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
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What to Watch For

Mathematics teachers are some of the hardest working people I know, which may make it hard for you to keep up with news related to mathematics teaching and learning. In this *Reflection's* column, I'm going to provide a quick update on recent news that will be useful to you, along with websites so that you can learn more:

- a new National Council of Teachers of Mathematics (NCTM) publication
- the draft release of Common Core Standards
- the release of 2009 NAEP Scores

NCTM's *Focus in High School Mathematics: Reasoning and Sense Making*

This fall, NCTM published Focus in High School Mathematics: Reasoning and Sense Making by the National Council of Teachers of Mathematics. It follows the 2006 publication of *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence.* NCTM describes this new publication as "a conceptual framework to guide the development of future publications and tools related to 9–12 mathematics curriculum and instruction" (http://www.nctm.org/standards/content.aspx?id=23749). Focus in High School Mathematics was written by a team that included high school teachers, mathematics educators, an administrator, mathematicians, and a statistician.

NCTM explains that "reasoning and sense making are simultaneously the purpose for learning mathematics and the most effective means of learning it" (in the FAQ). NCTM plans to publish a series of books highlighting reasoning in major areas of secondary mathematics content: *Reasoning with Statistics and Probability, Reasoning with Algebraic Symbols, Reasoning with Functions, and Reasoning with Geometry.*

Other supporting documents NCTM has made available include an Executive Summary, President's Letter, FAQ, Press Release, Teacher's Guide, Administrator's Guide, Policymaker's Guide, and Family's Guide. You'll find answers to many of your other questions in the NCTM Frequently Asked Questions document.

If you teach grades K-8 and aren't aware of the 2006 NCTM *Curriculum Focal Points* publication, please check it out too. NCTM says that curriculum focal points are "important mathematical topics for each grade level, pre-K–8 . . . [that] can serve as organizing structures for curriculum design and instruction at and across grade levels."

For further information:

Frequently Asked Questions:
http://www.nctm.org/uploadedFiles/Math_Standards/FHSM_FAQs.pdf
Executive Summary:
http://www.nctm.org/uploadedFiles/Math_Standards/FHSM_Executive_Summay.pdf
Teacher's Guide:
http://www.nctm.org/uploadedFiles/Math_Standards/Teacher_Guide_FHSM.pdf
To purchase:
http://www.nctm.org/catalog/product.aspx?ID=13729

Common Core Standards

So far, 48 states and 3 territories have joined the Common State Standards Initiative (CSSI). This initiative is a collaborative effort between the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO), along with Achieve, ACT, and the College Board. Their goal was to adopt a common core set of standards for K-12 in mathematics and English-language arts.

What is the rationale for this common curriculum? "To maintain America's competitive edge, we need all of our students to be well prepared and ready to compete with not only their American peers, but with students from around the world. These common standards will be a critical first step to bring about real and meaningful transformation of our education system to benefit all students" (from the FAQ).

Georgia was represented on the Standards Development Work Group, the group that wrote the standards, by Dr. Sybilla Beckmann of the University of Georgia. A Feedback Group will use research to review and provide input on draft documents. As each state decides how to use these standards, the Validation Committee will check to ensure they are faithfully implementing these standards. Georgia is represented on the Validation Committee by Dr. Jeremy Kilpatrick of the University of Georgia.

In September 2009, the CSSI released a draft of these standards for feedback, which was due in October 2009. Watch for the release of the final version in early 2010.

For further information:

Common Core Standards:
http://www.corestandards.org/Standards/index.htm
Frequently Asked Questions:
http://www.corestandards.org/Files/CoreFAQ.pdf

Executive Summary:
http://www.corestandards.org/Files/CCSSIOne-Page.pdf

National Assessment of Educational Progress (NAEP)

The NAEP is a national assessment of U.S. students in mathematics, reading, science, writing, the arts, civics, economics, geography, and U.S. history. The NAEP is given to representative samples of students at three grade levels: 4, 8, and 12 and is administered by the National Center for Education Statistics in the U.S. Department of Education. Versions of the NAEP have been given since the 1970s. The two goals of the NAEP program are to compare students in different states in their academic achievement and to track trends in academic achievement over time.

What's new? This fall NAEP released scores from the 2009 assessment of 4th and 8th grade students. Georgia was one of only 14 states whose 8th graders showed statistically significant improvement. Nationally, 8th grade scores improved and 4th grade scores stayed the same. Georgia's 4th grade scores increased by 1 point, but that wasn't a statistically significant increase.

What sort of items are on the NAEP? Here's a sample 8th grade item:

For a school report, Luke contacted a car dealership to collect data on recent sales. He asked, "What color do buyers choose most often for their car?" White was the response. What statistical measure does the response "white" represent?

1) Mean 2) Median 3) Mode
4) Range 5) Interquartile range

Here's a sample 4th grade item:

$2 + n$	5
$3 + n$	6
$4 + n$	7
$5 + n$	8

What number does n represent in the table?
1) 2 2) 3 3) 4 4) 5

For further information:

Main website:
http://nces.ed.gov/nationsreportcard/
Graphic representations of data:
http://nationsreportcard.gov/math_2009/gr4_state.asp and
http://nationsreportcard.gov/math_2009/gr8_state.asp
Results from 2009 Math NAEP:
http://nationsreportcard.gov/math_2009/
Sample items:
http://nationsreportcard.gov/math_2009/sample_quest.asp

What do these three events mean for mathematics education in Georgia? All three are encouraging. The Common Core Standards Initiative shows that Georgia was ahead of the game in establishing world-class standards for our schools. The increase in NAEP scores at the 8th grade level shows what an improvement the Georgia Performance Standards (GPS) are over our previous Quality Core Curriculum. The NCTM *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence (2006) and Focus in High School Mathematics: Reasoning and Sense Making* (2009) both align nicely with our GPS curriculum, which really makes sense because the NCTM standards underpin all three.

