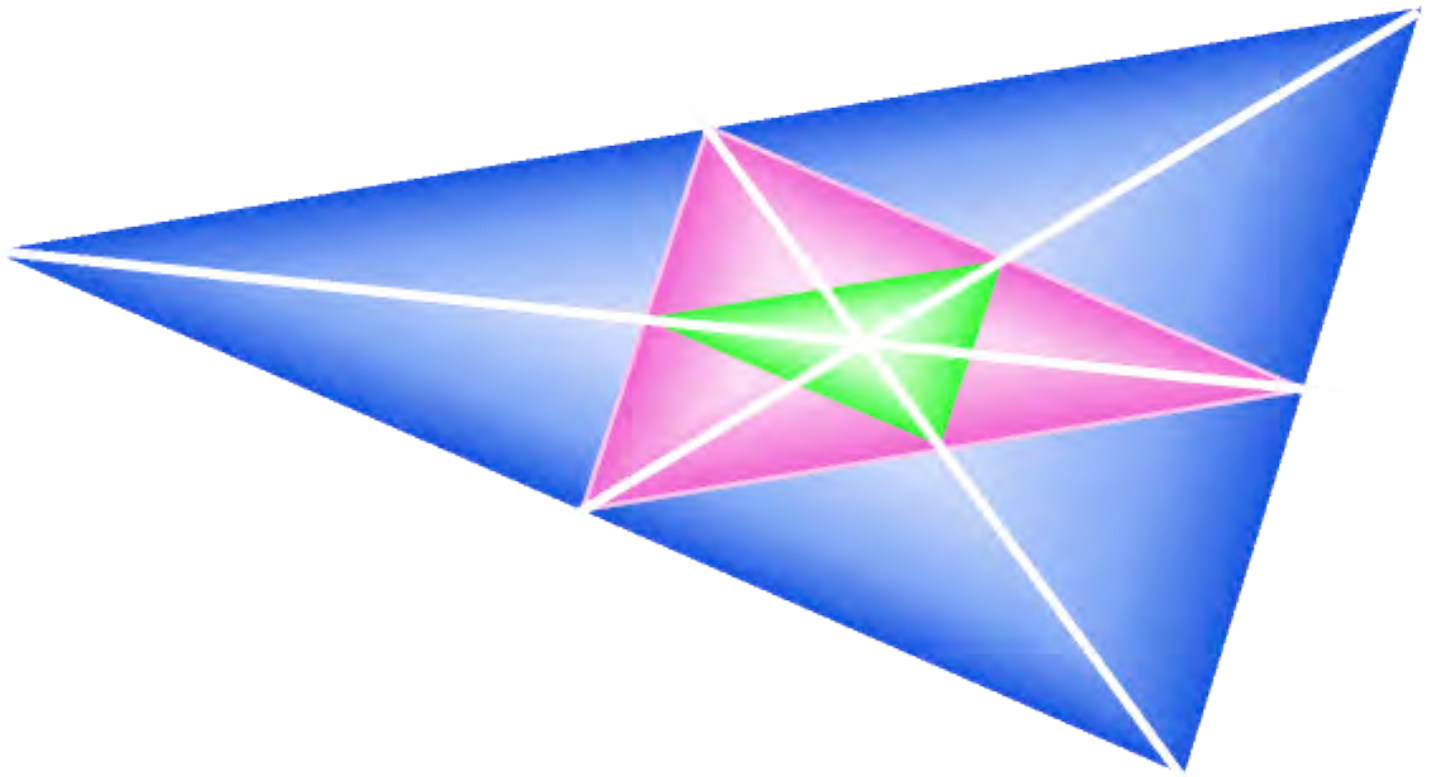


# The Centroid



## *IN THIS ISSUE:*

- ▶ An Alternative Development of Measures of Center and Spread
- ▶ Graduate School: A Journey to be Remembered
- ▶ Milky Way Math
- ▶ A Wrong Assignment that was Somehow Just Right
- ▶ 2010 Logo Contest Winners
- ▶ 2010 State Math Fair Winners



OFFICIAL JOURNAL OF THE NORTH CAROLINA COUNCIL OF TEACHERS OF MATHEMATICS  
VOLUME 36 • NUMBER 2 • FALL 2010

**The Centroid** is the official journal of the North Carolina Council of Teachers of Mathematics (NCCTM). Its aim is to provide information and ideas for teachers of mathematics—pre-kindergarten through teacher education. *The Centroid* is published in January and August. Subscribe by joining NCCTM; see the Membership Form on the last page.

## Submission of Manuscripts

We invite the submission of news, announcements, and articles useful to school mathematics teachers or mathematics teacher educators. In particular, K-12 teachers are encouraged to submit articles describing teaching mathematical content in innovative ways.

News and announcements (president's messages, award winner announcements, professional development announcements, etc.) must be received by December 1 for the spring issue and by July 1 for the fall issue.

Articles that have not been published before and are not under review elsewhere may be submitted at any time to the address below. Submit one electronic copy via e-mail attachment (preferred) or diskette in *Microsoft Word* or rich text file format. To allow for blind review, the author's name and contact information should appear *only* on a separate title page. Manuscripts should not exceed 10 pages double-spaced with one-inch margins. Figures and other pictures should be included in the document in line with the text (not as floating objects). Scannable photos are acceptable and should be large glossy prints mailed to the editor or minimum 300 dpi tiff files emailed to the editor. Proof of the photographer's permission is required. For photos of students, parent or guardian permission is required.

Manuscripts should follow APA style guidelines from the most recent edition of the *Publication Manual of the American Psychological Association*. References should be listed at the end of the article, and should also follow APA style, e.g.,

- Bruner, J. S. (1977). *The process of education* (2nd ed.). Cambridge, MA: Harvard University Press.
- National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.
- North Carolina Department of Public Instruction. (1999). *North Carolina standard course of study: Mathematics, Grade 3*. Retrieved October 17, 2005, from [http://www.ncpublicschools.org/curriculum/mathematics/grade\\_3.html](http://www.ncpublicschools.org/curriculum/mathematics/grade_3.html)
- Perry, B. K. (2000). Patterns for giving change and using mental mathematics. *Teaching Children Mathematics*, 7, 196–199.
- Ron, P. (1998). My family taught me this way. In L. J. Morrow & M. J. Kenney (Eds.), *The teaching and learning of algorithms in school mathematics: 1998 yearbook* (pp. 115–119). Reston, VA: National Council of Teachers of Mathematics.

General articles and teacher activities are welcome, as are the following special categories of articles:

- *A Teacher's Story*,
- *History Corner*,
- *Teaching with Technology*,
- *It's Elementary!*
- *Math in the Middle*, and
- *Algebra for Everyone*.

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# The Centroid



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## From the Editors

Welcome back to a new school year! This year promises to be a busy one, now that North Carolina adopted Common Core Standards. We encourage all math teachers at all levels to come to the NCCTM Fall Conference to find out more about how these standards will impact mathematics education in North Carolina.

- Debbie Crocker and Holly Hirst

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## NCCTM 2010 Conference: October 28-29

*Innovation for Change: Collaboration, Differentiation, Formative Assessment*

**Koury Convention Center, Greensboro**

Online registration is now open for the 2010 State Math Conference and Math Leadership Seminar. Look for the links under the Events Calendar on the left side of the NCCTM website.

### **Keynote Speakers:**

Catherine Twomey Fosnot, City College of the City of New York  
Clif Mims, University of Memphis

### **Featured Speakers:**

Phil Daro, Chair of the Common Core Standards Mathematics Workgroup  
Jere Confrey, North Carolina State University

### **NC DPI Consulting Sessions on the Common Core Standards**

**Preregistration:** \$55 for NCCTM Members; \$95 for Non-members; \$10 for full-time students  
Preregistration Deadlines: October 15 by mail; October 22 online (students must preregister online)

**Onsite Registration:** \$75 for NCCTM Members; \$115 for Non-members; \$20 for full-time students

Follow the “Conferences” link on the website to access either the online form or a printable form to mail in.

<<http://www.ncctm.org>>

## Pre-conference Math Leadership Seminar

**Wednesday, October 27, 2010**

Phil Daro, Jere Confrey, and NCDPI staff will lead sessions on the Common Core Standards and what they mean for NC mathematics teachers. The seminar runs from 9 am to 3 pm, with lunch provided.

**Preregistration:** \$60 (includes lunch)

Follow the “Conferences” link on the website to access either the online form or a printable form to mail in.

<<http://www.ncctm.org>>

# Presidents' Messages

## State President

**Wendy Rich**

*wrich@asheboro.k12.nc.us*

It is hard to believe another school year is upon us already. A lot has happened in a year. North Carolina is now one of the 23 states that have already adopted the Common Core State Standards for mathematics; more are expected to adopt by the end of summer. The standards were developed through the National Governors Association (NGA) Center and the Council of Chief State School Officers (CCSSO) to establish clear and consistent goals for learning that are intended to prepare America's children for success in college and the workplace. National organizations are busy developing initiatives and ongoing work that will support implementation of the common standards. The National Council of Teachers of Mathematics (NCTM) has formed a group to study its existing publications to identify ways these resources can be used to support the Common Core Standards. NCTM is also working to develop an implementation framework that will determine materials and resources needed by math teachers and leaders to support implementation. We are excited about the future support and possibilities.

The North Carolina Department of Public Instruction (NCDPI) has been working diligently to provide support for the Common Core Standards. The North Carolina Council of Teachers of Mathematics (NCCTM) plans to have a huge role in communicating these curriculum changes to our teachers across the state. The theme for our fall conference this year is *Innovation for Change*. Our fall conference will have many featured sessions by NCDPI to inform mathematics educators across our state of the Common Core Standards, support documents, and North Carolina's Formative Assessment Learning Community's Online Network (NCFALCON), NCDPI's Formative Assessment Training Modules. We are also excited to have Phil Daro, one of the writers for the Common Core Standards, as a featured speaker on Thursday. Please invite your friends and colleagues to attend the conference October 28 - 29, 2010. Every school needs to have representation at this year's conference to be informed of the changes headed our way!

Mathematics remains strong in our state primarily through the dedicated service of our NCCTM members. I am blown away by the amount of time our members VOLUNTEER for mathematics education each and every day. I owe a huge debt of gratitude to all of our committee members, board members, and volunteers. I am proud to serve alongside so many wonderful mathematics educators! If you would like to be more involved in NCCTM, please contact me or contact your regional president. We are always looking for ways to better serve our membership.

