# MSCS Mess

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

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## This Week's Colloquium

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| Title: | Travel to the Mediterranean with the 2006 Math Practicum Groups! |
| Speaker: | 2006 Math Practicum Groups |
| Time: | Tuesday, May 2 at 1:30 p.m. |
| Place: | SC 182 |

The Mathematics Practicum is a January interim course for St. Olaf junior and senior mathematics majors. Three teams of (usually) five students work on consulting problems solicited from area businesses, government agencies, and non-profit organizations. These problems have significant mathematical, statistical, and computational components, and the projects end with a professional quality presentation by the students at the client's home office.

In this colloquium, you will learn what the Mathematics Practicum is all about, and each group will present a short (5-10 minute) description of its project. Then, you will have an opportunity to enjoy some fine Mediterranean cuisine and circulate through SC182, reading the project posters and asking questions of the group members. What, you may ask, does the Mediterranean have to do with this year's Practicum topics? Nothing, really—we in the MSCS department just like any excuse to eat good food and talk a little math...

The three projects from January 2006 are listed below.

### Metropolitan Council Environmental Services

**Title**: Estimating Non-Point Source Load and Measuring Uncertainty
**Group members**: Haley Hedlin '06, Jostein Reiners '06, Phillip Schulte '06, Allan Trapp II '06, Molly Tuerk '06, and Stacey Wood '06
**Abstract**: As both industrial and residential development continue to increase, upholding federal and state water standards becomes progressively difficult. This group investigated both common ratio and regression methods for pollutant load, and proposed a new estimation model incorporating additional factors affecting pollutant concentrations. They also investigated how, after establishing the accuracy of an estimate, we can we determine uncertainty surrounding it.

### St. Jude Medical

**Title**: Two Approaches to Transforming Hearts
**Group members**: Sarah Edwards '06, Sarah Gilles '06, Will Mitchell '06, Shannon Preble '06, Jimmy Randolph '06
**Abstract**: This group worked on the problem of mapping coordinates of the heart atrium from a distorted space to the corresponding atrium coordinates provided by a CT Scan. Their work was made more complicated because the transformation from one space to the other was extremely nonlinear. They developed two mapping algorithms.

### SageGlass

**Title**: Component Placement Optimization in Electronically Tintable Windows
**Group members**: Doug Baumann '06, Kieran Cofell-Dwyer '06, Heidi Hendrickson '06, Kristin Herreid '06, Danny Szydlo '06
**Abstract**: This group developed and analyzed component placement in electronically tintable windows. Design specifications when making double-paned electrochromic glass windows are important when maximizing the aesthetics of a window while ensuring durability. During Tuesday's presentation, this group will present a computational approach for component placement, as well as component shape analysis.

## Problem of the Week (POW)

Is there a number $A$ such that the decimal digits in $A^2$ add up to 44?

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

## Last Week's Problem

A two-part question last week:

a) Is it possible to place the numbers -1, 0, 1 on the squares of a 4 X 4 grid so that the eight row and column sums will all be different?

b) What if we also want one of the two diagonal sums to be different from the previous sums? Is that possible?

Congratulations to Kelly Nail '07 and Carrie Manke '06 who gave two similar, but different, solutions to part a):

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & -1 & -1 & -1 \\ 0 & -1 & 0 & -1 \end{bmatrix} \text{ and } \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 \\ 0 & -1 & -1 & -1 \\ 0 & -1 & 0 & -1 \end{bmatrix}$$

Part b) is not possible. There are only 9 possible sums of 4 numbers from the set {-1, 0, 1}, ranging from -4 to 4. Thus, of the 8 column and row sums, one must be 4 or -4. By symmetry about the diagonal we can assume it is a row (a solution remains a solution if we reflect about the diagonal). Also, a solution remains a solution if all entries are multiplied by -1. Thus, we can assume 4 occurs as a row sum. This implies that one row has all ones and therefore no column or diagonal sum can be -4. Therefore, one row has to have sum -4. This implies that no column or diagonal sum can be -3 or 3, which in turn implies that the row sums are 4, -4, 3, and -3, but this forces two columns to have the same sums.


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