In Memory of
Dr. Larry Elbrink

1941 - 2005
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Vol. LI No. 3  Fall 2005

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Saving the Starfish

A young boy was walking along the beach early one morning. The tide was receding, leaving numerous starfish stranded on the beach. The boy began picking them up and tossing them back into the water. Enraged at the task, he didn't notice the old fisherman sitting quietly watching him. He started the youngster, asking gruffly, “What are you doing?” The boy enthusiastically replied, “I'm saving the starfish. The stranded starfish will die if left in the morning sun.” The fisherman laughed at him and launched into a scoffing ridicule. “Look ahead of you down the beach,” he said, pointing to the seemingly endless expanse of sand and surf. “There are thousands of starfish washed up on this beach. You can’t hope to save them all. You’re just wasting your time. What you’re doing doesn’t matter,” he replied condescendingly. The young boy stopped, momentarily pondering his words. Then he picked up a starfish and threw it far into the water. He stood straight and looked him in the eye. “It matters to that one,” he said, and continued down the beach.

—Anonymous

“It matters to that one.” These words have provided guidance to me throughout the past 20 years through the challenges of work and daily life. These words have guided my behavior to “always try” and “we must try!” For those of you who have been in the teaching profession for some time, you know that there have always been challenges and struggles. The fact that we have new struggles should not be surprising. Some of the obvious challenges we currently face in our profession are: learning to teach the new GPS, raising the achievement of all students in our classes and schools, taking new classes and workshops, helping our students perform at levels that give them a future, helping our schools make AYP, and the list goes on and on. We also face challenges in our daily lives and our personal quests for growth. There are new challenges every day!

As we face each challenge it is easy to wonder if we can do it and if we can make a difference, and it sometimes feels like there is so much to be done. All of these things can feel overwhelming and leave us asking, “Where do I begin?” Like the boy who was saving the starfish, we begin with small steps, small efforts, reaching out everyday with enthusiasm, believing in the good of the mission and the idea that “it matters to this one” even if we can’t save everything and everybody today.

Recently several members of GCTM attended the memorial service for our beloved GCTM Executive Director, Larry Elbrink. I shared with those gathered that we at GCTM knew and loved Larry Elbrink, and he made such a difference to GCTM. What we learned at Larry's memorial is that Larry tried to make a difference in everything he touched. Not only did he love teachers and mathematics, but he adopted several children, he loved to grow flowers, he advocated for children's rights and protection, he supported his community theater, and he made a difference in so many lives.

At this time I invite you to reflect on the small and large ways that you make a difference and to make little steps and efforts. Remember, “It matters to that one,” one person, one step, one effort, and one child at a time. You, me, and Larry; we can and do make a difference.

Thank you and God bless you, Larry.
Thank you for making a difference and God bless us all.

REFLECTIONS FALL 2005
Hello from DOE! Carolyn Baldree now is doing training for the Georgia Performance Standards (GPS) full time. I was moved into a position as a mathematics education specialist last fall. In December, the Department hired another mathematics specialist, Claire Pierce, who has been working primarily with the Advisory Committee on the new draft of the high school mathematics GPS and with committees across Georgia developing tasks for the GPS.

In March, the State Board approved the posting of the new draft high school mathematics GPS. Reviewers were able to send comments online to the Department. All comments were carefully reviewed by the Advisory Committee at a weekend meeting—yes, Friday afternoon, Saturday and Sunday!—at the end of April, and appropriate changes made.

The Board approved the revised high school mathematics GPS at their meeting March 12. Many thanks to all the teachers, mathematicians and other educators who worked on the GPS! We now have a completed state curriculum in mathematics!

The Department is presently delivering Days 4 & 5 Training for the sixth grade mathematics GPS. Training for Days 4 & 5 began in mid May and continued throughout the month of June. Each day of training is repeated at 8-10 sites across Georgia for trainers selected by each school system, RESA, and other educational entities in Georgia. Each school system has been encouraged to train every sixth grade mathematics teacher—regular, special education, Title I, remedial—anyone who teaches sixth graders mathematics. Training for Days 6-8 will occur in the 2005-2006 school year. Also, next year the DOE will begin the training cycle for Grades K-2 and Grade 7 mathematics.

Sample Grade 6 mathematics tasks have been posted on our Web site. If you have not visited our Web site, it is www.doe.k12.ga.us or http://gadoe.org. Student work and teacher commentary for Grade 6 will follow later, as will tasks, student work, and teacher commentary for other grades.

Having performance standards in mathematics is an exciting change for Georgia. Yes, any change in curriculum means more work for teachers and other educators. But this change can really make a difference in students learning mathematics.

Research, and the experience of the many teachers in Georgia already teaching to performance standards, has shown us what is possible in terms of improved student achievement. If we work together, as a professional learning community of learners ourselves, we can accomplish our goal of helping our students learn more mathematics in a more meaningful way.
In Memory: Dr. Larry C. Elbrink

Dr. Larry C. Elbrink, 64, died Friday afternoon, July 1, 2005, at his residence following a short illness. He was a native of Vigo County, Indiana but had lived in Waycross since 1975. Dr. Elbrink was preceded in death by his father, the late Francis M. Elbrink, his mother the late Elma Jane (Evinger) Bourdeaux, step-father, Joseph T. Bourdeaux and his brother, the late Joseph Bourdeaux.

Dr. Elbrink obtained his Bachelor of Arts and Master of Arts degrees from Indiana State University, followed by obtaining his Ph.D. in Education at Ohio State University. He was a consummate teacher, having taught kindergarten through college level as well as teaching at Ohio State University.

Dr.’s Larry and Donna Elbrink moved to Waycross in 1975 where he began work on a government project in Alma. He worked at RESA for many years and continued to teach at numerous local colleges and universities. He was an elder for the First Presbyterian Church. He belonged to numerous professional and civic organizations such as the Georgia Council Teachers of Mathematics (where he served as Executive Director), the National Council Teachers of Mathematics, and the Georgia Technology Center (where he served as the Treasurer).

