MO MAA Conference – Presentation Abstracts

Alphabetized by Presenting Author's Last Name

Presenting Author:	Kevin Anderson
Author(s):	Kevin Anderson
Presenter is:	Faculty
Institution:	Missouri Western State University
Paper Title	How to Japanese Abacus (Soroban)

Abstract:

This is a hands on talk where you will learn to use an abacus (soroban) to do basic computations (addition, subtraction, multiplication, division). Time permitting we may also highlight other "old" computational devices such as the slide rule.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Tric Courtaway
Author(s):	Tric Courtaway
Presenter is:	Undergraduate Student
Institution:	Northwest Missouri State University
Paper Title	Visualizing Groups of Order 8

Abstract:

There are 5 algebraic groups of order 8: the dihedral group D4; the cyclic groups and their crosses Z2 x Z2 x Z2, Z2 x Z4, and Z8; and the quaternion group Q. Shepherd previously constructed a cross-stitch visualization of the subgroups and cosets of D4 and a quilting version of the group Z2 x Z4. Along the same vein, we will discuss our process of developing craftable representations of the other order 8 groups.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Connor Daniels
Author(s):	Connor Daniels
Presenter is:	Undergraduate Student
Institution:	Northwest Missouri State University
Paper Title	An Exploration of the Randomness of Pi Across Multiple Bases

Abstract:

We will explore how to generate pi in other bases, and then we report on statistical tests to consider the randomness of the digits of pi in different bases.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Kim Druschel
Author(s):	Kim Druschel, Katie Radler, Mike May, Sadita Salihovic
Presenter is:	Faculty
Institution:	Saint Louis University
Paper Title	A Partially Flipped Statistics Course with In -Context Projects for Nursing and Physical Therapy Students

Abstract:

This talk reports on a partially flipped statistics course which is taken primarily by nursing and physical therapy students. The course is partially flipped to allow students time to work on team projects relating the statistics just taught to their major. Students' projects include: 1) finding and reporting on statistical concepts in articles from the health care field 2) exploring Medicare data used in public websites about hospital care and health care disparity 3) explaining how different statistical concepts might arise in their work. The course is currently being implemented in all sections of SLU's STAT 1100 and data on students' perceptions of statistics and performance is being collected.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Matthew Enlow
Author(s):	Matthew Enlow, Dr. Nicholas Baeth
Presenter is:	Undergraduate Student
Institution:	University of Central Missouri
Paper Title	Multiplicative factorization in numerical semigroups

Abstract:

Numerical semigroups are subsemigroups of the natural numbers whose additive factorization theory has been widely studied. Their multiplicative factorization, however, has not been as extensively researched. One does not have to look hard to find examples of elements in these semigroups with non-unique factorizations. That is to say, there are elements that can factor in different ways as products of atoms --- elements that themselves cannot be factored further. The question is, given an arbitrary element of a numerical semigroup, when is said element an atom? Can we describe how different the factorizations of an arbitrary element can be? We have attempted to answer these questions by investigating various arithmetic and algebraic properties of these semigroups. Working inside the natural numbers, we were able to classify some of the more well-behaved atoms and, from this information, deduce a measure of how non-unique factorization must be in each of these semigroups based only on the finite set of elements in their complements.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	David Garth
Author(s):	David Garth
Presenter is:	Faculty
Institution:	Truman State University
Paper Title	Does AAS Imply SAS?
Abstract:	

Euclid, in Book I of the Elements, proved the side-angle-side congruence criterion for triangles (SAS). His proof made use of a principle of superposition, in which one triangle is essentially picked up and placed over another in such a way that the vertices coincide. Mathematicians and philosophers since the time of Euclid have been skeptical of the principle of superposition. As a result, most modern axiomatic systems of Geometry take SAS as an axiom.
Once SAS is accepted, either as a theorem or an axiom, one is able to prove that the angle-angle-side congruence criterion for triangles (AAS) holds. George Martin, in an exercise in his well-known Geometry text, posed the question of whether AAS could replace SAS as axiom in neutral Geometry. The exercise turned out to be pretty hard. In fact, the solution was not known at the time of the publication of the text! It was finally solved in 2010, in a rather round about manner. In this talk, we will present a shorter solution that will hopefully be more accessible to students taking the course.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Ziad Ghanem
Author(s):	Ziad Ghanem
Presenter is:	Undergraduate Student
Institution:	Principia College
Paper Title	Stochastic Analysis, a Study.

