UETCTM News

UETCTM Meeting

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Tuesday, May 4, 2010
4:00 p.m. - 6:00 p.m.

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UETCTM Meeting Location:

Northeast State Community College
Faculty/Staff Dining Room –
next to Subway in Student Center
2425 Highway 75
Blountville, TN 37617
(423) 323-0243 / (800) 836-7822

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UETCTM Meeting Agenda:

Breakout Sessions

Elementary/Middle – Solving Problems with Singapore Math
Presented by:
Nelle Gobble and Malissa Trent - NESTCC

Middle/High School – Synergistic Learning and Teaching with Slide Rules
Presented by:
Mark Pollock - NESTCC

MATH FUN

How can Pablo Picasso's *Pot, Wine-Glass and Book, 1908* inspire math in the classroom? **See Pg 8.**

IN THIS ISSUE

Essay on the Storm Shelter Problem

By Larry Swindell
Clinch School, Hawkins County Schools

On the first day of class Dr. Nivens assigned the attached "Storm Shelter Table" and the associated problem to solve. I have entered the results (perimeters and costs) for all applicable integral factors. Our group was instructed to graph the data using a scatterplot with length as the independent variable and perimeter as the dependent variable. I calculated the perimeters using plastic squares and counting rather than trying to derive a formula for the perimeter with the given constraints. Since the inputs from 1 to 24 meters resulted in outputs that began at 50 meters, decreased to 20, repeated at 20, then cycled back up to 50 through the same output values (see Attachment 1), I suspected the graph might be a parabola. However, when we graphed the data (see second attachment), the resulting curve was clearly not parabolic.

Also, since the answer to the problem involved minimizing the perimeter, I was sure that for integral factors, 20 meters was the minimum perimeter and $2500 was the minimum cost. We had used all possible integral factors of 24. However, it seemed probable that if the curve could be more carefully drawn, that there should be a minimum perimeter less than 20 meters resulting from a fractional length between 4 and 6 meters.

Therefore, at Mr. Nivens' suggestion, I have investigated the nature of the curve and the minimum point on the curve as follows:

First, I realized that given a fixed area of 24 square meters, the formula for the perimeter was

$P = 2L + 2W$, or, letting x = length, y = perimeter,

$$y = 2x + 2(24/x), \text{ or}$$
$$y = 48/x + 2x$$

This function is the sum of a hyperbola ($y = 48/x$) and a line ($y = 2x$). When I graphed this function on the TI-84 calculator in the first quadrant - the only place it has relevance - (also see second attachment), it fit the original data but gave a clearer picture of the nature of the curve.

- First, as $x \to 0$, $y \to \infty$, so the curve is asymptotic to $x = 0$.
- Second, as $x \to \infty$, $y \to 2x$, so the curve is asymptotic to $y = 2x$ and becomes essentially straight.
- Finally, the first derivative of $48/x + 2x$ is $-48/x^2 + 2$. Thus, when $-48/x^2 + 2 = 0$, the slope of the curve is zero, indicating a minimum point. The *trace* and *calc* functions of the TI-84 calculator yielded a minimum at $x = 4.9$ and $y = 19.6$. Since $(4.9)^2$ is very close to 24, and $-48/24 = -2$, this value of x (the length of the rectangle) yields the minimum value of y (the perimeter).

Contrary to what I initially suspected, the curve was in fact not parabolic: identical y values did not result from equally spaced x values. And, although the problem was posited for *integral* values of length, a smaller perimeter (~19.6 meters) could be derived from using a *fractional* value for the length, namely ~4.9 meters. ■

