Texas Mathematics Teacher

Volume LXIII Issue 1 Spring/Summer 2017

Find the Mathematics...

... in a Sports Arena!

see page 11

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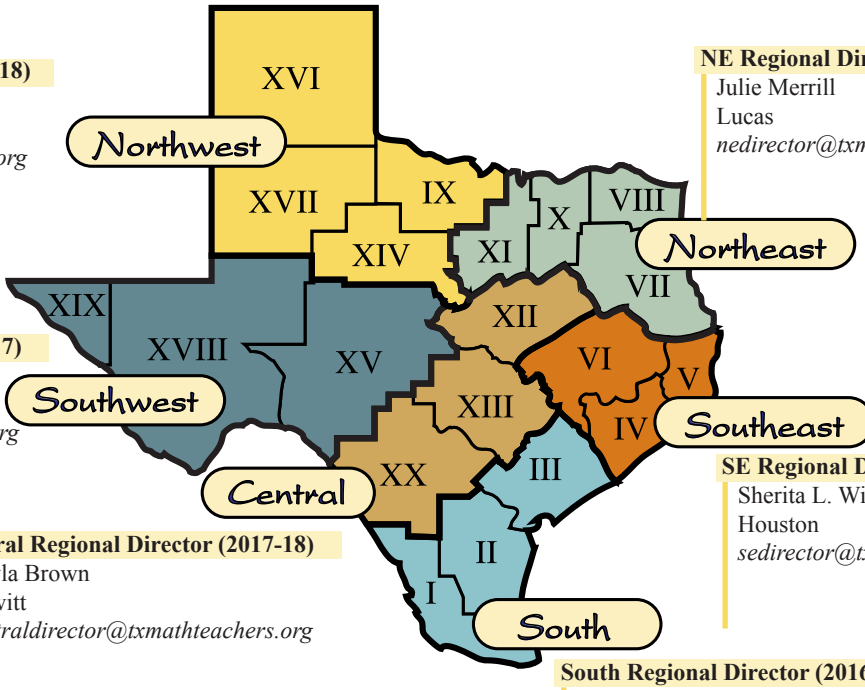

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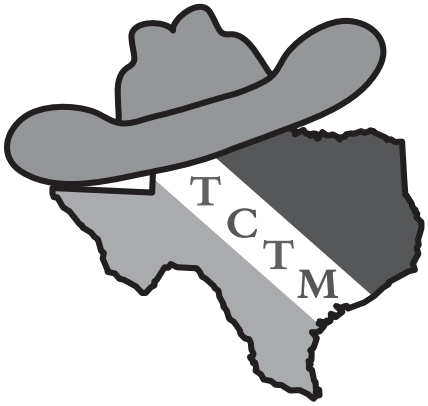

Texas Mathematics Teacher

A PUBLICATION OF THE TEXAS COUNCIL OF TEACHERS OF MATHEMATICS

Volume LXIII Issue 1 Spring/Summer 2017

cover photos by Mary Alice Hatchett and Rebekah North

Articles

Features

Departments

TCTM Applications

All applications (including TCTM membership) are available online at <*www.txmathteachers.org*>.

Letter from the President

Dear TCTM Colleagues,

This special issue of the TCTM journal, *Texas Mathematics Teacher*, marks the transition of editorship, as well as publication location. Since Fall of 2002, Dr. Cynthia Schneider has served as editor of the journal and Mary Alice Hatchett served as TCTM Publications Director. They transformed the journal from a "basic xerox-copied format" into the polished publication format we have today. The features of the journal have expanded over the years in order to offer beneficial resources to support mathematics learning. As we enter this time of transition for the journal editorship, we want to offer our sincere appreciation to Cynthia Schneider and Mary Alice Hatchett for their dedication to the journal over the past 15 years. Their dedication to this organization has made great impact for TCTM to sustain important leadership for mathematics education in Texas.

In Fall 2017, we welcome the new editors of the journal. Dr. Trena Wilkerson will serve as editor and Dr. Rachelle Rogers will serve as Associate Editor, both faculty at Baylor University. With this transition of editorship, the journal will now be housed in the School of Education at Baylor University. The journal is published twice a year and provided to current members of TCTM. We invite you to consider submission to the journal so that you can share your great ideas with others! Details are provided on the TCTM web page.

The leadership of TCTM works hard to provide members with the latest information related to mathematics education in the state. With your current membership, you will receive quarterly eBlasts from the President that provides helpful information and announcements about upcoming events. In addition, TCTM hosts a Facebook page and often "tweets" on Twitter, so visit our web site at www.txmathteachers.org for more information about these social media connections.

I offer an open invitation for you to share with me any ideas, questions, and/or important events that you think would be helpful to TCTM. In addition, if there are ways that TCTM can further support you, please email me at president@txmathteachers.org.

Sincerely,

Sandi Cooper
TCTM President, 2017-2018
<president@txmathteachers.org>

Website: *<www.txmathteachers.org>*
Facebook: *Texas Council of Teachers of Mathematics*
Twitter: *< txmathteachers >*

Letter from the Past-President

Dear TCTM Colleagues,

I always love getting updates on former students who have gone out into the world and managed to find success. I spent my years teaching math in middle school, so it is sometimes difficult to look at the awkward pre-teen with a mouth full of braces and see that person as a successful nurse, teacher, lawyer, doctor, or engineer ten or so years down the road. Most students at this awkward time in their lives lack confidence and need lots of reassurance that life does get better.

A mother to one of these former students thanked me a few days ago for offering her son this reassurance. He was one of those students who worked very hard but just struggled with the math. I really did not remember doing anything special for him, but she said that one simple act changed his whole attitude about school. One day he was really struggling with a test in class, and she said I just stood behind him and told him that he was doing fine. She said those words calmed him down, and he was able to finish his test with reasonable assurance that he would be okay. That student went on to graduate from college and is now in graduate school to further his career while working full-time as a registered nurse in a neonatal intensive care unit.

As teachers our words and actions are powerful. A few words of encouragement could possibly change a student's whole world. Temper your words with kindness. That awkward kid may be your surgeon or lawyer some day!

Know that you are not alone in the challenges that you face as a math educator. The Texas Council of Teachers of Mathematics (TCTM) is here to help you meet those challenges and tackle the obstacles that stand between you and success for you and your students!

Sincerely,

Martha Godwin
TCTM Past-President
<secretary@txmathteachers.org>

Affiliate Groups

These are local affiliated groups in Texas. If you are actively involved with them, please send future meeting and conference information to Trena Wilkerson at <*editor@txmathteachers.org*> so we may publicize your events. Contact information for each group is also available on the NCTM website, <*www.nctm.org*>. Contact information for regional directors is located on the inside front cover of this publication.

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NORTHEAST REGION
Service Centers 7, 8, 10, 11
Julie Merrill, Regional Director

East Texas CTM
Contact: Martha Godwin, <*mgodwin@qcisd.net*>.

Greater Dallas CTM
Contact: Richard Newcomb, <*RNewcomb@cistercian.org*> .

SOUTHWEST REGION
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Greater El Paso CTM
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Fort Bend CTM
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SOUTH TEXAS REGION
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The South Texas Region is on Project Share! The group is "Texas Council of Teachers of Mathematics: South Region."

Coastal CTM
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CTM @ Texas A&M University at Corpus Christi (Student Affiliate)
Contact faculty advisor Faye Bruun, <*faye.bruun@tamucc.edu*>.

CTM @ Texas A&M University at Kingsville (Student Affiliate)
Contact NCTM Representative: Susan Sabrio

Rio Grande Valley CTM
Contact: Velma Sanchez at <*vesatea10@hotmail.com*>, or visit <*www.rgvctm.org*>.

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Alamo District CTM
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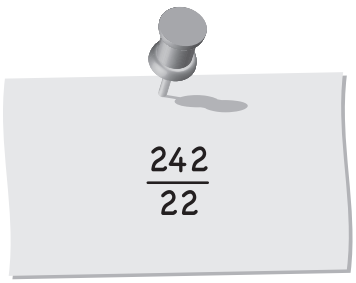
Central Texas CTM
Contact: President of CTCTM Kayla Brown, <*kayla.brown@midwayisd.org*>, or visit <*www.ctctm.org*>.



STATEWIDE

Texas Association of Supervisors of Mathematics (TASM)
Contact: Linda Sams <*TxASMOnline@gmail.com*>, or visit <*www.tasmonline.net*>.

The Association of Mathematics Teacher Educators of Texas (AMTE-TX)
Contact Dusty Jones at <*dljones@shsu.edu*>, or visit < *www.amte-tx.org*>.

NATIONAL

National Council of Teachers of Mathematics (NCTM) visit <*nctm.org*>.

National Council of Supervisors of Mathematics (NCSM) visit <*www.mathedleadership.org*>.

Fractions and Other Things That Don't Make Sense

If you were to walk into almost any early grade elementary classroom during mathematics instruction, you would no doubt hear students reciting in chorus "one, two, three, four, five…" on a daily basis. Students are provided with frequent opportunities to display their ability to count using whole numbers which reinforces and cements their whole number reasoning. It would be challenging however, if not impossible to walk into one of these early grade elementary classrooms and hear students reciting in chorus "one-fifth, one-fourth, one-third, one-half, one-whole…" at any time during the school year. In the United States, instruction of fractions is very different from instruction of whole numbers in both the strategies employed and the amount of instructional time assigned. The result is that students have fewer opportunities to develop their understanding of fraction concepts than they do with whole number concepts.

