



eREFLECTIONS

eREFLECTIONS

Publication of the Georgia Council of Teachers of Mathematics

From the President's Pen

Looking Back

By the time you read this GCTM will have wrapped up a second successful summer of Academies.

Approximately 1,200 K-12 teachers invested 2 days of their summer vacations to improve their content area knowledge, their assessment strategies, and their classroom pedagogy. We owe a huge debt of gratitude to Peggy Pool who has spearheaded the Academies this summer and last. Thank you Peggy! And thanks to your helpers who have volunteered. Among them are Don Slater, Debbie Poss, Kay Haugen, Carolyn Cutts, Cheryl Keck, Chuck Garner, Lynn Skinner, Cathy Franklin, Rachel Bonner, Denise Peppers, Yolunda Rivers, Valencia Thornton, Sonya Tokerud-Hoelscher, Chantelle Kirk, Vicki Mullis, Valerie Flagg, Bridgette Thurman, Jennifer Peek, Anita Funsch, Susan Craig and Paul Oser and many other generous souls.



[Dan Funsch](#)
President

Looking Forward

The Georgia Mathematics Conference Board is hard at work preparing for this year's conference at Rock Eagle, October 16-18, 2013. Browse through this issue of *eREFLECTIONS* to check out the planned highlights. I hope that, as the Conference Board is planning for a great conference, you are planning to attend. Registration will open on line in about a month – keep your eye on the GCTM web site.

In a matter of a very few number of weeks, we will all be heading back to our schools, classrooms, and students. The challenges you face are many. As your state professional organization, GCTM stands ready to support and assist you. Our resources and personnel are at your disposal.

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eREFLECTIONS is a publication of the Georgia Council of Teachers of Mathematics
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REFLECTIONS

GCTM Responds to the GDOE Announcement Concerning PARCC Assessments

Dear GCTM Members,

July 23, 2013

Georgia is withdrawing from the Partnership for Assessment of Readiness for College and Careers (PARCC) test development consortium according to a July 22, 2013 press release from the Georgia Department of Education (GaDOE).

The cost of the PARCC assessments was cited as one of the main reasons for Georgia's withdrawal from the consortium. Governor Nathan Deal and State School Superintendent Dr. John Barge announced that Georgia will create its own assessments aligned to the current academic standards, the Common Core Georgia Performance Standards (CCGPS). The GaDOE has pledged to continue using Georgia educators to help develop our state assessments as we move forward with implementation of the standards. "Assessing our students' academic performance remains a critical need to ensure that young Georgians can compete on equal footing with their peers throughout the country," Gov. Deal said. "Georgia can create an equally rigorous measurement without the high costs associated with this particular test. Just as we do in all other branches of state government, we can create better value for taxpayers while maintaining the same level of quality."

As GaDOE begins to build new assessments, please note that our Georgia assessments:

- will be aligned to the math and English language arts state standards;
- will be high-quality and rigorous;
- will be developed for students in grades 3 through 8 and high school;
- will be reviewed by Georgia teachers;
- will require less time to administer than the PARCC assessments;
- will be offered in both computer- and paper-based formats; and
- will include a variety of item types, such as performance-based and multiple-choice items.

Even though the full impact of this decision is not yet known, GCTM will continue its advocacy for quality mathematics education as well as its support of individual teachers. As additional information becomes available, we will keep you informed on our web page, through Facebook, and on Twitter.

Sincerely yours,
Dan Funsch

GCTM President

Objectives of the Georgia Council of Teachers of Mathematics

- To encourage an active interest in mathematics and to
- To act as an advocate for the improvement of mathematics education at all levels



Where did the summer go? We are very fortunate in our profession, in that we are able to work hard, see our students' progress, and then bring closure to all that the year has offered, with a fresh start in the year ahead. We spend time between the school years, in busy rest and family activities, travel, and most often in professional growth and enrichment.

Many of our members and their colleagues have enriched themselves at the Summer Academies offered this summer, in 4 Georgia locations. If you attended one of these sessions, and are not a member of GCTM, please consider joining us. Membership is but \$20, and the professional growth you experience is invaluable. To those participants who joined us, please encourage your colleagues to join you in affiliation with this exceptional organization.

GCTM has 2597 current members. We would like to see this number grow as the new year begins. If each member were to recruit one new member, we would have over 5000 members. Won't you take on this challenge as you return to your schools this fall?

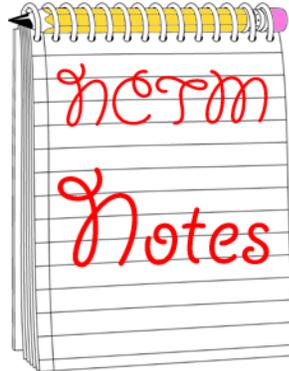
In October, you have the opportunity to meet with hundreds of other mathematics teachers at Rock Eagle for the Georgia Mathematics Conference. Each year, veteran teachers are amazed at the quality of the sessions and learning experiences offered by this conference. They ask why they have never heard of it before or have never attended before. Spread the word and encourage others to attend.

Be sure to stop by the Membership Table at registration. We want to hear from you! That is your opportunity to give us feedback and ideas to make GCTM better! We look forward to seeing you there!

Happy New School Year!



[Susan Craig](#)
Membership Director



New Executive Director

Bob Doucette has been selected as the new Executive Director of NCTM!

He comes from the fascinating field of neuroscience and will assume the responsibilities of his new position on August 15. (If you are interested, see more at <http://www.nctm.org/#sthash.kiNnMzfm.dpuf>)

NCTM Smart Brief

Do you want to stay current with what's happening in the Mathematics Education field but feel pressed for time to scan all the professional journals? NCTM SmartBrief, is filled with the day's most relevant stories and provides mathematics education professionals with a free news snapshot that can be quickly scanned for articles of interest.

This is a complimentary service for NCTM members!! You can subscribe or unsubscribe at any time. Be aware that it contains many advertisements, which is probably why it is free to us.

Support for CCSS-M/CCGPS implementation

NCTM Illuminations (illuminations.nctm.org) offers 108 online activities, 607 lesson plans and 724 web links for you to use at all the various grade levels. They are organized by grade bands and content strands. While these links have been carefully selected by the editorial panels of NCTM, NCTM reminds us that these are external sites and NCTM is not responsible for the content.

If you are not currently a member of NCTM and would like to be, visit www.nctm.org and click the tab that sends \$3 to our GCTM affiliate!
<https://www.nctm.org/profile/login.aspx?return=/membership/membership.aspx>



[Dottie Whitlow](#)
NCTM Representative



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COMPETITION CORNER

The 38th annual American Regions Mathematics League (ARML) tournament took place at UGA on Saturday, June 1. The Georgia ARML "A1" team finished 9th in the nation in the A division. This marks the 24th consecutive year that the Georgia team finished in the top 10% at the "world series" of math team tournaments. Each member of the 9th place team earned plaques and books.



