GEORGIA COUNCIL of TEACHERS of MATHEMATICS
GCTM

REFLECTIONS

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50th Annual Georgia Mathematics Conference

GMC 50 and Fabulous

Author Guidelines

Manuscript Format: Manuscripts are blind reviewed by members of the editorial review board. For this reason, each manuscript should include a cover sheet containing: title of manuscript, author's name, position and email address. Identifying information should not appear elsewhere in the manuscript in order to ensure an impartial review.

Manuscripts should be double-spaced, with 1-inch margins on all sides, typed in 12-point font and follow the APA 5th Edition style guide. Manuscripts should be submitted in MS Word. If you have a picture or graphic in the text, please include the original picture(s) in a separate file.

Manuscript Submission: Manuscripts should be submitted to reflections@georgiasouthern.edu. Receipt of manuscripts will be acknowledged. Manuscripts are accepted for consideration with the understanding that they have not been published previously and are not being considered simultaneously for publication elsewhere. Additional inquiries should be sent to Gregory Chamblee, Editor, Georgia Southern University, Department of Teaching and Learning, PO Box 8134, Statesboro, GA 30460-8134; Phone: 912.478.5701; Fax: 912.478.0026; reflections@georgiasouthern.edu.

Manuscript Publication: When a manuscript is accepted for publication, the editor/journal reviewers may make suggestions or revisions in consultation with the principal author. However, because of publication deadlines the editor reserves the right to make minor revisions without seeking prior approval from the author. Release statements for all copyrighted materials must be received prior to publication. Upon publication, two complimentary copies of the issue are sent to the principal author.

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President's Welcome

by Lynn Stallings
GCTM President
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Navigating Mathematics

When you move to a new city, you may initially need directions from home to work. You might jot down a set of steps like these:

1. Turn left on Shiloh Road.
2. Turn left on Frey Road.
3. Turn right on Chastain Road.
4. Turn right into work.

At the end of the day, you'll reverse those directions to get home. You'll turn left on Chastain, left on Frey, right on Shiloh, and right into the neighborhood. You might also have a set of directions that will get you from your home to your favorite restaurant. As long as you drive each of those routes regularly, you will remember them.

What happens if one day you want to go from your work directly to your favorite restaurant? Do you go from work to home and from home to the restaurant? If you haven't developed some mental map of the area, including knowing what the major roads and landmarks are, you just might have to get another set of directions. Imagine the number of sets of directions you would have to have to go about your daily life.

If you are dependent on sets of directions to get around, a wrong turn that takes you only a few blocks off your route may leave you hopelessly lost. Your directions are no help. Your only option is to try to get back to the route you know.

Although that scenario sounds a little ridiculous, that's the way many people learn mathematics. They remember sets of directions or procedures for solving one type of problem with little understanding of the surrounding mathematical terrain. As they try to memorize more and more disconnected sets of directions, they confuse them or forget them. They can't take shortcuts because they don't understand connections between different mathematical topics.

In contrast, think about how you navigate an area you know well. Instead of navigating using sets of step-by-step directions, you have a map in your mind. You might think of where you are and where you'd like to go. You consider several possible routes. You make judgments about which route is best based your knowledge of traffic patterns in the area on that day and at that time of day, rush hour, school traffic, possible construction, and other factors. You may select a different route based on whether you are walking, running, biking, or driving your car. Some routes are so direct and efficient that no alternative route is needed. For routes traveled frequently, such as your commute to work, you know a variety of alternative routes just in case of traffic jams or wrecks.

Our mathematics knowledge works the same way. Given a non-standard problem to solve, we might think of relevant mathematical ideas. We might think of several approaches to solving the problem and then decide among them based on your knowledge of the advantages and disadvantages of each and the tools you have available (mental math, paper and pencil, calculator, computer, etc.). We may solve problems differently based on the accuracy needed in the answer.

Every mathematical learner at any level has all sorts of knowledge: procedures or sets of directions, areas with a few overused, inefficient routes, and well mapped areas. Even well-mapped areas may have areas that aren't as well mapped as you may realize when you teach a topic you've taught for years and suddenly realize an "Aha!" moment as you make a connection—or find a new route through the terrain. In order to map out new areas of mathematics, we need to bravely venture into unfamiliar areas of mathematics with the necessary guide or maps and take the time to explore the area.

The purpose of mathematics instruction in schools is for all students to map out the mathematical terrain. In each unit of instruction, you and your students map out new areas of mathematics together. You provide additional mathematical routes and tools as their mathematical abilities grow. You are your students' tour guide through unfamiliar areas of mathematics. As you teach, your ultimate goal is to ensure they can return to that mathematical neighborhood area without a guide in the future. You provide an overview of the area, make connections to other nearby areas of mathematics, ask them

to find routes through the area by solving problems, use different areas of mathematics (number, algebra, geometry) to see the area differently, and spend time exploring the area to ensure familarity.

You may even use landmarks to describe an area to others. In the Marietta area, a certain restaurant on a busy road has a sign that is a large statue of a chicken. This "Big Chicken" is a major landmark for our area. People will say, "Go about a mile past the "Big Chicken on 41." or "If you get to the "Big Chicken, you've gone too far."

Mathematics has its own landmarks or "Big Chickens." The National Council of Teachers of Mathematics has identified the "focal points" of each level of mathematics in their K-8 *Curriculum Focal Points* (**http://www.nctm.org/standards/content.aspx?id=270**). (The high school book will soon be published.) For example, one of the "focal points" or "Big Chickens" of 6th grade mathematics is "connecting ratio and rate to multiplication and division." NCTM also used this analogy in their naming of the Navigations resource series.

This navigating analogy can be useful in thinking about student learning. If students just learn sets of procedures, they will just confuse or forget their mathematical knowledge. Instead, they need to move beyond navigating by procedures to explorations of mathematics that develop a rich and well-connected mental map of the mathematical terrain. They need a rich enough knowledge to explore multiple routes to a solution of a certain problem and be able to decide the most advantageous.

As you enjoy your summer and begin plans for next fall, think more about the map of your mathematics curriculum. Where are you going? Where have your students been before? What will be the most challenge parts of the terrain? What are the major ideas or "Big Chickens" in your curriculum? What does the road map of your curriculum look like? How could you and your students draw or represent that roadmap next year as you map out the terrain ahead of you? What areas of mathematical learning do you plan to explore next?

Have a restful and recreational summer!

GCTM Grants and Awards Opportunities

- Gladys M. Thomason Award for Distinguished Service
- Dwight Love Award
- John Neff Award
- Awards for Excellence in the Teaching of Mathematics (Elementary, Middle & Secondary levels)
- Teacher of Promise Award
- Mini-Grants
- Special Projects

For additional information visit the GCTM website www.gctm.org.

GCTM NEWS

A Conversation With Janet Davis

by Cindy Fielder
GCTM Executive Committee

Recently, Janet joined a group of teachers and others at Kennesaw State University where the topic was naturally, the GPS, and more specifically, Math 1.

Q: Janet, what's the word on the street?

J: Math 1 is like the first year of anything; it varies room to room, school to school and system to system. We've done okay and now we know for next year what needs to be done. We probably won't be comfortable for a couple more years. Just like anything new, the first year you survive, second year make changes and adjustments, and by year three you pretty much 'get it'.

Q: Why not roll in a year at a time so students would have been prepared?

J: We know students in Math 1 did not have the opportunity to go through the entire GPS but there was no way for us to get where we need to be if we didn't get started! Rolling out from kindergarten would have meant 12 classes not getting the 'good'.

A comment: Julie Pinto, a teacher at Marietta High School, shared this observation from her team of 8 teachers teaching Math 1 at her school: The students in Math 1 do not have better math skills than before; they're not worse, just not better yet. However, conversations are so much better. Hearing freshman come in and talk about 'rate of change' is encouraging!

Q: What is one of the big issues out there with supporting students?