## Eastern Region President

**Ray Jernigan**

*jernigan@suddenlink.net*

Greetings! I know that you are busy in your classrooms but please make the time to become more active in NCCTM - YOUR professional organization. Our State Math Conference is one of the best in the nation. I encourage you to take advantage of this opportunity to network with a wonderful group of colleagues, to find and/or share teaching ideas, to spend some time thinking and talking about the teaching and learning of mathematics. Don't keep your teaching successes a secret; share your teaching ideas, research and insights with other around the state via the Centroid. We had a very successful regional event at ECU this past spring sponsored and hosted by the ECU Math-ED group and the ECU NCCTM student affiliate. There were about 300 people participating in the conference! I express my sincere gratitude to the ECU Math-Ed faculty and to all the speakers and volunteers that made the conference possible. With the tight budget and shortage of school funds, I would encourage teachers to submit a mini-grant to support your class. Visit our website for more information

about conferences, the Centroid, mini-grants, our organization, and more. We have had some wonderful happenings in the East during the past, and with your help and participation better things are yet to come!

## **Central Region President**

**Barbara McGill**

*motley455693@bellsouth.net*

Members of the Central Region of NCCTM, greetings. The summer is over and the school year is upon us! Many changes took place and new ideas were shared. Remember, we always need your input and expertise to ensure that the children of North Carolina have the ‘best’ mathematical exposure available. It is great to have our president-elect, Pat Sickles aboard. She brings much experience, expertise, and exposure to our board. We’re looking forward to working with her in the transition of roles in the Central Region.

There are many opportunities available to our membership and I encourage each of you to take full advantage of any and all of them. The mini-grants will again be available to enable you to provide additional activities for your students at little or no cost to you. I also encourage all persons who have received these grants to follow through with presentations at the conference and/or submissions to the Centroid for publication. Please apply and follow all guidelines in the application. If you are furthering your education, the tuition grants are also available. Lastly, if you have lessons or activities that you wish to share, the Centroid is the vehicle available to get it out to the membership. I do encourage you to take advantage of all membership benefits!

I always take any opportunity to thank the Central Board members for their dedication to NCCTM and mathematics education in North Carolina. It is my pleasure to work with such a great representation of teachers in our great state! Thanks so very much!

We are looking forward to seeing you at the 2010 State Conference in Greensboro on October 28-29 at Four Seasons. Thanks for all you do for children in mathematics in North Carolina.

## **Western Region President**

**Kathy Jaqua**

*kjaqua@email.wcu.edu*

Welcome to another new school year here in North Carolina! I hope each of you had a wonderful summer with time to rest, to revitalize, and to renew yourself. Here in the Western Region, we had a busy year. Last spring seemed like the winter that wouldn’t end with lots of snow days that led to a variety of make-up schedules. The Western Region hosted a great meeting in February at the University of North Carolina in Asheville after our original site was taken by a Saturday make-up day! Even with the threat of more snow, we had a strong meeting with over 70 participants and presenters. Throughout the meeting, I was continually impressed by the enthusiasm and energy of everyone present, and I started to think about how important it is for us, as teachers, to get to recharge our mathematics.

As you prepare for a new group of students and you think about how you will capture their attention, I encourage you to consider the beauty and utility of mathematics. Throughout our history, mathematics has always been recognized as an important part of being an educated person. As we move forward into a more scientific, more technological world, the role of mathematics only gets stronger. We know that mathematics has many facets and that students need to be strong in each of them. So how can we encourage students to want to learn and to understand mathematics?

Students must be strong at actual calculations—by hand, by calculator, and by estimation—and they must also be good at deciding what needs to be calculated. Our textbooks provide a good variety of problems to encourage practice for mastery, and our job is to find ways to get students to do the practice. Each year at

NCCTM meetings, I find at least one new and clever way to motivate my students to practice. I've collected games, puzzles, and challenges that all emphasize practice through interesting problems. I hope you can join us in October to pass along your favorite activities and to collect some new ones for your files.

Helping students to learn how to decide what to calculate and how to look at mathematics in a deeper fashion is always my biggest challenge. Deciding what points are the most important in any topic makes me examine mathematics from elementary through college level to be sure that I'm not glossing over or overemphasizing particular ideas. As I work with pre-service teachers, it is always a great exercise for each of them to pick a mathematical topic and investigate the Standard Course of Study to examine where the precursors to that topic appear and what ideas develop from that topic. This careful study helps them to see the continual flow and development of ideas and to consider which ideas need the most emphasis at a given level.

NCCTM meetings help me to take a broad look across all levels of mathematics and a deep look at particular topics. I always try to attend sessions at each of the grade band levels and examine the various tools, books, and other supplies in the Marketplace for all levels. I am continually renewed and my teaching is made stronger through interacting with other teachers, so I always make sure to talk with my students and my colleagues about what they saw in sessions and in the Marketplace.

State and regional meetings and publications like the Centroid are some of the ways that NCCTM helps me to recapture my mathematical energy. I hope to see each of you in Greensboro in October as you renew and recharge your mathematics. Have a great new school year!

## NCTM Regional Conference - Baltimore

**October 14-15, 2010**

Summer is winding down and the new school year has started. Begin on the right foot and make sure it's a successful year! Join your colleagues from around the region at NCTM's Regional Conference & Exposition in Baltimore. Coming to the Baltimore Convention Center, October 14-15, this is your opportunity to experience the best in mathematics education. Register Today!

Here's a sampling of what you'll find over the two-day program. Want to see the entire program? Visit the Online Conference Planner to view all presentations and search by grade band, topic, and day and time.

- My Teacher Didn't Teach Us This Last Year, or Retention Rules
- Twirling Batons, Sparkling Capes, and Mysterious Hats Create the Magic of Math
- So, You're a Math Specialist, Coach, Resource Teacher, or Mentor: Now What? Come Find Out
- Taxicab Travel: A Mathematical Tour of Baltimore
- My Math Teacher Talks and Writes in Secret Code: I Really Don't Get It
- Problem Solving and Technology Implementation in an Inclusion Classroom
- Solving Discipline Problems in Math Class
- English as a Second Language Students and Mathematics: Is It Another Foreign Language?
- Does Math Make Sense? Switching the Light Bulb On
- Using PDAs, iPhones, iPods, GPSs, and More to Enhance Your Mathematics Curriculum

[<http://www.nctm.org/conferences/content.aspx?id=25432>](http://www.nctm.org/conferences/content.aspx?id=25432)



# Teaching With Technology

## An Alternative Development of Measures of Center and Spread Using Dynamic Diagrams<sup>1</sup>

P. Holt Wilson, UNC at Greensboro

Hollylynne S. Lee, North Carolina State University

Karen F. Hollebrands, North Carolina State University

Technology has radically changed the nature and content of data analysis in school mathematics. No longer bound by computational limitations, students and teachers can engage in true Exploratory Data Analysis (Konold & Higgins, 2003), using data from real world contexts and investigating questions pertinent to these contexts. In addition to computational power, dynamic statistical software (e.g., Fathom 2.1, KCP Technologies, 2007) offers multiple linked representations and the ability to overlay statistical measures on graphical displays that have the potential to change how students think about concepts such as distribution, center, and spread (Ben-Zvi, 2000).

Data analysis skills are of utmost importance for today's citizens. The National Council of Teachers of Mathematics (NCTM, 2000) has long recognized the significance of these skills and advocated the inclusion of data analysis in mathematics curricula. The Guidelines for Assessment and Instruction in Statistics Education report (GAISE, Franklin et al., 2005) furthers this emphasis by bringing issues specific to statistics to the fore, specifically the role of variability and differences between statistics and mathematics. From public opinion polls to consumer awareness, the ubiquitous nature of data in the 21st century requires that today's students become proficient and competent consumers of data.

Measures of center and spread are central to understanding data. Researchers of students' understandings of data analysis describe the importance of using informal notions of these measures prior to introducing formal measures (Konold & Higgins, 2003). Many advocate a de-emphasis on formal computations of the mean in favor of the more intuitive measures of mode, median, and midrange. Traditionally, textbooks focus on the calculation of a measure of center, such as the mean or median. After mastering the computation of measures of center, attention would be given to measures of spread, such as the standard deviation or the interquartile range. While many textbooks may make the point that both types of measures are important in describing a distribution, experiencing these ideas in isolation might not facilitate an understanding of their complementary nature.

DelMas and Lui (2005) note the conceptual difficulties associated with a common measure of spread, the standard deviation, and advocate connecting three fundamental concepts in developing this idea: 1) viewing data as an aggregate in a distribution rather than merely a collection of individual cases; 2) considering the arithmetic mean as a "self-adjusting fulcrum on a balance" (p. 56); and 3) attending to deviations of each case from the mean (Figure 1).

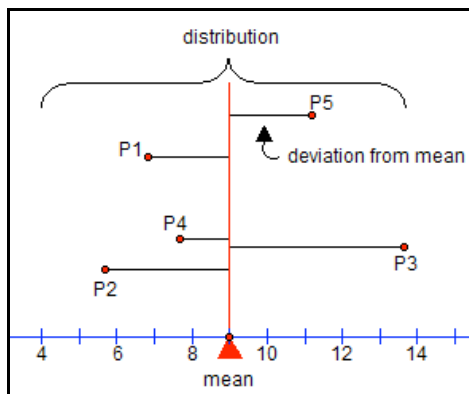
We propose a method for building an understanding of center of a distribution as a balance point of deviations that leads to understanding the standard deviation (delMas & Lui, 2005). This article illustrates, with the use of a dynamic statistical software package, an alternative way to conceptualize measures of spread for univariate distributions that provides additional insight into how a measure of center relates to spread. The development described for univariate distributions is then applied to a bivariate distribution, treating a least-squares line as a measure of center. To illustrate this development, one motivating context for students might be

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<sup>1</sup> This article was adapted from materials developed by *Preparing to Teach Mathematics with Technology: An Integrated Approach* (<http://ptmt.fi.ncsu.edu>). This project is supported by the National Science Foundation under Grant No. 0442319 awarded to North Carolina State University. Any opinions, findings, and conclusions or recommendations expressed herein are those of the principal investigators and do not necessarily reflect the views of the National Science Foundation.



gas mileage for new vehicles. Increases in gas prices may be one contributing factor to many automobile manufacturers' focus on improving vehicle miles per gallon (mpg) performance and the development of alternative types of engines that use a combination of electricity and gasoline. To become more informed about the variety of vehicles on the market today, students can investigate a collection of 41 vehicles manufactured in 2006 (Table 1, at the end of this article). Most of the vehicles in this data set were rated as the top fuel economy leaders in the most popular vehicle classes.