Chuck Garner
VP for Competitions

Held simultaneously at four sites around the nation (Pennsylvania State University, University of Nevada at Las Vegas, University of Iowa, and University of Georgia), this competition attracted 138 teams comprising over 2000 students from all over the U.S. as well as Canada, China, Macau, South Korea, and Vietnam. Any geographically contiguous region may enter as many 15-person teams as it likes, whether that region is as small as a school district or as large as a state, as long as regions do not overlap. Georgia fields four teams of 15 students (plus two alternates, for a total of 62 students). Students are selected based on results from the state tournament, AMC scores, AIME scores, and winning scores at other Georgia tournaments. The Georgia A1 and A2 teams are made up of experienced ARML participants, while the Georgia A3 and B1 teams are considered "training" teams made up of promising newcomers to ARML.

The ARML tournament brings together the nation's finest students, where they meet, compete, and socialize, forming friendships and sharpening their mathematical skills. The contest is written for high school

students, although some highly-talented middle school students attend each year.

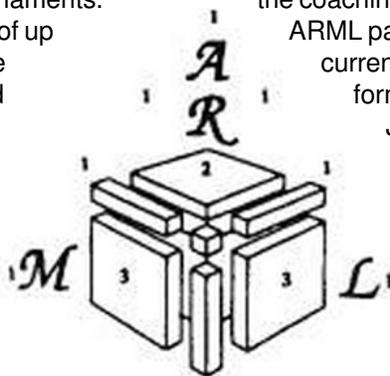
The tournament consists of four rounds. The Team Round is first, in which the 15 teammates have 20 minutes to solve 10 problems. Next is the Power Round, in which the team has 60 minutes to write proofs to complex, multi-part problems. Next is the only round that is not team-oriented, appropriately called the Individual Round. For this round each student solves 10 problems independently. However, the students receive the problems two-at-a-time with a time limit of 10 minutes per pair of problems. After a lunch break is the final round, the Relay Round. The 15 teammates form five relay teams of three each, where one person's answer is used in the next person's problem.

National sponsorship of ARML is mainly provided by the D. E. Shaw Group, an investment and technology development firm. Other national sponsors include the American Mathematical Society, Art of Problem Solving, Key Curriculum Press, Math League, Mu Alpha Theta, Texas Instruments, and Wolfram Research. Locally, sponsorship of the Georgia ARML teams is mainly provided by GCTM.

Coaches of this year's Georgia ARML team were Angelique Allen (Greater Atlanta Christian School), Tom Fulton, Chuck Garner (Rockdale Magnet School), Jeff McCammon (Georgia State), Debbie Poss (Lassiter High School), Carol Sikes (South Forsyth High School), and Head Coach Don Slater (Lassiter High School). Joining the coaching staff this year were four former Georgia ARML participants: Miles Dillon Edwards, currently at Indiana University; Harrison Brown, formerly at the University of Alabama; and Jonathan Johnson and Santhosh Karnik, both currently students at Georgia Tech.

To learn more about ARML, visit www.arml.com.

The members of the outstanding 2013 Georgia ARML team are listed on the next page.



Members of the Outstanding 2013 Georgia ARML Team, their School, & Grade

| | |
|---|--|
| Porter Adams, Westminster, 11 | Sophie Mori, Walton High School, 11 |
| Moncia Agrawal, Chamblee High School, 12 | Michael Peng, Hightower Trial Middle School, 8 |
| Sereym Baek, Walton High School, 9 | Jeremy Rachels, Rockdale Magnet School, 10 |
| Udai Baisiwala, Walton High School, 11 | Om Sakhalkar, Stratford Academy, 8 |
| Anirudh Bikmal, South Forsyth High School, 9 | Madhav Sambhu, Johns Creek High School, 10 |
| Josh Brunner, Gwinnet School of Math, Science, & Technology, 10 | Edward She, Lakeside High School (Evans), 11 |
| Benjamin Chen, Campbell High School, 10 | John Shen, Westminster, 10 |
| Ryan Chen, Brookwood High School, 10 | Brian Silva, Rockdale Magnet School, 12 |
| Daniel Chu, Pine Mountain Middle School, 7 | Aaron Sommer, Columbus High School, 12 |
| Nitant D&ekar, Peachtree Ridge High School, 11 | Amy Su, South Forsyth High School, 9 |
| Jason Fan, Trickum Middle School, 8 | Cathy Sun, Northview High School, 10 |
| George Fei, Walton High School, 12 | Joshua Tam, Johns Creek High School, 11 |
| Timothy Giesecking, School of Math, Science, & Technology, 9 | Derek Tang, Johns Creek High School, 9 |
| Gil Goldshlager, Walton High School, 12 | Hubert Tang, Autry Mill Middle School, 8 |
| Nolan H&ali, Norcross High School, 10 | Farita Tasnim, Columbus High School, 10 |
| Eujin Jang, Walton High School, 9 | Matthew Torrance, Woodward Academy, 10 |
| Rickie Jang, Northview High School, 10 | Andrew Tsao, Chamblee Charter High School, 12 |
| Dong Jun Kim, Northview High School, 9 | Anirudh Udutha, Wheeler High School, 11 |
| Heeyoon Kim, Rockdale Magnet School, 12 | Jason Wang, Duluth High School, 11 |
| Woo Jae Kim, Northview High School, 9 | Mark Wang, Gwinnet School of Math, Science, & Technology, 11 |
| Akhil Kota, South Forsyth High School, 10 | Michael Wang, Northview High School, 10 |
| Parth Kumar, Cambridge High School, 9 | Mike Wang, Gwinnet School of Math, Science, & Technology, 11 |
| Justin Lee, Northview High School, 10 | Oxford Wang, Northview High School, 10 |
| Matt Lee, South Forsyth High School, 10 | Kevin Xiang, Rover Trail Middle School, 8 |
| Jonathan Li, Duluth High School, 12 | Jaimie Xie, Roswell High School, 11 |
| Michael Li, Wheeler High School, 10 | David Xing, Northview high School, 11 |
| Michael Liang, Northview High School, 11 | Avery Yang, Paideia, 10 |
| Nicholas Lindell, Lassiter High School, 11 | Anchen Yao, Parkview High School, 12 |
| Alex Mann, Rockdale Magnet School, 12 | Anna Yoon, Johns Creek High School, 10 |
| Gerry Meixiong, Lakeside High School (Evans), 11 | Susan Yoon, Johns Creek High School, 10 |
| Sina Monfared, Wheeler High School, 11 | William Zheng, Dodgen Middle School, 8 |



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Greetings from Your Regional Representative!
Click the representative's picture to see his or her message to you!