J: Scheduling. Should I do block, A/B, skinny, etc. It's important to remind schools that scheduling is about what's best for kids, not the adults. This is true with what happens in class, what happens with textbooks and resources, etc.: It's about the kids, not the adults. What I learned when I had the opportunity to open a school (1997 Starrs Mill High School) is that the central question is 'Should we do this (for kids)?', not 'Can we do this?'

Q: With Accelerated Math 1: Do we assume unit 6 has been taught. In other words, how do we communicate with the Math 2 Accelerated teachers?

J: The issue around 'finishing' Accelerated Math 1 has a lot to do with placement issues. This is not just a rigorous course, it is accelerated and students who are not ready for this pacing should not be there. It would make sense that some students need a 'deeper' Math 1 course rather than an accelerated Math 1 course. One suggestion heard around in conversations is to consider giving summer assignments to help prepare students for the next year.

J: How can we facilitate talking to high schools? Teaming between middle and high is critical for the students.

Q: I'm concerned about not getting my scores back on the EOCT.

J: In the fall semester we (state) had no idea how many block/traditional Math 1 or Accelerated Math 1 students there were until the testing company told us how many tests had been ordered. The group who tested in December was very small, only about 14,000 schools (there are approximately 120,000 9th graders). Given we have 2 forms, less than 10% of the population of students actually took a form which is too small a sample to generalize to the whole population. So, it was decided the December administration would be 'hold harmless' and not count. What we learned we incorporated into the spring administration (such as a new formula sheet with more formulas and words describing where a formula is not appropriate). We also got feedback that the test was cognitively overloaded so we cut the number of questions from 72 to 60. This administration will be a field test and will be reviewed again.

Q: Why can't I have the raw score?

J: The raw scores are essentially meaningless for school/classroom use as you don't know how the tests related to one another. For example, a student may have gotten 3 questions on a topic and gotten them all correct while another student may only have gotten 1 question of 3 correct on the same topic on another form of the test. Raw score only gives number correct but you don't know if the first student had 3 'easy' questions (Depth of Knowledge Level 1 or 2) while the second student had more difficult questions (Depth of Knowledge 2 and 3).

In reality, both students may have the same understanding of the concept but you can't compare raw scores. Until the forms are equated and you have a scale score, you cannot make comparisons or generalizations.

Q: How will I know how to better prepare my students?

J: We have gotten permission to get released test items from this administration of the exam. We expect to get 10 items per strand (algebra, geometry, statistics). Our plan is to get the released items to you, and then provide feedback as to each response for each item in terms of what kids were doing or thinking to choose that response. We've requested data on the items (how well students performed on them) but this is expensive (as is releasing items) and we are still negotiating the level of information that will be released.

Q: It seems as if the content of Math 1 is significantly more than the subsequent courses. Any chance we'll move the content around?

J: Math 1 feels like a lot, but you have to remember that: Our kids didn't have the ideal preparation (but again, we couldn't wait till they did to start). We can't teach everything we ever knew about a topic and have to look ahead to see where they will pick up a concept and go deeper

Q: So, will Math 1 be revised?

J: There is a timeline for all revisions to the curriculum, including Math 1. The K-5 precision review was completed last spring so this spring we'll be seeing their revisions. Since 6-8 have not had kids that have experienced the revised curriculum they need to wait a few more years to do their revision. Revisions are considered once an entire grade band has been taught twice, so in the case of high school, not until Math 4 has been taught at least twice. This is a long way around to say that Math 1 will not be undergoing revisions in the near future!

As for the frameworks, they are able to be continually revised and improved. This is where we need your feedback! Learning Village will soon be updated to version 2.0 and you will then be able to submit lessons. These lessons will go through a juried process prior to approval and posting to ensure that they are a match to expectations. If a submitted lesson doesn't meet approval, submitters will receive feedback on the lesson. The frameworks are critical for painting the picture of 'how deep do I go' on a topic so feedback (what's too far or what's not enough) is important.

Q: I have a student who wants to move out of the accelerated curriculum. They are currently in Accelerated Math 2; where do they go next?

J: If they have been successful in Accelerated Math 2, then they should move into Math 4. (Accelerated Math 2 is the same as Math 3). Students must have Math 1, Math 2, Math 3 on their transcript OR EQUIVALENT, so having the above sequence (Accel. Math 1, Accel. Math 2, Math 4) will meet that requirement.

Membership Report

by Susan Craig
Membership Director
secddc@aol.com

Membership Memories, Changes, and Requests

As GCTM approaches its Golden Anniversary, I find myself pausing and reflecting on all the gifts I have received from it and its members over the 35+ years of my membership. Most of my philosophy of teaching and learning mathematics has been formed and has grown from the influence of GCTM members and speakers at the Georgia Mathematics Conference. Beginning with my esteemed professor, Bill Bompart, (who did not allow us to leave his methods class without GCTM and NCTM membership cards in hand) I found a wealth of support and knowledge in the programs and opportunities these memberships afforded me. I have been honored to hear, learn from, and meet visionaries such as Mary Dolciani, Krulik and Rudnick, Randy Charles, Frank Demana, Bert Waits, Mary Lindquist, Linda Foreman, Jane Barnard, Dan Teague, Judy O'Neal, Murray Seigel, Beth Bryan, David Johnson, Steve Leinwand, … The impact of these and so many others, on my students and my teaching, is almost limitless.

So, GCTM members, do not miss the Georgia Mathematics Conference in October! It will be a great time to refuel, reflect, and renew acquaintances. Renew your membership TODAY if you have lapsed. Encourage your colleagues to invest the small $20 in such an enriching professional membership. It is the best investment of my teaching career!

To renew, visit www.gctm.org, log in, and you can renew by credit card or check. Or use the form in this issue of Reflections. Visit the website to be sure your personal information is correct and complete.

STUDENT MEMBERS, please visit the website and renew, if you will continue your student status for the coming year. All student memberships end on June 30. BE SURE TO VERIFY YOUR ADDRESS OR MAKE CHANGES AS YOUR ACADEMIC YEAR ENDS.

A NEW MEMBERSHIP LEVEL is for fulltime graduate students who have taught previously, but are not currently employed. The rate is $10 annually, half the annual membership rate.

LIFE MEMBERS, please send your email information to the membership director. It is necessary to get you enrolled online and to consolidate our membership information into one document. (scraig@gctm.org or secddc@aol.com) This is only necessary for those who have not enrolled in the online database.

Current membership stands at 1421 with 494 annual members, 455 student members, 472 life members.

Executive Director's Report

by Becky King
Executive Director
bwking@comcast.net

Professional Learning Unit

Plan Now!

Earn a PLU when you attend the 50th Annual Georgia Mathematics Conference at Rock Eagle on October 14 – 16, 2009. Many teachers around the state have earned one Performance Learning Unit while attending the annual Georgia Mathematics Conference. If you will be attending this year's conference for at least a day and a half, let 2009 be the year when you take advantage of this opportunity. You must be able to attend 10 hours of sessions; and, the Georgia Department of Education does not allow more than 8 hours to be earned in any one day.

The FIRST Step is done in your school system BEFORE you arrive at the Conference.

A **Prior Approval Form** will be on the GCTM website in August and September. Visit www.gctm.org to download the form. Fill it out and get the required signatures **before** you attend the conference.

Bring the form to the PLU desk in the registration area and receive information regarding the two steps required for completion of the unit. Step 2 is accomplished at the conference and step 3 is an on-the-job assessment back in your school system.

The deadline for submission of the on-the-job performance for the 2008 conference was December 31, 2008. Anyone having questions regarding this requirement should contact Becky King, Executive Director, GCTM at bwking@comcast.net.

Call for Favorite Conference Memories

October, 2009 is the 50th Georgia Mathematics Conference. GCTM would like to publish a collection of conference memories. Please send a favorite conference memory to reflections@georgiasouthern.edu or Becky King, bwking@comcast.net. They will be published in an upcoming issue of Reflections.