Dr. Elbrink enjoyed his association with the Kiwanis Club for many years. He also enjoyed gardening, coin collecting, and stamp collecting. This gentle giant of a man was greatly loved and will be missed by his wife, family, friends, co-workers, and students.

Dr. Elbrink is survived by his wife, Dr. Donna S. Elbrink of Waycross; his daughter, Laura K. Elbrink of Waycross; two sons, Christopher S. Elbrink (wife Janis) of Waycross, Warren N. Elbrink of Nashville, Ga.; grandchildren, Tonia and Amber. A memorial service was held where many expressed their love for Larry and what he had meant in their lives and the lives of the organizations they represented. Memorial contributions may be made to a Hospice Care, the National Association of Wegener’s Disease, or to GMET (Georgia Mathematics Education Trust).

Larry Elbrink is just the most recent death that has deeply affected me. We have lost John Neff (former GCTM president), Dwight Love (Facilities coordinator and conference chairperson), Bill Bompart (former GCTM president) and now Larry. These men were not only outstanding mathematics educators, but they were very dedicated to GCTM.

When I think of the loss of these wonderful men, I can’t help but pray there will be other outstanding leaders to help fill the void.

Each gave of their time and talent by not only serving in a leadership role in GCTM, but helped make me proud to be a part of this organization.

As a classroom teacher for 30 years, their excitement about mathematics helped keep me going and always trying to do the best, not only for my students but for other teachers. GCTM has a wonderful heritage and I hope the young educators will step up to the plate and help fill the shoes of these wonderful men.

—Mildred Sharkey
Closing the Achievement Gap
A Position of the National Council of Teachers of Mathematics

Question
How can we close the achievement gap in mathematics education?

NCTM Position
Every student should have equitable and optimal opportunities to learn mathematics free from bias—intentional or unintentional—based on race, gender, socioeconomic status, or language. In order to close the achievement gap, all students need the opportunity to learn challenging mathematics from a well-qualified teacher who will make connections to the background, needs, and cultures of all learners.

The achievement gap indicates disparities among groups of students usually identified (accurately or not) by racial, ethnic, linguistic, or socioeconomic status with respect to a variety of measures, including attrition and enrollment rates, alienation from school and society, attitudes toward mathematics, and test scores. The achievement gap is not a result of inclusion in any demographic group, but rather of disparities in the way that learners are treated on the basis of racial, class, and language differences. These disparities can be conscious or unconscious, blatant or subtle, personal or institutionalized. Students internalize others’ perceptions of the group to which they belong. The feelings and anxieties that students harbor as a result of negative messages can and do affect their performance on tests (Croizet & Claire, 1998; Shih, Pittrinsky, & Amhady, 1999; Steele & Aronson, 1995). Teachers’ expectations and belief systems also affect students’ mathematics achievement (Strutchens, 2000).

Every student should have equitable and optimal opportunities to learn, free from any bias on the part of schools, communities, and teachers. Every student should be taught by teachers in schools where expectations are high, regardless of the community where the school is located. The teachers should be mathematically competent and pedagogically proficient. They should use curricula that are culturally relevant and methods of instruction that are culturally sensitive. Ideally, all children who are not proficient in English should receive mathematics instruction in their first language as they work to acquire English proficiency. Alternative and authentic assessment practices should be used, and the federal mandate for achievement, insofar as it is based on inadequate and inequitable standardized assessments, should be challenged.

Convincing evidence suggests that teachers can play a significant role in closing the achievement gap. Unfortunately, students who have the greatest needs often have the least qualified teachers. Key decision makers in government, industry, community leadership, and education must fully understand the issues related to equity in mathematics education so that they can carry a strong, consistent message. Finally, educators at the local, state, and federal levels should be knowledgeable about equity issues and communicate with their legislative representatives about the current inequities in education.

April 2005
Computation, Calculators, and Common Sense
A Position of the National Council of Teachers of Mathematics

Question: Is there a place for both computation and for calculators in the math classroom?

NCTM Position
School mathematics programs should provide students with a range of knowledge, skills, and tools. Students need an understanding of number and operations, including the use of computational procedures, estimation, mental mathematics, and the appropriate use of the calculator. A balanced mathematics program develops students’ confidence and understanding of when and how to use these skills and tools. Students need to develop their basic mathematical understandings to solve problems in and out of school.

Technology pervades the world outside school. There is no question that students will be expected to use calculators in other settings; this technology is now part of our culture. More importantly, when calculators are used well in the classroom, they can enhance students’ understanding and use of numbers and operations. Teachers can capitalize on the appropriate use of this technology to expand students’ mathematical understanding, not to replace it.

Written mathematical procedures—computational procedures in the elementary grades and more symbolic algebraic procedures as students move into the secondary level—continue to be an important focus of school math programs. All students should develop proficiency in performing efficient and accurate pencil-and-paper procedures. At the same time, students no longer have the same need to perform these procedures with large numbers or lengthy expressions as they might have had in the past without ready access to technology. Furthermore, computation should not exist in isolation. Measurement, geometry, and analyzing data represent important mathematical content and provide useful contexts as students develop their numerical abilities.

Even more important than performing computational procedures or using calculators, students need greater facility with estimation and mental math than ever before. These skills are essential both for understanding numbers and because of their usefulness outside school. Students should have a solid understanding of what addition, subtraction, multiplication, and division mean and how they work so that they can identify what operation(s) can help them solve a problem they encounter in math class, in another subject, or outside school. As they develop number sense, students acquire abilities to estimate and perform mental calculations quickly and proficiently. Students should become proficient at using mental math shortcuts, performing basic computations mentally, and generating reasonable estimates for situations involving size, distance, and magnitude.

