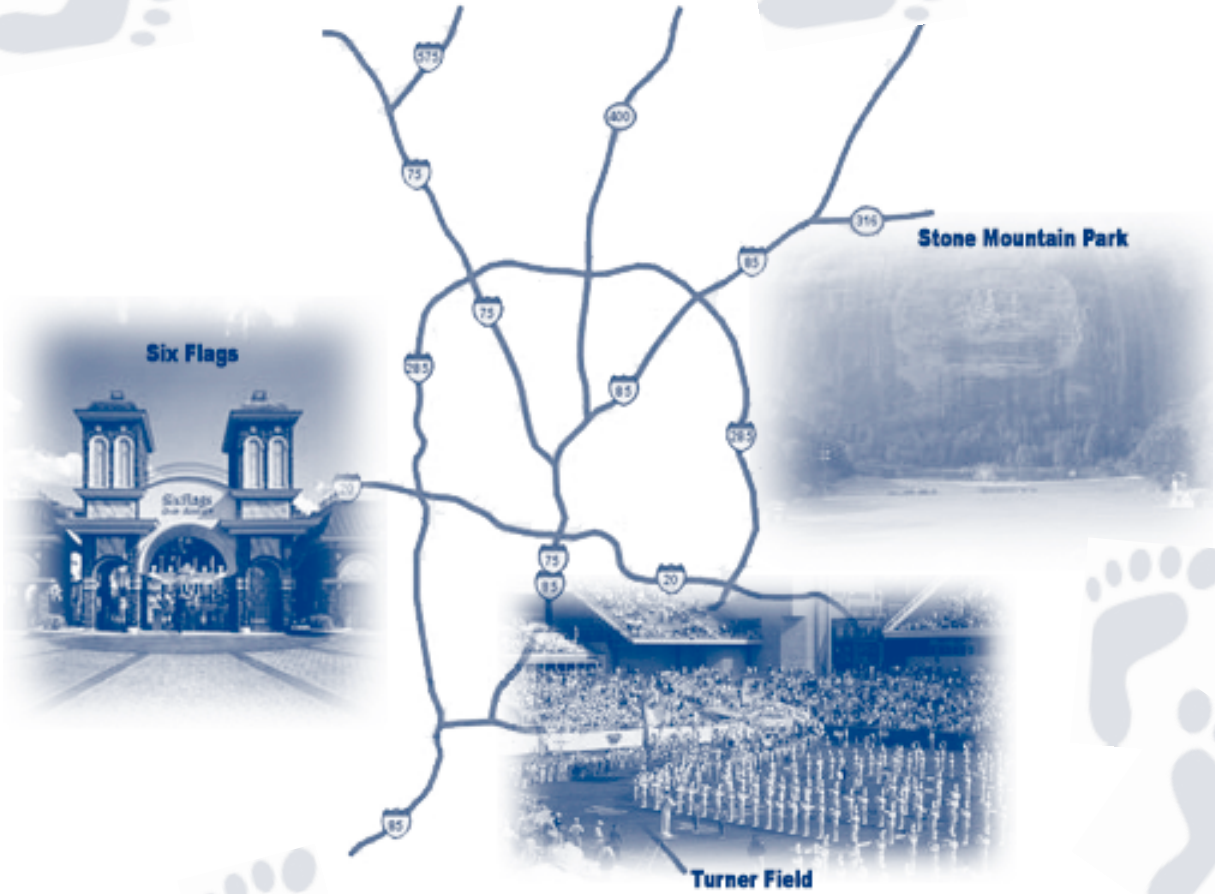
GEORGIA COUNCIL of TEACHERS of MATHEMATICS
GCTM

REFLECTIONS

Vol. LI No. 2 Spring 2005

Trekking Around Atlanta



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REFLECTIONS

Vol. LI No. 2 Spring 2005

SPECIAL REFLECTIONS

REGULAR REFLECTIONS

Writers Needed

The *Reflections* staff is seeking articles on issues of interest to teachers of mathematics in Georgia.

Please submit your article electronically in Microsoft Word, including your name, title, email address, school, and a phone number where you can be reached. Include works cited at the end of your article, as well as any recommended Web sites and readings.

Manuscripts related to upcoming themes will be given priority, but articles on any facet of mathematics education will be considered.

High-resolution electronic phototographs (jpeg or tiff), original artwork, or examples of student work to accompany articles would also be welcomed. If submitting student work or pictures of students, be sure to include a statement that permission for publication from the students and their parents is on file at the school.

Still Learning

President's Desk

by
Dottie Whitlow
GCTM President

I am still learning" is a quote attributed to Michelangelo when he was 87 years old. These words graced a huge banner at last year's Georgia Mathematics Conference and many of you who attended the conference signed it in agreement. I did too.

During my talk at the conference, "Lessons from a Learner," I invited you to think about your own learning. Many of you shared the names and wonderful stories of people that you have learned from and continue to learn from. I'd like us to continue this conversation about our professional learning.

There are many ways and avenues to participate in professional learning and the times are certainly ripe for encouraging us to do just that. We were introduced to the new Georgia Performance Standards last fall and those standards have begun their rollout. As you know, during this school year, 6th grade teachers were invited to begin learning about the 6th grade GPS and they will be the real deal with the coming year. The rollout of math GPS continues during the coming year with teachers in grades K-2 and 7 taking their turn to acquaint themselves with their new standards. The following year completes the elementary and middle school rollout of the mathematics GPS with grades 3-5 and 8.

So what needs to be on our agenda for professional learning surrounding the new GPS? There are several possibilities, but a couple of key areas include a greater focus on geometry and the use of multiple representations of mathematics.

Geometry is an area of weakness for students across the nation. The evidence of this weakness is seen in the Third International Math and Science Study (TIMSS, now Trends instead of Third). Geometry and measurement were obvious areas of need. But one doesn't need to look at international studies for this; most of us can look at the test results for our school and even our class. While looking at those results, also try checking out the chapter where geometry occurs in your textbook. It's usually late; chapter 9, 12 or 14. It's an area that many teachers just don't "get to." In order to help with this, GCTM is offering a second annual Geometry Academy this summer.

The summer Geometry Academy is a unique opportunity for professional learning. This year our Academy will focus on the geometry of grades K-2, 7 and high school geometry, integrated with other math concepts. You can become acquainted with the concepts and pedagogy for mastery of the GPS and then have the school year to try things out and refine them.

There are many other avenues for professional learning. Think of setting up study groups with one or more other teachers. This is simply the math version of Oprah's book of the month club! Instead of a novel, it might be a book about:

- Giving student feedback (*Error Patterns in Computation*, Robert Ashlock)
- Research on the best ways to teach a topic (*Research Ideas for the Classroom*, NCTM)
- Being a reflective teacher (*Teaching Problems and the Problems of Teaching*, Magdalene Lampert)
- Changing assessment practices (*Mathematics Assessment: A Handbook,* NCTM: *Inside the Black Box,* Willam & Black)
- Just pick a topic and go!

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NCTM President

Who's Doing the Talking?

by
Cathy L. Seeley
NCTM President

In the November 2004 President's Message for the NCTM News Bulletin (available at www.nctm.org/news/president), I suggested that the most important factor in a student's mathematics learning (after teacher expectations) is the student's active engagement in the learning process. One clue to whether students are engaged in learning can be found by looking into classrooms and noticing who is doing the most talking—the teacher or the students.

Most of us learned to teach the same way we ourselves were taught. Often, the classrooms we experienced as learners were teacher-centered, with students expected to listen, take notes, do homework, and answer test questions based on what was presented to us by the teacher. Along the way, there may have been a few absolutely wonderful teachers who drew us into their teaching through entertaining and nonroutine variations on the traditional lecture model. Other times we suffered through boring mathematics presentations where we were not engaged in our own learning. Fortunately, many of us were successful as students in this type of lecture-based classroom, and we may even have become somewhat proficient using a similar model of teaching ourselves. While we were learning, however, many other students were never engaged in mathematics through lectures, even with the most energetic teacher.

Today we are called to teach challenging mathematics to a much wider range of students than ever before. Teachers tell me that fewer and fewer of even their more successful students respond positively to teacher-centered, lecture-based teaching. In recent curriculum projects based on NCTM's Principles and Standards for School Mathematics, a different teaching model is emerging. Often, students are expected to work in small groups around engaging tasks, either in real settings or in interesting mathematical contexts.

