Texas Mathematics Teacher

A PUBLICATION OF THE TEXAS COUNCIL OF TEACHERS OF MATHEMATICS

http://www.tenet.edu/tctm/

Volume LI Issue 1 **Spring 2004**

Volunteer for CAMT
sign up by May 15, 2004

TCTM Elections
vote by June 1, 2004

TCTM Annual Breakfast Meeting at CAMT
sign up by June 1, 2004

Check the Back Cover
for your membership card and renewal date

Texas Council of Teachers of Mathematics
2003 Mission and Goals Statement

MISSION

To promote mathematics education in Texas.

GOALS

Administration

- Investigate online membership registration through CAMT and/or the TCTM website

Publications

- Survey membership to identify what they want in the Texas Mathematics Teacher (TMT)
- Review and redesign the TMT journal and the TCTM website based on above findings

Service

- Increase the number of Mathematics Specialist College Scholarships
- Increase the donations toward Mathematics Specialist College Scholarships
- Staff CAMT registration with volunteers and other volunteers as needed
- Advertise affiliated group conferences on the TCTM website and in the TMT

Communication

- Maintain an e-mail list of members for timely announcements
- Communicate with affiliated groups in a timely manner
- Improve communication with NCTM consignment services

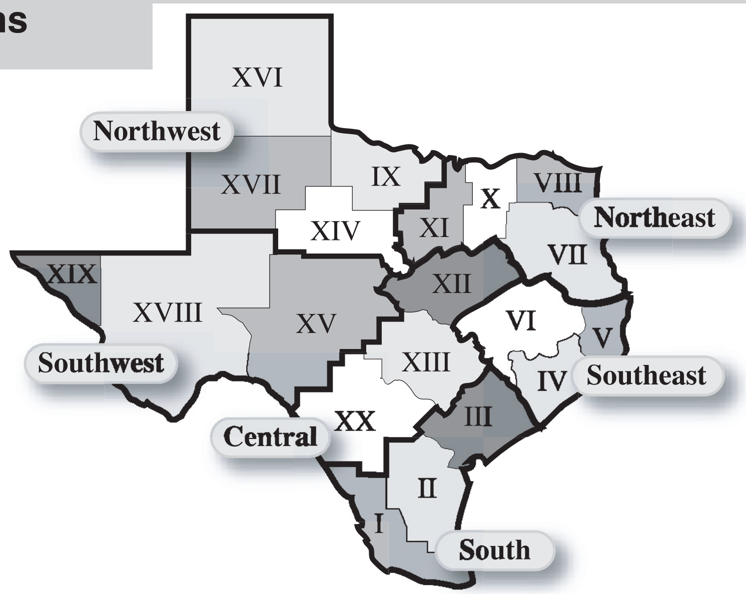
Membership

- Based on information gathered by TCTM board members as to advisability, advocate at CAMT Board meetings for TCTM membership to be required for all CAMT participants
- Encourage affiliated groups to include TCTM registration on their membership forms

Public Relations

- Staff and sponsor the NCTM/TCTM booth at CAMT
- Follow NCTM *Communication Guidelines* (1993) for increased media coverage of TCTM membership and issues relevant to our mission

TCTM Regions



TCTM Past-Presidents

1970-1972	James E. Carson	1982-1984	Betty Travis	1994-1996	Diane McGowan
1972-1974	Shirley Ray	1984-1986	Ralph Cain	1996-1998	Basia Hall
1974-1976	W. A. Ashworth, Jr.	1986-1988	Maggie Dement	1998-2000	Pam Alexander
1976-1978	Shirley Cousins	1988-1990	Otto Bielss	2000-2002	Kathy Mittag
1978-1980	Anita Priest	1990-1992	Karen Hall		
1980-1982	Patsy Johnson	1992-1994	Susan Thomas		

Texas Mathematics Teacher

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Volume LI Issue 1 **Spring 2004**

Articles

Features

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Texas Mathematics Teacher, the official journal of the Texas Council of Teachers of Mathematics, is published in the fall and spring. Editorial correspondence should be mailed or e-mailed to the editor.

Call For Articles

The ***Texas Mathematics Teacher*** seeks articles on issues of interest to mathematics educators, especially K-12 classroom teachers in Texas. All readers are encouraged to contribute articles and opinions for any section of the journal.

Manuscripts, including tables and figures, should be typed in Microsoft Word and submitted electronically as an e-mail attachment to the editor with a copy to the director. No author identification should appear on or in the manuscript. A cover letter containing author's name, address, affiliations, phone, e-mail address, and the article's intended audiance should be included. After refereeing, authors will be notified of a publication decision.

Teachers are encouraged to submit articles for ***Voices From the Classroom,*** including inspirational stories, exemplary lessons, or management tools. If submitting a lesson, it should include identification of the appropriate grade level and any prerequisites.

Items for ***Lone Star News*** include, but are not limited to, NCTM affiliated group announcements, advertisements of upcoming professional meetings, and member updates.

Businesses interested in placing an **advertisement** for mathematics materials should contact Mary Alice Hatchett.

Deadline for submissions: Fall, July 1 Spring, January 1

Letter from the President

Dear TCTM Members,

The TCTM Board has been actively pursuing policies that will increase our membership substantially. Under discussion is the inclusion of TCTM membership in CAMT registration as soon as 2005. This will warrant some changes to the registration fee and accommodations with the CAMT office in increased costs due to check processing. We feel that membership provides professional support through this publication and the annual conference that we co-sponsor. Our goal for all members is to bring you up-to-date information and exemplary materials for the classroom.

Speaking of up-to-date information, some recent online resources outlined in the March 2004 Bulletin from NCTM are:

- Elementary: Math at Home (available in English and Spanish)

  http://athomewithmath.terc.edu
- Elementary: Activities Integrating Mathematics and Science (AIMS)

  http://www.aimsedu.org/
- Elementary-Middle: Fact Monster

  http://www.factmonster.com/mathmoney.html
- High School: Great Achievements in Mechanical Engineering

  http://asme.org/education/precollege/archive/
- The following websites may also be of interest to you. See Educator Essentials and Fun for Families at

  http://utopia.utexas.edu/
- For online assessments and materials for the 11^{th} grade TAKS test, try

  http://www.track.uttelecampus.org/
- CAMT 2004 registration materials are online at

  http://www.tenet.edu/camt/

The San Antonio venue is always popular and we have over 700 sessions scheduled for your investigation. If you're going to be there, take some time to volunteer a few hours and see how the conference works "behind the scenes." To get started with your volunteer opportunity, just send me an e-mail. More TCTM members are encouraged to attend the annual business meeting and breakfast on Saturday morning (see the registration form in this journal). Lots of door prizes are available every year.

I would like to express a special thanks to Bill Jasper of Sam Houston State University for organizing and leading the group of volunteers that have solicited door prize donations for the last several years. He has done a truly fabulous job, with exemplary assistance from Sheryl Roehl of the South Texas Rural Systemic Initiative and several other TCTM members such as Cindi Beenken of Austin ISD. Bill is going to take a well-deserved break from this task. Anyone that would like to coordinate these efforts at future conferences, please let me know.

Look for the CAMT 2005 speaker proposal forms on the website soon. I encourage all members to consider becoming speakers in Dallas next year. Remember that speaker proposals for the 2005 NCTM annual meeting are due May 1, 2004. The conference next year will be in Anaheim, California.

The final report of the Texas School Finance Project may be downloaded from the left column of this website

http://www.capitol.state.tx.us/psf/

(under The Committees see Final Report). As concerned educators, I recommend that you keep abreast of the news on this issue. A phone call or e-mail to your elected representative is your opportunity to be heard on the issues. Information on how to contact your legislators may be found at

http://lrl.state.tx.us/citizenResources/ContactLeg.html

Finally, let me encourage you to continue collaborating with your colleagues, use multiple representations whenever possible and assess for student learning – these have been my mantra for several years. Improvements in our teaching and student's learning will occur if we remember it's a process, not a destination. Remember that we are all getting better everyday. Success is a proven motivator. Keep trying new things and never settle for less than the best from yourself or your students. I applaud you for your professionalism and dedication to the children of Texas.

Sincerely,

Cynthia L. Schneider

TCTM President 2002-2004

Reviewers

The quality of the Texas Mathematics Teacher very much depends on the voluntary efforts of many mathematics educators. Each article that appears in TMT is judged for content and style by at least three referees who volunteer their time and expertise. TCTM members who are interested in refereeing 2 or 3 manuscripts each year should contact Cynthia L. Schneider, TCTM President, 2002-06 *<cschneider@mail.utexas.edu>* or Mary Alice Hatchett, Director of Publications, Texas Mathematics Teacher *<mahat@earthlink.net>* .

The efforts of all of these 2003-04 referees in maintaining the high quality of the Texas Mathematics Teacher are very much appreciated.

Joyce Fischer	Norma Torres-Martinez
Tommy Bryan	Tony Petrosino
Susan May	Kathy Birdwell
Larry Lesser	Pam Littleton
Diane McGowan	Scott Fay
Michelle King	Tim Pope
Elsie Sneed	Bradley Beth
Monica Mahfouz	Bonnie Davis
Barbara (Basia) Hall	Andreas Frangeskou
Lois Moseley	Beth Grayson
Pam Summers	Julia Hedden
Judy Beauford	Lee Holcombe
Tom Butts	William Jasper
John Huber	Carl Juenke
Ulli Reichenbach	Joe Kemble
Jeanne Womack	Jo Ann Lawson
Ann Worley	Carol Lindel
Murray Siegel	William Luke
Mary Jane Smith	Jacqueline Luplow
Patti Bridwell	Beth Nicholas
Jo Ann Reyes	Patricia Rossman
Jacqueline Weilmuenster	Sharon Taylor
Rhonda Bailey	Laura Travalini
Donna Harris	Alicia Torres
Terri McLaughlin	Jeff Valentine
Amy Serda	Trena Wilkerson
Linda Shaub	Shirley Willingham

Affiliate Group News

These are local affiliated groups in Texas. If you are actively involved with them, please send future meeting and conference information to Cynthia Schneider at *<cschneider@mail.utexas.edu>* so we may publicize your events. Contact information for each group is available on the NCTM website,

http://www.nctm.org.

NCTM 2005

Dear Colleague:

The National Council of Teachers of Mathematics 2005 Annual Meeting and Exposition will be in Anaheim, California, Wednesday, April 6 – Saturday, April 9, at the Anaheim Convention Center, the Anaheim Marriott Hotel, and the Hilton Anaheim Hotel.

The conference theme is **"Embracing Mathematical Diversity".** The Program Committee seeks proposals that represent diverse perspectives, approaches, information, and ideas. Proposals are encouraged that address topics, ideas, issues, and strategies that can contribute to participants' professional learning, especially:

- knowing and understanding mathematics more deeply,
- improving instructional effectiveness to produce results with students, and
- expanding awareness of crucial or timely issues.

The meeting's theme calls for presentations that address diverse ways that students learn or demonstrate mathematics, teaching strategies that help a diverse group of students learn, and diverse models of mathematics professional development, and issues of equity and bias. Approximately 20 percent of the program will be selected to address NCTM's professional development Focus of the Year, ***Developing Algebraic Thinking***.

We especially encourage K-12 teachers to submit proposals to share their first-hand classroom experiences and observations.