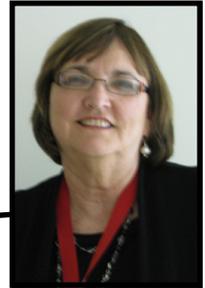
[Karen Lawrence](#)
Northwest
Region-
Representative



[Lynn Stallings](#)
Metro West Region
Representative



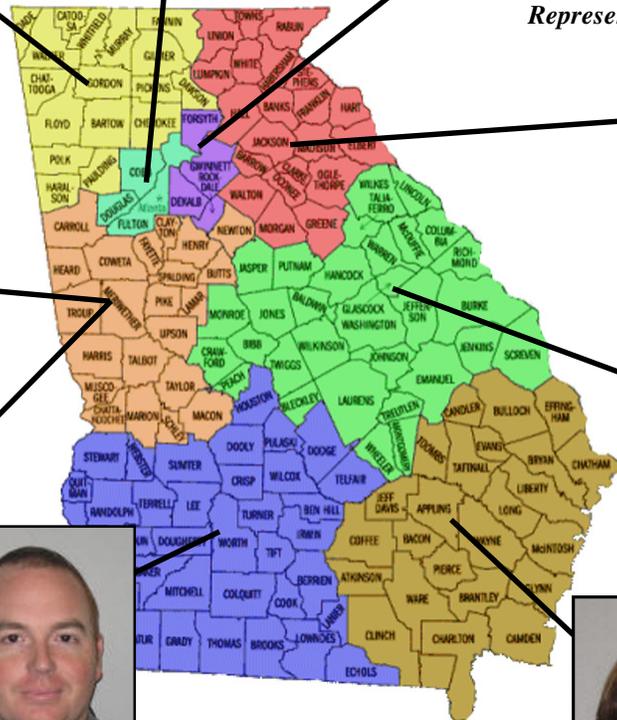
[Sharquinta Tuggle](#)
Metro East Region
Representative



[Kay Haugen](#)
Northeast Region
Representative



[Cathy Franklin](#)
Central West
Region
Representative



[Lynn Janes](#)
Central-East Co-
Representative



[Kenneth Jones](#)
Central-West Co-
Representative



[Jason Williams](#)
Southwest
Region
Representative



[Emma Salzar](#)
Southeast Representative

2013
EQUIPPING
LIFELONG
LEARNERS



54TH ANNUAL GEORGIA
MATHEMATICS CONFERENCE

October 16 - 18, 2013
Rock Eagle 4-H Center

Georgia Mathematics Conference



REFLECTIONS

Welcome to the 2013 Georgia Math Conference PreView!

The focus of this year's program is to equip teachers with resources to develop lifelong learners in their classrooms. In addition to the local presenters from your schools and universities, we have assembled a collection of featured speakers to share their expertise.

Keynote Speakers

Dr. Robert Mayes, a professor from Georgia Southern University and champion of STEM education, will present on Wednesday night. Dr. Mayes will discuss the importance of developing mathematical connections across the curriculum. On Thursday night you will have the opportunity to hear **Dan Meyer**, a popular mathematics blogger. Mr. Meyer will focus on what teachers can learn from the most successful video games. The conference closes on Friday afternoon with **Dr. Karen Morgan Ivy** from New Jersey City University. As an advocate for including the Arts in STEM education, Dr. Ivy will share her loves of poetry as a tool for communicating in the mathematics classroom.

Featured Speakers

Go on an adventure with Berry College Professor **Dr. Jill Cochran** as she speaks about interactive math trails to model math in context. Discover the power of collaboration and reflection during lesson study with **Denise Huddlestun**. Watch **Dr. Deshonda Stringer** and **Marsha Shrago** employ practical strategies for differentiating instruction with the Common Core curriculum. Uncover the language barriers experienced by ELs in your mathematics classroom with **Dr. Maria Montalvo-Balbed** and **Denise Huddlestun**.

New Features

Come to the **Teacher Exchange** during the Conference Pre-Session on Wednesday afternoon from 3:00- 5:00 pm. to exchange resources, technology tips and tasks aligned to the CCGPS. Teacher leaders will conduct demonstration lessons in a room dedicated to each grade-band.

See the wonders of mathematics with interactive exhibits in the **Math Midway 2 Go (MM2GO)** from the Museum of Mathematics in New York City. While you participate in the hands-on activities, brainstorm ways to stimulate creativity and engagement in your classrooms. MM2GO will be open during the Pre-Session on Wednesday, all day on Thursday, and Friday morning.

Technology Update

Bring your own technology! Rock Eagle is now fully Wi-Fi. Get your QR reader ready to make Evaluating each session easier! Follow the conference on TWITTER @gctm_math and join the conversation on this year's conference by including "#2013GCTM" in your tweets and FB posts.



Dr. Robert Mayes



Dan Meyer



Dr. Karen Morgan Ivy



Dr. Maria Montalvo-Balbed

Georgia Mathematics Conference 2013

Special Speakers

[Click here for speaker bios, workshop titles and times.](#)

Georgia Mathematics Conference



Dr. Deshonda Stringer



Marsha Shrago



Dr. Jill Cochran



Denise Huddleston



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This year the 2013 Georgia Mathematics Conference will present the traveling exhibit, **Math Midway 2 Go** by special arrangement with the Museum of Mathematics in New York City www.momath.org.

The Museum of Mathematics located on Madison Square in mid-town Manhattan features two floors of interactive exhibits that present mathematical ideas through accessible, hands-on, high interest exhibits. GCTM Regional Representative, Kenneth Jones visited the Museum and noted, "[T]he groups of school children ... were ... so excited to be doing mathematics."

GCTM President, Dan Funsch, and former President, Cathy Franklin, had the opportunity to interact with the Museum's traveling exhibit, **Math Midway 2 Go**, while attending the recent NCTM meeting in Denver, CO. Cathy commented, "This exhibit was truly mathematics in action."

The **Math Midway 2 Go** exhibit features six of the Museum's most popular exhibits and will be open to registrants at the GMC all day Thursday and Friday morning. One teacher whose students visited the Midway remarked, "What impressed [us] was the level of mathematical engagement in both our Upper and Lower School [students]." At Rock Eagle, the exhibit will be housed in the International Paper Building directly across the hall from the registration area. Plans also call for the exhibit to be available to school children locally in Putnam County.

Volunteers are needed to unpack and set up the exhibit on Wednesday, to pack the exhibit for shipment Friday afternoon, and to staff the exhibit on Thursday and Friday morning, Oct 16 - 18. Please contact Dan Funsch, president@gtm.org, to volunteer or for more information.

