

November 1999

# Sinclair Mathnet

Volume 6, Issue 2

## FROM THE CHAIR



"Build it and they will come." It was a good line in the movies and it seems to apply equally well to the Math Help Room. We built it and they came. So far, after 8½ weeks of the quarter, 276 students have come a total of 1026 times to the Math

Help Room. More particularly, 55 students in 200 level classes have made a total of 278 visits. This is important to note because tutoring in 200 level courses is not available through Tutorial Services. Students can only get it in the Help Room. This is all thanks to full-time Math Department staff who have provided 15 hours of tutoring per week and student tutors from Tutorial Services who have supplied an additional 19 hours per week. Part-time instructors, if you have not seen the Help Room yet, please take the time to drop by. It is in Room 1343 and it is open all day and evening Monday through Friday. And please feel free to use it as a convenient place to meet with your students who need help outside of class.

On a less happy note, I was saddened to hear of the recent death of one of our former Mathematics Department colleagues, Professor Gordon Bennett. Gordon taught for the Sinclair Mathematics Department from 1967 until 1983 when he retired and moved to Phoenix, Arizona. He was very knowledgeable in the history of mathematics, was always able to keep his students laughing and mostly liked to teach Math 121. He was a graduate of Columbia University and also taught at Ohio Northern University for a number of years. Gordon hiked in nearly every national park, drove the Alaskan Highway in 1976, was an avid and accomplished roller skater and advanced Commission RSROA roller skating judge, and an amateur ham radio operator. He left no relatives, but many fond memories in the hearts of those who knew him.

I would like to conclude with a few comments on the recent College Wide Learning Day (CWLD). Having

polled the department, I received the following feedback: There was general consensus that it was good to spend time with people from other departments. Many felt that the keynote speaker was very good, and there was some feeling that the other parts of the day may also have had some value. However, the general feeling seemed to be that little learning took place, the day was not terribly useful, and faculty would rather have the day available for instruction since our course syllabi are so difficult to cover.

I agree that it is a nuisance to lose a day of instruction when our course syllabi are already so full. Traditionally we have used the extra time in the Fall Quarter to accomplish such tasks as implementing our sequence embedded assessment in Math 108 and Math 116, and providing extra coverage of more challenging topics such as factoring sums and differences of cubes in Math 101. On the other hand, with the rapid advance of technology and new pedagogical concepts and theories, we do need "on the job time" to keep up with these advances so that we don't have to do so much of it on our personal time. But I did not feel that I gained any specific and useful knowledge at this most recent CWLD to help me keep pace with all the changes. I hope that in any future CWLDs specific and useful learning will occur, preferably learning that is discipline specific. If not, I would prefer to have the days back for instruction.

Al Giambrone ■



Al prepares to cut the cake during the Math Help Room Open House. Visitors enjoyed refreshments and gifts, and information was shared through discussions, literature, and a presentation.

**Primes, Generators and Lucky Seven****PRIMES**

We know that with a number having all ones as digits, that an even number of ones gives a whole number divisible by 11 with no remainder. Such numbers would not be prime. Some interesting numbers that are prime are 11,111,113 and 11,111,111,113, along with the notable prime twins 11,111,117 and 11,111,119. (Prime twins differ by two.) A rare form of prime is 1,111,111,111,111,111.

The biggest gap between consecutive primes below three trillion is composed of 651 composites between 2,614,941,710,599 and 2,641,941,711,251.

$n^2 - n + 41$ , with  $n = 1, 2, 3, \dots, 40$ , gives primes. What algebraic expression takes you up to  $n = 80$ ?

5 + 5 = 10  
86 + 14 = 100  
977 + 23 = 1000  
9968 + 32 = 10,000  
99,959 + 41 = 100,000

**GENERATORS**

But 1,000,000 has no whole number generators, therefore is a self-number. In powers of ten, what is the next self-number? (Hint: If you don't see the pattern in the generators, see the box at the bottom right of the page.)

91 + 10 = 101  
100 + 1 = 101

But we have to go to 9,999,999,999,892 + 109 = 10,000,000,000,001 to get the next whole number with two generators. What are two other generators of this number?

What is the smallest whole number with four generators, and what are they?

**LUCKY SEVEN**

Looking at the repeating segment of the decimal expansion of  $\frac{1}{7} = .142857142857\dots$ , we get an interesting pattern with  $1 \times 142857$ ,  $2 \times 142857$ , etc. What is the pattern for  $n \times 142857$  (where  $n$  is a whole number), and how far does this pattern go?