Information about the types of presentations, answers to frequently asked questions, criteria for selection of proposals, and the speaker proposal form are available online at

http://www.nctm.org/meetings/

The deadline for proposals is May 1, 2004.

We hope to see you in Anaheim in 2005 for a fantastic professional development and networking experience that you won't find anywhere else!

Cathy Seeley	Bettye Forte
NCTM President-Elect	Carol A. Edwards
	Program Cochairs

Functions and Equations

• *Dick Stanley*
• *Diane McGowan*
• *Susan Hudson Hull*

Introduction

This article discusses how two kinds of mathematical objects, **functions** and **equations**, are related to each other, and how they are different. This is a relevant subject for those who teach algebra courses and the courses that lead up to algebra, since in recent years there have been significant changes in the way these subjects have been introduced in the curriculum. A generation ago the Algebra I course was primarily a course about equations; functions tended to be viewed as a more advanced subject that appeared in Algebra II and Precalculus. Today the tendency is to introduce functions much earlier, even before Algebra I.

There is much to recommend this early use of functions, provided that it is an appropriately simple and useful concept of function that is developed. A difficulty is that, in this era of transition in the role functions play in the curriculum, there is often considerable inconsistency and vagueness in the way curriculum materials treat functions, equations, and their relationship. This is unfortunate, since understanding the distinct but related roles that functions and equations play can be of considerable help in solving problems.

This article does two things. First, it shows a situation where we start with a function and then proceed to solve an equation based on this function. Second, it reverses the process, showing a situation where we start by solving an equation, and then proceed to generalize the solution by creating a function based on this solution. The examples are purposefully kept very simple so that the interaction between functions and equations can emerge more clearly.

Overview

A **function** expresses a relationship between two quantities, an input x and an output y, such that every input yields a unique output. For example,

$$y = 1.75 \bullet x$$

describes a function that expresses a relationship between y and x. Specifically, the value of y is always 1.75 times the value of x. We **evaluate** a function at a particular input value of x when we find the value of y that corresponds to this value of x. For example, evaluating this function at the input $x = 9$ gives the output $y = 15.75$.

An **equation** states a condition on a single quantity. For example,

$$1.75 \bullet x = 35$$

is an equation that states a condition on x. Specifically, the condition is that 1.75 times x must equal 35. We **solve** an equation when we find a value (or values) of x that meet the condition. In this case, there is a unique solution to the equation, namely $x = 20$.

Note: The particular function illustrated above is called a **function of one variable**, since there is just one input variable x. For comparison, $z = 1.75 \bullet x + 10 \bullet y$ describes a function of *two* variables, x and y and states an equation in *two* unknowns, x and y.

In this article we only look at functions of one variable and equations of one unknown.

Starting with a function

Suppose we consider a situation where the cost of gasoline is $1.75 per gallon. This situation can be represented with a *function*

(1) $\qquad y = 1.75 \bullet x$

where the input x is the number of gallons, and the output y is the cost in dollars of x gallons. A typical use of such a function would be to evaluate it to find the cost of a certain number of gallons. For example, if we buy 7 gallons of gasoline, we can find the cost in dollars by evaluating this function at $x = 7$:

$$y = 1.75 \bullet (7) = 12.25.$$

We have found the output $12.25 corresponding to the given input 7 gallons.

Suppose we are interested instead in how much gasoline we can buy for $35.00. We need to find an input x of the function (1) that corresponds to the given output $35.00. Putting these values into the function gives this equation in the unknown x:

$$35.00 = 1.75 \bullet x$$

Solving this equation gives the answer, $x = 20$ gallons.

Notice that this equation is based directly on the function (1). The desired output $y = 35.00$ is specified, and the input x is the unknown. In general, asking for the *input* of a function that produces a specified *output* always leads to an equation in exactly this way.

This example was very simple, and the equation was easy to solve. Often, however, equations may be hard to solve even when the corresponding function is easy to evaluate. For example, consider this function:

$$(2) \qquad y = x^2 + 1.5 \bullet x$$

We can easily find the *output* this function at any *input* x simply by computing. For example, at the input $x = 7$ the output is

$$(7)^2 + 1.5 \bullet (7) = 59.5$$

However, if we want to find the *input* x that corresponds to the *output* $y = 45$, we need to solve this equation for x:

$$45 = x^2 + 1.5 \bullet x$$

This requires more work than just computing. (In this case, the quadratic formula shows that there are actually two solutions to the equation, $x = 6$ and $x = -7.5$.)

> In the previous section we have shown a situation where we are given a *function*, and have found the input corresponding to a given output of that function by setting up and solving an *equation*. In the next section we show how we might start with an *equation* and go on to define a *function* based on this equation.

Starting with an equation

Suppose we have to make a trip of 175 miles and we need to get there in 5 hours. How fast do we need to travel? Since the rate of speed r, time t, and distance d satisfy the relationship $d = r \bullet t$, we can represent the problem by letting $d = 175$ miles and $t = 5$ hours, and set up this *equation* in the unknown r.

$$(3) \qquad 175 = 5 \bullet r$$

Solving this equation for the rate of speed r gives $r = 35$ mph.

On the other hand, suppose we have 5 hours in which to make a trip. In general, how fast do we need to travel if we want to cover d miles? Building on the solution above, we substitute $t = 5$ hours into $d = r \bullet t$ and get the equation $d = 5 \bullet r$. Solving this equation for the rate of speed r gives r as a *function* of d:

$$(4)\ r = \frac{d}{5}$$

This shows that the rate of speed $\boldsymbol{r}$ is directly proportional to the distance $\boldsymbol{d}$.

Notice that this function (4) *generalizes* the solution to the original problem. The original problem asks for the speed needed to go 175 miles in 5 hours. The function (4) tells us how to find the speed required to go *any* number of miles $\boldsymbol{d}$ in 5 hours.

For another variant, suppose that we often have to make a trip of 175 miles. In general, how fast do we need to travel if we want to get there in t hours? We substitute $d = 175$ miles in $d = r \bullet t$ and get the equation

$$175 = r \bullet t.$$

Solving this equation for the rate of speed r gives r as a function of the time t.

$$r = \frac{175}{t}$$

This shows that the rate of speed $\boldsymbol{r}$ is inversely proportional to the time $\boldsymbol{t}$.

The purpose of the examples in the above section has been to illustrate how *equations* can lead to *functions* in the solution of problems. Many problems in algebra can be approached in the same way. We first set up an equation with one unknown r that expresses a relationship among the numbers given in the problem statement. Solving that equation gives a number (or perhaps more than one number) as a solution to the original problem. Then, if we replace one of these numbers with a variable d, and solve the *same equation* for the *same quantity* r in exactly the same way, we get r as a *function of d***.** This function represents a generalization of the problem.

This article is one of several that are included in the Texas Mathematics Academy for 7th and 8th-grade teachers. These articles are also available through the resource section of the Mathematics TEKS Toolkit: http://www.mathtekstoolkit.org/ .

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Director of Mathematics • Charles A. Dana Center

TCTM Breakfast and Business Meeting at CAMT

Saturday July 17, 2004, 7:00 a.m. – 8:30 a.m.

Marriott Rivercenter

Come join us for the annual TCTM breakfast and business meeting. This is your opportunity to meet the current and incoming board members and be a part of TCTM decisions. Plus, there will be great door prizes from the vendors you see at CAMT. This breakfast is for members only (no children or other guests). Breakfast tickets must be reserved in advance; there will be no tickets available at CAMT. Please mail your contact information, along with your check for the breakfast, to the address below no later than June 1, 2004. Your ticket for the breakfast will be mailed to you no later than June 30.

Member Information

Name: ____
Last First Middle

Address: ____
Number and street Apt. number

____
City Zip Code

(___) ________________ (___) ________________ < ________________ >
Home Phone Work Phone Email Address

☐ Enclosed please find my $10.00 check, payable to TCTM, for the breakfast.

Distrcit or Professional Affiliation ________________ ESC ________

Please mail your check and form to

Cynthia Schneider,
234 Preston Hollow,
New Braunfels, TX 78132

Voices From the Classroom

Transformer Babies: A Summative Evaluation

• *Alice J. Young*

Grade Level / Subject: 7^{th} – 10^{th} Geometry

Overview & Purpose: This assessment was designed to show student's mastery of transformations.

Objectives: The student will be able to:

1. Transform polygons (TEKS 8.6A &B)
2. Write coordinates of vertices (TEKS 7.7A) in a table
3. Find the coordinates of the centroid of a polygon (Geometry TEKS (e)(2)(B))
4. Find the perimeter of a polygon
   a. Use measurement tools in middle school geometry (TEKS 7.9)
   b. Use distance formula in high school geometry (Geometry TEKS (e)(1)(C))

Keywords:

Polygon, transformation, translation, reflection, rotation, dilation, centroid, perimeter

** This activity is an adaptation of the FRACTION BABIES birth certificate activity that is used by many teachers across the state. I have been unable to find the originator of this idea.

Alice J. Young • <ayoung@nbisd.esc8.net>
Teacher and Department Chair • New Boston ISD

TRANSFORMER BABIES

You are going to create a birth certificate for the polygon of your choice. This is a test grade due at the beginning of the period on the following date: ________________

Your certificate must be done on a sheet of white paper (not notebook paper) and include the following:

Polygon's name: This must be the coordinates of a polygon written as a table and may not be an equilateral triangle or a square. Complete figure must be in one quadrant (worth 5 points).

Polygon's parents: Mother must be a fractional dilation; father must be an integral dilation. Centers of dilation must be the origin and coordinates of mother and father must be written as a table (worth 20 points).

Length: Must be the perimeter of the polygon baby and labeled in inches (worth 15 points).

Weight: Must be the coordinates of the centroid with the x-coordinate as pounds and the y-coordinate as ounces (worth 10 points).

Time of Birth: Must be the time of your geometry class (worth 1 point)

Date of Birth: Due date of the assignment (worth 1 point).

Ancestors: A total of 4 transformations of your polygon baby with the coordinates written as tables.

1 reflection about the x-axis (worth 10 points)

1 reflection about the y-axis (worth 10 points)

1 translation into another quadrant (worth 10 points)

1 rotation about the origin of 90^0 counterclockwise (worth 10 points)

Footprints of the polygon baby (worth 5 points). Be creative!

Decorations, neatness, graphs of baby and ancestors, and correct spelling (worth 3 points)

TEA Talks

Hot News

Refer to the websites listed for additional information on each topic

- TEA is in the process of conducting a TEKS revision for secondary mathematics. This process will run in conjunction with the textbook adoption cycle and will need to be completed for State Board approval and discussion in September. If you have any suggestions for grades 6 through High School TEKS modifications, please forward them to Paula Gustafson at *<pgustafs@tea.state.tx.us>* by March 30, 2004. Paula will also need a few volunteers to serve on committees that begin meeting in early April. If you would be interested, and can attend a meeting (or two) in Austin please forward your contact information to her.