GCTM NEWS

Treasurer's Report

by Dan Funsch
GCTM Treasurer
dfunsch@alleluiaschool.org

This issue of *Reflections* features a report of our organization's income and expenses for the most recently completed fiscal year (2007-2008). I invite you to review the report. I have made some notations on items that I thought needed a word or two of explanation. I think that you will be pleased at the breadth and scope of the activities that your Council undertakes on your behalf. If you'd like further explanation or have questions feel free to contact me at dfunsch@alleluiaschool.org.

Sincerely,
Dan Funsch

The Georgia Council of Teachers of Mathematics, Inc.
Budget vs. Actual
November 2007 through October 2008

	Nov '07-Oct '08	Budget	
Ordinary Income/Expense			
Income			
Conferences	206,845.93	214,850.00	
Dues - GCTM	16,430.00	30,000.00	
Interest Income	5,716.87	5,990.00	
Miscellaneous Income	1,134.16		
NCTM Affilate Rebate	186.00		
NCTM Booktable (Net)	-100.00	150.00	
Total Income	230,212.96	250,990.00	
Expense			
Accommodations	-11.99		
Awards & Honors	710.67	750.00	
Bad Checks	337.00		
Bank Service Charge	4,293.77	3,075.00	mostly fees associated with credit card transactions
Competitions	1,459.81	1,500.00	Middle and High School math tournaments
Contract Labor	12,668.00	30,000.00	Academy not held in summer of 2008
Dues - NCTM Affiliate	270.00	400.00	
Executive Director	672.35	600.00	
GMC Expenses	103,707.49	112,250.00	
Grants	10,034.00	15,400.00	includes equipment upgrades to Rock Eagle campus
Membership Director	1,082.32	1,600.00	
Miscellaneous	-238.43	-29.00	
President	17,434.32	21,900.00	includes expenses for travel, Board meetings, and the biennial retreat
President Elect	0.00	200.00	
Professional Fees	550.00	500.00	
Publications	10,720.22	20,991.00	
Reconciliation Discrepancies	-1.05		
Regional Services	330.43	2,000.00	
Secretary	0.00	100.00	
Taxes	0.00	0.00	
Treasurer	130.70	100.00	
Total Expense	164,349.61	211,537.00	
Net Ordinary Income	65,863.35	39,453.00	
Net Income	**65,863.35**	**39,453.00**	

Call For Award Nominations

by Cindy Fielders
VP of Awards and Honors
cindyfielder@bellsouth.net

GCTM NEWS

Do you know a mathematics educator who deserves to be honored? It's not too late! We've extended the deadline to July 1, 2009.

Each year, GCTM sponsors up to seven awards that are presented at the Georgia Mathematics Conference at Rock Eagle in October. This year is extra-special, with the Georgia Math Conference celebrating its Golden Anniversary! This is the year to shine a light on those around us making a real difference for children!

To nominate, go to Grants and Awards at gctm.org and follow the instructions, or contact Cindy Fielder, VP of Awards and Honors at cindyfielder@bellsouth.net

Gladys M. Thomason Award for Distinguished Service

This award is given for distinguished service in the field of mathematics education at the local, regional, and state levels, where the service is significant, is beyond normal job requirements, and is primarily for the improvement of mathematics instruction.

Awards for Excellence in the Teaching of Mathematics

Three awards, one each for elementary, middle, and secondary levels, are given to excellent teachers who have strong content foundation in mathematics appropriate for their teaching level, show evidence of growth in the teaching of mathematics, and show evidence of professional involvement in GCTM and NCTM.

Teacher of Promise Award

GCTM recognizes one outstanding new teacher in the state each year who has no more than 3 years experience at the time of the nomination and who demonstrates qualities of excellence in the teaching of mathematics.

John Neff Award

This award is presented to a member of GCTM who demonstrates excellence as a full time post secondary educator and/or district supervisor. The recipient is someone who is an inspirer, a mentor, and an advocate of mathematics and mathematics education.

Dwight Love Award

This award is presented to a teacher in Georgia who models excellence in the profession and in life and gives much to others beyond the classroom as mentor, teacher and leader. The awardee is a master teacher, professionally active, and promotes GCTM and its mission.

Southwest Georgia Math Menagerie

by John H. Walker, Sr., EdD
Southwest Georgia GCTM Representative
walkerjsr@yahoo.com

February 7, 2009, was an exciting day at Macon County Elementary School in Oglethorpe, GA as they hosted their very first "Southwest Georgia Math Menagerie"! "Southwest Georgia Math Menagerie" replaced "Southwest Georgia MATHFEST" due to the possibility of a title infringement. The competition is in its third year.

Students from Southwestern Elementary School in Crisp County; Sumter Elementary Math, Science, and Technology Academy and Sarah Cobb Real World Academy in Sumter County; and Macon County Elementary School represented their schools and districts most admirably. The third, fourth, and fifth grade students competed on their respective grade levels for prizes, trophies, and medallions.

The competition was separated into two levels for each grade. During "Open Competition", all students from each grade participated in solving math problems with time constraints. During this segment of the competition, parents, teachers, administrators, and other interested parties were welcome to observe the competition. Prior to the competition, each student was given ten tickets. For each problem they missed, they lost one ticket. The competition continued until approximately 15 students remained with tickets. These students moved on to the "Final Round". These students moved to a restricted area where only two judges and one representative from each school were allowed. They were given ten new tickets, and the competition began over and continued until the top ten students were ranked accordingly. The process was repeated for each grade level.

Every student that participated received at least three prizes. The final ten students for each grade received trophies engraved according to their finishing place and medallions in addition to their prizes. The competition is always intended to recognize and reward students for their academic efforts; displaying their mathematical skills; giving up their after-school time to practice for the event; and giving up their Saturday to compete. Students and school representatives assured everyone they had had a great time and were looking forward to being back next year!

Anyone interested in organizing a "Math Menagerie" event in your area may contact Dr. John Walker; 318 Paschal Street; Plains, GA 31780-5668 or by e-mail at walkerjsr@yahoo.com.

Northeast Georgia Report

by Kay Haugen

Math teachers in Northeast Georgia, along with others across the state, have been busy with implementing Math I and gearing up for Math II implementation. Because everything is so new to us, we are extremely interested in what others in our region are doing. Our high school math professional learning community is an invaluable resource for those teaching math using the Georgia Performance Standards. The PLC meets monthly and is well represented by teachers in the Northeast Georgia RESA district. Among other things, we discuss pacing, what is working as well as what isn't working, and the best way to utilize the resources provided by the state. Contact Kaycie Maddox at Kaycie.maddox@negaresa.org if interested in participation.

We also have two other professional learning communities in northeast Georgia that support AP Statistics and AP Calculus (both AB and BC) teachers. Contact Kaycie Maddox (Kaycie.maddox@negaresa.org) if interested in the Statistics PLC and Paula Whitmire (pwhitmire@oconee.k12.ga.us) if interested in the AP Calculus PLC. Teachers attending these PLCs have reported a statistically significant increase in the number of students passing the AP test. As a personal participant in the Math I PLC and the AP Calculus PLC, I can attest to the difference they have made in my teaching and in my student achievement.

In addition to the state provided GPS training, Northeast Georgia RESA has two other professional learning opportunities planned. We will have a Unit Writing workshop June 15-19. There will be four different teams concentrating on refining Math I and Accelerated Math I units and creating Math II and Accelerated Math II units. We hope to have the work from this workshop available on the Northeast Georgia website. Back by popular demand is the statistics workshop facilitated by Christine Franklin and Gary Kader. The 4-day workshop is divided into two-parts. June 29 and 30 will be a repeat of last year's activities (Math I topics) while July 1 and 2 will introduce Math II topics. Teachers can attend either or both sessions. You can register for this workshop at www.negaresa.org.

I am new to this job of representing northeast Georgia teachers at GCTM. I welcome all suggestions for what I can do to serve you better.

