UETCTM News

Third Meeting for the Fall

The third meeting this Fall of the Upper East Tennessee Council of Teachers of Mathematics will be held at Sevier Middle School in Kingsport.

Elementary Break-Out Sessions (choose 1):
1. Classroom Discussions: Using Math Talk in Elementary Classrooms
Presented by Jan McCall and Lori Seehorn
Targeted Audience: Teachers in Grades PreK-5

2. Let's Tessellate
Presented by: Pam Stidham and Penny Salyer
Targeted Audience: Fourth Grade Teachers

Middle School Break-Out Session
Using Polydrons to Teach Geometry
Presenter: Kris Krautkremer

High School Break-Out Session
Teaching Statistics in Algebra 1
Presenters: Julia Grecol and Lora Hopkins

Don't forget to attend the Franklin Math Bowl this month (see page 7 for details).

IN THIS ISSUE

What the Heck is a Fractal?

***by* Cindy Dye**

A fractal is an object that displays self-similarity or the object repeats over and over. The object doesn't have to be the same structure at all scales, but it must be the same type of structure that appears on all scales. A fractal is a rough or fragmented geometric shape that can be subdivided into parts where each part is a reduced sized copy of the whole item. Fractals can also be defined as any pattern that exposes greater complexity as it is enlarged. There are several structures that are fractals that include the Sierpinski triangle, Koch snowflake, Peano curve, Mandelbrot set, and Lorenz attractive.

Fractals can be traced back to the late 19 century. The term fractal was coined by Benoit Madelbrot in 1975 from the Latin word fractus meaning based or fractured. A mathematical fractal is based on an equation of feedback or recursion. The Mandelbrot set was developed by none other than Benoit Madelbrot. In mathematics, this is a set of points in the complex plane that forms a fractal. This set of numbers is characterized by complex polynomials.

A fractal is made up of a fine structure that is by chance made up of small scales. Fractals appear similar at all levels of magnification and they are considered to be infinitely complex. Fractals also occur in natural objects such as clouds, mountain ranges, lightning bolts, and even vegetables such as cauliflower and broccoli. Other examples of fractals occurring in nature include natural objects that display fractals in a self-similar structure over a finite scale range include examples of broccoli, blood vessels, and coastlines.

There are four common techniques for generating fractals. The first is the escape time fractals that are characterized by a repetition relation at each point in a space. Examples of this type of fractal include the Mandelbrot set. Another technique for generating fractals is the iterated function system that has a fixed geometric replacement rule. Some examples include the Cantor set, Koch snowflake and the Peano curve. Random fractals are generated by stochastic rather than a deterministic process. Finally, strange attractors are generated by the repetition of a map or the solution of a system of initial value of discrepancy equations that display chaos.

Fractals are a part of our world. Scientists and mathematicians are using fractal technology to better understand topics such as the human body as well as the universe. Scientists also utilize fractals to assist with medical research. In the future, fractals technology may be the key to unlocking many medical mysteries.

~ Cindy Dye teaches at Colonial Heights Middle School in Sullivan County.

Strategies for Drawing 3-D Figures

by Megan K. Blakely

The Tennessee Curriculum Standards are constantly changing in Mathematics to increase the development of problem solving and reasoning skills across all grade levels. Geometry seems to be one of the most difficult standards for seventh grade middle school students to successfully develop and apply. Students are required to master being able to use visualization, spatial reasoning, and geometric modeling to solve problems by constructing and drawing a three-dimensional object from a two-dimensional representation. Most students do not even know the difference between a two or three-dimensional figure. This lack of knowledge makes our job as the teacher even more challenging and important. The ability to draw three-dimensional figures is an important visual thinking tool. "A picture is worth a thousand words," so my goal is to provide teachers with several strategies in introducing three-dimensional figures, 3-D drawing techniques/tips, and enrichment or extension activities that I have used to aid in visualization and spatial reasoning for middle school students.