- Do you want to know all the latest mathematics information from TEA? Sign up for the TEA Mathematics Listserv to receive email updates on statewide initiatives, policies, and assessments. Join today at the following web address:

  http://www.tea.state.tx.us/list/

- During the 78th Texas Legislative Session, Senate Bill 1108 was passed. This legislation, known as the High School Initiative, has many components that will serve to support the educational progress of students who are at risk of failing for the year or dropping out of high school. SB 1108 requires campuses to develop a Personal Graduation Plan (PGP) for each student in junior high, middle, or high school who does not meet the passing standard on the Texas Assessment of Knowledge and Skills (TAKS) or who is not likely to receive a high school diploma before the fifth school year following the student's enrollment in grade nine. Region XIII Education Service Center, the Texas Association of Secondary School Principals, and the Texas Education Agency have collaborated to produce the Personal Graduation Plan Resource Guide and Model. This model is being made available to districts only as a guide since PGPs are developed for individual students. The PGP Resource Guide and Model can be found at the following web address:

  http://www.tea.state.tx.us/taa/stanprog102303.html

- TEA is currently revising the TAKS Information Booklets. Revisions will be posted to the TEA website this fall.

- The State-Developed Alternative Assessment (SDAA) is changing to a TAKS-based model called SDAA II. Beginning in 2005, SDAA II mathematics will be available to students receiving special education services enrolled in grades 3–10. High school staff who are unfamiliar with SDAA should contact their special education department to learn more. The field-test window for SDAA II is May 3–14, 2004. All eligible students in the district are required to participate in the SDAA II field tests. SDAA II Information Booklets will be available this fall.

- The Student Successive Initiative (SSI) will affect grade 5 students in mathematics and reading in 2004-2005. Student Assessment staff are working on a new Grade Placement Manual to address grade 5 SSI issues. TEA staff are currently working on a request for application for the alternate assessments that districts may adopt for the third administration. Information on the possible alternate assessments will be forthcoming. In 2005 the grade 5 TAKS mathematics test will be administered on

  First Administration – April 5, 2005
  Second Administration – May 17, 2005
  Third Administration – June 28, 2005

  You can see the entire 2004-2005 Student Assessment Calendar at the following web address:

  http://www.tea.state.tx.us/student.assessment/admin/calendar/0405.pdf.

Keep in Mind

- Are your students proficient in using technology? Students should be using technology throughout the school year, not just on the day of the high school TAKS. Remember to clear all calculator programs and memory back to factory default both before and after the TAKS test. Call your calculator vendor if you are having difficulty with the clearing procedure.

- For the spring 2004 TAKS administration, the passing standard for all students (except grade 11 exit level) will be at 1 SEM below the panel's recommended passing standard. This means that students will have to get about 3-4 additional items correct on this year's TAKS to meet the new passing standard. The 11^{th} grade students will remain at 2 SEMs below the panel's recommended passing standard as they were during their 10^{th} grade year. You can find the TAKS raw score cuts and scale score cuts required to achieve the "met standard" and "commended performance" at the web address listed below. Remember, if you are standing still in the curriculum renewal process, you are falling behind as we progress to the new passing standards.

  http://www.tea.state.tx.us/student.assessment/scoring/pstandards/rawscore04.pdf

- Every year TEA convenes groups of Texas educators to edit and approve test items for the Texas Assessment Program. If you are willing to take a few days out of your busy schedule to participate in this invaluable process, please fill out a Recommendation for Educator Committees form. The form can be found at the following web address:

  http://www.tea.state.tx.us/student.assessment/develop/reform2004.pdf

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Educational Consultant for Mathematics • Texas Education Agency

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NCLB Highly Qualified Teachers: Texas HOUSE Criteria

• William A. Jasper, Ph.D

The No Child Left Behind Act (NCLB) of 2001 requires that all teachers be "fully qualified" by the end of the 2005-2006* school year. For a teacher who is teaching mathematics in grades 6-12, this means that you have to have a major in mathematics (interpreted as 24 hours of mathematics courses). As an alternative, Texas has recently released the High, Objective, Uniform Standard of Evaluation (HOUSE) criteria for determining the "highly qualified" status for experienced elementary and secondary teachers.

HOUSE options are covered in detail in the TEA NCLB Bulletin, Volume 1, Issue 2, October 21, 2003. See
<http://www.tea.state.tx.us/nclb/bulletin.html>
There are two requirements under HOUSE for teachers without a mathematics major, and both must be met:

1. At least one creditable year of teaching experience in mathematics or a closely related field (secondary).
2. At least 24 points derived from:
   a. Experience teaching at grades 6 (elementary) or 7-12 (secondary). One point is earned for each year of teaching, up to a *maximum* of 12 points for 12 years experience.
   b. College coursework in mathematics (1 college hour equals 1 point)
      and/or
   c. Professional development that meets the standards for Continuing Professional Education (CPE) credit established by SBEC rules (15 CPE hours equals 1 point).

The bottom line is that many teachers who have been teaching mathematics at grade 6 and above with as little as 6 hours of college coursework will most likely have to go back to school and take more mathematics courses in the next two years.

*According to an announcement by U. S. Education Secretary Rod Paige on March 15, 2004, rural teachers will have until Spring 2007 to prove they are qualified in all their subjects, provided they are highly qualified in at least one subject and get training in the others. This new guidance makes clear that current teachers don't have to go through this evaluation process for each subject they teach; states can decide whether to give teachers overlapping credit for similar subjects. Overlapping subjects for mathematics include engineering, statistics, and accounting.

William A. Jasper, Ph.D. • <mth_waj@shsu.edu>
Assistant Professor • Sam Houston State University

Voices From the Classroom

Ways to Count to 11: Activities for the Elementary Classroom

• *Barba Patton*
• *Carol Klages*
• *Ann Nagel*

Teachers do not need to apologize for including children's literature books into today's curriculum. Students and books should be brought together in content areas other than the reading and language arts courses. In the content areas, textbooks become encyclopedias stuffed with so much information that the subject matter becomes overbearing and un-enjoyable for students. Unflattering descriptions of textbooks abound such as how they lack stimulating information and are often incomprehensible (Richgels, Tomlinson, and Tunnell, 1993). Education does not need to be this way. Teachers do have alternatives and supplements to textbooks. According to Ravitch and Finn (1987), children's literature offers students of any age the opportunities to interact with a human element that textbooks just do not possess. While children's literature is not meant to replace any required content area textbook, the text in children's literature books is brief, but meaningful and the illustrations are colorfully detailed, yet not academically insulting. Children's literature is a vehicle for spurring student's interest in reading and interacting with text while working within various content areas. Mathematics and children's literature can and should coexist in the classroom together, not as separate entities, but viable teaching partners.

Teacher Notes:

Materials:
Book: *12 Ways to get to 11* by Eve Merriam and illustrated by Bernie Karlin.
Die cut paper apples and hole punch
Apple slice for each student
Die cut paper apples, pencils, and scissors

Introduction

As an introduction to the activities, read *12 Ways to get to 11* to the students. After reading the book, ask the students what other ways could they make 11 such as count your fingers and add your nose.

Activity 1 (TEKS (K.1) (A) & (C):
Give each student a die-cut apple that has teeth marks. Ask the student to add (or count) the number of teeth marks in their apple.

Activity 2 (TEKS (K.1) (A) & (C):
Using real apples, cut into slices, ask the students to take two bites, side by side, from their apple slice. Let each student then count the number of teeth marks on his/her apple slice. The student will record the number of teeth marks on a sheet of paper. The student will also record the number of teeth marks that his/her friend has. According to the grade level, the teacher should be able to expand and discuss 'less than, more than and equal'. (This activity may not have 11 as a sum.)

Activity 3 (TEKS (1.3) (A):
Using the paper apples and two color markers, let each child draw 11 teeth marks on his/her apple. The students will then add the different colored teeth marks to determine the number of total teeth marks on his/her apple. The student will record the corresponding number sentence (number of teeth in color one plus number of teeth in color two equals eleven) on a sheet of paper.

Activity 4 (TEKS (1.12) (A) & (C):
To make sure you have all the different combinations

that make 11 from Activity 3, the students as a group will record their data on a chart to illustrate the ways they made 11 using whole numbers. The final chart may look like this:

Ways to Make Eleven

11	+	0	11
10	+	1	11
9	+	2	11
8	+	3	11
7	+	4	11
6	+	5	11
5	+	6	11
4	+	7	11
3	+	8	11
2	+	9	11
1	+	10	11
0	+	11	11

Activity 5 (for Grade 2 or as an extension for younger students):

Using pennies, nickels and dimes, let the children determine how to make 11¢

Ways to make 11 ¢

penny	+	nickel	+	dime	=	11 cents
11	+	0	+	0	=	11 cents
1	+	0	+	1	=	11 cents
6	+	1	+	0	=	11 cents
1	+	2	+	0	=	11 cents

Evaluation:

When given a die-cut apple with a cutout of teeth marks, the student will be able to determine if there are 11 teeth marks or not. The student will also be able to identify number sentences that have 11 as a total.

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CAMT 2004

Strengthening Texas Through Mathematics
July 15 – 17, 2004

CAMT 2004, Strengthening Texas Through Mathematics, will be held July 15-17, 2004, at the Henry B. Gonzalez Convention Center in San Antonio. Program Co-Chairs are Dr. Elizabeth Kreston and David Eschberger. Registration and program information are online at:

http://www.tenet.edu/camt/

How Scientists Communicate with Numbers

All the numbers, big and small … now and then we use them all.

• *Diana Mason*
• *Carmen Fies*
• *Sharon E. Taylor*
• *Kathleen C. Mittag*

Two subject areas that have always been intertwined are the study of mathematics and science--both use numbers to express relationships, but have you ever been curious about the ways scientists use numbers to communicate? While mathematics may well be considered a discipline that can exist in the purest form, more specifically, in a framework that does not require interaction with other disciplines, science without mathematics is unthinkable. In fact, it has been said that mathematics is the language of science (Appling 1994). Mathematics disseminates knowledge through a series of abstract numbers and symbols that when combined correctly produce sentences we call formulae. Science uses these formulae, so brilliantly laid out in mathematics, to communicate its findings by building models, some concrete and others steeped in symbolic language and theory, until appropriate applications for them are found in the real world. A goal of both the National Science Education Standards and the National Council of Teachers of Mathematics' standards is to teach students how to communicate with numbers (NAP; NCTM). In fact, "if teachers of mathematics use scientific examples and methods, understanding in both disciplines will be enhanced" and when the science program at a school is coordinated with the mathematics program, then students' use and understanding of both mathematics and science are improved (http://www.nap.edu/html/nses/html/7.html#sp).

Communication with Numbers by Scientists

To simply state that an experiment led to 'many' or 'few' of the resulting entities would not be clearly reproducible, would not be meaningful, and thus would not serve as an instrument for scientific inquiry. Working with numbers can be time consuming and tedious. However, making numbers work for us can be very rewarding. Scientific theories are generally supported by mathematical computations based on measurements. Many times these measurements are either very small or very large. Because of our need to report scientific findings to others, we have adopted a system called scientific notation to accomplish this task. The use of scientific notation is usually accompanied by our use of significant digits (or figures). No measured quantity is considered to be exact since the last digit always contains an amount of uncertainty. If the investigator had access to a better instrument or technique for comparison, then the uncertainty could be reduced, but this cycle always continues. To indicate the uncertainty of a single measurement, scientists use a system called significant digits, which has adopted rules that govern our use of this means of reporting data. The rules can be reduced to some very simple observations:

(1) All nonzero integers are significant and so are the "captive" zeros between them (e.g., 120,034 has six significant digits.)

(2) Never start counting significant digits until you get to the first non-zero number and then count all the digits that follow (e.g., 0.000 000 000 123 has three significant digits.)

