Augarithms

Vol. 17, No.10 Visit us at augsburg.edu/math/ February 18, 2004

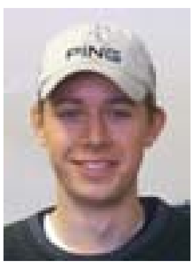
Colloquium Series Dates for Spring 2004

Colloquia are held on Wednesdays from 3:40 to 4:40 p.m. in Science 108. Except for the names of some of the speakers, here is the schedule of dates for the 2003-2004 academic year:

Feb.	18	Kevin Sanft (‘02), Div. of Biostatistics, Mayo Clinic
Mar.	3	Thomas Sibley, St. John’s University
Mar.	31	Augsburg Students
Apr.	14	Augsburg Students

*My Role as a Data Analyst and Advice for Math Majors--Kevin Sanft

I will be talking about my job in the Division of Biostatistics at the Mayo Clinic. I'll discuss the projects I'm working on and how a Data Analyst contributes to medical research. As a recent graduate from Augsburg (in Math and Computer Science), I will also provide some valuable advice to current math majors on how to land a good job after graduation and the skills they'll want to develop while in school.



Kevin Sanft

Fractal† (1970s)

The term was coined by the Polish-born American mathematician Benoit Mandelbrot (1924-) from the latin adjective *fractus* meaning ‘broken’.

A set of points which is too irregular to be described by traditional geometric language. It has a detailed structure which is visible at arbitrarily small scales, and many fractals have a degree of self-similarity; that is, they are made of parts which resemble the whole, and which may be approximate or statistical. Applications of fractals are rapidly expanding and to date include statistical physics, natural sciences and computer graphics. For example, fractals are used in image processing to compress data and to depict apparently chaotic objects in nature such as mountains or coastlines. Examples of fractal objects include the KOCH CURVE, MENGER SPONGE and SIERPINSKI GASKET.

R L Devaney, *An Introduction to Chaotic Dynamical Systems* (New York, 1989) **Martha Limber**

†Reprinted with permission from *Dictionary of Theories*, by Jennifer Bothamley, Visible Ink, Detroit

Departmental Honors in Mathematics: Research Opportunities for Students

- Are you really good at math?
- Do you earn top grades in your classes?
- Do you enjoy working on tough math problems?

If so, talk with your mathematics professor, advisor, or me about getting involved in undergraduate mathematics research, working one-on-one with a mathematics professor on a problem. Doing research projects can make you a better student, and can help your chances of getting a good job after graduation or getting into the graduate program of your choice.

Students who have demonstrated exceptional talent, interest, effort, and achievement in mathematics and who complete a faculty-student senior research project are awarded departmental honors in mathematics.

To learn more about past student research projects, check out:

http://www.augsburg.edu/math/stu-research.html

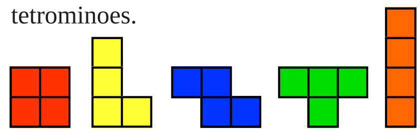
The specific requirements for departmental honors are posted at:

http://www.augsburg.edu/math/depthonors.html

Mathematics Department Chair, Su Dorée doree@augsburg.edu

Puzzle & Problem...

Correct solvers of the puzzle of the last issue (building a 3x3x3 cube from 3-cube blocks () include Associate Registrar **Paul Pierson**, **Brent Lofgren** (‘88), **David Wallace**, **John Ronnei**, and **Lisa Kopitzke**. Here’s this week’s puzzle: Using four congruent squares, one can glue together five essentially different tetrominoes.



S L Z T I

For each of these types, is it possible to tile a 10x10 grid with 25 copies of the tile?

Solvers to the oddly buttoned elevator problem include **Maggie Flint**, 6th grade Field Middle School, Minneapolis, **Brent Lofgren** (‘88), **Lisa Kopitzke**, and **David Wallace**. Now, for this week’s problem, in two parts:

a) If a stick is broken in two at random, what is the average length of the smaller piece?

b) What is the average ratio of the smaller length to the larger?

Send your solutions to the editor at kaminsky@augsburg.edu, or drop them in the *P & P* box just inside the math suite, Sci. 137.

Augarithms is available on-line at augsburg.edu/math/augarithms/. Click on the date you want to see.

