The Centroid

In This Issue:

Official Journal of the North Carolina Council of Teachers of Mathematics
Volume 39 • Number 3 • Spring 2014

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

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*.

Editorial Board

About the Cover

The featured logo is the current year's winning logo from the NCCTM Logo Contest; entrants are K-12 students.

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Contact Information

Address all correspondence and submissions to

The Centroid
c/o Dr. Deborah Crocker, Editor
Department of Mathematical Sciences
Appalachian State University
Boone, NC 28608

or send email to <CrockerDA@appstate.edu>. Please include a return email address with all correspondence.

The Centroid

OFFICIAL JOURNAL OF THE NORTH CAROLINA COUNCIL OF TEACHERS OF MATHEMATICS
VOLUME 39• NUMBER 3 • SPRING 2014

Articles

News & Information

Spring Leadership Seminar

Friday, March 28, 2014; 9:30-3:15
Marriott Greensboro Airport

Theme: "Gifts from the Common Core State Standards for Grades K-12: Meaningful Tasks, Rigor, and Mathematical Practices"

We are fortunate to have four of the authors of the books, "NCSM Great Tasks for Mathematics: Grades K-5" and "NCSM Great Tasks for Mathematics: Grades 6-12" as Keynotes for the Spring Leadership Seminar.

- Kit Norris; E2 - PLC Consulting Group; Boston, MA
- David K. Pugalee; Center for STEM Education University of North Carolina at Charlotte; Charlotte, NC
- Connie Schrock; Emporia State University; Emporia, KS
- Richard Seitz; Helena High School; Helena, MT

The registration fee is $65 for NCCTM Members and $75 for Non-members. For more information and to register: http://www.ncctm.org.

NCCTM 2014 Conference – Oct 30-31

Koury Convention Center, Greensboro
Proposal Submission is Open

Start making plans to attend the Fall Leadership Seminar on October 29, 2014 and the 44th Annual State Mathematics Conference on October 30-31, 2014 at Koury Convention Center in Greensboro. Speaker proposals are now being accepted for the Conference at: http://tinyurl.com/NCCTM2014. Watch the web site during the summer for more information on the Fall Leadership Seminar and the 44th Annual State Mathematics Conference.

Information for exhibitors and on sponsorships will be available on the NCCTM web site <http://www.ncctm.org/exhibitor_info.cfm> or by contacting Kay Swofford, Conference and Exhibit Coordinator at ncctm@conferenceresourcesnc.com

2013 NCCTM Conference

Thanks to All Who Participated!

The North Carolina Council of Teachers of Mathematics 43rd Annual State Mathematics Conference was a success! We want to thank everyone who attended, participated and/or volunteered for helping to make it a wonderful experience.

The following exhibitors provided sponsorship:

- McGraw Hill as a Benefactor, for neck wallets and sponsorship of Doug Clements
- Houghton Mifflin as a Friend, for their generous contribution to our 2013 conference
- Pearson for travel for Teruni Lamberg.

NCCTM would like to thank all of our 2013 Exhibitors for their continued support of our Annual State Mathematics Conference. Thanks to all who contributed door prizes as well.

Presidents' Messages

State President Debbie Crocker

crockerda@appstate.edu

I hope everyone is having a great 2014 so far! I know it has been busy. The elections for State and Regional Presidents are in progress. Log in at http://www.ncctm.org to cast your vote. Choose the leadership for your region and the state. The North Carolina Council of Teachers of Mathematics sponsors numerous opportunities for members and students in the spring each year.

Please plan to attend the Spring Leadership Seminar on Friday, March 28, 2014. It will be held at the Marriott Greensboro-Airport. We are fortunate to have as Keynote speakers four of the authors of the "NCSM Great Tasks for Mathematics" books (one book is Grades K-5 and the other is Grades 6-12). The authors are Kit Norris, David K. Pugalee, Connie Schrock, and Richard Seitz. The theme for the Seminar is: "Gifts from the Common Core State Standards for Grades K-12: Meaningful Tasks, Rigor, and Mathematical Practices." The four authors will facilitate the morning session. There will be two sets of breakout sessions in the afternoon, by grade band. The Keynote speakers will facilitate one set of breakout sessions and representatives from the North Carolina Department of Public Instruction will facilitate the other. For more information and to register, go to the web site at http://www.ncctm.org. The cost is $65 for members and $75 for non-members. Encourage others from your area to attend!

NCCTM sponsors Regional and State Math Fairs in the spring for students in Grades K-12. Please work with your students to put together projects for the fairs. The information on all three regional fairs and how to register can be found by clicking on "Math Fairs" on the menu on the left at http://www.ncctm.org.

NCCTM sponsors the State Math Contest in the spring as well. These competitions are another good opportunity for your students. Information on the State Mathematics Contests can be found by clicking on "Math Contest" on the menu on the left at ncctm.org.

It will be a busy spring for sure! I hope you and your students will take advantage of some of the opportunities available. Check the web site for information regularly. This is your professional organization. Make the most of the opportunities supported by NCCTM.

Start making plans to attend the Fall Leadership Seminar on October 29, 2014 and the 44th Annual State Mathematics Conference on October 30-31, 2014 at Koury Convention Center in Greensboro. Speaker proposals are now being accepted for the Conference at: http://tinyurl.com/NCCTM2014. Watch the web site, during the summer, for more information on the Fall Leadership Seminar and the 44th Annual State Mathematics Conference.

We have regional conferences, regional and state math fairs, regional and state math contests, the spring Leadership Seminar, and more! Spring is a great time to involve yourself and your students in these mathematics opportunities sponsored by NCCTM. I hope you will take advantage of them.

Eastern Region President Katie Schwartz

schwartzca@ecu.edu

Happy Spring! We hope you have been able to join us for some of our Eastern Region events this spring. These events happen because of the work of many volunteers. Our Eastern Region officers this year are Ron Preston, past president; Katie Schwartz, president; Kitty Rutherford, elementary vice president; Katie Martin, middle grades vice president; Christie Wuebbles, secondary vice president; Shelby Morge, college vice president; and Angel Powers, student representative.

A big thank you to Shelby Morge, Eleanor Pusey, and Katie Martin for planning and hosting the regional conference at UNC-Wilmington and to Katie Martin and Lynnly Martin for organizing the NCCTM

Eastern Region Math Fair. The Gamma Chapter at ECU has volunteered once again to help judge the logo contest entries from our region.

We are always looking for volunteers and people who want to get more involved in the organization. If you would like to help with one of our existing events or have other ideas for ways NCCTM can serve Eastern North Carolina teachers, please contact one of the officers. We look forward to hearing from you!

Central Region President Vincent Snipes

snipesv@wssu.edu

The NCCTM Central Region has a variety of mathematical activities available for its teachers and students from grades K-12. The Central Region Conference was held on February 22, 2014 at Randleman Middle School and offered sessions on topics focusing on Common Core mathematics for grade levels K-2, 3-5, 6-8, and 9-12.

This year's Central Region Math Fair is scheduled March 8, 2014 at North Asheboro Middle School. It's almost time for the NC State Mathematics Contests to begin. In the Central Region, qualifying contests will be held at Winston-Salem State University (4/11/14), North Carolina A&T State University (3/27/14), and Elon University (4/12/14).

Discussion Point: CCSS and the Future of HS Mathematics Education

After participating in a meeting about the future of high school mathematics, a group of teachers, faculty, mathematicians, and statisticians has prepared an essay explaining its recommendations for moving forward.

Key points:

- A broad and integrated vision of high school mathematics would serve our students better than the narrow and compartmentalized structure of traditional programs.
- Developing important mathematical habits of mind should become a central goal of high school instruction, especially the process of mathematical modeling that is required to solve significant real-world problems.
- Improved performance on international assessments like PISA are likely to result from moves toward curricula and teaching methods that balance and integrate mathematical techniques, understanding, and applications.
- Personal computers, tablets, smartphones, and other computing devices will almost certainly transform school mathematics in fundamental ways. Intelligent response to that challenge will require creative research and development efforts and the courage to make significant changes in traditional practices.

You can read the essay at: http://www.washingtonpost.com/blogs/answer-sheet/wp/2013/12/06/the-future-of-high-school-math-education/.