Wishing you all the best in 2010!

Executive Director's Report

by Becky King
Executive Director
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Performance Learning Unit Credit

Have you completed your PLU credit that you began at the Georgia Mathematics Conference in October? If you attended at least 10 hours of sessions at the October 2009 conference at Rock Eagle. The PLU Course Completion Form was due December 31, 2009. Here is a review of Steps 7-9 for PLU credit.

STEP 7: Return to your school or workplace and begin to implement some of the strategies or ideas that you learned at the conference. You must do both of the following:

1. Schedule a "sharing" session to share strategies and ideas that you learned at the conference. This session should be appropriate to your responsibilities in your workplace.
2. Schedule a "classroom observation" or "model teaching session" that demonstrates strategies or ideas learned at the conference. Someone authorized to make this observation should conduct this observation and he/she must verify its quality. This person must sign the PLU Course Completion form.

STEP 8: Following the completion of the sharing session and the classroom observation, the participant is responsible for returning the signed completion form (signed by the system-designated person i.e., Principal, Supervisor, etc.) to the Georgia Council of Teachers of Mathematics (GCTM).

The PLU Course Completion Form were due December 31, 2009.

STEP 9: Completed verification of your PLU credit will be returned to you. It is your responsibility to send this PLU credit form to your accrediting agency when needed.

GCTM will match and verify that all activities and artifacts (prior approval form, training and completion forms) are received and in order. GCTM will return a certified course completion form to the participant. It is the participant's responsibility to submit the final documentation to the certifying agency.

For additional information contact Becky King. bwking@comcast.net.

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Membership Report

by Susan Craig
Membership Director
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2900+ Members Celebrate 50 years of GCTM!

I hope you joined us for the gala celebration at Rock Eagle, of our 50th anniversary. Georgia Council of Teachers of Mathematics has been a growing and influential organization for half a century and is poised to continue working to improve mathematics education for Georgia's students and teachers. Membership stands at about 2900 members as we begin a new decade!

If you are a new member of GCTM we hope you make your membership an annual commitment for your entire career. It will be one of the most important ones you make as a teacher!

For your information and as a reminder to our renewing members please note the following membership items:

- Your membership dues were included in your conference registration, unless you were a speaker or board member. Those members need to renew at the website.
- We are finally getting our online membership stabilized. You can help by always checking for a current record of your membership before you add a new record. Some members have entered 4 records with 3 or more addresses.
- If you receive duplicates of mailings from GCTM, please go to the membership website and edit your record(s), or inform membership at secddc@aol.com and it will be corrected for you.
- If you move, please notify us of your new address. Bulk mailings are not always forwarded.
- We urge you to encourage your colleagues to renew their membership or to become a new member of GCTM. Each year we have many members who are not able to attend the conference and then become lapsed members.

Please contact me any time by email or phone if I can assist you with membership issues. Make it a great year!

Susan Craig
706-733-4368
secddc@aol.com

2009 GCTM Awards

Gladys M. Thomason Award

Patti Barrett
Retired

John Neff Award

Ellice Martin
Valdosta State University
Valdosta, GA

Excellence for Teaching in Elementary Mathematics

Jane Hannon
LaFayette Education Center
Fayette County, GA

2009 GCTM Awards

GCTM NEWS

Excellence for Teaching in Middle School Mathematics

Pamela How
South Central Middle School
Barrow County, GA

Excellence for Teaching in Secondary Mathematics

Debbie Kohler
Sequoyah High School
Cherokee County, GA

Teacher of Promise Award

Neomi McLendon
Glynn County

2009 GCTM Awards

Mini-Grant Award

Lorrie Bearden
Milton High School
Fulton County, GA

Sections Model: The grant is being used to purchase wooden conic section models to illustrate how parabolas, circles, hyperbolas, and ellipses are created from slicing a cone. Students will be able to discover key vocabulary and relationships using the slices of the wooden cone model.

Call for Manuscripts

Topics:

GPS implementation manuscripts are needed. For example, instructional strategies to teach GPS, GPS implementation issues, working with special populations in a GPS environment and sample student task solutions are some of the ideas of interest.

Teaching Tips Ideas:

Share with your fellow teachers a pearl of instruction or assessment wisdom you have used in your classroom. Topics include how to design and implement effective warm-ups, strategies for implementing journal writing, etc. Manuscripts published in this section are typically one page in length.

NCTM Releases New High School Publications

NCTM has released a publication focusing on the teaching of high school mathematics. *Focus in High School Mathematics: Reasoning and Sense Making* emphasizes teaching for understanding and critical decision making.

To provide teachers with the necessary tools to apply the new approach in their individual disciplines, NCTM is releasing three additional publications focusing on reasoning and sense making in specific content areas. These ancillary publications are Focus in High School Mathematics: Algebra, Focus in High School Mathematics: Geometry, and Focus in High School Mathematics: Statistics and Probability.

For more information, go to http://www.nctm.org/catalog/content.aspx?id=23485

GCTM Mission Statement

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.

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.

The Georgia Council of Teachers of Mathematics supports and encourages donations to the Georgia Mathematics Education Trust.