Georgia Mathematics Conference

The Georgia Mathematics Conference is:

Good times with colleagues and new friends

Awesome presenters with resources, information and tools for your classroom

Meat individuals who share your love of math and teaching

Answers to those burning questions you have

Tasty food for breakfast, lunch, and supper

Helping cheer on those in the Pi Run (or run/walk for a free t-shirt)

Common Core Math Informative Sessions

Open and informative discussions about the future of GA and CCGPS

Nice way to pick up those much needed PLU's

Fireside math talks with smores!

Experience of staying at "The Rock" - If you haven't stayed there, you should!

Reading the "in" famous Rock Eagle map - The key is to rotate the map to keep from getting lost

Enjoy browsing and shopping at the Exhibit Hall where many vendors will be present

Network with others at your Regional Caucus

Cheering for door prizes at the end of keynote sessions

Engage your students with strategies, techniques, and teaching resources gained from attending GMC 2013

Jason F. Williams
Southwest Region Representative
uncprimefactors@gmail.com

The members of the GMC Board are:

Kimberly Gardner - Conference Board Chair

Kaycee Maddox - 2014 Program Chair

Nickey Ice - Conference Coordinator

Don Brown - Director of Records

Patrick Morgan - Director of Facilities

Anthony Stinson - Director of Exhibits

Consuela Jack - Director of Special Events

Bernard Young - Intern for Dir. of Special Events

Gayle Herrington - Program Co-Chair

Michael Lomuscio - Program Co-Chair

Marian Tillotson - Director of Volunteers

Nikita Patterson - Intern for Dir. of Records

Cassandra Marks - Director of Promotions

Ken Montgomery - Director of Technology

Jean Linner - Registrar

Lynne Rees - Assistant Registrar

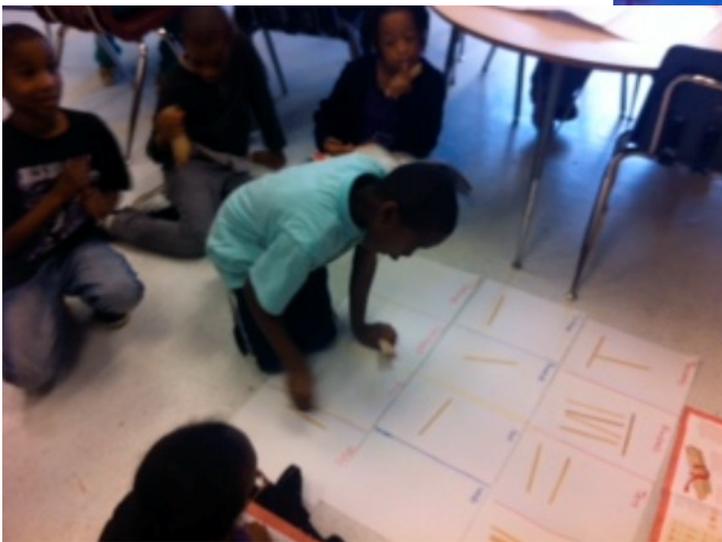
The GMC and GCTM Boards extend their sincere appreciation to all those people willing to volunteer to help make each year's conference great!

[Visit our website](#) to register and to volunteer for this year's conference,
October 16 - 18, 2013.



Math and Literacy Project: **Math Through Time**

**By:
Kristin
Siembieda**



Kristin Siembieda has been teaching for 19 years. She has taught elementary school and middle school. Currently, she is teaching gifted students at Conley Hills in Fulton County Schools. She has a BA in middle grades education and an MA in curriculum and technology. In her spare time, she enjoys hiking, reading, and cooking. This summer she is doing an internship at the Chattahoochee National Recreational Area and serving as a Teacher Ranger Teacher.

As a Talented and Gifted teacher, I am responsible for teaching higher level thinking, creative problem solving and advanced research skills to my students through social studies and science standards. Two of my units that I teach annually explore ancient civilizations in 3rd grade and architecture in 2nd grade. As I have been teaching these units, I have thought about the importance of mathematics in both of these subjects.

As Georgia and the whole United States implement the Common Core Standards in mathematics and language arts, social studies and science teachers

have to adapt these standards into their curriculum as well. While researching ways to integrate math and language arts into my unit, I realized that mathematics has not drastically changed through the centuries. People have depended on math since the beginning of civilizations to keep

track, design, create, and problem solve. My investigations lead me to Ann McCallum's book *The Secret Life of Math: Discover How and Why Numbers Have Survived from the Cave Dwellers to Us*. With the help of the GCTM (Georgia Council of Teachers of Mathematics), I found a way to integrate mathematics and language arts into my units. From the GCTM mini grant, I purchased a class set of *The Secret Life of Math: Discover How and Why Numbers Have Survived from the Cave Dwellers to Us* along with supplies to integrate the lessons into my curriculum.

While researching ways to integrate math and language arts into my unit, I realized that mathematics has not drastically changed through the centuries. People have depended on math since the beginning of civilizations to keep track, design, create, and problem solve.

Each week students took a journey back in time by reading *The Secret Life of Math: Discover How and Why Numbers Have Survived from the Cave Dwellers to Us*. Before the journey, the lesson began with a giant brainstorm. Students created lists of reasons why architects and ancient civilians need math. Students generated answers such as to count materials, build pyramids, measure clothes, count food or animals. They deducted that these practices are not that different from our own.

Then the journey began with by looking at the cave dwellers. The students compared ancient hatch marks to today's tally marks. Students created their own ancient tally stick from a survey they wrote. Next, students explored Native American way of keeping track. They realized that thousands of years ago, North American Indians kept track of what was important to them, just like us.

Students then began to move toward how keeping track led to writing numerals and counting. Students discovered the history of Roman numerals and practiced adding Roman numerals. Students also practiced writing in Roman numerals. They came up with a list of numbers we use in our lives such as height, weight, phone numbers, zip codes. After writing all these numbers in roman numerals the class voted and decided that Arabic numbers were much better, but they weren't ready to give Arabic numbers the title of "Best Number System" yet. ➤



Math and Literacy Project: Math Through Time *cont.*

Next, students traveled to the year 2700 BC to the Sumerians and Babylonians and learned about cuneiform. The only problem was they needed to engrave tablets. Students had fun creating a cuneiform birthday tablet. Afterwards, they evaluated if cuneiform was a step forward or backward in math. The students decided that it was neither. It was just math continuing.

