fertility and mortality rates, and age distribution. I first model how population growth affects resource usage and hypothesize how changes in oil consumption rates in the major consuming countries will affect the long-term usage of oil globally. Lastly I estimate how the changing age distribution within the United States will affect the future of Social Security. I conclude with a summary of my results and stress the importance of using mathematics to gain a better understanding of the world around us. This talk is based on joint work with John David"

"Estimating Variance-Mean Mixtures of Normals"

Kevin Stoll
Baldwin Wallace College

Abstract 19: "In this presentation, we will introduce a new method, NVM_UNMIX for estimating the density function of Normal variance-mean mixtures. This new method is a manipulation of the previously developed Normal scale mixture program UNMIX (Hamdan et al., 2005). NVM_UNMIX is designed to model Normal variance-mean mixtures by minimizing the weighted square distance between an empirical density and the theoretical mixture, taking into account any factors that effect the variability of the estimates. This modeling technique is then evaluated using several simulated examples and is compared to the Bayesian approach in a couple of real life situations. It was found, from the simulation that NVM_UNMIX appears to perform with efficiency and precision."

"Location of First Sunrise in the . 48"

Mark de Saint-Rat
Miami University - Oxford

Abstract 20: "A January 1 1972 article in Yankee Magazine by Blanton C Wiggin is commonly quoted when considering the first sunrise in the lower 48.
October 7 to March 6: Cadillac Mountain, Maine
March 7 to March 24: West Quoddy Head Lighthouse, Lubec, Maine

March 25 to September 18: Mars Hill, Maine
September 19 to October 6: West Quoddy Head Lighthouse, Lubec, Maine.
With tables provided by the Naval Observatory giving the altitude and azimuth of the sun, and new software incorporating standard surveying allowances for refraction and giving distances to the horizon from any geographical point in the United States and at any heading I will consider the question as to the possibility of a Katahdin sunrise preceding that of Mars Hill during the spring and summer."

Friday 6:05 – 6:20 PM

"To Be, or Not to Be, Dry!"
Polly Widmer
Ashland University

Abstract 21: "Think about the last time you began running to get out of the rain. Could you have run slower and still been exposed to the same amount of rain or maybe even less? Should you have run faster to stay drier? These questions are answered for a two-dimensional rectangle in the November 2009 Math Horizons article "Soggy Jogging in Flatland: A 2D Analysis of Running in the Rain." • In this presentation, these questions will be explored for an equilateral triangle with four different orientations in a vertical rain using geometry and trigonometry. It will focus mainly on whether a triangle with a side perpendicular to the ground should travel forwards or backwards in the rain and the speed that it should travel."

"Predicting Substrate Specificity in an Enzyme Family using Artificial Neural Networks"
Jason Van Houten
College of Wooster

Abstract 22: "Phosphagen kinases are an enzyme family found throughout the animal kingdom. In humans, as well as other species, these enzymes help regulate energy homeostasis. Within this enzyme family, there are a variety of different subgroups of enzymes that use slightly different substrate molecules to carry out their reaction. There are differences in the amino acid chains not only among the subgroups, but also within each subgroup. The aim of this study was to use artificial neural networks to recognize patterns in one subgroup, called arginine kinases, and then to create a predictive model applicable to other enzymes. The network was trained separately with inputs of three different properties for each amino acid position in the sequence. The networks were analyzed on their accuracy to predict whether or not a given protein was an arginine kinase, and we achieved accuracy as high as 89%. This talk is based on joint work with Dean Fraga and R. Drew Pasteur."

"Pythagorean Triangles and Differences"
Ryan Yoder
Defiance College

Abstract 23: "There are a few interesting patterns that can be found in consecutive Pythagorean Triangles. These triangles are generated using one of Pythagoras's methods, and each triangle will have a consecutive odd number as one of the legs. With the triangles found, the

hypotenuses, perimeters, areas, and volumes will be analyzed in their differences. There will be a special appearance by another triangle that may surprise people not expecting it!"

"No Matter How You Slice It, ..."

David Cusick
Marshall University

Abstract 24: "An ordinary, Egyptian-type, pyramid with a square base provides several opportunities to create integrals which calculate its volume. This is an easy subject which is clearly accessible to students in calculus II. "

Saturday 10:25 – 10:40 AM

"Simplifying Ford Links"

Molly Eickholt
Ohio Northern University

Abstract 25: "This paper discusses the relationship between Ford Circles and their fractional representation, Ford Fractions, involving Farey operations. Properties and patterns dealing with the Fractions are also explored and discussed. The fractional representation is then used to develop Ford Links. Questions about adding Ford Links together and simplifying are addressed."

