The Mathematical Association of America
New Jersey Section Meeting

Virtually (via Zoom)

Saturday, October 24, 2020

9:00 – 9:30	**Networking**
9:30 – 9:40	**Welcome.** *Paul von Dohlen, Chair of MAA-NJ.*
9:40 – 10:35	**What Can Puzzles Do for Us?** *Peter Winkler, Dartmouth University***.** Presider: Deepak Bal, Montclair State University.
10:40 – 11:00	**MAA-NJ Business Meeting**
11:00 – 11:55	**The Definition of a Mathematician.** *Rosalie Bélanger-Rioux, McGill University***.** Presider: Grace Cook, Bloomfield College.
12:00 – 12:30	**Lunch and Networking**
12:35 – 1:35	**Paper Sessions**
	Online Teaching
	Recreational Mathematics
	Student Presentations
1:35 – 1:40	**Closing Remarks.** *Paul von Dohlen, Chair of MAA-NJ.*

Abstracts and Biographies of Plenary Speakers

What Can Puzzles Do For Us?

Peter Winkler
William Morrill Professor of Mathematics and Computer Science
Dartmouth College
Distinguished Visiting Professor for the Public Dissemination of Mathematics
National Museum of Mathematics

Abstract: Mathematical puzzles can certainly entertain us, challenge us, confound us, and embarrass us. But a great puzzle can do much more: it can open our eyes to something we had never seen before (but maybe should have).

We'll present a series of eye-opening puzzles, some with solutions, some without. See if you agree that each has something new to offer. The hope is that we (and our students) can cast aside all fear of puzzles and grasp each new challenge as a precious gem.

Peter Winkler is the William Morrill Professor of Mathematics and Computer Science at Dartmouth College. He is the author of about 160 research papers and holds a dozen patents in marine navigation, cryptography, holography, gaming, optical networking, and distributed computing. His research is primarily in combinatorics, probability, and the theory of computing, with forays into statistical physics. He is a winner of the Mathematical Association of America's Lester R. Ford and David P. Robbins prizes.

For the academic year 2019-2020, Dr. Winkler is serving as Distinguished Visiting Professor for the Public Dissemination of Mathematics at the National Museum of Mathematics.

Dr. Winkler has written two collections of mathematical puzzles, a book on cryptology in the game of bridge, and a portfolio of compositions for ragtime piano. He's working on a new puzzle book: send him your favorite puzzles!

The Definition of a Mathematician

Rosalie Bélanger-Rioux
McGill University

Abstract: In this interactive workshop, participants will reflect on what we think it means to be a mathematician, who is seen or counted as a mathematician, what causes this, and how that affects our communities of learning, teaching and research in mathematics. If you would like to explore those issues, come and find out! Be prepared to discuss some potentially difficult topics.

Dr. Bélanger-Rioux is a Faculty Lecturer in the Department of Mathematics and Statistics at McGill University. Before that she was a Preceptor and the Assistant to the Director of Undergraduate Studies in the Mathematics Department at Harvard University. She

received her undergraduate degree in applied mathematics from McGill University, and her Ph.D. in applied mathematics from the Massachusetts Institute of Technology. She teaches mathematics courses and participates in advising, mentoring and otherwise supporting mathematics students, majors, and teaching assistants. She is also committed to issues of diversity and inclusion in mathematics departments, and has been invited to give talks and workshops at universities and national meetings around the issue.

Abstracts of Contributed Paper Sessions

Session 1: Online Teaching

Organizer and Presider: Grace Cook, Bloomfield College

12:35 – 12:50: **Online Strategies to Increase Student Participation and Motivation**
Sheila Tabanli, Rutgers University

Abstract: During a pandemic, we need more human interaction and meaningful learning (and also teaching) experiences than ever! The instructor have implemented different strategies to improve student-instructor virtual interactions with the goal of increasing student engagement and retention. Some of the strategies she implemented include: having additional office hours on the weekends before the six midterms, 1-1 appointments to review individual exams. In addition to these strategies, assessments are changed in a way to enable students to reflect on their own mistakes and offer corrections by using sentences (not necessarily re-solving the problems). The instructor strongly believe that "reflective essay" type of assessments in large lecture freshman Calculus I classes for life sciences majors is an important component of students' Math learning experience. It should be noted that this group of students may not be very strong in Math comparing to their peers in engineering majors.

