St. Olaf Mathematics Department

Math Mess

Department of Mathematics
St. Olaf College
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This Week's Mathematics Colloquium

Title: Huge Erdös Magic
Speaker: Joel Spencer
Time: Thursday, April25th, 7:00 pm
Place: SC 282

This Week’s Colloquium

Joel Spencer is a Professor of Mathematics and Computer Science at the Courant Institute in New York. He received his B.S. at MIT and his Ph.D. at Harvard. He has published/edited numerous articles and books and given lectures around the world. Joel has served on the boards of many mathematical organizations and is currently the editor of the journal *Combinatorica*. Here’s what he has to say about his talk:

Paul Erdös was a unique figure, an inspirational figure to countless mathematicians, including the speaker. Why did his view of mathematics resonate so powerfully? What was it that drew so many of us into his circle? Why do we love to tell Erdös stories? What was the *magic* of the man we all knew as Uncle Paul?

One of Erdös’ lasting legacies is the Probabilistic Method. We will give two examples of this method - both problems formulated by Erdös in the 1960s with new results in the last few years and both with substantial open questions. In each of these examples we take a Computer Science vantage point, creating a probabilistic algorithm to create the object and showing that with positive probability the created object has the desired properties.

- Given m sets each of size n (with an arbitrary intersection pattern) we want to color the underlying vertices Red and Blue so that no set is monochromatic.

In a universe of size N

Last week’s problem: The standard dimensions in the US of a sheet of plywood are 48" by 96", or 4608 square inches area. A queen-sized bed is

60" by 80", or 4800 square inches. If we cheat a bit on the width, we should be able to get a 57.6" by 80" platform out of a single sheet. The problem is, how can
you cut a single sheet of plywood into two pieces that can be repositioned to get a rectangle 57.6" by 80"? Or, alternatively, if you cheat the length instead of width, to get a rectangle 60" by 76.8"?

Solution: This week we saw solutions from **Adam McDougall**, **Nick Larson**, **Brian Peters**, and **Bob Hanson**, who came up with a variety of alternative, and possibly more comfortable, ways to distribute the "missing" area. All solutions were based on the idea of a "zig-zag" cut: imagine the entire 48" by 96" sheet scored into 20 or 30 equal rectangles (depending on which bed you're going to make), and cut along those scorings in a zig-zag fashion.

Problem of the Week

Here is another immensely practical problem which I was reminded of watching trebuchet videos on Tom Engle's homepage. It is well-known that the best angle at which to launch a projectile in order to maximize distance traveled across a flat field is 45 degrees. (This is math class; we ignore air resistance, etc.) That's all well and good, but what if you are launching apples down Old Main hill? I don't know how much of a slope that is, so let's call the angle of inclination of the hill θ. Assuming a fixed initial velocity, what launch angle (as a function of θ) will maximize distance traveled down the hill?

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

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