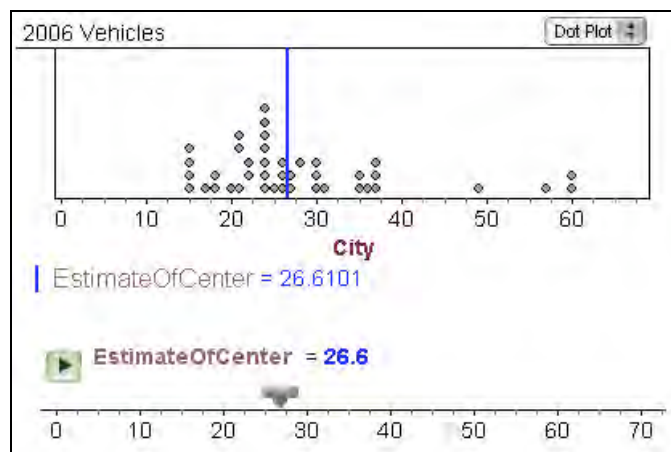


**Figure 1.** Diagram illustrating connections between distribution of data (P1, P2, P3, P4, P5), mean, and deviations from the mean.

### Developing the Concept of Mean through Deviations

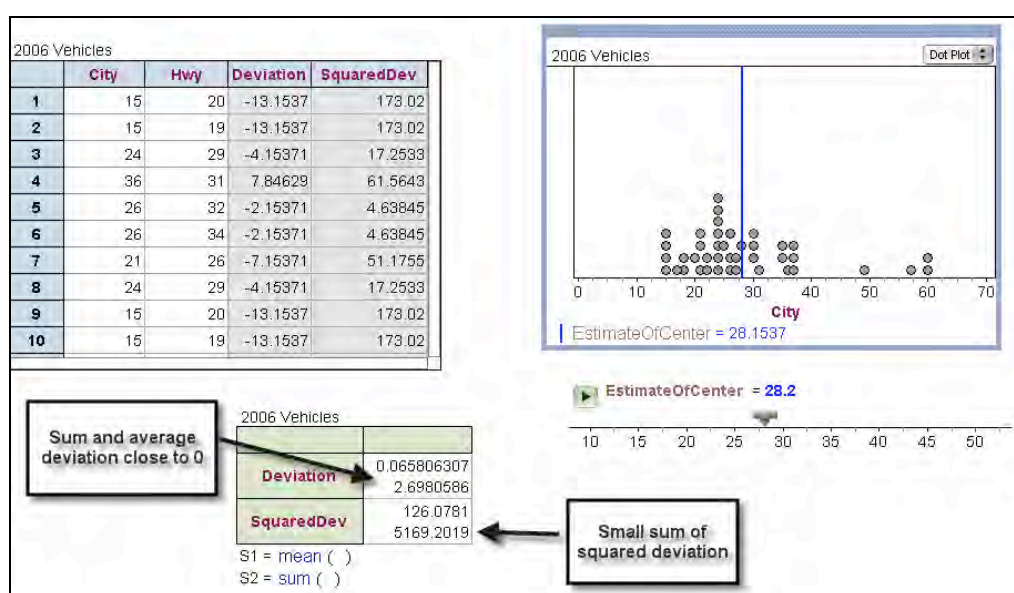
To assist students in exploring the vehicle data with an attention to center and spread, consider the following question: “How do these automobiles typically perform in their gas mileage when driving in the city?” Traditionally, textbooks have students calculate a measure of center, such as the mean or median, to answer such a question. After mastering the computation of measures of center, attention would be given to measures of spread, such as the standard deviation or the interquartile range. However, a coordinated understanding of center and spread is essential in describing a distribution, for simply knowing that the average city miles per gallon is 28 ignores how much variation could be expected in city mpg for any vehicle. A consideration of spread is needed to provide a more complete picture of the distribution of city mpg for these vehicles.

Many students intuitively use a balancing metaphor described by delMas and Lui (2005) when finding a measure of center on a graphical display (Konold & Higgins, 2003). Capitalizing on the features of dynamic statistical software (e.g., Fathom 2.1), a slider can be used to represent an estimate of a typical center value and then this value can be plotted on a dot plot of the city mpg attribute (Figure 2). Dragging the value of the slider along the number line changes the estimated center value and causes the plotted vertical line to move through the distribution. This dynamic diagram allows students to attend to the distribution as an aggregate and to consider where to place the vertical line to serve as a visual fulcrum to balance the data values.



**Figure 2.** Distribution of City mpg with a movable line to estimate the center.

Next, the distance from each observation to the estimated center could be defined as a deviation and computed as a new attribute in the data set. Summary statistics of these deviations, such as a sum and mean, can be created. As students drag the value of the estimated center, three linked representations simultaneously update: (1) the vertical line representing the estimated center on the graph, (2) the computed values of the deviations in the table, and (3) the summaries (mean and sum) of the deviations. Students using the balance point metaphor for the mean might notice that their visual estimate of a typical center value for the city mpg corresponds to a sum and an average deviation close to 0. However, in working towards describing a typical deviation from an estimate, an equal distribution of positive and negative deviations does not allow one to characterize that value through either their sum or average. Squaring a deviation can improve its usability in creating descriptors of spread, such as the average of squared deviations. This practice will lay a foundation for other commonly used methods for quantifying variability. Using the technology to calculate summaries, the sum and average of the squared deviations can be found. Thus, by dragging the slider value, students may either notice that a good estimate of center is the value that produces a sum and an average deviation close to zero, or is the value that minimizes the sum of the squared deviations (Figure 3.).



**Figure 3.** Linked representations to help observe deviations from estimate of center.

With the goal of helping students see the complementary nature of mean and standard deviation, teachers can use the dynamic diagram as shown in Figure 4 to build an understanding of the mean in terms of deviations and squared deviations. To facilitate this, students can overlay the value of the mean on the graph and compare this computed value with their estimated center. Through aligning the vertical line for the estimated center with the line for the plotted mean value, students can observe that the mean of a distribution is the value that makes the sum of the deviations zero (i.e., a balance of the deviations) and where the sum of the squares of the deviations is minimized (Figure 4).

The software can also be used to visually show that the mean is the value that minimizes the sum of squares of the deviations. After removing the vertical line representing the estimated center, a Moveable Line can be added to the graph and the Show Squares feature can be utilized to provide a visual representation of squared deviations (Figure 5a). By dragging the moveable line to the value of the plotted mean, one can observe that the mean is the value that minimizes the sum of squares of the deviations (Figure 5b).

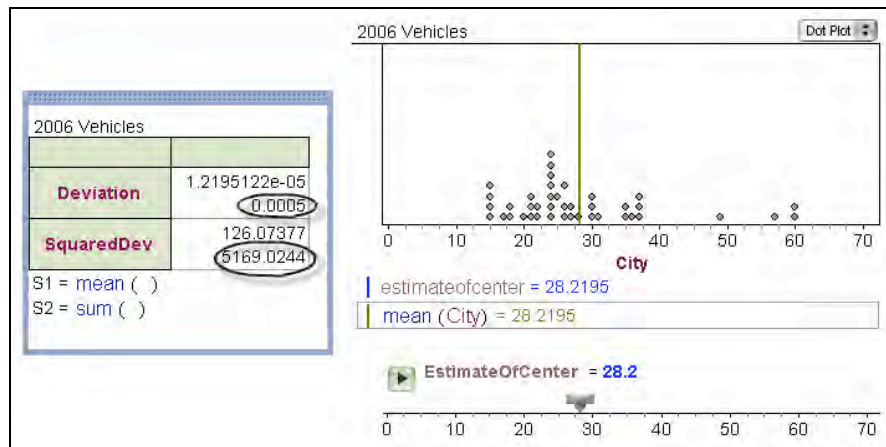


Figure 4. Estimate of center aligned with mean to minimize deviation measures.

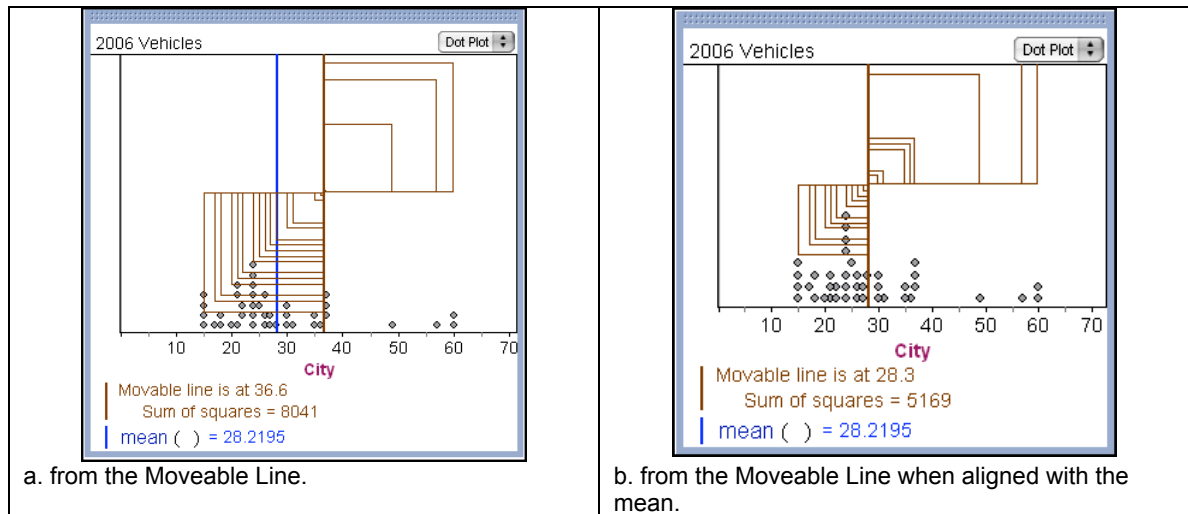


Figure 5: A visual representation of the squared deviations.

The constructed value of the average of the squared deviations is the variance for this population of vehicles. Computing the square root of the mean of the squared deviations will standardize the measure, resulting in the measure called the standard deviation. Using the software to calculate the variance and/or standard deviation of the data, the average of the squared deviations and its square root could be compared to the computed values of the variance and the standard deviation (Figure 6). Students may notice that these values are slightly different. Averaging the squared deviations from the estimated center considers the data as the entire population and divides by  $n$ , whereas by default, Fathom considers data as a sample and divides by  $(n - 1)$  when computing the variance and standard deviation. This observation could motivate a discussion about the difference between a population and a sample and the importance of unbiased estimators.