During the small-group, once-a-week recitations that accompany the twice-a-week, students work in smaller-groups (Zoom's breakout rooms) on the worksheets prepared by the instructor. The worksheets are prepared by the instructor by utilizing the textbook resources. She puts the priority on the question types such as find the error, word problems, explain your reasoning rather than drill type of questions to increase critical-thinking. Before the end of the recitation, the instructor shares the solutions with students to check their answers. Students work on the assigned worksheet problems collaboratively. Instructor sets an accuracy goal of 85 percent on the worksheets that she prepares by providing the solutions and having students check their answers with the posted solutions. In addition to solving problems from the worksheets, instructor also assign "reflective" assignments in a format of ungraded surveys in Canvas. These assignments involve students' self-evaluating their contributions and peer-evaluation as well. Students are also asked to identify the topic that they struggle the most. Although these reflection assignments are not considered as graded assignments, student submission rate changes from 94 percent to 72 percent on different weeks.

By incorporating goal-setting, collaboration and reflection strategies, instructor is intentionally aiming to create an online learning community which we are lacking as an in-person learning community during a pandemic.

12:50 – 1:05: **Reducing Anxiety in Online Learning Environments in STEM Fields**
Krassi Lazarova and Kathy Turrisi, Centenary University

Abstract: How do you get a student to learn in the online environment without being overwhelmed? STEM courses seem to cause anxiety even in person; online learning has its own additional challenges as well. The presentation will discuss the insights and best practices to teach STEM courses online to facilitate the learning process for all learners. Among others, repetition of concepts in different subjects, synchronous meetings with the class, graded reflections or summaries of the learning, and frequent applications of concepts helps with reducing anxiety in these courses.

1:05 – 1:20: **Calculus and the Mathematics of Social Justice**
Mónica Deni Morales-Hernández, Adelphi University

Abstract: During times of crisis we are challenged to reconsider our teaching methods and improve them with the goal of helping the maximum number of students. Mathematics has always been known as a realm to which only the *privileged ones* have access to it. In the last months, *we*, the professors/teachers have been *forced* to change and discard the traditional teaching math techniques that most of us thought were set on stone but that we now know are useless and harmful for the majority of the students taking our classes. In recent weeks a lot of us heard the term “Social Justice”, but we might wonder how Social Justice is linked to the well-established and known calculus curriculum. I pose some questions, how do we teach Social Justice in a Calculus class? How do we teach calculus to improve the accessibility of knowledge to the majority of students that have been marginalized by old teaching techniques? In this talk I will discuss a project-based approach to the calculus curriculum and the use of the book “Mathematics for Social Justice, Resources for the College Classroom” by G. Karaali and L. Khadjavi.

1:20 – 1:35: **The Virtual Classroom- Online tools for differentiation and personalization of learning in the Mathematics classroom**

Galia Kisiova, Cliffside Park High School, University of the Cumberlands

Abstract: Technology can be an extremely powerful tool in the Mathematics classroom, used to remediate, strengthen knowledge and relationships between educators and students. However, technological applications produce results only if they are used effectively and with purpose. The implementation of technology can help special education, struggling students and English language learners by providing independence, as well as boosting feelings of achievement and increasing motivation. As a result students are able to choose their own pace of learning and instruction, which in turn reduces anxiety levels and stimulates further engagement and desire to learn. Various online tools will be presented and discussed - Geogebra, Desmos, Choice Boards, Pixel Art activities, Digital Escape Rooms, Youtube, and gamification of material to foster engagement and facilitate learning.

Session 2: Recreational Mathematics

Organizer and Presider: David Nacin, William Patterson University

12:35 – 12:50: **Open Problems from the OEIS**
David Nacin, William Patterson University

Abstract: The On-Line Encyclopedia of Integer Sequences (OEIS) is the largest online database of integer sequences. All sequences are reviewed before acceptance, yet the database still grows quickly with many new fascinating sequences added every week. In this talk we discuss some open problems arising from recent sequences in the areas of number theory and recreational math.