Abstract:

Stochastic Analysis is an important branch of mathematics. As our need to simulate more sophisticated systems with higher accuracy increases, so too does our reliance on stochastic modeling. As it is for deterministic systems, calculus must be our analytical tool for the stochastic system. My research introduces the Brownian motion, a stochastic process with broad versatility, and makes the connection between its unique properties and the obstacles in constructing a stochastic calculus (chiefly, non-differentiability and quadratic variation of the Brownian motion). Next, the derivation and application of three variations on Ito's Lemma, and the Ito Integral are considered. Then, Girsanov's theorem is unveiled, affirming a linear relation between the probability distributions of stochastic processes with and without drift, and it is shown that we have built the necessary toolkit to tackle the Radon-Nikodym derivative multiplier. Finally, the relevance of stochastic calculus in gen eral and Girsanov's theorem in particular has to the field of applied mathematics is discussed.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Leon Hall
Author(s):	Leon Hall
Presenter is:	Faculty
Institution:	Missouri S&T
Paper Title	The Missouri MAA "Gauss Meeting" at Lindenwood in 1952
Abstract:	

The 1952 Missouri Section meeting at Lindenwood College in St. Charles was a memorable one. At this meeting,a special tribute was made in honor of Karl Friedrich Gauss, and members of Gauss' family who were then living in St. Charles were introduced at the meeting. Two of K.F. Gauss' sons, Eugene and Wilhelm, immigrated to America in 1830 and 1837, respectively, and both eventually settled in the St. Charles/St. Louis area. The Gauss family members who attended the meeting were Matthew Johns Gauss and his sister Miss Virginia Gauss, plus M.J. Gauss' wife Mary and their son David. Matthew and Virginia Gauss were great-grandchildren of K.F. Gauss. David Gauss was 15 at the time, and he later attended Westminster College in Fulton, graduating in 1958.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Christopher C. Hogan
Author(s):	Christopher C. Hogan
Presenter is:	Undergraduate Student
Institution:	Lindenwood University
Paper Title	Numerical Methods for Solving the Wave Equation

Abstract:
This presentation is concerned with numerical methods for the solution of the two-dimensional wave equations. Two methods are considered: an explicit and an implicit one. Issues of efficiency, accuracy, and stability are considered for these methods on two spatial domains: a square and an L-shaped region. Applications of this research are in the fields of acoustics and electromagnetics.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Michael Hwang
Author(s):	Michael Hwang
Presenter is:	Undergraduate Student
Institution:	Southeast Missouri State University
Paper Title	A Brief Survey of Motzkin Path Pattern Avoidance

Abstract:
By establishing bijections and manipulating recurrence relations, we explore and prove a few attractive properties of Motzkin paths that avoid one or more patterns. In particular, we expand upon a result from the last year's presentation on pattern-avoiding Motzkin paths by Mary Ramey from Southeast Missouri State University, concerning Motzkin paths that avoid "HUD" and those that avoid "UDH."

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Pranish Kotha
Author(s):	Pranish Kotha

Presenter is:	Undergraduate Student
Institution:	Westminster College
Paper Title	Algebro-geometric description of robot gymnastics

Abstract:
Robot kinematics is modeled as the motion of rigid bodies, the description of which is given by representations of the special Euclidean group and its Lie algebra. This talk will introduce necessary background and tools in Lie theory and projective geometry. As an application, the configuration of the screw systems of robots with joints is studied in sufficient generality.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Mike May
Author(s):	Mike May
Presenter is:	Faculty
Institution:	Saint Louis University
Paper Title	Designing Math Courses for Business Students

Abstract:
At SLU, we have been working to design courses for business students that follow the recommendation of the MAA's CRAFTY (Curriculum Renewal Across the First Two Years) Committee. We look at efforts with business calculus, college algebra, and shifts made by the business college.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Lori McCune
Author(s):	David McCune, Lori McCune, and Dalton Nelson
Presenter is:	Faculty
Institution:	Missouri Western State University
Paper Title	The Cutoff Paradox in the Kansas Presidential Caucuses

Abstract:
The Kansas Republican Party uses an apportionment method of its own invention to apportion delegates to candidates in its presidential caucus. In this talk, we will use geometry to describe the apportionment method used and we discuss the Cutoff Paradox, which can occur due to a threshold that eliminates candidates who receive less than 10% of the vote. We use the geometry of the apportionment method to calculate the probability that the Cutoff Paradox occurs in an election.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Jeff Poet
Author(s):	Jeff Poet
Presenter is:	Faculty

Institution:	Missouri Western State University
Paper Title	A Tournament Scheduling Problem

Abstract:
This is a preliminary report on progress made in designing a program to create a schedule for a tournament in which three teams compete in a room at a time. The currently used algorithm uses an exhaustive approach and can take weeks before finding a solution ... or not!