Fraction Misconceptions

Teachers are often frustrated when faced with students who do not understand fractions and who lack the ability to reason with fractions. To better understand how to help these students, teachers must be better equipped with their own understanding and awareness of these misconceptions. So, what do teachers need to know about students' fraction misconceptions? Research on student use and understanding of fractions has yielded a variety of misconceptions that students apply when working with fractions. One such misconception is the application of whole number reasoning (Petit, Laird & Marsden, 2010). Students incorrectly use whole number reasoning when comparing and ordering fractions, when identifying fractional parts of the whole and when applying operations with fractions. For example, when students are asked to place the fractions $\frac{1}{4}$, $\frac{1}{3}$, and $\frac{1}{2}$ on a number line in the correct order they often order them $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. They explain their decision using whole number reasoning by stating that 2 comes before 3 which comes before 4, ignoring the fractional representations.

While much research reports on the importance and positive results that student's prior knowledge and intuitive knowledge has on future learning of mathematics concepts (Fyfe, Rittle-Johnson, & DeCaro, 2012; Van de Walle, Karp, & Bay-Williams, 2016), some research findings indicate that while this prior knowledge can be helpful, it can also inhibit the learning of some mathematics concepts (Mack, 2001). Whole number concepts in particular, may confuse students' understanding of rational number concepts. Students often do not see fractions as numbers representing a value and do not understand the concept that rational numbers are whole numbers represented as a ratio whether as a fraction or as a decimal. According to the *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics: NCTM, 2000) children need to develop and increase their understanding of fractions as numbers and have opportunities to use fractions in context. In order to solve fraction problems involving equivalency or ordering, students must be able to recognize the multiple relationships presented by the fractional parts (Clark, Roche, & Mitchell, 2008; Lamon, 2012). Without this recognition, students apply whole number reasoning to fractions and struggle with understanding rational numbers (Mack, 2001).

So, what is it about fractions that makes this concept so difficult for students to understand and so difficult for teachers to teach? To understand fractions, students must recognize and internalize the fact that the term "fraction" actually represents multiple concepts. A fraction can be used to represent all of the following concepts: a part-whole relationship, a measurement of length, a division problem, an indication of operation and a ratio (see Figures 1-5) (Van de Walle et al., 2016).

Students also often understand a fraction as two whole numbers rather than a single quantity and this misconception results in great confusion both for them and their teachers. Without the knowledge and understanding of this misconception, teachers are at a loss for how to support their struggling math students. The notion that fractions must be understood as representing a specific quantity is paramount to understanding how students learn to understand rational numbers and how students develop rational number concepts (Behr, M., Wachsmuth, I., Post T., & Lesh R., 1984). When students come to recognize fractions as numbers on a number line they have increased clarity and develop meaning for the addition of fractions. Conversely, students who resist acknowledging fractions as numbers further complicate fraction instruction and fraction understanding (Kerslake, 1986).

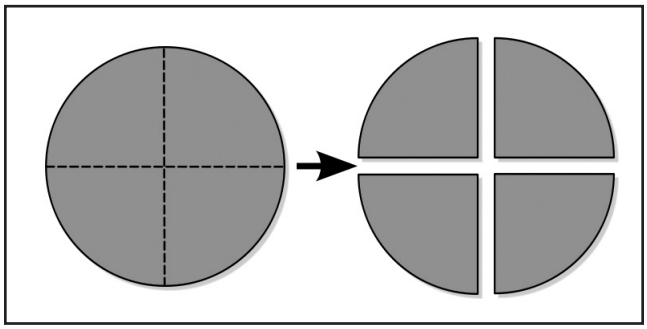


Figure 1. **Part-Whole Relationship**

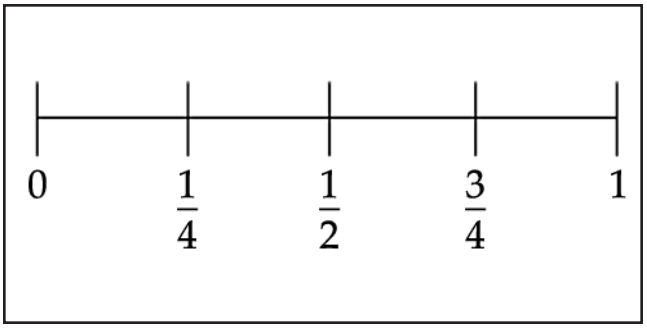


Figure 2. **Measurement of Length**

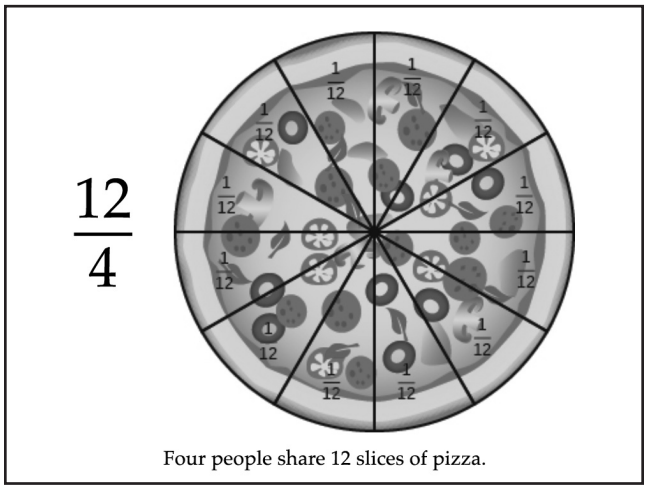


Figure 3. **A Division Problem**

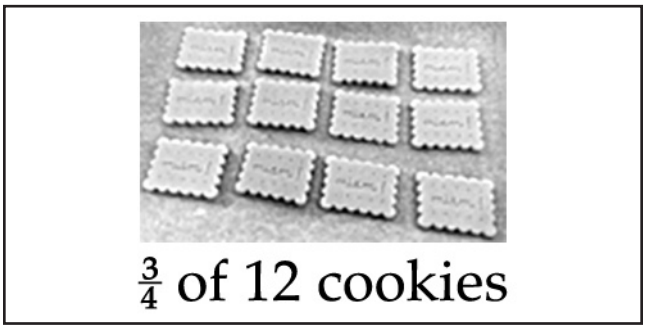


Figure 4. **An Indication of Operation**

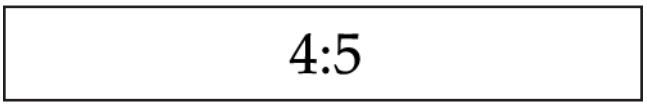


Figure 5. **A Ratio**

The research on students' use of whole number reasoning in understanding fractions suggests that teachers play a key role in helping students avoid common misconceptions. Teachers can gain a significant edge by recognizing students' incorrect or faulty use of whole number reasoning when working with fractions. This insight will help in significantly reducing or minimizing these misconceptions for students (Petit et al., 2010).

Teacher Tips

So, what are some practical steps that teachers can take to make learning fractions more accessible to their students?

Tip 1: The use of manipulatives or concrete representations to model fraction concepts has the potential to de-mystify fractions for students. Students are more likely to see important relationships in problems when they represent the problem in some way (NCTM, 2000). Manipulatives such as number lines are necessary in helping students' clarify their thinking and reasoning with fractions as well as their thinking about fractions as numbers.

Tip 2: Teachers must take precautions to ensure that manipulatives are not used in a rote manner but are tied specifically to the mathematics represented or modeled by the manipulative (Van de Walle et al., 2016).

Tip 3: Children benefit when provided with commercially developed manipulatives particularly during beginning interactions with fraction concepts. The commercially developed manipulatives allow children to create a mental model of fractional pieces that are of equal size (Fosnot & Dolk, 2002). Creating a mental model will make it possible for a child to re-create equal-sized fractional parts when manipulatives are not available by drawing a picture or diagram of their mental model.

Tip 4: Students gain flexibility with fractions when they are provided opportunities to work with a variety of fraction manipulative models. For example, students will need to see fractional parts represented as circular "pie" pieces, rectangular pieces and lengths on a number line. Students benefit from opportunities to choose and create representations and opportunities to explore the advantages and limitations of these representations (NCTM, 2000).

Tip 5: Students will benefit from lots of opportunities to

engage with manipulatives before expected to create or draw their own pictures of fractional pieces and parts of a whole (Petit et al., 2010).

As well as reasoning with fractions using models or manipulatives (Figure 6), students can effectively order and compare fractions through experiences using unit fractions (Figure 7), using extended unit fractions (Figure 8), using reference points or benchmarks (Figure 9) and using equivalent fractions (Figure 10).

It is important that students have opportunities to express fractions in a variety of ways. In other words, students should see fractions represented with models (drawings), represented in writing (e.g. two-thirds), represented orally (e.g. "Tom has $\frac{1}{3}$ of a candy bar."), represented with real-world objects (physical objects) and represented using symbols (e.g. $\frac{4}{5}$) (Petit et al., 2010). Teaching and learning fractions are both complex and challenging tasks and neither should be thought of as easy to accomplish; however, developing an awareness of students' misconceptions about fractions is a beginning step in increasing their understanding. Being better equipped with effective, research-based strategies to incorporate in fraction lessons, teachers can craft lessons that will help students develop a deeper understanding of fraction concepts. Fractions can and do make sense when placed within a meaningful context and explained with models and/or manipulatives.

Conclusion

The big ideas and strategies presented in this article represent a wide array of research about common misconceptions students have when interacting with fractions. At the heart of effective teaching and learning of fractions is meaning making of fractions as numbers. When students can engage with the multiple representations of fractions and move back and forth among representations, they develop greater flexibility with understanding and applying fraction concepts.

