Sinclair Mathnet

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FROM THE CHAIR

In the 1999-00 academic year the LAS Division set as one of its five goals the reduction of the number of W grades in five selected courses. One of these courses was Math 102. (There was some concern among division faculty about the appropriateness of having student grade distributions as part of a college goal since this could be a conflict of interest for faculty. I would whole-heartedly agree with this concern if the goal pertained to grades of A, B, C, D, or F since these grades involve an assessment made by an instructor. But since instructors do not assign W grades, and reducing the number of W grades is a desirable goal, I think it is not unreasonable for the division to set this goal provided that the initiatives put into place to accomplish it are appropriate.)

In the case of Math 102 the initiative we put into place to reduce the Ws focused on proper placement. Prior to the start of each quarter, the math background of each student enrolled in Math 102 was reviewed to identify any students whose satisfaction of the prerequisite was in question. Instructors were given lists of these students that were in their classes and asked to advise them to go back to Math 101 if the instructor also deemed it appropriate. Two hundred and two students were identified. Seventy-one were counseled out of Math 102 before the last day to withdraw without record. Forty-three remained in the course and were successful. Eighty-eight remained and were not successful. Unfortunately the effort did not achieve the desired goal, as 26.45% of the students in 1999-00 received Ws as compared to 23.17% in 1998-99. Of course, one might argue that this does not mean the initiative was ineffective, but that the increase was due to other differences between the 1999-00 population and that of 1998-99, and that without the initiative the percent would have been higher than 26.45%. But that thought offered little motivation for celebration. Furthermore, sadly (though comforting to the Math Department) only one of the five LAS courses showed a decrease. This was a Chemistry course. My compliments to the Chemistry Department.

When deciding on goals for the 2000-01 academic year, the dean and division chairs at first shied away from repeating this same goal of reducing the Ws. But, much to their credit, I think, they had the courage and determination to restate the same goal for this year, focusing only on the four courses that had not fared well last year. As this decision was made during Fall Quarter, no particular initiative was instituted for Math 102 until this Winter Quarter.

During this Winter Quarter, however, the department has undertaken a two-pronged attack to attempt to reduce the number of Ws. Again, prior to the start of the quarter, the math backgrounds of all Math 102 students were reviewed. Students not appearing to meet the prerequisite were called or received a recorded phone message advising them to drop back to Math 101. Students with the prerequisite, but who appeared to be at risk for one reason or another, were called or received a recorded phone message inviting them to participate in the Math Retention Program. A third group of students who appeared to be at risk, but who did not fall clearly into one of the first two categories, were called and counseled appropriately. These calls were made by Marie Stroh and Nancy Nevius. All students were given information about study skills workshops, math anxiety workshops, the Math Lab, the Math Help Room, and the Catch-up section. This brings us to the second prong, the Catch-up section. Adolph Harris has agreed to voluntarily teach an extra section of Math 102 that any Math 102 student may attend at their leisure without registering. The Math 102 topics are covered in this section several days behind the syllabus that is followed in all other sections. This way students can hear a second lecture and ask questions on any topic of their choice from a second instructor shortly after they hear it for the first time.

If you are teaching Math 102, I hope you will help support this initiative by encouraging your students to attend the workshops and the Catch-up section, and to use the Math Lab and Math Help Room. If we can show that these efforts can be effective, we can lay claim to the need for more resources to continue these efforts and to expand them to other courses.

Al Giambrone ■

The Nature of Problem Solving

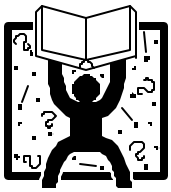
A CALL FOR CHANGE	The NCTM has called for mathematics instruction to be based upon the process of problem solving. It is believed that this type of instruction will enable students to become more mathematically powerful by utilizing investigation, exploration, verification and explanation skills.
THE BENEFITS OF PROBLEM SOLVING	Problem solving has been defined as the process of "confronting a novel situation, formulating connections between facts, identifying the goal, and exploring possible strategies for reaching the goal." It requires the problem solver to coordinate previous experience, knowledge, and intuition in order to solve problems for which no direct procedures or paths to a solution have been provided. Requiring students to apply judgments, make interpretations and find the structure needed to arrive at solutions develops a richer and more powerful understanding of the nature of mathematics. Problem solving activities allow students to think beyond algorithms and procedures and engage in higher-order cognitive tasks. These activities also encourage an appreciation of the concepts and mathematical principles involved in real-world situations and help connect mathematics learning to learning in other subject areas. Problem-solving skills are seen as essential to success in the workplace. The United States is in the process of shifting from a manufacturing-based economy to one that is service-based and information-based. Our students will need skills in accessing, interpreting, using and communicating information, not simply in acquiring it. In essence, thinking skills will be the driving force as our society shifts from physical energy to brainpower.
FOUR PROBLEM SOLVING STEPS	Although some consider problem-solving ability to be a unique talent outside the realm of teachable skills, research on problem solving has shown otherwise. Polya (1985) studied the nature of problem solving and identified four phases associated with successful problem solving. 1. Construct an appropriate representation of the problem. Identify what is being asked, what is the goal of the problem, what are the known and unknown elements of the problem and whether or not the conditions presented are sufficient to determine the unknowns. 2. Determine a plan for finding a solution by developing a systematic strategy for approaching the problem. Consider different strategies and select a particular one to use in solving the problem. Examples of mathematical strategies include guess and check, draw a picture, make a graph, solve a simpler problem, work backwards, use a formula, and use a model. 3. Implement the chosen strategy until the problem is solved or until a new strategy is chosen. Monitor the implementation of the strategy by checking to see that it is producing results that are consistent with the goal of the problem. 4. After obtaining the desired goal, evaluate the solution, making sure it is reasonable in the context of the problem and communicate the how and why of the solution process. If the solution is judged faulty or inadequate, search for procedural or conceptual errors and, if necessary, refine the problem representation and proceed with a new strategy.