12:50 – 1:05: **Exploring the Recursive Sequence 1, 4, 17, 72, 305, 1292, 5473, …**
Jay Schiffman, Rowan University

Abstract: This paper explores the Fibonacci sequence of order four which is defined recursively as follows: Define u(1) = 1, u(2) = 4, and u(n) = 4u(n-1) + u(n-2). We explore the above integer sequence with regards to divisibility and periodicity patterns and prime outputs in the sequence. I was able to completely factor the initial one hundred fifty terms in the sequence using MATHEMATICA Version 12.0. In addition, the MATHEMATICA search revealed only one prime output, 17 among the initial ten thousand terms in the sequence with the sole one occurring in the third term. The use of congruences and modular arithmetic enables one to detect patterns, form conjectures and substantiate them. In addition, we determine the first occurrence of each prime factor less than one hundred among the initial one hundred terms if such primes exist. We then examine the ratio of successive terms in the sequence and observe that they approach a number called the metallic ratio; namely $2 + \sqrt{5}$ which is similar to the Golden Ratio.

1:05 – 1:20: **Flexagons**
Elizabeth Uptegrove, Felician University

Abstract: Flexagons are flat models made from strips of paper that can be folded in various ways to reveal hidden faces. They were discovered in 1939 by students at Princeton University and popularized by Martin Gardner in 1956 in his first Mathematical Games column for Scientific American. In this talk, we will display some flexagons

including the hexahexaflexagon and the tritetrahexaflexagon, and we will demonstrate how to build a simple flexagon. In addition to discussing flexagon theory, including the Tuckeman Traverse, we will also talk about how Gardner's work served to inspire students and others to take an interest in recreational mathematics. We will share some interesting connections we found while investigating flexagons.

Session 3: Student Presentations

Organizer and Presider: Lee Collins, Atlantic Cape Community College

12:35 – 12:50: **Hadamard Transform & Error-Correcting Output Codes (ECOCs)**
Jordan Jiosi, Rowan College at Burlington County; Faculty Advisor: Jonathan Weisbrod

Abstract: Error-correcting output codes (ECOCs) are used in machine learning to represent class labels as codewords constructed from an ECOC matrix. The ECOC matrix includes relatively large minimum row and column Hamming distances. Classification of an object is performed by matching its corresponding output codeword to the class codeword of nearest Hamming distance. Anomalies are detected and encoded as new concepts based on output codewords of the unseen objects and their Hamming distances with respect to recognized objects. This presentation describes how the properties of the Hadamard Transform can be used to achieve better than-standard error correction.

12:50 – 1:05: **Using a Numerical Baseball Simulator to Analyze Batting Lineups and Hitter Streakiness**
Maximilian Rohrer, William Paterson University; Faculty Advisor: Paul von Dohlen

Abstract: Since the introduction of sabermetrics and baseball analytics, the formation of the "perfect" batting lineup has undergone changes and been influenced by different philosophies. For example, the best hitter has found a home in just about every spot in the nine-man lineup. In constructing an optimal batting lineup, players may be shifted up and down based on their "streakiness," or their tendency to be more (or less) productive over given periods of time. With the help of a baseball simulator we created and modified in MATLAB, we were able to draw conclusions as to what spots in a batting lineup are most influential and how a given player's "streak" and how switching player's batting positions may affect the lineup as a whole.