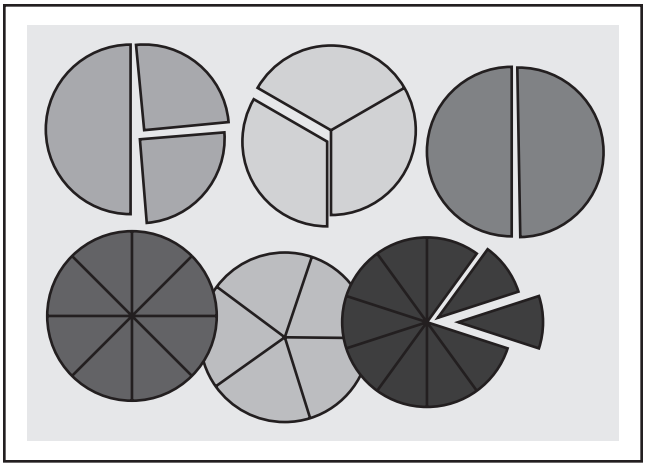


Figure 6. **Models/Manipulatives**

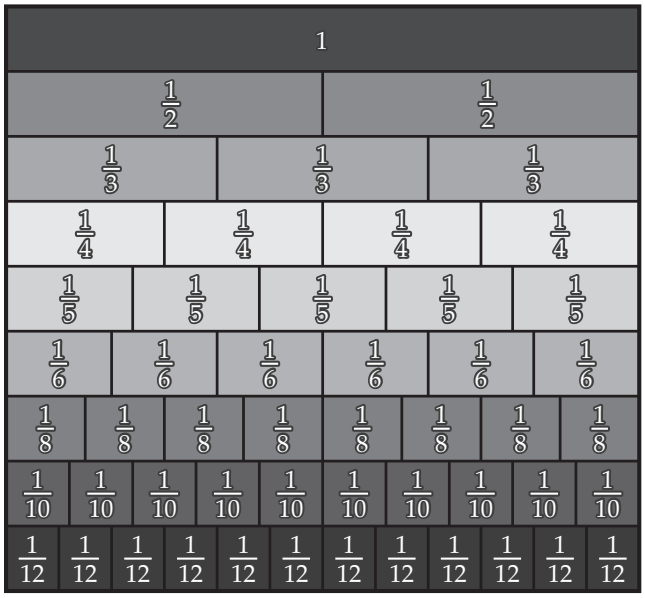


Figure 7. **Unit Fractions (numerators of one)**

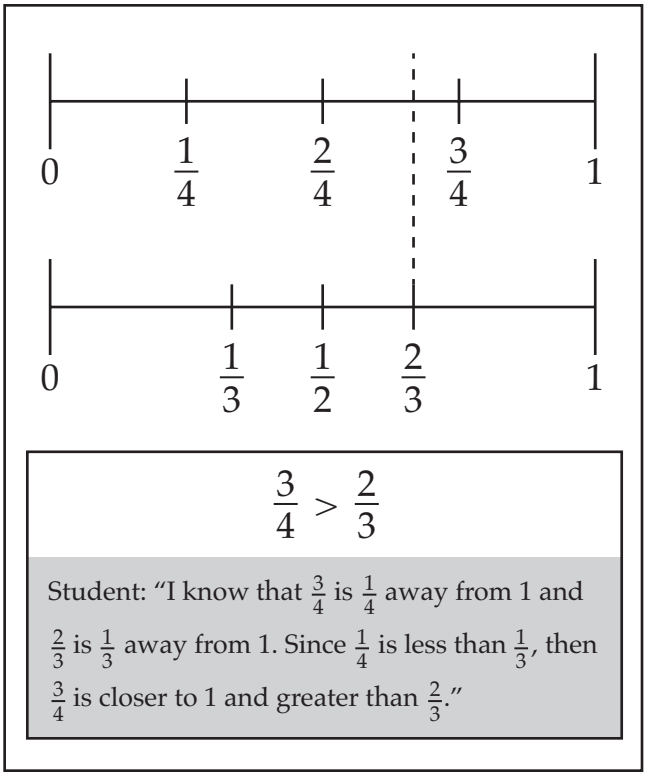


Figure 8. **Extended Unit Fractions**

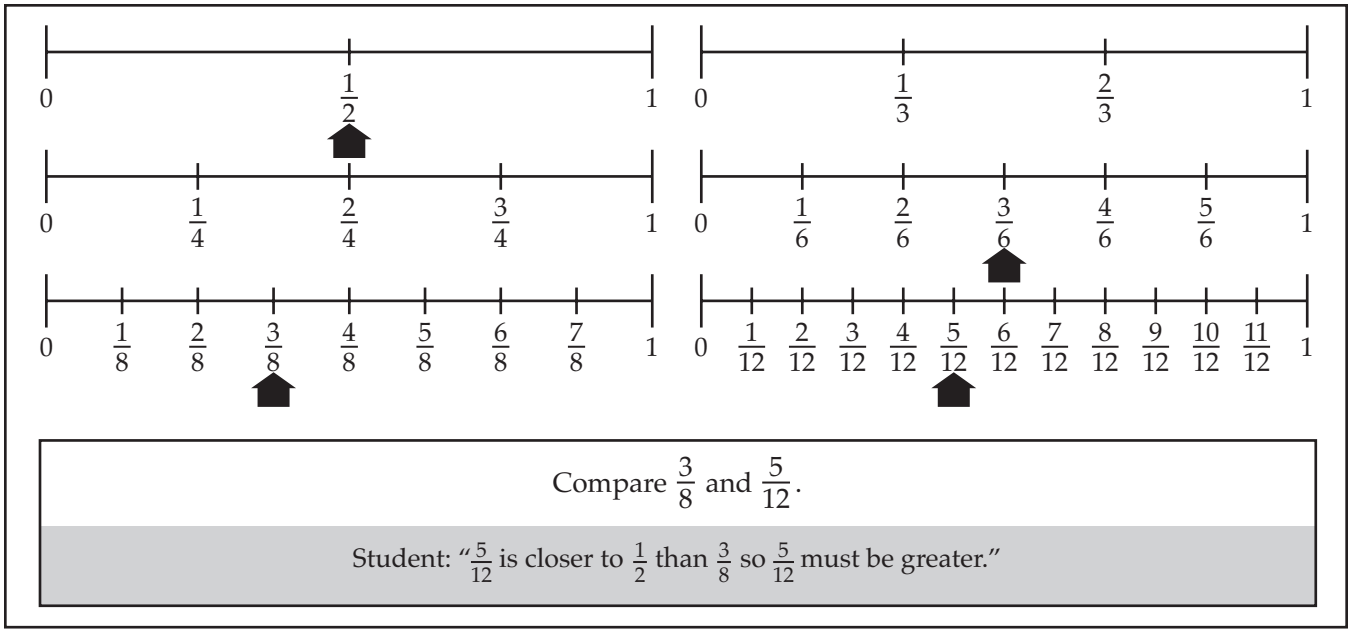


Figure 9. **Using Reference Points or Benchmarks**

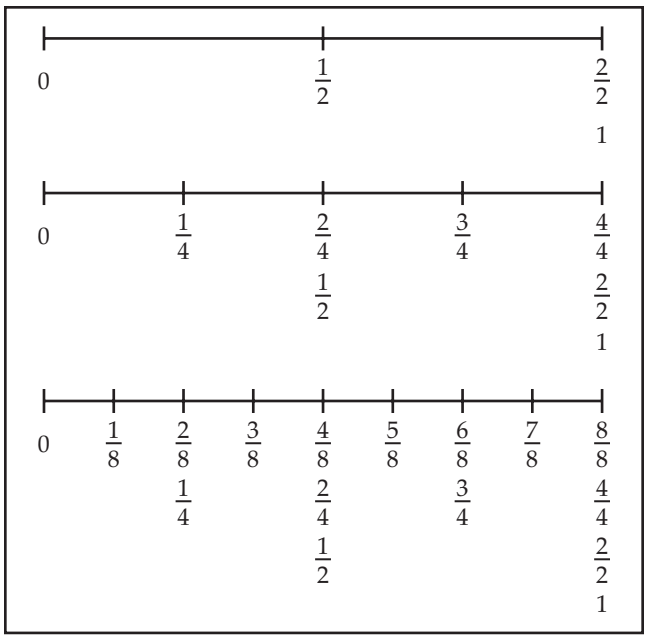


Figure 10. **Equivalent Fractions**

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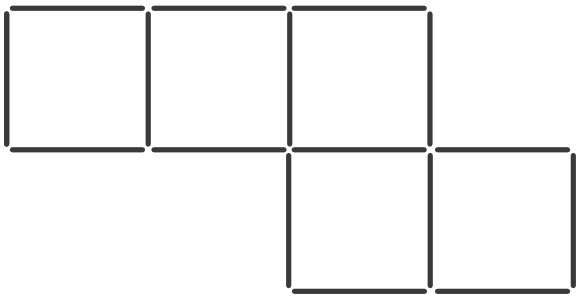
Puzzle Corner

Sticks #25 Puzzle

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.

Please prepare a sketch of your solution.

Arrange 18 craft sticks to form 6 squares, as shown.