Attachment 1

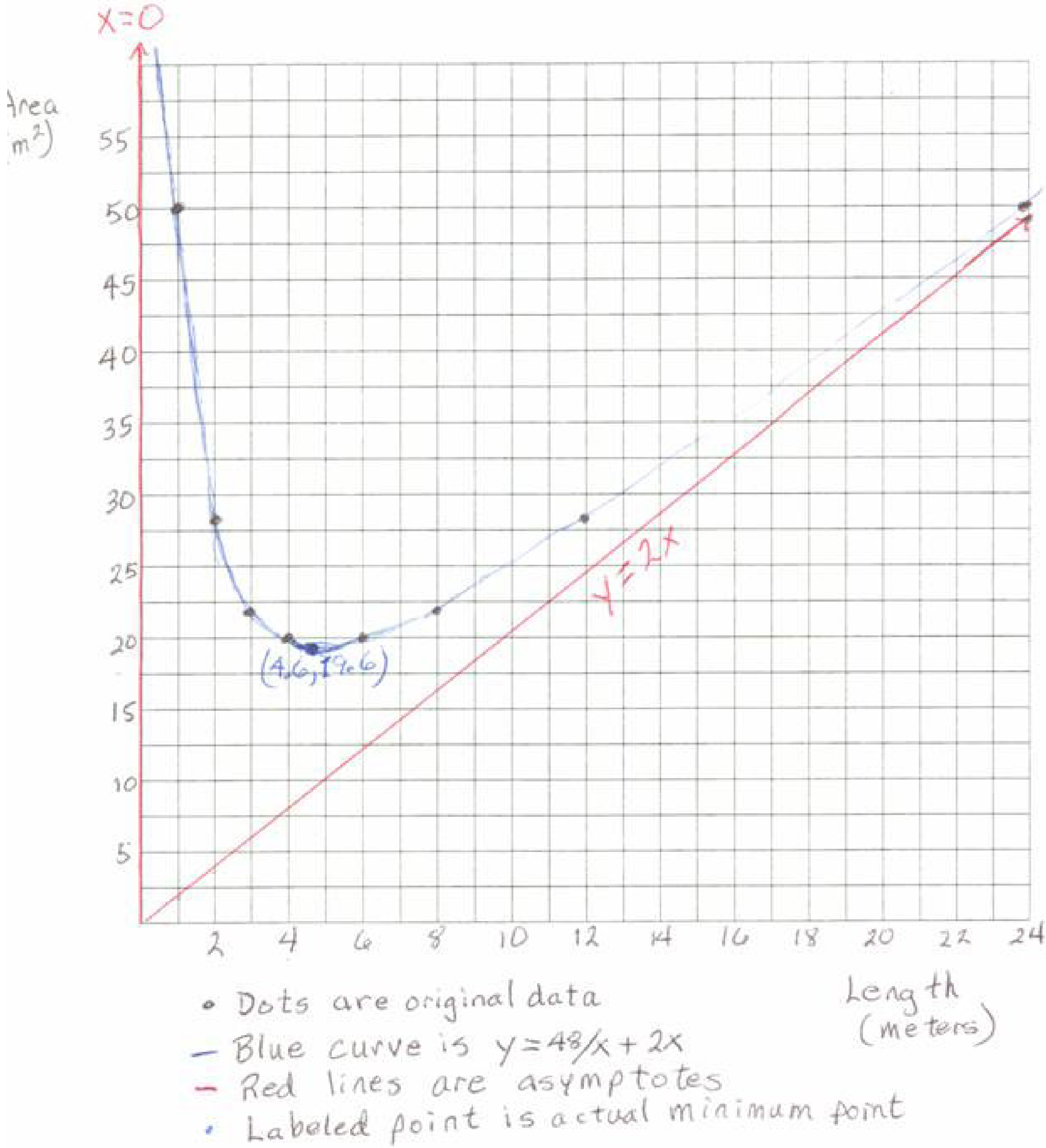
Storm Shelter Table

The rangers in the Great Smoky Mountains National Park want to build several inexpensive storm shelters. The shelters must have 24 square meters of floor space. Suppose the walls are made of sections that are 1 meter wide and standard wall height. Use your tiles to experiment with the different rectangular shapes of the floors. Sketch each possible floor plan on your grid paper. Record all information in the table below. Determine the cost of each of your arrangements if each wall section costs $125.