A skillful teacher knows how to help students develop these abilities in a balanced program that focuses on mathematical understanding, proficiency, and thinking. The teacher should help students learn when to use a calculator and when not to, when to use a pencil and paper, and when to do something in their heads. Students should become fluent in making decisions about which approach to use for different situations and proficient in using their chosen method to solve a wide range of problems.

May 2005
How to Make the Most of a Conference

At ttending a conference is a great way to network, stay current on new products and technologies in your industry, as well as providing a form of professional education. But when you flip through the program guide of that conference, you realize there are many sessions you want to attend, and unfortunately, some of them even occur at the same time. How can you optimize your time at panel discussions and still have time to deal on the exhibit floor and press flesh in other settings? Here are some tips that will help you make the most of your conference experience.

Review Program in Advance

“Decide ahead of time which exhibitors you would like to visit and be prepared to negotiate for specific products you wish to buy,” says Karla Krause-Miller, conference director at RSA Conference of San Mateo, CA. Vendors usually have great flexibility at a show to make deals, considering they have to demonstrate that the sales that came from the show justified them being there. This gives you great negotiation power.

Bring Ample Business Cards

Inevitably you will meet someone at a conference who will say they forgot to bring their cards or that they ran out. Don’t be that someone. Constantly replenish the stash in your pocket. Exchanging cards is an important part of networking. Mailing labels work well to sign up for drawings in the exhibit hall also.

Get Materials

If there are sessions you cannot attend, find the presenter and ask for the handouts they are offering. Some presenters will also email their packet of information to you, if you can obtain their email address.

Ask a Presenter to Lunch

Many speakers attend conferences alone and have no one to eat or hang out with. If you want some free consulting time with a speaker you respect, find out their schedule and ask them to lunch or dinner. “I once did a presentation at the beginning and end of a conference and had really nothing to do in between,” says Steve McClatchey, president of Aller Consulting of Malverny, PA. “With some consultants ranging in the thousands for consulting time, it’s worth a shot.”

Apply to be a Presenter

While the seminars are still fresh in your mind, start thinking about what you can present on next year. Calls for proposals for next year’s conference and other related ones can often be found at the handout tables. Sharing a presentation is a great way to be positioned as an expert, and it’s a great way to network. “When there are 200 people attending a seminar, I gather more business cards there than in the exhibit hall,” says Bill Brooks, CEO of the Brooks Group, a sales management training company in Greensboro, NC.

Keep Your Program

Save a copy of the convention program. Mark the sessions you attended. Its list of panels, speakers and contact information can prove to be a useful reference. If you’re presenting at the conference, you can also use your listing in the booklet in your portfolio as proof of your participation to your administration when raise time rolls around, or when positioning yourself as an expert to others.

Edited from “How to make the most of a Conference” originally appearing in Go!, Airtran Airways’ in-flight magazine. Reprinted with permission of the author.
**Extreme Makeover: Mathematics Edition**

**The Georgia Council of Teachers of Mathematics Invites You to the 46th Annual GEORGIA MATHEMATICS CONFERENCE!**

**October 20–22, 2005**

Things are changing fast in mathematics education. This year’s conference is designed to help you survive and thrive in this environment of change! We have exciting keynote speakers to get you fired up about mathematics. In addition there are major speakers from all over the country, as well as our own outstanding Georgia people!

The new Georgia Performance Standards are on everybody’s mind, and we have numerous sessions designed to explore, explain, and use them. The high school keynote and panel discussion Thursday morning will introduce the recently approved high school GPS. Sessions are planned at all grade levels to introduce the tasks that help explain the standards. Other sessions discuss topics new to a particular grade level and methods of teaching with performance standards. Most sessions include ideas and activities appropriate for the GPS.

Technology is changing both what we teach and how we teach. Sessions will show you how to use the Internet in a variety of ways. Other sessions demonstrate the use of computers and calculators at all grade levels.

The school population is changing. Georgia’s teachers need to be able to teach students who are not proficient in English, and we’ve got the help you need. Be sure to look for sessions on how to work with English Language Learners.

Testing is becoming increasingly important in this time of accountability. Look for sessions about how to teach for understanding and improve test scores at the same time!

Vendors have produced extensive materials to help you teach effectively. You’ll want to make time during the conference to visit the exhibits to see what’s available. In addition, some vendors will showcase their materials during sessions.

Parent involvement makes a difference. Come visit Saturday’s Math Fair to see how one school successfully got parents interested and involved in their children’s education.

PRESIDERS NEEDED: Sign up to introduce a speaker and be guaranteed a front-row seat. Email Nickey Ice to sign up (nice@gctm.org).
Conference Keynote Speakers

Thursday Morning

Carol Malloy is currently an associate professor of mathematics education at the University of North Carolina at Chapel Hill. She has served on the Board of Directors of NCTM, as president of the Benjamin Banneker Association and as a member of the writing group for NCTM’s Principles and Standards 2000. She is also an author of algebra and geometry textbooks for Glencoe McGraw-Hill.

Thursday Night

Tom Reardon has been teaching high school mathematics for 31 years. He enjoys integrating appropriate technology into his lessons when possible—especially SMART Boards and graphing technologies. Tom has worked with Texas Instruments on developing software: the Symbolic Math Guide and TITeSmartView. A current project is incorporating Computer Algebra Systems in teaching Algebra. Tom enjoys traveling the country and doing workshops, biking and music.

Friday Night

Dr. Monica Neagoy was educated in the French school system, grades 1-12, in Asia and the United States. She has a B.S. in mathematics and philosophy from Georgetown University, a MA in Mathematics from The Catholic University of America, and a PhD in Mathematics Education from The University of Maryland. Her exposure to many cultures, her mastery of several languages and her professional involvement in both the arts and the sciences provide her with a unique perspective on the learning and teaching of mathematics.

