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: Taking the Sting out of Computations: Modeling Wasp Nests
Speaker: Tom Sibley
Time: Tuesday, March 4, 1:30 pm
Place: SC 182

This Week's Colloquium

Different species of wasps build quite varied shapes of nests. How can we measure how close actual wasp nests come to the most efficient arrangement of their hexagonal cells? Dr. James Poff, the entomologist at St. John's, asked Dr. Sibley's Mathematical Biology class for practical formulas to answer this question. Dr. Sibley's talk investigates geometrical and numerical patterns of these nests, and discusses the biological significance of this problem and the nature of mathematical modeling. Be prepared to look for patterns and find justifications for the patterns which are found.

Tom Sibley graduated from St. Olaf's Paracollege in 1973 and received his Ph.D. in 1980 from Boston University. His education alternated with two tours of teaching in Africa, first as a Peace Corps volunteer in the Congo and later as a college professor in Liberia. His research interests center on symmetry in geometry, although he has a burgeoning interest in mathematical biology.

Remember the Lounge

The new student lounge on the second floor of Old Music Hall has been surprisingly empty! Stocked with interesting books and toys, the lounge is a perfect place to wind down after a hard day of math classes. The couches in the lounge are far more comfortable than anything you'll find in a dorm, so the lounge is also a wonderful place to sit and chat with some friends about the latest developments in algebraic k-theory. But if neither socializing nor homework are of interest to you, feel free to take an afternoon nap in the lounge. Don't forget about this new hangout!

CS Poem of the Week

By Peter Erling Sprangers

I'll let you through
my boolean guard
Just promise you'll be true,
Then I'll assert I head
The list and leave
The (car) to you.

Math, Baseball, and Art

Annalisa Crannell of Franklin & Marshall College contributed an article to mathforum's webpage about Math Awareness Month, which is coming up in April.

Here's a neat question that comes from studying the mathematics of art. Suppose you're watching a baseball game on television, and the screen shows the pitcher getting ready to serve up a fastball to the batter. The pitcher, who is closer to the camera than the batter, takes up a lot more of the TV screen—in fact, he's half again as tall (on the screen) as the batter is. Where on the field is the camera? This question reverses the one that Renaissance artists had to ask themselves; they knew (or imagined) where their artistic subjects sat in the real world, and so their question lay in how to portray relative sizes on the canvas. The answer to both questions relies on an old geometric favorite: the similar triangle. We can think of the television screen (or the easel) as an imaginary wall between the camera (or the eye of the artist) and the baseball players. The pitcher himself becomes one side of a triangle whose opposite vertex is the camera lens; the image of the pitcher on the screen forms the side of a smaller similar triangle. So we get the equality (HEIGHT/DISTANCE) = (height/distance). The batter, who is about the same height as the pitcher but who stands 60 feet, 6 inches further away, helps to create a second pair of similar triangles—they are similar to each other, but not to the pitcher's triangles. Because we noticed that his image on the TV screen is only two thirds the size of the pitcher's image, we get the second equality,

HEIGHT/(DISTANCE + 60.5) = (2/3)height/distance.

The reader can check that this gives the distance from the camera to the pitcher of 121 feet.

(This article was taken from http://mathforum.org/mam/03/essay7.html.)

Last Week's Problem

Place six distinct positive integers on a cube, one per face. Form at each corner the product of the three numbers on the faces at that corner and add the eight such products together. Show it is possible that this total is 385. There is a unique set of six numbers which works. Are there totals other than 385 for which there would still be a unique solution?

Jason Saccomano '05 writes, "If *a* and *A*, *b* and *B*, *c* and *C*, are numbers on opposite faces of a cube, the quantity described can also be calculated as $(a + A)(b + B)(c + C)$." 385 factors as 5?7?11, which gives two solutions: (1 + 4)(2 + 5)(3 + 8) and (2 + 3)(1 + 6)(4 + 7). Most people found only the first. Kyle Haemig '03, Nick Larson '05, and Jared Irwin '06 found that 231 = 3?7?11 = (1 + 2)(3 + 4)(5 + 6) gives a unique solution, but they made some assumptions which ruled out other possibilities. With a little prodding, Jared followed up with 275, 308, and 343, all of which work. I especially liked the 308, since I had made an assumption that ruled that one out. Jason also found 343, which is the sum obtained from a normal 6-sided die, and only from that labeling.

Problem of the Week

Prove $n! < \left(\frac{n+1}{2}\right)^n$ for all integers $n > 1$.

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

If you would like to receive a copy of the Math Mess in your P.O. Box weekly, please e-mail Donna Brakke at brakke@stolaf.edu.

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