1:05 – 1:20: **Internal Symmetries in Musical 12-Tone Rows**
Viren Sachdev, Adelphi University; Faculty Advisor: Anil Venkatesh

Abstract: Twelve-tone composition is a method of musical composition. Pioneered by composer Arnold Schoenberg, this technique is a means of ensuring that all twelve notes of the Western chromatic scale are sounded equally often in a piece of music in order to

prevent the emphasis of any one note. The rigidity of twelve-tone composition invites mathematical study. Using group theory, we can discover which patterns of notes are symmetric under certain musical transformations such as transposing into a different key or playing backwards. In 2003, Hunter and von Hippel found that 10% of the compositions of Schoenberg, Webern and Berg contained extremely rare symmetries of the entire twelve-note sequence. However, their approach left open the question of whether the remaining 90% of compositions contained symmetries on a smaller scale than the full twelve-note sequence. In this talk, we present a method for measuring internal symmetries in twelve-tone compositions, and give strong evidence that the composers Schoenberg and Webern favored these symmetries in their work.

1:20 – 1:35: **Size Ramsey Number of Cycles Versus a Path**
Ely Schudrich, Montclair State University; Faculty Advisor: Deepak Bal

Abstract: In this talk, we will explore a problem involving graph Ramsey Theory. We say a graph G has property S(n) if G still has a path on n vertices after the removal of any forest, and the function f(n) is defined as the smallest number of edges in a graph with property S(n). Dudek, Khoeini, and Pralat proved that $2.0036n \leq f(n) \leq 31n$; we improve both bounds, showing that $2.066n \leq f(n) \leq 5.25n+27$ for sufficiently large n.

2020 Sr. Stephanie Sloyan Award for Distinguished Service

New Jersey section of the Mathematical Association of America

The recipient of the 2020 Sr. Stephanie Sloyan Award for Distinguished Service from the New Jersey section of the Mathematical Association of America is **Professor Elizabeth Uptegrove of Felician University**.

Elizabeth has made important contributions to the New Jersey section for more than a decade. Since 2009, she has been a member of the MAA-NJ's Executive Board. Elizabeth currently serves as MAA-NJ's Vice-Chair for Spring Meetings and since 2009, as a co-organizer for the section's book sales. She served as the section's Program Editor from 2013-2019, and as a member of MAA-NJ's Awards committee from 2011-16, serving as the committee's chair from 2015-16. Elizabeth also chaired the host committee for MAA-NJ's Spring 2013 meeting at Felician University and has served on the organizing committee for the section's meetings since 2009.

Elizabeth currently serves as Special Issues Editor for the *The Journal of Mathematical Behavior,* and served as an Associate Editor for the journal from 2009-16. She is a coeditor of the book, *Combinatorics and Reasoning: Representing, Justifying, and Building Isomorphisms,* author of four book chapters and twelve journal and refereed conference proceedings.

Elizabeth earned her BA in Mathematics from Douglass College and her MS in Mathematics from New York City. She received her Ed.D. in Mathematics Education from Rutgers University. From 2005-2017, Elizabeth taught at Felician University and served as chair of the Mathematics Department from 2008-12. She is now Professor Emerita at Felician and a Research Associate at the Rutgers University School of Education.

The section is very appreciative and grateful to Elizabeth Uptegrove for her many contributions to the New Jersey section of the Mathematical Association of America.

MAA/AMS Book Sales

There is a virtual book sale for Fall section meetings for AMS published books. There is no discount code associated with the sale; prices are open to all and good until 11/25/2020. The following is a list of sale prices for Titles on Display. Information will also be posted at https://bookstore.ams.org/books-on-sale.

Meeting Puzzle Contest

There will be an official puzzle contest the day of the meeting with a book prize. The puzzle was created by MAA-NJ's own David Nacin, author of the book "Math-Infused Sudoku: Puzzle Variants at All Levels of Difficulty". Details to be given at the meeting.

Future MAA Meetings

MAA-NJ. TBA

GSUMC. TBA

MathFest. The MAA will hold its annual MathFest in Sacramento, CA, August 4-7, 2021.

Joint Mathematics Meeting. The 2021 JMM will be held virtually, January 6 – 9, 2021.

Social Media Information

Check us out!

Email:	maanj.socialmedia@gmail.com
Facebook:	https://www.facebook.com/maanewjersey
Instagram:	https://instagram.com/maanewjersey
Twitter:	https://twitter.com/maanewjersey

Acknowledgments

A special thanks to Kirstin Uptegrove for her assistance on planning and running our first virtual meeting.

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