AMATYC Conference

The 26th Annual AMATYC Conference was held last November in Chicago, and was attended by the four department members shown - Susan Harris, Bob Chaney, Lyn Keeler, and David Stott. Bob presented two workshops at the conference, "Using Calculators to Link Mathematics with Science and Technology" (co-presented with Fred Thomas of the physics department), and "Integrating Lab Activities into Introductory Statistics."

Future issues of *Mathnet* will highlight some of the talks that participants went to, including "Math is Fun…Isn't it?" - a presentation that addressed how to motivate students through the use of historical anecdotes.

DEPARTMENT COLLOQUIUM



We will have a Department Colloquium on Friday, February 9, 2001 at 2:30 p.m. in Room 1001. All members of our full- and part-time faculty are welcome, as well as students who are interested in mathematics. The speakers and titles are as follows:

1. Mr. Tom Wilson, Professor of Mathematics
   "Education in China"

2. Dr. Harvey Chew, Professor of Mathematics, Sinclair Community College
   "The Personalities of Numbers"

Refreshments will be served.

REMINDERS

- Please return textbooks you are not using this quarter. We need them for other instructors and sometimes for the bookstore when they run out and students can't get a text.
- Remind your students to use the Math Lab and the Math Help Room.
- Remind your 102 students to attend the Catch-up section. It meets 12-1 MW in room 3031 and 1-2 TR in 1117.
- Remember that the department handbook indicates that no more than 30% of a student's grade can depend on take-home tests, and that multiple choice questions should not account for more than 40% of their grade. (See p. 4.4)
- If you have to miss a class please get someone to cover for you from the sub list and notify the office.

Faculty Feature

In this edition of *Mathnet* we feature a Mathematics Department member who has taught at Sinclair Community College since 1987. Vicki Lair taught her first Sinclair class as a part-timer at Wright Patterson Air Force Base some fourteen years ago, but for the last five years has been a full-time faculty member for the Mathematics Department. This is her first year in a tenure-track position.

A native of South Dakota, Vicki grew up on a 500-acre farm "in the middle of nowhere." She says of her childhood, "I attended a one-room country school for all eight years of grade school. We had no telephone and no indoor plumbing of any kind there. We did have electric lights, though! Nevertheless, I believe I got a good education." She and her sisters worked very hard on the farm herding the cows, working in the fields, and canning and freezing fruits and vegetables. Vicki says she knew that a college education was the way off the farm, so she studied night and day.

It is at South Dakota State University that Vicki received a B.S., and her Master's degree in Mathematics was earned at the University of Nebraska-Lincoln. She started working towards an Ed.D. in math education at Oklahoma State University in the summers, but gave it up after she got married.

Her teaching experience includes 9½years at the University of South Dakota. After moving to Dayton in 1982, she began teaching part-time at Wright State University in the fall of 1983. When asked what brought her to Sinclair, Vicki says "The part-time work was drying up at Wright State and I was interested in teaching upper-level classes, which I was allowed to do at Sinclair." Her favorite class to teach is Calculus II.

In addition to her teaching duties at Sinclair, Vicki has served on the Study Skills Committee for the Math 101 Learning Challenge Grant, and has worked with the DEV department to help create a booklet on math study skills. In December she had the opportunity to attend a meeting in Columbus to give input to the Board of Regents on how and what math should be taught in grade school and high school.

In her spare time Vicki enjoys swimming, reading, visiting with neighbors and friends, and collecting antiques. She says, "I've also discovered in the last twenty years, I love to listen to people and find out what makes them tick."

Vicki lives in Fairborn with her husband Alan Lair, who is the chair of the Mathematics Department at the Air Force Institute of Technology (AFIT).