Gender Differences in Attitudes and Perceptions of Middle Grades Mathematics Students

Shirley A. Disseler and Allison Thomson, High Point University, High Point, NC

Throughout history the number of women involved in mathematics-related fields has increased, and more opportunities have become available for women to contribute to the advancement of mathematical principles. While women have long been engaged in mathematics, their credibility and recognition has developed over time. In the last century, great strides have been made providing women more opportunities to contribute to society through utilizing their intellectual abilities. However, even in today's modern society, women are still the minority among the science, technology, engineering, and mathematics fields (STEM). According to the U.S Department of Commerce in 2009, women comprised only 24% of all STEM related jobs. By comparison women make up about 48% of the overall workforce in the United States (Beede, Julian, Langdon, McKittrick, Khan, & Doms, 2011). This is an interesting fact considering women who are in a mathematics-related field have a significantly higher income. In addition, some women, even if they graduated with a degree in STEM, often go into other fields including education and healthcare.

This gender gap in the STEM workforce, while an improvement from the past, is still not closed and leads us to wonder why women aren't major contributors to these professions. The study mentioned above suggests that some possible reasons could come from lack of good role models, gender stereotyping, and "less family-friendly flexibility" (Beede et al., 2011, p. 8). While these may all be valid possible reason for the onset of the gap, it is a continual issue in that it holds our economy and society back. According to recent research, the number of math and science courses taken by high school females has increased, thus leaving the score gap only slightly higher for males (Hiederle & Versterlund, 2010).

Research regarding the gender gap in mathematics is not new. Berenbaum, Martin, Briggs, Fabes, and Hanish (2008) looked at why boys and girls differ in the mathematics and found some interesting factors. One argument is that boys are far superior in the realm of spatial skills than girls, which provides an advantage in math. Also, boys tend to engage in play types that are more movement oriented, therefore grow up more involved in the spatial environment. By middle school other problems exist that might play a role in the gap and how genders perceive the learning of math. In order to identify where the problem may originates, the authors in this study investigated factors that may be contributing to the gap.

During internship courses, college students studying middle grades education have the opportunity to work with various diverse students of mathematics in the middle school setting. Through this experience, the students noticed that there exists a pattern of more involvement from female students than males in class. This pattern brought forth the question: why at the middle grades level female students, who excel in math class, fail to pursue math fields in higher education? This study attempts to get at the heart of this question. Middle school students struggle with self-esteem, and the intellectual development required to excel in math is sometimes not evident during this period.

The Study

Through this quantitative study, we investigated the attitudinal differences between boys and girls at the middle school level, examining attitudes toward math, its concepts and vocabulary, and how each gender felt they best learned the material. The hypothesis of the study was that at this age, female students show more potential than males in mathematics, yet don't have the same confidence in their abilities as boys. The study seeks to identify the factors that contribute to this gender-based attitudinal discrepancy through a paper-delivered survey.

The study included the survey results from 78 boys and 75 in attendance at a middle school located in an urban area of North Carolina. The classes selected for the survey were of average ability level at each grade and the survey was anonymous. Two sixth-grade, two seventh-grade, and two eighth-grade classes were surveyed for the study. Students responded to 14 questions concerning how they felt about mathematics, if it was their favorite class, and how they preferred to learn the material. Students were first asked to identify

themselves as male or female on the survey so that data could be compared. Through this study we were able to ascertain the degree to which the original hypothesis was correct.

Favorite subject. Students were asked to name their favorite subject in school. The purpose of this question was to see how many students at this level would select math as the top choice. The authors found that only 13% of all students identified math as their favorite subject and 8% selected science. This was not surprising, as most students do not favor mathematics in comparison to subjects such as physical education (35%), which was the top scoring area from the questionnaire. There were no significant differences between males and females for this question. Consequently, when asked if they like math, on a scale from one to five (1= not at all, 5= significantly), 40% of all students surveyed chose three. This indicates that while math is not their favorite, it is something they still find somewhat interesting in their lives.

Time spent on homework. The next question focused on the amount of time students spent on math homework each night. As seen in Figure 1 there was a difference between genders, 58% of all boys said between 0-20 minutes per night, while 52% of girls chose 30-45 minutes per night.

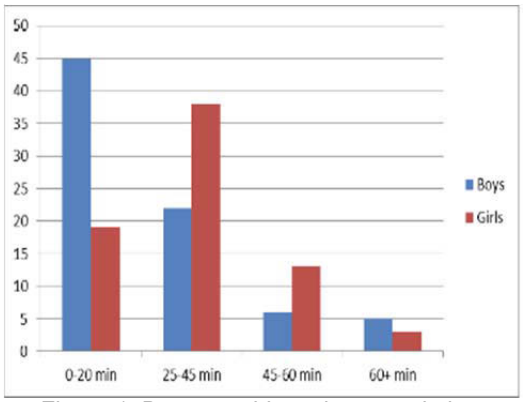


Figure 1. Boys vs. girls on homework time

Vocabulary. Question three dealt with student self-perception about personal struggle with mathematical concepts. When asked how much they struggle with math vocabulary on a scale of one (not at all) to five (significantly), 35% of boys and 42% of girls ranked themselves a two; however, when asked about how they felt about mathematical concepts on a scale from one (no trouble) to five (significant trouble), 76% of boys rated themselves between a one and three on personal confidence while only 69% of girls felt this way.

These data might suggest boys will report that they have more confidence in learning math concepts than girls. Other research as far back as 1994 indicates that this could be the case (Catsambis, 1994, p.200).

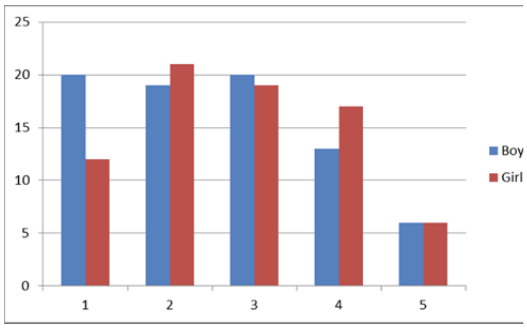


Figure 2. Response to the question "Do you have trouble learning math concepts?"

Use of manipulatives. The next question concerned manipulatives in the mathematics classroom. Manipulatives, as defined on the survey, included any props or visual aids that could be used to understand a concept. Studies have shown that students recall information better when they are actually seeing and creating what they are learning. The students were asked how they felt about using such manipulatives in a math setting on a scale of one (not at all) to five (significantly). We found that girls were more likely to appreciate being able to use props and use hands-on methods to learn mathematics concepts. When compared to boys, 26% of girls chose five ,while only 10% of boys chose five. While this is a significant difference, both boys and girls equally chose option three with boys at 39% and girls at 35%, demonstrating that while girls may more strongly prefer using manipulatives, both genders do appreciate having manipulatices incorporated them in the classroom.

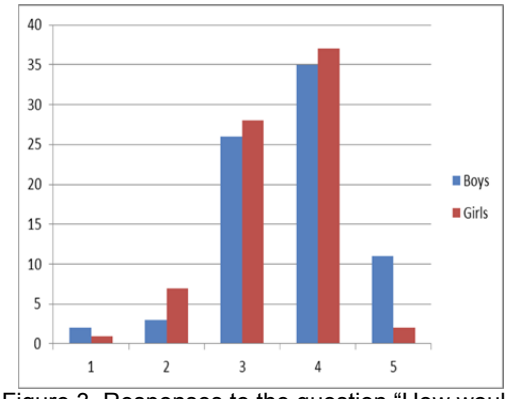


Figure 3. Responses to the question "How would you rate your math ability overall?"

Test anxiety. The students were then asked to rate how nervous they felt when it came time for mathematics tests. The question asked "On a scale of one to five, how nervous do you get about math tests (one = not at all, five = significantly)." There was a sizable difference between girls and boys on this question. While only 13% of girls selected one, 29% of boys selected this option. This could

suggest that girls get more test anxiety than boys. Also, 22% of girls and 14% of boys selected five. These results indicated that feel that they girls get more nervous than boys before a math test.