Photo reprinted with permission of the publisher, Early Years, Inc. From the January 2004 issue of Teaching K-8 Magazine, Norwalk, CT 06854

Although it is possible to use these excellent materials in a teacher-centered classroom, far greater gains are found when the teacher gives students a greater role in the learning process.

The teachers who are most effective with these materials offer guidance and probing questions instead of telling students all the things they are supposed to learn. In this kind of student-centered classroom, the teacher's role is to set the stage, organize the task, ask good questions, and help students connect their experience to the mathematics being addressed. Much of this work happens with the class as a whole, but there is usually a period of intense student activity where students interact around the mathematics in pairs or small groups. This new teacher role calls for sophisticated knowledge of both mathematics and learning, and it takes at least as much preparation as a good lecture or content presentation. But the payoff is immense. When students have the opportunity to figure out an approach to a problem; discuss, argue, and justify their ideas; and wrestle with challenging mathematics, they are truly engaged in their learning. They are hooked into the mathematics. They are much more likely to be able to

remember what they learn and apply it to other situations than they would if they were simply told how to solve a particular type of problem.

To determine how engaged your own students are, take an objective look at your classroom and ask yourself who's doing the talking. If the teacher's voice is the voice usually heard, how engaged are students? If the classroom is largely quiet, how engaged are students? If only short fill-in-the-blank kinds of responses are expected from students, how engaged are students? Even if students are heard, if only a few students have the opportunity to make comments or offer possible answers to the teacher's questions, how engaged are the rest of the students?

Shifting the focus of the classroom to include more student engagement does create a noisier classroom. In fact, it may appear to be less structured or orderly than a teacher-directed classroom. After all, this type of learning environment involves lots of students talking, often at the same time, as they work in small groups. Learning to see the benefits of this apparent disorder is an important step for a teacher shifting toward more student engagement. Noise and student involvement do not have to turn into chaos or lack of structure. On the contrary, effective teachers learn to manage such classrooms with clearly spelled-out expectations for student behavior and student participation. Students have well-defined roles in their groups, and the teacher serves as an organized facilitator. The result is that students learn with real understanding.

If you are accustomed to teaching in a teacher-directed classroom, it may be challenging to shift to a more student-centered style. You will likely need to go through appropriate professional development that will ideally include some kind of long-term support. But the payoff for you and your students will be tremendous as you hear a higher level of mathematics conversation and as you see for yourself a higher level of student learning.

Cathy Seeley is president of the National Council of Teachers of Mathematics (NCTM). This article is provided as a service to Affiliates of NCTM. If you are not currently a member of NCTM, find out how to be part of this national professional community committed to a high-quality mathematics education for every student at www.nctm.org.

Georgians are Appointed to Serve NCTM

Appointed by Cathy Seeley, President of NCTM, **Tom Ottinger** will be the new NCTM Affiliate Services Representative for Florida, Georgia, North and South Carolina, and Virginia (the position Carol Newman currently holds), taking office in May.

He will be helping informally with the regional caucus and delegate assembly at Anaheim this year, but his first official meeting will be an affiliate leadership conference in ATLANTA on Aug. 12-14.

Christine Thomas and **Dottie Whitlow** have been appointed by NCTM President-elect Skip Fennell as Co-Chairs for Local Arrangements for the NCTM 2007 Annual Conference in Atlanta.

Also at the request of Cathy Seeley, **Dottie Whitlow** has been asked to serve on the NCTM Task Force on Family and Community Outreach.

Executive/ Membership Director

by
Larry Elbrink
Executive Director
Waycross
lelbrink@accessatc.net

by
Susan Craig
Membership Director
Augusta
scraig@gctm.org

Professional Learning Units

GCTM is now authorized to offer courses that are eligible for PLU's. Our first effort was the Georgia Mathematics Conference of 2004 where approximately 200 teachers participated. In order to qualify for this coming conference, please speak to your principal about obtaining a PLU form. Bring that with you to Rock Eagle, and you will get credit for the conference. We are in the process of sending the Course Completion Form to the Professional Learning Coordinator now for each person who completed all the requirements. The deadline for submission of On-the-Job performance was March 1, 2005.

One of our goals at GCTM is to provide as many opportunities as possible, for professional development of our teachers.

Election

Ballots for the election of 2005 have been mailed to the address in our database. From all those returned to date many address were either incomplete or incorrect. Please contact Larry Elbrink at lelbrink@accessatc.net if you have not yet received a ballot. Deadline for return of ballots is April 25, 2005.

If you are changing your address or moving to another school, it is important that you contact Susan Craig so you can remain current on our mailing list.

Oh Mathematicians, Where Art Thou?

Each time we send a mailing of GCTM material to the members, we have a number of items returned. The reasons are varied. Primarily, the mail is undeliverable because the member is not at the address given. Sometimes they have moved and the forwarding has ended. Other times the address is incorrect. This is caused by reversed house numbers, incorrect zip codes, incomplete street names, etc. Soon we hope to have this personal data available for update and correction by the individual member on the GCTM Web site.

Presently we have a lengthy list of members who are missing! These are items which have been returned since Rock Eagle. Some of these are brand new members. Please help us find our missing colleagues. Check over the following list. If you see the name of a colleague, please inform them that we are missing them, and ask them to contact Susan Craig at scraig@gctm.org with the correct information. If you have a colleague who mentions that they have not received GCTM information for some time, please encourage them to send updated information as well.

Deborah Flood, Albany
Sabrina Stephens, Albany
Pam Drummond, Atlanta
Lori Gatling, Atlanta
Vicki Massey, Atlanta
Benjamin Nsah-Fredua, Atlanta
Tamara Ross, Atlanta
Umamaheswari Subramanian, Atlanta
Cynthia Cisneros, Augusta
Matt Lowery, Augusta
Elisha Magnusen, Augusta
Erin Daniel, Ball Ground
Tamara Griffith, Cartersville
Billie Smith, Cartersville
Tiffany Campbell, College Park
Sancia Joseph, College Park
Natalie Meiguez, College Park
Joyce Lee, Columbus
Jenna Mauriello, Conyers
Nancy Barajas, Covington
Nathalie Sanders, Dalton
Crystal Harris, Decatur
Endia Jackson, Decatur
Mattie Jones, Decatur
Larry Ferrer, East Point
Brequeia Ashley, Eastanollee

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The Mathematical Association of America

Convergence: Where Mathematics, History and Teaching Interact

This is a new online magazine and resource in the history of mathematics and its use in teaching, with the cooperation of the National Council of Teachers of Mathematics and the financial support of the National Science Foundation. The target audience is teachers of grades 9-14 mathematics, be they secondary teachers, two- or four-year college teachers, or college teachers preparing secondary teachers.

The magazine will include articles dealing with the history of various topics in the curriculum, classroom suggestions designed for immediate use, historical problems, a "what happened today in history" feature giving mathematical events that happened on that date in history, interesting mathematical quotations changing daily, reviews of books and teaching materials, and a calendar of upcoming meetings and other events in the history of mathematics and its use in teaching.

To visit the magazine, point your browser to http://convergence.mathdl.org. For more information, or to contribute, write to the editors: Victor J. Katz: vkatz@udc.edu; Frank J. Swetz: fjs2@psu.edu.

Quantatative Literacy Resources

The Mathematical Association of America has established a Web site for Quantitative Literacy resources, including those formerly located on the Web site of the National Council on Education and the Disciplines (NCED). The address of this site is:

www.maa.org/ql/index.html

Currently the site contains:

- information about purchasing QL volumes that resulted from the NCED QL project;
- links to downloadable pdf files of essays in "Mathematics and Democracy" (NCED, 2001);
- links to a 1994 MAA report on QL;
- links to the Web sites of two new QL initiatives: MAA's Special Interest Group on Quantitative Literacy and The National Numeracy Network (NNN).

We hope that in the future additional downloadable files from the NCED publications will be made available on this site.

Rock Eagle

Extreme Makeover: *Mathematics Edition!*

by
Tom Ottinger
2005 Conference Chair
tottinger@ gctm.org

THE 2005 GEORGIA MATHEMATICS CONFERENCE AT ROCK EAGLE

OCTOBER 20–22

Georgia is implementing a new curriculum which changes the way topics are taught and the grade level at which they're taught. Technology is also changing what and how we teach, and testing is becoming increasingly important. In short, mathematics education in Georgia is taking on a very new look! This year's Georgia Mathematics Conference will focus on preparing teachers to survive and thrive in this environment of change!