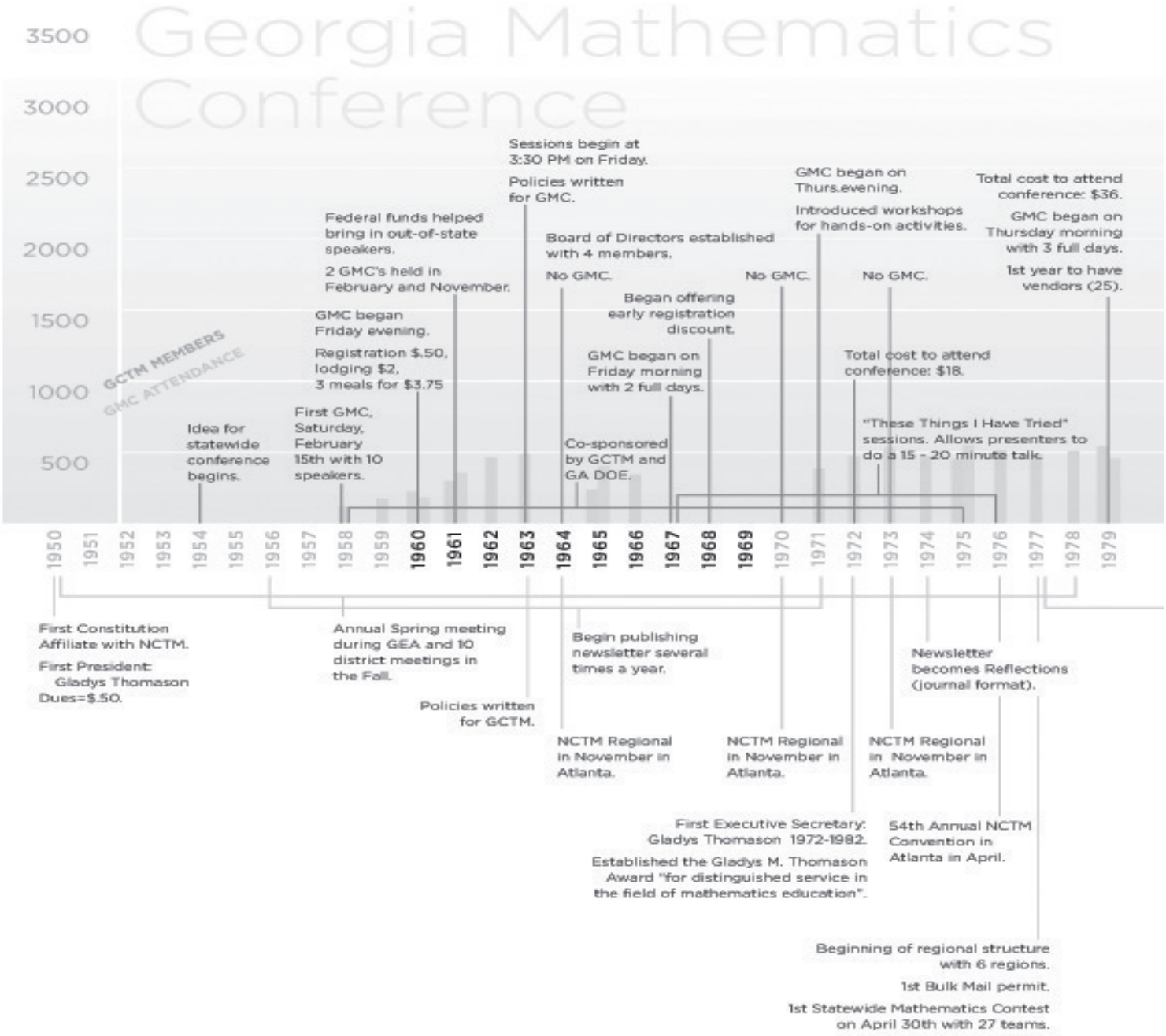
Celebrating Our 50th Annual Conference

The Georgia Mathematics Conference was a great success. Conference sessions were full of enthusiastic participants. Keynote speakers challenged conference participants to further their dedication to implementing a hands-on curriculum in their classrooms. Technology sessions were abundant. Hands-on strategies to teach content were numerous. Entertainment options were available each evening of the conference. All left reinvigorated to teach the Georgia Performance Standards to their students. The 50th Annual Conference will be one to remember and not only for the weather but for all the fun and collegiality. We all look forward to another 50 conferences and want to see everyone at Conference 2010!

