

MSCS



Mess

Department of Mathematics, Statistics and Computer Science
St. Olaf College
Northfield, MN 55057

March 7, 2005
Volume 33, No. 15

This Week's Colloquium

Title: Experiential Learning in MSCS:
Practicum and Internship Projects
with Mayo Clinic Biostatistics

Speakers: Mayo Practicum Group; Andrea Rau

Time: Tuesday, March 8th, 1:30 pm
(treats at 1:15)

Place: SC182

Mayo Practicum Group (Caleb Buecksler, Kelly McConville, Andrew Sperling, Kristine Thomsen, Heather Wiste):

Quality of Life (QOL) is of growing importance as a factor in disease treatment. The QOL for patients with high-grade gliomas (brain tumors) is of particular importance in assessing possible treatments, as brain tumors affect many aspects of the patients' QOL, including mood, cognitive abilities, energy level, and ability to function. We spent the month of January working with Mayo Clinic on a QOL study involving patients with high-grade gliomas. Our main goal was to investigate the relationship between a patient's assessment of his or her QOL and the caregiver's assessment of the patient's QOL. We used statistical analyses to determine that there is a positive linear relationship between patient and caregiver assessment of

QOL, but that using a caregiver's assessment of QOL in place of a patient's is dependent upon the desired accuracy because of large variation.

Andrea Rau (Mayo statistical intern in January 2005):

Phase I clinical trials are used to evaluate how a new drug should be given to people, as well as to identify what dosage is appropriate. As a result, the way the body absorbs, metabolizes and eliminates the drug is of primary interest. Pharmacokinetics refers to this study of the action of medicine in the body. The Area Under the Curve (AUC), which is a measure of total drug exposure in a patient, has been determined to be a useful pharmacokinetic parameter in understanding the relationship between plasma concentration and therapeutic or toxic outcomes. However, the exact calculation of AUC is both inconvenient and costly as it usually requires the measurement of plasma drug concentration at 10 to 20 time points, often at inconvenient hours. Over interim, I studied another modeling technique used in approximating the AUC--the Limited Sampling Model.

Friday Research Seminar

Title: Geometry and Islamic Art
 Speaker: Rich Allen
 Time: Friday, March 11th, 3:30 pm
 Place: SC186

Sacred geometry as embodied in Islamic art possesses an inner logic and symmetry that is less an expression of human emotion and more a representation of science where the Muslim artist willingly subordinates his individuality to the objective and impersonal beauty of his work. Islamic art is based on geometric models and is composed of geometric repeat units, each with a circle as the base figure at the center of the repeat unit. All the geometry of the repeat unit emanates from the central circle which, when its circumference is divided evenly, gives rise to regularly shaped polygons that can be developed into star-shaped polyhedrons organized and displayed in perfectly balanced proportions.

This is a champagne and chocolates talk where one could be led to ask whether God put pi in the circle, the square root of 2 in the octagon, and the square root of 3 in the hexagon. I'll show you some pretty pictures around which discussion ebbs concerning the role of the circle in constructible figures and numbers, the role of Euclid and those other Greeks in the appropriation of geometry as the basis of Islamic art, the role of plane geometry and, especially, of the hexagon, the octagon, and the pentagon in Islamic art. One cannot miss visually the proliferation of stars and symmetries that ensue.

This is a light talk to reassure you once again that mathematics in the form of geometry is dazzlingly beautiful. It should also be a pleasant way to end your long week.

Konhauser Results

Congratulations to the St. Olaf teams listed below for an outstanding performance at the 13th annual Konhauser contest, held at Carleton College on Saturday. All of our teams did well, with St. Olaf taking both second and third place (Carleton took first). We also had the largest number of teams at 5. For the Konhauser, the top 3 teams win money and the first place team is, additionally, the keeper of a pizza puzzle trophy (ask a faculty member if you are curious about the pizza theorem the puzzle is based on). The St. Olaf teams are listed here with their mathematician team names in alphabetical order.

Bourbaki:

Carl Carlson
 Lori Donovan
 Robert Orme

Eisenstein:

Adam McDougall
 Matthias Hunt
 Jason Saccomano

Germain:

Becky Blessing
 Sara Krohn
 Kaicy McLeod

Kovalevsky:

Ohmar Coughlin
 David Swanson
 Tony Zbacnik

Peano:

Nolan Cook
 Joey Paulson
 Paul Tveite

Last Week's Problem

This week's question, thanks to Paul Zorn, grew out of last week's question. This time, remove a corner square (or in fact any black square, assuming we color the chessboard starting with black in the corners). Is it possible to tile the remaining board with twelve T-tetrominoes?

Sadly, no solutions this week either. I do not have an elegant solution to this and would still welcome anyone's solutions. It is still impossible to tile the board. Unfortunately, the counting argument from last week no longer works as when a black tile is removed this leaves 24 of each color and 6 T-tetrominoes of each of the two possible colorings gives the correct number of colored tiles. One approach is a slightly brute force approach that is greatly facilitated by pictures. I will simply sketch the ideas and continue seeking a non-exhaustive solution. First, we note that by symmetry we only need to prove that 6 of the 24 black tiles cannot be removed (the upper left corner, the three others on the diagonal from there, including the center, and the two others that are in the right triangle, for which the diagonal is the hypotenuse). In every case, except the center, at least one tile placing is forced and following the forced tiles leads to a configuration with few (often only 2) choices that clearly give a group of tiles (usually 2 or a square of 4) that cannot be tiled using T-tetrominoes. For the center tile, there is again a nice symmetry, so that considering all tilings that use the white tile directly above the center is exhaustive and quickly leads to showing no tiling is possible.

Problem of the Week

Thirty-five young people were invited to take part in a mathematics contest (something like the Konhauser). Unfortunately, several of them were delayed and could not be present at the appointed time. Each problem in the contest counted for one point. If the women had each solved five problems and the men had each solved four problems, the total score of all contestants would have been 4 percent more than if the men had each solved five problems and the women had each solved four problems. Did more than 10 women take part?

*** Please submit all solutions by Wednesday at noon to Amelia Taylor (e-mail: ataylor@stolaf.edu) or by placing them in her box at OMH 201.

Math Recital

The annual math recital will be held at 7:00 pm on Wednesday, April 13th in Ytterboe lounge (not the 26th as previously reported). If you are interested in performing at this great event, contact Amelia Taylor (e-mail: ataylor@stolaf.edu).

***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.

Editor-in-Chief: Paul Roback

Associate Editor: Thomas Noah Loome

MM Czar: Donna Brakke

Problems Editor: Amelia Taylor