We introduced the Georgia Performance Standards at last year's conference, and we looked at how they were different from the old QCC. This year we want to concentrate on how to put those standards to use in your own classroom.

At this year's conference, most sessions will be an hour long. There will be very few sessions that overlap others, and there will be more sessions than ever! When possible, popular sessions will be repeated.

Want to know how to incorporate geometry activities into your elementary school classroom? Want help teaching mathematics to ESOL children? Want to see a real live math fair? Want to make something you can use and take it with you? Want to be inspired, challenged, encouraged and invigorated?

JOIN US AT GMC 2005
EXTREME MAKEOVER: MATHEMATICS EDITION!

P.S. Want to make this conference better than ever? Volunteer to be a speaker! You can get more information and submit a proposal on the Web at gctm.org.

GCTM Academy 2005

for Primary, Middle and Secondary grades
(with special emphasis on the 7th grade)

Focus: Implementing the Georgia Performance Standards

Where: ETC at Macon State College

Presenters:
Mary Buck (Helena Schools, Montana)
Ron Armontrout (Hotchkiss School, Connecticut)

Wednesday through Friday
July 20-22, 2005

Registration: $300
(does not include meals/lodging)

Contact: academy@gctm.org
Website: www.gctm.org

Registration deadline is Friday, July 8, 2005

NCTM in the News

Who Will be Tomorrow's Math Teachers?

Reston, Va., Feb. 10, 2005—The National Council of Teachers of Mathematics (NCTM) launched a new site today, TeachMath.org, where those considering a career as a math teacher can go for information.

TeachMath.org targets young people thinking of teaching math as a career, those considering a second career as a math teacher and teachers seeking information on certification requirements and resources they can use in their classrooms.

At TeachMath.org they will find answers to such questions as why they should consider becoming a math teacher and information on traditional and alternate certification paths. There are also links to each state's or Canadian province's department of education for further information on certification needs.

TeachMath.org provides a list of resources for anyone who is already a math teacher or is studying to be one. Students will find information on loan forgiveness programs, and teachers will find a list of ideas they can use to encourage young students to stay interested in math and continue their mathematics studies.

"Selecting a career as a math teacher is choosing a career with a future for yourself and your students. It can be one of the most significant and rewarding careers as it opens doors to a wide range of options," says NCTM President Cathy Seeley.

As the economies of the United States and the world continue to rely on technological advances, the need for math teachers will continue to grow. Presently 1.8 million elementary school and 225,000 secondary school math teachers are needed in the United States. As the country's population grows and becomes more diverse, there will also be a need for math teachers who reflect the diversity of the student population. The need is worldwide, making math teaching a mobile career.

Those thinking about a career in teaching can learn about their state's or province's requirements under "How to Become a Math Teacher." The No Child Left Behind (NCLB) Act requires every classroom to be staffed by a "highly qualified" teacher, a designation that translates to a bachelor's degree, state certification, and different levels of mathematical content knowledge depending on the grade.

A 1999 study conducted by the Council of Chief State School Officers revealed that nearly 30 percent of the 300,000 middle school and high school math teachers in the United States neither majored nor minored in the subject they teach. In low-income schools, students have less than a 50 percent chance of having a math or science teacher who holds both a license and a degree in the subject.

TeachMath.org is organized under six headings to provide information and resources for those thinking of becoming a math teacher.

TeachMath.org, a new NCTM Web site, provides information on how to become a math teacher

Why Consider a Career as a Math Teacher?
You are needed! Educate tomorrow's citizens and teach valuable real-world skills.

How to Become a Math Teacher
Complete a teacher education program and gain a state license.

Why Certified Math Teachers Are in Demand
Schools need experienced, licensed teachers with math degrees.

Resources for Math Teachers
There are many new resources you can use to help students learn math.

Steps Students Can Take Right Now
If you are a middle or high school student, find out if a math teaching career is right for you.

NCTM Student Membership
College students enjoy NCTM benefits at half the cost of regular membership.

The National Council of Teachers of Mathematics is a public voice of mathematics education, providing vision, leadership, and professional development to support teachers in ensuring mathematics learning of the highest quality for all students. With 100,000 members and 250 Affiliates, NCTM is the world's largest organization dedicated to improving mathematics education in prekindergarten through grade 12. The Council's Principles and Standards for School Mathematics includes guidelines for excellence in mathematics education and issues a call for all students to engage in more challenging mathematics.

President's Desk CONTINUED FROM PG. 1

One can take college courses, add a specialty to a teaching certificate, pursue National Board certification, attend a math conference, seek a position in a new place that requires adjustment and learning, step up and lead, accept new responsibilities, reach out and help others! The possibilities are endless. Find a learning buddy and get started!

One other thing… when you've found your buddy(s) and set on a path, let us know what you are doing. Your GCTM Executive Board and Regional Representatives all have contact info on the GCTM Web site. We're waiting to hear from you! —Dottie

Math Trail

Trekking Around Atlanta

by
Sandra Baggett,
Cindy Lawrence,
Greater Atlanta Christian
Debra M. Valdez,
Buford High School

Engaging students in learning is the goal of all teachers. Our math trail, "Trekking Around Atlanta," uses multimedia to connect mathematics to the world around our students. So often students want to know how they will use the math that is taught in schools. This math trail will show them several ways math is used in the sites they see around Atlanta. It also allows students to become independent learners, problem solvers and critical thinkers. Through all of this they may even realize that there is not always just one right answer to a problem. The math trail is one way to stretch their thinking beyond the classroom into their world.

"Trekking Around Atlanta" takes students to various sites around Atlanta and challenges them to work practical problems relating to those locations. Designed for students in Pre-Algebra through Algebra II, the objective of the math trail is to help students apply the mathematical concepts to real-world situations. The project gives students the opportunity to solve given problems, as well as to create and solve their own problems associated with a landmark from their area. Additionally, the math trail improves the students' abilities to communicate about mathematics and improves their problem-solving skills. A brief history and some interesting facts about each location will increase the students' interests and knowledge about their community.

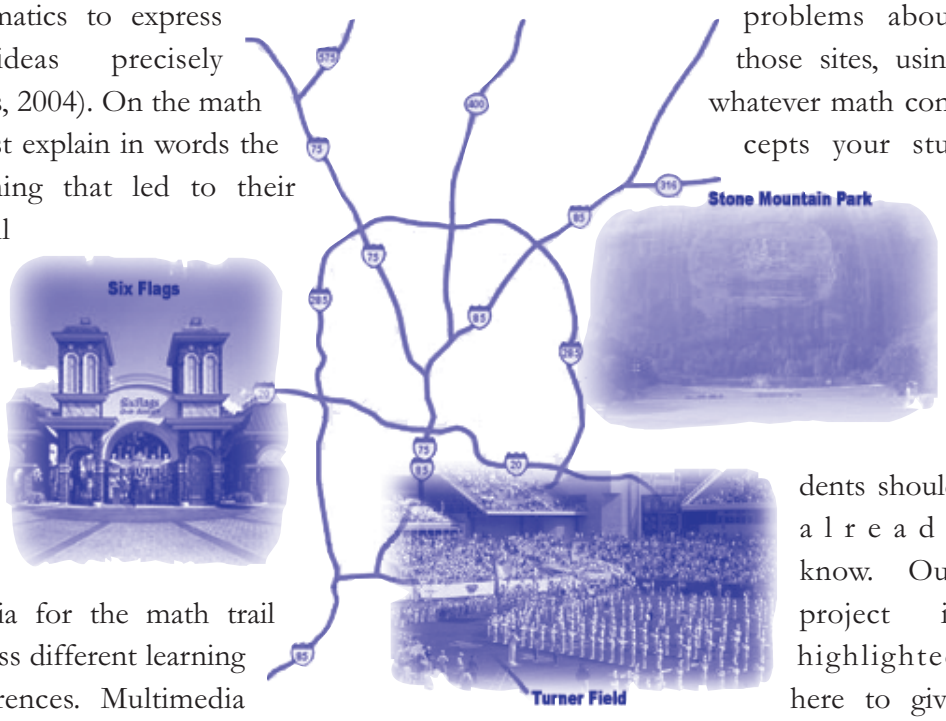
The overall objectives for the project are as follows:

1. Students will relate math to the real world.
2. Students will become independent learners.
3. Students will become problem solvers.
4. Students will determine the reasonableness of their answers.
5. Students will communicate math principles in their solutions.