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The Bi-weekly Newsletter of the Department of Mathematics at Augsburg College

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Born on this day...

Alberti

Leone Battista Alberti was born in Genoa, Italy on February 18, 1404. As a child he received his mathematical education from his father. He attended a school in Padua then the University of Bologna where he studied law but did not enjoy this topic. Alberti lived mainly in Rome and Florence working within the Roman Catholic Church. By 1432 he was following a literary career as a secretary in the Papal Chancery in Rome writing biographies of the saints in elegant Latin.

Alberti studied the representation of 3-dimensional objects and wrote the first general treatise *Della Pictura* on the laws of perspective in 1435. It was printed in 1511. He is quoted as saying:

Nothing pleases me so much as mathematical investigations and demonstrations, especially when I can turn them to some useful practice drawing from mathematics the principles of painting perspective and some amazing propositions on the moving of weights.

Alberti also worked on maps (again involving his skill at geometrical mappings) and he collaborated with Toscanelli who supplied Columbus with the maps for his first voyage. He also wrote the first book on cryptography which contains the first example of a frequency table.

Alberti died on April 3, 1472 in Rome, Italy.

Article by: J J O'Connor and E F Robertson

Mathematical Proofs...

Here is the final installment in our Mathematical Proofs series. These "proofs' were compiled in the May 1961 edition of OPUS by Joel E. Cohen. So, what do we know so far?

Lemma 1: All horses are the same color (by induction).
Theorem 1: Every horse has an infinite number of legs. (Proof by intimidation).
Corollary 1: Everything is the same color.
Corollary 2: Everything is white.
Now we are ready for the main result.

Theorem 2: Alexander the Great did not exist and he had an infinite number of limbs.
Proof: We prove the theorem in two parts. First we note the obvious fact that historians always tell the truth (for historians always take a stand, and therefore than cannot lie). Hence we have the historically true sentence, 'If Alexander the Great existed, then he rode a black horse Bucephalus.' But we know by Corollary 2 that everything is white; hence Alexander could not have ridden a black horse. Since the consequent of the conditional is false, in order for the whole statement to be true, the antecedent must be false. Hence Alexander the Great did not exist.

We have also the historically true statement that Alexander was warned by an oracle that he would meet death if he crossed a certain river. He had two legs; and 'forewarned is four-armed.' This gives him six limbs, an even number which is certainly an odd number of limbs for a man. Now the only number which is even and odd is infinity; hence Alexander had an infinite number of limbs. We have thus proved that Alexander the Great did not exist and that he had an infinite number of limbs.

Cartoon Cartoon

Thanks to Linda Lehner for the idea

Special to the *Augarithms:* Augsburg's **David Wallace** has contributed the following addendum:

Corollary 3: All horses are identical:

Proof: We proceed as in corollary 1. The proof of lemma 1 does not depend on the individual characteristics of the horse under consideration. The predicate of the consequence of the universally quantified conditional, 'For all x, if x is a horse, then x is the same color,' namely color, may be generalized to any attribute without affecting the validity of the proof. Hence, 'for all x, if x is a horse, then x is the same weight,' or 'for all x if x is a horse, then x is the same size,' etc. Of course, we already knew that if everything about a horse is the same, it must be the same horse. This just provides some rigor to the intuitively obvious.

Theorem 3: Everything is a horse.

Proof: To prove this, we must consider the implicit object of the predicate of the consequence of the universally quantified conditional 'for all x, if x is a horse, then x is the same color,' i.e. 'for all x, if x is a horse, then x is the same color as a horse.' This implicit object is not changed by corollary 1 or 2 and remains unchanged. By applying corollary 1 and 2 simultaneously to lemma 1, we have 'for all x, if x is anything, then x has the same characteristics.' Adding the implicit object gives 'For all x, if x is anything, then x has the same characteristics as a horse.' QED

As an aside, notice that the more general result, i.e. everything is the same horse, was known by the ancient philosophers. The same usage of the 'same' is demonstrated by the question, "what's the difference between a duck?" Once the answer to this question was discovered, i.e. "one of its legs are both the same," results analogous to ours followed directly. (Cf. 'History of Math,' Augsburg College.)