In my teaching experience, it is best to introduce the concept of a three-dimensional figure as having a length, width, and depth. A perfect example of a three-dimensional figure would be the cube. Next, I would recommend explaining the three parts of a cube, which are the faces, edges, and vertices. Hands-on manipulatives are a terrific way of allowing students to visually and physically locate these parts of a cube. Teachers should allow students to experiment with isometric dot paper to see how many ways to draw a cube. This experimentation is crucial for students to self-discover the many possibilities of drawing three-dimensional figures using cubes. Many times, students enjoy creating designs and learning from their successes and mistakes without worrying about failing.

After students have experimented, I would suggest allowing them to demonstrate various techniques they have developed and applied to create their cube drawing. Once students share their tips, I usually present at least six helpful ways of creating a three-dimensional cube on their isometric dot paper. The SmartBoard has isometric dot paper that the teacher can use in their demonstration. One technique students can choose is drawing a sideways rhombus, with two more rhombuses directly underneath the first. The second technique would be to first draw a Y shape, and then draw an upside down V on top of the Y. You will also need to draw two more slightly slanted V shapes on both the left and right sides of the Y to complete your cube. The third tip is basically similar to the second, except you can start out drawing an upside-down Y with V shapes around the figure to create a cube. A fourth design would be to connect the isometric dots to create a hexagon. Then, draw a normal Y shape or upside-down Y inside of the hexagon. A fifth tip is to draw two V shapes directly underneath one another. The student should connect each endpoint on the top V with the endpoint on the bottom V, also connecting the vertexes of both V shapes together. The last step is drawing another upside-down V on top of the figure to complete the cube. The sixth technique is similar to the fifth, except just the opposite. This will create the cube in a different perspective. Most of the time, students can reflect (continued on page 4)

the drawing and create the cube from various other perspectives such as looking from the top or bottom view. This is where students need to begin practicing, constructing, and drawing a simple three-dimensional figure from different perspectives.

Students will feel more comfortable after constructing and drawing simple three-dimensional buildings using the cubes. Through various teaching mentors, I've learned that labeling a clear, plastic plate with the words "front," "back," "left," and "right" allows for students to construct/stack their cube buildings on the plate, so that they can turn or lift the plate easily for viewing in several different perspectives. Several of these views would be left-front, right-front, left-back, and right-back from both the top or bottom perspective, along with many more examples such as flipping the shape on its side. A common mistake I observe is that students forget to place the "front" label facing them while building their cube design, so please remember to remind them of this. As the buildings get bigger and more complicated, I recommend using the simple steps of drawing individual cubes from earlier in this article. However, I have realized that it is easier for me to sketch a stacked three-dimensional figure by first following its (continued on next page) outline on the plate, while tracing its shape on the isometric dot paper. Then, draw in the edges of each cube inside of your three-dimensional drawing. Remember to only draw the visible edges, not ones that are hidden by other cubes. If students are sketching the bottom perspectives, then I would recommend having them work with a partner. This will allow for their partner to hold the plate while the other sketches and vice versa. When finished drawing the building, I usually encourage students to shade in either the tops or bottoms of the cubes that are visible. If it is a top perspective, students should shade the tops of their building and the opposite if it is the bottom perspective.

The Geometry Standard of constructing and drawing a three-dimensional figure is an extremely difficult challenge for many middle school students. The teacher needs to practice constructing and sketching several different three-dimensional figures in gaining the confidence needed to demonstrate and assist students with this skill. Most importantly, both the teacher and students need to discover that we do not live in a perfect world, so we should not expect to conquer this skill on the first try. It will take plenty of practice drawing these three-dimensional figures to gain the confidence needed in mastering this visualization and spatial reasoning geometry standard. In addition, please allow for your students to "experiment" first, ask them to share their techniques with one another, and then you can reveal other tips that were not discussed. The "Think, Pair, Share" method is a valuable instructional strategy students can use to self-discover, especially when it involves three-dimensional figures.

~ Megan Blakely teaches at Holston Valley Middle School in Sullivan County.