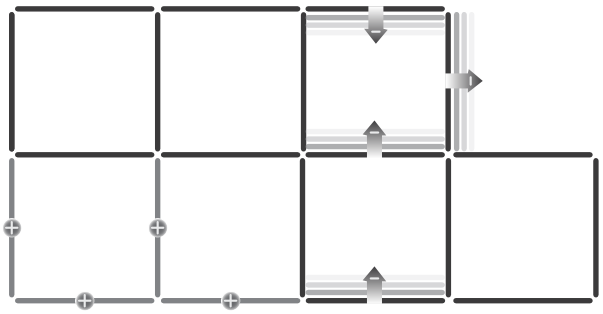


Puzzle: Now remove two sticks, leaving four squares - two large and two small.

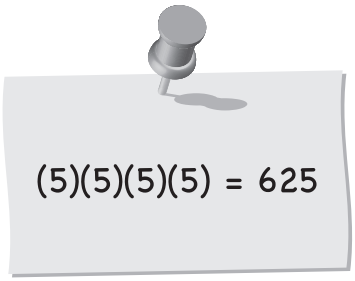
Sticks #24 Answer

Arrange 16 craft sticks to form the previous shape. Now remove four sticks leaving six squares.

Shown is a diagram of **a solution.**



Arrows indicate a moved or removed stick; plus-sign on a stick indicates new position.



Quotes for Thought

"Access without preparation does not equal opportunity."

Donald Maxwell
British writer and illustrator
(1877 – 1936)

"It is a miracle that curiosity survives formal education."

Albert Einstein
theoretical physicist
(14 March 1879 – 18 April 1955)

"When one door of happiness closes, another opens; but often we look so long at the closed door that we do not see the one which has been opened for us."

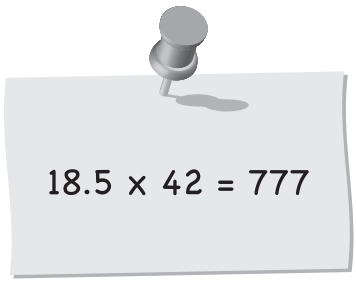
Helen Keller
author, political activist, and lecturer
(June 27, 1880 – June 1, 1968)

CAMT 2018

July 16 – July 18, 2018

The Conference for the Advancement of Mathematics Teaching (CAMT) 2018 will be held July 16 – July 18, 2018, at the George R. Brown Convention Center in Houston, Texas.

For more details, visit the CAMT website at *<www.camtonline.org>*.



On The Cover

Find the Mathematics… in a Sports Arena

When you look at this cover, what questions do you have? What *mathematics* questions come to mind?

The goal of 'Finding Mathematics' is to engage students in math through fun; everyday activities, build their problem-solving and collaboration skills; increase their desire to learn; and ultimately extend their understanding of math. In this issue, we'll look at familiar sports playing fields, with which most students are aware.

Start by sharing this journal cover with students and asking: 'What math questions come to mind as you look at this picture?' You might be surprised at what students SEE!

A few ideas follow:

- The yard markers on the football field are like a number line. Pick any two adjacent yard marker numbers and determine the sum. (30 + 40 = 70) Now find the sum of the numbers that are one yard marker to the left of the first addend and one yard marker to the right of the second addend. (20 + 50 = 70). Go to the left and right again, guess what! (10 + 60 = 70) Pick two other adjacent numbers and see if this still works.
- This time, pick any two adjacent yard marker numbers and determine the sum. (30 + 40 = 70), move one yard marker to the right of each addend and find the sum (40 + 50 = 90). If you repeat this, do you think you'll get the same sum? (50 + 60 = 110) Repeat several more times, how are the sums related? (they each increase by 20)
- If you stretched a rope from one goalpost to the other goalpost on a football field (120 yards. The goalpost is traditionally 10 yards behind the goal line) then added 1 more yard, how high could the rope be stretched vertically at the 50-yard line? Would it be as high as the top of the goalpost upright? (Goalpost height is 18.5 feet.) [Use Pythagoras Theorem ($60^2 + x^2 = 60.5^2$)]
- A baseball field is called a diamond; it contains many geometric shapes.
  - It is in the shape of a SQUARE with sides 90 feet long.
  - Home plate is a PENTAGON. The 'point' of home plate points toward the pitcher's mound.
  - The ball is a SPHERE.
  - If you drew a line from home plate to 2nd base, it would split the field into two CONGRUENT RIGHT TRIANGLES.
- If a baseball player hit a home run and is 21.5 feet from third base, how much farther do they need to run to get to home plate? (90 ft + 21.5 ft = 111.5 ft)
- The perimeter of a tennis court is 228 feet. The length of the court is 42 feet longer than the width. What are the width and length of a tennis court? (2W + 2(W+42) = 228)
- The Isner–Mahut tennis match on Court 18 at Wimbledon was played on June 22-24, 2010. It lasted 11 hours 5 minutes. How many minutes did the game last? (60 x 11 = 660 minutes. 660 + 5 = 665 minutes)

Although not always realized, mathematics plays an important role in sports and in sports arenas. Open the discussion with your students!

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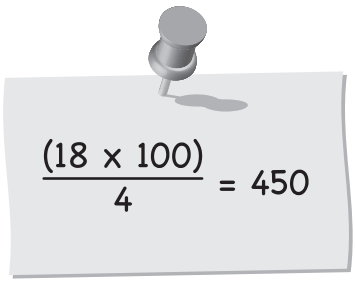
Scavenger Hunt

Broken Calculator Scavenger Hunt

In this issue you need to find the matching problem and possible answer for the Broken Calculator Scavenger Hunt. These problems must be solved without using a specific key or keys on your calculator. The solutions may be found throughout this issue. Submit the possible answer along with the page number via email to Mary Alice Hatchett at <*mahat@earthlink.net*> by October 1, 2017. All correct entries will be entered into a drawing for a $100 NCTM gift certificate. The winner will be notified by October 15, 2017.

	Solve	Without using these keys on your calculator	Possible solution	Page #
1	18 • 25	5	(18 • 100) ÷ 4 = 450	
2	18 • 25	2	9 • 50 = 450	
3	22 • 40	0	(22 • 39) + 22 = 880	
4	50 ÷ 2	2	50 • 0.5 = 25	
5	5^4	5 or ^ (exponent)	(5)(5)(5)(5) = 625	
6	121 ÷ 11	1	242 ÷ 22	
7	37 • 21	3 or 7	18.5 • 42 = 777	
8	315 ÷ 5	5	630 ÷ 10 = 63	
9	88 • 8	8 or x (multiply)	176 + 176 + 176 + 176 = 704	
10	6 • 5	5	(6 • 6) – 6 = 30	



TEA Talks

The Texas Education Agency (TEA) has several web pages important for mathematics educators

Curriculum

To find out more about the Texas Essential Knowledge and Skills (TEKS) and resources to support their implementation, see the TEA website at < *tea.texas.gov*>. For additional information, contact: Jo Ann Bilderback, Math/Science Manager at (512) 463-9581 or <*joann.bilderback@tea.state.tx.us*>.

Assessment

To find out more about the State of Texas Assessments of Academic Readiness (STAAR) and changes resulting from the new mathematics TEKS, see < *tea.texas.gov*>. For additional information, contact: Student Assessment Division at (512) 463-9536 or <*student.assessment@tea.state.tx.us*>.

Application Information

2018-19 Mathematics Preservice Teacher Scholarship

There are five $2000 scholarships available for 2018-19. Any student attending a Texas college or university - public or private - and who plans on student teaching during the 2018-19 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. Look for the scholarship application online at <*www.txmathteachers.org*>. The application deadline is May 1, 2018. Winners will be announced in July 2018.

2018 TCTM Grant

This grant is for K-12 educators, university faculty and NCTM affiliate groups in Texas. Please note, pre-service teachers are not included as they can apply for the Mathematics Preservice Teacher Scholarship. The grant can be awarded to an individual, a group of teachers or to another NCTM or NCSM affiliate organization, if they are in Texas. Grant requests up to $800 will be accepted.

Uses include (1) improving mathematics classroom(s), or (2) helping your school achieve its goals related to mathematics, or (3) promoting mathematics teaching and learning, or (4) improving your ability to teach mathematics.

The online application may be found at <*www.txmathteachers.org*>. The application deadline is November 30, 2017. Awardees will be notified by January 31, 2018.

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What Doesn't Belong Student Activity

What Doesn't Belong? Why?

1

$6n = 18$	$6n = 22$
$6n = 42$	$6n = 36$

2

$x + y = 5$	$x^2 + y^2 = 9$
$y = x^3$	$y = x^2$

3

$4n^2 - 9$	$49c^2 - 8$
$16a^2 - 25$	$25b^2 - 1$

4

32	128
25	1024

5

$\sqrt{36}$	$\sqrt{200}$
$\sqrt{81}$	$\sqrt{100}$

6

Associative
Repetitive
Commutative
Distributive

Solutions:

1. $6n = 22$ does not belong because 22 is not a multiple of 6.
2. $x + y = 5$ does not belong because it is the only one that is linear.
3. $49c^2 - 8$ does not belong because it is not the difference of 2 squares.
4. 25 does not belong because it is not a multiple of 8.
5. $\sqrt{200}$ does not belong because it is not a perfect square.
6. Repetitive does not belong because it is not a mathematical property.

