IN DISCRETE MATHEMATICS

Using Discrete Mathematics in the Classroom

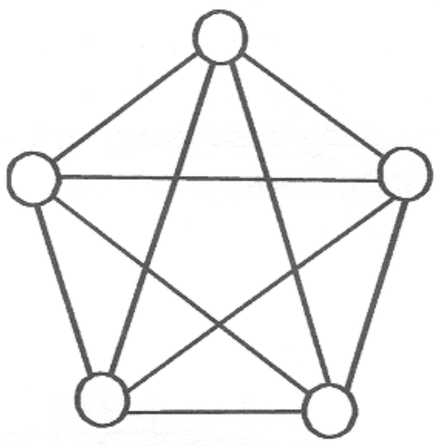
Issue #10 *Winter 1999*

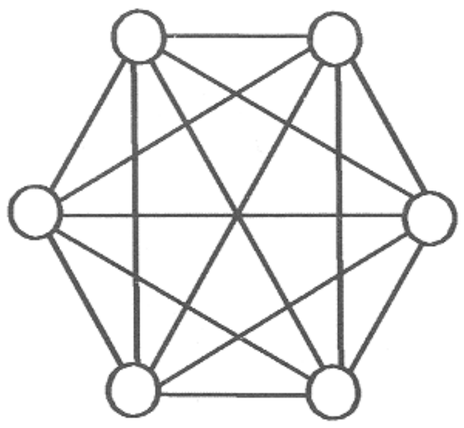
Speaking Discretely...

Robert Hochberg

I remember in graduate school when, in a certain class, we were stumped by the following question: "Can you color the edges of this graph, using just red and blue, so that no monochromatic triangles result?" (See diagrams and questions below, with answers on Page 6.) In the end, we solved the problem by imagining a game in which two players (red versus blue) took turns coloring the edges, and a player lost if he created a triangle, all of whose edges had his own color. Answering the original question then amounted to finding out whether a tie was possible in this game. That's when we discovered that there could be a lot of real mathematics in games.

The theme of this issue is "games." We have 3rd graders playing Nim, 7th graders inventing their own games, algebra students doing shortest path problems, and 5th graders solving mazes blindfolded. We also have a solution to the Farmer's Daughter Challenge from our previous issue, a new challenge, an article on prime and composite numbers, and our Discrete Reviewer presents a few books on games. Enjoy!





For the graph on the left, is there a way to give each edge a color (red or blue) so that no three edges that form a triangle all have the same color? How about the graph on the right?

In This Issue

Games are Math!

Elizabeth Kelsey Hicks

I teach at Algonquin Middle School in the Averill Park School District, a rural district on the outskirts of Albany NY. There are twenty four students in one of my 7th-grade classrooms. Although this is an accelerated class, I have discovered that it is a not-so-accelerated group; many students struggle to do any type of work that is not straightforward. The Game Theory Unit I did in this class helped students think differently and branch out from using solely traditional problem-solving strategies.

"Games are math?"

This was the question students asked when I introduced games in my 7th-grade class on the second day of school this year. Students were amazed to think that creating games and playing games was actually considered math. The students were able to then convince themselves and each other that there are many occupations that really use math and/or science to create games. They came up with occupations such as computer programmers, authors of mystery and drama stories, delivery people, map makers, and the list went on.

After discussing what a strategy is, I then asked, "Do all games involve strategy?" This question generated much discussion and as a class we decided that the answer was "No." We listed games that involve only dice or spinners where winning depends only on chance. The idea of strategy instantly had the students thinking because it grabbed their attention and was something they had not experienced.

My Game Theory Unit included some Nim-like games as well as the following game, involving both strategy and chance:

Remove One (See *Discrete Challenge* on Page 12)

Directions: Give each student a Remove One game board and 14 bingo chips. Explain to the students that they are to place their chips on the numbers; they may place as many chips as they like on each of the numbers, and they may decide to leave some numbers with no chips on them, but they must use all 14 chips.

Roll the dice and call out the sum. Every time you call out a sum, the students remove a chip from that number. The first

Remove One
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____
11 _____
12 _____