(3) Final zeros, which precede a understood decimal point are not significant (e.g., 123,000 has three significant digits), but final zeros following a decimal point are significant (e.g., 123.1230 has seven significant digits.)

(4) A number expressed in scientific notation contains that number of significant digits (e.g., $1.230 \bullet 10^{-5}$ has four significant digits.)

(5) Counts (e.g., 24 students) and conversion factors (e.g., 1 in. = 2.54 cm) are said to have an infinite number of significant digits, by definition, and therefore do not influence calculations.

Two common special notations exist to lessen confusion in regards to using zeros: (1) 0, is used to indicate a significant zero that doesn't fall into any of the categories listed above (e.g., 100 has two significant digits and 100 has three) and (2) alternatively, a decimal point at the end of a number ending in zero is used to indicate that the final zero is significant (e.g., 100. has three significant digits and 1000. has four.)

Measurements

Some of the *fundamental* (directly measured) standards of measurements are seen in Table 1 below. Scientists have agreed upon certain "housed" standards to communicate experimental results obtained under different conditions in comparable ways. Examples of most of these measurements are kept in special places like the International Bureau of Weights and Measures in Sèrves, France. The *Systeme International* (SI) was instituted by an international committee who meets regularly to establish the rules and govern how we use the SI measurement procedures. When we calculate quantities from formulae, we usually employ fundamental measurements like meter (length), kilogram (mass), second (time), kelvin (temperature), and candela (light intensity) to derived new measurement units.

Table 1: Measurements and Standards

Measurement	Instrument	Standard	Symbol
length	meter stick	meter	m
mass	balance	kilogram	kg
time	clock, watch	second	s
temperature	thermometer	kelvin	K
mole	none	mole	mol

The mole is considered to be a fundamental unit for an amount of matter. Specifically, the mole is approximately equal to $6.0221 \bullet 10^{23}$ "particles". Examples of particles are ions, atoms, molecules, grains of sand, footballs, or little furry creatures called moles! If you can count it, you can eventually have a mole of it. However, considering a mole a count is a little naïve (Freeman 2003; Gorin 2003). The actual counting of a value this large (602,210,000,000,000,000,000,000) is virtually impossible; therefore, the size of a mole is determined by indirect measurements.

Bob Everson, Animal Disease Diagnostic Lab, Purdue University has an interesting comparison posted on the Mole Day Foundation Web site (http://www.moleday.org) that makes it a little easier to imagine a very large number like that which retains Avogadro's name. To give you some idea of its magnitude picture the following: suppose that the entire state of Texas, with an area of 262,000 square miles, is covered with a layer of fine sand 48 feet thick, each cubic grain of sand being 0.01 of an inch on a side. If you now take the time to perform this calculation, you will obtain the amount of sand grains it takes to approximate Avogadro's number

$262{,}000\ mi^2$	48 ft	$(5280\ ft)^2$	$(12\ in)^3$	1 grain (volume)
.		$1\ mi^2$	ft^3	$(0.01\ in)^3$

$$= 6.06 \bullet 10^{23} \text{ sand grains}$$

However, if you have a gulp of water (about 18.0 g = 1/25 pint), you would also have the same number of molecules of water that are found in one mole of water.

$18.0\ g\ H_2O$	$1\ mol\ H_2O$	$6.02 \bullet 10^{23}$ molecules
	$18.0\ g\ H_2O$	$1\ mol\ H_2O$

$$= 6.02 \bullet 10^{23} \text{ molecules}$$

Scientific Notation

You can see from some of the previous examples that numbers can be written in different ways. One way is scientific notation, introduced in the eighth-grade mathematics TEKS (8.1 (D)). The means by which we report very large and very small numbers is a technique that is referred to as scientific notation. Helping students understand the concept of place value in a base-10 system is typically an elementary grade task. However, even at the college level, again-and-again there is evidence that students are not entirely clear on the meaning of a particular place value in a calculation. The same inconsistencies of thought can be found in operations requiring the use of fractions, such as ratio relationships.

Recall that scientific notation is a number greater than or equal to 1 and less than 10 multiplied by 10 to some power. Any number, when written in scientific notation has the number of significant digits present in the number before the base 10. A wonderful visualization of the meaning of orders of magnitude is available under the header 'Powers of Ten' at http://micro.magnet.fsu.edu/primer/java/scienceopticsu/powersof10/. The applet is based on an earlier filmed version developed by architect Charles Eames and his wife, Ray. The sequence steps through the orders of magnitude beginning 10^9 light years from Earth to the subatomic level at 10^{-16} m.

Think of a hypothetical number line as extending to infinitely small and infinitely large quantities. To help us cope with these uncommon quantities, we employ shortcuts to express these numbers in ways that are easy to read and write. Besides scientific notation we can also employ the use of prefixes. Our students need to be familiar with at least the most common SI prefixes (see Table 2), generally those describing the range from nano to giga.

In today's prevalence of computer application, students seem to most readily relate to prefixes they are familiar with in that context. They have heard computer memory capacity expressed in KB (kB), MB, or GB. However, other prefixes are less transparent to them and especially those indicating numbers < 1 frequently cause difficulties. Since the use of prefixes for most students requires memorizing vocabulary, the main obstacle to at least initial proper use lies in the lack of connection between the new vocabulary and the existing knowledge structure.

Table 2: SI Prefixes

NUMBER	PREFIX	SYMBOL	NUMBER	PREFIX	SYMBOL
10^1	Deka-	Da	10^{-1}	deci-	d
10^2	Hecto-	H	10^{-2}	centi-	c
10^3	kilo-	k	10^{-3}	milli-	m
10^6	Mega-	M	10^{-6}	micro-	μ
10^9	Giga-	G	10^{-9}	nano-	n
10^{12}	Tera-	T	10^{-12}	pico-	p
10^{15}	Peta-	P	10^{-15}	femto-	f
10^{18}	Exa-	E	10^{-18}	atto-	a
10^{21}	Zeta-	Z	10^{-21}	zepto-	z
10^{24}	Yotta-	Y	10^{-24}	yocto-	y

Writing large or small numbers in scientific notation avoids the 'disconnect' between vocabulary and meaning by using the powers of base-10 number system directly. The distance of the first non-zero digit from the decimal point is indicated by the exponent of 10 by using positive exponents for numbers > 1 and negative exponents for numbers < 1. Thus, as soon as we see the number expressed in scientific notation, we know whether the quantity is relatively large or small. This gives us a tremendous advantage. At the same time, it is much more convenient to consider large and small numbers in scientific notation because we do not have to keep track of all the zeros along the way.

We encounter very large and very small numbers in macroscopic and in microscopic environments. On the macroscopic level, as the above-mentioned applet illustrates, we obviously encounter vast quantities in astronomy. For example, Carl Sagan is often quoted to have talked about 'billions and billions' of stars. We also know that distances between galaxies are tremendously large, but don't even have to go that far to encounter large numbers. The mean distances between our Sun and the planets of our solar system are immense (see Table 3). To avoid working with large number, these distances are usually given in astronomical units (AU) where 1 AU is equal to the distance between the Sun and Earth (1.496×10^8 km).

Table 3: Mean distance form the Sun*

	Mercury	Venus	Earth	Mars
Distance in millions of km ($n \bullet 10^6$)	57.9	108.2	149.6	227.9
Astronomical units (AU)	0.387	0.7233	1.000	1.517

*Source: NASA

When teaching the concept of a negative exponent it is simple to show an example of how numbers expressed as decimals and fractions can be related. By definition 0.01 is equal to $\frac{1}{100}$. One hundred is also 10×10 or 10^2. Therefore, can be written as $\frac{1}{10^2}$ $= 10^{-2}$ by definition of negative exponents. Consequently, 10^{-2} is equivalent to 0.01. This issue of not having to keep track of the zeros also facilitates computations of large and small values. For example, if I wanted to multiply one large number and one small number, such as 1,230,000,000,000,000 and 0.000 000 000 000 980, converting them to scientific notation simplifies the process tremendously.

<u>Example:</u>

$$1{,}23{,}000{,}000{,}000{,}000 = 1.230 \times 10^{15}$$

$$0.000\ 000\ 000\ 000\ 980 = 9.80 \times 10^{-13}$$

Next multiply the coefficients and add the exponents of the base:

$$(1.230 \times 10^{15})(9.80 \times 10^{-13}) = 12.054 \times 10^{2}$$

The first number has four significant digits and the second number has three. Therefore, the answer to this product will have three (the lesser of four and three) significant digits (12.1×10^2). In order to put this number in proper scientific notation, you write 1.21×10^3. Division problems are treated like multiplication problems when it comes to the rules of significant digits; however, addition and subtraction problems follow a different set of rules for determining the number of significant digits. To complete the following addition problem you must not only count the number of significant digits, but also note where they are located.

<u>Example:</u>

$$\begin{array}{r} 0.000\ 54 \\ \underline{+\ 0.009\ 876} \\ 0.010\ 416 \end{array}$$

The rules that govern how we round numbers to the correct number of significant digits in the case of addition and subtraction problems require us to find the leftmost significant digit between the addends. (Note: all zeros in the addends above are place holders and therefore not significant!) Since you cannot be more certain than your least certain measurement, then note that the least certain number above is 0.000 54. The hundred-thousandth's digit, 4, of the top addend is to the left of the 6 in the bottom addend. This leftmost digit in turn determines how many digits you can display in your final answer. The place of the 4 (hundred-thousandth's place) limits the answer to 0.010 42, which has four significant digits even though the top number contains two.

To do scientific notation problems on your calculator, you must make use of your exponential key. The exponential key can look different on different calculators. The examples below show how you can use your calculator to enter scientific notation.

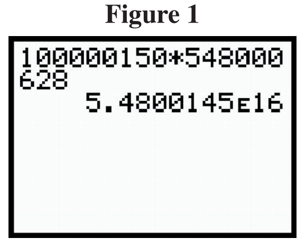
<u>Examples using technology</u>:

(1) Multiply 5×10^4 by 6×10^9.

You would first press 5, press the [EE] button, press 4, press [X], press 6, press [EE], press 9, then press [ENTER] to obtain 3E14 as the answer. You should report the answer as 3×10^{14}.

(2) Multiply 100,000,150 times 548,000,628 (see Fig. 1).

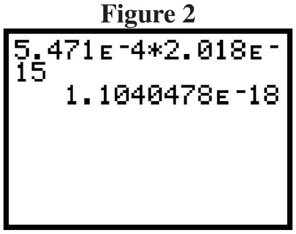
Figure 1



Note that the display shows 5.4800145E16. This is the calculator's method for writing 5.4800145×10^{16}. Also note that the calculator loses some certainty in the problem. It is best to enter a problem in scientific notation, so as not to lose any certainty in the final answer. The first number entered, 100,000,150 has eight significant digits and 548,000,628 contains nine. Therefore, the answer should have eight digits in it. In this case the display is correct, but most calculators are not programmed to adhere to rules of significant digits—it is up to you to record your answers with the correct number of significant digits! (Note: the TI-83 Plus Silver Edition has an application in SciTools called SIG-FIG_CALCULATOR.)

(3) Multiply 0.000 547 1 times 0.000 000 000 000 002 018 (see Fig. 2)

Figure 2



Since both factors contain four significant digits, the correctly written answer is 1.104×10^{-18}.