Looking at  $7 \times 2 = 14$ ,  $14 \times 2 = 28$ ,  $28 \times 2 = 56$ , etc., check out:

$$\begin{array}{r}
 14 \\
 28 \\
 56 \\
 112 \\
 224 \\
 448 \\
 896 \\
 1792 \\
 \dots \\
 \hline
 14\ 28\ 57142857\dots
 \end{array}$$

**AND FINALLY...**

The formula  $a^3 + b^3 + c^3 = d^3$  is satisfied by:  
 $3^3 + 4^3 + 5^3 = 6^3$ .

The formula  $a^4 + b^4 + c^4 + d^4 = e^4$  is satisfied by:  
 $30^4 + 120^4 + 272^4 + 315^4 = 353^4$ .

In 1966, integers for  $a^5 + b^5 + c^5 + d^5 = e^5$  were found. What are  $a$ ,  $b$ ,  $c$ ,  $d$ , and  $e$ ?

Doug Rose ■

Hint: Note that the digits of 86 add up to 14, the digits of 977 add up to 23, etc.



## Wind Symphony Concert and Dinner

The Sinclair Wind Symphony will be giving a concert on Saturday, December 4, at 8 p.m. in Blair Hall, Building 2. They will be performing works for winds that have been composed throughout the past century, including a spectrum of works from 1901 to 1999. There will also be music to celebrate the beginning of the Christmas holiday season. Full-time faculty member Susan Harris will be performing on the oboe.



All full- and part-time faculty are invited to meet at Uno's Pizzeria next to the Victoria Theatre (on North Main and First Street) at 6 p.m. for dinner before the concert. Come for an opportunity to spend time with colleagues, and to enjoy an evening of dining and music.

## DEPARTMENT COLLOQUIUM



We will have a Department Colloquium on Friday, February 11, 2000, 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. John C. Sparks, Senior Staff Engineer  
Air Force Research Laboratory / Wright Site  
Project Technology  
**"Probability over Serbian Skies"**
2. Dr. Mark E. Oxley, Associate Professor of  
Mathematics, Air Force Institute of Technology  
**"Arrangement of Hyperplanes (Cut the Cheese)"**

Refreshments will be served.

## REMINDERS

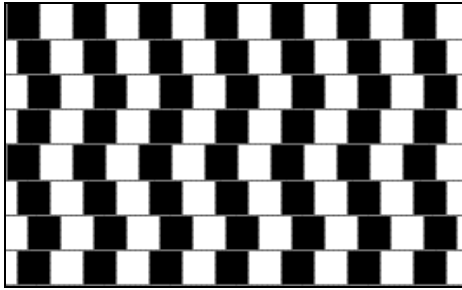
- First day in-class diagnostic tests must be given in all sections of Math 101, 102, 116 and 131.
- Students receiving an accommodation for calculator use in Math 101 by Disability Services should be given the two-part exams prepared by the department. They are available in the Office.
- When students do not meet your expectations, it does not mean your expectations should be lowered. It means you should look for ways to help raise students to your meet expectations. (Expectations should be based on what students need to know to be successful in future courses.)
- If you are teaching Math 102 next quarter, we will again be focusing on improving the initial advising in that course. You will receive a list of students in your class with questionable preparation. Please counsel carefully with these students and send them back to Math 101 if appropriate.
- Please remember to return copies of tables borrowed from the office for exams.



Al Giambrone presents a gift to Dr. Munsup Seoh, Associate Professor of Science and Mathematics at Wright State, who was the visiting Colloquium speaker in October.



"This statement is false."



Are the rows going across slanted or straight?

A paradox has been described as “truth standing on its head to attract attention.” There are many forms a paradox might take – some are visual, some logical, and some mathematical. Let’s take a look at a few classic mind teasers.

## THE SORITES PARADOX

A paradox of ancient origin is the *sorites* paradox, and it goes as follows: Suppose we have a large amount of grain piled in a heap. Surely, from so much grain, if we remove but one kernel, we will still have a heap of grain. And if we remove one kernel from that pile, it will still be a heap. Yet if we apply this principle repeatedly, removing kernels one by one, eventually we end up with a “heap” consisting of just one kernel of grain.