Length (meters)	Width (meters)	Area (m^2)	Perimeter (meters)	Cost of Walls
1	24	24	50	$6250
2	12	24	28	3500
3	8	24	22	2750
4	6	24	20	2500
6	4	24	20	2500
8	3	24	22	2750
12	2	24	28	3500
24	1	24	50	6250
			(seemed to suggest parabola)	

Attachment 2

Grid Paper (24x24)



Why They Fail and Why They Rebel

By Michael Robinson
Sullivan County Schools, North High School

The special education student entering the high school math classroom has not been adequately prepared for the transition. I believe that the concept of fractions is not being introduced. Students who are removed from the regular classroom to the resource classroom during the regular math class lose the introduction of new material because they are still struggling with concepts that should have been mastered such as basic addition and subtraction skills. Students should not be removed during regular math but at other times so they will receive both lessons. Mercer and Mercer (2005) state that there are several disadvantages associated with pulling students out of the general education classes, one of which is that "the student may miss valuable lessons in the general education class while attending the resource room" (p. 16). Brown and Quinn (2006) tell us that there are five concepts of fractional numbers that must be connected: whole to part relationship, ratio, quotients, measures, and operators. All are needed to form fractional number thinking patterns ("Australian Mathematics Teacher," Winter). These students are unable to cognate fractions because the metacognitive process may have not been fully developed. The special education student struggling in the resource classroom enters high school with the hope of acquiring the education needed to obtain a job in today's competitive job market. Their hopes are often shattered because of their inability to fulfill the minimum math requirements.

Their hopes are often shattered because of their inability to fulfill the minimum math requirements.

Students who are referred to special education at the second, third and fourth level are missing the basic introduction of fractions. According to the Tennessee state standards, the part to whole relationship is introduced at the first and second grade level. This is the first important concept necessary for understanding and being able to think in the fractional process. Missing this concept will greatly diminish the cognition necessary to form visual understanding in the algebraic process. Sousa (2007) tells us that students with number concept difficulties appear to have the understanding of small numbers and quantity at birth. The understanding of large numbers and place value, however, seems to develop during the preschool and early elementary years. Subsequently, ratio and measures are covered in the third and fourth grade, which is during the early elementary years, and the special education student is out of the regular classroom while this critical concept is being taught.

Tennessee Curriculum Standards Second Grade

Use concrete models or pictures to show whether a fraction is less than 1/2, more than 1/2, or equal to 1/2.
Match the spoken or written word names and concrete or pictorial representations (parts of regions or parts of sets of objects) of halves, thirds, and fourths.
Compare the unit fractions 1/2, 1/3, and 1/4.

Tennessee Curriculum Standards Third Grade

Connect written and pictorial representations of fractions with denominators up to ten.
Compare fractions with numerators of 1 and denominators up to 10.

Tennessee Curriculum Standards Fourth Grade

Use concrete or pictorial representations to compare and order commonly used fractions.
Use concrete and pictorial representations to compare decimals.
Use various models and equivalent forms to represent order and compare whole numbers and commonly used fractions and mixed numbers (e.g., number lines, base ten blocks, expanded notation, Venn diagrams, and hundreds boards).

With the struggling student in the resource class during the regular math class, this material can very well be overlooked. Unlike the student struggling with language who has three opportunities during the school day—English, History, and Science—to improve on their reading ability, the struggling math student gets only one chance. By the time the resource student reaches the conclusion of the fourth grade, he/she has missed three of the five concepts for introduction and understanding of the algebraic process. Intervention at this time can be successful with hands on activities and repetition of the needed material.

The introduction of quotients occurs in the fifth grade. If this crucial step is not covered, the now at-risk student will lose the critical thinking skills necessary to perform algebraic reasoning. Mathematics Developmental Continuum P-10 tells us: "Fractions are a way in which division is written in algebra, where the division sign ÷ is not used. Facility with fractions is needed for many aspects of algebra including algebraic fractions (i.e. any division), rationalizing irrational and solving equations" (http://www.education.vic.gov.au/studentlearning/teachingresources/maths/mathscontinuum/number/N45001P.htm). In algebra, fraction notation is used for division. Consequently, 'fractions' arise that appear unusual and perturbing to students. Can students see the main structure (and hence which number is divided by which) in unusual fraction-like expressions like these?