Any of these examples can lead to confusion for students who assume that they need to press the "multiply" button on their calculators more than once to complete the above problem. When you press [EE] or [10^x] the calculator accepts the entry as one value and there is no need to hit the "times" button unless you are doing a multiplication operation between the multiplicand and multiplier. If you do, then you will get an answer that is a factor of 10 greater than you anticipate for each entry. Only hit the multiply button when you want to perform the operation of multiplication.

Much of the scientific knowledge we hold dear today came from precise measurements made by investigators with crude instruments. The hours of inquiry by scientists such as Robert A. Millikan who determined the mass of the electron from his famous Oil Drop Experiment are unsurpassed. Millikan and his research team, based on the previous work of J. J. Thompson, who by measuring the amount of beam deflection produced by electric and magnetic fields of known magnitude inside a cathode ray tube (CRT), was able to determine the ratio of the mass of the electron to its electrical charge, or the mass:charge. This ratio of 5.686×10^{12} kg for every one Coulomb was then used in Millikan's calculations (ca. 1909) to determine the mass of the electron, which is 1/1836 of the mass of a hydrogen ion (${}^{1}_{1}H^{+}$, the subscript of 1 indicates the atomic number or number of protons; the superscript of 1 indicates the mass number (sum of protons and neutrons) or in this case, 1 proton and 0 neutrons). The mass of the electron is approximately 9.11×10^{-28} g. Using these two numbers for comparison purposes, one can see that 10^{12} is much greater than 10^{-28}. If simply comparing relative magnitude of two numbers, then there is no need to do anything beyond look at the exponents. Making comparisons easier, when communicating with numbers, is a very valuable aspect of the use of scientific notation.

Logarithms

Logarithms can be a very useful way to deal with very small and very large numbers. Logarithmic functions are introduced in Algebra II (see TEKS (c) (1) (A)). The manipulation of logarithmic functions also gives us another common scientific use of significant digits -- that of reporting of pH values. Acidic solutions have a larger concentration of hydronium ions, H_3O^+, than hydroxide ions, OH^-. When the concentrations of H_3O^+ and OH^- are equal, then the solution is considered to be neutral (or pH = 7). The equation used to determine the concentration of the hydronium ion ($[H_3O^+]$) is:

$$pH = -\log [H_3O^+]$$

In this equation 'p' indicates 'opposite the logarithm of' and the brackets are used to indicate 'concentration of'. (Note: concentration of hydronium ions is sometimes simplified to the "hydrogen ion" or H^+.) The pH scale is a simple one usually ranging from 1 to 14 representing the logarithms of the concentrations of the acid. (There is also a pOH scale that can be used for representing the logarithms of the concentrations of the base.) On a pH scale what is represented is the 'negative logarithms' of concentrations of the acid. The advantage of using the pH scale over contemplating the concentrations is that it gives us a quick indication of whether the solution is acidic or basic. When the concentration of the acid is 0.1 M (M = molar or moles of solute/liter of solution) or 10^{-1} M, then the pH is 1; if the concentration is 0.000 000 000 000 01 M or 10^{-14} M, then the pH is 14. As you can see, reading very small numbers can be difficult; therefore presenting relative concentrations in terms of pH simplifies the procedure. Every change of 1 pH unit corresponds to a factor of 10 difference in acidity (i.e., the difference between having a solution of a pH = 1 vs. pH = 2 means that you have solutions of 0.1 M vs. 0.01 M, respectively.) The greater the pH the less concentrated the acid.

<u>Example</u>:

Rainwater was collected for pH analysis. The concentration of H^+ measured in the sample is 1.6×10^{-5} M. What is the pH?

$$pH = -\log [H^+]$$

$$pH = -\log [1.6 \times 10^{-5}]$$

$$pH = 4.80$$

The rule for significant digits in the case of calculating pH is a little different than we have reported before, and more times than not it is often forgotten by students and teachers alike (Appling 1994). In this case the number of significant digits is determined by the number of significant digits in the concentration (1.6×10^{-5} M), which is two. When reporting the pH the two significant digits appear in the mantissa (i.e., the number of digits in the characteristic are not counted). As you can see, two significant digits (.80) appear after the 4.

To determine the pOH for the solution mentioned above simply subtract the pH from 14.

$$pH + pOH = 14$$

$$pOH = 14 - 4.80$$

$$pOH = 9.20$$

The 14 is considered to be "perfect" with an infinite number of zeros following the decimal point, therefore the leftmost significant digit is the 0 (hundredth's place) in 4.80, which is used to complete the subtraction and determine that the pOH should also be reported to the hundredth's place or 9.20.

In order to determine the concentration of the pOH simply use the pOH formula and calculate the answer.

$$pOH = -\log [OH^-]$$

$$9.20 = -\log [OH^-]$$

$$[OH^-] = \text{antilog}(-9.20) = 10^{-9.20}$$

$$[OH^-] = 6.3 \times 10^{-10}\ M$$

Since 9.20 has two significant digits following the 9, you report the concentration to two significant digits, 6.3×10^{-10} M. To check your work you can multiply the $[H^+][OH^-]$. The product should be close to 1×10^{-14} M or what is known as the K_w, the constant for the concentration of ions in pure water. The product in this case is:

$$(1.6 \times 10^{-5})\ (6.3 \times 10^{-10}) = 1.0 \times 10^{-14}$$

Many interesting examples are possible when dealing with acid/base chemistry. Lessons can evolve around acid rain, body fluids, or many household solutions (e.g., vinegar, ammonium, drain cleaners, etc.).

Conclusions

Scientists use very large and very small numbers to communicate their experimental findings. Mathematics is the language that scientists use to communicate not only value but also the significance of the quantities. All measured quantities are limited as to their certainty by the instrument that was used to obtain the value. In other words, no measured quantity is exact, and always use a label when recording a measurement (*No naked numbers!*). The last digit of a measurement is always an approximation. To understand how reliable a measurement is, we need to understand the limitations of the measurement: how the measurement was obtained, under what circumstances (whether or not the instrument(s) were calibrated), and what techniques were used for comparisons. Error always accompanies a reported measurement. When problems are solved, a percentage of error can be determined by using the following formula: $\frac{\text{actual value - experimental value}}{\text{actual value}} \bullet 100 =$ percent error, and when scientists report measurements, they should always use a system called significant digits to indicate the uncertainty of a single measurement.

If your students do independent research or reading, you might encourage them to explore this paper so that they can gain a greater understanding about the ways in which science and mathematics are interrelated. The activities given below are fun, give good results, and can easily be completed within a typical class timeframe. Integrating the curriculum is appropriate for both the study of mathematics and science. It is also appropriate and valuable for the students enrolled in a secondary school classroom.

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The following are activites around which a lesson could be built.

Guided-Inquiry Activity

Did you know that you can have fun with density in a mathematics' classroom? This activity is excellent for providing students with needed application that bridges mathematics and physical sciences. Your students will get practice performing English-metric conversions, using geometric formulae, and doing science. Materials needed are at least one bowling ball and one golf ball for every group of 3-4 students, tape measures (inches), one small scale that reads from 0-20 lbs for the class, and a typical classroom trashcan 3/4 full of tap water. The instructions you give your students are minimal. Prior knowledge regarding the formulae for density: $d = \frac{\text{mass in g}}{\text{volume in cm}^3}$; circumference, $C = 2\pi r$ or $C = \pi d$; and volume, $V = \frac{4}{3}\pi r^3$ will be helpful. Instructions given to your students are to determine the density of the bowling ball and golf ball and then make a hypothesis as to whether the balls will sink or float in tap water. Stress the importance of accurate measurements and the use of significant digits. Students can only test their hypothesis AFTER they show you their calculations for the densities. If the bowling balls are less than 12 lbs with the standard circumference of 27 in., then the density will be less than $1.00 \frac{\text{g}}{\text{cm}^3}$ and it will float! All standard golf balls will sink. You can usually obtain "throw away" bowling balls from your local bowling alley for free; in fact, most alleys are glad to be able to give the damaged balls to someone so that they do not have to dispose of them. (Never wash a ball that is still being used because it has to be slowly dried over a long period of time and re-oiled.)

Directed Discovery (*Examples 1-4 are from the authors' book 2003.*)

1. Obtain a rectangular piece of foil. (Note: any foil may be used for this procedure; aluminum is usually the most assessable.) Measure the mass (in grams to as many places as your balance allows), length (in centimeters), and width (in centimeters) of the foil. Use the known density to calculate the thickness of your foil. Does your calculation result in a reasonable answer?

   (Known densities: Al = 2.70 $\frac{g}{cm^3}$, Cu = 8.92 $\frac{g}{cm^3}$, Sn = 7.28 $\frac{g}{cm^3}$, and Zn = 7.13 $\frac{g}{cm^3}$)

Sample data needed.

Mass: m_1 = ___________ g m_2 = ___________ g m_3 = ___________ g average mass = ___________ g

Length = _________ in. Width = _________________ in. Thickness = ____________ in.

Show calculations for determination of foil thickness and for the conversion.

2. From the above measurements for length, width and thickness, calculate the volume of the foil. No *naked* numbers!

   Volume = ___________ _____

3. Next fold the foil as tightly as possible. Determine the volume of your foil by water displacement. Calculate the density using the average mass from problem 1. How does it compare to the expected value?

   Experimental density = ______________________

   Show your calculation for the percentage error of your experimental density.

4. How many bacteria will it take to fill up the Gulf of Mexico starting with a single cell that divides once a day, assuming all cells survive and continue to divide? Use the following information: size of bacterium = 1.0×10^{-3} cm; average depth (d) of gulf = 2.2 km; area (A) of gulf = 1.5×10^{6} km^2. Formulae: volume of bacterium = $(\text{size})^3$ and volume of sea = A × d

5. A sample of human blood has an acid concentration of 3.9×10^{-8} M. Determine the pH, pOH, and the $[OH^-]$. Which of your calculated values is the easiest to interpret and compare? Why?

CAMTership Application

Eligibility: Six $300 CAMTerships will be awarded to teachers with five or fewer years teaching experience who are members of TCTM and have not attended CAMT before. CAMTerships will be awarded to teachers in each of the following grade levels: K - 4, 5 - 8, and 9 - 12. Winners will be determined by random drawing of names and will be notified by June 1, 2004. Winners will be asked to work for two hours at registration or the NCTM material sales booth and will be TCTM's guest at our breakfast, where the checks will be presented. Good luck!

Deadline: May 1, 2004

Name: ____
Last First Middle

Address: ____
Number and street Apt. number

____
City Zip Code

(___) ____________________ (___) ____________________ < ____________________ >
Home Phone Work Phone Email Address

Are you a member of TCTM? ☐ yes ☐ no

Have you attended CAMT before? ☐ yes ☐ no

Note: If you are not a member of TCTM, you must enclose $13 with this application to apply for membership.

How long have you been teaching? ____________

Describe your primary teaching responsibilities

Send your completed application to:

by mail: **Cynthia Schneider,**
234 Preston Hollow,
New Braunfels, TX 78132

by fax: **(512) 232-1855**
ATTN: Cynthia Schneider

by email:
<cschneider@mail.utexas.edu>

Volunteer by May 15, 2004 to work at CAMT 2004 in San Antonio!

All members of TCTM should take an active role to help make CAMT successful. Come work 'behind the scenes' to facilitate the experience for all participants. Please examine the times below and volunteer to serve. There are two locations for volunteers to work. We need you! Identify the time slot(s) when you can help and e-mail the date and time(s) on or before May 15, 2004 to Cynthia Schneider by using the address listed below. We will confirm your assigned time via e-mail or phone on or before June 30.

