

## New Discrete Mathematics Courses in Tennessee...

by Lina Bowyer

Two years ago, the Principal and the Math Department Chair asked me to develop a one-semester course in Discrete Mathematics to complement our existing semester course in Statistics. My background at the time did not include any courses in Discrete Math. Luckily, I found out about the Leadership Program in Discrete Mathematics offered at Rutgers University, which has proven to be an invaluable resource to me in developing and implementing this course. I piloted a course, which I have taught for two years, using early versions of COMAP's new text, *Discrete Mathematics Through Applications* [1]. Now, the state of Tennessee is in the process of adopting Discrete Mathematics as a one-semester course at the high school level; through a combination of lucky circumstances, I am responsible for developing the curriculum guidelines and piloting the program for the whole state.

I teach at a public magnet school for academically talented students, where we require all students to take Math and Science for four years. Discrete Math, Statistics, and Calculus are all offered to those students who have completed or are taking Advanced Math/Trigonometry. The enrollment for the Discrete Math course has been 40-45 students each year, taught in two sections.

The first time I taught the course, after surveying several Discrete Math texts, I chose COMAP's text because it included most of the topics I wanted to cover, and I liked its emphasis on student discovery, projects and computer explorations. The curriculum I designed for the course centers on four main themes: Graph Theory, Social Decision Making, Matrix Modeling, and Recursion. My first syllabus included three 6-week sessions on the first three topics, with only a brief look at recursive processes. One of the highlights was a unit on voting theory which corresponded nicely with the presidential election of November 4, 1992. To complement this unit, the Government teacher and I coordinated a survey which was written, conducted, and analyzed by both of our classes.

The second time I taught the course, after having taken Terry Perciante's unit on fractals during the summer, I included much more on fractals and chaos, using the workbook, *Fractals for the Classroom* [2]. (See the sidebar for the current syllabus.) This unit was great fun to teach and a favorite among students: one of the highlights was constructing a 4-foot-high, stage-5 Sierpinski tetrahedron!

In teaching these topics I have found that I need different methods for evaluating student work than those I had used in other math courses. I let the learning process center more on student discovery and less on lectures. The students do a lot of work in cooperative groups. Part of the grade is based on participation in class discussions and problem-solving activities. I give writing assignments on homework and tests, which has been a challenge both for me and the students! I also require each student to complete a six-week project which further explores a topic we have covered in class.

As their final semester project, I ask students to put together

### One-Semester Discrete Math Course

- I. Graph Theory (6 weeks)  
Euler and Hamilton paths and circuits, critical path analysis, graph coloring, scheduling, minimum spanning trees, Steiner points, traveling salesperson problem, and shortest paths.
- II. Matrix Models (4 weeks)  
Leslie model, Leontief input-output models, Markov chains, game theory, and cryptography.
- III. Fractals and Chaos (4 weeks)  
Chaos game, basic fractal curves, fractal dimension, iterated function systems, cobweb diagrams, Mandelbrot and Julia sets.
- IV. Tessellations (1 week)
- V. Social Decision Making (3 weeks)  
Election theory, voting power, fair division, and apportionment.

## ...and New York City.

by Susan Picker

All students in New York City must now complete 3 years of mathematics to meet new diploma requirements. However, there are many students who have completed two years of Algebra, yet are ill-prepared for or have not passed the first term of the third year in the Algebra sequence. The Manhattan Superintendent, Patricia Black, has now given the go-ahead to Manhattan to create a completely new course in Discrete Mathematics to fill the need for another third-year course. Manhattan will be the first borough to implement such a course.

The curriculum committee of the Office of the Superintendent is currently preparing a Discrete Mathematics curriculum for implementation in September 1994. The committee includes six alumnae of the Leadership Program in Discrete Mathematics at Rutgers University. This two-semester course is intended as an academic college preparatory course. The syllabus will include such topics as voting, apportionment and fair division, graph theory and coloring, coding theory, combinatorics, matrices, algorithms, number sequences and recursion, introduction to fractals and chaos, and tessellations.

The proposed new Leadership Program for 1995 will include a special section for teachers implementing curricula like that of Manhattan.

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