Math trails have been popular among the more progressive math teachers for the last few years because they take math into real life situations. However, one challenge faced in designing a math trail seems to be to make problems higher quality with upper level skills and meaningful situations. For example, it is not compelling to students to go to a site and count something because it is there, but it would be meaningful if there is a real-life application for which that computation would be used. Therefore, in making the virtual math trail, one of the most time-consuming tasks is to find meaningful situations which require critical thinking skills on an appropriate skill level. We searched textbooks for real-world problems to write for this project. This was exciting, because we envision our students searching through their books for ideas as well, and through that activity they will be reminded of the multitude of applications of the mathematics they are learning. The variety of skills represented by the problems is dictated by the concepts previously taught.

Presenting the content with this multimedia format has unique advantages in reaching the students. "Trekking Around Atlanta" provides for interactivity and student choice. The images, sound, and videos promote engagement by making the material more interesting and relevant. The format of the math trail gives students examples of quality problems and then allows them to research and produce their own problems, which will be put on PowerPoint slides and can be added to the project for future classes.

Good communication is also important in math education. Students need to organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers and others; and use the language of mathematics to express mathematical ideas precisely (NCTM Standards, 2004). On the math trail, students must explain in words the logic and reasoning that led to their answer. Not all problems have only one right answer, so the students must be able to justify their conclusions.



In addition, the use of multimedia for the math trail allows us to address different learning styles and preferences. Multimedia puts the learner in control and thus involves and focuses the learner. It also allows the student to work at his own pace. Furthermore, our trail is open-ended. Each student is required to create a problem associated with a location. It is our intent to choose the best of the student-created problems and add them to the existing trail. This has the additional advantage of involving the student in an authentic task. Finally, because the trail was created in a multimedia format, it is accessible over distance and time. If a student is absent on the day(s) that the trail is used, the assignment can be completed during the student's own time.

We decided to use the advantages of multimedia to make the math come alive so that students could see the practicality of what they learn in the classroom. Students will learn technology skills in addition to reviewing math skills.

To create your own math trail, choose several locations (landmarks) in your area, and create problems about those sites, using whatever math concepts your students should already know. Our project is highlighted here to give you an example. But as you can imagine, it can even be used in the elementary classroom.

We presented our project to our students using multimedia as part of a master's level class in Educational Technology through Lesley University, Cambridge, Massachusetts. To avoid copyright problems in using images from Web sites, we took a Saturday field trip and traveled around to the various sites to take our own digital pictures. Then we used various technology tools to put our project together. For more information or questions about how to create your own math trail, please contact us at hughesgctm@yahoo.com attend our workshop at the Georgia Mathematics Conference at Rock Eagle, Oct. 20-22, 2005.

Mathematics Around Atlanta

Students are asked to choose a blue footprint for ready-made problems. Then they are told to:

1. Choose a problem.
2. Restate the problem.
3. Use the information given and solve the problem.
4. Show your work in an organized manner.
5. Write a paragraph to explain how you determined your answer.

Then students are asked to choose a red footprint from the map. At this site they are to:

1. Read the information provided.
2. Follow the link(s).
3. Create your own math problem using the information you find.
4. Write the problem on the worksheet.
5. Show a solution with all steps shown.

The teacher may choose how many problems of which type to assign, ready-made or student-created. A sample rubric is provided here for you, and that should also be adjusted at the discretion of the teacher.

"The World of Coke" Problems

Geometry: You are responsible for obtaining a Coke product for every person at your school for the fall festival. There are 1312 students and 90 teachers. How many 12-packs will you need?

Pre-Algebra: The formula for Coke is a well-kept secret, but soda jerks from the 1930s would mix the syrup with carbonated water in the ratio of 1 ounce syrup to 5 ounces carbonated water. How much syrup would be needed to provide Coke to your 20 friends at your birthday party?

Stone Mountain Problems

Algebra One: You begin your walk on the Cherokee Trail at the mile marker on the west side of Howell Lake and walk at a rate of 29 1/3 ft/min. Your friend misunderstood and started at the mile marker on the north side of Howell Lake, but only walks at a rate of 17.6 ft/min. How long will it take for you to catch up to him? Where will you be along the trail?

Algebra Two/Trig: A surveyor locates two points on the same elevation near the base of the mountain, which are 300 feet apart. At point A the angle of elevation to the top of the mountain is 36 degrees and at point B the angle of elevation is 44 degrees. If the elevation of the point on which he is standing is 800 feet above sea level, what is the elevation of the summit of the mountain?

Trekking Around Atlanta Rubric

Problem Solving at Each of Four Sites

Solution was accurate	5	4	3	2	1
Appropriate data was used	5	4	3	2	1
Work was organized; all steps shown	5	4	3	2	1
Explanation of your reasoning was well-written	5	4	3	2	1
Problem above your level	+1				
Problem below your level	-1				

Solution was accurate	5	4	3	2	1
Appropriate data was used	5	4	3	2	1
Work was organized; all steps shown	5	4	3	2	1
Explanation of your reasoning was well-written	5	4	3	2	1
Problem above your level	+1				
Problem below your level	-1				

Solution was accurate	5	4	3	2	1
Appropriate data was used	5	4	3	2	1
Work was organized; all steps shown	5	4	3	2	1
Explanation of your reasoning was well-written	5	4	3	2	1
Problem above your level	+1				
Problem below your level	-1				

Solution was accurate	5	4	3	2	1
Appropriate data was used	5	4	3	2	1
Work was organized; all steps shown	5	4	3	2	1
Explanation of your reasoning was well-written	5	4	3	2	1
Problem above your level	+1				
Problem below your level	-1				

Problem Creation at One Site

Creation:

Problem was appropriate to the chosen level	5	4	3	2	1
Problem was clear; sufficient information given	5	4	3	2	1
Solution given was accurate	5	4	3	2	1
Steps were shown, neat and organized	5	4	3	2	1
Problem above your level	+1				

Score: __________ out of 100

Lesson Plans

Using Children's Literature to Teach Mathematics

by
Iris Lloyd &
Beck McRae,
students of
Dr. Billy Lacefield
& Dr. Mary Kay
Baccallo

The following are excerpts from a workshop presented by the students of Dr. Billy Lacefield and Dr. Mary Kay Baccallo, at the Georgia Mathematics Conference, 2004. Each lesson contains activities that correlate to the NCTM Principles and Standards. We welcome your feedback as you adapt these lessons to your classroom.

The Adventures of Taxi Dog
by D. Barracca and S. Barracca
Lesson Plan by Iris Lloyd

Geometry

The teacher will provide the students with a cardboard pattern of a taxi. The students will choose colored construction paper, trace the pattern and cut out the taxi. Then the students will be instructed to repeat the checkerboard pattern from the book, or design their own geometrical pattern on the taxi.

Geometry, Numbers & Operations, Measurement, Communication

The teacher will have the children divide into small groups. Each group will choose their favorite fare from the book. The teacher will then ask them to re-enact the scene during a dramatic play period, providing the children with play money that they will use to pay Jim. They will need to decide how much to charge per mile, how many miles they traveled, how much the fare is and how much change will be given. They will be asked to document their information as a written problem, as well as share the information with the class during an oral presentation.

Data Analysis & Probability, Problem Solving, Number & Operations

After dividing the class into partners or groups of three, the teacher would pass out teacher-made city maps that included areas discussed in the book. (The next book in the *Taxi Dog* series could be used in this activity also.) The map would be divided into grids. The teacher will provide each group with a worksheet that will contain various grid locations. The students will be instructed to locate the grids, record the number of passengers waiting at each location and add/subtract the fares as they ride in the taxi. The fare information will be written in words and the children will need to represent the information in words and correct mathematical/operational symbols.