Volunteer Information

Name: ____
Last First Middle

Address: ____
Number and street Apt. number

____
City Zip Code

(___) ____________ (___) ____________ < ____________ >
Home Phone Work Phone Email Address

Distrcit or Professional Afffiliation ____________ ESC ____________

Registration Area

Wednesday July 14	1:30 p.m. – 3:30 p.m.	3:30 p.m. – 5:00 p.m.			
Thursday July 15	6:30 a.m. – 9:00 a.m.	9:00 a.m. – 11:00 a.m	11:00 a.m. – 1:00 p.m.	1:00 p.m. – 3:00 p.m.	3:00 p.m. – 5:30 p.m.
Friday July 16	6:30 a.m. – 9:00 a.m.	9:00 a.m. – 11:00 a.m.	11:00 a.m. – 1:00 p.m.	1:00 p.m. – 3:00 p.m.	3:00 p.m. – 5:30 p.m.
Saturday July 17	7:00 a.m. – 9:00 a.m.	9:00 a.m. – 11:00 a.m.	11:00 a.m. – 1:00 p.m.	1:00 p.m. – 3:00 p.m.	

Exhibits Area –NCTM Materials Booth

Thursday July 15	9:45 a.m. – 12:00 p.m.	12:00 p.m. – 2:00 p.m.	2:00 p.m. – 5:00 p.m.	
Friday July 16	7:45 a.m. – 10:00 a.m.	10:00 a.m. – 12:00 p.m.	12:00 p.m. – 2:00 p.m.	2:00 p.m. – 5:00 p.m.
Saturday July 17	7:45 a.m. – 10:00 a.m.	10:00 a.m. – 12:00 p.m.	12:00 p.m. – 1:00 p.m.	

Please submit your form to Cynthia Schneider

by mail: **Cynthia Schneider, 234 Preston Hollow, New Braunfels, TX 78132**

by fax: **(512) 232-1855 ATTN: Cynthia Schneider**

by email: ***<cschneider@mail.utexas.edu>***

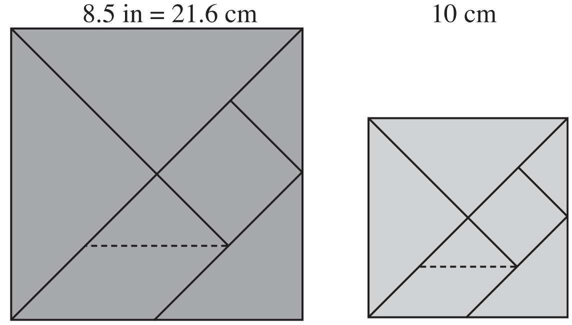
Learning Ratio and Proportion Through Tangrams

• *Sylvia R. Taube*
• *Carolyn Pinchback*

Proportional reasoning is a cornerstone of middle school mathematics. Mathematics teachers need to present mathematical tasks that provide students with varied opportunities to use proportional reasoning including activities that explore meanings and properties of proportions in multiple contexts. We will describe a series of Tangram activities to demonstrate how measurement, geometry, and current technology can all be infused in mathematical tasks that can help sixth-grade students make more sense of proportional relationships. These activities should precede any discussion of the cross-product method.[1]

Figure 1

Two square papers showing the creases for folding and cutting seven shapes.



Large Tangrams Small Tangrams
cut by die-cutting machine

Making Tangrams through paper folding

Prior to the activities described here, our students used the commercial plastic Tangrams to compare attributes of geometric shapes and to create new shapes by putting two or more shapes together. In this activity, we used two different sets of Tangrams cut from squared paper of two different colors (see Fig. 1).

Cutting larger Tangram pieces. Form an 8.5 inch by 8.5 inch square cut by folding a 2.5 inch strip from a sheet of standard 8.5 inch by 11 inch paper and then detaching it. The teacher should model a step-by-step procedure to guide the students in folding and cutting the seven Tangram pieces.

Cutting smaller Tangram pieces. Use a die-cutting machine to make another set of Tangrams from a smaller square, 10 cm. by 10 cm. If a die-cutting machine is not available, the students can again use paper folding.

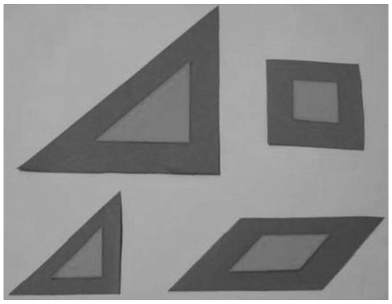
Launching the problem for exploration

By sorting the two sets of Tangrams, the students matched the two pieces that have the "same" or "like" shape by either positioning the two like shapes in the same orientation (see Fig. 2) or making the corresponding corners coincide. The teacher then posed the following questions to the students:

- How can you determine if pairs of "like" shapes are proportional?
- Is there a constant of proportionality?
- What data (measurements) might we need?
- What tools do we need to investigate proportional relationships given any two "like" shapes?

[1] The Texas Essential Knowledge and Skills (TEKS) recommends that 6th graders should be using ratios to describe proportional reasoning involving numbers, geometry, measurement, and probability (for specific TEKS objectives, refer to 6.3, 6.4, 6.12, and 6.13). Meanwhile, teachers traditionally teach the cross-product method, also known as the butterfly method, as the standard algorithm for solving proportion prior to meaningful explorations using hands-on activities. Prematurely introducing the cross-product method does not encourage students to think and to gain a sense of proportion (Billings, 2001). It falls short of a mathematical explanation or reasoning that is needed in understanding proportion.

Figure 2



Going metric to measure corresponding lengths

To reduce measuring errors, centimeters were used to measure corresponding parts of two "like" shapes (see Table 1). After the students recorded the two measures of length, they calculated the ratios between the two quantities. Later, after analyzing the data in Table 1, the students observed that there was something "constant" about the ratios (a/b) for any two similar shapes from the two sets of Tangrams. We also discussed errors in measurement and why we need more measurements to see a trend. The Tangrams offered more pairs of "like" shapes to measure and to compare ratios of corresponding parts.

Table 1: Measures of corresponding lengths (in cm) and ratios.

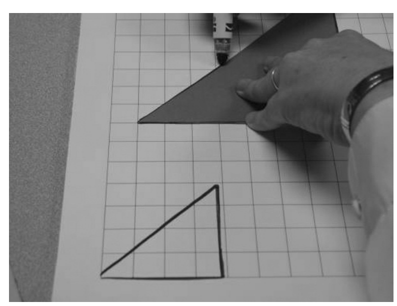
Tangram Shapes	Larger shape	Smaller Shape	Ratio a/b
Large triagle	21.5	10	21.5/10= 2.15
Square	7.5	3.5	7.5/3.5= 2.14
Parallelogram	Diagonal =17	Diagonal= 8	17/8= 2.12
Medium triangle	11	5	11/5 = 2.2
Small triangle	7.3	3.5	1.5/3.5= 2.14

Estimating and comparing areas of "like" shapes

After discovering a "uniform ratio" between two corresponding lengths, the students were asked: "If we estimate areas of two "like" Tangram shapes, will the ratio between the areas of "like" shapes also be constant?"

The students traced pairs of "like" shapes on one cm. grid paper (see Fig. 3). They then estimated each area by counting the number of unit squares inside each figure. The estimated areas were recorded and the ratios calculated (see Table 2). Students observed that the ratio between the areas of two similar shapes was not the same as the length ratios recorded in Table 1. That is, the area ratios rounded to four, meaning that the larger shape was four times the area of the smaller "like" shape.

Figure 3



Using technology to gain more sense of proportion

Our students entered the data from Tables 1 and 2 on a spreadsheet like EXCEL. We then asked the students: "How can you visualize the data recorded in these tables?" The scatter plots based on the length measures in Table 1 revealed a linear relationship between the lengths of corresponding parts. To verify that a linear relationship existed, the students pulled down the chart menu and clicked on "trend line" to let the computer draw the "line of best fit".

Similarly, the corresponding areas recorded on Table 2 were plotted and a trend line was added (see Fig. 4). The observations made from the scatter plot graphs helped students generate meaningful discussions about what the line meant and how the constant ratio was represented in the scatter plot graph. Through this visual representation, students gained a better understanding regarding the connection between the ratio of the measurements and the slope of the line representing them. With a short explanation from the teacher, students' conception of "ratio" was broadened to include the slope of a line. The sixth graders were also required to (a) write about their experiences as they were engaged in the activities, and (b) reflect on their evolving ideas about proportion.

Extension activities

To extend the activity, students can investigate the relationship between the perimeters of "like" Tangram shapes and explain their conjectures.

Another related activity asks the students to find a square whose area is one-half the area of the original (8.5 in. by 8.5 in) square. One method is to use a folding strategy (see Fig. 5) that ensures the smaller square was one-half the area of the original square. The teacher can then ask students to predict and verify their responses to the following questions for the two squares:

- What is the constant of proportionality for the areas

Table 2: Estimated areas of "like" shapes and ratios.

Tangram piece	Area of large shape (cm^2)	Area of small shape (cm^2)	**Ratio**
Large triangle	33	8	**4.1**
Square	16	4	**4.0**
Medium triangle	15	3.5	**4.3**
Parallelogram	15.5	4	**3.9**
Small triangle	8.5	2	**4.2**

Figure 4

Graph showing a linear trend between areas of two like shapes.

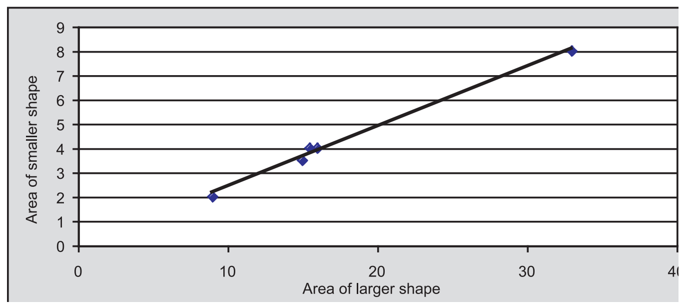
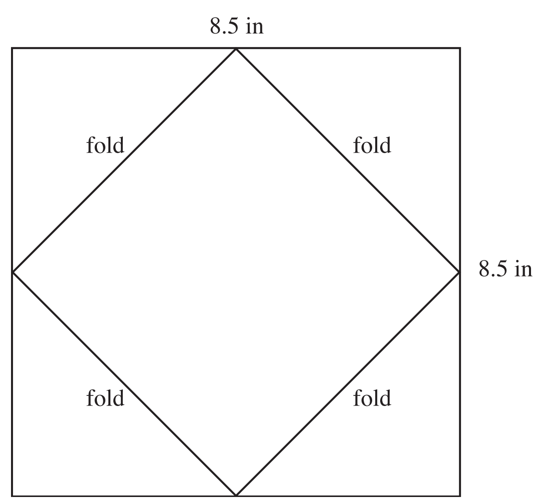


Figure 5

Making Tangrams from a square paper that is exactly half the original square.



of “like” shapes?

- What would be the constant ratio between any two corresponding lengths?
- How is the perimeter different between any two “like” shapes?