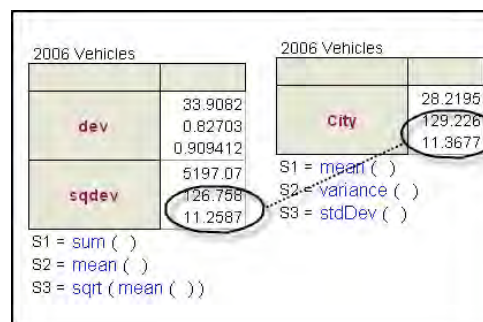
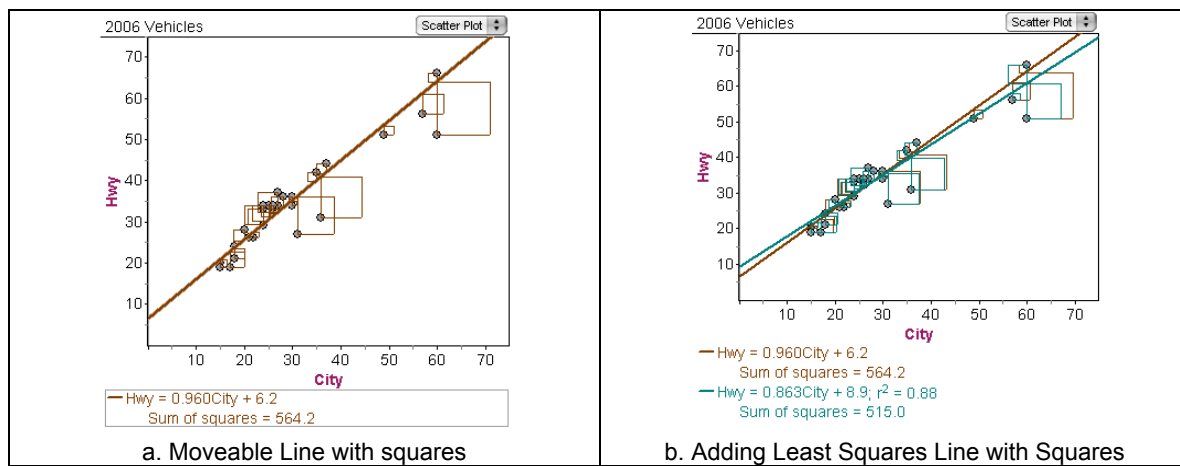


Figure 6. Comparison of mean of squared deviation from estimated center and its square root to variance and standard deviation.

Traditional approaches tend to separately define the mean and the standard deviation with complex formulae. The proposed approach conceptualizes the mean as a desirable value in relation to deviations. The dynamic diagram allows students to utilize an intuition of the mean and an exploration of deviations to understand a distribution in terms of interconnected ideas of center and spread.

### Bivariate Distributions: A Natural Extension

In their study of algebra, students likely have experiences in modeling data using linear functions. Another perspective on these linear models is that they are a measure of center for a bivariate distribution. An approach similar to the one described above could reinforce this idea. Returning to the data set described above, students could consider the question: “Given a particular value of city miles per gallon, what would be a typical corresponding value for highway miles per gallon?” Using a scatterplot of these two attributes (City, Hwy) a Moveable Line can be overlain and adjusted to fit the trend of the data. Again, using the Show Squares feature provides a representation of the squared deviations of each data point from the Movable Line (Figure 7a). Adjusting this line allows students to find an estimate for the typical highway mpg given a city mpg by minimizing the sum of squares displayed at the bottom of the graph. After plotting the least squares line on the graph, students again can compare their estimated line of center and see that the computed least squares line minimizes the sum of squares of the deviations from the line that serves as a center of the bivariate distribution (Figure 7b).



**Figure 7.** Using sum of squares in a scatterplot to estimate center of bivariate distribution.

### Conclusion

Technologies such as dynamic statistical software packages provide powerful ways for students to explore data contextualized from the real world and build on students' intuitive understandings of center and spread prior to introducing formal measures. Conceptualizing measures of center and spread in a simultaneous complementary manner has the potential to help students build a more robust understanding of center, overcome the complexities of the standard deviation, and connect concepts and techniques used in univariate and bivariate analysis. A better understanding of these important statistical ideas may help prepare citizens who make informed data-based decisions that include a thorough understanding of how to interpret and use reported means and standard deviations, and predictions based on linear models.

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National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston: Author.

**Table 1.** Vehicle data compiled from 2006 Fuel Economy Guide; source: <http://www.fueleconomy.gov/feg/download.shtml>

Mfr	Model	Class	Trans	City	Hwy	AnnFuel	Engine	Weight
Chevrolet	Cargo Van	Van	Auto	15	20	1940	Standard	4894
Chevrolet	Passenger Van	Van	Auto	15	19	1940	Standard	5295
Ford	Escape Fwd	Suv	Manual	24	29	1270	Standard	3180
Ford	Escape Hybrid Fwd	Suv	Auto	36	31	1000	Hybrid	3627
Ford	Focus Wagon	Wagon	Auto	26	32	1178	Standard	2775
Ford	Focus Wagon	Wagon	Manual	26	34	1138	Standard	2771
Ford	Ranger Pickup	Truck	Auto	21	26	1436	Standard	3028
Ford	Ranger Pickup	Truck	Manual	24	29	1270	Standard	3028
Gmc	Savana Cargo Van	Van	Auto	15	20	1940	Standard	4894
Gmc	Savana Passen Van	Van	Auto	15	19	1940	Standard	5295
Gmc	Sierra Hybrid 2wd	Truck	Auto	18	21	1736	Hybrid	5038
Gmc	Sierra Hybrid 4wd	Truck	Auto	17	19	1835	Hybrid	5357
Honda	Accord	Sedan	Auto	24	34	1178	Standard	3168
Honda	Accord Hybrid	Sedan	Auto	25	34	1176	Hybrid	3589
Honda	Civic Hybrid	Compact	Auto	49	51	660	Hybrid	2875
Honda	Insight	Compact	Auto	57	56	591	Hybrid	1881
Honda	Insight	Compact	Manual	60	66	525	Hybrid	1850
Honda	Odyssey	Minivan	Auto	20	28	1436	Standard	4475
Hyundai	Elantra	Sedan	Manual	27	34	1099	Standard	2784
Hyundai	Sonata	Sedan	Auto	24	33	1221	Standard	3266
Hyundai	Sonata	Sedan	Manual	24	34	1178	Standard	3253
Isuzu	Ascender 4wd	Suv	Auto	22	26	1338	Diesel	4954
Jeep	Liberty 4wd	Suv	Auto	22	26	1338	Diesel	4011
Lexus	Rx 330 4wd	Suv	Auto	18	24	1800	Standard	4065
Lexus	Rx 400h 4wd	Suv	Auto	31	27	1138	Hybrid	4365
Mazda	B2300 2wd	Truck	Auto	21	26	1436	Standard	2994
Mazda	B2300 2wd	Truck	Manual	24	29	1270	Standard	2994
Mazda	Tribute 2wd	Suv	Manual	24	29	1270	Standard	3192
MercBenz	E320 Cdi	Sedan	Auto	27	37	1024	Diesel	3835
Mini	Mini Cooper	Compact	Auto	26	34	1242	Standard	2557
Mini	Mini Cooper	Compact	Manual	28	36	1242	Standard	2425
Pontiac	Vibe	Wagon	Manual	30	36	1000	Standard	2700
Saturn	Ion	Compact	Manual	37	44	769	Diesel	2752
Suzuki	Aerio Awd	Compact	Auto	35	42	809	Diesel	2859
Toyota	Corolla Matrix	Wagon	Manual	30	36	1000	Standard	2679
Toyota	Prius	Sedan	Auto	60	51	601	Hybrid	2890
Toyota	Scion Xb	Wagon	Auto	30	34	1066	Standard	2470
Toyota	Tacoma 2wd	Truck	Auto	21	26	1436	Standard	3180
VW	Golf	Compact	Manual	37	44	769	Diesel	2972
VW	New Beetle	Compact	Auto	35	42	809	Diesel	2965
VW	New Beetle	Compact	Manual	37	44	769	Diesel	2884



# A Teacher's Story

## Graduate School: A Journey to be Remembered

Karen S. Perry, North Wilkes Middle School

It is best to begin a story about a journey by describing the point of departure. I decided rather late in life that a middle grades classroom would feel like home. I have never regretted my decision. It has been a wonderful experience. I have enjoyed many glorious moments with my middle grades students. In an effort for forward motion, both personally and professionally, I volunteered to represent the county in a mathematics focus group. This organization, and the driving forces at work from within, proved to be a catalyst that would spur me in the direction of higher education once more. The decision seemed simple enough, to pursue a graduate degree; the only question that remained was which degree program would I enter? I already had a middle grades education degree. I was certain I did not want to be an administrator. The thought of running the school held no appeal. One of my areas of concentration for my middle grades degree was mathematics. I was teaching eighth grade mathematics and I loved it. I knew I had to somehow expand my knowledge in the area that was near and dear. I chose to enter into the secondary mathematics program. I knew this would be challenging.

I have always heard that personal growth is painful. Perhaps the most painful is coming to terms with our ignorance. We hide from it, try to mask it, and find all types of coping mechanisms to avoid facing the truth; we are all swimming in a sea of ignorance and some of us are barely treading water. The careful conversations that I had with one faculty member about all the holes in my learning were really just my fears of not achieving my goals. She never had any doubts, and if she did, she would never voice them. She reassured me that the university was great at filling in holes. I really felt like they more closely resembled deep wells than holes, but who would argue about the difference?

The first class was difficult. The first night was torturous. I left the classroom feeling like I did not belong with these other teachers who clearly did not seem terrified at the potential content. I felt that everyone in that classroom knew I did not belong. A middle grades teacher taking classes with high school mathematics teachers, imagine. I was insecure and full of doubt, but I went back the second night, and the third, until the semester had passed and the class was over. Word to the wise, do not let your self-doubt rule your life or you will never achieve your goals. Goals are wonderful tools to help forge your future. Do not set goals for yourself that you are unwilling to work toward; it undermines the whole process. During the first semester I had to complete an undergraduate class, introduction to linear algebra. This dragon would need to be slain in order to complete the degree program. At the end of the semester I could check off three classes from my checklist.

