Augarithms

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Colloquium Series Dates for Spring, 2003

Colloquia are held on Wednesdays from 3:40 to 4:40 p.m. in Science 108. Here is the tentative schedule for 2002-2003:

Wed.	Feb.	26	Tracy Bibelnieks, Augsburg College*
Wed.	Mar.	12	Laura Chihara, Carleton College
Wed.	Mar.	26	Nick Coult, Matt Haines, & Ken Kaminsky, Augsburg College
Wed.	Apr.	9	Augsburg Students
Wed.	Apr.	16	Augsburg Students

*This week's talk: Using Operations Research to Lighten the Load of Your Friendly Neighborhood Postman(woman)

With the advent of new technologies for manufacturing goods, there has been a shift in the retail business from an emphasis on cost effective production as a primary means to achieve profitability, to the development of innovative marketing strategies that improve customer satisfaction, increase customer retention, and increase profitability. More and more, it is clear that the winning marketing strategies are those that are tailored to fit the individual characteristics of consumers. In the case of direct mail (e.g. catalogs), tailoring catalog mailings to individual consumers has meant a shift away from the paradigm that more catalogs to good customers means more sales.

Tracy Bibelnieks

This talk will introduce you to the mathematical science of operations research and how it was used to develop a catalog mailing model for one of the largest direct-marketing and online retailers in the US. The result of the model was fewer catalog mailings to customers (e.g. the lightened load of the Postman), an increase in customer satisfaction, and increased profits which were realized while minimizing sales growth loss.

--Tracy Bibelnieks--

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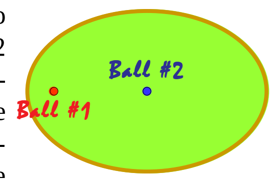
Puzzle & Problem...

PUZZLE SECTION:

Last issue's 3-D puzzle was solved by **Morris A. Bjurlin** ('63) of Hutchinson.

Here is this week's puzzle: On an elliptical billiard table, are two balls. Ball #1sits on one of the two foci; ball #2 sits in the center of the table. The object is to make ball #1 hit ball #2, but ball #1 must hit the cushion at least twice before hitting ball #2. Where should you aim in order to eventually hit ball #2 with ball #1? Assume that the struck ball can continue rolling indefinitely, and that spin has no effect.



PROBLEM SECTION:

Last issue's radius/chord problem was solved by **Hung Nguyen** and **David Wallace**. They both found the desired probability to be 2/3.

Here is this week's problem: You want to find someone having the same birthday as you, so you stop strangers on the street and ask them their birthday. What is the smallest number you need to stop in order to have a 50-50 chance of finding a match among the people stopped?

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

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From *Dictionary of Theories**

Fixed point theorem: Any theorem giving conditions for a mapping to have a fixed point; that is, a point which is mapped into itself by a transformation.

Proofs for the existence of fixed points and methods for finding them are important since the solution of every equation $f(x) = 0$ can be reduced to finding fixed points of the equations $x \pm f(x) = x$.

Reference: M. Hazewinkel, ed., *Encyclopadia of Mathematics* (Dordrecht, 1988)

Martha Limber

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

Mathematics Unlocks Mysteries of the Universe

by Allyn Jackson*

What is the shape of the universe? Is it finite? These are two of the most important questions in cosmology today. Mathematics is providing striking new insights into deducing the shape of the universe from observational data. These insights, which will be put to the test in the coming decade as scientists receive data from a new space probe, have the potential to transform our view of cosmology.

Gazing out into the night sky, one easily gets the impression that the universe continues forever in all directions. However; this impression is akin to thinking that the Earth is flat and continues forever in all directions because that is how it appears when one scans the horizon. Fairly sensitive measurements are needed to detect the curvature of the Earth. The same is true for detecting the shape of the universe.

One possible shape the universe might have is analogous to the surface of a doughnut. Mathematicians call this shape a torus, and it is a fundamental object of study in the areas of geometry and topology. The torus model has a weird property: For every object we observe in the universe, we would see not one but multiple images of the object. These images correspond to light emitted by the object at different points in time and at different angles. In fact, mixed in with all the observational data cosmologists collect would be multiple images of our very own galaxy. Taken together, these images would provide information about some fundamental properties of the shape of the universe.

The problem is that we cannot recognize these images of our own galaxy; we do not even know what it looks like from the "outside". However, the Cosmic Microwave Background radiation---the after-glow of the Big Bang that permeates the universe---may provide some clues. For this approach to work, more detailed data of the CMB is needed. By 2002, NASA's Microwave Anisotropy Probe will have furnished more accurate data with much better resolution than is available today.

These ideas are explored in the article "Measuring the Shape of the Universe" by Neil J. Cornish and Jeffrey R. Weeks, which appeared in the December 1998 issue of theNotices of the AMS.

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Mathematician Biography--Alfréd Rényi

Alfréd Rényi

Alfréd Rényi was born in Budapest in 1921. He received a literary, rather than scientific, schooling. In 1944 he was forced to a Fascist Labour Camp but somehow managed to escape. He obtained false papers and hid for six months avoiding capture. During this time his parents were held prisoners in the Budapest ghetto. Alfréd rescued them with an extreme act of bravery:-

> *Alfréd got hold of a soldier's uniform, walked into the ghetto, and marched his parents out. ... It requires familiarity with the circumstances to appreciate the skill and courage needed to perform these feats.*

At the end of World War II, Rényi obtained a Ph.D. at Szeged under F. Riesz for work on Cauchy-Fourier series. He was taught by Fejér at Budapest, then he went to Russia and worked with Linnik on the theory of numbers, in particular working on the Goldbach conjecture. He discovered methods described by Turán as

> *at present one of the strongest methods of analytical number theory.*

After returning to Hungary he worked on probability which was to be his main research topic throughout his life.

He published joint work with Paul Erdös on random graphs and also considered random space filling curves. Known by the nickname of Buba, he is best remembered for proving that every even integer is the sum of a prime and an almost prime number (one with only two prime factors), he is also remembered as the author of the anecdote:

> *a mathematician is a machine for converting coffee into theorems*

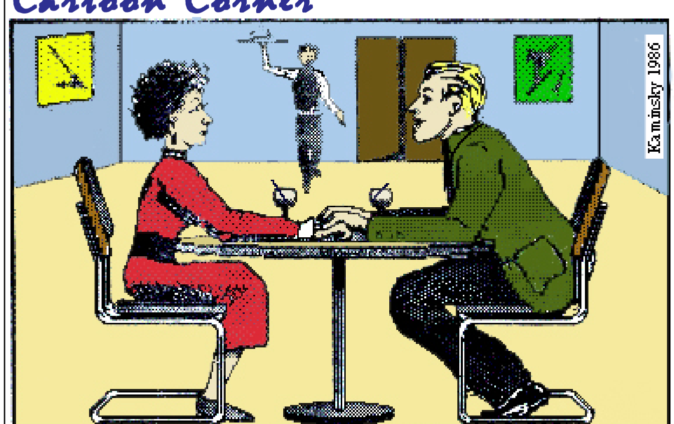
Turán developed the anecdote by describing weak coffee as *fit only for lemmas.*

Rényi was the founder, and for 20 years the director, of the Mathematical Institute of the Hungarian Academy of Sciences. He was a famous raconteur remembered for many performances of his dialogue, which he spoke with his daughter, on the nature of mathematics.

Alfréd Rényi died in Budapest in 1970.

Article by J J O'Connor and E F Robertson--reprinted with permission.

Cartoon Corner



You can tell me how old you are Mildred. I'm an actuary.

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