Susan Harris ■

Teaching Tips

A nice ten-minute group activity for a 102 or 131 class is shown below. Students are asked to grade a quadratic formula problem, looking for mistakes in arithmetic and notation. A checklist of items they should look for is provided. The student is graded upon how many of the mistakes in the problem are found. This activity and similar activities for 102/131 word problems can be found on the z-drive under "Lyn."

Consider the following problem and its proposed solution:

Solve the quadratic equation by using the quadratic formula: $3x^2 - 4x = -5$.

$3x^2 - 4x + 5 = 0$ (1 point)

$\frac{4 \pm \sqrt{-4^2 - 4 \cdot 3 \cdot 5}}{6}$ (4 points)

$= \frac{4 \pm \sqrt{16 - 60}}{6}$

$= \frac{4 \pm \sqrt{44}}{6}$ (3 points)

$= \frac{4 \pm 2\sqrt{11}}{6}$ (2 points)

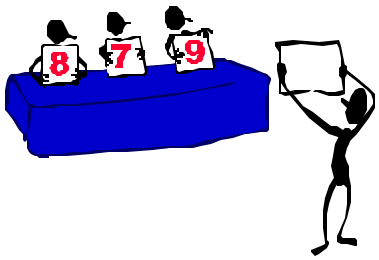
$= \frac{2 \pm 2\sqrt{11}}{3}$ (2 points)

Use the rubric below to grade this problem. If the problem shows the step correctly, then mark "yes." If the problem does not show the step correctly, mark "no," and write the number of that step next to where the error occurred in the problem.

The problem you are grading is worth 12 points, with point values listed next to each part of the problem. Deduct points for the mistakes that you find. Write the final grade at the top of the paper.

YES NO

1. Was the equation shown with zero on one side?
2. Was the variable denoted?
3. Were all fraction bars drawn correctly?
4. Were all radical symbols drawn correctly?
5. Were the values of the quadratic formula filled in correctly (and were parentheses used correctly)?
6. Was the radical reduced correctly?
7. Was the fraction reduced correctly?

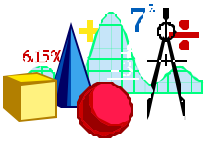


Just Thinking

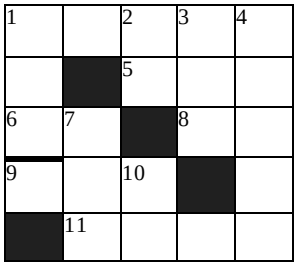
- When dog food is new-and-improved tasting, who tests it?
- Why didn't Noah swat those two mosquitoes?
- Why doesn't glue stick to the inside of the bottle?
- Why is it called tourist season if we can't shoot at them?
- Why are there Interstates in Hawaii?

Test Your Skills

We hope you have time to try this puzzle, and to offer your solution to either Lyn Keeler or David Stott.



No zeros are used in this number crossword.



ACROSS

1. All digits are odd and all are different.
5. Sum of digits is half the cube root of 3 down.
6. A prime number.
8. Three times the sum of its digits.
9. This number reversed is the square of an even number.
11. This is the same when reversed, and is divisible by nine.

DOWN

1. The first three digits of 4 down rearranged.
2. A prime number.
3. A perfect cube.
4. Each digit is greater than the preceding one.
7. A multiple of 8 across.
10. The sum of the digits is the square of a perfect square.

Infinite Series - Can you Believe It?

Every calculus student knows that the harmonic series $\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\cdots$ diverges (or at least we'd like to think they do). Some variations on this series offer some real surprises, however, and raise some interesting questions, too.

Consider the series derived from the harmonic series by *removing* all of the terms that have denominators that are composite numbers (leaving only those terms with prime denominators). This series still diverges, even though the primes become increasingly scarce.

But, in 1916 Frank Irwin showed that if we remove from the harmonic series only those terms that have the digit 9 in the denominator (such as 1/19), then the resulting series converges! Very curious! One would assume then that the series that contains the 9s diverges. Would the harmonic series also converge if we removed the terms containing the digit 8? Seems as though it should. But then, what about all those terms containing 9 that are still left in the series. Wouldn't they cause it to diverge? Clearly not, but it certainly makes one think twice about these infinite series!

Harvey's Joke Corner

What the 3-sport athlete gave his school – the old college "tri."

A math teacher's drawn out divorce trial was a "long division."

Q. What kind of horse can you buy for 25 cents?
A. A quarter horse.

After a long doctoral dissertation and inquisition, I felt like I was given the "third degree."

Churches welcome all denominations, especially fives and tens.

Q. Name a man of really low degree.
A. A snowman.

Can you guess why this issue of *Mathnet* can be called a "Wizard of Oz" issue?