Saturday Morning

Jane Barnard is currently on leave of absence from the Department of Mathematics at Armstrong Atlantic State University in Savannah and is completing a PhD at Saint Louis University. She is a past president of the Georgia Council and received the Gladys M. Thomason Award in 1994. Jane received many awards and has been actively involved in GCTM, NCTM and NCSM, and also served as the President of the Mathematics Educators of Greater St. Louis this past year. Having classroom experience at Kindergarten through university levels, Jane has a passion for the learning and teaching of mathematics, with a special love for technology, communication, connections and mathematical photographs and cartoons.
Conference Major Speakers

Jeane Joyner has a B.A. from Mary Baldwin College, M.A. from North Carolina Central, and has done Post-graduate work at North Carolina State, Sacramento State, and UNC-Chapel Hill. She has experience teaching middle school, adults, and has taught in a Learning Exchange Lab for K-5. Currently she is a research associate with the Department of Mathematics & Computer Science at Meredith College, Raleigh, N.C. and president of the North Carolina Council of Teachers of Mathematics.

Gail Englert is a sixth grade pre-algebra and science teacher at the School of International Studies in Norfolk, VA. A National Board Certified teacher, Gail has received the Presidential Award for Excellence in Mathematics Teaching and was named an All-Star Teacher by USA Today. She is active in her local and state mathematics councils and has just completed a term on the National Council of Teachers of Mathematics Board of Directors.

Diane Morren has a B.S. in Elementary Education from the University of Texas at El Paso and an M.A. from New Mexico State University. After receiving her degrees, she taught literacy and trained teachers in the Philippines, Guatemala, Honduras and Colombia before returning to work in the public schools in Texas. Her teaching career there has included ESL teaching—both children and adults. Most recently she has been a full time bilingual reading teacher at the elementary level in Duncanville.

David Hammett has a B.S. in Mathematics from the University of Georgia and an M.A.T. in Mathematics from Georgia State University. He spent fourteen years teaching at South Cobb High School in Cobb County, eight of those as mathematics department chair, before moving to southern California in 1997. Since then he has served as mathematics teacher and department chair at Oakwood School in North Hollywood and has also acted as a mathematical consultant to a variety of game shows.

Antonio Gutierrez earned his B.S. in Electrical Engineering from the National University of Engineering, Lima, Peru. During his 21 year career in the computer and mining industry, Gutierrez worked in all areas of the computer field. Finally, he retired from the industry to pursue teaching in secondary education. He is the creator of the Web site Geometry Step by Step from the Land of the Incas: agutie.homestead.com. This intriguing, multi-award winning site is filled with facts, problems and interactive puzzles relating to secondary school geometry.

Irina Lyublinskaya has a Master’s degree in Physics and a Ph.D. in Theoretical and Mathematical Physics from the Leningrad State University, Russia. During more than 15 years of teaching mathematics and physics at high school and college levels, she has received the Radioshack/Tandy award for teaching excellence, NSTA distinguished science teaching award and Northern Life Unsung Heroes award. Currently she is an Associate Director of the Discovery Institute and Associate Professor of Teacher Education at the College of Staten Island/CUNY.

REFLECTIONS  FALL 2005
Eyeball Theorem

Given two circles with centers A and B, draw the tangents AC, AD, BF and BE from the centers of the circles as shown in the diagram. Then the chords MN and PQ are equal in length, where M, N, P and Q are as shown in the diagram.

I found that MN = PQ about 35 years ago whilst exploring new problems concerning circles, tangents and chords. I am convinced that this result has been discovered in almost all cultures. However, a recent Internet search surprisingly turned up only a few relevant references to the “Eyeball Theorem.”

This would be the type of theorem to take on a desert island to exercise the mind because it is elementary, beautiful and surprising. It is designed to improve visual abilities, intuition and proof, thinking and reasoning skills, and above all, the geometric inspiration without which no discovery can be made. Like Archimedes, we can draw our sketches in the sand, but without the assistance of an ancient Roman soldier, please!

In what follows, I present three proofs of the Eyeball Theorem and a new Eyeball-to-Eyeball Theorem with corollary. All are described with graphics, as a reflection of how a humble geometer thinks. What is the process by which geometers scan, focus, drill down and zoom?

Proof

In sympathy with the noble qualities of “simplicity, economy and elegance,” this proof reveals the content and the context of the Eyeball Theorem and, by elucidating new relations between geometric objects like the cyclic quadrilateral FMPC, leads to further discoveries, such as the new Eyeball-to-Eyeball Theorem.
1. \( \angle AFB = \angle ACB = 90^\circ \)
(a tangent is perpendicular to the radius drawn to the point of contact)
\( \therefore \) AFCB is a cyclic quadrilateral.
\( \therefore \angle BAC = \angle BFC \) (i.e., \( \beta = \beta' \))

2. Let \( \angle MCP = \alpha \), so that
\( \angle FBC = 2\alpha \)
(alternate segment theorem, then, angle at center is twice angle at circumference)
\( \therefore \angle FAC = 2\alpha \) (angles in the same segment)
\( \therefore \angle MFP = \alpha \)
\( \therefore \) FMPC is a cyclic quadrilateral and
\( \angle PFC = \angle PMC \) (i.e., \( \beta' = \beta'' \))

3. So \( b = b'' \) and hence MP \parallel AB (pair of corresponding angles).
Similarly, NQ \parallel AB and MPQN is a rectangle.

4. \( \therefore MN = PQ \).
Q.E.D. (Quod erat demonstrandum).

We are very pleased to announce that Antonio Gutierrez will be speaking this year at the Georgia Mathematics Conference at Rock Eagle. The proofs of the Eyeball Theorem were too lengthy to be published here, but he will be presenting the entire text at that time, as well as some newly discovered theorems. Also please check our Web site www.gctm.org, where you will see the complete proofs soon.