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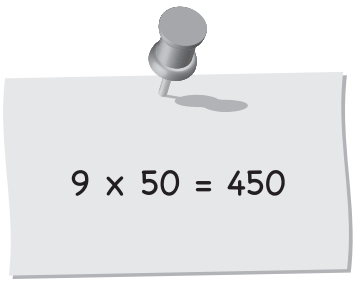

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Hooking Students to Functions: Giving Fun Context to Mathematical Vocabulary

Introduction

The *Principles and Standards for School Mathematics* calls for all students in grades 6-8 to understand patterns, relations, and functions and be able to identify functions in multiple representations such as graphs, tables, words, and equations (NCTM, 2000). Additionally, the new *Texas Essential Knowledge and Skills* [TEKS] (2012) emphasize that students taking algebra be able to understand function as a dependence of one quantity on another and that it can be emphasized in a number of ways. In the eighth grade, TEKS (2012) calls for an understanding of identifying "functions using sets of ordered pairs, tables, mappings, and graphs" while in the 9th grade, TEKS (2012) requires students to have a thorough understanding of linear functions and be able to find reasonable domain and range values for a real-world situations. This task requires students to possess an understanding of the functional relationship between numbers or variables and to be able to visualize and decode the relationship if it exists. But in many circumstances, functions are introduced through definition and procedure rather than an initial, understandable context. Students tend to use concepts without in-depth reasoning. The problem is further compounded with the introduction of new vocabulary such as 'one-to-one correspondence,' 'mapping,' 'element,' 'function,' 'domain,' 'range,' 'output,' and 'input' that is difficult for students to assimilate. Having the student memorize new vocabulary without context creates confusion and disengagement from the topic. One of the ways to increase engagement, motivation, and interest is to use games to teach mathematical concepts, especially vocabulary (Hull, Miles, & Balka, 2013).

Rich games motivate students and at the same time are educational and helpful in developing conceptual mathematical understanding (Burns, 2009). For example Tong, Yang, Han and Velasquez (2014) cite the importance of using games such as *24* ® to help students develop fluency with number operations. Ramani, Siegler, and Hitti (2012) recommend the use of linear board games as they found them to increase low-income children's number line estimation, magnitude comparison, numerical identification, and counting. Games also act as a springboard for discourse about various mathematical concepts. Girad, Ecalle, and Magnan (2013) and Kebritchi and Hirumi (2008) recommend the use of games as they foster high quality learning by engaging students in interactive decision-making as the students analyze the situation and make reasonable decisions. Van de Walle, Karp, & Bay-Williams (2010) and the National Council of Teachers of Mathematics in *Principles to Action* (2014) calls for the need to use everyday life to help students make connections for a more successful and meaningful development of mathematics concepts. Using games to teach mathematical concepts that specifically focus on mathematical vocabulary can be an engaging way to get students ready for a mathematical concept and develop conceptual understanding.

The purpose of this article is to showcase the classic "Seven-up" game as a way to engage and stimulate students' understanding of functions. The aim of the activity is to help students understand new vocabulary in a contextual scenario. The activity presented involves active student participation, which is a key to increased student learning and performance (Freeman & Lucius, 2008).

Explanation of the Original Game

The goal of the "Seven-Up" game is for students to correctly guess the person who pressed their thumb. The original "Seven-Up" game involves any seven students to start the game by coming to the front of the room. On the cue "heads down, thumbs up!" by the teacher, all other students put their heads down. The seven selected students circulate through the classroom, each secretly pressing the thumb of one student with his or her head down. On the second cue "heads up, seven up!" from the teacher, students raise their heads and the seven students whose thumbs were pressed stand up. Each student takes a turn guessing the name of the person they think pressed their thumb. When all the chosen students have guessed their thumb-presser the actual identities are revealed. If they guess correctly, they swap places with the thumb-presser and the game starts again.

The Game

I use the original game and modify it to fit the context of teaching functional relationships. Rather than choosing seven students, I ask for three to four students to volunteer

to start the game. The students who volunteer are referred to as student-volunteers and the rest of the class is referred to as participants. Just as in the original game, student-volunteers circulate pressing thumbs of the participants. To make the game more stimulating and fun, lights can be turned off to further create a sense of suspense and mystery. The game is halted after one round to discuss the relevance to functions, before proceeding with another round.

Connecting Mathematics to the Game

In order to connect the game to mathematics, I write the names of the student-volunteers on the left side of the white board and those of the chosen participants on right side of the board, side by side. Even if the guesses are wrong about their thumb-pressers, I use the correct ones for connection with functions. Arrows are drawn from left to right indicating the correct pairs as shown in Figure 1. Figure 1 depicts a "match-up" between the two that sets the stage for introducing new vocabulary.

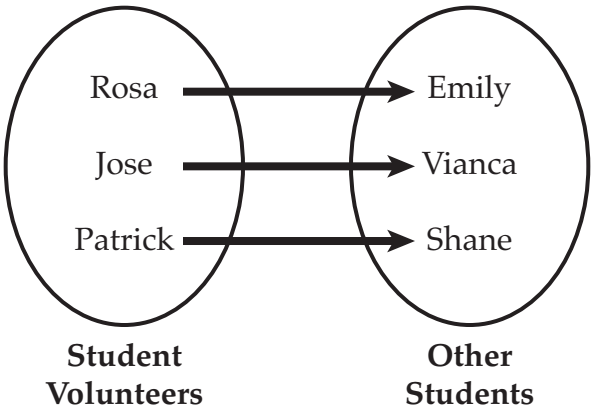

Figure 1. **Arrows indicating "match-up"**

The mathematical vocabulary of functions is then introduced using the example in Figure 1. Each of the student-volunteers is an 'input' who could have chosen any of the participants. The student-volunteer group can also be classified as 'independent' as they volunteered on their own. The vocabulary is further extended by naming the whole set of student-volunteers or all the 'input' the 'domain' in mathematics. Participants on the right of Figure 1 were chosen based on the choice of student-volunteers in the 'domain' group and form the 'dependent' or 'output' of the 'input' group. At this point I try to help students comprehend the 'output' group as 'range' by connecting the fact that the whole class, except the student-volunteers, is the *maximum possible* range of students that could have been chosen. Eventually but deliberately, the word 'element' is used to denote each student in the class (student-volunteers and participants). Vocabulary of 'one-to-one correspondence' is also discussed in reference to the fact that no two volunteers chose the same person. The aim is to use this scenario to help students contextualize mathematical terminology related to functional relationships. Figure 2 shows the mathematical vocabulary discussed. The game is then played again with new student-volunteers.

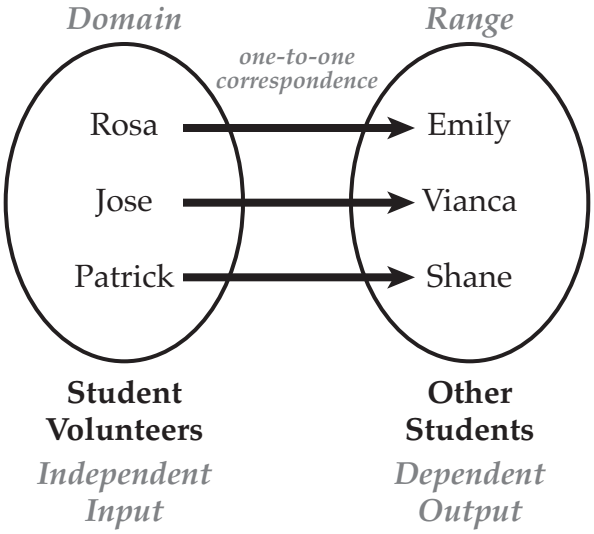

Figure 2. **Mathematical vocabulary of functions**

Variations of the game

As the game is played several times, different scenarios arise that can offer meaningful extensions and rich discussions on identifying a function. The first scenario as shown in Figure 1 that has each student-volunteer (an element in the domain) paired with only one other participant (an element in the range), with no two volunteers choosing the same student, thus providing a visual for students to grasp the concept of 'one-to-one correspondence' between 'domain' and 'range.' In reality Figure 1 represents an ideal situation but different versions of that situation can offer the platform for prompting rich discourse and meaningful insight into understanding the various mathematical vocabulary.

A second type of scenario can occur in which each student-volunteer (an element in the domain) chooses only one participant (an element in the range), but some participants (elements in the range) are chosen twice. Figure 3 shows an example of such a situation. This situation provides a platform for rich discussions about 'functional relationship.' What is a function? How do we define function? How is this situation different than that of Figure 1? I use this scenario

to discuss the element pairs and try to help students contextualize the fact that one 'input' still gives one 'output' and hence it represents the functional relationship but does not represent 'one-to-one correspondence.' Definition of function in terms of one 'input' giving exactly one 'output' is further clarified through comparison with the third scenario as described below.

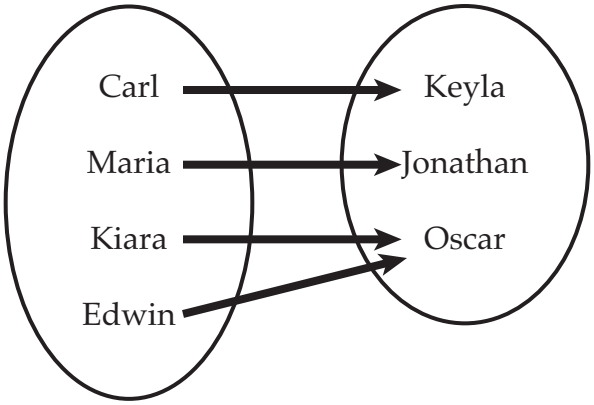

Figure 3. **A different scenario of 'function'**

A new scenario could occur in which one student-volunteer (an element in the domain) chooses more than one student in the class (elements in the range) from the class. An example of it is shown in Figure 4. The scenario provides an opportunity for the students to discuss its differences and similarities to previous scenarios and classify it as a 'function' or in this case 'not a function.' Contextual discussions by comparing the situations in Figures 3, 4, and 5 about whether an 'input' gives a *unique* 'output' can deepen conceptual understanding of function as the dependence of one quantity on another. A variation of this scenario is also shown in Figure 5. Questions, such as those listed below, can help promote critical thinking and facilitate understanding of functional relationships.