Learn More About Your Organization

www.gctm.org

* Grants and Award Information
* Membership Renewal
* Mathematics Competitions
* Previous *Reflections* Issues
* Other

GCTM NEWS

2009 Georgia Mathematics

GMC: 50 and Fabulous

Are you ready to celebrate? That's right, we are having a party! The Georgia Mathematics Conference is ***50*** and we are planning a ***Fabulous*** celebration. So plan to join us October 14 – 16, 2009 at the Rock Eagle 4-H Center near Eatonton, GA to reflect on where we have been, share what we are currently doing in mathematics classrooms, and look to the future of mathematics education in the State of Georgia. Of course there will be the usual fun and fellowship that we have come to expect and enjoy at the conference each year.

In addition to the many sessions provided by classroom teachers and mathematics leaders, the program will include three keynote sessions. The first keynote session will feature Dan Flockhart, the author of the *Fantasy Sports and Mathematics* series, on Wednesday night. This series has been used by many students throughout the U. S. For the second keynote session we are bringing you *Calculus the Musical!*, a comic "review" of the concepts and history of Calculus. Although, Calculus is usually thought of as a high school topic, the musical promises to be entertaining for all spanning genres from light opera to hip-hop. We will close the conference on Friday with the third keynote presented by our friend and colleague, Jane Barnard. Jane is a well-respected mathematics educator and has served GCTM, NCTM, and mathematics education in Georgia for many years. She will look back at these first fifty years and set the course for the next fifty.

As part of the sessions provided on Thursday and Friday, we will be inspired by a series of featured speakers. Bill Jasper, Sam Houston State, will share his work on Mathematics for English Language Learners. Ana Escuder, a project director at Florida Atlantic University, will demonstrate activities with GeoGebra, a free dynamic mathematics software. Michaele Chappell, Middle Tennessee State University professor and Georgia native, will encourage teachers to integrate culture into the mathematics classroom, and Chris Franklin, University of Georgia, will provide statistics activities. Janie Cates, Virginia Wilcox, and Beth Oberg are all leaders in mathematics education in Georgia and will offer elementary teachers activities and mathematical ideas to use in the classroom.

Again this year, we will continue the pre-conference Open House on Wednesday, October 14 from 3 – 5 PM. Experienced educators will provide a technology experience for conference participants interested in an introduction to using graphing calculators, GeoGebra, Geometer's Sketchpad, and interactive white boards. During this same time period, seasoned teacher-leaders will coach participants through tasks and share tips for incorporating tasks in classroom instruction. This session will include tasks that are appropriate for each grade band: K-2, 3-5, 6-8, and 9-12. Unlike the sessions on Thursday and Friday, the Open House will be "drop-in" style. So come early and take advantage of the opportunity to share in these activities.

If you plan to get acquainted with Geometer's Sketchpad or GeoGebra, please bring a laptop computer. If you plan to work on a task, you may want to encourage a colleague to join you and serve as your partner.

Dan Flockhart

Dan Flockhart is the author of the Fantasy Sports and Mathematics Series, hands-on programs that give students opportunities to manage "fantasy" teams of professional athletes. The programs are based on football, baseball, basketball, and soccer, and have been featured widely in the media, including ESPN. Flockhart taught middle school mathematics for 11 years in the San Francisco Bay Area and has over 25 years experience playing fantasy sports. He has also taught college success courses at a community college in Northern California. In 2008, he produced a documentary film that showed the impact of fantasy sports in learning environments. The film is posted on YouTube. Flockhart has recently completed a new book on ethics, culture, and education (including math education). More information can be found at www.fantasysportsmath.com.

Conference Information

Calculus the Musical!

Calculus: The Musical! is a comic "review" of the concepts and history of Calculus. Using musical parodies that span genres from light opera to hip-hop, the quest for the instantaneous rate of change and the area under the curve comes to life—through song! The musical was written by high school math teacher Marc Gutman and actress/musician Sadie Bowman and is now being produced by Know Theatre of Cincinnati. Know Theatre company members Jae Boley and Sean Powell—a soon to be husband-and-wife musical theatre duo—will be bringing the "edge" back to "education" at the GCTM conference this October. More information can be found at www.calculusthemusical.com.

Jane Barnard

Jane Barnard has taught in both public and private schools at all levels K-12 as well as in the Department of Mathematics at Armstrong Atlantic State University. After 30 years of teaching, she decided to go back to school to become a full-time student and pursue PhD work at Saint Louis University in 2002. Jane received the Gladys M. Thomason Award in 1994 and the John Neff Award in 2008 from the Georgia Council of Teachers of Mathematics, having served as President of the Council and in other leadership positions. She has served in leadership positions with the National Council of Teachers of Mathematics as well as the National Council of Supervisors of Mathematics. Jane is passionate about learning and teaching mathematics (especially about communication and technology in mathematics) – both from the students' perspectives as well as K-University teachers' and leaders' perspectives.

Call for Manuscripts

Topics:

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GCTM NEWS

Double Number Lines: An Introduction

by **Tad Watanabe**
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Beckmann & Fuson (2008) suggested that double number lines may be fruitful representations to assist teaching and learning of rational number multiplication and division. Although double number lines (and their variations) are commonly used representations in Japanese elementary school mathematics textbooks (Watanabe, 2006), they are still relatively new representations for many Georgia teachers. The purpose of this brief essay is to help GCTM members become familiar with this potentially powerful representations.

Double number lines are used to represent the ways quantities relate in some multiplicative situations where there are two distinct quantities. For example, imagine a simple multiplication problem that may be investigated in the second grade when students are introduced to multiplication:

Problem 1 *There are 4 apples on each plate. If there are 6 plates, how many apples are there altogether?*

In this problem, there are two quantities, the number of apples and the number of plates. Since there are two different quantities involved, it is difficult to represent them on a single number line. Thus, we will use two parallel number lines that are hinged at 0's (see Figure 1). These number lines, however are scaled differently. Note that the positions of the number lines for the two quantities may be reversed, that is, the top number line may be for plates and the bottom for apples.

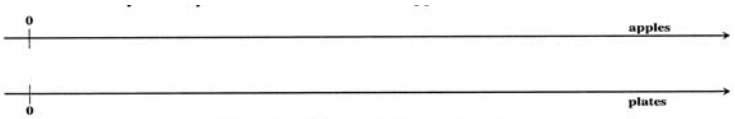


Figure 1 A blank double number line

Let's say that the top number line is for the number of apples and the bottom one for the number of plate. Since there are 4 apples on each plate, or there are 4 apples on 1 plate, 4 on the top number line will correspond to 1 on the bottom number line. Since the missing quantity is the number of apples, it should be on the top number line. Moreover, that quantity should correspond with 6 on the bottom number line since that is the total number of apples on 6 plates (see Figure 2).

Figure 2 A double number line representation for Problem 1

Let's see how division problems may be represented with double number lines. Consider the following problem:

Problem 2 *There are 24 children in a classroom and 6 large round tables. How many children should be seated at each table if there must be the same number of children at each table?*

Again, there are two quantities involved in this problem: the number of children and the number of tables. Let's use the top number line for the number of children and the bottom one for the number of table. Since there are 24 children to be seated among 6 tables, 24 on the top line must correspond with 6 on the bottom line. The missing quantity is the number of children, so it should be on the top number line. Moreover, it is the number of children at a table, so it must correspond with 1 on the bottom line (see Figure 3).

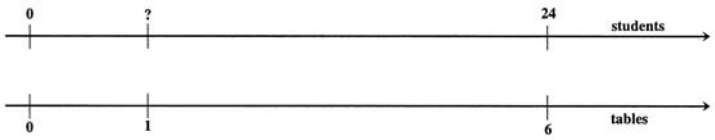


Figure 3 A double number line representation for Problem 2

Of course, students learn in the third grade that there are two situations where division is appropriate. The previous problem is the type where division is used to determine the size of a group. What about the following problem:

Problem 3 *There are 24 students in a class. A hexagonal table can seat 6 students. How many hexagonal tables do we need to seat all students?*

Again, we have two quantities. Let's use the top number line for the number of students and the bottom for the number of tables again. Both 24 and 6 are number of students, thus they go on the top number line. We are told that 6 is the number of students at a table. Thus, 6 on the top number line must correspond with 1 on the bottom,

and the quantity corresponding to 24 on the bottom line is the quotient we are looking for (see Figure 4).