Overall Ability. When it comes to overall ability in math, most students generally ranked themselves in the middle, between a three and four on a scale from one (very poor) to five (extremely good). See Figure 3. This suggests that both genders feel equally confident in their ability to do math. This was also indicated in a previous study completed by Sophia Catsambis in 1994. Catsambis (1994) states that for "middle schoolers gender differences in coursework performance and ability are minimal; however strong differences exist in both attitude and self-perception in use of math in everyday life" (p. 200)

Overall attitudes. Other questions in the survey focused on overall attitudes of mathematics and its significance in their lives. The survey asked, "Is math a skill you can learn?" "Do you believe that if you struggle with math now, you will not be good at it in the future?" and "Is math a separate subject that does not relate to other subjects?" These questions provided information concerning middle school students overall, but there were essentially no differences in the responses between genders on these questions. When asked if they thought their struggle with math now, meant that they would not be good at math in the future, 62% of boys and 63% of girls responded no. Students felt that their ability in math in middle school would not determine their future ability to do math. In addition, the majority of middle school students felt that math is a subject that is relevant to other disciplines, with 75% of all students surveyed responding no to the question, "Is math a separate subject that does not relate to other subjects."

This Study in Context

A number of published research studies also support our hypothesis (Bruce, Ross, & Scott, 2012; Catsambis, 1994; Halpern, 2007; Lockheed, Thorpe, Brooks-Gunn, Caserly, & McAloon, 1985; Oakes, 1990). Our research suggests that girls tend to show more potential in a mathematics career at the middle school level than boys, yet don't have the same confidence in their abilities as boys. Prior research examined the difference in confidence and self-efficacy between middle school boys and girls. According to Bruce, Ross, and Scott (2012), "If females are becoming as successful as males on mathematical tasks, the self-beliefs of females and other facets of their belief systems should be as supportive of mathematical learning as the self-beliefs and belief systems of males" (p. 284). This means that if achievement due to gender differences is declining, then there should be a relationship with confidence. From this, Ross et al. (2012) were able to conclude that females were less confident than males about the ability to be successful on mathematics assessments. Both girls and boys were assessed on fractions and a very small margin between the genders was determined, meaning that females, in this study, tended to underestimate their abilities.

This trend is one that cannot be conclusively identified in the elementary grades. It is at the middle and high school levels that this difference truly begins to develop. Theoretically, not because anything changed cognitively between boys and girls, but societal influences affect the way boys and girls perceive their own math ability. According Fryer and Levitt (2009), "The bulk of the evidence in the past 50 years suggests that the gender gap in mathematics does not exist before children enter school, but is large and significant in the middle school years and beyond" (p. 213). This crucial time period determines the future for students and their future in mathematics; it is a transition time and if not does not occur successfully, than these potentially successful females may not appreciate their own abilities or foster them as needed.

The current trend occurring in today's society as reflected by the number of females in math-related careers mirrors this finding. From research conducted by the US Department of Commerce, women's involvement in computer and math jobs has declined, pointing to the fact that only one of every seven engineers is female. Women are succeeding, however, in physical and life sciences positions. The table "Employment in STEM Occupations in 2009" is a reflection of the different STEM careers and the percentage of males and females that comprise each one, as researched by the US Department of Commerce (Beede et al., 2011). While for the most part there was a slight increase in female involvement, there is an overwhelming male domination in these careers. Beede et al. also suggest that women are much less likely to choose their major in undergraduate studies to be in a STEM field. The article reads:

> *The findings provide definitive evidence of a need to encourage and support women in STEM with a goal of gender parity. Given the high-quality, well-paying jobs in the fields of science,*

technology, engineering and math, there is great opportunity for growth in STEM in support of American competitiveness, innovation and jobs of the future. (p. 8)

Presently, there are many jobs and opportunities for women in these careers that remain unfilled. The question as to how this problem could be remedied lies within the education system and motivating these women at a younger age to follow their potential to contribute to one of these fields.

Conclusions

The results of this study, as well as from prior research (e.g., Leaper, Farkus, & Brown, 2012) suggest that both genders are equally confident in overall ability; however, when broken down into specific aspects of the discipline, girls reported having less confidence with math concepts while boys are extremely confident in their ability. This study indicates that girls prefer to work with manipulatives in the classroom suggesting that they appreciate math more when something tangible is in front of them. The study data also indicates that girls get more nervous before math tests than boys do, and spend more time on homework each night.

In addition, the research suggests that females show more interest and motivation at the middle school level, but fail to demonstrate these abilities in choosing careers. This difference suggests that something occurs between middle school and higher education that shifts the scale for female students. Many female middle school students work harder to achieve success at this level in math. From the data collected it appears that females seem to feel that there could be a future for them in mathematics, even if math may not be their favorite or their strength at the middle school level.

A stronger emphasis on motivating these students to keep this attitude through high school and into higher education needs to exist. Educating students about women who are successful in STEM fields could serve as a great motivator for females in knowing that it is possible to succeed in a rigorous profession. One question the survey addressed asked the students to report whether they knew any adults currently in a math-related field. While the results were not very conclusive due to the write-in nature of this question, an overwhelming number of responses pointed to the field of "Math Teacher." In addition, more often than not, the teacher referenced was selected as female. This implies that even if students don't have mathematics role models in their home lives, they see their math teachers as such. It is important for educators to keep this in mind when entering into the field. Students model the behaviors of their math teachers and often make life choices from motivation provided by the most influential people in their lives. If there is a female math teacher in the life of a female student to encourage and enlighten them to the possibilities that they could achieve, it is possible that this gender gap in STEM fields could be lessened or even closed.

However, it is not solely the responsibility of teachers to motivate these students. Society as a whole convinces young girls that pursing math-related careers is not acceptable. We have recognized this gap between middle school and higher education achievement. It is possible that an intervention needs to be done at the high school level and the atmosphere needs to foster continuing mathematic achievement both for males and females alike. There is a void for female workers in STEM fields and as seen through this study, the motivation exists at some point in their lives and it is between these two points that potentially successful female mathematicians, scientists and engineers are lost. It is up to society to determine how this can be changed and possibly identify these women who will shape our global future.

References

Beede, D., Julian T., Langdon, D., McKittrick, G., Khan, B., & Doms, M. (2011). Women in STEM: A gender gap to innovation. *Economics and Statistics Administration issue brief No. 04-11*. Washington, DC: U.S Department of Commerce. Retrieved from http://www.esa.doc.gov/sites/default/files/reports/documents/womeninstemagaptoinnovation8311.pdf

Berenbaum, S. A., Martin, C. L., Briggs, P., Fabes, R. A., & Hanish, L. D. (2008). Sex differences in children's play. In J. Becker, K. Berkley, N. Geary, E. Hampson, J. Herman, & E. Young (Eds.), *Sex on the brain: from genes to behavior* (pp. 275-290). New York: Oxford University Press.

Bruce, C.D., Ross, J.A., & Scott, G. (2012). The Gender confidence gap in fractions knowledge: Gender differences in student belief–achievement relationships. *School Science and Mathematics, 112* (5), 278-288. Retrieved from http://onlinelibrary.wiley.com/ doi/10.1111/j.1949-8594.2012.00144.x/pdf

Catsambis, S. (1994). The path to math: Gender and racial-ethnic differences in math participation from middle school to high school. *The sociology of Education 67* (3), 199-215.

Halpern, D.F., Benbow, C.P. Geary, D.C., Gur, R.C., Hyde, J.S., & Gernsbacher, M.A. (2007). The science of sex differences in science and mathematics. *Psychological Science in the Public Interest, 8,* 1-51. Doi: 10.1023/A:1011332704215.

Fryer, R.G., & Levitt, S.D. (2009). An empirical analysis of the gender gap in mathematics. *American Economic Journal*, *2* (2), 210-240. Retrieved from http://www.nber.org/papers/w15430

Leaper, C., Farkus, T., & Brown, C. (2012). Adolescent girls' experiences and gender-related beliefs in relation to their motivation in math/science and English. *Journal of Youth Adolescence 41,* 268-262. Doi: 10.1007/s10964-011-9692-z.

Lockheed, M.E., Thorpe, M., Brooks-Gunn, J., Casserly, P., & McAllon, A. (1985). *Sex and ethnic differences in middle school mathematics, science and computer science: What do we know?* Princeton, NJ: Educational Testing Service.

Niderte, M., & Vesterlund, L. (2010). Explaining the gender gap in math test scores: The role of competition. *Journal of Economic Perspectives, 24* (2), 129-144.

Oakes, J. (1985). *Keeping track: How schools structure inequality.* New Haven CT: Yale University Press.