REFLECTIONS FALL 2005
Using Children’s Literature to Teach Mathematics

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

Too Many Pumpkins
by L. White
Holiday House, New York, 1996
Lesson plan by Linda Brewer

Summary
Ever since she was a little girl, Rebecca Estelle has hated pumpkins. One afternoon an enormous pumpkin falls off a truck and smashes in her yard. Rebecca Estelle then shovels dirt over the pieces and forgets about them. But those slimy pumpkin pieces sprout up in autumn, and she finds herself with a sea of pumpkins. She decides to make every kind of dish she can think of with pumpkins. Then she carves pumpkins and puts candles in them. She sits back and waits for people to arrive and eat her pumpkin treats.

Activities
Algebra—Pumpkin patterns: The teacher will cut out pumpkins to use for patterning. The pumpkins can be big and small. The student is to make different patterns using the pumpkins. Examples: big, small, big, small or big, big, small, small.

Problem Solving—Estimate how many seeds are in the class pumpkin, graph the estimates. Count the seeds to see who was the closest. Guess how many cups your seeds will fill.

Measurement—Measure the circumference of the pumpkin with yarn. Measure the height of the pumpkin with unifix cubes and other math manipulatives.

Communication—Have students compare pumpkins to gourds and/or squash. The students should write in their math journals their observations about the pumpkin, gourd, and squash. After the children observe and write in their math journals, the teacher will hold a discussion so the students can discuss their findings.

Numbers and Operations—The teacher will make pumpkins for the students to use to do pumpkin math. Using pumpkin seeds the students will place the number of seeds the teacher directs on one side of the pumpkin and then the number of seeds the teacher directs on the other. The student will add or subtract the seeds according to the teacher’s directions and record the answer on their math paper. Then the teacher will do another problem, etc.
**Caps for Sale**
by E. Slobodkina
Scholastic Publishers, New York, 1940
Lesson plan by Deborah Wise

**Summary**
A cap peddler sets out one morning carrying many different colored caps stacked on his head. He walks up and down the streets, but by midday he has not sold a single cap. He walks into the country and takes a nap under a tree. When he awakens, his caps are no longer on his head. He looks up into the tree and his caps are being worn by monkeys. He tries many unsuccessful attempts to get the monkeys to drop his caps. In frustration he throws his cap down onto the ground. The monkeys imitate the peddler and throw their caps down also. The peddler then picks up his caps, restacks them on his head, and walks back into town.

**Activities**
**Data Analysis**—“What color is your cap?” Students will be permitted to wear a cap to school on a designated day. Students will choose a strip of colored construction paper which identifies the color of their cap. A bar graph will be constructed for each cap color represented in the classroom. Students will evaluate the data represented. The teacher will ask questions pertaining to the data regarding the concepts of “most,” “least,” “fewer,” and “more.”

**Numbers and Operations**—“How much will the Peddler Earn?” The book states that the peddler is selling his caps for $.50. The students will be given color coded cards representing the different colors of the peddler’s caps. Depending on the number of cards each student receives, they will determine how much money the peddler will make if he sells all the caps represented by their cards. The activity can be enhanced by changing the price value for each color cap, and redistributing the color cards. Gray caps can be $.50, brown caps can be $.75, etc. The students will share their determinations with the class.

**Connections**—“How long did the peddler sleep?” The students will be divided into groups of two. Each group will receive a card with a word problem relating to how long the peddler slept. When the groups have solved their particular problem, they will share with the class, and the other students will evaluate how they arrived at their answers.

**Problem Solving**—“How high are the peddler’s caps?” Students will be divided into groups of two. The teacher will state a random measurement for the height of each colored cap. Each group will receive cards with numbers of each color cap. The groups will determine the total height of the caps represented on their card and then share with the class. The class will evaluate each group’s responses. New cards will be distributed.

**Measurement**—“How far did the peddler walk?” The teacher will indicate the distance in feet which the peddler walked from the town to the country. Students will work in groups of two to convert those measurements into yards, miles, and then kilometers. Students will have access to conversion tables for these measurements. The class will evaluate and compare the group responses.
Factoid Challenge

Factoids

• Canada is the world's second-largest country with an area of 9,971,500 square kilometers.

• The rocks on the moon are between 3 and 4.6 billion years old.

• The moon has a 15,000-mile tail of sodium atoms that can only be detected by instruments.

• Hummingbirds fly at speeds up to 71 mph.

• Lightning strikes earth somewhere over 17 million times a day or about 200 times a second.

• It takes from 25 to 30 seconds for blood to circulate through the body.

• At birth you start with around 300 bones, but by adulthood you have around 206.

• The American opossum’s gestation period is 12-13 days; the elephant’s is 21.7 months.

The challenge:
How can you use these in YOUR classroom? Be among the first 5 teachers to submit the activity you created using any or all factoids, along with 5 samples of student work (electronically, please), to chughes@gctm.org.

The reward:
You will receive $10 to be used in the exhibit hall at GMC 2005 at Rock Eagle.

GCTM Mini–Grants

Do you have an innovative teaching idea, but you need a little money to get started?

As a member of GCTM you are eligible to apply for a mini–grant of up to $300. The purpose of the grant should be to fund a creative teaching project.

Applications are received during September, awarded in October, and the project should be implemented October through June.


Job Opportunity

Editorial assistant for REFLECTIONS. Duties may include editing, minimal writing, networking with Georgia teachers to procure writers, photography at GMC, layout and graphic design. Experience welcomed but not required.

All interested parties please contact Cheryl Hughes at hughesgctm@yahoo.com.
Numberlines: From Infinity to Infinity

CONCEPTS: Number Sense, Measurement
SKILLS: Ordering numbers, using a ruler
MATERIALS: Set of cards with numbers or expressions written on them, adding machine tape, yardstick or meter stick, ruler, Student Activity Sheets (following pages).