- How does the 'input' relate to the 'output?'
- How can the relationship be described?
- How are element pairs formed? Justify the situation as a 'function' or 'not a function.'
- How does it differ from the other situation?
- What happens if the 'domain' and 'range' are interchanged?

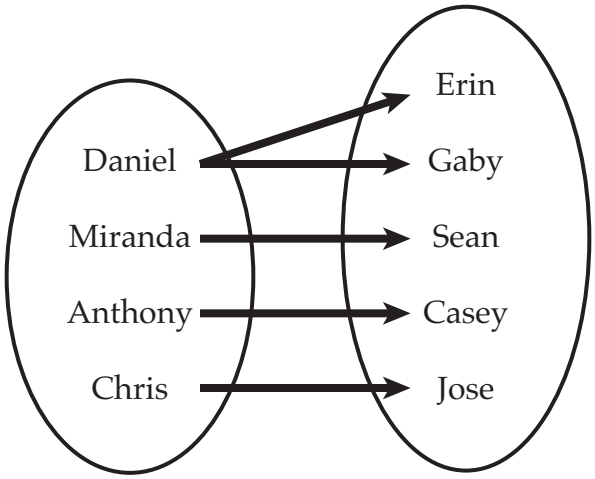

Figure 4. **Student-volunteer choosing more than one student**

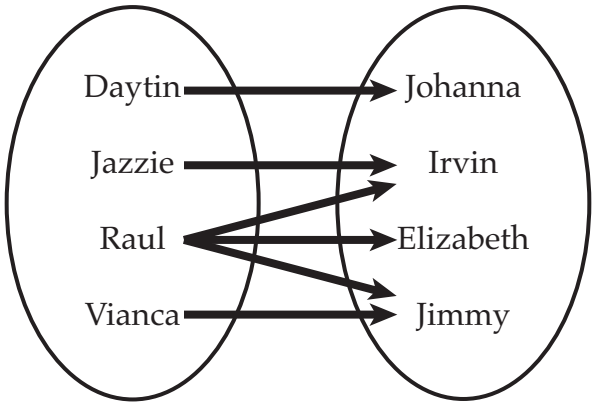

Figure 5. **Another variation of 'not a function'**

A fourth scenario can occur in which either the student-volunteers (elements in the domain) or other students (elements in the range) have the same names. The teacher has a choice here to either use last names or first names to prompt rich discussions among students about defining a functional relationship. Students can compare and contrast the scenarios and justify the scenario as 'function' or 'not a function' depending whether last or first names are used, hence leading to deeper conceptual understanding. Once again questions, such as these listed, can help students analyze and evaluate this scenario with others:

- How does the scenario change if only first names are considered?
- How does considering last names change the scenario?
- Would you classify it as a 'function' or 'not a function' and why?
- What happens if 'domain' and 'range' both have the same name?

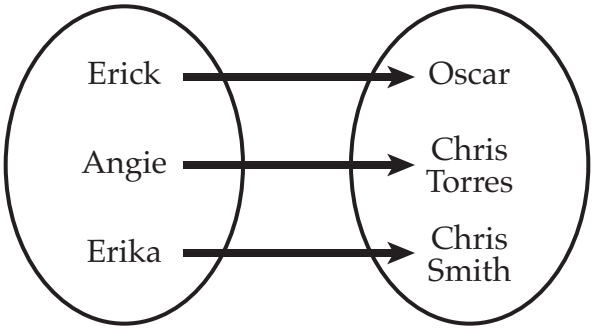

Figure 6. **Same first name in 'range'**

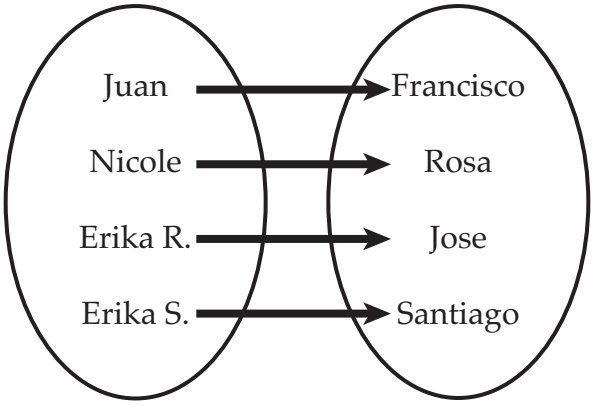

Figure 7. **Same first name in 'domain'**

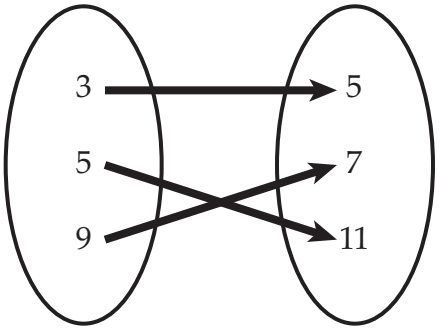

Figure 8. **Function**

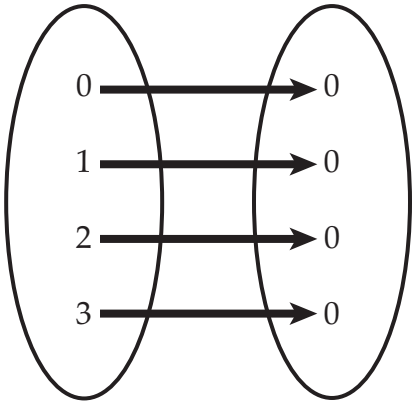

Figure 9. **Function**

Extension

This activity is extended by replacing names of students with numbers. The class members are paired and given a situation as illustrated in Figures 8, 9, 10 or 11, and asked to classify the situations as a 'function' or 'not a function' and explain and justify in context of the game played. This helps students to connect the scenarios with numbers and develop deeper understanding of functions. Another benefit of presenting students with different number scenarios is to help them communicate, talk and connect their learning and clarify doubts to form a solid foundational base for understanding functions. There are several modifications of this part of the activity that I have done over my years teaching, such as giving students matching cards and work as a group to sort them or having them come up with their own version of function or not-a-function and share with the class to prompt whole class discussions.

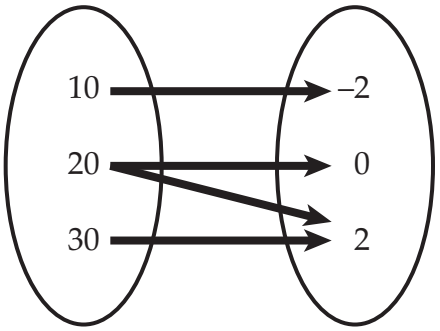

Figure 10. **Not a function**

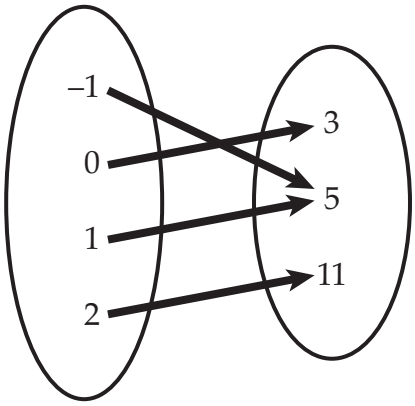

Figure 11. **Function**

Discussion and Implications

This game provides a context for students to connect to new vocabulary and generate new ideas related to functions. This game can be played in one class period or even be used as a 'hook' while beginning functions. Another way to use the game is as a re-teach if the concept and the vocabulary are getting difficult for them. The game can also be used as a review in which the students discuss the scenarios based on their understanding of functions and to further reinforce the concept. Overall, the most powerful impact of this game is at the beginning of the concept when new terms are being used, but it can be adapted in a number of ways. I have used the game as an opening activity to get students to talk about functions. Active participation and involvement engages students and fosters their interest and thinking. The most benefit comes from the fact that students are learning using a game, possibly the one that they have played in their elementary years. Students could be divided into groups and asked to provide scenarios for the whole class to discuss. Function terminology plays a crucial role in understanding the concept and this game gets the students to assimilate new information and becomes simpler when connected to a context in a fun way. The unpredictability in the outcome of the game provides for rich and stimulating discussions on functions. Various scenarios are an opening to jump-start understanding of functions and get students ready for further work with algebraic concepts.

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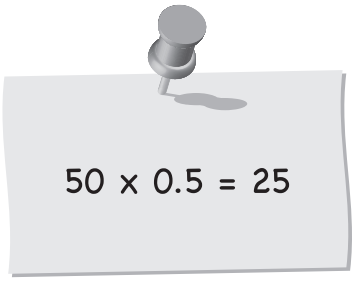

Legislative Update and Advocacy

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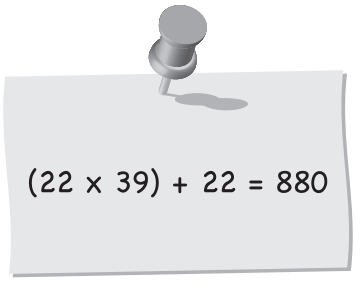
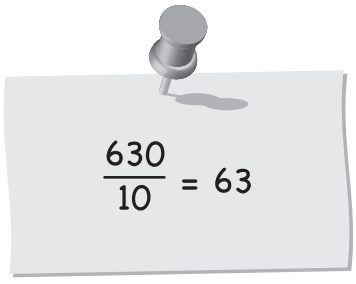




Recommended Readings and Resources

Intentional Talk: How to Structure and Lead Productive Mathematical Discussions ISBN-10: 1571109765

by Elham Kazemi and Allison Hintz Publisher: Stenhouse Publishers (March 28, 2014)

This book is considered a textbook.