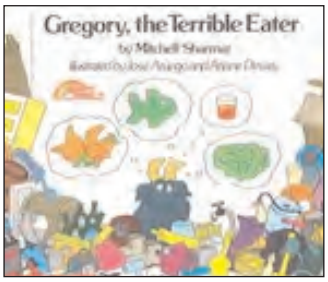
Algebra, Representation

The teacher will make and distribute packages of cutout shapes (i.e. taxis, Maxi dogs, clowns, dog biscuits). Each shape will have 5-6 counterparts. The children will need to order the set by color, size or design, whichever the set was designed to represent.

Numbers & Operations, Reasoning & Proof

The teacher will make individual cutouts of a dog biscuit that will be divided into various numbers of pieces. After asking each child to determine how many pieces were in his biscuit, the teacher will instruct each child to find other children who have the same amount of pieces. After finding their like denominators, the children will be instructed to find two other denominators that are different from their own. This second grouping will stay together for the remainder of the exercise. This group will compare denominators. The teacher will then ask each group to remove two of their own pieces and tell how many pieces are left. The students will write this information as a fraction for each group. Then they will be led to a basic understanding that even though each dog biscuit had a different number of parts, all the parts equal one dog biscuit.

Gregory, the Terrible Eater
by Mitchell Sharmat
Lesson plan by Beck McRae



Geometry

Look at each food in your handout. Find all geometrical shapes in each food. Then draw the shapes on the food picture using a fine point black Sharpie. You may write the name of the shape below it.

Numbers & Operations, Problem Solving, Representation

Suppose Gregory's parents ate 4 tin cans, 6 tires, 3 shirts, 7 shoes and 3 old violins in one week. How many of each would they have eaten in a year? Show 2 ways to compute the answer—using multiplication, manipulatives, colored markers, graphs.

Reasoning & Proof

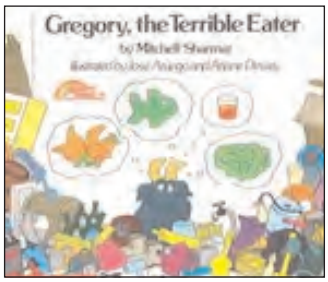
What would happen if the parents decide to eat only the goat "foods" that weigh the most and the goat "foods" that weigh least? How many of each would they eat?

Reasoning & Proof, Connections to Algebra

Gregory loves a particular recipe for vegetable soup. This recipe makes 6 servings. If Gregory eats 2 servings and his parents together eat 1 serving per week, how many recipes would be needed to last them a year?

Communication

Ask students to share the ways they solved the recipe problem. Which way was easier? Why do you like your way and dislike another's way? Would you use another way next time to solve this problem?



Math History

THE HUMAN EQUATION: George Boole: *The Laws of Thought*

by
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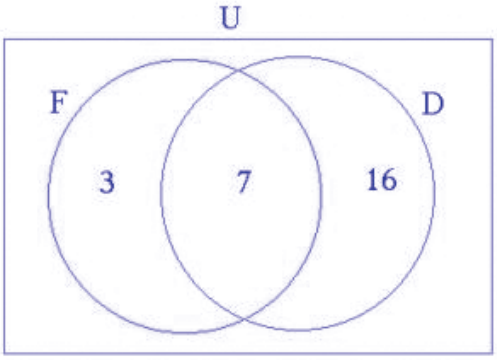
Does x + x = x? Of course, if we are dealing with ordinary algebra this equation is true if and only if x = 0. This is hardly earth-shattering! But in the strange and exotic world of Boolean algebra, it makes a world of sense. You might even say it describes a "law of thought."

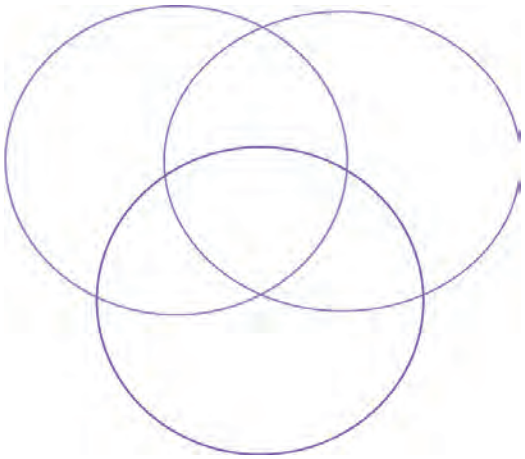
George Boole was born in 1815 in Lincoln, England, to a family of very limited means. He had to drop out of school as a teenager to help support his parents, but not before becoming fluent in Latin, German, Italian and French. Young George loved the classics, and his translations of Latin and Greek poetry—while he was yet a boy—won him local fame.

At the age of 16, George took a job as an assistant school teacher, and a few years later he became head of his own school. His responsibilities made it impossible for him to continue his own formal education.

Boole was not deterred. From his father he had inherited a love of mathematics, and for the next several years Boole taught himself math from books borrowed from the library. Soon he was publishing articles in the leading journals of the day, and in 1844 he won a medal from the Royal Society.

But his greatest work was yet to come. Boole loved both languages and mathematics, and he





felt that logic could bridge the two seemingly disparate disciplines. Logic, as laid down thousands of years earlier by Aristotle, was considered a branch of philosophy. Boole believed that a mathematics—an "algebra"—of logic was possible. If so, seemingly impenetrable philosophical arguments could be made precise, and could be checked by mathematical means.

Boole was to devote years of his life to this project. In 1847, he published "The Mathematical Analysis of Logic," which led in 1854 to the more refined "An Investigation of the Laws of Thought." In Boole's system, variables refer to sets, rather than numbers, while the seemingly familiar operation symbols "+" and "·" represent unions and intersections.

At a first glance, "Boolean" algebra looks like ordinary algebra—in fact, many of the rules are the same. But there also some surprises. For example, the union of a set with itself is, again, the set itself. Thus, x + x = x.

It is fairly easy to translate simple "thoughts" into this system. For example, if M = "the set of all men" and W = "the set of all women," then the union of these sets is M + W. Building on this idea, complex arguments can be translated into equations, which can then be

manipulated using mathematical operations.

By developing a mathematics that could translate and verify logical arguments, Boole hoped to apply his methods to classical philosophical questions. But Boole found that it was much more difficult to apply his mathematics to more subtle arguments.

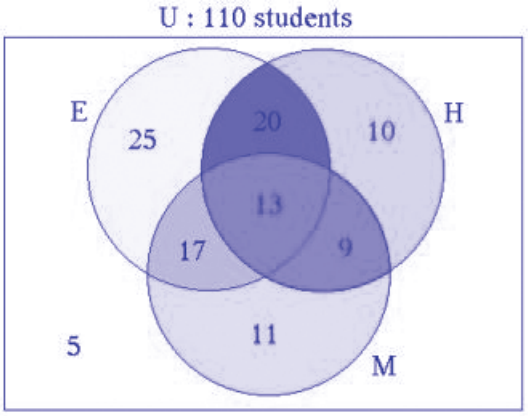
There is in the second half of "The Laws of Thought" a chapter titled "Clarke and Spinoza," which opens with these words: "Analysis of a portion of Dr. Samuel Clarke's 'Demonstration of the Being and Attributes of God,' and of a portion of the 'Ethica Ordine Geometrico Demonstrata' of Spinoza" (Spinoza's work dealt with the attributes of God). Yet after many pages of closely-worded definitions and equations, Boole confesses:

> It is not possible, I think, to rise from the perusal of the arguments of Clarke and Spinoza without a deep conviction of the futility of all endeavours to establish, entirely a priori, the existence of an Infinite Being, His attributes and His relation to the universe.

"No matter how correct a mathematical theorem may appear to be, one ought never to be satisfied that there was not something imperfect about it until it also gives the impression of being beautiful."

Quoted in D MacHale, Comic Sections (Dublin 1993)

Although in the end Boole's contributions to practical philosophical may have been less than monumental, his work was later developed and applied to the design of switching circuits—which are at the heart of the modern digital computer—and to the retrieval and analysis of database information. His application of mathematics to logic also inspired a wealth of research and helped create the field now known as "mathematical logic."



References

www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Boole.html

en.wikipedia.org/wiki/George_Boole

www.erraticimpact.com/~19thcentury/html/boole.htm

www.who2.com/georgeboole.html

www.home.gil.com.au/~bredshaw/boole.htm

"TODOS"
Part 3

Activites Aid the English Language Learner

by
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In our first issue of this school year, we discussed how to structure the vocabulary of your class to the English Language Learner (ELL). Then once the vocabulary is learned and the concepts are taught, it will then be necessary to test or assess the learning that has taken place. In the last issue we gave suggestions for a variety of assessments.