Concluding thoughts on teaching proportional reasoning

Developing facility with proportional reasoning has been a problem not only for middle school students but also for teachers. This difficulty is due, in part, to the complexity of thinking required (Miller & Fey, 2000) and the different interpretations of ratios as part-part or part-whole comparisons, rate, and operators, among others (Lamon, 1999). Meyer (2001) argued that learning mathematical concepts such as ratio and proportion occurs over a longer period and goes through different levels of abstractions. Teachers can help students close the gaps between the concrete and more sophisticated levels of abstraction through drawing and constructing models, diagrams, and tables. Most importantly, teachers are urged to defer symbolic representations until students are able to make sense of the problem through the use of real contexts and different physical representations (Meyer, 2001, p. 250).

The hands-on activities with Tangrams could help middle school students understand the key concept of “scale factor” through measurements and visual analysis of data recorded on a spreadsheet.

Online guide for folding and cutting Tangrams for teachers:

http://www.ac.wwu.edu/~mnaylor/stations/tangrams.html

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Carolyn Pinchback • *<carolinp@uca.edu>*
Department of Mathematics • *University of Central Arkansas*

References

Billings, E. (2001). Problems that encourage proportion. *Mathematics Teaching in the Middle School*, 7, 10-14.

Lamon, S. J. (1999). *Teaching Fractions and Ratios for Understanding.* New Jersey: Lawrence Erlbaum.

Meyer, M. (2001). Representation in realistic mathematics education. In A. Cuoco (Ed.), *The Roles of Representation in School Mathematics* (pp. 238-250). Reston, VA: National Council of Teachers of Mathematics.

Miller, J. L. and Fey, J. T. (2000). Take time for action: Proportional reasoning. *Mathematics Teaching in the Middle School*, 5, 310-313.

In Memoriam
Iris Carl
NCTM President, 1990-92

Iris Carl died on January 2, 2004 while attending the Hawaii Conference on Education in Honolulu. Mrs. Carl began her lifetime career in teaching in 1955. She taught in Connecticut and Texas in both elementary and secondary schools. She was an instructor at Wesleyan University in the National Science Foundation PRIMS program and at the University of Houston Graduate School Department of Curriculum and Instruction.

Her former positions included: Director of Mathematics K-12, Principal of Petersen Elementary School in Houston ISD, President of the National Council of Teachers of Mathematics, President of the National Council of the Supervisors of Mathematics, President of the Houston Council of Teachers of Mathematics, Director of the National Board of Professional Teaching Standards and President of the Houston Chapter of The Girl Friends, a national African-American women's organization. Mrs. Carl was appointed to the National Academy of Science's Board for the Center For Science Mathematics and Engineering Education, the National Council on Education Standards and Testing, and the Texas Committee on Student Learning. She was a witness for the U.S. Senate Subcommittee on Education, Arts and Humanities. She appeared as spokesperson for the NCTM Standards book entitled *Prospects for School Mathematics* published in 1995, which she edited.

Reflections by Cathy Seeley, President-Elect NCTM

Throughout her prestigious career, Iris worked with students, teachers, administrators, governors, CEOs and legislators. Her voice has been heard before the U.S. Congress and Texas legislators. And when Iris spoke, people always listened. She was one of the more respected voices in the history of our profession, and when she represented us, I always smiled, knowing that her audience would never know what hit them. Iris was the voice of credibility and conviction. Iris was…elegant, classy, gracious, joyful, determined, happy, persistent, committed, patient, wise, insightful, visionary, encouraging, prodding, even pushing when necessary, and tremendously respected.

Professionally, she has influenced every aspect of mathematics education in this nation, and that influence has helped transform an educational system. I remember sitting at an NCTM Board meeting with Iris, Dorothy Strong, Glenda Lappan, and a handful of other people as the Board created its first statement about NCTM's commitment to the mathematics education of every child. It was a revolutionary moment, and it forever changed the course of how a profession looked at its responsibility for every student.

A Tribute to Iris Carl by Lois Gordon Moseley

In the thirty plus years I've known Iris Carl, I've known nothing but kindness, support, and encouragement. She played a significant role in my life from the time we collaborated on the use of manipulatives in Title 1 mathematics laboratories in the 1970's through the implementation of the Standards. Our airport conversations always ended with the words "off to spread our wings." For her many contributions she is deserving of our thanks, our praise, and our gratitude.

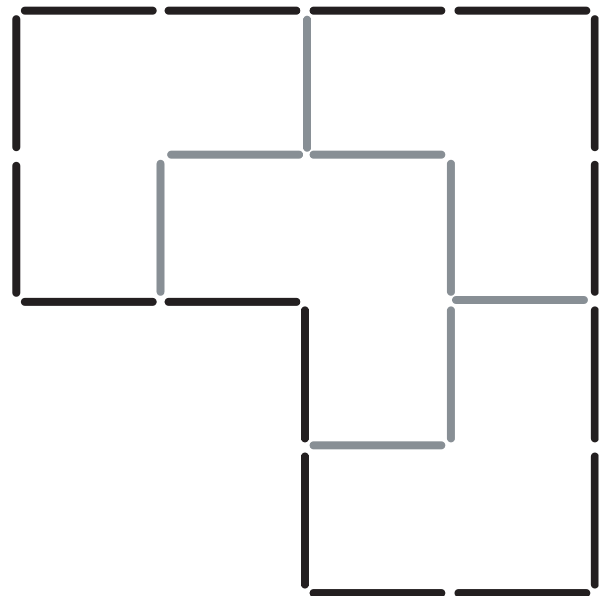
Those interested in contributing to an education fund in Iris Carl 's name may contact her daughter, Francine Walker, at <*www.walkland@earthlink.net*>

Puzzle Corner

Sticks #2 Answer

Arrange 16 craft sticks to form the origional figure. Add 8 more sticks to devide the area into four congruent fogures without disturbing any of the origional sticks.

Shown is a diagram of *a* solution



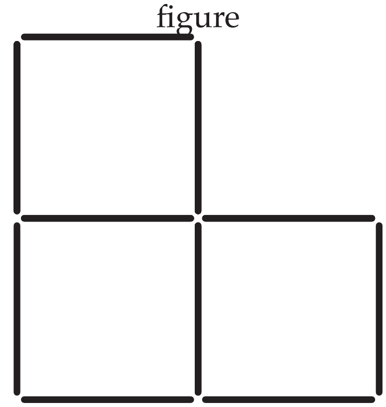
Puzzle Corner

We are interested in how your students responded to this problem and how they explained or justified their reasoning. Please e-mail copies of your students' work, include your name, grade level, campus name and district name to Mary Alice Hatchett, Director of Publications *Texas Mathematics Teacher*. Selected submissions will be acknowledged and published in subsequent issues.

Sticks #3

Please prepare a sketch of your solution

Arrange 10 craft sticks to form the following figure



Move 3 sticks to form a vertical reflection of this figure.

TCTM E. Glenadine Gibb Achievement Award Application

Eligibility: The E. Glenadine Gibb Achievement Award is presented to someone nominated by a TCTM member to be honored for his/her contribution to the improvement of mathematics education at the state and/or national level.

Deadline: May 1, 2004

Information about the **TCTM member** nominating a candidate:

Name: ____
Last First Middle

Address: ____
Number and street Apt. number

____
City Zip Code

(___) ____________ (___) ____________ < ____________ >
Home Phone Work Phone Email Address

Are you a member of TCTM? ☐ yes ☐ no NCTM? ☐ yes ☐ no

Information about the **nominee**:

Name: ____
Last First Middle

Address: ____
Number and street Apt. number

____
City Zip Code

(___) ____________ (___) ____________ < ____________ >
Home Phone Work Phone Email Address

Is the nominee a member of TCTM? ☐ yes ☐ no NCTM? ☐ yes ☐ no Retired ☐ yes ☐ no

Applications should include 3 pages:

☐ Completed application form

☐ One-page, one-sided, typed biographical sheet including:
- Name of nominee
- Professional activities
- National offices or committees
- State TCTM offices held
- Local TCTM-Affiliated Group offices held
- Staff Development
- Honors/awards

☐ One-page, one-sided essay indicating why the nominee should be honored for his/her contribution to the improvement of mathematics education at the state/national level

Please submit the completed application, biographical sketch, and essay

by mail: **Cynthia Schneider, 234 Preston Hollow, New Braunfels, TX 78132**

by fax: **(512) 232-1855 ATTN: Cynthia Schneider**

by email: ***<cschneider@mail.utexas.edu>***

Recommended Readings and Resources

Sir Cumference and the Sword in the Cone: A Math Adventure

"The Sword in the Stone" is retold from a mathematical view. Readers follow along with Sir Cumference and Lady Di of Ameter as their son Radius and his friend Vertex set out to find Edgecalibur, the sword that King Arthur has hidden in a geometric solid. You will delight in this geometry mystery/adventure that is filled with riddles and puns. This book could also be used to support initiatives such as 'multiple intelligences' as well as the integration of literature into mathematics.

Author: Cindy Neuschwander
ISBN 1-57091-600-4
Grade Level: 3-5

(available on-line through most bookstore websites)

A History of School Mathematics

The chapters of this work represent the history of math education, "not through a story of unbroken and unending progress but through an incomplete but honest history of the struggle to understand the role of mathematics in the education of human beings" according to its editors George M.A. Stanic and Jeremy Kilpatrick.

The first volume of the history is organized chronologically; the second is organized thematically. The first volume explores the numeracy and mathematics pedagogy of the nineteeth century through the late-twentieth-century efforts to set standards for school mathematics. Themes addressed in the second volume include instructional materials, students and teachers, assessment, and the role of government in mathematics education.

(available through NCTM at http://www.nctm.org/)

A Research Companion to Principles and Standards for School Mathematics

This book focuses on research in a wide array of subject areas, including professional development of teachers, mathematics assessment, and literature on curriculum topics. Chapters consider the implementation of the Standards from different perspectives on teaching and learning. Editor Jeremy Kilpatrick states, "The book synthesizes a sizeable portion of the literature to provide valuable insight into current thinking about school mathematics."

(available through NCTM at http://www.nctm.org/)

TCTM Mathematics Specialist Scholarship

Eligibility: Any student attending a Texas college or university – public or private – and who plans on student teaching during the 2004-05 school year in order to pursue teacher certification at the elementary, middle or secondary level with a specialization or teaching field in mathematics is eligible to apply. A GPA of 3.0 overall and 3.25 in all courses that apply to the degree (or certification) is required.

Deadline: May 1, 2004 **Amount:** $1500

Name: ____
Last First Middle

Address: ____
Number and street Apt. number

____
City Zip Code

(___) ____________________ (___) ____________________ < ____________________ >
Home Phone Work Phone Email Address

Social Security #: ______________ Birth date: ______________

What college or university do you plan to attend? If you are awarded this scholarship, TCTM's treasurer will send a check directly to the business office of the college. We need the college's complete address.

You must submit three (3) copies of each of the following documents:

1. Completed application form.
2. One official college transcript and two copies.
3. Two letters of recommendation:
   - One from either a mathematics or mathematics education professor you have taken coursework from and is not related to you.
   - One from a K-12 classroom teacher of mathematics you have worked with recently or that was a former teacher of yours and is not related to you.
   - It required that at least one of these recommendations come from a current member of TCTM, it is preferred that both recommendations come from current members of TCTM.
4. An essay of 1,500 words or more that describes your philosophy of teaching mathematics and how you will implement this philosophy with your future students. Specific examples of how you will teach a mathematics concept are required to illustrate your teaching philosophy. Or you may write an essay that explains a specific mathematics topic or concept, for example, a paper on proportionality.