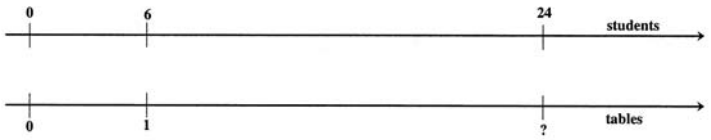


Figure 4 A double number line representation for Problem 3

Here are some additional problems. I encourage readers to represent using double number lines.

Problem 4 *Paul is building a book case. If each shelf can hold 15 books and there are 5 shelves in the book case, how many books can be placed on in the book case?*

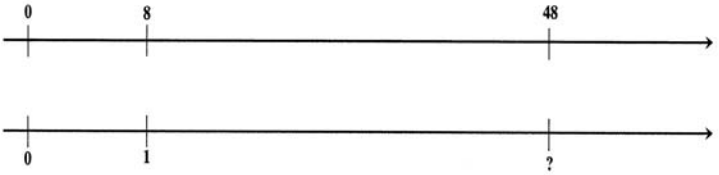
Problem 5 *Willie has a board that is 32 feet long. If he cuts the board into 4 equal length pieces, how long will each piece be?*

Problem 6 *Carlos bought 8 packages of gum. If each package has 6 pieces of gum, how many pieces of gum did Carlos buy altogether?*

Problem 7 *Lynn bought 28 chocolate bars. They were in packages of 4. How many packages did Lynn buy?*

Now that you have drawn several double number line representations, let's compare and contrast them. You will notice that all fair sharing problems have the missing quantities corresponding to 1 (see Figure 3). This makes sense since what we are trying to find is the number in a group, or per-unit quantity. On the other hand, both multiplication (Figure 2) and measurement (or repeated subtraction) division (Figure 4) situations will show an amount on one number line corresponding to 1, unit, on the other. This correspondence shows the number in a group, or per-unit quantity. In the multiplication situations, however, the third known quantity is on the same number line as the one with 1. In other words, you know how many groups, or amount of unit, there are and you are calculating the total amount of the other quantity. However, with measurement division situations, you are trying to find out the number of groups, or amount of unit, thus it is the missing quantity that will be on the same number line as 1.

Here are some double number line representations. Can you identify what operation is necessary to calculate the missing quantities?



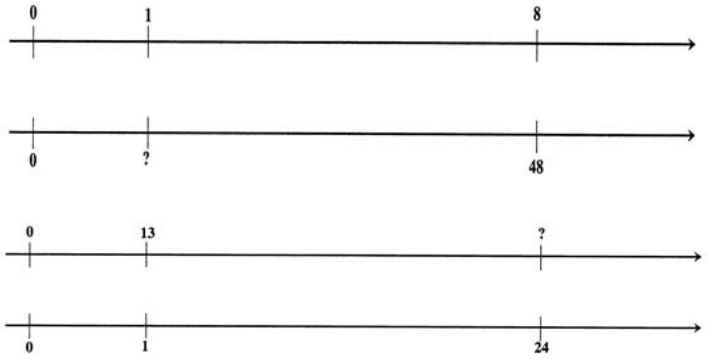


Figure 5 Can you tell what mathematics operation is needed to find the missing number?

Although we have been using only whole numbers, we can still use the same representations to illustrate the relationship among quantities even when they are not whole numbers. Let's look at an example:

Problem 8 *One meter of plastic pipe weighs 13 pound. How much will 0.7 of the same pipe will weigh?*

Many students recognize that the answer should be less than 13; however, because they believe that multiplication makes bigger and division makes smaller, they mistakenly think that the 13 ¸ 0.7 is the appropriate computation. Let's represent this problem on double number line.

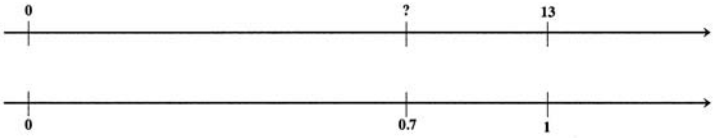


Figure 6 A double number line representation for Problem 8

Since this is the situation where we are given the per-one correspondence, and the missing quantity is on the opposite number line from the one with "1," it must be multiplication situation. Thus, the correct equation is 0.7 x 13 = ? This diagram visually represents that when the multiplier is less than 1 the product will be less than the multiplicand. So, multiplication can make a number smaller.

Finally, the double number lines in Figure 7 are the representations for $24 \div 1\frac{1}{4} = ?$ and $24 \div \frac{3}{4} = ?$ because the missing number is the per-one quantity in both situations.

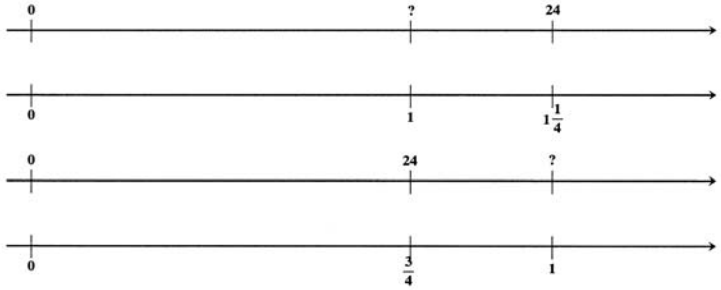


Figure 7 When the divisor is less than 1 (the bottom double number line), the quotient will be greater than the dividend.

From these diagrams, you can visually note that when the divisor is less than 1, the quotient will be greater than the dividend. Thus, division doesn't always make the number smaller.

In this essay, I only described the mechanisms of double number line. Although the last example may give a glimpse into the potential usefulness of this representation, more elaborate use of double number lines to explore rational number multiplication and division is beyond the scope of this essay. However, before students can use double number lines as their own thinking tools, they must become familiar with this form of representation while they work with whole numbers. I hope this essay gave readers some ideas how to get started with double number lines with their students.

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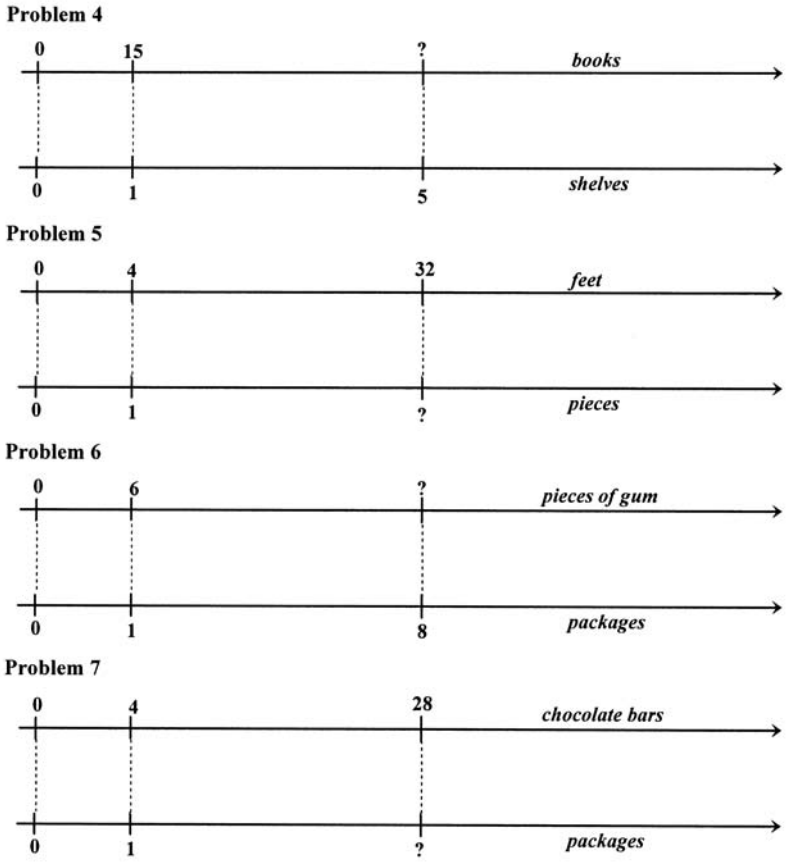
Answer to Problems



Mathematical equations represented in double numbers lines in Figure 5 (from the top):

$48 \div 8 = ?$ (or $? \times 8 = 48$)
$48 \div 8 = ?$ (or $8 \times ? = 48$)
$24 \times 13 = ?$

Note: The first problem is a measurement (repeated subtraction) division problem, while the second problem is a fair sharing division.