> Language becomes less of a barrier in an informal setting

The last of our series will be about classroom activities that will aid the ELL student in understanding. All students benefit by active learning, so it is no surprise that activity also aids the ELL student. But the benefits go beyond the cognitive level; they include the language element for these students. Language becomes less of a barrier in an informal setting. Interaction with peers is less threatening than interaction with adults in many cases, so the ELL student may exhibit more effort to communicate by any means possible in this setting. He/she also has the comfort of doing something, not just listening.

During activities the teacher can be the observer, not the initiator. That allows the teacher to listen more closely to what the students are saying, to watch their body language and to attempt to ascertain the level of understanding they have on a particular concept.

Gaps in a student's learning can be more easily determined while watching them work on a project, which couldn't be seen in other ways. Many "holes" in thinking are in evidence during assessment, but sometimes they cannot be diagnosed. While working on an activity, sometimes these gaps become more apparent, and sometimes the teacher can address them more easily. These are "doing" things, not "speaking" things. Since language is the barrier we are discussing, we are erasing some of the barrier by "doing."

While students are engaged in these activities, the teacher will be observing, taking notes, encouraging and interjecting hints when needed.

Here are a few things to try:

1. **Models**—Have students work on building projects, alone or in groups. Many textbooks give suggestions for such things, from building pyramids in Geometry class, to building a network with toothpicks and miniature marshmallows.
2. **Problem-solving in groups during class**—Since many students do not like word problems, try a new twist. Type the word problem from their book in large font on a piece of paper and attach it to a colored piece of construction paper. You can laminate these and use them from year to year. If laminated, students can write on them with overhead markers and you can erase them. Give only one copy to the group and specify that each student may do only one thing: draw the picture, write the equation, work the equation, justify the answer. That way each student MUST do something. When you give the second problem, specify that each student must do something DIFFERENT on this problem, etc. That will help you observe the ELL student in all tasks.

3. **Cooperative learning**—Many teachers use "jigsaw" problems, giving each student only a part of the whole problem. These work well with ELL students, as the English-speaking students will want to help them read their clue. These are great for "warm-up" problems, for logic problems and for a quick problem when there is time left at the end of the period.
4. **Survey**—In teaching statistics, assign a survey and have the students work in groups to gather data. This will help the ELL student interact, as they may want to survey others of their nationality, if available.
5. **Graphs**—Since graphs are universal and used in so many industries, the ELL student is probably familiar with this method of displaying information. They may need help with the wording of the identification of the axes, but that is easy to provide.
6. **Drawing pictures/charts to solve problems**—This activity can be used across the curriculum and may be your best tool to aid understanding of text. The teacher can draw the preliminary drawing, with the student adding detail.
7. **Technology**—Your ELL student's exposure to technology is dependent on several things: nationality, parent involvement, economics, access, etc. Try to ascertain their comfort level with technology and be sensitive to their needs. The calculator is a great place to start. Give them opportunity to explore with technology and feel comfortable with your resources.

The gaps one finds in the educational development of the ELL student could be due to the fact that the schools in their former country are not regulated and not consistent. It is our task to help these students adapt to our school and to prepare them to be successful adults. This includes filling the gaps in learning and pointing them to the resources necessary to help them succeed.

As we bring this series of articles to a close, here are several things to remember:

First, ELL students want to communicate with us. Even though they do not know the English terms for mathematical symbols, they may still know the mathematical concepts surrounding the symbols.

Secondly, assessment for the ELL student should be modified to include less "English" and more mathematics. We want to test their mathematical progress, not their language progress.

Thirdly, activities in the classroom will give the ELL student the opportunity to "do math" without necessarily having to "talk math," and they will give us as teachers a venue in which to observe the abilities and inabilities of these students.

Our task is great, as teachers, but theirs is greater! They must learn the mathematics we are teaching, and at the same time they must learn a new language.

Patience and encouragement should be our watchwords!

Good Discussion Topic

What are Your Favorite Numbers?

by
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Many people have favorites. They have favorite relatives, friends, teachers, books, subjects, movies, games, etc. Have you ever considered what your favorite numbers are? Sometimes I tell my pre-service teachers that I have five favorite numbers and I ask them to guess what these numbers are. I also ask them to relate these five numbers in one meaningful, non-trivial equation using each number once and only once. I use this task as a motivational, extra-credit activity.

In the past, not many students completed this task successfully. Some guessed a few numbers correctly. I recall only one student who found all five numbers and the equation. He did say that he saw the equation on the office door of one of the professors and he experienced an illumination. (Readers may want to attempt this task before reading on.)

Students have used a variety of strategies in attempting this task. For example, some students thought of numbers that I emphasize in class; others thought of my birth date, my car's license plate number, the number of children or grandchildren that I have, the date of my wedding anniversary and so on.

Some students guess 0 because it is one of the greatest discoveries in mathematics, it is the additive identity, it plays an important role in place value and it is not easily understood by young children. Teachers experience difficulty in teaching children about 0. Other issues related to 0 are multiplication and division by 0 and 0 as an exponent. For example, Why is $a^0 = 1, a \neq 0$? Why is a 0 undefined?

Another guess is 1 because it is the multiplicative identity and the concepts of unity and uniqueness are prevalent in everyday life. We learn to count by ones initially. Students state 2 because it is the only even prime and this leads into a discussion of even, odd and prime numbers. Three is given because, in addition to being prime and odd, it is a triangular number and this leads into a discussion of figurate numbers such as square numbers (1, 4, 9, 16...) and pentagonal numbers (e.g., 5).

The choice of 6 initiates much discussion and research into perfect numbers (e.g., 6, 28), deficient numbers (e.g., 8), and abundant numbers (e.g., 12). A number is perfect if the sum of its proper factors is equal to the number; it is deficient if the sum of the proper factors is less than the number; and it is abundant if the sum of the proper factors is greater than the number. A proper factor is a factor which is less than the number. A guess of $\sqrt{2}$ leads to rationals and irrationals and the classical proof by contradiction that $\sqrt{2}$ is irrational.

Students choose 10 because it is even, it is a triangular number, it is the base of our number system and we have ten fingers and ten toes. In a game of Chinese Checkers, each player can start with 10 marbles or pegs. Seven is chosen because it is the sum that has the great-

est chance of occurring if two dice are rolled once. As a boy I was interested in a particular board game in which two dice were rolled and I wondered why "LUCKY SEVEN" was written in large characters in the middle of the board. We also talk about the Seven Wonders of the Ancient World, and there are seven days in a week.

Pi (π) is usually a popular choice because it is such an ubiquitous concept in mathematics and it has attracted so much attention over the years. For example, mathematicians have researched the history of π and have calculated it to thousands of decimal places. It is indispensable to a study of circles. It is an irrational number.

Other guesses are ? and ?. The former leads into discussions of imaginary numbers in particular and complex numbers in general; and the latter leads into exponentials which are common in calculus. The exponential function models real-life phenomena such as growth and decay.

What are your guesses? The numbers that I expect are ?, ?, π, 1 and 0 and these are related in ?π? + 1 = 0. Of course, this equation is derived from de Moivre's theorem ??? = cos ? + ? sin ?. By putting ? = π, we have ?π? = cos π + ? sin π = -1 + 0; so ?π? + 1 = 0. An extension of the task of obtaining ?π? + 1 = 0 is to ask students to relate e, 0 and 1 in one equation using each quantity only once. The result, of course, is $e^0 = 1$.

I have used this task with my pre-service education students and they have found it to be interesting, meaningful and intellectually stimulating. It induces students to do research and then share and discuss their findings. The study of many mathematical concepts emanate from this task.

Westminster Schools to Host International Computer Algebra Systems Conference

The Westminster Schools in Atlanta is hosting the third annual USACAS Conference June 25-26, 2005. CAS (Computer Algebra Systems) has the potential to revolutionize mathematics education. This program will do for Algebra and Calculus what calculators do for arithmetic. With CAS a student or teacher can simplify expressions, solve equations, factor, take derivatives and so much more! Now students will have the power to solve many problems which would otherwise be inaccessible.