Applying for NCCTM Mini-grants

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***. A total of $15,000 is available each year for mini-grants, with each region awarding approximately $5000 in grants to its members.

Directions

The application is available on the NCCTM website <http://www.ncctm.org>. 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. Grant proposals must be postmarked or emailed by September 15, and proposals selected for funding will receive funds in early November. You will receive an email confirmation of receipt of your proposal. If you do not receive a confirmation within one week, follow up with the Mini-grant Coordinator. 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.

Common Core in Action

Using Technology in Middle-Grades Math – NCTM Smart Brief

Incorporating technology -- from using video tutorials to introduce lessons to having students plot graphs on iPads -- is a great way to engage middle-school students in math lessons, educator Monica Burns writes in this blog post. Burns offers several ideas for using technology in math class, such as having students create digital tutorials demonstrating a mathematical concept and discussing a math concept after watching a video.

To learn more: http://www.edutopia.org/blog/ccss-middle-school-math-tech-monica-burns/

History Corner

Descartes' Coordinate Geometry and Pick's Theorem

Lauren DuVall and Jessie Davidson, Miami University, Miami, OH

Are you looking for a fun way to connect geometry and algebra to history? Look no further than Descartes coordinate geometry and Pick's theorem, a method for measuring the area of irregular shapes! Descartes coordinate geometry allows for students to work with geometrical figures on coordinate planes. Then, as they move into upper level middle school (6th or 7th grade), Pick's theorem enables students to meet many common core content standards by linking the two. Both geometric and expression/equation standards 6.G.A.1, 6.EE.A.4 and 6.EE.B.5 (NGAC, 2010) are met through work with polygons and algebraic expressions.

In this paper, we explore areas of irregular shapes on the coordinate plane. After a brief discussion of the origins of coordinate geometry, we discuss methods for motivating discovery of Pick's Theorem through sample student work.

History

Rene Descartes and Coordinate Geometry. The coordinate plane is a historically notable finding in mathematics. Its development by Rene Descartes, a French mathematician in the 17th century, laid the foundation for many important mathematical results, including Pick's Theorem. According to legend, while lying in bed one day Descartes noticed a fly land on the ceiling. He watched the fly for a long time and began to wonder if the fly landed in the same spot more than once. He realized he could describe the fly's position by its distance from the walls, hence, the coordinate plane (Glass, 1998). His work provided the basis for coordinate geometry, commonly called Cartesian geometry, in his honor.

The development of the Cartesian plane enabled geometers to explore shapes on a grid. This made the process of measuring various attributes of shapes - including area - far simpler. For instance, the grid allowed mathematicians to calculate areas of shapes by breaking them up into smaller parts.

Georg Pick and Pick's Theorem. From Descartes' discovery of coordinate geometry, Georg Pick, an Austrian Mathematician who studied at the University of Vienna, developed Pick's Theorem and published it in 1899. Pick's Theorem is used to calculate the area of irregular shapes. Pick headed the committee at the University of Prague, which appointed Einstein chair of mathematical physics in 1911. Pick later introduced Einstein to the work of Italian mathematicians, which later helped Einstein to successfully formulate general relativity.

Mathematics

Coordinate Geometry. Figure 1 shows one way of breaking up the irregular shape and solving for the area. This way involves breaking up the interior of the shape into triangles and rectangles and solving for their individual areas. To solve for the area A of the triangles the formula is $A = \frac{1}{2}bh$, where b represents the base length and h the height; the area for the rectangles is $A = bh$. Once the areas of each shape formed within are calculated, they are added to find the area of the irregular shape.

Figure 2 demonstrates an alternate approach that can be used to calculate the area of an irregular figure. This method begins by creating rectangle around the irregular shape that touches each of the outermost vertices. Then instead of breaking up the inside of the irregular shape, the extra space creating by drawing a rectangle around the outside is broken up into rectangles and triangles. The area of the large rectangles on the outside is calculated and then the triangles and rectangles are then subtracted from that area leaving the area of irregular shape as the answer.

Before Pick's Theorem, the only known way to solve for the area of an irregular shape was by breaking it up into regular polygons such as rectangles and triangles. There are, however, many different ways to break up the shape.

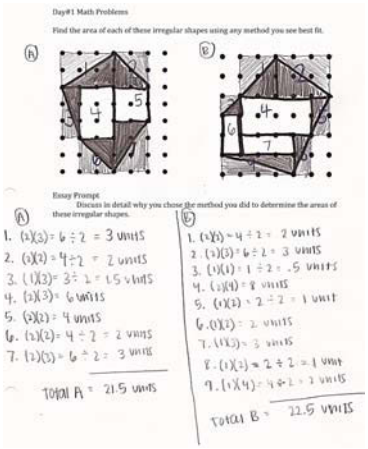


Figure 1. Calculating area by splitting up shape on grid

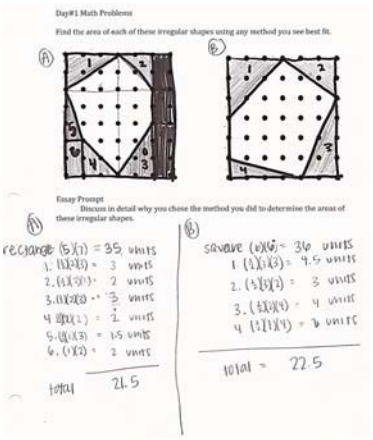


Figure 2. Alternative method

Formulating Understanding

Figure 3 shows a table constructed to organize and record the number of border points and interior points of various polygons when working towards the discovery of Pick's Theorem. An important part of this process is keeping either the number of interior points or the number of border points constant. Figure 4 shows what happens when the number of perimeter pins is increased by one each time, while the interior pins remain constant at 0. With each progression, the area goes up by ½. Figure 5 shows what happens to the area of three polygons as the number of interior pins is increased by one each time, while the perimeter pins remain constant at three (Russell, 2004). From step one to two, and then two to three, the area goes up by one.

Border Points	Interior Points	Area
6	0	2

Figure 3. Pick's Theorem table

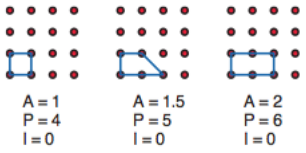


Figure 4. Interior points held constant

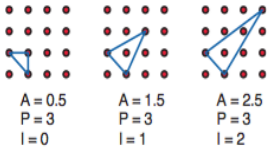


Figure 5. Border points held constant

Pick's Theorem. Using Figure 3, we can tie in the relationship to Pick's theorem from Figures 4 and 5, holding interior points and then border points constant. Through this process, it can be discovered that as border points of the shape are increased by one, the area increases by one half and as interior points increase by one, the area increases by one as well. Pick's theorem combines the border points and interior points from the first two columns in Figure 3 to give you the area of an irregular shape when placed on a geoboard. Use the relationships found in Figure 4 and 5 between area, border points and interior points to discover the formula: Adding the number of interior points to half of the border points and subtracting one will give the area of the polygon (Russell, 2004).

If we let I represent the number of interior points, i.e., the points that lie wholly inside the polygon, and P represent the points that lie on the perimeter, i.e., the border points, we get Pick's Theorem:

$$A = I + \frac{1}{2}P - 1.$$

Applying the Formula

Figure 6 illustrates a student highlighting an area calculation with Pick's Theorem. The circled points on the inside are the interior points and the points that are along the perimeter are the border points. As shown in the first problem, I =18 and P = ½(9) = 4 ½. Thus the formula for the area A yields 18 + 4.5 - 1 = 21.5, the area of the first polygon. Similarly, in the second figure, I =19, P = ½(9) = 4 ½ and so A = 19 + 4.5 - 1 = 22.5.

