

Math Mess

Department of Mathematics
St. Olaf College
Northfield, MN 55057

April 19, 2004
Volume 32, No. 18

This Week's Mathematics Colloquium

Title: Demography and Democracy: The Mathematics of Undercounting

Speaker: Rebekah Dupont, Augsburg College

Time: Tuesday, April 20th, 1:30 pm - refreshments at 1:15

Place: SC 182

This Week's Colloquium

Population counts from the U.S. Census determine public and private funding allocations and representation through congressional apportionment. The Census Bureau first became aware of the differential undercount in 1940 when the number of young black men who registered for the draft significantly exceeded the Bureau's predictions to the War Department. In this talk, we will discuss the history and significance of the differential undercount and explore mathematical techniques for estimating the undercount at national and local levels.

Rebekah Dupont is associate professor of mathematics at Augsburg College in Minneapolis, where she has taught for nine years, since spending a year as a visiting professor at St. Olaf. She has a Ph.D. from Washington State University and became interested in the Census while working with her students to investigate the impact of undercounting on the neighborhood immediately

surrounding Augsburg. In her free time she enjoys running and playing with her two daughters.

The Math Recital Is Here!

This spring's Math Recital is this Wednesday. Here are the details:

What: The N-th Annual Mathematics Recital

Who: All Friends of the Mathematics Department

Where: Ytterboe Lounge

When: Wednesday, April 21st from 7:00pm until 9:00pm

Why: A chance to eat together, play together and laugh together.

The Math Recital is an annual tradition in the mathematics department. Calling it a mere "talent show" fails to do it justice. The recital is a chance for any friend of the department to share his or her instrumental, vocal, thespian or other talent with the rest of their mathematical friends and colleagues. Good food is provided by the faculty.

Good taste is provided by the students. The evening is a relaxed chance to gather and enjoy a wide variety of performances.

Please consider performing as an individual or part of a group. Steve McKelvey is keeping the official play list, so please let him know (in person or by phone, x3421, or email) what you would like to present. The sooner you let him know, the more likely it is there will be a place on the program for you.

Last Week's Problem

Last week's problem is stolen, I mean borrowed, from Macalester's Problem of the Week, which has a webpage at <http://mathforum.com/wagon/>. You are served a plate containing 100 spaghetti noodles. You randomly grab two ends from the pile and tie them together. (I checked; the spaghetti is cooked.) Then you repeat this process until there are no ends left. What is the expected number of loops at the end? "Expected value" here means the average over all possible outcomes.

For the third week in a row we had an alumni solver, **Mike "Spaghetti" Watercott '02**. The problem was also solved by **Carl Carlson '05** and **Adam McDougall '05**. Recall that the spaghetti is cooked. When you first pick up an end, there are 199 other ends available to tie it to, but only one of these is on the same piece of spaghetti, so there is a $1/199$ chance of forming a loop on the first tying. For the second tying, whether you made a loop or not previously, there are 198 ends to choose from, so a $1/197$ chance of making a loop. This pattern continues until the 100th tying, when there are only two ends left, so a $1/1$ chance of making a loop. Summing the probabilities of making a loop at each stage, we have an expected value of $1 + 1/3 + 1/5 + \dots + 1/199$ loops, which is approximately 3.28.

This sum is related to the harmonic numbers, $h_n = 1 + 1/2 + 1/3 + 1/4 + \dots + 1/n$, which can be approximated by the integral $\int_1^n 1/x dx$. While the harmonic numbers diverge as $n \rightarrow \infty$ (very slowly), the difference between the harmonic number h_n and the integral converges, to a number known as the Euler-Mascheroni constant, γ , which is roughly .577. (<http://mathworld.wolfram.com/Euler-MascheroniConstant.html>). This could be used to approximate h_n for large n without extensive computing time. Note that our sum above is $h_{200} - (1/2)h_{100}$, or $\ln(200) + \gamma/2$.

Problem of the Week

Another baseball problem this week - what is the probability that at some point this season, the Twins will have either a winning streak or losing streak of six games or more? We need to make some simplifying assumptions. Assume that the individual games are independent events (they aren't) and that the Twins have a .5 probability of winning any particular game (also arguably not true). There are 162 games in the season. Ignore any actual results up to this point.

*** Please submit all solutions by Thursday at noon to David Molnar by e-mail (molnar@stolaf.edu) or by placing them in his box at OMH 201.

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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