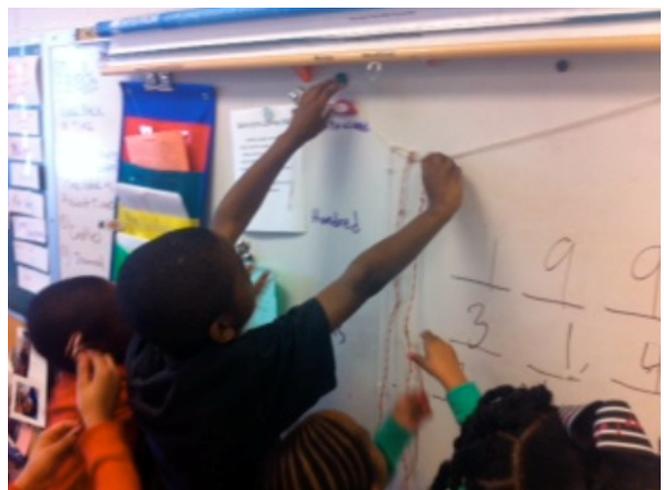
Off to Egypt, the students were ready for hieroglyphics. The students first made their own papyrus paper just like the Egyptians. Next, they learned to write hieroglyphs. Students enjoyed the drawing of the pictures, but concluded that this system was too time consuming and a lot of drawing for one equation. Their most important discovery though was that after using this ancient math, something was missing. Where was the zero? A missing zero made problem solving really difficult because of place value.

To explore the importance of having a zero for place value, students made a batch of Mayan number cookies based on the base of 20. This activity made

the students crown zero a hero.

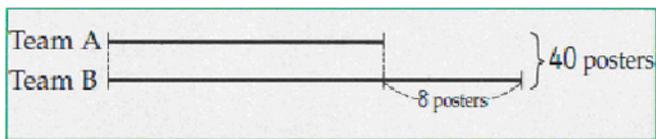
After all that traveling, the students were ready for algorithms. Students learned how algorithms keep frustration low and give us familiar small steps to follow. Students used Middle East lattice method of multiplication, an Egyptian algorithm for multiplication, Chinese counting rods to solve addition problems, and a Chinese abacus for calculations. All these algorithms helped the students discover that there are many ways to solve a problem. Students ended their journey with a paper describing the common denominator of math through the ages.

As I reflect on the unit, I am glad that students were able to experience ancient civilizations ways of using mathematics. The students learned that problem solving is universal and that math is essential in life. The unit also reinforced the common core standards in mathematics and allowed the standards to be connected to their social studies and science units. Besides all of this, we had tons of fun! π



Tape Diagrams and Double Number Line Diagrams:

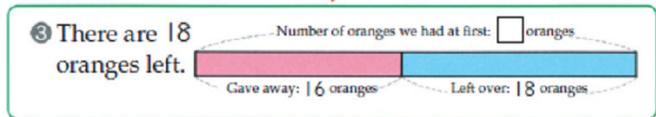
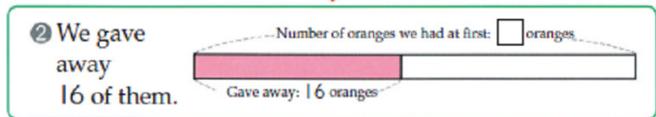
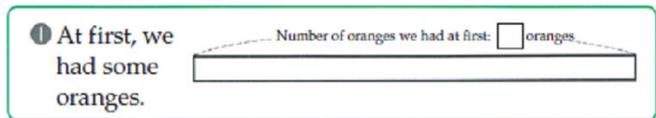
Visual Reasoning Tools



① There were some oranges in the box.

② We gave away 16 of them.

③ We still have 18 oranges in the box.



by

Tad Watanabe

Tad Watanabe is a Professor of Mathematics Education in the Department of Mathematics & Statistics at Kennesaw State University. His primary responsibility at KSU is to teach mathematics content courses for prospective teachers. His research interests include teaching and learning of multiplicative concepts such as fractions and proportional reasoning and lesson study. This article will be concluded in the next issue of eREFLECTIONS.





REFLECTIONS

In the Grade 6 Common Core State Standards (CCSS) (Common Core State Standards Initiative 2010), you will find the following standard.

6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

Many teachers are familiar with ratio tables and equations, but may not be familiar with tape diagrams and double number line diagrams, and how these representations can support students' ratio and rate reasoning? In the Glossary of the CCSS, tape diagrams are defined as follows:

Tape diagram. A drawing that looks like a segment of tape, used to illustrate number relationships. Also known as a strip diagram, bar model, fraction strip, or length model.

There is no entry in the CCSS Glossary on double number line diagrams. So, what are these diagrams and why are they included explicitly in 6.RP.3? Although these diagrams may not be familiar to teachers in North America, they are often regular features of some Asian mathematics curriculum materials (see, for example, Author (2010) for how Japanese elementary school materials develop these models). Furthermore, these models are gaining more attention in North America (Beckmann & Fuson, 2008). The purpose of this article is to provide a brief explanation of these diagrams and illustrate how they may be used and for what types of problem situations. These diagrams may become powerful reasoning tools for students that go beyond ratio and rate reasoning in the 6th grade. Several examples from Japanese textbooks will be included, but similar problems are found in textbooks in North America, too.

Tape Diagrams

As the glossary of the CCSS states, a tape diagram is used to represent the relationships among numbers and quantities in a particular situation. For example, consider the following word problem taken from a Japanese elementary school textbook

(Hironaka & Sugiyama, 2006, 4A, p. 40).

Teams A and B are making 40 posters for the sports festival. Team B will make 8 more than team A. How many posters will they each make?

For this problem, the textbook includes the diagram shown in Figure 1 below. You notice that this particular textbook uses segments instead of tapes - a thin rectangle. Whether the diagrams actually involve tapes or segments is insignificant. What is significant is how those tapes/segments are used to represent the quantities and their relationships.

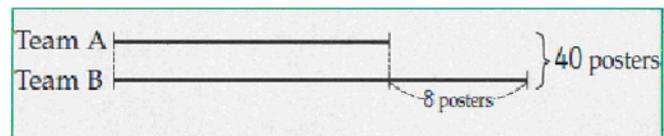


Figure 1 A segment diagram represents how the quantities in this word problems are related to each other.

The diagram concisely represent the relationship among the quantities involved in the problem. Moreover, from the diagram, students might generate different solution strategies. For example, some students might see that if Team B does not make the extra 8 posters, the two teams will be making the same number of posters and there will be 32 posters ($40 - 8$) all together. Thus, dividing 32 by 2, we know how many posters Team A makes. Adding 8 to the number will give us the number of posters Team B makes.

However, the diagram suggests 2 other strategies. What if Team A made 8 more posters? Then, the two teams will be making the same number of posters again, but this time, there will be 48 posters ($40 + 8$) all together. Thus, dividing 48 by 2, we know how many posters Team B makes. Subtracting 8 from this number will give us the number of posters Team A makes. Or, what if those 8 extra posters Team B is making were evenly split between the two teams? Then, since the total number of posters these two teams are making remains 40, they will be 

Tape Diagrams *cont.*

each making 20 (40 ÷ 2) posters. But, since 20 posters for Team A include 4 posters Team B will be making, the actual number of posters Team A will make will be 16(20 - 4) and the number of posters Team B will make will be 24 (20 + 4).

