MSCS Mess

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

October 12, 2007
Volume 36, No.5

Special Event

Math, Stats, CS Party

Thursday October 18th
(Evening)

Wondering what math class to take next? Come learn about what you can do with a math major and how you can make it happen.

There will be food, a drawing and lots of fun!

Look for posters with details after Fall Break!

Mathematics and War

Prior to World War I almost all applications of mathematics to war involved already existing mathematics. During World War I, developments in sonar and ballistics depended on new research in mathematics. The research in ballistics, which focused on the motion of a projectile from gun to target, was conducted in two locations, Washington, D. C. and the newly established Aberdeen Proving Ground in Maryland, where new weapons were tested. The Washington office was under the direction of Forest Moulton, an astronomer. After identifying problems in the existing theory of mathematical ballistics, Moulton divided the work required to revise the theory among the mathematicians in his office. For example, one worked on numerical methods to solve differential equations, while another modeled the effects of wind and the rotation of the earth. At Aberdeen, the office of experimental ballistics was headed by Oswald Veblen, a Princeton University mathematics professor who had volunteered for military service. (Regional note: Veblen was the grandson of Norwegian immigrants and grew up in Iowa.) Veblen and his group worked on both theoretical problems and data collection to test the mathematical models. In addition to recruiting young mathematicians to work with them on research, Veblen and Moulton hired human "computers," since the only technology available for calculations was adding machines. Veblen was able to hire enlisted men at Aberdeen, but due to the lack of men in Washington, Moulton hired women who had been mathematics majors to work as computers. Following the war, Veblen returned to Princeton, where he helped found the Institute for Advanced Study.

References: Herman Goldstine, *The Computer from Pascal to Von Neumann,* Princeton University Press, Princeton, 1972.

David Grier, Dr. Veblen Takes a Uniform, *The American Mathematical Monthly*, 108 (2001) 922-931.

-Kay Smith

Hey, Hey, Hey, Hey, Hey
The Real Analysis Exchange Needs You!!

Are you a first year student, interested in mathematics, not computer phobic and would like a solid, good paying job for your next three years at St. Olaf? Then does Humke have the deal for you!!! The Real Analysis Exchange is a journal that he edits, and he needs help. This job will pay for your training and then 3-4 hours of editing type work per week. If you think you might be interested, drop Humke an email note analysis@stolaf.edu. Hey, what can you lose? This could be great!

International Research
for Undergraduates in Real Analysis and Dynamical Systems

With significant support from the National Science Foundation and St. Olaf College, the Department of *Mathematics, Statistics and Computer Science* will sponsor four undergraduate research scholars during summer of 2008. These undergraduates will join teams of professional research real analysis at one of two host institutions, Lodz University in Poland or Selesian University in the Czech Republic. See our website for additional info: http://www.stolaf.edu/people/humke/REU2005-2007/REUintro.html.

Grant funding allows full support for three International Interns per summer for each of the next three years. This support includes:

- all travel expenses to/from the host sites
- all living expenses while in residence in Europe
- a $4300 research stipend.

The grant also pays for travel and living expenses at one or perhaps two professional conferences upon return. This is a wonderful opportunity and available only for St. Olaf students. Josh Campbell and David Swanson are our current International Research Scholars

Application is simple:
*Ask 3 professors to write a letter in support of your application. (Two references must be from mathematicians.)
*Complete a 9 question application form on the right hand column of the math website: www.stolaf.edu/depts/math or directly at http://www.stolaf.edu/people/humke/REU2005-2007/REUintro.html

The Deadline for all materials is **Nov. 9, 2007**

Some Upcoming Courses
Interim:

Mathematics in the Real World: Mathematics Practicum- Math 390 (Interim)
Every January three small groups of junior and senior MSCS students spend their interim learning about mathematics in the "real world." The Saint Olaf Mathematics Practicum involves real problems of real interest to real companies, not-for-profit service agencies and governmental agencies. These are research problems, problem without back-of-the-text answers, problems that require creativity and open minds to solve. The best part is that there is a group of very interested clients eagerly awaiting your insights.

Admission to the course is by permission of the instructors only and involves an interview process. Please sign up for interviews by putting your name on the sign-up sheet outside Old Music, Rm. 107, Prof. Kohnen's office. The interviews start shortly after fall break.

Any MSCS background is appropriate for the practicum. If you have questions, please feel free to contact Prof. Christine Kohnen or Prof. Steve McKelvey.

Number Theory- Math 238 (Interim)
Number Theory, the oldest branch of mathematics, is the study of the set of positive integers. Among other things, we will investigate properties of the prime numbers and perfect squares and also look at questions about divisibility of integers. Much of the course will consist of discovering patterns among various sets of integers and then figuring out why these patterns hold. Prerequisite: Math 220

Spring 2008

Applied Math Seminar: Fourier Series and Differential Equations- Math 238
Fourier series are an important tool in mathematical applications, especially in physics and differential equations. They also have many interesting properties for the pure mathematician to investigate. This seminar will take a look at the following questions, among others: (1) Which functions can be represented by Fourier series? (2) How do we find such a representation if it exists? (3) How can we use Fourier series to solve differential equations? (4) What other uses do Fourier series have? Prerequisites: Math 226 and Math 244, or permission of instructor.

