

M * A * T * H COLLOQUIUM

Wednesdays 4 p.m. ❖ Darwin 103 ❖ Coffee, Tea & Cookies @ 3:45 p.m.

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

"Mathematics is the process of turning coffee into theorems" Paul Erdős

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- Jan 23** **Generation and Propagation of Stop-and-Go Traffic Waves** **Martha Shott, Sonoma State University**
 Many drivers have experienced stop-and-go traffic waves, a phenomenon that causes traffic to slow or even stop for a period, only to accelerate back to free-flow speed with no apparent cause. Mathematical models of freeway traffic are able to mimic these waves, shedding light on the specific conditions that cause the oscillations to arise. We'll look at a couple of these models, determine when they predict stop-and-go traffic, and discuss how these results may be applied to improving freeway travel in the future.
- Jan 30** **A History of Congressional Apportionment** **Charles Biles, Humboldt State University (Emeritus)**
 George Washington issued only one veto in his first term: the first congressional apportionment bill. What was the problem? It still persists today. The House of Representatives has 435 members. Why 435? And, how are they allocated to the states? Listen to voices of George Washington, Thomas Jefferson, Alexander Hamilton, John Quincy Adams, Daniel Webster, James Dean, James K. Polk, Senator Samuel Vinton (Whig-Ohio), the US Constitution, the US Census, and mathematicians Balinski and Young, as they describe the evolution and strategies of congressional apportionment.
- Feb 6** **Student Projects from Mathematica Class** **Math 180 Students, Sonoma State University**
 You thought Mathematica could only take derivatives and integrate? Come see the amazing student projects — swimming fish, crazy clocks, and more—from Nick Dowdall and Ben Ford's Fall 2012 Mathematica class, Math 180.
- Feb 13** **Heuristic Problem Solving: When "Good Enough" is Good Enough** **Ken Yanosko, Humboldt State University (Emeritus)**
 When solving complicated combinatorial problems, we frequently employ "heuristic" methods, i.e. methods which are not necessarily optimal, complete, accurate, or even guaranteed to work at all. In this talk we consider some elementary examples, such as the N Queens Problem and the Knight's Tour Problem, and we will see why in some cases heuristic methods may be the best choice after all.
- Feb 20** **What is a proof?** **Balasubramanian Ravikumar, Computer Science, Sonoma State University**
 What makes Mathematics unique as a discipline is its reliance on proof to establish its structure of Knowledge and this is what gives Mathematics a degree of unassailability and certitude that is absent in other fields. However, proof is covered with mystery and beginners are often perplexed by the seeming arbitrariness in what is and is not permitted in a proof. In this talk, many facets of proofs will be discussed with examples. We will also talk about proof, knowledge and computation and their relationship.
- Feb 27** **Chromatic Numbers and Other Geometric Combinatorics Delights** **Tatiana Shubin, San Jose State University**
 Geometric combinatorics is a relatively new and rapidly growing branch of mathematics. It deals with geometric objects described by a finite set of building blocks, for example, the convex hulls of finite sets of points. Typically, problems in this area are concerned with finding bounds on a number of points or geometric figures that satisfy some conditions, or make a given configuration "optimal" in some sense. Problems encountered within geometric combinatorics come in various forms; some are easy to state. Nevertheless, there are lots of problems that are extremely hard to solve, including a great many that remain open despite the efforts of some leading mathematicians. In this talk, we'll discuss some such problems, in particular, chromatic numbers of Euclidean spaces.
- Mar 6** **Seeing Symmetry** **Frank Farris, Santa Clara University**
 Whether you know a lot of mathematics or only a little, your mind knows how to continue a repeating image beyond the frame to fill the whole plane with a regular pattern. This talk will explain the mathematical classification of plane patterns, and describe a mathematical and artistic process that anyone can use to create images like these. Acquaintance with complex numbers will be helpful but is not required. The story will introduce ideas from such diverse fields as group theory, number theory, and analysis.
- Mar 13** **Leonardo Fibonacci and the Birth of Modern Finance** **Keith Devlin, Stanford University**
 Most of the elements of modern world finance can be traced back to 13th Century Italy, and many accounts suggest that the introduction to Europe of Hindu-Arabic arithmetic by Leonardo of Pisa ("Fibonacci") in his 1202 book "Liber Abbaci" played a pivotal role in the sequence of events that led to a European domination of world commerce that lasted for eight centuries. But was Leonardo's role really that significant? The answer to that question was finally determined only recently, in 2003, with the discovery in Florence of a key manuscript from the time. Based on the speaker's recent book "The Man of Numbers: Fibonacci's Arithmetic Revolution" (Walker Books, 2011).
- Mar 20** **No Talk—Spring Break**
- Mar 27** **The Joy of Mathematics** **Kemble Yates, Southern Oregon University**
 Can there be joy in mathematics, or is this an ironic idea? How do the ideas of happiness, contentment, pleasure, and humor relate to the world of mathematics? Does mathematics as a discipline have any unique or provocative contributions to make towards humankind's understanding of happiness? In this talk I will answer these questions in the affirmative, and hopefully convince the audience that mathematics is a vehicle for joy in our lives. I will also prove the loose deduction that all mathematicians think, some mathematicians are funny, and too many mathematicians think they're funny!
- Apr 3** **Common Core State Standards for Math: What can college students and faculty learn from them?** **Brigitte Lahme, Sonoma State University**
 Forty-five US states have adopted the 2010 Common Core State Standards (CCSS) for K-12 Mathematics. These new standards, if implemented well, will fundamentally change math teaching & learning and improve achievement in the US. Part of the process will entail helping teachers to develop and teach productive mathematical habits of mind. How & where do they develop these habits? How about while taking math classes in college? We will discuss how the habits of mind set forth in the new standards can benefit college teaching and learning and how college faculty and students can support the success of the new standards. We'll explore resources and techniques that support these efforts and consider their use in the college context.
- Apr 10** **[MATH FESTIVAL] A Geometric Pascal's Triangle Hidden in a Cube** **Don Chakerian, UC Davis (Emeritus)**
 What are the possible shapes that can be obtained by slicing a cube with a plane? We can get an equilateral triangle, a square, and a regular hexagon. Can we get any shape triangle or any shape rectangle? Can we get a regular pentagon? What about slicing higher dimensional cubes with planes or hyperplanes? In particular, we show that cross-sections of a cube perpendicular to a main diagonal follow a pattern found in Pascal's Triangle of binomial coefficients.
- Apr 17** **A Bootstrap Approach to Statistics** **Elaine Newman, Sonoma State University**
 We will use resampling techniques to construct sampling distributions of statistics like the mean or median, and proportion; in the process we'll debunk the $n > 30$ myth (and other myths) about when we can approximate using the Central Limit Theorem. We'll use bootstrapping techniques to solve coverage issues related to confidence intervals (are you really 95% confident?), and compare classical and modern approaches to statistical problems. Many of the ideas in this talk will be accessible to any student who is enrolled in an elementary statistics course, or has a little bit of knowledge about statistics in general.
- Apr 24** **Math Bistro II** **Bill Barnier, Sonoma State University**
 This talk will include menu items not imbibed during the Fall, 2012 lecture. It includes mathematical dishes such as tasty sums, figurate proofs, prime surprises, gallons per mile, means testing, and perfect numbers. The Math Bistro specializes in small portions with numerous side dishes.
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