In this problem situation, two quantities (the number of posters two teams make) and their sum and difference are involved. It is possible to represent the situation in a single segment as shown in Figure 2.

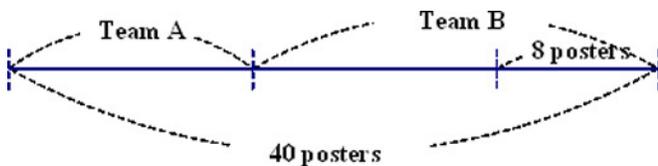


Figure 2 The same problem represented in one segment.

However, if there are more than 2 quantities being compared, it will be difficult to show multiple comparisons. Moreover, this diagram might suggest the first solution strategy, but perhaps not the others. Thus, when 2 or more quantities are being compared, signified by the explicit mention of their differences or ratios, it might be more useful to use separate tape/segment for each quantity.

Here is another example of a tape/segment diagram from the same Japanese textbook series (5 B, p. 48).

Emiko's group collected cans. The total number of aluminum and steel cans was 156. There were 3 times as many steel cans as aluminum cans. How many aluminum cans and steel cans were there?

The segment diagram accompanying this problem is shown in Figure 3 below. In this problem, a key

step in the solution is to divide 156 by 4. However, the divisor, 4, is not explicit in the problem statement. Students will have to figure out that 156 cans are made up of 4 sets, each of which is equal to the number of aluminum cans. However, the diagram gives that relationship more explicit.

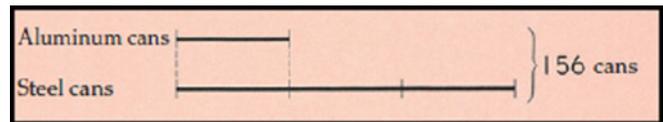


Figure 3 The segment diagram accompanying the aluminum/steel cans problem.

The next problem in the textbook is as follows.

Kiyoshi's group collected bottles. There was a total of 77 bottles. The number of plastic bottles was 8 more than twice the number of glass bottles. How many bottles of each type were there?

Older students might solve this problem by setting up an equation. However, if students can draw a diagram, like the one included in the textbook (Figure 4), perhaps they can solve the problem without using any algebraic equation. Of course, you may notice (see Figure 5) that the steps in solving this problem based on the diagram is the same "undoing" process students do to solve an equation. Thus, solving these problems with the help of tape diagrams may lay an important foundation for students' future algebra study.

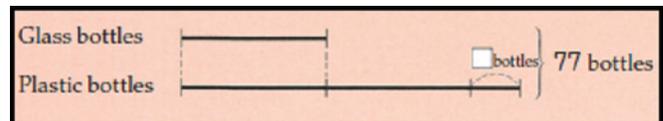


Figure 4 This segment diagram might suggest a non-algebraic way of solving this problem. ➔





Tape Diagrams *cont.*

| Algebraic Solution | "Undoing" to solve the problem |
|---|--|
| Let G be the number of glass bottles. | There were 77 bottles altogether. |
| Then, the number of plastic bottles will be $2G + 8$. | If we subtract the 8 plastic bottles, there will be 69 bottles altogether. |
| Since the total number of bottles was 77, $G + 2G + 8 = 77$ | But, 69 bottles are made up of 3 equal groups, each equals to the number of glass bottles. |
| Simplify and subtract 8 from both sides of the equation. | So, the number of glass bottles is $69 \div 3$, or 23. |
| $3G = 69$ | Since the number of plastic bottles was 8 more than the twice of 23, |
| Divide both sides by 3. | $2 \times 23 + 8 = 54$. |
| The number of glass bottles is 23. | |
| Substitute this in $2G + 8$. | |
| The number of plastic bottles is 54. | |

Table 1 Two solution methods for the bottle problem.

Note in the diagram above, the textbook left out one piece of information for students to supply - the number of bottles represented by the smallest segment on the Plastic bottles tape. The goal in this section is for students to learn to draw these diagrams and use them in solving problems. Thus, as they progress through the section, the book provides less and less complete diagrams to promote students to think about how to draw the appropriate diagram.

Although the label "tape diagrams" is mentioned in a Grade 6 standards in the CCSS, they appear in an earlier grade in the Japanese textbooks. Using the classification of the CCSS, the following word problem is a Take-From with the initial amount unknown problem. Research shows (e.g., Carpenter, Fennema, Franke, Levi, and Empson 1999), and experienced elementary school teachers know from their own experiences, these problems are difficult for children. However, if students can draw and examine a tape diagram like the one shown in Figure 5, perhaps they can conclude that they would need to add 16 and 18 to find the missing quantity. ➡

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Tape Diagrams *cont.*

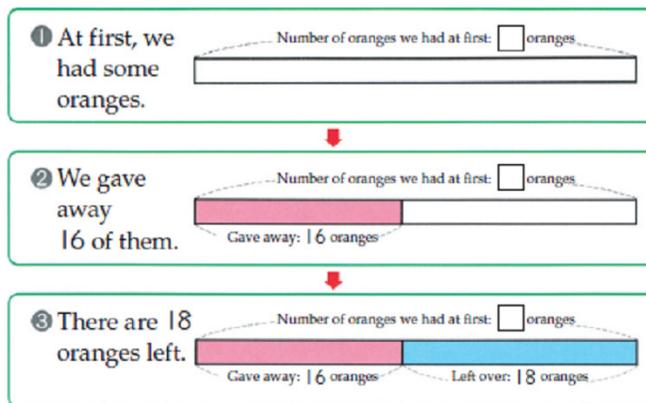


Figure 5 A tape diagram used with a take-from, initial unknown problem.

In this tape diagram, a single tape is being used because the number of oranges children had at first contained both the oranges they gave away and the oranges they had left at the end. Therefore, it makes sense to put all 3 quantities in a single tape.

In closing, the examples and explanations in this article are designed to provide you with some basic ideas of tape diagrams. The Japanese textbook series from which many of the examples came tries to help students make these models as their own reasoning tools, not just teacher explanation tools (Watanabe, et al 2010). Such an effort takes time across the grades. π

Part two of this article, "Double Number Line Diagrams: A Visual Reasoning Tool," will appear in the Winter 2013 edition of eREFLECTIONS. This continuation will contain the references for both articles.

The theme of our Winter issue is "Implementing the SMP's." Email us and share how you implement the Standards of Mathematical Practice in your classroom and get a free lunch at Rock Eagle! (one per member, please). We will share your ideas in the next edition.



Revisions to the GCTM Constitution

The current GCTM Constitution was drafted almost twenty years ago (1995) and its last revision was more than 10 years ago (2002). During the last several years the Executive Committee realized that there were some areas which needed to be re-examined. An ad-hoc committee was formed in 2012 to examine the entire document and propose needed revisions. The committee was chaired by then President-elect, Dan Funsch, and included, then President Debbie Poss; Executive Director Tom Ottinger; Vice-President for Constitution and Policy, Patti Barrett; former GMC Board Chair, Nikita Patterson; Vice-President for Regional Service, Peggy Pool; and long-time member, Don Slater.