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Bluma' Method: A Different Way to Solve Quadratics

One skill taught in an algebra class is the ability to find the roots of a quadratic equation. Factoring the quadratic and applying the Zero Product Property is one of the methods typically introduced to solve this problem. For many students, factoring is routine until they are asked to factor a quadratic equation whose coefficient of the quadratic term is not 1. In this article, we introduce a method (called Bluma's Method) for solving a quadratic equation by first transforming it into a quadratic with lead coefficient 1, then solving the new polynomial and relating its solutions to those of the original problem. We will then give two proofs of the method (one algebraic and the other more geometric in nature) and discuss its merits for classroom use.

Additionally, the academic standards of some states explicitly say that students should, at first, only work with quadratics with a 1 in front of the quadratic term, the so-called monic polynomials. More complicated quadratics are then handled at the next level algebra class. Bluma's method could be used as an intermediate step when transitioning from easier to more difficult problems. The newly introduced Georgia Performance Standards, MM1A3 and MM2A4, are examples of this approach and can be found on the Georgia Department of Education website, http://www.doe.k12.ga.us/.

Bluma's Method – The Procedure

We learned of this method from Bluma, an eighth grade student in a large, suburban middle school in the Washington, D.C., metro area who had, in turn, learned it from her teacher. It was introduced in the following manner.

Step 1: Starting with the equation:

$$5x^2 - 27x + 10 = 0,$$

move the coefficient of x^2 to the constant term by multiplying the two. This gives

$$x^2 - 27x + 50 = 0.$$

Step 2: Solve equation (1) by factoring it into

$$(x - 25)(x - 2) = 0,$$

which gives solutions of $x = 25$ and $x = 2$.

Step 3: The solutions of the original equation are obtained by dividing the answers from Step 2 by five, the coefficient of x^2 in (1). Thus, the solutions to (1) are $x = 5$ and $x = 2/5$.

First, we should check to ensure that these are, in fact, the solutions of the original equation. This is easy to see, as we can just substitute 5 and 2/5 into the first equation to verify that these are roots. More than this, though, we want to know whether or not the method always works and why.

Bluma's Method – A First Proof

The simplest way to show that this method is correct is to appeal to the quadratic formula. Let $f(x) = ax^2 + bx + c$ and $g(x) = x^2 + bx + ac$. We know that the solutions to $f(x) = 0$ are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

while the solutions to $g(x) = 0$ are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2}.$$

Therefore, we can get the solutions of $f(x) = 0$ by taking the solutions of $g(x) = 0$ and dividing by a as we expected. This proves that Bluma's Method is correct, not only for a certain type of quadratic, but for *every* quadratic. This proof has the advantage of being accessible to any student who has a basic understanding of the quadratic formula.

Bluma's Method – A Second Proof

By noting how similar equations (1) and (2) are, it is natural to wonder if there is some way to translate easily from one to the other. Of course, they are not equivalent equations (meaning they do not have the same solution

set), but they can be related by a transformation of variables, as we now see.

Let $f(x) = ax^2 + bx + c$ and $g(z) = z^2 + bz + ac$. Consider the substitution $z = ax$ (or $x = z/a$). We get

$$\begin{aligned} f(z/a) &= a(z/a)^2 + b(z/a) + c \\ &= \frac{z^2}{a} + \frac{bz}{a} + c \\ &= \frac{z^2 + bz + ac}{a} \\ &= \frac{g(z)}{a}. \end{aligned}$$

In other words, $f(z/a)$ is zero if and only if $g(z)$ is zero. Said more formally, let $z = T(x) = ax$ define a transformation from the x-axis to the z-axis. Then

$$\begin{aligned} af(x) &= (ax)^2 + bax + ac \\ &= T(x)^2 + bT(x) + ac \\ &= g(T(x)). \end{aligned}$$

We can interpret this transformation geometrically as stretching (if $a>1$) or contracting (if $a<1$) the x-axis in the graph of the original equation (see Figure 1). This proof is instructive because it introduces the idea of a change of variables, which is pivotal in later math courses.

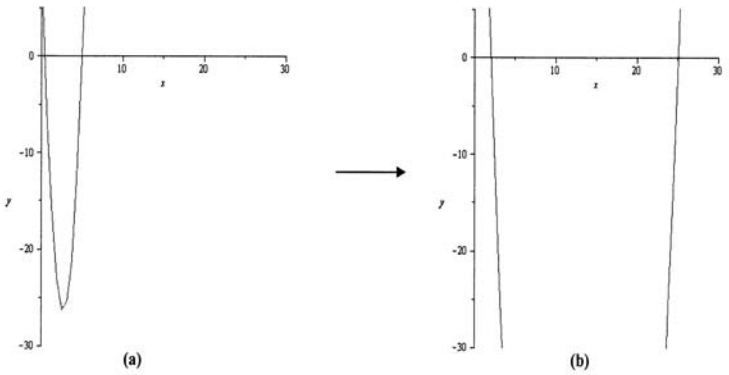

Figure 1: We have the graph of (a) $y=5x^2-27x+10$ and (b) $y=x^2-27x+50$. We can see how the transformation stretches the x-axis by five.

Generalizations of Bluma's Method

Bluma's method can very naturally introduce what is called a "mathematical habit of the mind," (MHM). Given a technique that works for quadratics, it is very reasonable to wonder if it extends to higher degree polynomials. In fact, the approach does, and is motivated by the second proof given above. The argument for polynomials of arbitrary degree can be clearly seen by looking at degree three. Therefore, we consider only the arbitrary cubic polynomial $f(x) = ax^3 + bx^2 + cx + d$ and again make the substitution $z = ax$. We get

$$\begin{aligned} f(z/a) &= a(z/a)^3 + b(z/a)^2 + c(z/a) + d \\ &= \frac{z^3 + bz^2 + acz + a^2d}{a^2}. \end{aligned}$$

This tells us that in order to solve $f(x) = 0$, we could first solve $g(x) = z^3 + bz + acz + a^2d = 0$ and then divide these solutions by a. It is important to note that solving a cubic equation with 1 in front of the cubic term is, in general, not any easier than solving the original equation, as factoring a^2d can be tedious. However, asking the question about generalizations is called a "mathematical habit" for a reason. It is something that most mathematicians will do and can be very helpful in extending the conceptual understanding of a particular technique. This also gives students an example of good questions to ask. For more information on the important concept of MHM, see (Cuoco, 2001), (Cuoco, Goldenberg, and Mark, 1996), (Long, DeTemple, Millman, 2008), or (Millman and Jacobbe, 2008).

Bluma's Method and Factoring

As stated, Bluma's method seems well suited only to find the solutions of quadratic equations. However, it can be used to factor as well. Again, we must use the change of variables idea. We can illustrate this with an example. In order to factor the expression $8x^2 - 2x - 15$, we first make the change of variable $z = 8x$. Thus, we get

$$\begin{aligned} 8x^2 - 2x - 15 &= (1/8)(z^2 - 2z - 120) \\ &= (1/8)(z - 12)(z + 10) \\ &= (1/8)(8x - 12)(8x + 10) \\ &= (1/8)*4(2x - 3)*2(4x + 5) \\ &= (2x - 3)(4x + 5). \end{aligned}$$

This is the factoring technique commonly referred to as the AC method.