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Paul N. Runnion
Author(s):	Paul N. Runnion
Presenter is:	Faculty
Institution:	Missouri S&T
Paper Title	The Challenges – and Successes – of Remediation in Calculus

Abstract:
Calculus students at Missouri University of Science and Technology arrive in Calculus I having officially met the prerequisite either by transcripted credit or by placement exam, yet they often lack the necessary foundational knowledge – and life skills – to succeed in Calculus I. These students frequently find themselves in a situation where, by midterm, they are almost guaranteed not to pass Calculus I. The Success for Calculus program was designed to provide these students with an opportunity to strengthen their foundational knowledge (and the calculus they've already seen). Students successfully completing this program are showing promising results in future mathematics and other STEM coursework. Information about Success for Calculus and data about its impact on student performance will be presented.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Drew Shotwell
Author(s):	Drew Shotwell
Presenter is:	Undergraduate Student
Institution:	Principia College
Paper Title	Logic as a Calculus of Propositions

Abstract:
This paper catalogs the definitive shift in the history of logic during the 19th and 20th centuries, especially its development from the advent of symbolic logic by George Boole to the comprehensive system of Principia Mathematica. However, more than just a way of concatenating and simplifying logical expressions, the symbolization of logic offers a way of making logic more akin to arithmetic, in that one can deduce new logical formulae from predefined logical axioms, making logic its own discipline in itself, a proper calculus, and not merely to serve the rest of mathematics. In this paper, I explore various consequences of this approach in logic, culminating in Godel's incompleteness theorem, which, taken together with Godel's other results, clarifies the role of logic and metamathematics in the rest of mathematics.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Charlie Smith
Author(s):	Charlie Smith
Presenter is:	Faculty
Institution:	Park University
Paper Title	The Müller Investigation

Abstract:

In De Triangulis Omnimodis, 1464, Regiomontanus (Johann Müller) stated the following theorem. "If the difference of two sides [of a triangle] is given and the difference of the two segments [into which the altitude divides the third side] is known together with the perpendicular itself, all the sides can be found."

Unfortunately, the example which he uses to illustrate his method of solution is flawed. Indeed, the numbers which he chooses for the three conditions lead to a system of equations which is insoluble in positive real numbers.

This talk will explain why such a triangle does not exist, and through rigorous investigation determine modifications to Müller's conditions which will result in a solvable system, thereby leading to a satisfactory conclusion.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Hannah Waine
Author(s):	Hannah Waine
Presenter is:	Undergraduate Student
Institution:	William Jewell College
Paper Title	The Elimination Paradox in the Delegate Allocation Method of the 2012 Georgia Republican Party

Abstract:

The different apportionment methods used in presidential primaries for allocating delegates are affected by various paradoxes, with some methods more severely affected than others. In this talk we present the geometry of the delegate apportionment method used by the Republican Party of Georgia in 2012, and present a theorem for the frequency of the occurrence of the elimination paradox when using this method in a three-candidate election. We then compare our findings with the method used in 2016 to determine which method is more susceptible to this paradox.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Haohao Wang
Author(s):	Haohao Wang and Ron Goldman
Presenter is:	Faculty
Institution:	Southeast Missouri State University
Paper Title	Rational Surfaces Constructed via Quaternion Product

Abstract:

We introduce a new kind of rational surfaces of rotation, provide some interesting examples, and investigate their algebraic and geometric properties. Quaternions and quaternion multiplication are used to represent these surfaces. In particular, we study the base points and syzygies of these rational surfaces. Examples are provided to illustrate our theorems and flesh out our algorithms.

Is the presentation directed towards a student audience?	No

Presenting Author:	Nick Wintz
Author(s):	Dylan Poulsen and Nick Wintz
Presenter is:	Faculty
Institution:	Lindenwood University
Paper Title	The Kalman filter on stochastic time scales

Abstract:

In this paper, we discretize a stochastic linear time-invariant system to a dynamic system on a time scale. We then develop a Kalman filter to estimate the true state for the corresponding system. Here, the measurement-update and time-update equations account for the size of the time step when the time scale is generated randomly. Numerical examples are also provided.

Is the presentation directed towards a student audience?	No

Presenting Author:	Matt Wright
Author(s):	Matt Wright, Daniel Ayasse
Presenter is:	Faculty
Institution:	Missouri State University
Paper Title	Improving Efficiency And Reliability Of Twitter Data

Abstract:

Twitter publishes a half billion new tweets every day, and until 2018, the Library of Congress was cataloguing each and every one of them. In this project, we constructed a custom variable length code for storing Twitter data. After analyzing a sample of 94,000 tweets, we applied a Huffman coding scheme that assigns shorter codes to more frequently used characters. We also expanded our definition of “character” to include emojis and commonly used words. For example, we chose to encode the word “and” as one entity rather than three separate characters. We then applied a Reed Solomon error correction scheme to add redundancy to our encoding method in order to fortify it against corruption during data transmission. Despite the added redundancy, data storage requirements still dropped by 46% compared to the standard Unicode format.

Is the presentation directed towards a student audience?	Yes

Presenting Author:	Gulsah Yeni

Author(s):	Elvan Akin, Gulsah Yeni
Presenter is:	Graduate Student
Institution:	Missouri University of Science and Technology
Paper Title	On Exact Solutions to Epidemic Dynamic Models

Abstract:

In this talk, we present SIR (susceptible-infected-recovered) and SIS (susceptible-infected-susceptible) epidemic models on time scales which unifies and extends continuous and discrete models. More precisely, we derive exact solutions to these models by using the Bernoulli equation on time scales.

We also discuss the asymptotic behavior of susceptibles and infectives and demonstrate our results on different time scales.

Is the presentation directed towards a student audience?	Yes