Conference 2009

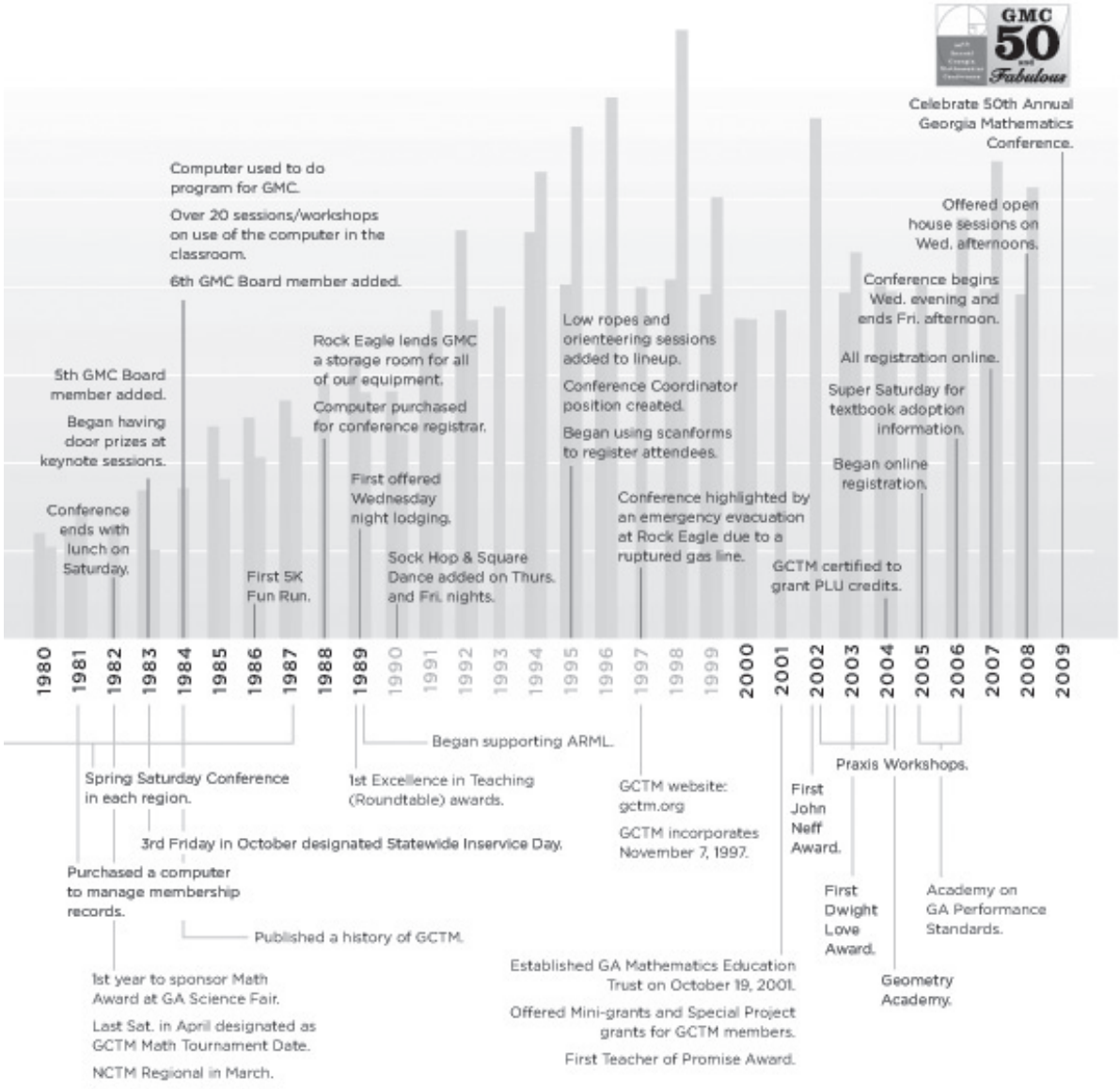
GCTM NEWS

Georgia Mathematics



Conference Timeline

GCTM NEWS



Teaching Tip

by **Chuck Garner, Ph.D.**
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The Classroom Average

One day a few years ago, I had some time on my hands so I decided to surf the world wide web. Always in the lookout for new ideas to improve my teaching of calculus, I began searching for calculus-related websites. It was then that I stumbled across Dan Kennedy's website. Dan is a calculus and algebra teacher at the Baylor School in Chattanooga, Tennessee. (He also happens to be the "Kennedy" in the popular calculus textbook by Finney, Demana, Waits, and Kennedy.)

I was amused to read his posted expectations for his math classes as well as an interesting grading system. The grading system rewards collaboration unlike any other I have ever seen. I was so intrigued by this grading method that I introduced it in my own classroom. Let me tell you about this grading system, and how its implementation has affected my classroom.

This grading system relies on the class average. The class average is, as you would expect, the average of the students' grades in the class. However, it is also partially a subjective measurement based on the teacher's opinion of how well the class as a whole is progressing. Dan puts it this way:

> *"I will be evaluating how well you and your classmates work together through personal observation over the course of the semester. How well do you work together with others in groups? (This is the "collaboration" part.) How involved are you in class discussions? How well can you ask a question when you don't understand, and how well can you explain it to others when you do understand? Do you come for extra help when you need it? Does your attitude help the class or hinder it? Is the class being dragged down by its lowest components, or being elevated by its highest components? Does the class work well together mathematically, or do some students resist work to the point of impeding the efforts of others? Does the class welcome challenges, or seek the path of least resistance? Am I the coach, or am I the enemy? Is it me against you or US against ignorance?"*

Thus, the class average is a reflection of how well the class is collaborating to learn mathematics. Collaboration is the key: students should be helping and encouraging each other. In other words, the class should be working together to ensure that everyone has the opportunity to learn mathematics. With such an attitude, understanding and learning happens for everyone so the homework will be more easily done and other grades will rise. This is reflected in the class average.

The class average affects students' grades in the following way: all tests are curved to the class average. Here is how this is done. Say a class of 30 students, which currently has a class average of 88, takes a test. Grading on a raw scale out of 100, the average raw score is found to be 77. The test caught some students unprepared (for some reason, academic or otherwise), but some did well, and everyone is attempting the right kind of mathematics. Let's say the highest raw score in the class is 92. Now, the highest raw score would have been even higher if not for some careless mistakes, so I decide to curve this to a 98. With the class average, I now have two ordered pairs with which I can curve everyone's raw score in a fair and objective manner: (raw high score, curved high score) and (raw test average, class average).

Using the numbers above, I have the ordered pair (92, 98) and (77, 88). The equation of the line that passes through these points is used to curve everyone's raw score. Notice that according to this curve, a raw score of 20 curves to a 50, a raw score of 50 curves to a 70, and a raw score of 80 curves to 90. The overall effect of this "linear curve" is that is increases the mean and decreases the standard deviation. This still results in a clear comparison of students among students and those that make A's still make A's. A student that fails may still get a failing test grade, but that student will be in a position to believe a comeback is possible, and that student is still responsible to continue trying.

The class average becomes critical when computing the curved test scores. If the class average for the above example was 83 rather than 88, and we leave everything else the same, then the raw score of 20 curves to a 26, a raw score of 50 curves to a 56, and a raw score of 80 curves to 86.

A class is that has overcome the lowest elements that may drag it down and been elevated by the higher elements (i.e., collaborating), is rewarded. Such a class, for the purposes of curving the test, may receive an extra point or two on the class average. This is critical: the class average must move slowly so that all students continue to strive. Awarding an extra five points to the class average would skew the test grades too much. Again, suppose everything in the above example is the same except that the class average is 93 rather than 88. Then a raw score of 20 scales to a curved score of 74.