"An Intuitive Look at the Poincare Conjecture"

Gregory Urbanski
Cleveland State University

Abstract 26: "Is a football actually a sphere? What about a donut? The Poincare Conjecture, which answers these questions, could not be proved for nearly a century. After becoming one of the most notorious problems in mathematics, it was solved by Grigori Perelman in 2002. In this presentation, we will take a look at the problem and its proof from an intuitive viewpoint, explaining concepts such as compactness, simply connected, homeomorphisms, and provide an overview of Grigori Perelman's proof. No background in topology is required."

"On a conjecture of Erdos and Straus about Egyptian Fractions"

Jonathan Bartles
Case Western Reserve University

Abstract 28: "This talks looks at Egyptian Fractions and a conjecture of Erdos and Straus about them."

"Not The Usual Triangle Inequality"

Matthew Alexander
Youngstown State University

Abstract 29: "We will consider problem 11527 from the October 2010 American Mathematical Monthly concerning an inequality relating the side lengths, inradius and circumradius of a triangle. We will use various trigonometric identities, Chebyshev's inequality, and Jensen's inequality to arrive at a solution."

Saturday 10:45 – 11:00 AM

"Maximizing The Product of Two Multi-Digit Numbers"

Kristin Elix
Ohio Northern University

Abstract 30: "This presentation is an extension of a problem Christy D. Graybeal poses in her article, "Whole Number Multiplication: There's More to It Than Might Be Expected!" • found in the November 2007 issue of Mathematics Teacher. In this article, Graybeal asks readers to arrange the digits 5,6,7,8, and 9 into a three-digit number and a two-digit number so that they produce the largest product. This presentation extends this problem by determining patterns for arranging digits to form an m1-digit number and an m2-digit number, where m1 m2, so that they produce the largest product. "

"Now I Understand Exhaustion!"

Thomas Hern
Bowling Green State University - Main

Abstract 31: "The Method of Exhaustion of the Greeks was used to find the area of a circle, and the volume of a cone, etc. This comes from Eudoxus of Cnidos (408-354 BC), and appears as Prop. 1 in Book X of Euclid's "Elements". This is actually more rigorous than the usual 'see, the areas of inscribed polygons approach the area of the circle' argument. The Greeks were better than that. And why then, didn't they invent the Calculus, and why did that take another millennium and a half?"

"Exploring the Platonic Relationship Between Probability and Yahtzee"

Kara Biltz
Ashland University

Abstract 33: "Yahtzee is a well-known game which consists of thirteen turns. During a turn, a player can roll five six-sided dice up to three times to get the highest scoring combination for one of the categories on his/her score card. Consider a variation of the game consisting of five distinct dice with four, six, eight, twelve, and twenty sides. These dice are the five Platonic Solids, three dimensional figures with faces of regular polygons. In this talk, we will look at the probabilities and expected values which correlate to the Platonic Solids variation of Yahtzee, and how these calculations compare to those for the actual game. "

"Modeling Professional Golfer Earnings with Microdata: A Multiple Regression Approach Incorporating Rank"

David Bertleff
Youngstown State University

Abstract 34: "This study attempts to examine the earnings of a professional golfer by gathering and improving on the methodology used in prior research. Using individual tournament data from the 2009 season, multiple regression can be utilized to explain the variation in earnings for a given tournament. Incorporating a player's final rank as an independent variable provides better results since the prize structure of professional golf relies ultimately on final rank. Also, adjusted statistics are developed in attempt to remove bias for individual golfer and course effects. Interesting results are discovered and a potential prize schedule for golfers who end in a tie is developed."

Saturday 11:05 - 11:20 AM

"Ways in Which I was Wrong"

David Mangus
Ohio Northern University

Abstract 35: "In the Fall of 2010, Dr. Robinson, who is a statistics professor at Ohio Northern University proposed a "Problem of the Week" that posed the question "what is the smallest integer that has x amount of divisors, where x is some positive integer?" • The method that I used to find a pattern was to examine the prime factorization of x. I found that subtracting 1 from each prime factor and raising the sequence of prime numbers in ascending order to those powers yielded the smallest number with x divisors. Dr. Hunt, a math professor, explained to me that although this method works some of the time, there are many cases in which it doesn't work. We examined several of these cases and developed a method for providing examples where our previous technique of using the prime factorization of x does not yield the smallest positive integer with x divisors."

