Mathematical Modeling

Week 1: **Thursday August 28**

TITLE Introduction to Mathematical Modeling
CURRENT READING Giordano, 2.1

SUMMARY
An introduction to Mathematical modeling. The Mathematical Contest in Modeling is described and a sample problem provided.

DEFINITION: **mathematical model**

A mathematical model "is a mathematical conistruct designed to study a particular real-world system or phenomenon" (Giordano, Weir & Fox, page 54.)

Consider the following problem from the 1998 *Mathematical Contest in Modeling*

Background
Some college administrators are concerned about the grading at A Better Class (ABC) College. On average, the faculty at ABC have been giving out high grades (the average grade now given out is an A-), and it is impossible to distinguish between the good and the mediocre students. The terms of a very generous scholarship only allow the top 10% of the students to be funded, so a class ranking is required.

The dean had the thought of comparing each student to the other students in each class, and using this information to build up a ranking. For example, if a student obtains an A in a class in which all students obtain an A, then this student is only average in this class. On the other hand, if a student obtains the only A in a class, then that student is clearly above average. Combining information from several classes might allow students to be placed in deciles (top 10%, next 10%, etc.) across the college.

Problem
Assuming that the grades given out are (A+, A,A-, B+, . . .), can the deans idea be made to work? Assuming that the grades given out are only (A, B, C, . . .), can the deans idea be made to work? Can any other schemes produce a desired ranking? A concern is that the grade in a single class could change many students deciles. Is this possible?

Data Sets
Teams should design data sets to test and demonstrate their algorithms. Teams should characterize data sets that limit the effectiveness of their algorithms.