The conference will attract teachers and professors from around the world to the Westminster campus. Participants will be able to discover how to use CAS in their classrooms and receive lesson ideas from prominent CAS pioneers. They will also be able to learn about the use of CAS in other countries.

The conference is sponsored by the Westminster Mathematics Department, Texas Instruments and Ohio University. If you would like more information about the conference or would like to volunteer to help, contact the Mathematics Department Chair, Chris Harrow, at chrisharrow @westminster.net.

Classroom Game

Preliminary Classroom Stock Market Game

Here is a simple classroom game to explain the stock market. You might like to try this game for several reasons:

1. It requires no special materials.
2. Though it is simple, it gives some flavor of how stock markets operate.
3. It rewards tactical play.
4. It's just fun to do.

The only material needed is a pair of standard dice. Preparation is simple; divide the blackboard (or whiteboard) into seven rows. Make columns (one per team plus two extra) and in the leftmost column write six stock names. In the second column write a 5 after each stock name, make the line separating the second and third columns a double line. The seventh row is used for 'cash,' so in the remaining columns write the starting amount (50 is a good value to use).

Play: Each team in turn throws the two dice. The team decides which of the two to use to choose a stock (number showing = the number of the stock, obviously) and the other die (the value it shows) is used to:

- buy that number of stock (if there is enough cash to afford them)
- sell that number of stock (if the team has at least that many)
- raise the stock price by that much
- lower the stock price by that much (provided this does not lower the value below 1)

The aim of the game is to be the first team to have a set amount of 'cash' (the target amount set decides how long the game takes; for a good game, 200 is a nice target value).

The basic tactic to follow is blindingly obvious: lower a stock value, buy the stock; raise the stock value, sell the stock. But most players will soon—hopefully—start to think about UTILITY: how much will any one of the possible moves benefit my team and hurt the other team(s)?

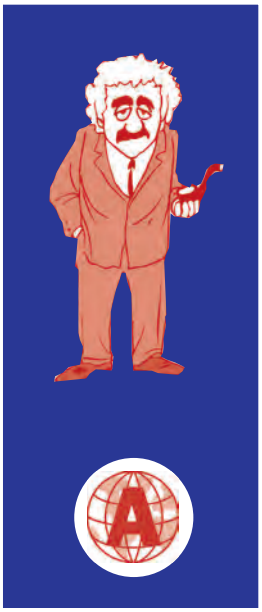
Basic probability dictates that the higher numbered stocks will be more stable so the game offers some scope for tactical play. There is also the possibility of adding rules (commission to be paid on purchases and sales, for instance) and practical basic mathematical exercise. Instead of seven rows, use nine rows. The seventh row is used for the TOTAL STOCK VALUE a team holds; row eight is used for CASH; and row nine is used for TOTAL VALUE. Each teams' column is—for the first six rows—divided into two columns, the leftmost of which is used for the number of said stock owned and the right one for the value of the stock owned. Each turn a different member of the team must update their part of the board.

This can be a simple mathematical exercise, or a statistics project or a lesson in economics. The applications and variations are endless.

SOURCE: www.gcee.org/www/projects/smg/open.htm

Al's Web Sites

Online Resources



sitesforteachers.com/index.html
Links and descriptions of hundreds of educational sites on academic topics as well as lesson plans, clip art and other activities.

www.mathtv.org/MainMenu1.html
A new problem is given each week for middle school students, specifically Algebra, with video footage explaining a sample problem. Then the actual challenge problem is viewed, and students may solve it online or at their desks.

www.murderousmaths.co.uk
Puzzles, games and tricks, with book reviews by "Thag" the Mathemagician, from the U.K. They hope to have their publications "Americanized" soon, through Scholar Publishing.

www.fi.uu.nl/wisweb/en/presentatie_enMC.html
Applets to illustrate mathematical concepts.

www.unclebobpuzzles.com
Puzzles, puzzles and more puzzles! They will even deliver them to your email address monthly.

www.schoolhousetech.com/products/mathematics/overview.htm
A site for creating worksheets. You provide the material (text) and they provide the format.

www.geocities.com/cnowlen/Cathy/Math.htm
If you have Geometer's Sketchpad by Key Curriculum Press, this site provides you with sketches and proofs that are ready to use.

Missing in Action

CONTINUED FROM PG. 4

Jetanna Dye, Ellenwood
Patricia Wilder, Fitzgerald
Doug Dagner, Grayson
Maralynn Beasley, Hampton
Holly Daniel, Hampton
Angela Gilliam, Kennesaw
Carl Rothe, Kennesaw
Kathleen Donnelly, Lawrenceville
Clara Okoka, Lithia Springs
Isabelle Kinnett, Macon
Eva Blanton, Marietta
Joyce Bramlett, Marietta
Kathryn Parrish, Martinez
Frederick Brown, Morrow
Shelley Scott, Moultrie
Deborah Edenfield, Mount Vernon
Susan Hollingsworth, Newnan
Tammy Folds, Perry
M. Blackburn, Rincon
Kathy Hunt, Rome
Kelly Garcia, Savannah
Fabiola Aurelien, Smyrna
Stephanie Branson, Smyrna
Teresa Dipple, Snellville
Walter Lynch, Stateboro
Anyah Beasley, Stockbridge
Christina Kingry, Stockbridge
Karlene Ebanks, Stone Mountain
Madonna Birdsell, Warner Robins
Fran Lurey, Watkinsville
Wanda Rivers, Westgreen
March Hall, Woodstock
Cindy Rabun, Wrens
Alicia Clark
Manada Driver
Helen Lively
Betty Murphy
Jennifer Roberts
Regenia Ware
Kim Wilson

Students

Suggested Summer Math Books for Students

Delicious books to help your children understand mathematics!

Twizzlers Percentages Book
by Jerry Pallotta

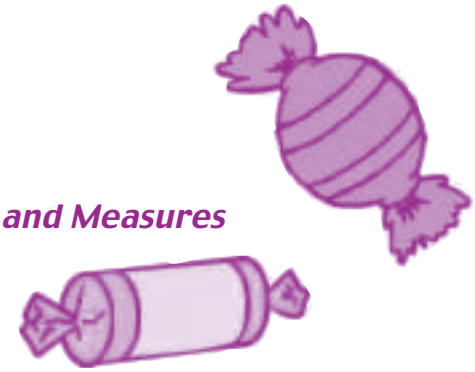
The Hershey's Kisses Addition Book
by Jerry Pallotta

Reese's Pieces: Count by Fives
by Jerry Pallotta

Skittles Riddles Math
by Barbara Barbieri McGrath

Hershey's Milk Chocolate Weights and Measures
by Jerry Pallotta

Twizzlers: Shapes and Patterns
by Jerry Pallotta



Your child will get so into the plots and characters that they probably won't even notice that they're learning! Ask for these and more at the library near you!

The Greedy Triangle
by Marilyn Burns

How Big Is a Foot?
by Rolf Myller

Sir Cumference and the First Round Table: A Math Adventure
by Cindy Neuschwande

Spaghetti and Meatballs for All: A Mathematical Story
by Marilyn Burns

A Remainder of One
by Elinor J. Pinczes

One Hundred Hungry Ants
by Elinor J. Pinczes

The Grapes of Math: Mind Stretching Math Riddles
by Gregory Tang

Summer Reading for Teachers

Teachers

Educating Esme—The Journal of a First-Year Teacher

"Easy reading, entertaining, good for all teachers."
—Becky King

The Curious Incident of the Dog in the Night

by Mark Haddon
"A short novel told entirely from the viewpoint of an autistic child. Reading this book helped me to better realize how differently the world may appear to different people." (Note: some of the language is a bit strong.)
—Dan Funsch

Research Ideas for the Classroom

(Early Childhood, Middle Grades and High School are different volumes)
published by NCTM
"Teacher-friendly, showing the stages of learning around a given topic with ideas for activities and lessons!"
—Dottie Whitlow

Every Minute Counts and *Making Minutes Count Even More*

by David Johnson
"There are more books by him, but these are my favorites."
—Susan Craig

Error Patterns in Computation, Using Error Patterns to Improve Instruction

by Robert B. Ashlock
"Wonderful book, easy read, full of examples and suggestions to "fix" misconceptions! Unquestionably one of the most important books I ever read that influenced my teaching behaviors and practices."
—Dottie Whitlow