If a test is especially difficult for a class, then they are protected by the fact that the class average moves sluggishly: say from 85 down to 83. I can understand how an 85 class might become an 83 class in the few weeks between tests, but how could they suddenly plunge to 78 unless one of the assessments was a poor indicator of progress?

This is the basic description of Dan's procedure. I was fascinated by the implications. We all want students to collaborate in a positive manner, but "group work" is where most of the graded collaboration takes place. However, this method stresses that *every aspect* of learning is collaborative, that each student is, in some manner, responsible for everyone's grade.

When I implemented this method in my classroom, I was surprised to find my students didn't seem to care. Until the first test. You see, it was when they saw what affect the class average has on their test grades that they began to really buy into it. Those that didn't do homework were suddenly being "gently reminded" by classmates to do homework, relieving me of nagging those students. Students began to keep each other awake during class, study groups were formed, notes were shared, and students began supporting each other's comments during class discussions. And, their grades on homework, quizzes, and other assessments increased, which of course means that the class average increased, and then the test grades increased.

Another interesting effect is that I now can ask anything I want on a test. I now create some fiendishly difficult tests. But the students are protected by the curve. This means I can challenge them without fear of students' failing, and they can be pushed to really show me what they know without fear of failing. I have noticed a decrease in test anxiety in those that normally exhibit such anxiety, and I have noticed a willingness in most to continue to figure out the problems after the test is over. Tests in my classroom have become, in the attitudes of the students, a "Show him what I can do" assessment, rather than a "He's daring me to get all of these right" assessment.

I currently teach two sections of precalculus, one first period and one sixth period. The first period class has a couple of slackers in it who have consistently not done homework for the three weeks leading up to the test. There are also a few very smart and very hard-working students in that class who maintain good grades. Unfortunately, first period also includes a majority of students not interested in getting each other working and collaborating. This is showing in the class average: had the group encouraged the slackers to do homework, the slackers' grades would be better, corresponding in an increase of the class average. First period's class average currently stands at 79, and even the smart, hard-working students cannot raise the lower elements of the class.

The sixth period class on the other hand has no one that fails to turn in homework. They have formed study groups, they encourage each other, and they help keep each other on track. There are no "geniuses" in that class, but their class average is an 85. By encouraging each other, they are learning more and performing better on all assessments.

I gave a different test to each class, but each test was at the same level of difficulty (i.e., both were insanely difficult). The raw test average was similar for both classes, but the grades were very different. The grades in the first period class were curved much lower than sixth period due to their respective class averages. The smart, hard-working students from first period managed very high raw scores which curved to the low 90s. Conversely, the highest raw score in the sixth period class didn't come close to the highest raw score in first period, but due to sixth period's class average of 85, the highest raw score scaled to the mid 90s. A similar effect occurs on the low end as well. The lowest raw score in the sixth period class ended up with a higher scaled test grade than the lowest raw score in the first period class.

By curving test grades to the class average, I believe Dan Kennedy has created a wonderful method. This is an objective curve that reflects abilities and encourages collaboration. This frees the teacher from makes tests that are too easy so that "everyone has a chance of passing" and instead lets the teacher create an assessment that pushes the students a little more. But most importantly, this is a curve that the students themselves control.

If you would like a copy of one of my precalculus tests to see just how difficult it really is, or if you would like more information about the curve, please contact me. Better yet, search for Dan Kennedy's website and read the original!

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Assumptions and Possibilities: A Task from Grade 8 Mathematics

A major role of mathematics teachers is to engage students in mathematical activities so that they can achieve learning goals. Mathematical tasks should be carefully selected or designed by teachers because meaningful tasks can promote mathematical reasoning and make connections across mathematics ideas (National Council of Teachers of Mathematics [NCTM], 1991), but it takes more than design quality to make a mathematical task worthwhile. Students' problem-solving strategies can be affected and prompted by the way teachers' introduce and explain the problem, a work of teaching called problem-posing (Brown & Walter, 2005).

Furthermore, many studies stress that mathematical tasks should be grounded in real-world applications. Such tasks may motivate students to learn (and help them understand) mathematical concepts (NCTM, 2000). When teachers pose real-world mathematical tasks in their classroom, their students must navigate the complex terrain of the problem's assumptions. Some of these assumptions are explicit, but others are not stated. Some assumptions radically alter the set of viable problem-solving strategies, whereas others have little impact on how one can approach the solution. Usually assumptions tell problem solvers that they can ignore some of the potentially relevant data that would be present in the real-world situation. For example, in physics we ignore the friction due to air resistance, our experience with Ping-Pong balls and feathers notwithstanding. Test and textbook authors frequently write math problems and expect the students who solve them to assume the improbable or impossible: trains and cars that travel at constant speeds, walls with no thickness, and containers with no weight.

However, there are at least two good reasons for making assumptions when posing a mathematical task. A real-world task involves a mathematical model of a far more complex reality, so the first good reason for assumptions is that they can make the problem tractable, that is, simple enough so that students are able to solve it in a reasonable amount of time with a reasonable amount of effort. In addition, it is often the case that more than one model can reasonably describe a real-world situation. These models might vary in complexity (the simplest models make the greatest assumptions in scope and number), but they also vary with respect to the mathematical ideas they use. A second good reason that teachers make assumptions is to achieve their goals of instruction and student learning about particular mathematical ideas.

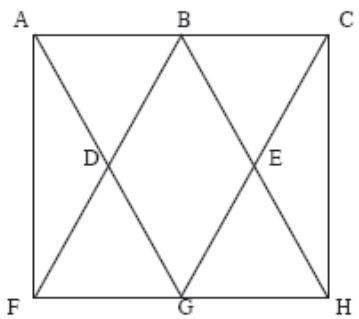
Imagine, for example, that the real-world situation is commuter traffic and students are provided with vehicle occupancy counts or alternatively they are given the average vehicle occupancy. In the first case, the number of commuters can be found by *summing* the data points; however, in the second case, the assumption of a known average allows the number of commuters to be related to the number of vehicles multiplicatively. The teacher's decisions in posing tasks are therefore pedagogical—different assumptions lead to different mathematical models, and these models entail different mathematics. If the teacher's instructional goal is practicing addition, then the assumption of a known average in this situation is not justified even though it leads to an appropriate mathematical model of the situation.