BACKGROUND:
This activity can help students at many grade levels develop their number sense. It also reinforces the concept that the markings on a number line need to be at equal intervals to provide an accurate picture of data and the distribution of numbers or algebraic expressions. Using teacher-made cards, students arrange a set of dates, numbers or algebraic expressions by placing them in order on a number line. You can use the suggestions given below or make up your own sets of cards depending on the level and interests of your students.

DIRECTIONS:
You can organize this activity for the class or for groups.

- Construct a number line on adding machine tape (or have students do it)
- Be sure to discuss with students the range of the data so that they will be able to place all of the cards on the number line. Also make sure the intervals have equal lengths. All of the number lines can be the same length, or groups can have different lengths of tape.
- If students are divided into groups, give each group a set of cards. Have the group arrange the cards in order and then, using paper clips, place each card in its appropriate place on the number line.
- Another suggestion is to have students measure each other's height and place these measurements on a number line. Students can construct a number line with metric measurements on one side and U. S. measures on the other side. Give students benchmarks such as 4 ft, 5 ft, 6 ft, or 50 cm, 100 cm, 150 cm.
- For younger students you could use a set of whole numbers. Depending on the grade level of your students, you might want to make different sets of cards, for example, integers, rational numbers including fractions, decimal numbers, percents, and real numbers including irrational numbers like square roots and pi.
- A variation that leads to some interesting discussions is to use algebraic expressions like those on Student Activity 2. You could use this set of cards for several days, assigning different values for each day.

Be sure to encourage the students to discuss why they placed the numbers or expressions where they did. Have students verbalize their thinking by asking them questions such as:
- How did you decide where to place the different numbers?
- How did you know the placement was correct?
- Which units of measurement did you find easier to place on the number line?
- How does the length of the tape affect the placement of the numbers?
# Numberline Flashcards

<table>
<thead>
<tr>
<th>2</th>
<th>73</th>
</tr>
</thead>
<tbody>
<tr>
<td>103</td>
<td>562</td>
</tr>
<tr>
<td>1,473</td>
<td>4,534</td>
</tr>
<tr>
<td>9,876</td>
<td>52,491</td>
</tr>
<tr>
<td>102,789</td>
<td>321,978</td>
</tr>
<tr>
<td>650,821</td>
<td>1,290,864</td>
</tr>
<tr>
<td>2,545,499</td>
<td>5,547,454</td>
</tr>
</tbody>
</table>
### Numberlines: Student Activity Sheet 2

<table>
<thead>
<tr>
<th>$2x$</th>
<th>$x + 2$</th>
<th>$x \cdot x$</th>
<th>$\frac{x}{x}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x - x^2$</td>
<td>$x - \frac{1}{3}x$</td>
<td>$3 + \frac{x}{x}$</td>
<td>$2 - x$</td>
</tr>
<tr>
<td>$x^0$</td>
<td>$2x - 3$</td>
<td>$\frac{x}{-x}$</td>
<td>$\frac{1}{2}x$</td>
</tr>
<tr>
<td>$3 + \frac{x}{2}$</td>
<td>$2^x$</td>
<td>$0 \cdot x^2$</td>
<td>$\sqrt{x}$</td>
</tr>
<tr>
<td>$x - \frac{x}{2}$</td>
<td>$2x - 1$</td>
<td>$x -</td>
<td>x</td>
</tr>
<tr>
<td>$\frac{x}{0.5x}$</td>
<td>$\frac{x}{2^x}$</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>$\frac{1}{x}$</td>
<td>$0 \frac{1}{x}$</td>
<td>$-</td>
<td>x</td>
</tr>
</tbody>
</table>
Why do These Work?

The following algorithms were found written by a layman (a non-mathematician) who claims that they work! Do they always work? If so, why? If not, why not? Could your students help you decide?

**The sum of the Integers between 2 Integers**

F (first) and L (last)

\[
\text{Sum} = (L \text{ squared} - F \text{ squared} + F + L) / 2
\]

where \(F > 0\) and \(L > 0\),

and \(L > F\)

**How to find the Fifth Root**

Begin with any positive number and raise it to the fifth power.

**Here is the process:**

The least significant digit of the big number is the same as the least significant digit of the root. That is always the case. The following is the list of the first 9 numbers with integer fifth roots.

<table>
<thead>
<tr>
<th>1</th>
<th>32</th>
<th>243</th>
<th>1024</th>
<th>3125</th>
</tr>
</thead>
<tbody>
<tr>
<td>7776</td>
<td>16807</td>
<td>32768</td>
<td>59049</td>
<td></td>
</tr>
</tbody>
</table>

Notice the last digit of each number goes up from 1 to 9. You can commit these to memory to make this process totally mental.

If this is the number for which you are to find the 5th root, 459165024, go down the list of memorized numbers until you have found one that is larger than the 4591. (Yes, you are starting at the right and overlooking the right-most 5 digits to yield the 4591.

When you get to a number that is larger than the 4591, you see 7776. The 6 is the only important digit in the 7776 as the last digit is always one greater than the first digit in the answer.

So the answer is 54.

**Here is another example:**

The problem is to find the 5th root of the number 79,235,168.

The one’s digit is 8 automatically. If you discard 35168 and take the 792, and then look at the list, 1024 is the next greater number with a 5th root. The first digit in the answer is one less than the one’s digit of 1024, so the final answer is 38.

Does this always work? Why? Is there an algebraic reason why it works? Is there a more concise way to write this algorithm? Send comments and solutions to Cheryl Hughes (chughes@gctm.org).
If:

• YOU have an had an “aha” experience in your classroom
• YOU students had great success at something
• YOU have used unusual project with your students
• YOU have taken your students on a successful mathematical field trip
• YOU have used an idea you read in REFLECTIONS

We hope you will write an article describing your experience. Please see the writer’s guidelines on page 26. Photos, students work, and samples of handouts are welcomed.