I spoke about being goal oriented, and I am. I kept a checklist on my refrigerator and as I completed the hours for my program of study I would highlight the class and write in the grade. This was very motivational, especially about half way through the program. At the midpoint, I was exhausted. My product of learning had to be designed, implemented, and compiled. There were still three comprehensive exams waiting for me, and I was teaching full time. I would look at the list and reassure myself not to lose sight of my goals. I could do this, and I would complete the program. I think the professors who work with graduate students understand how the process can seem overwhelming. They are always ready with an encouraging word or an understanding nod. I complained to anyone who would listen: family, friends, and co-workers. My husband, I fear, got the brunt of the disgruntled and snappish remarks. My family adjusted well to my new adventure and the local take-out restaurants now know us on a first name basis. We rearranged times for extra-curricular activities for my daughter as the semester-by-semester schedule of classes was issued. Without a doubt graduate school became an important facet of my life, but it was temporary. You can do anything for 18 weeks, right?

After about one and a half years I had checked off many classes and was well on my way to getting my degree. I completed the research component of my product and had a great time during the implementation phase. Then I hit a speed bump. Linear algebra was tough, really tough, and maybe too tough. I procrastinated

on writing up my product. I was not really sure I could ever pass a comprehensive exam in linear. I put off taking the exam until a month after the class ended. I thought surely I could learn the material with an extended period of study. As time drew near for the comp, I decided I was not ready. I cancelled the comp and really thought about changing my major to middle grades if I could. I had lunch with my product of learning advisor and she encouraged me not to change my major. She may not realize that she was instrumental in the decision to stay with the program, but she definitely helped me with my quandary. I enrolled in the fall classes and decided to take the linear comp in December. I did not go through with it. This was a black cloud hanging over my head. I had free myself from the belief that I could not be successful with this material.

At the advice of counsel (another faculty member), I took my first comprehensive final, Number Theory, a course that I really enjoyed. This course influenced my choice for my product of learning. I felt I could probably do well on this exam. The dread of the exam diminished when I read the email stating that I had passed the exam. I liked the email and wanted to receive two more: one for analysis and one for linear. About a month prior to graduation I decided one night I had had enough. I was going to commit to take the linear comp. I emailed the graduate coordinator and set up a day and time. I only gave myself five days prior to the test. I thought it would help to have as little time as possible to worry about it. I did not tell anyone I was going, what if I failed? The email that I passed the comp is now in my classroom. A student that is in my class made me a frame. My students realized how difficult this was for me to accomplish and I hope it made an impression. With this comp behind me, I finished up the rest of my requirements and am anxiously awaiting commencement ceremonies.

My master's degree is finished. I began with where I started but life is about new beginnings. We would not make forward progress if we did not look ahead to new challenges. My experiences while in the program were enriched with knowledge through the association of professors who truly care about learning. Notice I say learning. I was challenged, yes, but I will be a better mathematics teacher because I was challenged. I still have deep pits of ignorance. I can accept the ignorance and allow it to walk hand-in-hand with new learning experiences. Graduate school was a journey and the joy should be in the journey. I had difficulty sometimes finding the joy but I knew that in retrospect I would appreciate the experience. The destination, the degree, will be cherished, but not for the sake of the degree, rather for the sake of the learning experiences that have become a part of my life and a part of the life of my students. My students watched me struggle and supported my efforts. What more could I ask? My students realize, as do I, that in mathematics it is all right not to always have a ready formula or answer; life is like that, too.

## **Thinking about getting your master's degree in math for M licensure? Here are the approved programs in North Carolina:**

### **Middle Grades – Math Concentration**

Appalachian State University  
Campbell University  
East Carolina University  
Fayetteville State University  
Gardner Webb University  
North Carolina Central University  
North Carolina State University  
Salem College  
UNC at Chapel Hill  
UNC at Charlotte  
UNC at Greensboro  
UNC at Pembroke  
UNC at Wilmington  
Western Carolina University

### **Secondary Mathematics**

Appalachian State University  
Campbell University  
Duke University  
East Carolina University  
Fayetteville State University  
North Carolina A&T State University  
North Carolina Central University  
North Carolina State University  
Salem College  
UNC at Chapel Hill  
UNC at Charlotte  
UNC at Greensboro  
UNC at Pembroke  
UNC at Wilmington  
Wake Forest University  
Western Carolina University

Source: <http://www.ncpublicschools.org/work4ncschools/teachereducation/>



# Mini-grant Report

## Milky Way Math

Donna F. Trick, Rockwell Elementary School

“Rockwell Space Center presents Milky Way Math” greets you as you meander into our school auditorium. If you walked a little closer to the stage you might see 4th graders in small groups working together to solve a geometry problem – or you might see a group of Kindergarteners discovering a pattern at the Algebra station, while another group is discussing how to measure a feather. All of the 520 students in our K-5 school participate in the six math stations, which include Number and Operations, Measurement, Geometry, Data Analysis and Probability, and Algebra and Problem Solving.

Milky Way Math was born out of the need to bring changes in the ways our teachers taught math, which was mostly using worksheets during whole group instruction. My principal was determined to provide training and modeling for our teachers to show them how to lead their students into a deeper understanding in all areas of math. Through many hours of brainstorming and planning, Milky Way Math took shape two years ago. We called our brainchild “Milky Way Math,” in honor of the Rockwell Rockets. It is located on our school’s stage, which is a central location accessible to all classes. More importantly, the stage was the only space we had that was not already being utilized on a daily basis. Each grade level has a month during the school year in which the Milky Way Math centers are set up for their grade level. The classroom teachers and I collaborate on which activities will provide the best opportunities for the students to discover patterns, articulate their thinking, justify their answers, and think critically about mathematical relationships. Classes sign up for two 1-1/2 hour time blocks to bring their students to the auditorium to complete the Milky Way Math activities. During this time, the teachers and I circulate among the children and encourage “math thinking” and problem solving skills. The students love coming to Milky Way Math. Students pass me in the halls and ask, “Mrs. Trick, when can we go to the math stations again?”



Milky Way Math on Stage at  
Rockwell Elementary  
Photos courtesy of Donna Trick



Students Engaging in Activities During  
Milky Way Math

In the beginning, teachers were apprehensive about Milky Way Math. They anticipated having to do more work and not having the time to do it. As their students have participated, they have seen an increase in their students’ interest in math. Now when I visit classrooms I am observing a greater number of students in small groups involved in using math manipulatives and discussing their thinking. Since we began Milky Way Math, teachers have shared with me successes they’ve encountered in their classrooms. One teacher stopped me as I was walking by her room one afternoon. She was so excited sharing with me that she allowed her students to “turn and talk” in math class that day. She told me how pleasantly surprised she was that her students seemed to actually be learning from each other.

Milky Way Math has already made a huge impact on student learning. Evidence of this has been shown through ongoing formative and summative assessments. The administrators, teachers, and I have noted a significant climb in the level of students' understanding of math concepts and in the scores for several math strands. Our 3rd grade EOG Math scores rose from 82.4% in '07-'08 to 88.5% in '08-'09; our 4th grade from 58.2% to an amazing 92.4%; and our 5th grade from 67.4% to 81.5%. As the students continue to deepen their understanding of math concepts, we expect these scores to go even higher. Of course, Milky Way Math is only one strategy we are using at our school to improve mathematics learning, but it is an important one.

Our teachers have accepted the challenge to deepening their students learning by providing more rigorous math activities in their classrooms, using math manipulatives, and looking for ways to integrate math with all subjects. We can attribute much of this success to Milky Way Math!

## Applying for Mini-grants

Through its mini-grant program, NCCTM provides funding for North Carolina teachers as they develop activities to enhance mathematics education. This program will provide funds for special projects and research that enhances the teaching, learning, and enjoyment of mathematics. There is no preconceived criterion for projects except that students should receive an on-going benefit from the grant. The mini-grants are awarded by each of the three regional organizations to members within their geographic boundaries (If you incorrectly identify with the region, your proposal will be ineligible for funding). A total of \$15,000 is available each year for mini-grants, with each region awarding approximately \$5000 in grants to its members. In recent years, approximately 30-35 proposals have been funded, for an average grant of just less than \$800.

Grant proposals must be postmarked or emailed by September 15, and proposals selected for funding will receive funds just after the state conference. You will receive an email confirmation of receipt of your proposal. If you do not receive a confirmation within one week, it is your responsibility to follow-up with the Mini-grant Coordinator.

### Directions

The directions and application are available on the NCCTM website. Please read all directions carefully, and fill out the application and cover sheet completely. Failure to correctly list the NCCTM region and membership number will cause your application to not be considered. Be sure that your NCCTM membership is current and active for the upcoming year! Each year we have applications that cannot be considered because of the membership requirement.

<<http://www.ncctm.org>>

**Congratulations to the Most Recent Mini-grant Recipients!**

## NCTM Illuminations

### Cool Tools for the Classroom

**Dynamic Paper:** Illuminations Dynamic Paper is a great resource as you prepare your lessons. The math handout you need might be easier to create than you think!

<<http://illuminations.nctm.org/ActivityDetail.aspx?ID=205>>

**Back to School with Thinkfinity:** Illuminations is a partner with Verizon Thinkfinity. You can find lessons and resources to prepare for classes at the Thinkfinity Back to School feature. Explore free resources for a successful school year.

<<http://www.thinkfinity.org/back-to-school>>

# A Wrong Assignment That Was Somehow Just Right

Tracie McLemore Salinas, Appalachian State University

LaDonna Brown, University of Tennessee

My students don't carry cartoon character lunchboxes. They don't color pictures for me or bring me gifts for the holidays. No, as a teacher educator at a university, my students are much too grown up for that but still not so grown up that they aren't a little nervous that first day of class. In my teaching, I watch young men and women come to my classroom with big ideas and unrealistic expectations of their future students. "Oh, I will just tell him that this is the way it is done," they explain when prodded about how to correct a child's mathematics mistake. I smile.

My job is extremely rewarding. These students who arrive at my classroom door nervous and naive begin to find their way. They learn to make decisions, to evaluate research, to truly observe children and their work. More often than not, these changes take place slowly, over a span of semesters or years. I give many assignments each semester, journal writings, presentations, homework, and projects, trying to help hasten my students' journey to becoming a teaching professional.

However, I think the most eloquent submission I've received from a student was actually something for which I did not ask. She was to write a paper on her experiences in service learning. She didn't. She was to explain to me in at least three pages what she learned while tutoring students in an inner city after school program. She didn't. Instead, she wrote one of the most effective poems about teaching that I have ever seen. With her permission, I share LaDonna Brown's words here.