The Committee met and recommended amending the current Constitution in several places. The attached draft contains those amendments. A copy showing all the individual deletions and additions can be found for your reference in the "Member's Only" section of the GCTM website.

The full Executive Committee approved the amended draft as proposed by the committee and directed that it be published to the membership in preparation for a ratification vote to be taken at the Annual Business Meeting at Rock Eagle on Wednesday evening, October 16, 2013.

The committee felt that the current Constitution was sound and workable but did need some tweaking in order to accommodate the increased use of electronic meetings and on-line voting. In other places the language was clarified about the method of appointing Vice-Presidents and committees. In several other spots the language was adjusted to achieve greater consistency across the various articles and sections of the document. Further amendments provide for the recently created Information Technology Director. For further information please contact GCTM Presidnet, Dan Funsch (president@gctm.org).

GCTM is grateful for the careful attention demonstrated by the committee to assure that our Constitution clearly articulates the process by which it governs itself in a manner which provides unambiguous guidance for future members and their leaders.



CONSTITUTION OF THE GEORGIA COUNCIL OF TEACHERS OF MATHEMATICS

Page 1 of 6

Adopted: January 1995
Revised: 2013(pending)

Article I: OBJECTIVES

The objectives of the Georgia Council of Teachers of Mathematics are to encourage an active interest in mathematics and to act as an advocate for the improvement of mathematics education at all levels.

Article II: NAME, AFFILIATION, AND GOVERNANCE

Section 1. Name and Affiliation

The organization shall be known as the Georgia Council of Teachers of Mathematics (hereafter called "GCTM"). The organization shall be affiliated with the National Council of Teachers of Mathematics and other appropriate organizations.

Section 2. Governance

The governance of GCTM shall be through the policies as established and published by the Executive Committee.

Section 3. Annual Business Meeting

The annual business meeting of the Council shall be held during the Georgia Mathematics Conference. Five percent of the current GCTM membership shall constitute a quorum for the any business meeting.

Article III: MEMBERSHIP AND DUES

Section 1. Eligibility for Membership

Any person interested in the improvement of mathematics education and in the objectives of the organization shall be eligible for membership. Eligibility for membership will be considered without regard to race, creed, gender, national origin, or disability.

Section 2. Regions

Regions established for the purpose of providing services to the members shall organize the membership. The number of regions and their boundaries shall be established and/or amended by the Executive Committee. The Executive Committee shall review boundaries and number of regions for effective servicing of the membership at least every four years.

Section 3. Member's Dues

The Executive Committee shall determine membership categories and dues. The membership year shall be for twelve months from the date of payment of dues.



Article IV: GCTM PERSONNEL

Section 1. Officers

There shall be a President, a President-elect or an Immediate Past President, at least two Vice Presidents, a Secretary, a Treasurer, a Publications Editor, an Executive Director, an NCTM Representative, an Information Technology Director, a Membership Director, and Regional GCTM Representatives. All officers shall be members of GCTM. The President, at least two Vice Presidents, and Secretary are elected offices.

Section 2. Term of Office

- A. A. The President shall serve four years: the first year as President-elect, the next two years as President, and the last year as Past President. A President-elect is elected each odd-numbered year.
- B. B. At least two Vice Presidents will be elected in odd-numbered years and shall serve two-year terms.
- C. C. The Secretary shall serve a two-year term. A Secretary is elected each odd-numbered year.
- D. D. The Treasurer shall serve a four-year term. A Treasurer is appointed each year of the form $4k$.
- E. E. The Publications Editor shall serve a two-year term. If the publications editor is not going to be reappointed, then a publications editor intern is appointed for the last year of the editor's term and then serves for the next two years as the publications editor.
- F. F. The Information Technology Director shall serve a two-year term. An Information Technology Director is appointed even-numbered year.
- G. G. The Executive Director shall serve a four-year term. An Executive Director is appointed each year of the form $4k+2$.
- H. H. The NCTM Representative shall serve a four-year term. A Representative is appointed each year of the form $4k$.
- I. I. The Regional Representatives shall each serve a two-year term. The Regional Representatives are appointed.
- J. J. The Membership Director shall serve a four-year term. A Membership Director is appointed each year of the form $4k+2$.

Section 1. President

The President shall be chair of the Executive Committee, shall preside at meetings of GCTM, shall form ad hoc committees, and shall insure that all policies of GCTM are carried out. The President shall perform all other duties as specified in the Policies of the Council and as assigned by the Executive Committee.

Section 2. President-elect

The President-elect shall perform all duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 3. Past President

The Past President shall perform all duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 4. Vice Presidents

The Vice Presidents shall perform all duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 5. Secretary

The Secretary shall keep minutes, roster, and other records of GCTM and the Executive Committee, and shall handle correspondence as delegated by the President and President-elect. The Secretary shall perform all other duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 6. Treasurer

The Treasurer shall serve as chair of the Finance Committee, shall oversee the receipt of all GCTM monies, shall pay all bills as approved in the GCTM budget, and shall keep a financial record which shall be evaluated annually. The Treasurer shall perform all other duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 7. Publications Editor

The Publications Editor shall serve as chair of the Publications Committee. The Publications Editor shall perform all other duties as specified in the Policies of GCTM and as assigned by the Executive Committee.



Section 8. Executive Director

The Executive Director shall provide continuity and guidance for GCTM and maintain the archives of GCTM. The Executive Director shall perform all duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 9. Membership Director

The Membership Director shall serve as Chair of the Membership committee and maintain current membership records. The Membership Director shall perform all duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 10. Information Technology Director

The Information Technology Director shall maintain the electronic interface for GCTM. The Information Technology Director shall perform all duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 11. NCTM Representative

The NCTM representative shall perform all duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 12. Regional Representatives

The Regional Representatives shall perform all duties as specified in the Policies of GCTM and as assigned by the Executive Committee.

Section 13. Removal from Office

An officer may be removed from his or her elected or appointed office for cause by a 2/3 vote of the Executive Committee.

Article VI: ELECTION OF OFFICERS

The Nominations and Elections Committee shall be appointed as specified in the Policies of GCTM. The officers shall be elected by the membership according to procedures given in the Policies of GCTM. Any member of GCTM is eligible for elected office.

Article VII: COMMITTEES

Section 1. Executive Committee

The Executive Committee shall consist of the officers of the Council, the Chair of the Georgia Mathematics Conference Board of Directors, and the non-voting affiliate representatives. The Executive Director shall serve as a non-voting member of the Executive Committee. A quorum consists of the President or his/her designee and at least 50% of the voting members.

