Fall 2009 71st Series

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 Erdös

Sept 2 **The Curious Mascot of the Fusion Project—Meditations on Flexing, Dualizing Polyhedra** **Benjamin Wells, University of San Francisco**

The Fusion Project (FP) is a research program at the University of San Francisco that seeks to bring 7th grade math classes to the art of the de Young Museum (and vice versa). We also have our eye on the opportunities in new media for teaching middle school math. The Hoberman Switch-Pitch™ is the project's mascot. After an introduction to FP, we'll explore the static and dynamic symmetry of this curious, ancient shape. We'll also visit with other wild shapes in and out of cages.

Sept 9 **From Tsuruda to Sicherman: 11 of the Best Math Problems Ever** **Megan Taylor, Stanford University**

As the math methods instructor for a nearby teacher education program I am often asked by pre-service teachers, "where do I FIND great math problems?" From my experience as a student in Gary Tsuruda's 7th grade class, a mentee of Jo Boaler, a middle- and high-school math teacher, a collaborator of Keith Devlin, a participant of the Park City Math Institute, an Asilomar afficionado and now a teacher educator, I admit I've stolen (and experimented with) a ton of great math problems. Perhaps part of creating the "ideal" math curriculum is having a bank of "tried-and-true," "groupworthy" and "rich" math problems that support, intrigue and challenge a wide variety of students. Come play!

Sept 16 **Why Do We Teach This Stuff Anyway? A Brief History of School Math** **Eric Hsu, San Francisco State University**

How did Algebra 1 become the course that it did and how has it changed over the years? Who put those topics in and kept other topics out? Which aspects of the school mathematics curricula are coherent and which aspects are historical accidents? These are important issues to ponder, especially in light of the recent emphasis on moving Algebra to 8th grade and its use as a gatekeeper for graduation and college.

Sept 23 **The Apportionment Problem** **Rick Luttmann, Sonoma State University**

The U S Constitution requires that the seats in the House of Representatives be apportioned to the States according to their populations. But Representatives come in whole units while population proportions don't. "So, what's the problem? Just round off! It's third-grade mathematics." Well, no, it isn't. Though the Founding Fathers apparently didn't realize it, there are intractable difficulties in coming up with a "fair" apportionment scheme. This talk will explore various methods that have been used or proposed, along with what's wrong with them. The contribution of mathematics is to establish that there is no "perfect" method.

Sept 30 **Notions of Discrete Curvature, and Their Applications** **Shobhana Murali, U.C. Berkley**

The concept of curvature is well understood in geometric settings. In discrete settings such as graphs, however, it is not entirely clear how to define curvature. In this talk we will examine some notions of discrete curvature, and see how they can lead to interesting applications, including concentration of measure.

Oct 7 **Chaotic Dynamics and Fractals** **Sebastian Marotta, University of the Pacific**

What is nonlinear dynamics? Why can't we predict the weather? What is the structure of our lungs? Why can't we measure the coast of Britain? This talk will address these questions and present an introduction to discrete dynamical systems. We will show that the behavior of some simple systems is very difficult to predict due to sensitive dependence on initial conditions and chaos (the butterfly effect). Then we will introduce complex dynamical systems and explore some classical examples. We will show that the chaotic behavior is related to fractal structures in the complex plane.

Oct 14 **Dade's Ordinary Conjecture** **Jennifer Mogel, San Jose State and U.C. Santa Cruz**

In the study of Groups, Representation Theory is a very useful tool. We will discuss what a representation is, describe the character associated with a representation, and introduce one of the most interesting and perplexing conjectures in all of Representation Theory, Dade's Ordinary Conjecture. It would be nice if students have taken one semester of abstract algebra and be familiar with basic linear algebra, but you could probably get along without it OK.

Oct 21 **Growing Polya's Orchard** **Bruce Cohen, Lowell High School & David Sklar, San Francisco State University**

In 1918, Polya asked, how thick must the trunks of the trees in a regularly spaced circular orchard grow if they are to block completely the view from the center? We will explore this extremely rich problem considering a wide array of mathematical topics including integer lattices, number theory, and transformational geometry.

Oct 28 **Proof, Reasoning and Technology: The Mast Problem and Other Interesting Tasks** **Gail Burrill, Michigan State University**

We will solve several problems, analyze possible solutions drawing on different mathematical domains and consider how to use technology to develop mathematical habits of mind that support reasoning and making sense of mathematics - including the role of technology in helping students think about what it means to prove something in mathematics.

Nov 4 **Unsolvability in Mathematics** **Jennifer Chubb, University of San Francisco**

David Hilbert said that in mathematics, "there is no *ignorabimus*." We can always figure out the solution to a problem, if there is one, and if there is not, well, then *that* is provable. If we want to show a problem is solvable, we know what to do... find the solution! Showing that a problem is *un*solvable is trickier. One way is to show that being able to solve that problem would make it possible for us to solve another problem known to be unsolvable. We will discuss the Alan Turing's *Halting Problem* and see why it is unsolvable. With this example in hand, we will discuss other famous decision problems, including *Hilbert's 10th Problem*, and their connections to the Halting Problem.

Nov 18 **Partitions** **Neville Robbins, San Francisco State University**

A partition of a natural number, n , is a representation of n as a sum of one or more natural numbers. For example, the partitions of 4 are: 4 , 3 + 1 , 2 + 2 , 2 + 1 + 1 , 1 + 1 + 1 + 1 The study of partitions is a topic in additive number theory and combinatorics. Let p(n) denote the number of partitions of n. In this talk, I will discuss (1) a recursive formula for p(n) due to Euler; (2) how to estimate p(n) for very large n; (3) the Ramanujan congruences for p(n); (4) some related partition functions.

Dec 2 **Grading on a Curve – and Other Tools for Using Math to Teach Math Classes** **Warren Schonfeld, Santa Rosa Junior College**

Teaching involves engaging students in the learning process, as well as presenting definitions, concepts, and methods. But how can an instructor make topics such as graphing inequalities or conditional probabilities meaningful to students? This presentation will explore various techniques that simultaneously engage the class, assist the instructor in managing it, and provide students with relevant applications of the very topics in mathematics they are studying.

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