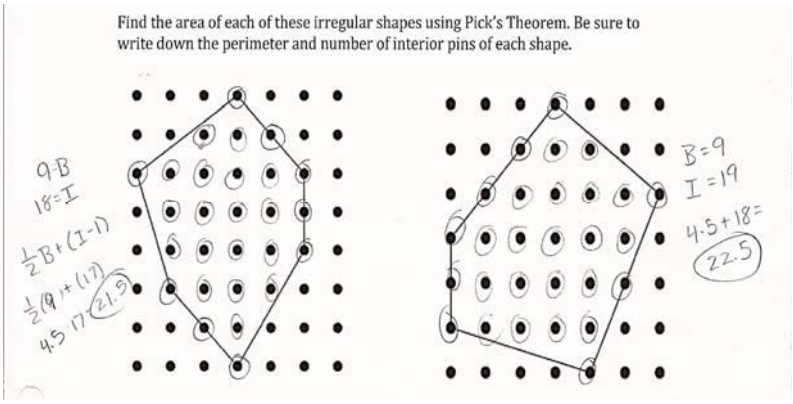
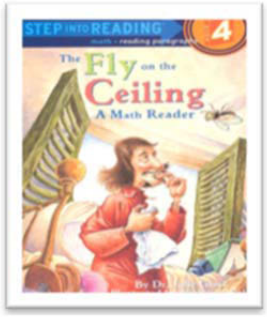


Figure 6. Calculating area using Pick's Theorem

In the Classroom

An alternative class reading for coordinate geometry is *The Fly on the Ceiling* by (Glass, 1998). This short math picture book gives students a quick historical background on coordinate geometry in a fun and exciting way. Through having students begin solving for the area of irregular polygons by dividing them up into rectangles and triangles, they will develop a sense of appreciation for Pick's Theorem. After tediously solving these areas without the theorem, students can then work together and use algebraic reasoning to come up with the formula for themselves. Once they have discovered Pick's Theorem, students can see the usefulness it has when working with irregular polygons and the formula's effect on coordinate geometry.



Conclusion

Pick's Theorem is an alternative method for measuring the areas of irregular shapes on a coordinate plane. It allows for students to make the connection between algebra and geometry through numerical reasoning no matter the grade level. Pick's Theorem brings together history and mathematics through the discovery of coordinate geometry in a formula that allows the manipulation of shapes on the coordinate plane. Both tangible manipulatives and technology can be incorporated into the learning process with geoboards. This association of math and history makes for a well rounded lesson and experience for students.

References

Glass, J. (1998). *The fly on the ceiling: A math reader*. New York: Random House Publishing.

National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). *Common core state standards: Mathematics*. Washington, DC: Author.

Russell, R.A. (2004). Pick's Theorem: What a lemon! *Mathematics Teacher*, *97* (5), 352-355.

Math Apps – Information Wanted!

Looking for some apps for Android and/or iPad that will help students practice their math skills? Check out this article published on the web by Parents magazine.

http://www.parents.com/kids/education/math-and-science/best-math-apps-for-kids/

Have you found a good app? Send in a short description so we can put it in The Centroid!

Problems to Ponder

Spring 2014 Problems

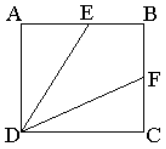
Holly Hirst, Appalachian State University, Boone, NC

Grades K–2: Jessica wants to take some of her toys to her grandmother's house. Jessica has a puzzle, a stuffed bear, and a doll. How many choices does she have if she can take 2 items to her grandmother's house?

Grades 3–5: A piece of ribbon 4 yards long is used to make bows requiring 14 inches of ribbon for each. What is the maximum number of bows that can be made?

Grades 6–8: 12 litres of water are poured into an aquarium of dimensions 50cm length, 30cm breadth, and 40cm height. How high (in cm) will the water rise?

Grades 9–12: ABCD is a square of side 5, and E and F are the mid points of sides AB and BC respectively. What is the area of the quadrilateral EBFD?



Directions for submitting solutions

1. 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

2. 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 1 June 2014 to (NEW ADDRESS!):

Problems to Ponder, c/o Dr. Holly Hirst
Mathematical Sciences
BOX 32069 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 2013 Issue

Problem: Mrs. Kline's class was given the task of measuring the width of the door to the classroom with a ruler. Katie reported that her measurement was 42 inches; Josie reported that her measurement was 20 centimeters; Trina reported that her measurement was 5 yards. Explain which student was correct and why the other two must have made a mistake.

Editor's Note: No one submitted answers to this question.

SOLUTION: Grades 3-5 Fall 2013 Issue

Problem: Steve and Kemal have offered to bring fruit salad to class as a snack to celebrate the end of the school year. Steve's recipe calls for 3 cups of strawberries and 2 cups of melon. Kemal's recipe calls for 5 cups of strawberries to 3 cups of melon. Susan likes strawberries a lot more than melon; which recipe has a higher ratio of strawberries to melon?

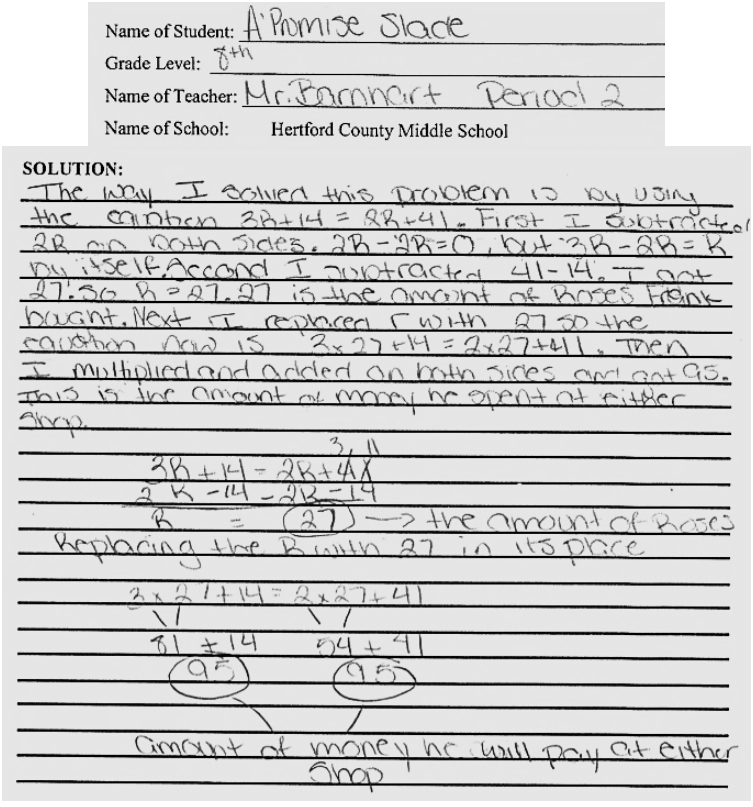
Correct Solutions were submitted by Mr. Baccus' and Ms. Schulze's classes at Ravencroft School.

Editor's Note: Most students justified their answers using the fact that 5 is greater than 3. I suggest that teachers ask the same question again with ratios of 6:4 and 5:3 to be sure students are thinking about this problem correctly.

SOLUTION: Grades 6-8 Spring 2012 issue

Problem: Frank is going to send some flowers to his wife. Lexington Florist charges $3 per rose, plus $14 for the vase. Jaclyn's Flowers, in contrast, charges $2 per rose and $41 for the vase. If Frank orders the bouquet with a certain number of roses, the cost will be the same with either flower shop. How many roses would there be? What would the total cost be?

Example Correct Solutions


Name of Student: A'Promise Slade
Grade Level: 8th
Name of Teacher: Mr. Brannart Period 2
Name of School: Hertford County Middle School

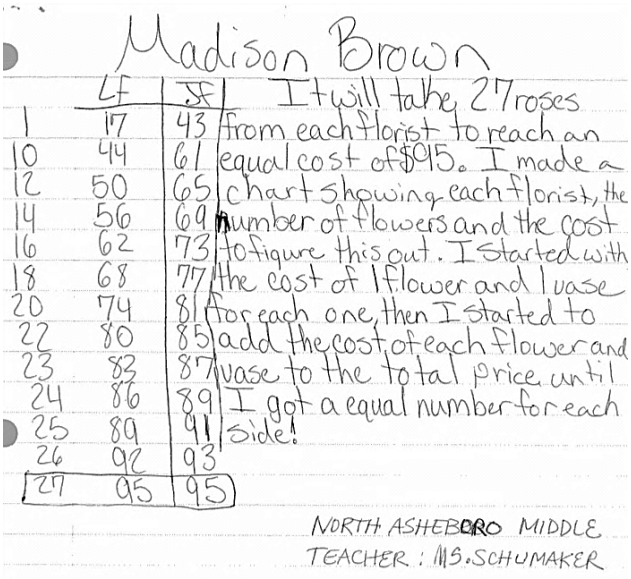
SOLUTION:
The way I solved this problem is by using the equation 3R+14 = 2R+41. First I subtracted 2R on both sides. 2R-2R=0, but 3R-2R=R by itself. Accord I subtracted 41-14. I got 27. So R=27. 27 is the amount of roses Frank bought. Next I replaced R with 27 so the equation now is 3x27+14 = 2x27+41. Then I multiplied and added on both sides and got 95. This is the amount of money he spent at either shop.