Al’s Web sites

Moneyopolls
www.moneyopolis.com/new/home.asp
A free site containing a game to teach students about investing, banking, and real-life situations involving money. Students play the game and teachers can view their progress.

Mudd Math Facts
www.math.hmc.edu/funfacts
Share random fun math facts with your students by posting them around your room, on tests, on worksheets, on your Web page, etc. Use these math facts to start discussions, fuel warm-ups, and a myriad of other activities.

Math Tools Technology POW (Problem of the Week)
mathforum.org/tpow
These POWs take advantage of technology using Java applets. Printable copies available. Regular POWs available on mathforum.org.

Towers of Hanoi applet
math.bu.edu/DYSYS/applets/hanoi.html
Students will enjoy playing this interactive computer game. Hold a contest for finishing in the fewest moves. Even the teacher can win!

ClickMAZES
www.clickmazes.com
This site has interactive mazes and puzzles of all kinds, with links to the history of the puzzle or maze. Many include hints for success.

Mathwords: Terms and Formulas
www.mathwords.com
This site provides a great dictionary of interactive definitions for terms used from Algebra through Calculus. There are many 3D graphics available to enhance the definitions.

NEXT ISSUE

Deadline: Oct. 30, 2005

Topics:
• Pi and Pi-Day
• Preparing students for yearly assessment
• Preparing students for competition
• Celebrating mathematics

REFLECTIONS FALL 2005
Homework: A Key to Improvement in U.S. Mathematics Education

Introduction
The United States has a serious problem in mathematics education. Test results show that beginning in middle school, the U.S. student proficiency declines in comparison with other developed countries throughout the world to near the bottom by 12th grade [PISA]. The Workforce/Education Subcommittee of the President’s Council of Advisors on Science and Technology identified two principal reasons for this: too many math teachers are not trained in math, and too many math textbooks are inadequate [Herbold].

This article suggests a third important contributing reason: low homework emphasis. The U.S. lags far behind in time spent by our students on homework [TIMMS]. Thus, improving homework completion at the secondary level may be a significant opportunity for U.S. math proficiency improvement at that level. This article suggests that new Internet math homework-help resources may be very helpful in getting more students to complete and understand their homework. As an important by-product, more class time will be available for more in-depth teaching than is currently possible. We identify some of the available resources, discuss their application and the background research that supports their use, present comments from several contributing authors, and present a case study of the use of one of the Internet resources.

Homework Not Being Done
Without homework practice, middle school or high school students cannot fully master the concepts presented in class. Homework provides an opportunity for the students to extend their understanding and directs the students to concepts that need further explanation. Homework provides an opportunity for students to make, discover, and correct mistakes so they can learn from them.

Students of teachers who emphasize the importance of homework score higher than students of teachers who do not [House]. However, teachers are finding that getting students to actually do assigned homework is increasingly difficult. Some students, and often their parents, express that homework is a useless burden. Furthermore, homework competes with TV, video games and other activities. A teacher in Northern California had this to say [Bradley]:

*I am a good teacher, as evidenced by my experience, by peer, student and parent feedback, and by advanced certifications that I have earned. Yet, many of my students fail. Most of those who failed will say it was because they did not do the work.*

Worked Examples
The use of worked-out examples is a standard practice in classroom lectures and textbooks. Some students understand the daily lesson after observing just a few worked-out examples. Others need more examples than can be presented during a class period or provided in a textbook section. These latter students would benefit significantly from additional worked examples, but they might not know where to find them or have the motivation to seek them out. The research described below shows that providing worked examples...
for actual assigned homework problems is beneficial. The Web sites described below allow students to view worked-out solutions for their assigned homework.

**Internet Resources for Math Homework Help Via Worked Examples**

A Web site that provided math homework help by showing tutorial (worked-out) solutions for actual math textbook homework problems was first introduced in 2001 [Beall]. Other Web sites with the same general capabilities have since become available.


Even students who may have fallen behind in math may be attracted to such Web sites, as they provide a new avenue for catching up. The help, via computer, with their assigned homework relieves them of the fear of peer or supervisory embarrassment. Math teacher Jane Monson noted that more of her students are completing homework since they began using Hotmath.com because it answers the question, “What is the next step?” so that students can continue on their own. According to Math teacher Lisa Winer, “I love that this Web site gives worked solutions to assigned homework, because students who want it can get instant help right away on their own. If a student says they didn’t understand the homework, my response is that they should have logged on to get help.”

Scientific research has investigated the use of “worked-out” examples in algebra, and the results show that this increases effective learning [Carroll, 1992]. A study was done in Texas: two groups of students, one of poor performers and the other of good performers, were taught together with only one difference; the poor performers were given their homework assignments with 50% of the problems accompanied by worked solutions. The good performers were given the same homework assignments without worked solutions. Interestingly, the poor performers achieved higher scores on the final exam than the original good performers. In related research, students in the worked examples group completed their work more quickly while perceiving the work as less demanding and displayed better performance on tests [Carroll, 1994]. The researchers suggest that the reduced cognitive load allows the students to process the under-
lying similarity of problems and integrate the methodology with existing knowledge [Grillmeyer, 2001]. They also note that less “wrong learning” results.

The availability of worked solutions also benefits advanced students. They can tackle the more challenging problems with more success and move forward with less outside help. Advanced, motivated students can work ahead in their textbook, knowing that an instant tutor is available.