Please submit all materials in one envelope to:

by mail: **Cynthia Schneider**
234 Preston Hollow
New Braunfels, TX 78132

by fax: **(512) 232-1855**
ATTN: Cynthia Schneider

TCTM Leadership Award Application

Eligibility: The TCTM Leadership Award is presented to a TCTM member who is nominated by a TCTM Affiliated Group. This person is to be honored for his/her contributions to the improvement of mathematics education at the local and state level. He/she has designed innovative staff development and has promoted the local TCTM Affiliated mathematics council.

Deadline: May 1, 2004

Information about the **Affiliated group nominating a candidate**:______________________________

Name: ______________________________
Last First Middle

Address: ______________________________
Number and street Apt. number

____
City Zip Code

(___) ______________ (___) ______________ < ______________ >
Home Phone Work Phone Email Address

Are you a member of TCTM? ☐ yes ☐ no NCTM? ☐ yes ☐ no

Information about the **person being nominated**:______________________________

Name: ______________________________
Last First Middle

Address: ______________________________
Number and street Apt. number

____
City Zip Code

(___) ______________ (___) ______________ < ______________ >
Home Phone Work Phone Email Address

Is the nominee a member of TCTM? ☐ yes ☐ no NCTM ☐ yes ☐ no Retired ☐ yes ☐ no

Applications should include 3 pages:

☐ Completed application form

☐ One-page, one-sided, typed biographical sheet including:
- Name of nominee
- Professional activities
- State/local offices or committees
- Activities encouraging involvement/improvement of math education
- Staff Development
- Honors/awards

☐ One-page, one-sided essay indicating why the nominee should be honored for his/her contribution to the improvement of mathematics education at the state/national level.

Send the completed application, biographical sketch, and essay to

by mail: **Cynthia Schneider, 234 Preston Hollow, New Braunfels, TX 78132**

by fax: **(512) 232-1855 ATTN: Cynthia Schneider**

by email: ***<cschneider@mail.utexas.edu>***

Texas Council of Teachers of Mathematics

INDIVIDUAL MEMBERSHIP **($13 per year)**

Name: ____

Mailing Address: ___________________________________

City: ____

State: _________________ Zip: _____________________

E-mail address: ____________________________________

Circle area(s) of interest: K-2 3-5 6-8 9-12 College

ESC Region Number: ______ School District: ______________

Check One: ☐ Renewal ☐ New Member ☐ Change of Address

$13 x __________ years = $_______

PROFESSIONAL MEMBERSHIP: For schools, institutions, or affiliated groups. $40 per year. Includes 3 journals.

School District or University: ______________________________

____

Campus: ____

School Mailing Address: ______________________________

____

City: ____

State: _________________ Zip: _____________________

Check One: ☐ New ☐ Renewal

$40 x _______ years = $_________

NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS MEMBERSHIP

Check One:
- ☐ New
- ☐ Renewal

One Journal
- ☐ Teaching Children Mathematics ($72)
- ☐ Mathematics Teaching in the Middle School ($72)
- ☐ Mathematics Teacher ($72)
- ☐ Journal for Research in Mathematics Education ($94)

Additional Journal
- ☐ Teaching Children Mathematics ($30)
- ☐ Mathematics Teaching in the Middle School ($30)
- ☐ Mathematics Teacher ($30)
- ☐ Journal for Research in Mathematics Education ($52)

Amount Due to NCTM: $ ______________

Scholarship Donations: $ ______________

TCTM awards scholarships to college students planning to pursue a career in mathematics teaching either as a mathematics specialist in elementary school or as a secondary school teacher with certification in mathematics. Your contributions in any amount are greatly appreciated. Please write a separate check for scholarship donations.

Make check(s) payable to TCTM and mail to:
TCTM Treasurer
2833 Broken Bough Trail
Abilene, TX 79606

Total Amount Due: $ ____________

VOTE!
TCTM Candidates

for Secretary

Bonnie McNemar

Bonnie McNemar has over 25 years experience in secondary mathematics education. She has taught both middle school and high school and served as secondary mathematics coordinator. Since 1989 her focus has been on designing, delivering and managing professional development for teachers of mathematics. For three years, she served as the director of the Teachers Teaching with Technology program. In 2002-2003, she was on the Math Team at the Charles A. Dana Center. Currently she serves as the coordinator of the Online Mathematics Initiative at the Distance Education Center, University of Texas at Austin.

John Huber

John Huber received his bachelor's and master's degrees in mathematics from Sam Houston State University and his doctorate in mathematics education and statistics from the University of Houston. He was professor of mathematics and mathematics department chair at Pan American University, now the University of Texas. In 1984 he went to Sam Houston State University as Professor of Mathematics. From 1994 – 2002 he served as chair of the Department of Curriculum and Instruction. In 2003 he returned to the department of mathematics and statistics and serves as director of the Reeves Center for Mathematics Education. He has served on the state committees for development of the Texas Essential Knowledge and Skills for EC-12 mathematics, the State Board of Educator Standards for 4-8 Mathematics, 8-12 Mathematics, and the Master Mathematics Standards, and served as chair of the Mathematics TASP Committee. He has been active in the Texas Council of Teachers of Mathematics since the late seventies and served as Secretary of TCTM during the late seventies and early eighties.

for Vice-President Secondary

Linda Shaub

Linda Shaub is a mathematics specialist for Education Service Center XIII. She has 19 years of teaching experience in middle school and high school. She is the president of the Austin Area Council of Teachers of Mathematics and is currently the secondary vice-president of TCTM.

David McReynolds

David McReynolds graduated from West Texas State University in 1978 with a BS in Secondary Education. His teaching fields are Mathematics and Health/Physical Education. He taught and coached in Brownfield, Dumas, and Stinnett for a total of seven years before moving to Boise City, Oklahoma where he taught and coached for three years. He then quit coaching and taught math for another thirteen years. In August 2002, he became a Mathematics Specialist for the Texas Rural Systemic Initiative (TRSI) working out of the San Angelo office. He has had the opportunity to facilitate workshops with the Oklahoma Department of Education, and has presented several sessions at various math conferences around the state of Texas.

for Northwest Regional Director

*Vote only if you live in one of these Service Center Regions: **9, 14, 16, 17***

Nita Keesee

Nita Keesee currently serves as the Secondary Curriculum Coordinator for Math and Science for the Abilene Independent School District. Her duties include curriculum, staff development, technology integration and TAKS coordination for special campuses. She has fourteen years experience in teaching high school mathematics. She has a BS and a Master's in Secondary Education. She is past president for the Abilene Association of Texas Professional Educators and past regional director. Nita strives to remain current in all aspects of her vocation such as the Dana Center Leadership Workshops and the TEXTEAMS Math Institutes. She has participated in the TEA TAKS Item Review for 10th grade math. A member of her local educators' organization, the Big Country Council of Teachers of Math and Science, since its beginning, Nita now wishes to support the work of TCTM as a regional director.

Beverly Anderson

Beverly Anderson is currently the Mathematics Specialist for Region 17 Education Service Center, where she has worked since 1991. Before that, she was a classroom teacher for 12 years. She is a member of the South Plains CTM, TCTM, NCTM, and the Texas and National Association of Supervisors of Mathematics. She enjoys traveling, golf, shopping, word puzzles, and crosswords. She has served TCTM well as Northwest Regional Director for many years.

Northeast Regional Director

Vote only if you live in one of these Service Center Regions: ***7, 8, 10, 11***

Jacqueline Weilmuenster

Jacqueline Weilmuenster has taught mathematics for twenty-three years in middle and high school and now serves as coordinator of mathematics K-12. Her past involvement with TASCD curriculum projects, EOC and TEXTEAMS review and writing committees, the co-chair for CAMT 2002 and the CAMT Board Chair have convinced her that TCTM should figure into the systemic change equation in Texas mathematics. She sees enlarging the presence of our area's mathematics organization as a very positive step and is willing to help facilitate this goal.

Kimberly Beechem

Kimberly Beechem teaches high school math and leadership classes at Redwater High School, a suburb of Texarkana. She has served as an active member of her local affiliate, Red River Council of Teachers of Mathematics, since it's beginning in 1994. She served on the steering committee for 3 STEAM Conferences, served as President from 2001-2003, and remains an active member of the executive council. In her 11 years of teaching experience, she has presented several workshops at local and regional math conventions. She received a Toyota TIME Grant in 1998 entitled "M&M Lab for Algebra 2" and was most recently awarded the Radio Shack National Teacher Award for 2004.

Central Regional Director

Vote only if you live in one of these Service Center Regions: ***12, 13, 20***

Scott Fay

Scott Fay is currently an eighth-grade pre-Algebra and Algebra I teacher at La Vega Junior High School – George Dixon Campus. He has been teaching for four years. Scott graduated from Texas A&M University at Commerce. Scott has always believed that any student can learn math, but the teacher has to put in the effort to get across to those students that need the extra help. Scott has been a member of the Texas Council of Teachers of Mathematics for four years and believes in what they are trying to accomplish throughout the state of Texas. He would like to try to spread the goals of TCTM in the Central Region and would try to put together regional workshops and bring in speakers that would make accomplishing these goals possible.

Pat Rossman

Pat Rossman would like to serve as Central Regional Director for TCTM in order to increase communication within this region in the pursuit of quality teaching and learning of mathematics. As a mathematics educator for the past 27 years, she feels it is crucial to search for the best methodologies that equip students with mathematical skills and conceptual understandings in all strands. For the past four years, she has been a Secondary Mathematics Specialist for the Austin Independent School District. Her current responsibilities include curriculum development---especially the alignment of written, taught, and tested curriculum, campus support for 9 Austin middle schools, and professional development. In November 2000, she became a National Board Certified Teacher in Early Adolescence Mathematics.

VOTE!

TCTM Ballot

Circle your choices below. Write-in candidate names are acceptable. Copy and mail your ballot to Wilma Cook at the address below. The voting deadline is June 1, 2004.

Secretary

☐ Bonnie McNemar ☐ John Huber ☐ ______________________________
write in canidate

Vice-President Secondary

☐ Linda Shaub ☐ David McReynolds ☐ ______________________________
write in canidate

Northwest Regional Director
Vote only if you live in one of these Service Center Regions: ***9, 14, 16, 17***

☐ Nita Keesee ☐ Beverly Anderson ☐ ______________________________
write in canidate

Northeast Regional Director
Vote only if you live in one of these Service Center Regions: ***7, 8, 10, 11***

☐ Jacqueline Weilmuenster ☐ Kimberly Beechem ☐ ______________________________
write in canidate

Central Regional Director
Vote only if you live in one of these Service Center Regions: ***12, 13, 20***

☐ Scott Fay ☐ Pat Rossman ☐ ______________________________
write in canidate

Mail in your ballot

Wilma Cook
TCTM Vice-President Elementary
6821 Norma St.
Fort Worth, TX 76112

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6821 Norma St.
Fort Worth, TX 76112

Texas Council of Teachers of Mathematics
Executive Board 2002-2003

When does YOUR membership expire?

Note the expiration date on your mailing label.
Use the membership form inside to renew before that date.

Texas Council of
Teachers of Mathematics

Member 2003-2004

NAME ___________________________

Texas Mathematics Teacher
234 Preston Hollow
New Braunfels, TX 78132