Got A Little Love For Math Before Valentine’s Day?

Student Research Colloquium
Thursday, February 13, 4-5 p.m.
CMC 206

Valentine’s Day is coming up, but on the day before, we’ll have an opportunity to hear about the research that several Carleton students did here last summer. Details (including titles and abstracts) are below. We hope you can join us for this one-of-a-kind student research colloquium.

Combinatorial Proofs of Jacobi-Stirling Number Identities
Leo Betthauser
4 – 4:30 p.m.

The Stirling number \( \left[ \begin{array}{c} n \\ j \end{array} \right] \) of the first kind counts the permutations of \( n \) elements with \( j \) cycles. Likewise, the Stirling number \( \left\{ \begin{array}{c} n \\ j \end{array} \right\} \) of the second kind counts the arrangements of \( n \) elements into \( j \) indistinguishable nonempty sets. Stirling numbers of both the first and second kinds satisfy simple recurrence relations; in particular, for all \( n \) and \( j \) with \( 0 \leq j \leq n \) we have

\[
\left[ \begin{array}{c} n \\ j \end{array} \right] = \left[ \begin{array}{c} n-1 \\ j-1 \end{array} \right] + (n-1) \left[ \begin{array}{c} n-1 \\ j \end{array} \right]
\]

and

\[
\left\{ \begin{array}{c} n \\ j \end{array} \right\} = \left\{ \begin{array}{c} n-1 \\ j-1 \end{array} \right\} + j \left\{ \begin{array}{c} n-1 \\ j \end{array} \right\}.
\]

When \( \gamma \) is a positive integer, the Jacobi-Stirling numbers have combinatorial interpretations analogous to those of the Stirling numbers. For example, the Jacobi-Stirling number \( \left\{ \begin{array}{c} n \\ j \end{array} \right\} \) counts the arrangements of \( \{1, 1_2, 2_1, 2_2, ..., n_1, n_2\} \) into \( j + \gamma \) sets where \( j \) sets are distinguishable, \( \gamma \) sets are indistinguishable and nonempty, and certain additional requirements are met. In this talk, I will provide combinatorial proofs of particular Stirling number identities and their Jacobi-Stirling counterparts.

Perfect Powers in Orbits of Rational Functions
Jordan Cahn and Jacob Spear
4:30 – 5 p.m.

Suppose that \( \phi \) is a rational function with rational coefficients and that \( \alpha \) is a rational number. The orbit \( O_{\phi}(\alpha) \) of \( \alpha \) under \( \phi \) is the set \( \{\alpha, \phi(\alpha), \phi(\phi(\alpha)), \ldots\} \). The field of arithmetic dynamics asks questions about the number theoretic properties of these orbits. For instance, when can \( O_{\phi}(\alpha) \) contain infinitely many perfect \( m^{th} \) powers of rational numbers? One obvious situation where this occurs is when \( \phi \) is already the \( m^{th} \) power of some other rational function. In this talk, we explain our result showing that these are essentially the only \( \phi \) that work, unless \( m \) is small and \( \phi \) satisfies very special properties.
**Who Wants To Be a Math Major?**

Thinking about a math major? Join us on Thursday, February 13, from 12 – 1 p.m. in CMC 206 to hear about the department, learn a bit of math, and meet some current majors and faculty. Pizza lunch will be provided!

**Tour of Mathematics**

The Tour is taking a break this week, and will resume on Friday, February 14.

**Gather Your Team for the Konhauser Problemfest**

On Saturday, February 22, the University of St. Thomas will host the 22nd annual Konhauser Memorial Problemfest, which is named after the late Macalester professor and legendary problem poser Joe Konhauser. In this contest, teams of up to three students get three hours (9 a.m. to noon) to work together on a set of ten challenging and intriguing math problems. The participants then have lunch together while the solutions are graded, and the results are announced right after lunch. The winning team gets to take the famous granite "pizza trophy" home to their college for the year. Last year's Carleton teams performed very well, with our top-scoring team nabbing second overall and missing out on the trophy by the slimmest of margins. Needless to say, it would be great to bring the trophy back this year.

If you would like some practice with past Konhauser problems, drop by the problem-solving group, which meets on Wednesdays 4:30 – 5:30 p.m. in CMC 328. To sign up for this year's Konhauser, contact Rafe or Eric as soon as possible; three people can sign up as a team, but individuals are also welcome to express interest, and we might be able to help you find teammates.

**Design the Math T-Shirt**

Do you like t-shirts? Do you like math? Combine the two and create a design for the 2013-2014 Carleton College Math Department T-shirt. Email designs to Hilary Marshall at marshallh or Martin Bobb at bobbm.

**Five Carleton Math Majors Present Posters at Joint Mathematics Meetings**

While most of us were enjoying the balmy week here in Northfield, Carleton math majors Martin Bobb, Cora Brown, Greg Michel, Dylan Peifer, and Michelle Yuen were presenting posters on their summer research at the MAA Undergraduate Student Poster Session at the Joint Mathematics Meetings in Baltimore. All of the Carleton posters were well received, and Martin's poster, "A Geometric Interpretation of Knot Complement Gluings" was among the presentations selected as Outstanding by the faculty judges. If you didn't happen to make it to the poster session in Baltimore, don't worry: you can peruse all of the Carleton posters on the second floor bulletin boards in the CMC. Congratulations to Martin, and kudos to everyone who presented a poster!
Colorado School of Mines

Interested in a math/stats graduate program at the Colorado School of Mines? It currently offers M.S. and Ph.D. degrees in both Computational and Applied Mathematics and Statistics. For more information, visit their departmental website: ams.mines.edu/. The application deadline is March 1, but they encourage prospective students to apply as soon as possible. If you have any questions, feel free to contact Steve Pankavich at pankavic@mines.edu.

Marine Science
Summer Internship

The College of Earth, Ocean, and Environment at University of Delaware is hosting a 10 week long REU summer program that supports 10 undergraduate students to conduct research in marine science. Student support includes a $6,000 stipend, campus housing, and travel assistance. Students will work with faculty and research staff in a graduate student atmosphere on a research topic in chemical, physical, or biological oceanography, marine biology, or marine geology. The application deadline is February 14. For more info, visit: www.ceoe.udel.edu/academics/for-current-undergraduates/marine-sciences-summer-program.

Problem of the Week

Let $I$ denote the unit interval $[0, 1]$. Given any finite collection of closed intervals $[a_1, b_1], ..., [a_n, b_n]$ such that any pair of them have at least one point in common, show that there must be a point in common to all the intervals.

Acknowledgments

Nick Haradhvala solved last week's problem (concerning roads) and should contact Andrew to claim a prize from the BBOP. John Snyder in Oconomowoc also solved the problem. We've still received no solutions to the locker combination problems, but we hope to see some soon!

Editors: Nami Sumida
Bob Dobrow
Problems of the Week: Andrew Gainer-Dewar
Subscriptions & Web: Sue Jandro