Homework review in class is an important part of math teaching. Teachers need their students to ask questions about processes, rules, and properties as a part of assessing both the students and their own teaching. Yet, routine questions of interest to only a few students can be a very inefficient use of class time. According to math teacher Marty Atkins, “As our students have begun to use Hotmath.com ...I am beginning to get more ‘Why did they take that step?’ questions rather than ‘How do I start?’ questions.” A survey of math teachers using one of the homework-help sites concluded that about 20 minutes per class time was freed up [Grillmeyer, 2004]. According to math teacher Paula Evans, “We saved class time, which we immediately reallocated to activities which allowed students to develop insight about the material. ...We have used this time to develop in-class activities which ask students to extend their homework.”

When teachers assign homework problems with solutions available on any of the listed Internet homework-help Web sites, their students can receive step-by-step explained solutions to their actual homework problems. Students are able to see their mistakes and learn from them, and parents are in a better position to see the methods being taught so they can amplify them as needed. Use of these sites is not simply checking or getting answers, but may be considered a directed, self-paced, tutorial experience.

Teachers justifiably want to balance the amount of available homework help so that students are certain to be challenged. Some students might mindlessly copy down solutions if they are available for every problem. The research concludes that 50% of assigned problems should have the available help. Two of the Web sites that provide solutions to actual textbook homework problems (Encarta and Hotmath) only explain the odd-numbered problems, for which numerical answers are already available in the back of the textbook.

**Jesuit High School Case Study**

I am a mathematics teacher at Jesuit High School in New Orleans, LA. This is a private Catholic urban school with approximately 1500 students. The student body is primarily middle class students from educated, success-oriented families. Our class size averages 25 students and 99% of the graduates attend a university.

When our math department introduced Hotmath.com to our students, only the most diligent took advantage of it. As individual teachers and as a department, we learned to approach the homework review in the classroom differently. Instead of asking, “What problems gave you trouble last night?” we began to ask “For what problems did you not
understand the solution given on the Web site?” and “At what point did you not understand what Hotmath did?” Eventually, homework review went from over 30 minutes a class to under 10. Even better, we saw students’ grades improve!

With the extra class time, our teachers were able to delve into problems or topics that focused on higher-level thinking skills. We could use open-ended problems to stimulate thinking both in a small group setting and to individual students. Even the lower track students became more able to think—rather than just repeat steps—to attain a solution.

As I listened to and read the experiences of the contributing authors, I realized that our school’s experiences were not unique. Almost universally they achieved additional instructional time in class. They found that they could limit the amount of time spent on homework review, maintain or increase their rates of success, and introduce creative classroom activities to stimulate mathematical thinking.

**Conclusion**

In addition to the recommendation that teachers consider these Internet math resources, we feel strongly that our school and political leadership should actively and repeatedly stress the importance of homework, as well as the importance of mastering math and science classes, so as to effect an attitude change over time that will benefit everyone.

---

**References**


Life Members with Comments

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I am retiring from North Springs High School in Fulton County in June 2005 and may teach part-time. I was the Reflections editor for 2 years (7 issues) in 78 and 79 when the format changed to a journal style over a newsletter for mat. Wonderful times with Bill Bompert, Do Sprypek, and Gladys Thomason.

—Jan Gaylord, Atlanta

I am serving as 6-12 Curriculum Director for Colquitt County Schools. I sure miss all my math friends. We are working on the standards, trying to find craft good performance tasks.

—Jenny Funderburk, Moultrie

GCTM Officers are doing a great job carrying on the tradition of quality. I was among the first to attend the first meeting at Rock Eagle (1954) and also served on committee of to compile The History of the Georgia Council of Teachers of Mathematics, finished in October 1984.

—Doris Dickey, Cartersville
Even though I am retired, I still enjoy the Reflections, to keep up with what is going on at GCTM. For example, I would not have known about Dr. Bonparte had I not been reading Reflections. I continue to be interested. If I can assist with something from home, I’d be happy to do whatever. Continued success with your work at GCTM.

—Annie Rogers, Augusta

I do enjoy Reflections and I do follow (via mail) the happenings. I’m now 85+—retired from Atlanta Schools in 1980, did college work for 6 years—doing just a little free tutoring now. You may see my name in the files, as I served as President of GCTM in the mid-seventies as the first Afro-American President. I do miss the activities of both GCTM and NCTM of which I attended several annual and Regional meetings. Good Luck!! I would certainly prefer to improve available resources via conferences and meetings to enhance the teaching skills of teachers.

—Gladys P. Richardson, Atlanta

If you too can support GCTM by becoming a life member. See the membership application on the inside back cover for details.
Here are just a few of the many reasons why you should make a donation to the Georgia Mathematics Trust:

1. Give in honor of a Mentor
2. Give to perpetuate good teaching
3. Give in honor of a teacher who is retiring
4. Give to help the mathematics students of the future

Writers’ Guidelines

Submissions to REFLECTIONS should be sent electronically to Cheryl Hughes at chughes@gctm.org. Photos and handouts should be indicated in the initial email, but sent later after acceptance. Priority is given to those articles that concern the topics for the particular issue, but all inquiries are welcomed. Priority is also given to Georgia teachers, as we strive to highlight excellence in teaching in our state. Typical word count is less than 800 words, but all submissions will be considered.

MOVING?

Please send your change of address information to
Susan Craig, 1011 Stewart Avenue, Augusta, GA 30904-3151
Or send it via our Web site: www.gctm.org
Congratulations to the Newly-Elected Officers on the Executive Committee

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President Elect

Barbara is an associate professor of Mathematics and Mathematics Education at Kennesaw State University where she teaches and is the Mathematics Education Program Coordinator.

Ellice Martin
Vice President for Honors and Awards

Ellice is an associate professor of middle grades and secondary education at Valdosta State University.

Patti Barrett
Secretary

Patti began her 36th year at Lowndes High (and her 30th year of part-time at Valdosta State) in August. She previously served as secretary of GCTM, as treasurer, registrar, and chair of GMC.

Missy Walker
Vice President for Regional Services

Missy is currently the Mathematics Department Chair at Martin Luther King Jr, High School in DeKalb County.
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