A similar paradox:

- One drop of water is not an ocean.
- If a body of water is not an ocean, then adding one drop will not make it one.
- Therefore, regardless of how many drops are in the body of water, it will not be an ocean.

The problem we are encountering here is one of *vagueness*. The word *heap* is defined as "a great deal, lots," and *ocean* is as a "great expanse or amount," but neither is defined in terms of a *number*. The paradox arises when we try to describe a term that is intrinsically vague by a specific number.

It sometimes happens that the recognition that a paradox exists and the resulting search for a resolution to that paradox brings about a change in the way we view the world. This is certainly true of the Barber Paradox proposed by Bertrand Russell. It is very simple to state, but its implications were phenomenal.



In a certain town a barber has the following sign on his shop:

I shave all those men in town, and only those men, who do not shave themselves.

The question is: who shaves the barber?

If he shaves himself, then he belongs to the set of people in town who shave themselves. But his sign says that he does not shave any such men. If he does not shave himself, then he belongs to the set of people in town who do not shave themselves. But his sign states that he shaves all such men.

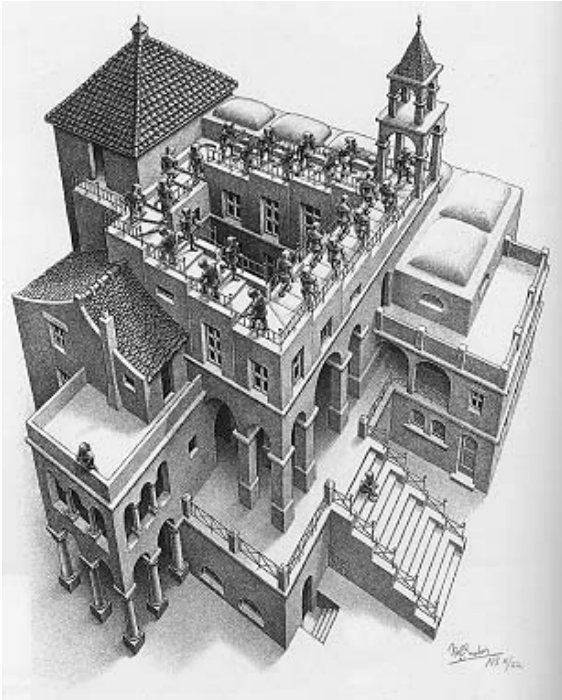
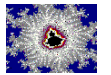
Up until Russell’s time it had always been assumed that the “universal set” existed, i.e., that there was a set that contained all sets and that the existence of this set was consistent with number theory. Using the Barber Paradox, Russell showed that this was not the case, and the resolution of the paradox led to the creation of axiomatic set theory.

A more exact representation of the paradox is as follows:

**Is the set of all sets that are not members of themselves really a set? If it is, and it is a member of itself, then it cannot be a member of itself, and similarly if it is not a member of itself, then it must be.**

## M.C. ESCHER THE ARTWORK OF M.C. ESCHER

The artwork of M. C. Escher contains many visual paradoxes. Escher’s “Ascending and Descending” is an example of an anamorphic figure. Anamorphic art is the art of distorting images. A curious property of anamorphic figures is that if they are viewed from the horizontal, just below eye level, they appear to rise slightly from the page. Check out this property with the Escher picture.



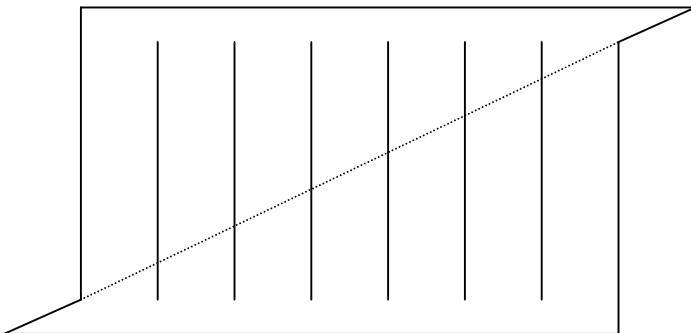
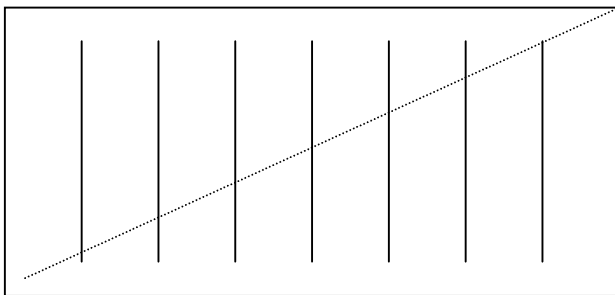
Ascending and Descending, by M.C.Escher.

