St. Olaf Mathematics Department

Math Mess

Department of Mathematics
St. Olaf College
Northfield, MN 55057

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This Week's Mathematics Colloquium

Title: Undergraduate Research in ... Combinatorial Games?
Speaker: David Molnar
Time: Thursday, May 9th, 2 pm
Place: SC 182

This Week's Colloquium

Combinatorial games are, roughly, games which involve no luck, and in which a winner is determined when one player cannot move. Examples include Nim (on the internet, this is known as the "Fruit Game"), Chomp, Hackenbush, Clobber, Mancala, and possibly Go. While the Fruit Game is sufficently simple that you could easily learn the `trick' necessary to beat the computer consistently, the same cannot be said of Go. Combinatorial Game Theory aims to span this gap, taking the basic principles involved in analyzing simple games, and building slowly from there, spinning off interesting examples at a wide variety of levels.

We will begin with a game that can be taught to second-graders, but the focus of the talk is to describe why Combinatorial Game Theory, with its unique learning curve and varied points of departure, is such a rich area for research by undergraduates. Seeing how the techniques which work for one problem (game) can be applied to another, and to what extent they must be altered--an essential aspect of mathematical research--is a lesson well-learned in studying combinatorial games. Examples will be given from a research project conducted by St. Olaf undergraduates this Spring.

David Molnar has been playing mathematical games for most of his 22 years. His hobbies include bratwurst and Ted Vessey. He does not believe that a salary cap would fix baseball's competitive imbalance problems, because "competitive imbalance" is not baseball's problem; Bud Selig is. His favorite fruit is 15. When he grows up, David wants to be either a fireman or a member of the Thai Elephant Orchestra.

Career Column

During this semester this column has featured a variety of careers that use mathematics. For additional information on careers consult the books 101 Careers in Mathematics and She Does Math (in the Saint Olaf library) or the "What Can You Do With a Math Major?" section of the

Mathematics Department webpage (www.stolaf.edu/depts/math).

While many math majors choose careers that directly use their mathematical knowledge, others enter professions where precision of language and analytical and problem solving skills are important. For example, an attorney profiled in the 101 Careers book comments: "I have found that those who have studied mathematics can approach and master both the legal principles and their effect in a way which most others cannot." In the same book, a culture critic for the New York Times observes: "I find myself, again and again, relying on the discipline and the patterns of thought I developed as an aspiring mathematician."

Announcements

It's Pig Roast time!! The Math Department Pig Roast is this Sunday, May 12th from 11-dark at Sechler Park. Tickets are on sale in OMH 201 for $5 each. Remember, moms are free!

Congratualations to Eric Weinhandl!

SENIORS!! Please send your post-graduation plans to mathmess@stolaf.edu so that you will be in the "Senior Salute" issue of the Mess.

Last Week's Solution

Last week's problem: It is possible to have a party of five people at which no group of three people either all know each other or all don't. This is evidenced by drawing a pentagon in blue, and a red star inside that, to represent which pairs of people repectively do or don't know each other. Find the largest possible party at which there is no group of **four** people, all of whom know each other or all of whom do not.

Solution: The size of the largest party at which it is possible for no set of four people to either all know each other or all not know each other is 17. A solution was found by **Eric Weinhandl**. I paraphrase. To show that such a party is possible, we draw a blue 17-gon. We label its vertices 0 through 16. Every pair of numbers must be connected with either a blue edge or red edge, so that no set of four number is connected by all the same color edges. This is done by connecting i and j with a blue edge exactly when the difference i-j is a square in Z_{17}, that is, when there is some perfect square which is i-j more than a multiple of 17. (In more concrete terms, draw a blue edge if |i-j| is 1, 2, 4, 8, 9, 13, 15, or 16; red otherwise.)

Problem of the Week

Consider the game of "Mini-Mancala", which you can play at http://www.mindsports.net/TheShop/MiniMancala/ Each side of the board has only two pockets, which initially contain two camels each. (Can also be played with jellybeans if you have no camels.) On your turn, you pick up the camels in one of the pockets on your side and "sow" the camels counterclockwise in the usual Mancala fashion. A camel is never placed in the pocket from which it has just been picked up. There are no scoring pockets and no capturing; all eight camels will remain in play. The game ends when one player (the *loser*) cannot make a move.

If given the choice, do you want to go first or second? If first, which move should you make? If second, how do you respond to each of the possible first moves by your opponent?

** Please submit all solutions to David Molnar (molnar@stolaf.edu) by noon on Sunday.

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