"Introduction to Tensors with Applications in Special/General Relativity"

Joseph Glaser
Cleveland State University

Abstract 36: "This talk will focus on the mathematics behind basic tensors and their applications. The talk will, for the most part, be informative regarding the mathematical properties of tensors. However, it will also touch on their most widely used application in the Theory of Special/General Relativity. Basic knowledge of differential geometric concepts is suggested for some material, but not required for the entirety of the talk as this is just an introduction to the subject of tensor applications."

"A banding result for Totally Nonnegative Matrices of Class 3."

Robert Fraser and Michael Steward
Case Western Reserve University

Abstract 37: "A matrix is said to be totally nonnegative of class k (TNk) if all of its minors of size at most k are nonnegative. The solution to the inverse-eigenvalue problem for 3-by-3 TN2 matrices makes use of the fact that any 3-by-3 TN2 matrix is similar to a tridiagonal 3-by-3 TN2 matrix. In this paper, we prove a banding result for TN2 and TN3 matrices that extends the corresponding fact for 3-by-3 TN2 matrices."

"A Differential Equation Model for Stochastic Riparian Ecosystems"

Lisa Curll
Youngstown State University

Abstract 39: "Zoar Valley, in New York State, contains one of the last Old-Growth riparian forests in the northeastern United States. The valley is subject to diverse river conditions which erode and recreate portions of the valley floor and change the characteristics of the environment. Field data were analyzed and divided into classes based on quantities like basal area and shade tolerance. These results directed the synthesis of categories for an ordinary differential equation model of the successional development of landforms over time. Given an approximate age of a landform, the model predicts the number of juvenile and adult trees present in early- or late-successional categories and solves for future steady-states. The model also includes a stochastic term for irregular and random flood events based on USGS data from the past 80 years. Funded by NSF grant DBI-0827205."

Saturday 11:25 – 11:40 AM

"Development of a First-Semester Transition Course for Freshmen"

Kristine Rosendale
Ohio Northern University

Abstract 40: "Making the move from high school to college can be daunting for students. This talk will briefly describe one of many courses being developed in ONU's College of Arts & Sciences designed to bridge this transition. The general theme of this particular course being offered through the Department of Mathematics and Statistics is personal finance."

"Projects in Elementary Linear Algebra"

David Meel
Bowling Green State University - Main

Abstract 41: "In this talk, we will discuss some of the projects and activities that I've used over the years to help Elementary Linear Algebra students explore linear algebra concepts. Topics ranging from marriage laws to predator-prey models will be discussed to illustrate the range of possible activities that can be incorporated into a linear algebra class."

"Gender Differences In High School Students' Drug Use"

Alyssa Krumpak
Youngstown State University

Abstract 42: "This study intended to investigate the gender differences in high school students' drug use, refusal techniques, and school education received. A sample of 393 students from three high schools in the Midwestern United States were surveyed during 2010. Data were collected in a classroom setting by using a self-developed questionnaire. The cross-sectional survey was anonymous and conducted with the permission of human subject conduct and participating school authorities with parental consent. Data were analyzed by using SPSS software."

"Frieze Groups"

Kevin Johns
Xavier University

Abstract 15: "In the field of abstract algebra, one of the more widely studied subjects is that of symmetry groups, groups formed by the set of symmetries of an object. Frieze groups are a specific type of symmetry groups created by the symmetries of a frieze pattern, a periodic pattern that exists on an infinitely wide strip of the plane. The goal of this presentation will be to provide an introduction to the seven known frieze patterns and their corresponding symmetry groups and also provide a brief sketch of the proof that only these seven frieze patterns exist."

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Announcement Fall 2011 Section Meeting

The Ohio Section of the Mathematical Association of America will hold its annual Spring meeting on **October 21-22, 2011**, at the University of Findlay. The invited speakers for that meeting are Sergei Tabachnikov of Penn State University, George Francis of the University of Illinois, Dick Little of Baldwin-Wallace College, and Mark Meckes of Case Western Reserve University. More details, including submission information for contributed talks from faculty and students, will be forthcoming in the Fall edition of the Ohio Section newsletter and also on the Ohio Section web site, **www.maa.org/ohio.**