3R+14 = 2R+41
-14 -2R -14
R = (27) → the amount of roses

Replacing the R with 27 in its place

3x27+14 = 2x27+41
81+14 = 54+41
(95) (95)

Amount of money he will pay at either shop



Correct Solutions were received from the following students.

Bertie Middle School

- Ms. Brittenham: Sade Proctor, Tatyana Taylor
- Mrs. Carlton: Derwin Bauser, Lauren Belch, Warren Dickens, Taylor Edmondson, Aleajah Proctor, Diamond Reid, Jhordan Rose, Gregory Sibelius, Samya Speller, Tykedra Vaughan, Jaijuan Vick, Deonji Watson, Kae'Asia Watson,
- Mrs. Credle: Carrington Dudley, Ja'Kiese Freeman
- Ms. Jefferson: Jakyah B., Sean Brown
- Ms. Johnson Bazemore: Keyana Purvis
- Ms. Lee: Jeannetta Lee
- Mrs. Miller: Jacoya Leary
- Mr. Orbita: Brett Brabble, Chris Cherry, Tyree H., Ra'Neesha Hathaway, Ethan Hin, Andrew Haggard, Ryan Hoggard, Dakayi McGee, Jacaya Moore, Chandler Orbita, Marcus Philyaw, David Pogola, Courtney Pugh, JaBrea Speller
- Mrs. Tyson: Jaclyn Flower, Antonette Thompson, Donquezia Watson
- Mr. Urquhart: Kemonya Green, Armani Higgs, Andrina Lee, Nyesha P., Melanie Taylor, Tyrese Williams

Hertford County Middle School

- Mr. Barnhart: William Askew, Jr., Amber Banks, Trey'Veyon Bloodworth, Armoni Bu, Destiny Chavis, Morgan Feckner, Ophelia Ferlin, Domonte Freeman, Aiyanna Harrell, TreMonte Harrell, Keara Huguley, Junious Hunter, Kenneth Konegay, Brendon Lassiter, Jemari Lassiter, Keyonte Lassiter, KiAsia Lassiter, Jabria Leary, Rasheed Lee, Trevor Lee, Jadin Lunsford, Nathan Montgomery, Breanna Outlaw, Kiyona Overton, Tony Peele, Eric Phelps, Lunzey Rhodes, Shymora Rivers, Aki'Ya Russell, My'Kia Sanders, Rusty Skaggs, A-Promise Slade, Allen Smith, Brandon Soles, Kasey Stroud, Talice Sutton, Ricky Tann, Talik Totter, Deezira Vinson, Deezira Virson, Wyatt Waterfield, Diysuana Watson, India Wiggins, Stephani Witzigmea
- Ms. Collins: Alyssa Askew, Esaius Askew, Detonio Boone, Justin Futrell, Ty'Mecia Futrell, Orrin Gatling, David Greenwell, Destiny Harrell, Zaria Hunter, Kalyssa Ortiz, Geneva Rascoe, Nathaniel Rowe, Braxtyne Seetram, Zachary Stoyer, Breena Willoughby, Zack Wise
- Ms Hutchinson: Monae Bishop, Kevarious Brownlow, Tracy Cherry, Kavon Cooper, JaBronnia Dickens, TyDaishua Hall, Jalen Jackson, Ethan Parker, Zyonna Robertson, Breasie Spruill, JaJuan Stevenson, Keshawn Taylor, Nasir Taylor, A'Shonti Thompson, Tia Thompson, Destiny Vaughan,

Katora Walker, Lonnie Warren, Bri'Asia Wilder, Ethan Williams, Ty'Naezh Williams, Crystal Zollicoffer

- Mrs. Roberson: Lauren Cannette, Dyquece Davis, Jasmine Edwards, Justin Goodwin, Ashley Lassiter, Keyshawn Lassiter, Jarek Moore, Akyia Stephenson, Tuarez Wiggins
- Ms. Ruffin: Deivan Harrell, Justin Jordan, Chelsea Lassiter, Emmanuel Olguin
- Mr. Watson: ShaDavia Holloway

North Asheboro Middle School

- Ms. Daniels: Veronica Alejo, Maxton Babula, Dylan Bisese, Adrianna Butler, Benjamin Carroll, Te'a Ettson, Julia Faile, Juan Gonzalez, Victoria Gould, Asia Hardy, Abigail Hawkins, Gabriela Henriquez, Crystal Jaimes, Lissandra Jiminez, Madison Jones, Carolina Kaser, Laura Koser, Chris Salinas, Alexander Schrader, Jillian Strider, Danielle Tucker, Juan Vences
- Ms. Rodriguez: Hayden Best, Elizabeth Redding, Carly Sullivan, Billie Jean Spicer, America Toledo
- Ms. Shumaker: Madison Brown
- Mr. Smith: Kiara Agudeb, Gabriela Vasquez

South Asheboro Middle School

- Mr. Hynd: Kendall Allen, Jonathan Beirran, Santiago Benitez-Garcia, Alicia Blanna-Martinez, Logan Brinkley, Megan Cornwall, Karla Estrada, Shoaib Fazal, Emma Ferree, Catie Ficquette, Taylor Fields, Yadira Guerrero, Alex Hamilton, Dalton Harris, Alize Headen, Jacquazha Nettles, Makenzie Perdue, Jesse Portillo, Alejandro Ramirez, Jenna Richardson, Isaiah Ridley, Linda Sepulueda, Jaden Skelly, Madison Stickler, Calista White, Wesley Williams, Christopher Zelna
- Mrs. Runnfeldt: Michael Britt, Makalah Brower, Dalton Downer, Sarah Ficquette, Riley Hammer, Andrew Hermon, Emily Hill, Jordyn Jacobs, Dylan King, Julie Lewis, Jimena Mendez-Torres, Leah Reid, Chelsea Sandoval, Evangelos Sistasis, Jenna Thompson, Briana Tillman, Hunter Trinkley, Chloe Wood
- Ms. Salamone: Makia Avila, Kennedi Brayboy, Rachel Brittingham, Jailine Bustamante, Tatum Herrin, Macy McBride, Juan Mendez, Eli Ortiz, Stephanie Sanchez, Makayla Santas, Riley Smith, Sky Skeen, Matthew Thompson, Olivia Tyler, Morgan Ward

SOLUTION: Grades 9-12 Fall 2013 Issue

Problem: The terms of a sequence of positive integers satisfy $a_{n+3} = a_{n+2}(a_{n+1} + a_n)$, for n = 1, 2, 3, ... If $a_6 = 8820$, what is a_7?

Editor's Note: No one submitted answers to this question.

ACT Report on the Condition of STEM

ACT has released its 2013 report on the state of STEM education, and among the findings are:

- Interest in STEM is high. Almost half (48.3%) of students in the 2013 ACT-tested graduating class have an interest in STEM majors or occupations.
- More female than male students are interested in STEM, although the opposite is true among higher-achieving students.
- The academic achievement gap that exists in general for ethnically diverse students is even more pronounced among those interested in the STEM fields."

(p. 3. http://www.act.org/stemcondition/13/pdf/National-STEM-Report-2013.pdf).

Awards

2013 Outstanding Elementary Mathematics Teachers

Reported by Kitty Rutherford, North Carolina Department of Public Instruction, Raleigh, NC

In 2013, principals of North Carolina schools were encouraged to nominate the elementary teachers they believe do the most effective job teaching mathematics in their school. From those nominated, each local education agency (LEA) selected one teacher to represent the best in elementary mathematics teaching from the entire system. The following teachers, listed in order by LEA, were selected and were honored at the Annual State Mathematics Conference in Greensboro, October 31-November 1, 2013.