Tennessee Curriculum Standards Fifth Grade

Order and compare (<, >, or =) whole numbers, fractions, mixed numbers, and decimals using models (e.g., number lines, base ten blocks, Venn diagrams, and hundreds boards).
Compare and order fractions using the appropriate symbol (<, >, and =).
Demonstrate knowledge and understanding of grade level mathematical terms.
Represent proper fractions, improper fractions, and mixed numbers using concrete objects, pictures, and the number line.
Connect symbolic representations of proper and improper fractions to models of proper and improper fractions.
Represent numbers as both improper fractions and mixed numbers.
Develop understanding of equivalent number representations (i.e., fractions, decimals, and percents).
Represent numbers using a variety of models and equivalent forms (i.e., whole numbers, mixed numbers, fractions, decimals, and percents).
Compare and order whole numbers, fractions, decimals, and percents using the appropriate symbol (<, >, and =).
Connect whole numbers, mixed numbers, fractions, and decimals to locations on the number line.
Demonstrate understanding of percents greater than 100 and less than one.
Connect ratios to a variety of models, real-world situations, and symbolic representations.
Identify a ratio using three forms: 3 to 5; 3/5; 3:5.
Determine if two ratios form a proportion and find the missing number in a proportion.
i.e., mixed numbers, fractions, decimals, percents, and integers.
Compare rational numbers using the appropriate symbol (<, >, and =).
Connect rational numbers to locations on a number line.
Connect percents greater than 100 and percents less than one to real-world situations.
Use ratios to represent quantitative relationships.

Students who have not had the benefit of the regular education curriculum by the time they reach the seventh or eighth grade are lost. The regular education student is starting to compute with the math skills they have acquired. Resource students have no idea what the fractional process is. They will often become behavior problems at this time or seek shelter in the resource classroom where they are not set up for failure. Knowing that the multiplication and division steps are critical in the formation of algebraic computation and reasoning, students are in need of intervention to try to build understanding of the lost concepts. Several special education techniques can be used to help rebuild the students' deficit, but at this age may only reinforce the stigma they may have developed by leaving the regular classroom for special help.

Tennessee Curriculum Standards Seventh Grade

Compute with whole numbers, fractions, decimals, and percents in problem-solving situations (e.g., mental computation, estimation, calculators, computers, and paper and pencil).
Eighth Grade
Compute efficiently and accurately with whole numbers, fractions, decimals, and percents. Develop and analyze procedures for computing with fractions, decimals, and integers.

The special education student entering the ninth grade is given a screening measure for achievement (either a WRAT III or a Woodcock Johnson). During the last three years, attention has been focused on the math section of these tests. None of the students entering the behavior modification environment has attempted to complete the fractions on the test. This demonstrates the failure of the current system for teaching mathematics concepts to special education students and the need to implement the measures I have described.

References:

Brown, G. and Quinn, R. J. (2006) *Algebra students' difficulty with fractions: an error analysis.* Australian Mathematics Teacher (December 2006).

Sousa, D. A. (2005) *How the special needs brain learns.* Thousand Oaks: Corwin.

Mercer, C. D., and Mercer, A. R. (2004) *Teaching Students with Learning Problems (7th Ed).* Columbus: Prentice Hall.

MATH FUN

Shaping Up With Picasso

Look at the world like Pablo Picasso did, analyzing geometric patterns. Visit the link from Crayola below for directions on how to create a Cubist still life, focusing on the shapes you see with your Picasso viewpoint.

http://www.crayola.com/lesson-plans/detail/shaping-up-with-picasso-lesson-plan/

Cubism

A nonobjective school of painting and sculpture developed in Paris in the early 20th century, characterized by the reduction and fragmentation of natural forms into abstract, often geometric structures usually rendered as a set of discrete planes.

Request for Article Submissions

We are always looking for people to contribute articles to our ongoing "Math Perspectives" series. Every month, we would like four people to write for the series: a preservice undergraduate student, a preservice graduate student, a current classroom teacher, and one of our local math coordinators. Each person will voice their opinions, concerns, or observations upon a particular aspect of teaching mathematics. There are no set topics for this series.

Another section will be included in the next volume dedicated to mathematics problems.We are looking for people to submit favorite problems focused on various grade bands.

If you or someone you know would like to contribute to this column, please contact the ***Newsletter Editor, Ryan Nivens.***

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Membership Fee: $10.00
Make check payable to: UETCTM

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