Bluma's Method in the Classroom

We should first note that Bluma's Method is not a magical technique. That is, if the original quadratic does not factor nicely, the transformed quadratic will not either. However, this fact alone does not make it less interesting. Right away, we can see that this could simply be another tool for students to use while trying to solve a quadratic equation. However, we feel that the true benefit of Bluma's Method comes less from the method itself as from the discussion it almost always seems to generate.

Any time we have presented this method (whether to high school students, teachers, or college faculty), we are almost always asked whether the method is correct. As a teacher, hearing a question like this from a student is wonderful. After the question is asked, the class could spend some time investigating it. In attempting to decide if the method always works, many students will simply try to work as many examples as possible. This is a perfect

opportunity to explain to students that working examples is a powerful tool to understand a method or even to convince oneself that something is true but that, ultimately, it is not good enough. One cannot simply work every possible example. It is at this point that one or both of the above proofs can be demonstrated to the class. Thus, high school or even middle school students are introduced to the proof concept – something that many have not experienced to this point.

Thirdly, as we have briefly mentioned, those classes which are able to work through the change of variable proof will be introduced to a concept that is very useful throughout mathematics. Making a change of variable can lead to great insights into a problem and can even lead to solutions that otherwise are impossible to see. For instance, those students going on to calculus will use a change of variables extensively for integration problems.

One last benefit comes from the fact that most everyone with whom we share the method likes it. This includes both high school and middle school students and their teachers. Any bit of mathematics that piques the curiosity of a student and can even lead them to think about some conceptual aspects of math should be highly sought after.

Our Experience in the Classroom

We have had the opportunity to present Bluma's Method to several teachers from a high school in rural Kentucky. One afternoon, one of the teachers shared it with her college-bound Algebra II class. These students had recently learned both factoring and the quadratic formula. They immediately latched onto the technique and thought it was neat. After struggling with factoring tricky quadratics for a few days, they were thrilled with any sort of "trick." What was amazing, though, was how they immediately wanted to know if and why the method worked. They were so insistent that the teacher sought us out (we were in a different classroom at the time) and asked us to present a proof. That type of response is almost unheard of! The students easily followed the quadratic formula proof and seemed impressed that, with just a little bit of work, we could show something was true about an infinite number of things. We also found it amusing that, upon hearing that the method was, at least to our knowledge, not well known, one student even claimed he wanted to write and submit a paper about it before we did!

Closing Remarks

This method is not well known but is also not new. We were pointed to (Jones, 1951), which refers to an article from the *Colorado Engineer* published in 1924 by William J. Hazard. The article mentions solving quadratics by making the substitution given in the second proof. We do not know of other articles about this method. It also is not universally useful, as it only works well when the transformed equation factors nicely. However, it has shown itself to be a valuable asset in solving quadratics that have rational solutions and engaging students in active mathematical discussion and exploration. That being said, we would only advocate its use in the classroom as long as there is enough time for teachers to adequately develop a proof (or provide other reasons for why it works).

And for those who are wondering, Bluma is a real person. She is the granddaughter of one of the authors!

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Judy's Book Shelf

by **Judy Chambers**
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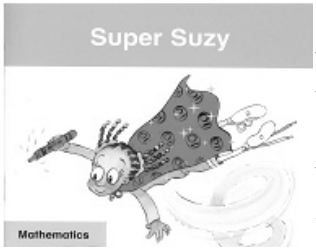
It's that time again…….let's look at some great (and maybe not so great) math literature books. You know I've said it before and I'll say it again, nothing starts a math lesson like a good book. It helps students make a connection between the concept and how it can be used in real or unreal environments. Once students see how the math concept can be used, they know it's worth learning. Now with all that said, let's look at some books.

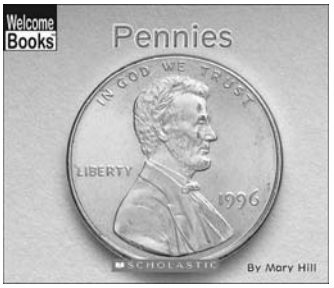


The first book I want to share with you is entitled Super Suzy was written by Jill Bever and Sheilah Currie. You can order it www.nelson.com. This book is labeled Grade 1 and explores larger numbers. This is a cute story about a first grade class getting reading for a big event. The students have to count the guests to determine if they have enough chairs. They group them by tens to count them. There are also other items that need counting too. I like this book and it's illustrations and I think the kids will too.

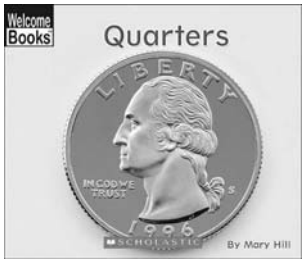
Jill and Sheilah have another book in this same series that deals with counting by tens. 10 Little Chickens is available at www.nelson.com . It's a cute story about a lot of chickens that keep coming into this grocery store. This story leads to some really good "What ifs"(What if you were in Publix and 100 chickens came in, What if you were in CVS and 100 cows came in?) in a discussion group. You could also have students create their own story with a similar storyline. It would also be a fun way for students to draw and count by 10s.

If you are working on sizes, try starting one of your lessons with Stuart Murphy's The Best Bug Parade (©1996, HarperCollins). This book is colorful, fun, contains loads of bugs, and still teaches size concepts of short, tall, long, short, etc. This would be perfect with a Pre-K or K class as you talk about comparing sizes. With the younger children have them create their own bugs and compare them. Ex. "My blue bug is longer than my orange one." Or let them compare with their classmates. This can be followed up with letting students line up other objects by smallest to largest or shortest to longest. The Best Bug Parade is part of Murphy's MathStart series.

If your students will be introduced to regrouping then you really should get a copy of Stuart Murphy's A Fair Bear Share (©1998, HarperCollins). This is another book from Stuart's MathStart series. As always, the illustrations are very child-friendly and colorful and are sure to draw in even the most reluctant student. The bears in the story are promised a delicious pie if the cubs go out and gather nuts, berries and seeds. When they bring them home Mama Bear groups them by tens and then has to regroup as they add the collections together. You can follow up with lettings students sort things such as pencils, markers, and crayons. You could also have them sort things at home with their parents. Check this out if regrouping is in your curriculum.

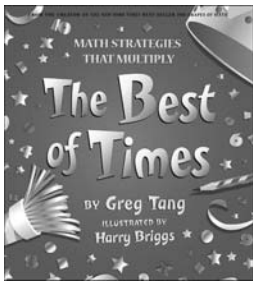


I ran across a series of books that I have somehow overlooked through the years. Mary Hill wrote a series of 6 books on money. They were published by Scholastic in 1977. These are introductory books for your younger students or those children that may have problems identifying coins. The first one is Pennies. The book gives great close up pictures of the coin, both heads and tails. It talks about what it is made of, what is on the front and back of the coin, what it is worth, where they are made and what people do with them. At the end of the book is a glossary of new words and their definitions along with a suggested list of books to find out more. This format remains the same for the

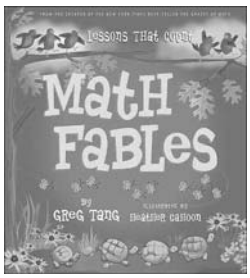


other books: Nickels, Dimes, Quarters and Dollars. The last book in the series Spending and Saving talks about how people get money and what they do with it. These books are great examples of non-fiction math informational books. They make a great way to introduce money to young students. They get clear close-ups of the coins to help in future recognition. If you teach money to younger students, I would seriously look at getting these books.