Alamance Burlington: Lori Smith
Alexander: Lori Sipe
Anson: Tracy Michelle Preslar
Asheboro City: Sharon Andrews
Avery: Jessica Jones
Beaufort: Katherine Holt
Bladen: Nicole Allen
Buncombe: William Henry
Caldwell: Janie Rickman
Carteret: Jill Hooley
Catawba: Brooke Potocki
Charlotte/Mecklenburg: Linda Simons
Chatham: Christina Lowman
Clinton City: Lori Baker
Columbus: Dana Scott
Cumberland: Jennifer Jammer
Currituck: Beth Williams
Dare: Bonnie Beacham
Davidson: Rachel Haynes
Durham: Tomika Altman-Lewis
Elizabeth City/Pasquotank: Diane Whedbee
Elizabeth City/Pasquotank: Jeane Jackson
Franklin: Crystal Williams
Gaston: Lisa Pennington
Guilford: Nalini Dorasamy
Harnett: Calvetta Dunkins
Henderson: Kathy Blackwell
Henderson Collegiate: Ella Bess Bumgarner
Hoke: Lynn Palko
Jackson: Susan Waller
Johnston: Amanda Gosek
Kannapolis City: Angie Campbell
Lee: Rebecca Harrington
Lenoir: Leigh Anne Hall
Lincoln: Kathryn Graham
Macon: Samantha Bullis
Martin: Stephanie Hardison
McDowell: Caitlin Hunter
Moore: Damita Nocton
Mooresville City: Stephanie Shaw
New Hanover: Barbara Ussary
Newton-Conover: Rebecca Vass
Onslow: Gary Cassidy
Pamlico: Sheri Hale
Person: Lisa Davis
Pitt: Becky Brinson
Randolph: Donna Dalke
Rockingham: Pamela Kaye Wood Dalton
Rutherford: Cheryl Whiteside
Sampson: Christy Adams
Scotland: Pam Coughenour
Stanly: Leah Swink
Stokes: Shannon Rose
Swain: Renee Peoples
Vance: Magnus Hemans
Wake: Courtney Beickert
Washington: Jwanita Boone
Watauga: Kim Shields
Wayne: Jennifer Harper
Wilkes: Rebecca Fain
Winston-Salem/Forsyth: Mary-Forbes Harrell Arkwright
Yadkin: Karen Joyner
Yancey: Teena Robinson

Awards

2013 Outstanding Mathematics Education Students

Reported by Bampia Bangura, North Carolina A&T State University, Greensboro, NC

Each year, NCCTM sponsors the selection of three Outstanding Mathematics Education Students. It is the task of the Special Awards Committee to identify the most Outstanding Mathematics Education Student from each region. Nominations are requested from all colleges and universities in North Carolina with teacher preparation programs.

All nominees receive a certificate and a one-year membership in NCCTM. Top award winners are recognized at the Awards Program at the Annual State Mathematics conference in the fall. The winners also receive a plaque and a check for $100.00. A second plaque is presented to each college or university in recognition of its honoree.

The recipients of this year's awards are: **Blair K. Watford** from East Carolina University in the Eastern Region, **Leigh Iler** from Elon University in the Central Region, and **James Adam Schrum** from Western Carolina University in the Western Region.

Outstanding Students James Schrum, Leigh Iler, and Blair Watford

Blair K. Watford is a double major with a BS in Mathematics Education and a BA in Mathematics at East Carolina University. Blair has been very active in the Mathematics and Mathematics Education activities at East Carolina University. She is a member and leader of the Finance Committee of the NCCTM student chapter at ECU. Blair has volunteered for the NCCTM Eastern Region Conference and is a Mathematics Education Representative at the Fall/Spring Open House. She helped judge the NCCTM Logo Contest and has been on the Dean's and Chancellor's List several times. Blair is committed to becoming a great Mathematics Teacher. Her professors describe her as an outstanding student with an exceptionally strong knowledge of Mathematics.

Leigh Iler is a Mathematics Education major at Elon who is pursuing a BS. Leigh is a Teaching Fellow (Class of 2014), and is currently completing a two-year research project entitled "Response to Intervention Techniques as Applied to Sixth Grade Math Content to Promote Student Success." This research project was funded by Elon's most prestigious research award. Leigh has also been involved in many other aspects of the mathematics education program at Elon: Tutoring in various elementary schools in Alamance County; Parent's Night Out Student Director; Study Abroad Student Ambassador presenting to several Elon 101 Classes regarding her experience studying abroad in London. She has acted as an Orientation Leader and has been a Teaching Fellow's student worker. She also has extensive involvement in the community.

James Adam Schrum is a senior at Western Carolina University completing a BS in Mathematics with a concentration in Secondary Mathematics Education. James is a Teaching Fellow who is very active in the local mathematics education program at Western Carolina. He presented a poster on the history of mathematics at the Smokey Mountain Undergraduate Research Conference. He participated in the William Lowell Putnam Competition 2012; He participated in the 2012 Virginia Tech Regional Mathematics Contest and attended the 2012 NCCTM Annual Conference in Greensboro. In addition to attending talks and group activities, James was elected president of the NCCTM Student affiliate at WCU. He also worked in the Mathematics Department under the supervision of faculty in the coordination of the WCU's Math Contest. James participated in several other Community activities such as the 2012 Discovery Orientation and the University Mentor-Mentee program.

Congratulations to these outstanding students!

Awards

Innovator Award Winners

Reported by Todd Abel, Appalachian State University, Boone, NC
and Janice Richardson, Elon University, Elon, NC

The purpose of the NCCTM Innovator Award is to recognize and reward individuals or groups who have made an outstanding and noteworthy contribution to mathematics education and/or NCCTM. It honors an individual or group who has founded, initiated, pioneered or developed a program in mathematics education of service to a geographic region of the state or the entire state. In 2013 there were two recipients: Dr. Sid Rachlin of East Carolina University is the individual recipient and the group recipient is the 24 persons who have served as editors of The Centroid in the last 39 years.

Sid Rachlin has made significant and major contributions to elementary teachers in our state. Dr. Rachlin has led the UNC System's effort in the design, development, and implementation of a statewide program of study to improve elementary mathematics instruction: an add-on license in mathematics education for elementary teachers. One of the persons involved with this project noted: "It is my honest opinion that without this person's passion and efforts for this project, we would not have the Add-on License in Mathematics Education today."

Dr. Rachlin's commitment to this program began in the spring of 2008, when, through funding from Burroughs Wellcome Fund and the Cisco Learning Institute, the North Carolina Department of Public Instruction co-sponsored a weeklong retreat to design an elementary mathematics special program of study for national and state-level consideration. His interaction with over 50 leaders in math education was instrumental in assuring that the proposed program of study would become a reality. From 2009-2013, Dr. Rachlin pursued additional funding through grants, coordinated the implementation of the program with math education faculty at eight universities, worked on the logistics with the UNC General Administration and NCDPI, collaborated with an evaluation team for a better fit with the state's curriculum, and worked with high needs districts to recruit teachers. "The program's success is a clear reflection of his commitment to its success," stated one of the participants. By 2018, NC Elementary Mathematics Add-on License will have impacted about 1500 elementary teachers!

In Spring 1975, the NCCTM newsletter, published since the organization was formed in 1971, announced that it was taking on a "new look," that of a journal, **The Centroid**. The journal was designed to reflect the philosophy of NCCTM: Service to the community of mathematics educators at all levels in North Carolina. That first edition of The Centroid stated that the it would serve as an official communication between the Board of Directors of NCCTM and its membership, a means to inform the membership of important events in the math education field and of significant and applicable findings from research, and as a forum for discussing successful programs and practices, professional ideas, proposals, and opinions.

Todd Abel (left) presents the plaque to current and past Centroid editors.

To read through the back issues is to track the development of mathematics education innovation in North Carolina and across the country over the past 40 years, which, as we know, has seen some pretty significant shifts. Throughout its 39 volumes, the Centroid has maintained its focus on that original mission, guided by a dedicated group of editors. From the original editor, Joseph Dodson, to the current co-editors, Deborah Crocker and Holly Hirst, 24 different people have served as editor or co-editor of this most important communication tool of our organization. This group of innovators has had a clear impact on mathematics education in our state, demonstrating true service to the community of mathematics educators of North Carolina.

Awards

Rankin Award Winners

Reported by Lee Stiff, North Carolina State University, Raleigh, NC

At the 43rd Annual State Mathematics Conference held in Greensboro, the North Carolina Council of Teachers of Mathematics (NCCTM) presented three individuals with the W. W. Rankin Memorial Award for Excellence in Mathematics Education, the highest honor that NCCTM can bestow upon an individual: Julia Kolb, Daniel Teague, and William Jernigan.