Indeed, the activity of making assumptions about a complex real-world situation that allows you to create and use mathematical models is important mathematical work in its own right and is work that students should learn to do. Discussing the assumptions a problem makes about a real-world situation will help students understand the mathematical model and prepare them to make mathematical models independently. Teachers could lead this discussion when they introduce the problem by asking students what the assumptions are and why they are important for the model. Alternate assumptions might be suggested and explored.

In the rest of this article, we discuss the explicit and implicit assumptions in an 8th-grade GPS task provided by the Georgia Department of Education. We hope that the reader will uncover the role of assumptions in making this problem (1) tractable and (2) useful for students who are learning 8th-grade mathematics. We also discuss the role of alternative assumptions in the teacher's work of problem posing, inviting the reader to explore the mathematical and pedagogical consequences of different assumptions.

We selected the task "Window Pain" in the Georgia Performance Standards Framework for Grade 8 Mathematics,

Unit Six "Traversing Congruency" (GADOE, 2007). The first part of the task is summarized below; please visit https://www.georgiastandards.org/Frameworks/Pages/BrowseFrameworks/math6-8.aspx to see the original task.



Window Pain Task: Your best friend has to replace a broken window. The window is rectangular and has seven panes and looks like the diagram at the right. The window company needs only the measurements of ∠BAD (60°), ∠BCE (60°), and $\overline{AG}$ (28 inches), and they said it would cost $20 per square foot to replace. Give a detailed explanation about how to find every angle measure and every edge length for each glass pane. Explain how to compute the total cost.

$AF^2 + FG^2 = AG^2$

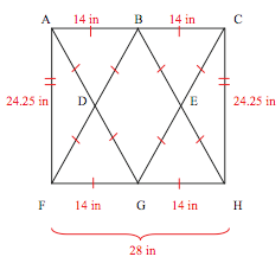
$AF^2 + 14^2 = 28^2$ *by substitution*

$AF^2 + 196 = 784$ *by squaring*

$AF^2 = 588$ *subtracting 196 from both sides of the equation*

$\sqrt{AF}^2 = \sqrt{588}$ *taking the square root of each side of the equation*

$AF \approx 24.25in$



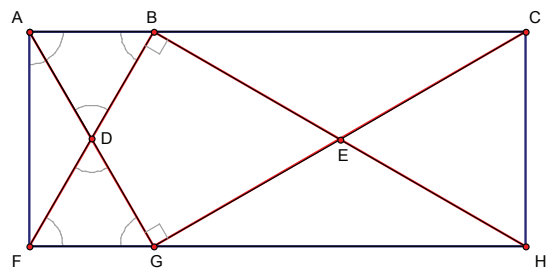
The solution provided in the Frameworks entails the use of several facts about triangles and transversals of parallel lines to find all the angle measurements in the diagram. To find the side lengths, the authors suggest that students might use facts about equilateral triangles and the Pythagorean Theorem. The area formula and a conversion from square inches to square feet are recommended to find the total cost.

The solution provided for the first problem in the first part of the task, which consists in finding all the measurements, is based on an unstated assumption that $\overline{FB}$ is parallel to $\overline{GC}$ or $\overline{AG}$ is parallel to $\overline{BH}$ or equivalently that the diagram is symmetric. Without that assumed condition, the measures of the angles and segments cannot be found, because we do not know for sure if the point B is the midpoint of AC or if the angles ∠AFB, ∠BFG, ∠BHG and ∠BHC are congruent to ∠BAD and ∠BCE.

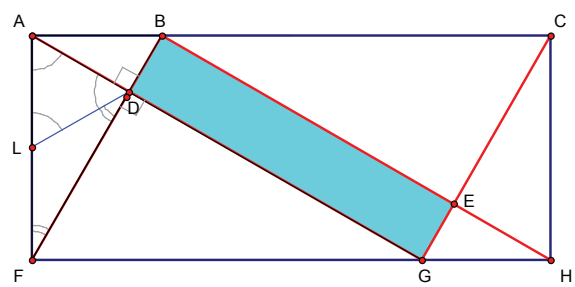
Making explicit all the conditions of mathematical tasks in classroom mathematical activities is important because if students do not understand the hidden assumptions, they may end up trying to solve a different problem that is too hard or not mathematically on topic. In light of the importance of assumptions, revising the assumptions of a given problem can prompt students' creative and diverse mathematical thinking as they generating a "new" problem (Kojima & Miwa, 2008). Posing new problems generated by modifying assumptions is closely related to the process of solving problems described by Brown and Walter (2005). By asking the questions "What-if?" or "What-if-not?" new problems can be generated from the original problem.

For example, we can pose new problems from the "Window Pain" task by asking the following "What-if-not" or "What-if" questions:

What if the figure is *not* symmetric about the line DE?



What if BDGE is a rectangle?



The reader may find it interesting to explore whether these new versions, obtained from the original task by modifying one of the implicit assumptions, are tractable and whether they would be useful for 8th graders to explore. What mathematical ideas, if any, are relevant to these new problems that were not relevant to the original problem?

Before teachers pose a real-world mathematical task, it may be helpful to ask themselves some of the following questions. Who are the students—will they understand the real-world situation and the implicit assumptions of the problem? Do the assumptions focus the problem on mathematics that is important for the students? Can they be productively involved in the process of making assumptions about the situation?