The Executive Committee shall act as the governing board of the organization. It shall have the authority to transact business in the name of GCTM, to initiate and to determine policies, and to aid the officers in carrying out their responsibilities. It shall fill vacancies in elected offices which arise between elections.

Section 3. Executive Committee Meetings

The Executive Committee shall have at least three regular meetings annually. The Executive Committee members shall be notified at least ten (10) working days prior to the regular meeting. Called meetings will be initiated as required. In the absence of a quorum, or for urgent matters, a subcommittee consisting of the President, President-elect or Past President, one Vice President, and the Executive Director may act for the Executive Committee.

Section 4. Standing Committees

The Executive Committee shall establish other standing committees of GCTM. The duties, responsibilities, and length of term of each committee shall be established by the Executive Committee and shall be included in the Policies of GCTM.

Article VIII: GEORGIA MATHEMATICS CONFERENCE

GCTM shall sponsor the annual Georgia Mathematics Conference. The Executive Committee shall appoint a Conference Board and its Chair to organize and conduct the annual Conference. The makeup of the Board and the duties of its members shall be included in policies established by the Executive Committee.

Article IX: PARLIAMENTARY AUTHORITY

The rules contained in the current edition of Robert's Rules of Order shall govern GCTM as applicable except that committee meetings may be conducted by telephone or other electronic means at the discretion of the committee chair.

Article X: AFFILIATE GROUPS

GCTM encourages organizations of similar interests, purposes and objectives to become affiliate groups. The requirements, process, and procedures for affiliation shall be established by the Executive Committee and included in the Policies of GCTM.

Article XI: AMENDMENTS

Any member of GCTM may propose changes in this constitution by sending the proposed changes to the President as least ninety (90) days prior to the annual business meeting. The Executive Committee must approve proposed changes prior to publication and vote. The proposed changes shall be published at least 30 days preceding the business meeting and must be approved by two-thirds of the members present at the annual business meeting.



Article XII: DISSOLUTION

If, at any time, GCTM shall cease to carry out the purposes as herein stated, all assets and property held by it, whether in trust or otherwise, shall, after the payment of its liabilities, be paid over to an organization which has similar purposes and has established its tax-exempt status under Section 501 C (3) of the Internal Revenue Code as now enacted or as it may hereafter be amended, and such assets and property shall be applied exclusively for such charitable, scientific, and educational programs.

Pack It Up and Move It Out

by Cathy Franklin, Central West Region Representative

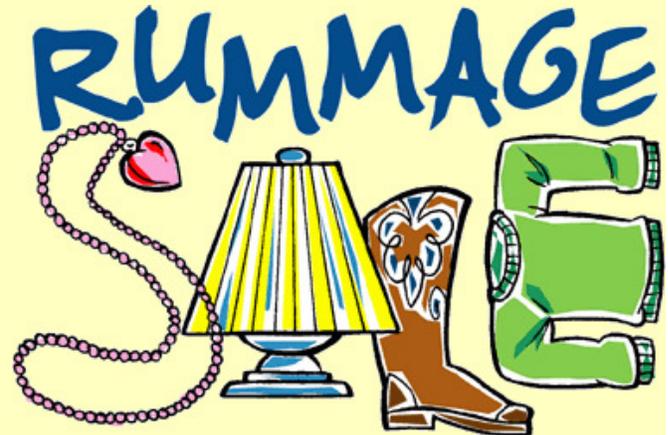
As you organize your classroom this year, you may find resources you no longer need. So pack them up and mark the box for the Georgia Mathematics Conference at Rock Eagle on October 16 - 18. Last year's Garage Sale was a great success. Many teachers found those great treasures that others had discarded. It is a great day when you get an item that you really need and get it for a donation. The Georgia Council of Teachers of Mathematics wants to take this time to tell you THANK YOU for coming and THANK YOU for giving! We hope to have another



Cathy Franklin
Central West
Region
Representative

room packed with items for you to peruse and take back and use.

Look for more information about the location at Rock Eagle! Just bring your boxes to the location and be sure to look around and find items that you will now need!



The mission of the Georgia Council of Teachers of Mathematics is to:

- promote a high quality mathematics education for all students,
- encourage an active interest in mathematics and in mathematics education,
- promote ongoing professional development for mathematics education, and
- promote and reward excellence in the teaching of mathematics in the state of Georgia.

GCTM/GaDOE 2013 Summer Academies

TESTING THE WATERS OF CCGPS: Anchoring Instruction with Assessment



What an exciting summer! Each school that hosted an academy gave us a warm welcome and their staff went out of their way to assure the academies ran smoothly. Special "Thank you's" to Sonoraville High School in Calhoun, Carver High School in Columbus, Baldwin High School in Milledgeville, and Statesboro High School in Statesboro for their gracious hospitality.

All 73 facilitators worked hard preparing for the academies and did a fantastic job assuring that the participants received two-days of information they will be able to use in their classrooms when the 2013-2014 school year begins.

Participants attended from all across the state. As we walked down the hallways and stepped inside classrooms, we saw smiles and heard amazing dialogue as they worked through engaging tasks. We also heard the sharing of fantastic ideas along with lots of laughter and even a little bit of singing, cheering, and clapping!

Volunteers were essential to the success of the academies and we thank all of those that helped with parking, registration tables, setting up for the academies, arranging lunches for facilitators, packing up after the academies, and running around during the academies doing whatever needed to be done.

A big "Thank you" goes out to Carolyn Cutts and Hand2Mind for the donation of many of the manipulatives and materials that were used throughout the academies. Plan to attend your Regional Meeting on Thursday during the Georgia Mathematics Conference at Rock Eagle in October for a chance to win some of these materials as door prizes.

The GCTM/GaDOE 2013 Summer Academies were a huge success! We wish every teacher of mathematics in the state could have attended one. Those that did, please share information with your peers.

“This summer in the 2013 GCTM/GDOE Mathematics Academy I learned why we put commas in numbers and I plan to use it in my classroom this year!” - Dietra McKinney



Peggy Pool
*GCTM Vice-President of
 Regional Services
 2013 GCTM/GaDOE
 Academy Director*



REFLECTIONS

GCTM Executive Board

President - Dan Funsch

Past President - Debbie Poss

Executive Director - Tom Offinger

Membership Director - Susan Craig

NCTM Representative - Dottie Whitlow

Secretary - Debbie Kohler

Treasurer - Patrick Morgan

IT Director - Paul Oser

REFLECTIONS Editor - Cheryl Hughes

VP for Advocacy - Shelly Allen

VP for Constitution and Policy - Patti Barrett

VP for Honors and Awards - Melanie Helms

VP for Regional Services - Peggy Pool

VP for Competitions - Chuck Garner

Conference Board Chair - Kimberly Gardner