Rankin Award winners: Dan Teague, Julie Kolb, and Ray Jernigan

Julia "Julie" Kolb has been a mathematics educator for nearly 35 years and has contributed to the mathematics education of countless students and teachers during this time. Ms. Kolb has been named "Teacher of the Year" in her home county, and has been presented by her Alma Mater with the "Outstanding Mathematics Educator Award" and the "Outstanding Service Award" on two different occasions. She has received the "Presidential Award for Excellence in Science and Mathematics Teaching" and is a National Board Certified Teacher of Mathematics.

Equally impressive is the outstanding service that Ms. Kolb has provided to North Carolina and NCCTM. She has given numerous presentations at local and state NCCTM meetings as well as workshops and sessions for the North Carolina Department of Public Instruction, school districts, and area colleges; she has been a curriculum writer, a textbook consultant, and an End-of-Course test item reviewer. And, perhaps most importantly, she has served NCCTM as a Regional President, an Executive Board member in the roles of Secondary Vice President, Secretary, Parliamentarian, and as a member of the NCCTM Finance Committee.

For more than 20 years, Ms. Kolb supported and facilitated high school students' participation in the American Math Contest and the American Invitational Math Exam; for 17 years, she served as the high school Math Club Advisor; for 18 years, she mentored in-service and pre-service math teachers; and for the last 4 years, she has served as a materials writer and presenter of the TAP MATH Project which develops school-based visions of quality mathematics instruction and creates K-8 Mathematics Instructional Leadership Teams in school districts across the State. A colleague wrote that Julie's personal goal is "…to help all mathematics teachers so that they, in turn, can make a difference in the mathematics education of all students."

Daniel "Dan" Teague is unanimously regarded as an excellent teacher of mathematics, a scholar of mathematics and mathematics education, and as a person whose service to NCCTM, the National Council of Teachers of Mathematics (NCTM), and the mathematics education community around the world is exemplary. Dr. Teague has received numerous teaching recognitions, including the Presidential Award for Excellence in Mathematics and Science Teaching, the UNC Board of Governor's Award for Excellence in Teaching, and the Tandy Technology Scholar Outstanding Teacher Award. He is also a National Board Certified Teacher of Mathematics.

Dr. Teague is an outstanding scholar with expertise in AP Calculus and Statistics, math modeling, mathematics curriculum development, and instructional uses of graphing calculators and computer software. He has authored over 50 articles in scholarly publications, and has given numerous presentations and lectures to a wide variety of audiences on topics including Common Core Standards, differential equations and infinite series, and the Infamous 5-Color Theorem.

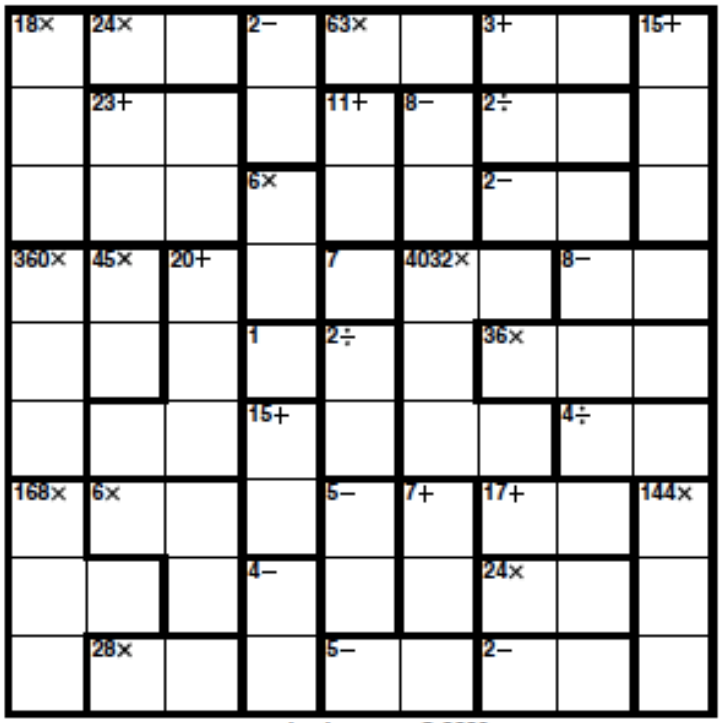
Dr. Teague has provided leadership to the Mathematics Association of America, the Mathematical Sciences Education Board, the Woodrow Wilson Institute, the U.S. National Commission on Mathematics Instruction, and the International Congress on Mathematical Education. His colleagues all agree that Dr. Teague "…has enriched the lives of so many people through his selfless dedication to the field of mathematics education."

William Ray Jernigan was recognized for his more than 40 years of service to mathematics and mathematics education in North Carolina. He served as President and Board Member of the North Carolina Association for Advanced Placement Mathematics Teachers, Curriculum Developer for the North Carolina Partnership for Improving Mathematics and Science, a Regional President of NCCTM, and Co-Author of a professional development series of modules on modeling; data, probability, and measurement; geometry; and algebraic thinking, written for middle grades and high school mathematics teachers to help them implement Standards-based practices in North Carolina classrooms.

Mr. Jernigan is a former Mathematics Teacher at Farmville Central High School, a past Mathematics Lecturer at East Carolina University, and most recently, Instructional Coach for the North Carolina New Schools Project. Of Mr. Jernigan it was said, "He is an exceptional mathematics teacher, an exceptional mathematics educator, and an exceptional NCCTM leader. We have all benefited from his generous commitment to improving the teaching of mathematics and to supporting teachers of mathematics in North Carolina."

Puzzle

Here is a challenging KenKen for you to try! This is a 9x9 grid, so the goal is to use each of the digits 1 through 9 only once in each row and column while satisfying the operation and total provided in each subset of cells.



www.kenken.com © 2009

Nominations for NCCTM Awards

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.

The nomination form can be obtained from the "awards" area of the NCCTM Website (http://www.ncctm.org). More information can be obtained from: Lee V. Stiff, lee_stiff@ncsu.edu.

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.

The nomination form can be obtained from the "awards" area of the NCCTM Website (http://www.ncctm.org). more information can be obtained from: Bampia Bangura, babangur@ncat.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:

Joette Midgett
North Carolina Council of Teachers of Mathematics
P. O. Box 33313
Raleigh, NC 27636

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 John Kolb, Trust Fund Chair.

NCCTM Trust Fund Scholarship Application

North Carolina Council of Teachers of Mathematics

$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 degree or graduate add-on mathematics certification 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 six months of the application deadline.

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

- **March 1 for courses completed in a Fall term**
- **October 1 for courses completed in a Spring or Summer term**

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

_____, NC _____
City 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 program in which you are currently enrolled: _____

Course name: _____ Course number: _____

Dates of enrollment: *(circle one)* Fall Spring Summer 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

1. A letter of acceptance to an accredited graduate program in North Carolina;
2. 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.

NCCTM Board

contact information can be found at ncctm.org

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	State	Eastern Region	Central Region	Western Region
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Math Contest, Philip Rash
Math Counts, Harold Reiter
Math Fair, Betty Long
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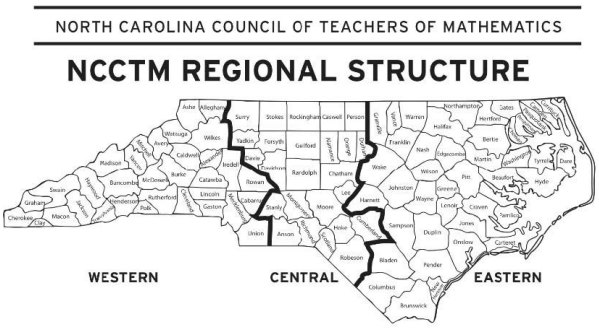
Nominations, Betty Long
Parliamentarian, Tim Hendrix
NC MATYC Representative, Ann Deboever
Rankin Award, Lee Stiff
Special Awards, Bampia Banguria
Student Affilliates, Lisa Carnell
Trust Fund, Robert Joyner

Becoming a Member

Follow the “Membership Information” link on the ncctm.org website, or go directly to:
http://www.ncctm.org/members/register.cfm



NORTH CAROLINA COUNCIL OF
TEACHERS OF MATHEMATICS
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