## The Boy

*The innocence projected.  
The tears that fall.  
The tears that fell.*

*Now he laughs more than he cries.  
I thank God that day finally died.  
The information, the available education.  
Only one problem: It needs to be taught.*

*But wait, contain.  
The presentation, the vibration felt in the room while  
the education process  
answers the boy's never asked questions and few  
curiosities, is the delicate situation.*

*He's now willing to learn -  
He wants to learn.  
I have his attention.*

*Although the boy is not a fantasy,  
disciplined, sitting down, pencil ready.  
Un-distraught by distraction  
Laughing together while learning.*

*Under his oblivion, sometime between me not  
having his attention and then having it,*

*He began to look at me as a sister instead of just  
another tutor.  
His words have made it permissible for me to say  
so.*

*Although he is the boy falling out of his chair,  
Laughing out of place,  
Speaking when not spoken to,  
Changing the subject at all the wrong times -  
Two weeks later, he brings me happiness and  
indirectly lets me know that  
My time with him is not without meaning.*

*"I got 100% on my tests!!!"  
"Good job, you're pretty smart."*

*I suppose that some of the words I said,  
the activities we did when I thought he was  
unfocused, stuck to his mind.*

*He's exactly what I would not change for a fantasy.  
He's perfect, in his own way of course.  
He's learning.  
Having fun.  
Realizing, little by little,  
That he is capable and he can do it, too.*

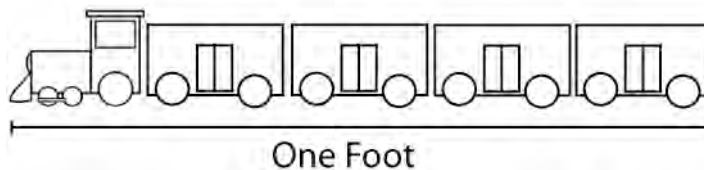
# Problems to Ponder



## Fall 2010 Problems Holly Hirst, Appalachian State University

**Grades K–2:** A box of raisins costs 45¢. Jordan has quarters, nickels, and dimes. How many different ways can Jordan pay for one box of raisins?

**Grades 3–5:** Tyler made a train out of model cars like the ones below. A train of five cars is one foot long. How long would the following trains be? 100 cars; 100,000 cars; 1 million cars.



**Grades 6–8:** Which plan would provide you with more money?

- (A) receive one penny on day 1, two on day 2, four on day 3, doubling each day until day 60
- (B) receive one penny on day 1, three on day 2, nine on day 3, tripling each day until day 15

**Grades 9–12:** Is there a polynomial,  $p$ , with integer coefficients such that  $p(1) = 2$  and  $p(3) = 5$ ?

### Directions for submitting solutions

Neatly print the following at the top of each solution page:

- Your full name (first and last)
- Your teacher's name
- Your grade
- Your school

Submit one problem per page.

Students who submit correct solutions will be recognized in the next issue of *The Centroid*. We wish to publish creative or well-written solutions from those submitted. If you would rather not have your solution published, please so indicate on your submission. Proper acknowledgement is contingent on legible information and solutions.

### Send solutions by 30 November 2010 to:

Problems to Ponder, c/o Dr. Holly Hirst  
Dept. of Mathematical Sciences  
Appalachian State University  
Boone, NC 28608

As these problems are intended to stimulate independent thinking, it is expected that a submitted solution indicates the student completed a significant part of the work. Please try to have the students use complete sentences when they write up their solutions to promote effective communication of their ideas.



## SOLUTION: Grades K-2 Fall 2009 issue

On Dale's 5<sup>th</sup> birthday, his dad gives him an option. He will give Dale 10 cents each day for the next week, or he will give him a penny the first day, two pennies the second day, continuing to double what he gave Dale on the previous day for the next week. If Dale saves the money his Dad gives him each day for the next 7 days, which option will give Dale more money at the end of the week?

**Solution by Jackson Hase, 2nd grade of Indian Trail Elementary. Teacher: Ms. Nicole Lykins**

**Correct Solutions were received from:** Elijah Carter, Erick Gonzalez, Jackson Hase, Allison McDowell, and Austin Rowell of Indian Trail Elementary, Zachary Hopkins, Kalie Lynch, Nicholas Paschal, and Caroline Wilson of Lindley Park Elementary.

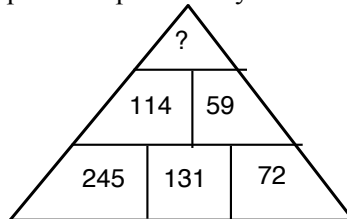
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
10¢	20¢	30¢	40¢	50¢	60¢	70¢
1¢	3¢	7¢	15¢	31¢	63¢	127¢

Dale would get more money at the end of the week if he chooses the double amount every day.

What I was doing...  
On the top I was counting by tens and on the bottom I was keep on doubling it like  $1 + 1 = 2$  and  $2 + 2 = 4$  and so on and so on and then under that I would put how much he got the other day and add both of them.

## SOLUTION: Grades 3-5 Fall 2009 Issue

Find a pattern in the following pyramid of numbers. Determine the number that goes in the top of the pyramid that completes the pattern. You should explain the pattern in your solution.



**Solution by Emily Burke, 5th grade of New Salem Elementary. Teacher: Dr. Beverly Little.**

my Solution:

? = 55

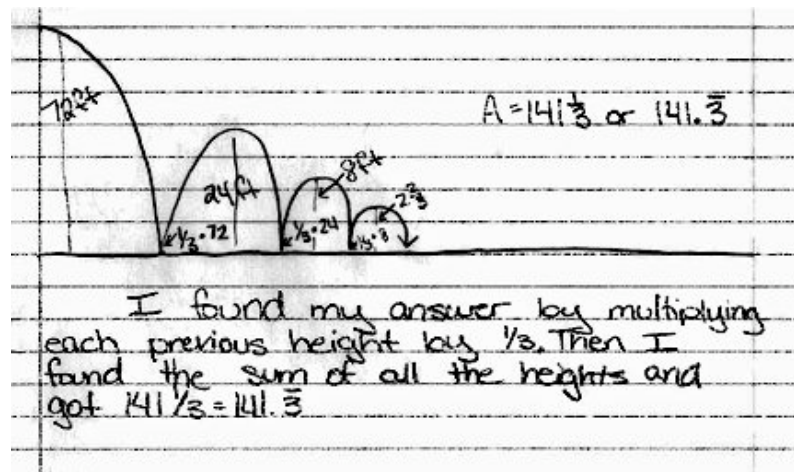
First you subtract 131 from 245.  
Then you subtract 72 from 131.  
When you subtract 131 from 245, you get 114, which is the first number in level two of the pyramid. When you subtract 72 from 131, you get 59, which is the second number in the second level of the pyramid. Then you subtract 59 from 114. You get 55. That is the number that should replace the ? mark.

**Correct Solutions were received from:** Chloe Deason, Andrew Hathaway, Max Inglesby, Caroline Jones, Marcus Pierce, Colby Ratliff, Bailee Sholar, Jacob Tarlton, Fernando, and Hannah of Marshville Elementary, Pedro Benitez, Julia Berardelli, Emily Burke, Savannah Collins, Nathanael Hammond, Taylor Holt, Hannah Locklear, Jacob Morley, Tyler Owen, Zach Savery, Ariel Wallace, and Josh of New Salem Elementary, Madison Bradley, Skyler Brindamour, Sophie Burkhardt, James Castleman, Callie Cece, Chaz Crosby, Lizzy Crumpton, Stevie Cummins, Julia DeRoza, Arman Dillard, Carter Duncan, Jack Hanley, Cole Hudson, Cole Malone, Suiter Ragland, Lily Sykes, Ally Tannenbaum, Madison Taylor, and Madeline Zuchery of Ravenscroft School, Mikey Darby, Manny Harris, Piper Hill, Zach Morris, and Iris Raven Wick of Stallings Elementary, Scott Fey of Sun Valley Elementary, Amya Bijou, Marc Crimmins, D'Marea McGill, and Darien Ruth of Waxhaw Elementary.

### **SOLUTION: Grades 6-8 Fall 2009 issue**

Julie has a super ball that will bounce back  $\frac{1}{3}$  of any height it is dropped from. She dropped it from the top of her school (72 feet high) onto the concrete below. How far has the ball traveled when it hits the ground for the fourth time?

**Solution by Tamara Vasquez 6th grade of Marvin Ridge Middle School. Teacher: Mrs. Carmen Harpham.**



**(Editor's Note:** Many students thought they were to compute the distance the ball bounced only during the last bound, the intent was to compute the total distance the ball travelled from the time it was released.)

**Correct Solutions were received from:** Eric Collins Jr., Luke Davis, Laarni Lapat, Brittany Ledford, Alex Quintero, Nathan Wright of Bertie Middle, Thomas Donton of Cuthbertson Middle, Delaney Dewey, Abbey Ekegbu, Max Engle, Eilis Finn, Megan Gallagher, Coleman Johnson, Aathmika Krishna, Emily Martin, Sofia Martisen, Cameron Mazikowski, Delaney McGehee, Nicholas Mitchell, Bobby Muir, Becca Pierce, Simran Puri, Tamara Vasquez, Jacob White of Marvin Ridge Middle, Drew Little of Piedmont Middle, Austin Allen, Bailey Allgood, Sarah Allmon, Alexis Andrews, Christine Azuara, Manuel Badillo, Giselle Benitez, Jayola Brunson, Austin Chambless, Danielle Chisholm, Madeline Cofer, Madeline Coggins, Connor Criscoe, Monica DeLaVega, Kory Edmundson, Dylan Ferguson, Will Ford, Alexia Gallegos, Andrew Gavin, Adam Gross, Shania Ibrahim, Alexis Jaimes, Sam Kemp, Courtney King, Mikaela Kunzmann, Jra'keela Legrande, Heather Malin, Lucas McLeod, Keymiya McMillan, Katie Mellon, Hunter Morgan, Magali Perez, Shivasaran Prabhushankar, Adriann Price, Julia Quante, Alex Queen, Sidney Rogers, Ashten Russell, Dillon Shaw, Eboni Simon, Carly Wallace, Samuel Wilson, Bridget, and Caroline of South Asheboro Middle, and Scott Fey of Sun Valley Elementary.

## SOLUTION: Grades 9-12 Fall 2009 Issue

The set of points that are twice as far from the point  $(0,3)$  as from  $(3,0)$  is a circle of what radius?

Solution by the editor, Dr. Greg Rhoads. No correct solutions were received.