Professional Learning Communities at Work, Best Practices for Enhancing Student Achievement

by Richard DuFour and Robert Eaker
published by ASCD
—Dottie Whitlow

Kudos

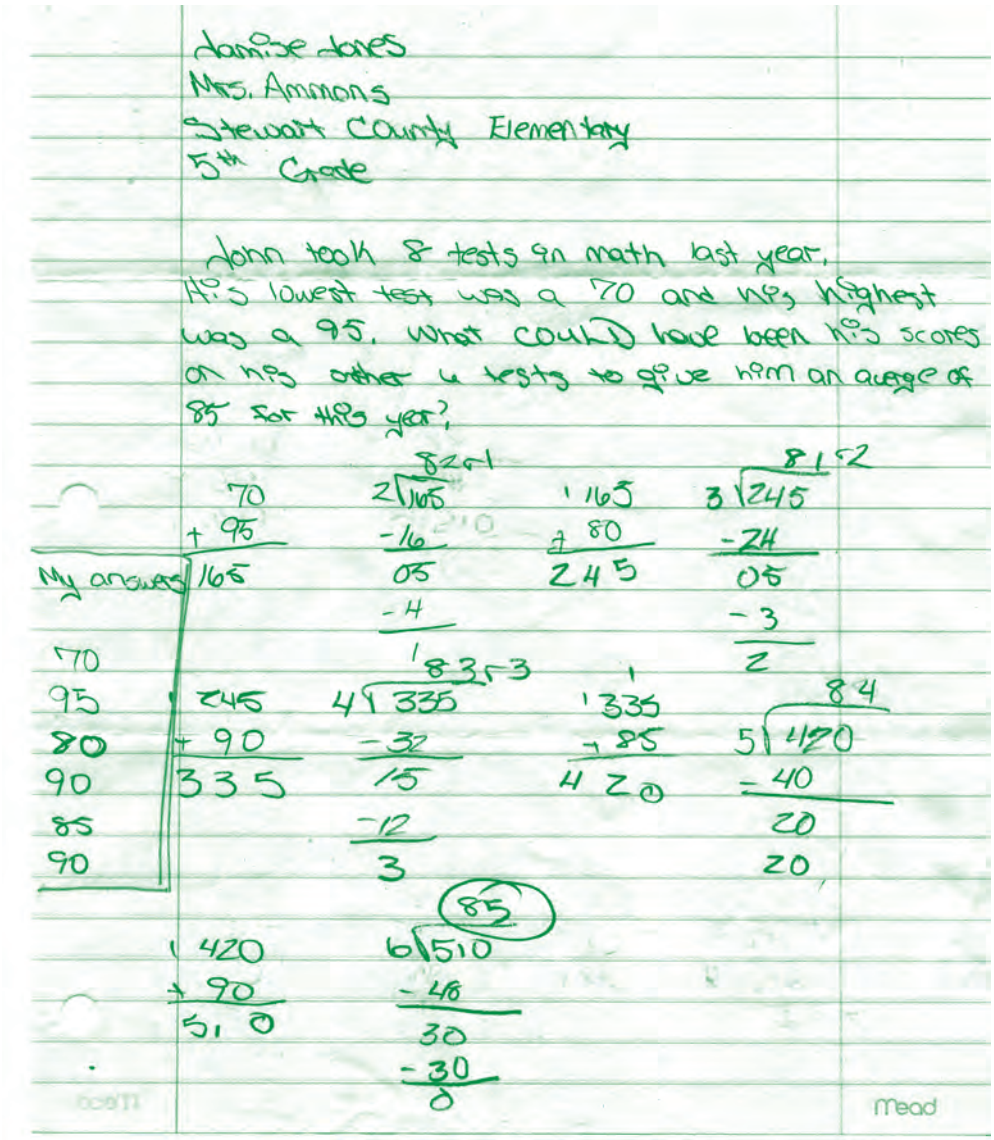
Cranium Cracker Crack-Up!

Last fall we had only one student response to the summer "Cranium Cracker," so we planned to publish her answer in the winter issue.

Due to our error, the correct answer of Jamise Jones from Stewart County Elementary School was NOT included in the winter issue!

Our humble apologies to Jamise and hearty congratulations for a very thorough answer to our question:

> John took 8 tests in Math last year. His lowest test was a 70, and his highest was a 95. What could have been his scores on his other 6 tests to give him an average of 85 for the year?



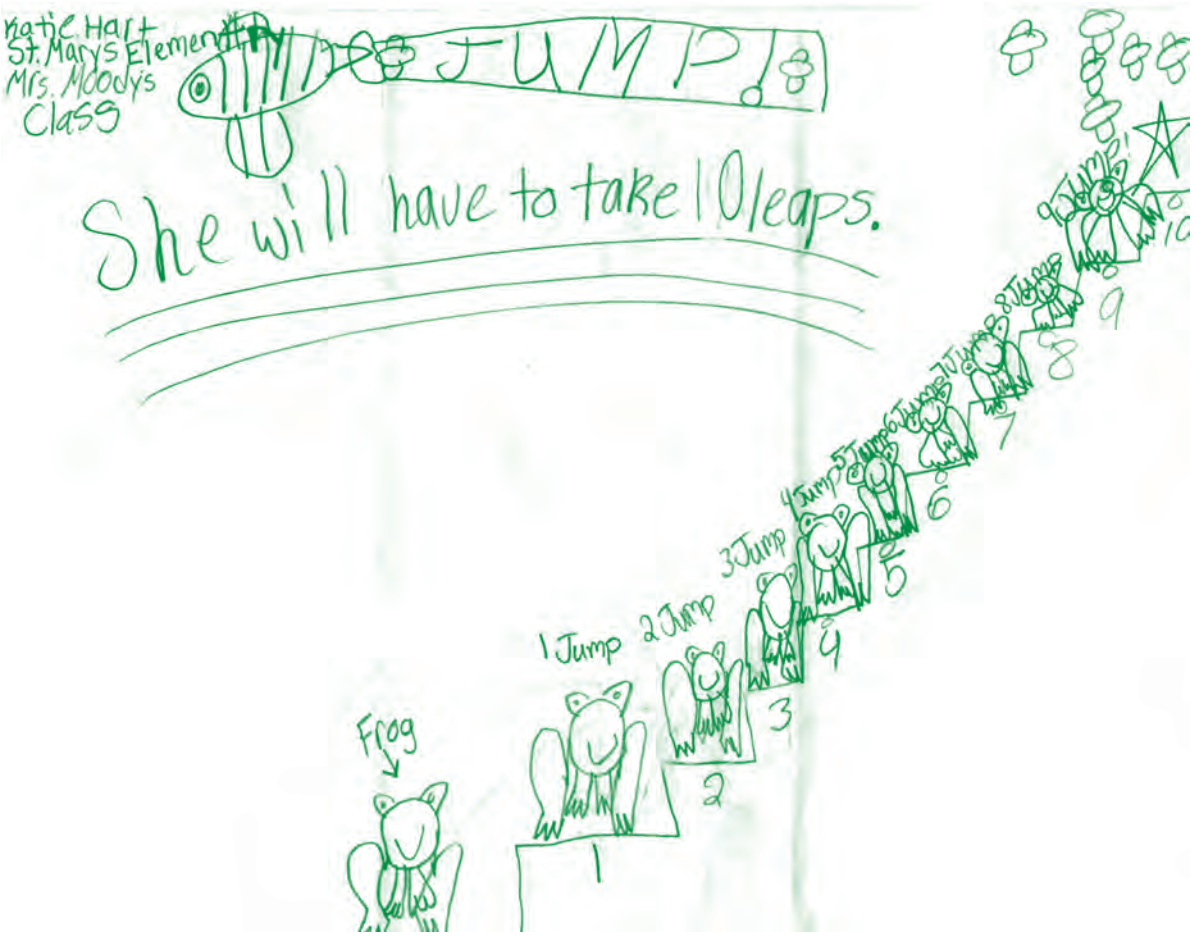
Cranium Cracker Results

Good Job!

Congratulations to Katie Hart of St. Marys' Elementary School in St. Marys, Georgia, for correctly answering our K-2 Cranium Cracker.

Draw a picture to illustrate this:

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?



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