M*A*T*H COLLOQUIUM

Sonoma State University Department of Mathematics and Statistics presents a series of informal talks open to the public

"The book of nature is written in the language of mathematics" - Galileo

Live & on Zoom ~ Wednesdays at 4:00pm
https://bit.ly/SSU-Math-Colloq-F22

Phone: (707) 664-2368   math.sonoma.edu

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Aug 31

Funds of Knowledge in Secondary Carceral Mathematics   **Tatiana Harrison, Sonoma County Office of Education**

This practitioner inquiry explored the perceptions and applications of students' funds of knowledge (FoK) by carceral mathematics educators in a California alternative education program. Carceral classrooms have not benefited from the application of the FoK approach. Findings uncovered the perception of potential in this approach and perceptions of inherently and prohibitively high levels of institutional and emotional liability in applying FoK pedagogy. Implications included a substantial need to engage in youth participatory action research (YPAR) and other PAR to strengthen supports for this approach in carceral classrooms. In this way, carceral students can enhance their learning with an engaging approach that scaffolds school learning off students' out-of-school education.

Sept 7

Making Waves   **Reuben Margolin, Artist**

Stories, math and videos from 25 years of making wave and caterpillar sculptures. See some of Reuben's art here: https://www.reubenmargolin.com/

Sept 14

Haploid Chromosome Set Organization in Human Cells   **Lisa Hua, Sonoma State University Biology**

Somatic homologous chromosome pairing is detrimental, and correlated to cancer. We have recently discovered a chromosome set based, antipairing, segregation pattern in human cells. The set organization has been proposed to prevent homologous chromosomes from abnormal pairing and recombination. However, it is unknown whether the pattern is preserved throughout the cell cycle. Here, we show that individual chromosomes consistently remain in their respective sides along a centrosome axis from mitosis onset to the subsequent G1 interphase. We provide a novel model for nuclear organization that will greatly facilitate our understanding of genome organization, and its implications in human disease.

Sept 21

Characterizing Teachers' Structural Reasoning   **Stacy Musgrave, Cal Poly Pomona**

The Common Core State Standards for Mathematical Practice ask students to look for and make use of structure. One component of this practice is flexibly using the substitution principle. In this talk, I will focus on characterizing teachers' ability to recognize mathematical situations in which the use of the substitution principle is profitable. I present tasks and rubrics designed and validated to characterize teachers' structural reasoning for the purposes of professional development. These tasks have been useful in fostering discussion with in-service and pre-service teachers to prepare them to support students in this practice.

Sept 28

Fractals as Final Coalgebras   **Victoria Noquez, St. Mary's College**

In this talk we will explore the development of a surprising connection between category theory and fractal sets. We have extended existing work in this area to consider the Sierpinski Carpet, which requires a substantially different technical framework from previous results for interesting geometric reasons. We will introduce final coalgebras (and all of the necessary category theory background) and outline the development of machinery to consider different fractal sets.

Oct 5

Exploring Relationships Between Faculty Perceptions and Student Experiences of Racial Equity in Gateway Mathematics Instruction   **Luis Leyva, Taylor McNeill & Nicolette Mitchell, Vanderbilt University**

Undergraduate STEM is a racialized experience for Black and Latin* students as they navigate deficit views of ability, feelings of isolation, and norms of participation entrenched in whiteness, and Gateway mathematics instruction is an important site for disrupting Black and Latin* students' racialized experiences in STEM higher education. We report findings from preliminary analyses across two research studies at different higher education institutions: a case study of a white instructor's support for a Black student in a coordinated calculus course at an elite, historically white university, and the TIPS research study at Sonoma State, highlighting Latin* students' perceptions of how instruction across various gateway courses provided and limited support for their racial identities.

Oct 12 ZOOM only

Exploring Prospective Teachers' Sense-Making of Area and Area-Units   **Sayonita Ghosh, Sacramento State University**

The concept of area is one of the foundational tools widely used in the mathematics curriculum that supports mathematical thinking in elementary schools, such as the four basic operations, to algebraic and calculus concepts in later grades. Despite its importance in the K-16 curriculum, studies over the last four decades have shown that students of all ages struggle with the concept of area. To investigate, we examined 18 prospective teachers' written work on three area measurement tasks involving non-square and square units. In this presentation, we will discuss different ways prospective teachers use area-units in area measurement tasks, their challenges in relating area measurement with area-units, and the implications of this work in teacher preparation courses.

Oct 19

How Do Film, Television, and Other Media Influence Girls to Pursue STEM   **Kim Bishop, Mechanical Engineer (Retired)**

What types of female STEM role models do girls see in television, film, and other forms of media today? Are they represented at all? What types of roles do they play? Which fields are represented? We will explore what the current STEM media landscape looks like, what plans are for the future, and how STEM and media professionals can work together to expand female STEM roles in media.

Oct 26 ZOOM only

Uncertainty Quantification and Risk   **Dusty Brooks, Sandia National Labs**

A general survey of uncertainty quantification and risk topics, with examples from nuclear waste, fire risk, and space launch systems.

Nov 2

Romancing the Triples   **John Martin, Santa Rosa Junior College**

A set of three whole numbers that are the side lengths of a right triangle is called a Pythagorean triple. There are many questions regarding these triples that have engaged the attention of prominent mathematicians throughout the centuries. In this lecture we will discuss some of these problems and their solutions. We will also examine the construction of an infinite data tree that contains all primitive Pythagorean triples, without duplication.

Nov 9

Casino of Life   **Bogdan Negru, Sonoma State University Chemistry**

Throughout history, humans have endeavored to efficiently transcribe and store information. Technology has improved, but how good can data storage get? My talk will explore a fantastically well-designed system for copying and storing data and some of the mathematical concepts associated with this process. This is an educationally focused interdisciplinary project that examines the equivalence classes that can be used to understand the embedded redundancy of this data storing process. This will be an introductory presentation geared towards a general audience.

Nov 16

The Poincaré Disk and the Hyperquilt: Easing into models of the hyperbolic plane   **Carol Keig, Sonoma State University Mathematics**

In hyperbolic geometry, given line l and point p not on line l, there exist multiple lines through point p parallel to line l. Wait, what? This can be challenging to model or even to imagine; mathematician Giovanni Girolamo Saccheri, after rigorous investigation, stated this to be "repugnant to the nature of straight lines." In this talk, we will briefly take stock of how we visualize Euclidean plane geometry, vanishing points, and spherical geometry, and then attempt to slide from there into visualizing models of hyperbolic geometry, starting with a partial model in the form of a homemade patchwork quilt, and moving to the Poincaré Disk model.

Nov 23

NO TALK—Thanksgiving Break

Nov 30

How to Untie a Knot (and Become Ruler of the World)   **Thomas Mattman, Chico State University**

The legend of the Gordian knot held that whoever untied the knot would become the ruler of the world. Alexander the Great fulfilled the prophecy by going on to conquer Persia (in other words, most of the known world) after dealing with the famous knot. We will discuss Alexander's method for untying knots and how research connecting mathematics and physics has given insight into Gordian numbers. The talk will also feature some square knot dancing.

Talks may change: Please confirm with the Department of Mathematics and Statistics

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