Let  $P(x,y)$  be such a point. The distance from  $P$  to  $(0,3)$  is (by distance formula)

$$\sqrt{(x-0)^2 + (y-3)^2}.$$

The distance from  $P$  to  $(3,0)$  is  $\sqrt{(x-3)^2 + (y-0)^2}$ . The condition that  $P$  is twice as far from  $(0,3)$  as from  $(3,0)$  means:

$$\sqrt{x^2 + (y-3)^2} = 2\sqrt{(x-3)^2 + y^2}.$$

Squaring both sides gives

$$x^2 + (y-3)^2 = 4((x-3)^2 + y^2)$$

Expanding and combining terms and dividing by 3 gives:

$$x^2 + y^2 + 2y - 8x + 9 = 0$$

Completing the squares gives:

$$(x-4)^2 + (y+1)^2 = 8$$

which is a circle centered at  $(4,-1)$  of radius  $\sqrt{8}$ .

## NC Teacher Honored

### Maria Hernandez Receives 2009 Presidential Award for Excellence in Mathematics Teaching

On Monday, June 7, 2010, President Barack Obama named 103 mathematics and science teachers as recipients of the prestigious Presidential Award for Excellence in Mathematics and Science Teaching.

The Presidential Award for Excellence in Mathematics and Science Teaching was established in 1983 and is awarded annually to the best K-12 science and mathematics teachers from across the country. The winners are selected by a panel of distinguished scientists, mathematicians, and educators. Each year the award alternates between mathematics and science educators teaching Kindergarten through 6th grade, and those teaching 7th through 12th grades.

Winners of this Presidential honor receive a \$10,000 award from the National Science Foundation to be used at their discretion. They also receive an expenses-paid trip to Washington, D.C. for an awards ceremony and several days of educational and celebratory events, including visits with members of Congress and science agency leaders.

The individuals receiving the 2009 Presidential Award for Excellence in Mathematics and Science Teaching this year for North Carolina are Maria Hernandez, The NC School of Science and Mathematics, Durham (Math) and Judith Jones, East Chapel Hill High School, Chapel Hill (Science).

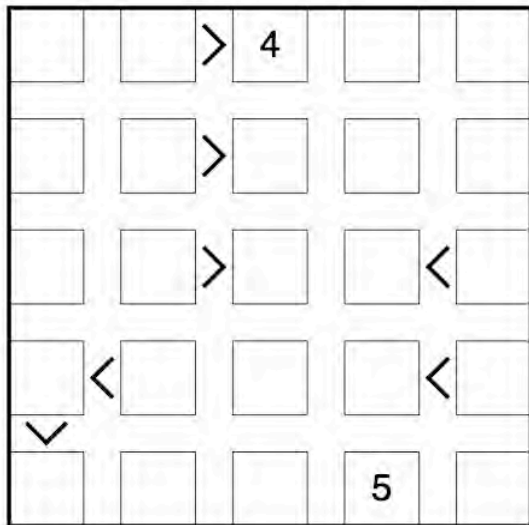


Maria Hernandez

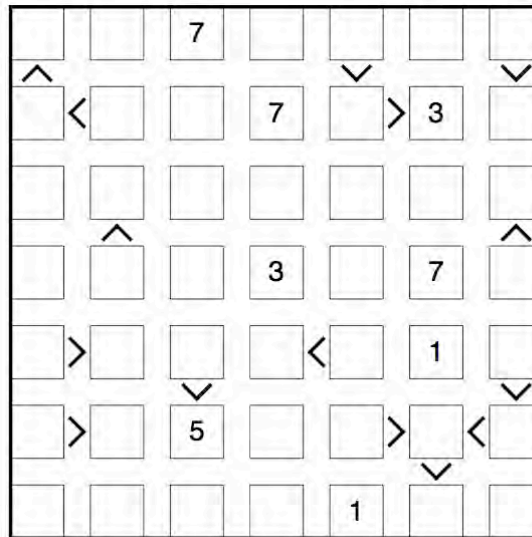


# Puzzles

**Futoshiki:** Place the digits 1 through  $n$  in the cells so that each row and column contains each digit once, and all of the inequality symbols are satisfied.

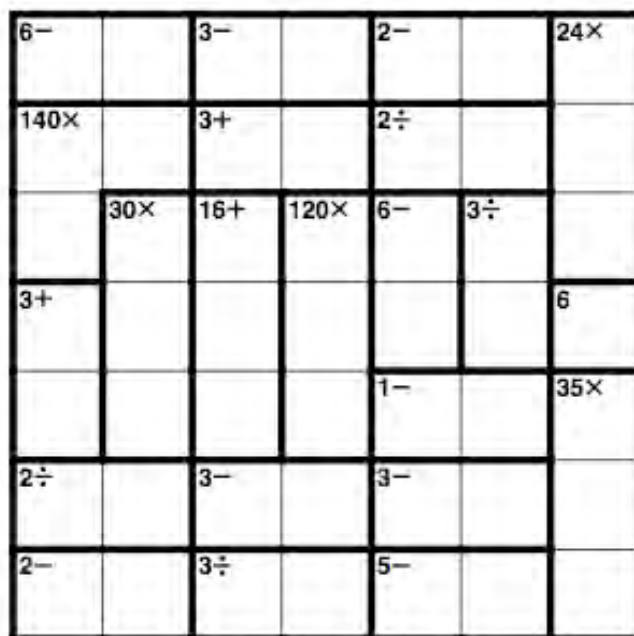


[www.sudoku-puzzles.net](http://www.sudoku-puzzles.net)



[www.sudoku-puzzles.net](http://www.sudoku-puzzles.net)

**KenKen:** Place the digits 1 through 7 in the cells so that each row and column lists each digit only once, and so that each outlined block totals to the given number using the given operation (in any order).



[www.kenken.com](http://www.kenken.com) © 2009

Solutions are posted on the Centroid webpage.

## Awards

### 2010 Logo Contest Winners Reported By Lisa Carnell, High Point University

#### State Winner

**Sara Bolton, 11th grade, Ridgcroft School, Ahoskie**  
**Teacher: Jenks Johnson**

#### Regional Finalists

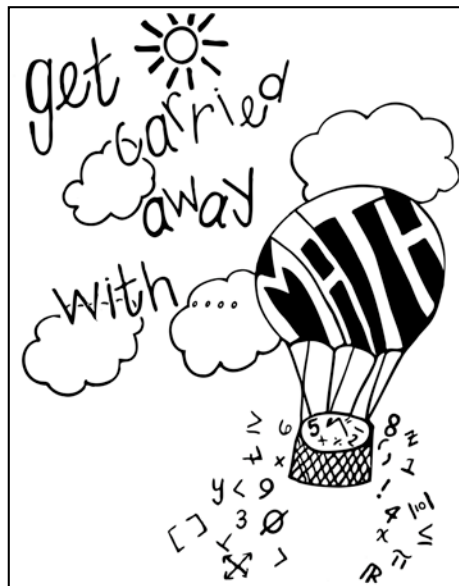
Erin Brown, 8th grade, Trask Middle School, Wilmington; Teacher: Colleen Quinn

Jade Carpenter, 4th grade, Norris S. Childers Elementary School, Lincolnton; Teacher: Denise Smith

Hannah Davis, 2nd grade, Rocky River Elementary School, Monroe; Teacher: Mrs. Brenda Todd

Melissa Fu, 7th grade, Marvin Ridge Middle School, Waxhaw; Teacher: Dianne Hooker

Mahlique Guthrie, 10th grade, East Chapel Hill High School, Chapel Hill; Teacher: Beth Neill



Cheyenne Harrison, 6th grade, Elkin Elementary School, Elkin; Teacher: Holly Simmons

Lindsey Kennedy, 5th grade, Kingswood Elementary School, Cary; Teacher: D'Ann Dickerson

Joshua Robertson, 5th grade, Warrenwood Elementary School of Math and Science, Fayetteville; Teacher: Susan Mescall

Devon Thompson, 2nd, Liberty Elementary School, Liberty; Teacher: Lindy Kirkman

## 2010 Presidential Award Finalists

The Presidential Award for Excellence in Mathematics and Science Teaching was established in 1983 and is awarded annually to the best K-12 science and mathematics teachers from across the country. Each year the award alternates between mathematics and science educators teaching Kindergarten through 6th grade, and those teaching 7th through 12th grades. The 2010 Award will focus on grades K through 6, and the finalists are:

**Penelope Shockley**  
**Rebecca Pearce**  
**Amanda Northrup**

The recipient will be chosen in early 2011.

**2010 State Math Fair Winners**  
**Reported By Betty Long, Appalachian State University**

**K-2 Division**

*First Place:*

Adrian Thananopavarn  
"Calculating Pi"  
Estes Hills Elementary School  
Chapel Hill, NC

*Second Place:*

Andrew Fraboni  
"Cheap Cheesy Pizza Popcorn"  
Snow Hill Primary School  
Snow Hill, NC

*Third Place:*

Erin Howard  
"School Lunch: To Eat or Not to Eat"  
Lake Norman Elementary School  
Mooresville, NC

*Honorable Mentions:*

Harrison Buchanan  
"Patterns, Patterns, Everywhere"  
Codington Elementary School  
Wilmington, NC

Mrs. King's Class (David Willis)  
"What is Lakeshore's Favorite Restaurant?"  
Lakeshore Elementary School  
Mooresville, NC

Madeline Carver  
"Fired Up for Math"  
White Oak Elementary School  
Edenton, NC

Cole Headley  
"Going the Distance"  
AB Combs Elementary School  
Raleigh, NC

**3-5 Division**

*First Place:*

Kara Bringewatt  
"Astronomical Volumes"  
Bringewatt Learning Community  
Davidson, NC

*Second Place:*

Gabriel Moore  
"Santa Claus: Fact or Fiction?"  
Victory Christian Center School  
Charlotte, NC

*Third Place:*

Florence Liu  
"Math in Container Loading"  
Lake Norman Elementary School  
Mooresville, NC

*Honorable Mentions:*

Thomas Steckmann  
"Breakfast? Bedtime? Big Deal?"  
AB Combs Elementary School  
Raleigh, NC

Cristina Bonnin  
"Lighten the Load With Levers"  
Woodland Heights Elementary School  
Mooresville, NC

William Schneider  
"Snow Day"  
Codington Elementary School  
Wilmington, NC

Madison Deal and Madison Dagenhart  
"Who is Golden?"  
Cool Spring Elementary School  
Cleveland, NC

## 6-8 Division

### First Place:

Ayano Annis

*"Hello, Hello! Are You There?"*

Clyde A. Erwin Middle School

Asheville, NC

### Second Place:

Niraja Pancholy

*"A Creative Way to Calculate"*

Mount Mourne IB School

Mooresville, NC

### Third Place:

Ashlyn Park

*"Got Boat Speed?"*

North Asheboro Middle School

Asheboro, NC

### Honorable Mentions:

Caroline Robinson

*"Viscosity Atrocity: Who Will Survive in a Warmer World"*

Camden Middle School

Camden, NC

Kiera Lyons

*" $1 + 1 = \text{Achoo!}$  The Mathematics of Disease Spread"*

Camden Middle School

Camden, NC

Nicholas Kowalski

*"Geocaching: Finding Math Along the Way"*

EB Aycock Middle School

Greenville, NC

## 9-12 Division

### First Place:

Rachel Jenkins and Mark Poczontek

*"Newton's Law of Cooling and R-Value"*

D H Conley High School

Greenville, NC

### Second Place:

Nathan Harmon and Jeremiah Collins

*"The Monty Hall Problem"*

North Iredell High School

Olin, NC

### First Place:

Aakash Gandhi

*"The Analysis of Musical Genre Using Computer Modeling"*

D H Conley High School

Greenville, NC

### Third Place:

Kaitlyn Anderson

*"Can Texters Multi-Task Better Than Non-Texters?"*

D H Conley High School

Greenville, NC

# Students' Understanding Of The Equal Sign Not Equal

Texas A&M University researchers have found that many US students do not understand the "equal sign" in a math problem, and this lack of understanding may be the reason why their peers from other countries are better in math.