Identifying and making explicit the assumptions in a real-world problem is a mathematical activity for anyone solving

the problem. Teachers should be aware of the assumptions they have in mind when posing a problem, and students might benefit from the experience of exploring the different versions of a problem that result from changing assumptions. Some students who struggle to solve real-world problems may have difficulty uncovering the implicit assumptions in a task and therefore work on the task in much harder (or even impossible) ways. Making implicit assumptions explicit is one way to scaffold real-world problems, but even better is teaching students how to do this mathematical work for themselves.

References

Brown, S. I., & Walter, M. I. (2005). *The art of problem posing* (3rd ed.). Mahwah, NJ: Erlbaum.

Freudenthal, J. (1973). *Mathematics as an educational task.* Dordrecht, Netherlands: Reidel.

Kojima, K., & Miwa, K. (2008). A system that facilitates diverse thinking in problem posing. *International Journal of Artificial Intelligence in Education*, 18(3), 209–236.

National Council of Teachers of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics.* Reston, VA: Author.

National Council of Teacher of Mathematics. (1991). *Professional Standards for Teaching Mathematics. Reston*, VA: Author.

National Council of Teacher of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston, VA: Author.

Polya, G. (1954). *Mathematics and plausible reasoning*. Princeton, NJ: Princeton University Press.

Silver, E. A., Mamona-Downs, J., Leung, S. S., & Kenney, P. A. (1996). Posing mathematical problems: An exploratory study. *Journal for Research in Mathematics Education*, 27(3), 293–309.

Reflections Purpose

Reflections, an official publication of the Georgia Council of Teachers of Mathematics, serves as a resource to inform the membership of Council activities and provide resources to enhance the teaching and learning of mathematics in Georgia.

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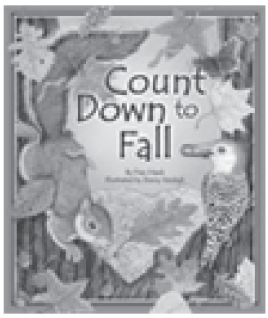
Judy's Bookshelf



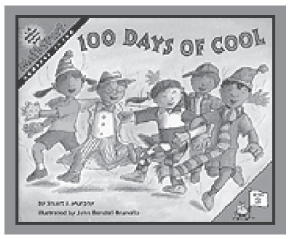
I started looking around for some new books to share with you and came across some new ones and some older ones that I still think are worth sharing . This first book is a new one that I think is very appropriate for this time of the year. This book is really a great book for Math and Science. The book, ***Count Down to Fall*** by Fran Hawk and illustrated by Sherry Neidigh is published by Sylvan Dell Publishing Co. (2009). This book is beautiful. The illustrations are going to draw every child in to learn more. The book introduces counting backwards from ten to one in delightful rhyming verses. But the book goes beyond counting backwards as it shows children different trees, their leaves and seeds in the border of each two-page spread. And the illustrations also include woodland animals for identification. The back of the book offers teachers and parents material for expanding the science learning. Teachers, you can't go wrong with this book in your library.

What's New At the Zoo? by Suzanne Slade and illustrated by Joan Waites (Sylvan Dell Publishing, 2009) is about animals, but these are in the zoo. This animal adventure deals with addition. "Two hungry pandas eat a bamboo lunch. One cub joins the meal. How many munch and crunch?" As you can see the book is written in rhyme with charming illustrations of zoo animals and their babies. In the back of the book there are lessons for addition including fact families for students to complete. This would be a great book for students to use as a springboard to write their own fact family books that they illustrate. They could make 4 page flip books with one fact per page, giving them space to add their illustrations.

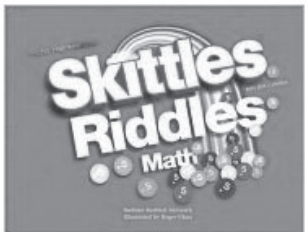
There is also two pages on animals and their babies, looking at the names of baby animals along with a few interesting facts about them. This book is another one that would be a good one for your class library, whether you are learning fact families or zoo animals and their babies.

If you are familiar with *One Odd Day and My Even Day* from Sylvan Dell then you will love this book as well. ***My Half Day*** by Doris Fisher and Dani Sneed (2008) is the hilarious story of a young boy that awakens to find he only has half a head of hair. The day continues as he drinks a glass of milk that is two-thirds gooey paste. The book just gets funnier as he goes to camp for the day and encounters more fraction fun and a soccer game that is out of this world. The illustrations keep children's interest as they search the pages for more oddities in the story. The story includes common fractions such as one-half but also fractions such as four-ninths, three-sixteenths, etc. This book will appeal to all elementary students that are learning about fractions. This story would also be a great one for students to springboard from and write their own *My Half Day adventure.* As in the other books from Sylvan Dell, there are lessons, information and activities in the back of the book. They also have more activities on their website, www.sylvandellpublishing.com along with Accelerated Reader, Lexile, and Reading Counts levels.

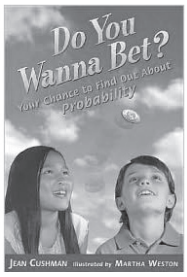
Are you trying to teach your students tally marks? Well, here's a book that you need. It's Stuart J. Murphy's book, ***Tally O'Malley*** from his MathStart series, HarperCollins, (2004) This is a Level 1 book for your youngest primary children. The story sees a family heading to the beach and of course the kids are restless. Mom gets them busy tallying various things like cars they pass. The tally game continues at the beach tallying T-shirts and more. This story can be followed up with a walk around the school to tally (doors, windows, teachers, tables, bulletin boards, and more). Go outside and tally cars and trucks, trees, and bushes. So for the little ones, this is a good book to introduce them to tally marks and have some fun. Older students can use this book to introduce graphing using tally marks.