Getting students to share their thinking so that everyone has an opportunity to hear and visualize others' ideas is not as simple as it sounds. These authors offer a structure on how to facilitate purposeful mathematics conversations through detailed vignettes from both primary and intermediate classrooms.

Mary Alice Hatchett • <mahat@earthlink.net>
Independent K-12 Mathematics Consultant • Georgetown, TX

Updated Publishing Opportunities for the Texas Mathematics Teacher

Call For Articles

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. Manuscripts should adhere to the general publishing guidelines listed below. **Deadline for submissions: Fall, July 1; Spring, January 1.** Please contact our journal staff with your article and information.

Call for Voices from the Classroom/Classroom Activities

Teachers are encouraged to submit articles for Voices From the Classroom, including inspirational stories, exemplary lessons, or management tools. Educators are encouraged to submit classroom activities or lessons for the journal. If submitting a lesson, it should include identification of the appropriate grade level and any prerequisites. These manuscripts are not peer reviewed, but are edited in-house and should adhere to the general publishing guidelines listed above. **Deadline for submissions: Fall, July 1; Spring, January 1.** Please contact our journal staff with your story and information.

Reviewers Needed

Apply or nominate a peer to become a reviewer by sending an email to our journal staff. Teachers are especially encouraged to apply.

Call for Lone Star News

Announcements for the Lone Star News include, but are not limited to, NCTM affiliated group announcements, announcements of upcoming professional meetings, and member updates. Please keep us and your members informed, contact our journal and web staff with your affiliated group's updates.

Additional Calls

The Texas Mathematics Teacher seeks submissions for the following departments. All readers are encouraged to contribute.

- Recommended Reading/Resources/Software/App
- On the Cover
- Puzzle Corner
- Quotes for Thought

Any images submitted for On the Cover must be original to the author and include a half page description of the image. Puzzle Corner submissions should include the solution.

Call for Advertisements:

For-Profit Organizations and businesses interested in placing an advertisement for mathematics materials should contact the journal staff. Advertisements do not imply endorsement by TCTM's board, editorial staff or members. **Deadline for submissions: Fall, September 1; Spring February 1.**

General Guidelines for Submission

As part of the submission process, authors are required to check their submission compliance with each of the following items. Submissions that do not adhere to these guidelines may be returned to authors.

General Preparation Checklist

- The manuscript has not been previously published and is not simultaneously being considered for publication elsewher
- The manuscript is in Microsoft Word format.
- All graphics, tables, and figures should be embedded in the manuscript.
- The manuscript follows the most current APA guidelines with in-text citations as well as references at the end of the article. When possible, DOIs should be utilized in the references.
- The manuscript is double spaced, Times New Roman, size 12 font, with 1 inch margins on all sides.
- The manuscript's title page should include the title of the article/activity, author name, affiliation, mailing address, email address, phone number, and the intended target audience. No author names should appear on the manuscript after the title page.
- The author should indicate whether his or her email address can be published with the article.

Receipt of manuscripts will be acknowledged. If the manuscript is accepted for publication, the editor/reviewers may make suggestions or revisions in consultation with the principal author. Receipts for all copyrighted materials must be received prior to publication.

A Blast From the Past

This article is a reprint from our very first Texas Mathematics Teacher in 1971. I thought it worth sharing to highlight how problems have continued over time and recommendations for engagement are not all that different.

Cynthia L. Schneider
Outgoing Editor

LET'S CHALLENGE THEM

W. A. ASHWORTH, JR.

In the relatively short time I have been teaching I have observed an everwidening conflict over the type mathematics we should offer our students.

Should we encourage almost all of them into a so-called pure mathematics track or should we direct more of them toward the numerous types of basic mathematics programs? Should we exert more pressure to direct our students, or should we accept the popular idea of permissiveness in education?

Perhaps the greatest area of problems is in determining which of our ninth grade students should take Algebra and which should take Related Mathematics. Originally, Related Mathematics was designed for about 20% of our students. Now, according to all indications, we have upward of 35% in Related Mathematics. I suggest there are several reasons for this situation.

First, the students are misinformed in the eighth grade. I have been told by many students that they have been told by principals and counselors, as well as arithmetic teachers, they should not take Algebra in the ninth grade if they do not have an "A" in eighth grade arithmetic. Worse than this, some arithmetic teachers do not encourage any of their students toward Algebra. Some of these misplaced students can be found in the first few days of school and redirected. Unfortunately, too many are not found soon enough to do this.

Second, there is too little communication between arithmetic teachers and high school teachers. We bemoan our problems in too many areas except those where something can be done to correct them. There should be interchange of ideas and problems to help thes studnts in their transition to high school. Failing to do this makes our students the losers.

Third, we are not selling our total program. Students, for the greatest part, tend to sink to the lowest level of effort. Unless we sell our program, there is an inevitable consequence — the students take the "easy courses" wherever possible. In a recent curriculum assembly in our school, students were asked "How many of you who are taking Related Mathematics plan to go to college?" The response was alarming! Almost half of the students in these courses indicated such intention. To be sure, many will not go to college, but the regretful part is that some will go to college grossly unprepared in mathematics.

Fourth, and this embodies much of our problem, we are not challenging our students. Sometimes, I agree, this seems to be an almost insurmountable task, but we must try harder. This year I am teaching a Related Mathematics I class. They were in no way hand picked; they were in every way a typical class. We decided to try teaching them Algebra I. Our progress has been very slow — but there has been progress. I would like to share with you some of the things I have learned from this class.

Patience in abundant amounts is imperative. These students sense they have been, and are, fail-

ures in mathematics. They sense quickly any expression of frustration or displeasure from the teacher. Sometimes patience is almost impossible, but it can be found. At least, I have, and that is quite an accomplishment.

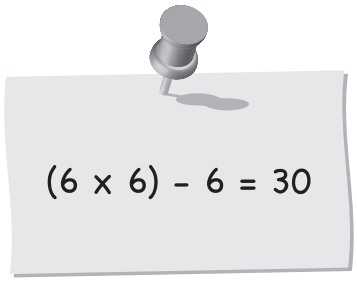
Praise the students for any success however small. I think it would be a good idea to have some type of progress chart for these students — even using gold stars might work to great advantage.

Accept as a guiding principle that maintaining these students' attention and interest in a particular topic for more than a few days is unlikely. Be prepared to move to a new topic when interest wanes. It may be necessary to go back to one topic several times in order to complete it. This is a new approach to "spiral teaching," but it works.

Be adventuresome and try new approaches and methods with these students. If they are a part of your adventure, most of them will rise to the occasion and cooperate.

To be sure, these ideas are directed toward Related Mathematics students, and this is not the only area where problems exist. I suggest some of the ideas will work whatever the level of subject matter if we are willing to use them. The most important part is in challenging our students.

LET'S CHALLENGE THEM! *(Mr. W. A. Ashworth, Jr. teaches at J. Frank Dobie High School, Pasadena Independent School District)* ■

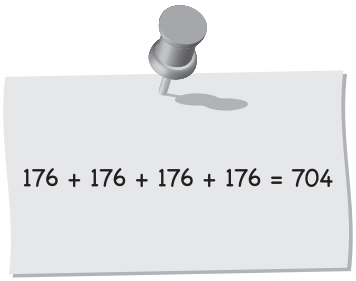


TCTM Leader Spotlight

Each year since 1995, TCTM has accepted nominations for two awards for leaders in our professional community. The TCTM Leadership Award is presented to a TCTM member who is nominated by a TCTM affiliate. The second award, the E. Glenadine Gibb Achievement Award, is presented to someone nominated by a TCTM member. The following individuals have been honored and we wish to acknowledge their former and ongoing contributions this year in the leader spotlight. **If you wish to nominate someone for 2018, please download the forms from our website. Please submit your nomination by Dec. 31, 2017.**

Our prior awardees are:

Year	Leadership(local/state)	Gibb (state/national)
1995	Mary Alice Hatchett	Iris Carl
1996	Betty Forte	Cathy Seeley
1997	Diane McGowan	Pam Chandler
1998	----	----
1999	Linda Shaub	Eva Gates
2000	Lloy Lizcano	Bill Hopkins
2001	Susan Hull	Pam Alexander
2002	Janie Schielack	Judy Kelley
2003	Bonnie McNemar	Dinah Chancellor
2004	Dixie Ross	Jacqueline Weilmuenster
2005	Barbara "Basia" Hall	Barrie Madison
2006	Nancy Trapp	Lois Gordon Moseley
2007	Kathy Hale	Cynthia L. Schneider
2008	Jim Wohlgeheagen	Juanita Copley
2009	Jane Silvey	Jo Ann Wheeler
2010	Elaine Young	Paula Steffen Moeller
2011	Beverly Burg Anderson	Jennie M. Bennett
2012	Paul Gray, Jr.	Linda Gann
2013	Vodene Schultz	Anne Papakonstantinou
2014	Caren Sorrells	Noemi Rodriguez-Lopez
2015	Jennifer Hylemon	Bea Luchin
2016	Robb Wilson	Trena Wilkerson



Apply now for a MET Grant, Scholarship, or Award!

