

L'Augarithms



vol. 23.07

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January 27, 2010

Mathematics Colloquium Spring Lineup

Colloquia are held Wednesdays 3:40—4:40 in Oren 113. Refreshments will be served.

| | | |
|--------|----|--|
| Jan. → | 27 | Pat Van Fleet, University of St. Thomas ¹ |
| Feb. | 10 | TBA |
| | 24 | TBA |
| Mar. | 3 | TBA |
| | 24 | TBA |
| Apr. | 21 | TBA |

¹This week's talk: The Discrete Wavelet Transformation and Digital Image Compression

Abstract: Digital images are ubiquitous in the technological world. We see them on Web sites, the FBI performs analyses on digitized fingerprint images, and medical images are often stored digitally. In order to improve speed of transfer or optimize storage space, digital images are often compressed. That is, a mathematical algorithm is applied to a digital image in hopes of reducing the amount of data needed to store it. We have seen tremendous advances in digital image compression in the past 10-12 years. The FBI developed an algorithm that compresses digital fingerprints at an astonishing rate and in the future, we hope to see the JPG2000 format used in web browsers. A key component of both of these compression algorithms is the discrete wavelet transform. In this talk we will describe a naïve image compression algorithm and, in the process, learn about the discrete wavelet transformation and how it is used in the process. This talk should be accessible to any undergraduate student who has a basic understanding of matrix multiplication.



Two Bonus Puzzles

Pick-a-number puzzle

1. Pick a positive integer with three or fewer digits. (For a one- or two-digit number, write 00x or 0xy.)
2. Repeat the digits (eg. for 205, write 205,205; for 15, write 15,015, etc.)
3. Divide your result by 7.
4. Divide your newer result by 11.
5. Divide your newest result by 13.
6. You got your original number back, didn't you?*

A birthday puzzle

When asked about his birthday, Sven said:

"The day before yesterday I was only 25. Next year I will turn 28."

How is this possible? When was Sven born?*

*What's up with these? Submit your explanations to: kaminsky@augsborg.edu

Problem of the week...

Ryan Brown, from White Bear Lake High School sent a solution to the POTW of volume 23.06. The limit was 1/2. **Rebecca Seaberg**, from Bethel University sent in a nice solution to the POTW of volume 23.03. The next POTW follows:

A positive integer is called a *digital prime*, a *dip* for short, if each of its digits is prime, each pair of consecutive digits is prime, each triple of consecutive digits is prime, and so on. For instance, the number 137 is almost a dip—137 is prime, 13 and 37 are prime, 3 and 7 are prime, but, sadly, the number 1 isn't prime. (Remember that a positive integer is prime if it is greater than 1 and divisible by no positive integer other than 1 and itself.)

- (a) Find all the dips.
- (b) Find all the dips, allowing 1 to be used as a digit.

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Puzzle of the week...

We heard from lots of folks on the puzzle from volume 23.06, "A man spent one-fourth of his life as a man..." **Melanie Flint**, of Field Middle School, **Susan Hecker** and **Bill Arden** from the Business-MIS department, and Augsburg student **David Nestrud** all calculated that the man was 60 when he died.

Here is the new puzzle:

Fill in the missing cells so that the rows, columns, and the two diagonals all add up to the same number.

| | | | |
|----|----|--|----|
| 32 | 19 | | 8 |
| 10 | 25 | | |
| 9 | | | |
| 35 | 16 | | 11 |

Submit puzzle & problem solutions to kaminsky@augsborg.edu, or under Ken Kaminsky's door at SCI 137E, or in the puzzles and problems box just outside of Su's office.

L'Augarithms

The approximately bi-weekly newsletter of the

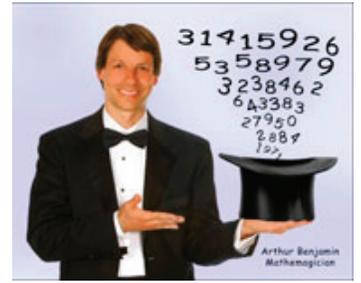
Department of Mathematics at Augsburg College

Editor.....Kenneth Kaminsky
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Ta Da!*

Published in *The New York Times* December 30, 2009

Arthur T. Benjamin has two passions: magic and math. When not amazing audiences around the country — squaring five-digit numbers in his head or guessing your number, any number — the Mathemagician is a professor of math at Harvey Mudd College in Claremont, Calif. There's even whimsy to his Ph.D. dissertation, at Johns Hopkins, titled "Turnpike Structures for Optimal Maneuvers": the maneuvers were inspired by a way of arranging Chinese checkers to move expeditiously across the board. Dr. Benjamin shares some of the concepts from his DVD course "The Joy of Mathematics" and his book "Secrets of Mental Math: The Mathemagician's Guide to Lightning Calculation and Amazing Math Tricks." Want to read more? Go to <http://www.nytimes.com/2010/01/03/education/edlife/03quiz-t.html>.



*Benjamin will be a guest on the Comedy Channel's *Colbert Report*, Wednesday, January 27 at 10:30 p.m.

3D Puzzle (bring the two images together to find the secret message)

The movie AVATAR is doing very well indeed at the box office. It has grossed over \$1 billion (bn) internationally, so far. However, adjusted for inflation of ticket prices, AVATAR has not yet appeared in the top 20 grossing films of all time. The top 3 are Star Wars Ep. IV: A New Hope at \$1.17 bn, ET: The Extra-Terrestrial at \$0.965 bn, and Titanic at \$0.925 bn. The "best" films of all time would almost certainly make for a very different list. Of course, who is to say which films are best, anyway? Critics? The general public? Would the best film you have ever seen appear on either of these lists? And, does seeing a film in 3D make it seem better than if you saw it in 2D?

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Coming Attractions

Konhauser Problemfest

The *Konhauser Problemfest* is an annual problem competition for teams of students from Macalester, Carleton, St. Olaf, University of St. Thomas, Gustavus Adolphus, and, since last year, Augsburg. Begun in 1993, the contest has been won four times by Carleton, five times by Macalester, five times by St Olaf, and once by St Thomas. This year's competition will be held on February 27.

Pi Mu Epsilon: Fall 2009 Journal Problems

Quote from Pi Mu Epsilon: "Problem-solving leads some of us toward scholarship in mathematics, which is why there is a Problem Section in the Pi Mu Epsilon Journal. Please share them with everyone in your Chapter of Pi Mu Epsilon and also with everyone in your mathematics department. The deadline for emailing solutions to the Problem Section editors is March 1, 2010, but submitting solutions earlier increases the probability that your solution will be the one printed in the Spring 2010 issue of the Journal." For this year's problems and the rules of the contest, visit:

<http://www.pme-math.org/journal/ProblemsF2009.pdf>

How many mathematicians does it take to screw in a light bulb?

$$\int_0^{\infty} \frac{\Gamma(\alpha + k) \lambda^{\alpha} x^{k-1}}{\Gamma(\alpha) \Gamma(k) (\lambda + x)^{k+\alpha}} dx$$