"About 70 percent of middle grades students in the United States exhibit misconceptions, but nearly none of the international students in Korea and China have a misunderstanding." Read more at:

<http://tamunews.tamu.edu/2010/08/10/students%E2%80%99-understanding-of-the-equal-sign-not-equal/>

# Award Nominations

## Innovator Award Nominations

The North Carolina Council of Teachers of Mathematics accepts nominations for the Innovator Award at any time. The purpose of this award is to recognize and reward individuals or groups who have made an outstanding and noteworthy contribution to mathematics education and/or NCCTM by having founded, initiated, pioneered, or developed some program in mathematics education of service to a geographic region of the state or the entire state. Further, this program must have been sustained for a period of at least three years. A number of organizations have made significant contributions to mathematics education in North Carolina; the Committee encourages the nomination of organizations as well as individuals. Any NCCTM member may submit nominations by sending in the form below. Nominations will be retained in the active file for at least three years.

### NOMINATION FORM

Name of Nominee: \_\_\_\_\_

Present Position: \_\_\_\_\_

Outstanding contributions to mathematics education in North Carolina which serves as the basis for this nomination:

Additional information that would be of value to the selection committee:

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name (print/type): \_\_\_\_\_

Position: \_\_\_\_\_

Business or Institution: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: Business \_\_\_\_\_ Home: \_\_\_\_\_

Email: \_\_\_\_\_

Send to: John Parker  
316 West Soundside Road  
Nags Head, NC 27959

## Rankin Award Nominations

The Rankin Award is designed to recognize and honor individuals for their outstanding contributions to NCCTM and to mathematics education in the State. Presented in the fall at the State Mathematics Conference, the award, named in memory of W. W. Rankin, Professor of Mathematics at Duke University, is the highest honor NCCTM can bestow upon an individual.

If you have nominated someone in the past who has not received the award to date, or if you would like to nominate someone new, please submit as much of the following information as possible!  
Nominations are accepted at any time.

Please submit the following information. Use as many typewritten pages as needed. If possible, attach a vita of the nominee.

Name of the nominee

Current position

Your relationship to the nominee (e.g. principal, co-worker, etc.)

The nominee's contributions to mathematics education, NCTM, NCCTM, etc. (Please include information on specific offices held and honors received by the nominee.)

Any information about contributions to the community, teaching, and education that would be of value to the Rankin Award Committee in its deliberations

Other relevant information

Letters of endorsement from other colleagues may be included.

Date of nomination

Nominator\*    Name  
                    Current position; Business or educational institution  
                    Preferred mailing address; Preferred telephone number

\*The Rankin Award Committee reserves the right to use portions of nomination information in the presentation of the award if the candidate is selected.

**Send to:**        Lee V. Stiff  
                    326-D Poe Hall, Box 7801  
                    North Carolina State University  
                    Raleigh, NC 27695-7801  
                    Sending information in the form of emails is okay: [lee\\_stiff@ncsu.edu](mailto:lee_stiff@ncsu.edu)

## Donating to the Trust Fund

If you wish to memorialize or honor someone important to you through a donation to the NCCTM Trust Committee, please send your donation to:

Rebecca Hoover, NCCTM Business Manager  
P.O. Box 4604  
Cary, NC 27519

Contributions (checks) should be made payable to Pershing LLC for the NCCTM Trust Fund. Please provide the name of the person being honored or memorialized through the donation and the name and address of the person that NCCTM should notify of your gift. For more information, contact Robert Joiner, Trust Fund Chair.

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# Trust Fund Scholarship Application

\$600 scholarships are available from NCCTM to financially support North Carolina teachers who are enrolled in graduate degree programs to enhance mathematics instruction.

Applicants must be:

- Currently employed as a pre-K - 12 teacher in North Carolina;
- Currently an NCCTM member (for at least one year) at the time of submitting this application;
- Currently enrolled in an accredited graduate program in North Carolina;
- Seeking support for a mathematics or mathematics education course in which they are currently enrolled or have completed within the previous four months of the application deadline.

Applications will be reviewed biannually, and the deadlines for applications are:

**March 1**  
**October 1**

*Send completed applications to:*  
NCCTM Trust Fund Chair  
1302 Oakview Dr.  
Greenville, NC 27858

*Direct inquiries to:*  
Robert Joyner, Chair  
phone: (252) 756-6803  
e-mail: rjoyner3@suddenlink.net

---

***(Please print all information.)***

## **PERSONAL INFORMATION:**

Name: \_\_\_\_\_

Home address: \_\_\_\_\_

Street

City

NC

Zip

Home phone: \_\_\_\_\_ Home e-mail: \_\_\_\_\_

NCCTM membership number: \_\_\_\_\_

## **EMPLOYMENT INFORMATION:**

How many years of teaching experience? \_\_\_\_\_

Currently employed in what school system? \_\_\_\_\_

School name: \_\_\_\_\_

School address: \_\_\_\_\_

School phone: \_\_\_\_\_ School e-mail: \_\_\_\_\_

Current teaching assignment: \_\_\_\_\_

Principal's name: \_\_\_\_\_



**COURSE INFORMATION: (One course only)**

Institution of higher education: \_\_\_\_\_

Graduate degree program in which you are currently enrolled: \_\_\_\_\_

Course name: \_\_\_\_\_ Course number: \_\_\_\_\_

Dates of enrollment: (*circle one*) Fall semester    Spring semester    Summer session Year: \_\_\_\_\_

Name of course instructor: \_\_\_\_\_

**PROFESSIONAL ACTIVITIES WITHIN PAST 5 YEARS WITH EMPHASIS ON ACTIVITIES RELATED TO MATHEMATICS EDUCATION:**

**BRIEF STATEMENT OF FUTURE PROFESSIONAL GOALS:**

**REQUIRED SIGNATURES:**

Applicant signature: \_\_\_\_\_ Date: \_\_\_\_\_

Principal's signature: \_\_\_\_\_ Date: \_\_\_\_\_

Instructor signature (if currently enrolled): \_\_\_\_\_ Date: \_\_\_\_\_

**REQUIRED ATTACHMENTS:**

Please attach a copy of

A letter of acceptance to an accredited graduate program in North Carolina;

Official verification of enrollment in the graduate course described in the COURSE INFORMATION above if the course is currently being taken, **OR** official transcript containing the grade awarded to the applicant if the course described in the COURSE INFORMATION above has been completed.

**NOTE:** Applications must be complete to be considered. If your application is approved, an official course grade report must be submitted to verify successful completion of the course before scholarship funds will be issued.

**Internal Revenue Information for Grant Recipients:** Please be aware that NCCTM is required to report all grants of \$600.00 or more to the Internal Revenue Service. In such a case you will receive an IRS Form 1099-MISC from NCCTM. However, you should be able to avoid the payment of any income tax on this. NCCTM has been advised that, if you receive one of the NCCTM grants, you must include the grant proceeds in income unless you made a binding commitment to have the proceeds paid directly to the sponsoring school.

# NORTH CAROLINA COUNCIL OF TEACHERS OF MATHEMATICS

## BOARD OF DIRECTORS

Office	State	Eastern	Central	Western
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## MEMBERSHIP – NORTH CAROLINA COUNCIL OF TEACHERS OF MATHEMATICS

Name: \_\_\_\_\_ Home Telephone: (\_\_\_\_) - \_\_\_\_  
 Address: \_\_\_\_\_ School Telephone: (\_\_\_\_) - \_\_\_\_  
 City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_ E-mail: \_\_\_\_\_  
 School System: \_\_\_\_\_

### MEMBERSHIP STATUS

☐ New ☐ Former/Renewing Member # \_\_\_\_\_

### POSITION

- ☐ Teacher  
☐ Department Chair  
☐ Supervisor/Administrator  
☐ Full-time College Student  
☐ Retired  
☐ Other \_\_\_\_\_

### LEVEL

- ☐ K-3  
☐ 4-6  
☐ Junior High/Middle School  
☐ Senior High  
☐ 2-Year College/Technical  
☐ 4-Year College/University

### MEMBERSHIP DUES

☐ 1 year: \$20.00 \_\_\_\_\_  
☐ 3 years: \$50.00 \_\_\_\_\_  
☐ Full-time Student: \$10.00 \_\_\_\_\_  
☐ Contribution to Trust Fund: \_\_\_\_\_  
 Total Payment Enclosed: \_\_\_\_\_

Payment by ☐ Check ☐ Visa ☐ MasterCard

Card # \_\_\_\_\_

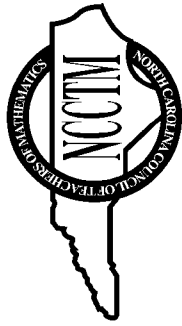
Exp. Date \_\_\_\_\_

Signature \_\_\_\_\_

**Please make your check or money order payable  
to NCCTM. Send this form and your payment to**

**NCCTM  
P.O.Box 4604  
CARY, NC 27519**

**Payments by credit card may be mailed or faxed  
to  
919-859-3342**



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