Combinatorics- Math 364
Have you ever wanted to know exactly how many ways there are to run up the stairs if you can climb either one or two stairs at a time? Have you ever wanted to know 66 different ways to describe a sequence of integers? Or have you ever just wanted to solve a problem in a 300-level math class by drawing a picture? If so, you should register for Combinatorics.

Combinatorial problems can be found in computer science, cryptography, physics and many other sciences. In this course we will discuss what it means to "count" things. Counting techniques will include the inclusion-exclusion principle, generating functions and recurrence relations. We will discuss permutations, set partitions, posets, graphs and more! Prerequisite: Math 252

Topics in Biostatistics: Statistics 282
The course introduces and explores both design elements and statistical methods related to both observational studies and clinical trials. Topics to be covered include: cohort, cross sectional and case-control studies: ordinal, multinomial and conditional logistic regression, factorial and cross-over designs, randomization schemes and stopping rules.
Prerequisite: Statistics 272
See Katie Ziegler-Graham for more details.

Bioinformatics- Computer Science 315:
Bioinformatics brings biologists and computer scientists together to work on problems that intrigue both groups. From the biology point of view, we have DNA and RNA sequence analysis, gene structure, phlogenetic trees, and protein folding, evolution, and structure prediction. Computer science contributes specialized algorithms for solving computational problems arising from the need to store, access, transform, and utilize DNA-related data. Topics from computer science central to the development of tools for solving such problems include: exhaustive search, greedy algorithms, dynamic programming algorithms, divide-and-conquer algorithms, graph algorithms, combinatorial pattern matching, clustering and trees, hidden Markov models. Prerequisites:CS 121 and one of (CS 251, Biology 125. Math major status); or permission of instructor. Counts toward the computer science major and the math major. T 9:35 and Th 9:30 (Rich Allen).

Programming Languages- Computer Science 276
This course examines key issues and features in the design and implementation of high level programming languages. An implementation-oriented approach is taken where students construct their own interpreters for an example programming language integrates the
various language features studied throughout the course. Topics include programming language syntax and semantics, programming language translation, lexical and syntactic analysis, implementation of control
structures and memory structures, abstraction mechanisms, language translation systems, types. Prerequisites: Computer Science 241 and either Computer Science 251 or Computer Science 125 or permission of instructor. Counts toward the

computer science major. Course is scheduled for MWF 9:05 and the instructor is Rich Allen.

Mathematical Foundations of Computing (MFC) - CS 231
The MFC course examines the Mathematics at the ground floor of Computer Science. Building from concepts introduced in CS 121, MFC introduces formal definitions and logic notation, then presents the standard Mathematical proof techniques in a careful, accessible way. We apply those proof techniques to verify the correctness of simple programs, prove facts about numbers, and explore concepts that appear elsewhere in Computer Science. For people interested in CS, MFC provides the mathematics you need for other CS courses. For folks interested in Mathematics, MFC gives you a chance to get familiar with proofs at a gentle pace before the Transition courses (Math 244 and Math 252). Prerequisite: CS 121 or CS 125. Offered Spring 2008, MWF 10:45-11:40, (Brown)

CS121
The introductory computer science course will be offered in both interim and spring. There are no pre-requisites. New this year: the animation project now spans the whole term, and culminates in a video that you can submit to YouTube. Other topics include web development, digital sound, and general purpose programming.

CS350
The advanced team project course is designed to allow students to work on a team undergraduate research project. New this year: for the first time, this course will focus on the Palantir Project (communication, visualization, and computer graphics). Possible projects include image segmentation, stereo vision, 3D video, and real-time object tracking with robotic cameras.

Game Night

Wed. Oct. 16, 6:30pm, SC188
Questions? see Mike Weimerskirch in OMH 304

Problem Solving Group

The Problem Solving Group is designed to prepare students for the Putnam Exam, the Konhauser Problemfest and other problem solving competitions.

Meetings: Tuesday at 7:00pm in SC 188.

NOTE: The next meeting is scheduled for October 22 due to fall break.

Problem of the Week (POW)

Computer Science Problem of the Week:

Alice and Bob play a game in which they take turns removing stones from a heap that initially has n stones ($n \in \mathbb{Z}^+$). The number of stones removed at each turn must be either 1, 2, or 3. The winner is the player who takes the last stone. Alice plays first.

Problem A) Write a program which determines whether Alice or Bob wins the game which initially has n stones, for $1 \leq n \leq 100$. Can you characterize the value of n for which Bob wins?

Hint: If Bob can win the game which starts with k stones, then Alice can win the game that starts with $k + r$ stones where r is any number of stones that can legally be removed in a turn. Alice wins by removing r stones, and then playing Bob's winning strategy as the second player.

Alice and Bob now play a slightly different game in which they take turns removing stones from a heap that initially has n stones. The number of stones removed at each turn must be one less than a prime number. The winner is the player who takes the last stone. Alice plays first.

Problem B) Write a program which determines whether Alice or Bob wins the game which initially has n stones, for $1 \leq n \leq 100$.

Solutions to the Problem of the Week should be submitted to Mike Weimerskirch's mailbox in OMH 201.

Have a Happy and Relaxing Fall Break!

Editor-in-Chief:	Kate Tummers
Faculty Advisor:	Katie Ziegler-Graham
MM Czar:	Donna Brakke
Problems Editor:	Mike Weimerskirch

If you would like to submit an article or math event to be published in the Math Mess, e-mail tummers@stolaf.edu.