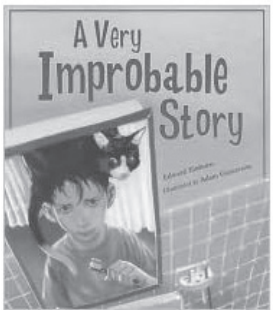
It will be time for the 100th day of school before you know it. Stuart Murphy has a book entitled ***100 Days of Cool*** (HarperCollins, 2003). The class celebrates this occasion with all sorts of activities. The book is lots of fun and will be a perfect introduction to the 100th day of school in your class or school. As a class project, have them work as a group and create a list of 100 things they have learned this year. Or let them make a list of 100 things they like about school. First or second graders could see how many addition problems they can list that add up to 100.



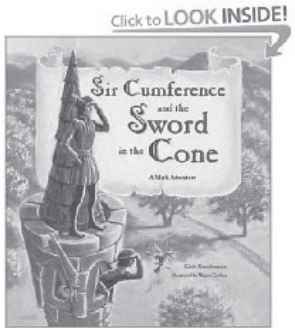
Skittles Riddles Math written by Barbara McGrath (Charlesbridge, 2000) is a book that looks at fractions using Skittles for the lesson. After you read the book to the class once, go back and re-read letting students use their Skittles to follow along. When you finish the lesson, let them eat the lesson's manipulatives. If you have concerns about giving them candy, substitute Fruit Loops for Skittles. And if eating is out, you can use color tiles or cubes for the lesson. Just remember, you will need five different colors to represent the Skittles, but it can be done and it's still fun.



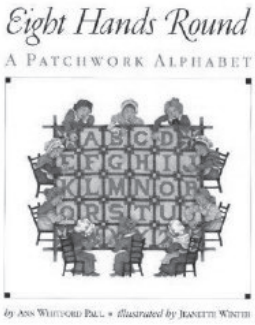
Now it seems that most of my books have been focused toward the lower grades. While looking through my collection I ran across an older book that I've forgotten about. And if you are teaching probability, you will want to check your library for ***Do You Wanna Bet?*** By Jean Cushman (Clarion Books). This book involves two students that learn that chance plays a very important part in their lives. They learn about probability in coin tosses, birthday parties, weather forecasts, baseball statistics, playing cards, and baby sisters. This 112 page book helps students see just how often probability effects their lives. Follow up activities include giving students a list of 12 sentences and having them decide the probability that those 12 things can or cannot occur. This is also a good time to use spinners to determine probability. Let students create their own list of sentences and swap with classmates. Let them sort them by things that are sure to happen, things likely to happen, things unlikely to happen and things that cannot happen. Make it a game and have students create a sentence that fits the criteria you call. Also, have the class generate a chart showing how things would probability effects their life.



For younger students working on probability, try ***A Very Improbable Story*** by Edward Einhorn. (Charlesbridge 2008) In this story Ethan wakes up with a talking cat on his head that refuses to move until Ethan wins a game of probability. Ethan discovers that this is not as easy as he thinks but keeps trying. It's a delightful story that demonstrates a skill that some children have trouble understanding. Check it out!



Looking for a book that supplements or introduces Geometry??? Check out Cindy Neuschwander's ***Sir Cumference and the Sword in the Cone*** (Charlesbridge 2005). This book in Cindy's series, the story opens with the king looking for an heir. To do this, the five knights competing must solve a puzzle. With characters like Vertex, Radius, and carpenters named Sym of Metry and Geo they use the clues to look for a place named Edgecalibur. If you are teaching geometric solids, start with this book.



Another book on geometric shapes that children will like is ***Eight Hands Round*** by Ann Whitford Paul (HarperCollins, 1991). While this is an alphabet book, it's an alphabet book for older students because each letter represents a quilt design. There's some history in the book as the history for each quilt pattern design is discussed. Students can see the pattern, look at the shapes in the design and then create their own. The book is interesting, colorful and an interesting way to discuss shapes and tessellations. Let each student create their own 8 x 8 inch square, then put them together to make a class quilt. Let them name the pattern they created if it's an original design.

Whatever skill or concept you are teaching in math remember that a good book will help put the skill into real life terms that shows children why learning this may be important to them. Everyone learns better when they know why they are learning it and how they will use it.

Books often help develop mathematical vocabulary for students. This is critical if they are to communicate mathematically. Use word walls, vocabulary charts, student made word books or whatever to help them master the math vocabulary they need.

Until next time keep reading that math!

by **Jeni Halimun**
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Contra Dancing: From Rock Eagle to My Classroom

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


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Making Mathematics FUN
Dr. Rock's Math Mystery

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

From Last Issue

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?

Leap Frog Solution: 26
The problem asked you to find out how many leaps til she reaches the tenth step, not remains on the tenth step. After 3 leaps she is on step 1. After 3 more leaps (total of 6 leaps) step 2. After 9 leaps, step 3. After 12 leaps, step 4. After 15 leaps, step 5. After 18 leaps, step 6. After 21 leaps, step 7. After 24 leaps, step 8. But on leap 25 she gets to step 9 and on leap 26 she gets to step 10 (even though she will go back after leap 27).

New One!

My House

My house has a number.

1) If my house number is a multiple of three, then it is a number from 50 through 59.

2) If my house number is not a multiple of 4, then it is a number from 60 through 69.

3) If my house number is not a multiple of 6, then it is a number from 70 through 79.

What is my house number?

Challenge Round

From Last Issue

Alphabetical Polynomial

Simplify the following polynomial:

(X A)(X B)(X C)(X D) . . . (X Z)

Counting Sheep Solution: 0

If you write out each binomial you find that the third to last one is (X X) which would be zero causing the entire expression to be zero.

New One!

Two, Three, Five

One is the smallest nonzero integer that is a perfect square, cube, and fifth power. What is the next smallest integer with this same unique property?

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