NCTM's Mathematics Education Trust (MET) channels the generosity of contributors through the creation and funding of grants, awards, honors, and other projects that support the improvement of mathematics teaching and learning.

MET provides funds to support classroom teachers in the areas of improving classroom practices and increasing mathematical knowledge. MET also sponsors activities for prospective teachers and NCTM Affiliates, as well as recognizing the lifetime achievement of leaders of mathematics education. Grant, scholarship, and award funding ranges from $1,500 to $3,000 and can be used for conferences, workshops, seminars; research and in-service training in mathematics coursework; or professional development activities. **The deadline is November 3, 2017**.

If you are a teacher, prospective teacher, or school administrator and would like more information about MET grants, scholarships, and awards, please visit their website,

<www.nctm.org/Grants/>

Presidential Awards for Excellence in Mathematics and Science Teaching

The **Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST)** are the nation's highest honors for teachers of mathematics and science. Awardees serve as models for their colleagues, inspiration to their communities, and leaders in the improvement of mathematics and science education. Nominations for mathematics and science teachers of grades K-12 will open in Fall of 2017. Please see *<www.paemst.org>*.

A state panel of master teachers, specialists, and administrators review the applications and choose the outstanding mathematics teachers for the National Science Foundation to consider for state finalist status. After an initial selection process at the state level, a national panel of distinguished scientists, mathematicians, and educators recommends a finalist to receive the national award. If chosen as a national winner, the state finalist will receive $10,000 and an all expense paid trip for two to Washington D.C. for ceremonies that include recognition from the president of the United States at the Capitol.

In the fall, outstanding certified mathematics and science teachers in grades K-6, with five years or more of teaching experience, will be eligible to apply. If you would like to nominate an outstanding mathematics or science teacher, nomination forms and applications will be available at the website above in the fall.

PAEMST 2016 Mathematics Winner: Erika Hassay, Austin, TX

Erika Hassay has been an educator for 12 years with experience in kindergarten, first, second, and fourth grade in public and private schools in Uganda and the United States. She spent the last eight years at Live Oak Elementary School in Austin teaching second and first grade in a unique setting that included students who are deaf and hard of hearing.

Erika believes that mathematics is learned best when students are responsible, active, and vocal participants. To this end, she fosters a lively community of problem-solving mathematicians in her classroom. Even young children are expected to discuss, debate, challenge, and learn from one another's thinking.

Erika has partnered with university professors and educational researchers to both refine her practice and contribute to the larger discussion about the characteristics of good teaching and mathematics learning. She has coauthored several presentations and publications to this end. Erika has served as a cooperating teacher for preservice teachers and routinely opens her classroom to students from universities for observation and practice teaching experiences. She has mentored new teachers and held several leadership roles at her school and district.

Erika has a B.A. and M.A. in education from Harding University. She is certified in elementary education with gifted and talented, and English as a second language endorsements.

PAEMST 2016 Mathematics Winner: Patty Hill, Austin, TX

Patty Hill has been teaching mathematics at Kealing Middle School for 18 years. She currently teaches Algebra I, Algebra II, and an elective she created called Math in the Arts.

Patty transformed her classroom using the flipped learning model, creating an environment where students learn that perseverance and hard work will be rewarded with improved confidence in their problem solving abilities and a deep understanding of mathematics. She designs engaging activities and projects in which students learn through communication and collaboration, acquire new skills in a safe environment, and are challenged to take intellectual risks. She believes that the flipped learning model can transform education by creating a level playing field for students of all backgrounds.

Patty is a founding member of the Math Teachers' Circle of Austin which advocates for the incorporation of authentic problem solving into the classroom. She has presented both problem solving strategies and flipped learning at local and state conferences. In addition, she has trained and mentored teachers to implement the flipped model. Patty is also working with Querium to develop an artificial intelligence that provides adaptive tutoring and student problem solving analytics for teachers.

Patty graduated from the University of Texas at Austin with a B.S. in mathematics. She is certified to teach 6–12 Mathematics.

About This Publication

Since 1971, the Texas Council of Teachers of Mathematics (TCTM) has produced the journal *Texas Mathematics Teacher* for our members. Our mission is to promote mathematics education in Texas. In the journal we accomplish this by publishing peer-reviewed articles by leading authors and local news from around the state. TCTM is committed to improving mathematics instruction at all levels. We place an emphasis on classroom activities that are aligned to the Texas Essential Knowledge and Skills and the NCTM *Principles and Standards for School Mathematics*.

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. Teachers are encouraged to submit articles for Voices From the Classroom, including inspirational stories, exemplary lessons, or management tools. More specific guidelines for submissions may be found below.

Original artwork on the cover is another way teachers may contribute. We publish the journal twice each school year, in the fall and spring semesters. Our website archives the journals in PDF format. If you wish to view past issues, please see

<*www.txmathteachers.org*>

Our current Editorial Board consists of Cynthia Schneider, Mary Alice Hatchett, Benjamin Reece, Larry Lesser, James Epperson and Katey Arrington. Larry, James and Katey serve as expert advisors; Cynthia is the editor. Mary Alice does many jobs, including requesting articles, serving as an elementary expert, and communicating with authors. Benjamin is the layout and graphic designer; he manages to fit all the text into the limited number of pages we have to work with. The TCTM Board wishes to thank them for their leadership in producing the *Texas Mathematics Teacher*.

The Editorial Board wishes to acknowledge the contributions - time, effort, and expertise - that our volunteer reviewers make to our final journal. Those that reviewed for the journal and deserve our thanks for their support last year, in 2016-17, were:

Paul D. Gray, Jr., Kathleeen Hart, Mary Alice Hatchett, Nancy Trapp

Advertising Guidelines for Texas Mathematics Teacher

All advertising is subject to the approval of the publisher. The journal staff shall be responsible for ascertaining the acceptability of advertisements. All advertisements should be sent "copy-ready" by the closing dates of September 1 for the fall issue and January 15 for the spring issue. Position preference, such as right-hand pages or first half of issue will be honored on a first-come basis. All advertisements must be pre-paid by the closing date with a check made payable to TCTM, and mailed to our current treasurer, Kathy Hale. Rates for *Texas Mathematics Teacher* per issue are: full page $500.00, half page $300.00, quarter page $200.00.

All advertisers must adhere to the guidelines posted on our website at <*www.txmathteachers.org*>.

Outgoing Editorial Board

Dr. Cynthia L. Schneider	**Editor**	*cschneider@utexas.edu*	Dr. James Epperson	**Board Member**	
Benjamin Reece	**Layout**	*secretmantra@gmail.com*	Dr. Larry Lesser	**Board Member**	
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Texas Mathematics Teacher (ISSN# 0277-030X), the official journal of the Texas Council of Teachers of Mathematics (TCTM), is published in the fall and spring. Editorial correspondence should be mailed or e-mailed to the editor.

This journal is funded by the Texas Council of Teachers of Mathematics and printed at The University of Texas at Austin, which does not imply endorsement by the University or by the Charles A. Dana Center.

Call For Articles

See page 21 for the updated Call for Articles and other components of the journal.

TCTM 2017 Mission, Focus and Goal Statements

Mission of the Texas Council of Teachers of Mathematics:

To promote mathematics education in Texas

To support this mission, TCTM has five **focus areas:**

Recruit and Retain Mathematics Teachers	Curriculum and Instruction Support	Advocacy	Promote Communication among Teachers	Serve as Partner Affiliate for NCTM

TCTM activities will align to the five strategic goals. **Goals** of the organization include six strands:

Administration

- Streamline online membership registration through CAMT

Publications

- Survey membership to identify what they want in the *Texas Mathematics Teacher* (*TMT*)
- Review and refine the *TMT* journal and the TCTM website
- Improve the review protocol, establish criteria for reviewers
- Provide tips for new teachers in the *TMT* and on the website

Service

- Increase the donations toward Mathematics Specialist College Scholarships
- Staff CAMT with volunteers as necessary
- Advertise affiliated group conferences on the TCTM website, in the *TMT* and at CAMT

Communication

- Maintain an e-mail list of members for timely announcements
- Communicate with affiliated groups in a timely manner

Membership

- Encourage affiliated groups to include TCTM registration on their membership forms

Public Relations

- Sponsor and staff the TCTM booth at CAMT
- Follow NCTM Advocacy Toolkit (2004) for increased voice of TCTM membership on issues relevant to our mission

TCTM Past-Presidents

1970-1972	James E. Carson	1986-1988	Maggie Dement	2002-2006	Cynthia L. Schneider
1972-1974	Shirley Ray	1988-1990	Otto Bielss	2006-2008	Jo Ann Wheeler
1974-1976	W. A. Ashworth, Jr.	1990-1992	Karen Hall	2008-2010	Paul Gray
1976-1978	Shirley Cousins	1992-1994	Susan Thomas	2010-2012	Nancy Trapp
1978-1980	Anita Priest	1994-1996	Diane McGowan	2012-2014	Mary Alice Hatchett
1980-1982	Patsy Johnson	1996-1998	Basia Hall	2015-2016	Martha Godwin
1982-1984	Betty Travis	1998-2000	Pam Alexander		
1984-1986	Ralph Cain	2000-2002	Kathy Mittag		

2018 George R. Brown Convention Center
Houston, Texas
July 16-18

CAMT
Conference for the Advancement of Mathematics Teaching

2019 Henry B. Gonzalez Convention Center
San Antonio, Texas
July 8-10

For more details, visit the CAMT website at <*www.camtonline.org*>

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