All M.C. Escher works (c) 1999 Cordon Art BV - Baarn - the Netherlands. All rights reserved.

## GEOMETRIC PARADOXES

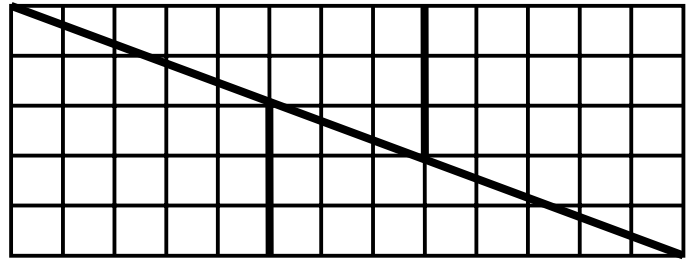
A few paradoxes are simply good exercises in geometry.

If this rectangle is cut along the diagonal and the bottom piece is slid one segment to the left then one of the vertical lines disappears. Where did it go?

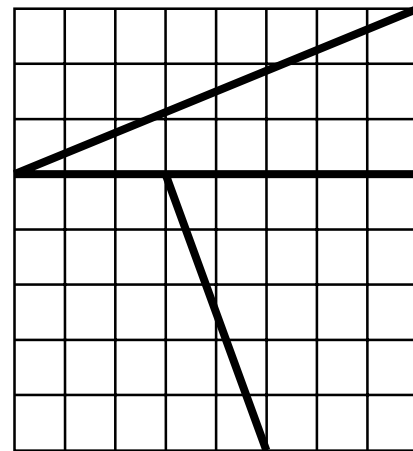


The explanation to this paradox is simply that the new lines are slightly longer than the original lines and the added length adds up to the length of the original seventh line.

The solution to the previous puzzle sheds light on the following disappearing square paradox. Consider the following five by thirteen rectangle containing 65 small squares. It is divided into four segments, two triangles and two quadrilaterals.



But notice that if we rearrange the pieces, we obtain an eight by eight rectangle that contains only 64 squares! Surely not, but where is the flaw? We'll leave this one for you to think about .



How is this possible?

### Just Thinking

- If you jogged backwards, would you gain weight?
- Wonder what you call a pocket calculator in a nudist camp?
- Is nostalgia the VCR of our minds?
- Before they invented drawing boards, what did they go back to?
- Does the little Mermaid wear an algebra?

John Pfetzing ■

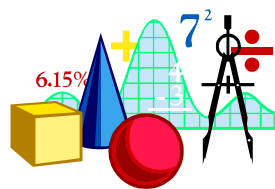


**GEOMETRY QUIZ** Match each description with the appropriate geometric term.

1.	What do you call a man who spent all summer at the beach?	A. a rectangle
2.	What should you do when it rains?	B. acute angle
3.	What do you say when you see an empty parrot cage?	C. coincide
4.	What do you use to tie up a package?	D. hexagon
5.	What do you call people who are in favor of farm machinery?	E. tangent
6.	What do you call a fierce beast?	F. geometry
7.	What do you call more than one L?	G. a chord
8.	What do you call an angle that is adorable?	H. polygon
9.	What did the little acorn say when he grew up?	I. a parallel
10.	What do you call a crushed angle?	J. protractors
11.	What did the Italian say when the witch doctor removed the curse?	K. a line

**Test Your Skills**

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



- Prove that  $\log_2 \pi + \log_\pi 2 > 2$ .

Sy Ostransky ■

**Geometry Quiz solutions: 1 E, 2 C, 3 H, 4 G, 5 J, 6 K, 7 I, 8 B, 9 F, 10 A, 11 D.**

**Harvey's Joke Corner**

Q: What is the favorite season of rabbits and adders?  
A: Summer.

A mathematics instructor was heard assuring students that he was more than just a figurehead.

Vacation note: Harvey visited his brother in Tennessee who is nicknamed the "Chattanooga Chew-Chew."



Harvey Chew ■

A cosine is good unless it is part of a loan.