Now if you are past coin recognition but your curriculum has you teaching square numbers, then go get yourself a copy of Sea Squares by Joy N. Hulme. (© 1991, Hyperion Books for Children, N.Y) This book is beautiful. Carol Schwartz did a great job on the illustrations. Each page has a border down the side of something related to the sea. Each two pages present a square number using sea residents. Here's an example: "Four slippery seals with four flippers each, swooping in the surf and flopping on the beach. 4 seals are quite complete, With 16 slippery feet." At the end of the book, Hulme gives more information about each sea creature for the readers. This really is a lovely book and a great way to introduce square numbers. Students could write their own square numbers books, using a theme of their choice; bugs, farm animals, dogs, plants, and more. What a great way to check their understanding as they write and illustrate their own publication.



Greg Tang writes some of the most interesting math related books around. Included in his collection is Math Strategies that Multiply The Best of Times. (©2002, Scholastic Press, N.Y.) Tang says in the Author's Note that he wrote this book to help students master times tables…not for the short term but by developing a sounder, deeper understanding of the concept of multiplication. With a series of verses, Tang has given students an opportunity to master the facts. The book presents facts by numbers so when you are working on the "0" tables, you can read the verse for that called Absolute Zero. If you are working on the eights, there's Crazy Eights. The illustrations draw students into the learning along with the verses. For those of you that teach multiplication, make sure you have access to this book, either in your own library or through the school. I'd have students learn the verses along with the facts. If the numbers don't stick in their mind the rhyme will and it will then facilitate the recall.



If you have younger students that are learning to count, then Greg Tang has a book just for you. This book has lessons that help students count. Using rhyme to catch student attention, he presents a series of poems and verses about numbers. Heather Cahoon did a great job of bringing the verses to life with her illustrations. So, if you have little ones that need to practice counting, get yourself a copy of Math Fables by Greg Tang. (©2004, Scholastic Press, NY) I'd recommend this for children as young as 3 years old. It's a fun book counting and learning.

That's it for this time, however, if you need to know more about these books or want ideas to use with them in class, feel free to email me at jchambers100@gmail.com . Also, if you are looking for suggestions of books to accompany a specific math concept let me know and I'll send you some suggestions. Until next time, happy math reading! -Judy

Contra Dancing: From Rock Eagle to My Classroom

by **Jeni Halimun**
Northeast GCTM Representative
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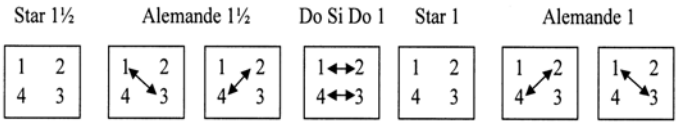
Rock Eagle annual conference of Georgia Council Teachers of Mathematics (GCTM) always provides fresh perspectives to Mathematics teachers with innovative techniques for teaching and learning. Many times I find myself with a new motivation, so I say, "I shall try this model lesson in my classroom." Coupled with this motivation, if I complete a few steps of the procedures stated in the Professional Learning Unit (PLU) Course Completion form, I will earn one PLU credit. However, the true reward comes from my students, when they engage and have fun in learning mathematics. Yes, "learn and have fun."

One of the many innovative ideas in the 49th Annual GCTM is learning "Contra Dancing in the Mathematics Classroom" with Dr. Mary Garner. The title claims "Contra Dancing can help students understand transformations, permutations, the commutative property, inverses, identities, associative property, binary operations, and it's FUN!" It sounds like a "must attend" presentation.

Dr. Garner shared the lesson on transformation that included the properties mentioned above. At the end, all of her audience filled the Senior Pavilion floor to practice and master Contra Dancing that demonstrates the properties we just learned. It is then up to me to deliver Contra Dancing in my own classroom.

The opportunity arose when my Math 1 students explored Logo Design in Unit 5. In addition to using pictures on the paper to demonstrate the symmetry and transformation concepts, Contra Dancing invites students to experience the symmetry and transformation themselves. For instance, my students rotated in 360 degree and 180 degree, commuted (switched) horizontally, vertically, and diagonally. In groups of four, students understand when the transformation demonstrated is an identity property, because everyone must return to her/his original position. "We are back at where we started," a student observed. Below is a replication of Dr. Garner 's lesson on Contra Dancing in my Math 1 classes.

First, I showed video clip from the Contra Dancing link which introduced the allemande, do si do, circle, and star movement. This preview gave me a chance to hear my students' comments that mostly were interested doing Contra Dancing in mathematics class. Some were ready to dance, and some decided, this is not their "thing." Before students take the floor, I drew the squares to guide the movement of Contra Dancing for quick reference.



I numbered index cards 1, 2, 3, 4 for each group, and then assigned a number to each dancer in a group of four. The index card eventually fell off of one student's shirt. However, the numbers made the activity looks organized as if the students are in a dance contest. I also think the number helps students to call each other, "One and three - your turn!"

As soon the practice began one of the dancers became the leader. Andy is a confident instructor in Math Support 3rd period. He also has recruited more dancers. Sam is a Contra Dancing instructor in Math Support 4th period, and believe it or not, Sam used to sleep in this period. Now, he also added his own twists in every dance. After two rounds of practice my students were ready to dance with the music. My first volunteers took this dance to a next level that I could not have ever predicted.

Several students recorded the activity with their cell phones. (These are the pictures taken by students.) I noticed the first activity took about 15 - 20 minutes. The 2nd time, since there are already some masters of the dance, we finished in less than 10 minutes. There was no problem in moving some of the desks. The students move them quickly. Since the two periods are back to back, I gave the activity at the end of the class for 3rd period and at the beginning for 4th period, so the students only moved the desk once. In this short dancing all of them were so excited on their feet, they were sweating just like doing a track exercises.

I have tried the dance in Math 1 classes as well which is introduced at the end of Unit 5. Contra Dancing became a fresh review of the transformation lesson. There were more participants in all three Math 1 classes. Students were eager to teach each other and excited to complete the Contra Dancing. And yes, there was plenty of laughter that is refreshing in mathematics class. For this fun and successful learning, I thank you Dr. Garner and GCTM. Please e-mail jenihalimun77@gmail.com if you have questions.

Music: "A Bright May Morning" by Jackie Dunn Maclsaac & Wendy Maclsaac

The links: http://www.youtube.com/watch?v=N1o7tdtHZyE&feature=related
http://www.youtube.com/watch?v=DBvhyVata9I&feature=related

Making Mathematics FUN
Dr. Rock's Math Mystery

by **David Rock**
Columbus State University
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Elementary Brain Teaser

From Last Issue

Bigger Than It Looks?

Albert Newton was examining an angle measuring fourteen and one-half degrees using his magnifying glass that magnifies everything three and one-half times. Look through the glass, how large would that angle measure?

Bigger Than It Looks? Solution:

Fourteen and one-half degrees! The length of the segments making up the angle might increase in size but the measure of the angle will remain the same.

New One!

Leap Frog

A little green frog is sitting at the bottom of the stairs. She wants to get to the tenth step, so she leaps up 2 steps and then back 1. Then she leaps another 2 steps and back 1. How many leaps will she have to take, if she follows this same pattern, till she reaches the tenth step?

Challenge Round

From Last Issue

Counting Sheep

If ten sheep jump over a fence in ten minutes, how many sheep jump over a fence in one hour?

Counting Sheep Solution: 55.

The interval between jumps for 10 sheep in ten minutes is 10/9 of a minute. The intervals between the 1st sheep and the 10th would be 10 divided by 10/9 = 9 intervals for 10 sheep. In 60 minutes 60 divided by 10/9 = 54 intervals in one hour producing 55 sheep in one hour over the fence.

New One!

Alphabetical Polynomial

Simplify the following polynomial:

$(X - A)(X - B)(X - C)(X - D) \ldots (X - Z)$

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Get Out Your Calendars, Day Planners, and PDAs

50th Annual	NCTM Regional	T^3 International Conference
Georgia Mathematics	**Nashville, TN**	**Atlanta, GA**
Conference	**November 18-20, 2009**	**March 5-7, 2010**
Rock Eagle, GA		
October 14-16, 2009		

REFLECTIONS

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