That's Not How I Learned to do Math!

***by* Aleta Compton**

Hands-on math? Manipulatives?? What in the world are these things? That's not how I learned to "do" math! When I was a student, we didn't use manipulatives or play with blocks in math class. I took notes, studied vocabulary, followed steps and rules, did all of my homework, and learned math. Using colored pencils in geometry class was a really big deal. I guess I was lucky that I could learn math in this manner, because that was the only way it was taught.

When I became a mathematics teacher, I began to learn a new way to teach the old concepts. Why? Primarily because today's young generation of learners is a tactile society. If my students can build it, touch it, manipulate it, take it apart, examine its parts, or draw it – whatever "it" may be – true understanding of the concept can be achieved. Educators are beginning to understand that today's students are accustomed to being in the middle of the action; they are no longer content with "because that's the way it is" or "because Pythagoras said so" as an acceptable answer. They want to understand why and how math works.

Secondly, exploring math concepts by "doing" math also promotes algebraic thinking. What is algebraic thinking? I perceive algebraic thinking as a process that begins at birth. From the first time that a baby stacks blocks in a pattern, sorts colors and shapes, or figures out that a friend has more candy than she does, that child is thinking algebraically. The process is never-ending! Every time a person uses computational skills or allows symbols to represent something else, algebraic thinking occurs; every time a person makes (Continued on page 6)

Request for Article Submissions

We are always looking for people to contribute articles to our ongoing "Math Perspectives" series. Every month, we would like four people to write for the series: a preservice undergraduate student, a preservice graduate student, a current classroom teacher, and one of our local math coordinators. Each person will voice their opinions, concerns, or observations upon a particular aspect of teaching mathematics. There are no set topics for this series.

Another section will be included next volume dedicated to mathematics problems. We are looking for people to submit favorite problems focused on various grade bands.

If you or someone you know would like to contribute to this column, please contact the newsletter editor, Ryan Nivens at nivens@etsu.edu.

numerical comparisons, algebraic thinking occurs. This logical thinking process is enhanced by using manipulatives and other concrete models to solve real-life mathematical situations. I think it's more effective if we teach the way kids learn, and hands-on activities which link concrete models to numerical tasks bridge the reasoning gap. Algebraic thinking lends itself to facilitating thought processes in many other academic pursuits, also.

Finally, using hands-on math and manipulatives in the classroom is just plain more fun than textbook, pencil, paper, drill, drill, drill! Engaging students in learning is more than half of the battle. If students look forward to a class and its activities, they are much more open-minded about the content being taught and much more willing to try to learn.

Professional development programs such as the Eastman Scholar Mathletes will educate teachers in the use of hands-on instructional techniques, encourage us to gain confidence in our own abilities, and make us more comfortable implementing the techniques in our classrooms. Make no mistake – the use of manipulatives requires practice on the teacher's part. We must be willing to accept change, enthusiastically adopt these ideas as our own, and develop an exciting learning environment for our students. Even though this is not the way I learned to do math, I'm excited about being part of the movement that will allow kids to explore and discover math concepts for themselves and open up a whole new realm of possibilities!

~ Aleta Compton teaches at Indian Trail Middle School in Johnson City.

Mark Your Calendar for NCTM Conferences

Annual Meetings
& Exposition

San Diego - April 21-24, 2010
"Connections: Linking Concepts and Context"
Speaker proposal deadline is May 1

Regional Conferences & Expositions
2009

Minneapolis - November 4-6
Nashville - November 18-20
(In Conjunction with TMTA's annual meeting)

Events Taken from NCTM Newsletter (45.6)

Quote of the Month

"A mathematician is a device for turning coffee into theorems."

-- Paul Erdos

NCTM Membership and Journal Subscriptions

Are you a member of NCTM (National Council of Teachers of Mathematics)? As an NCTM member you can receive one or more of four outstanding journals depending on your interests: *Teaching Children Mathematics* (geared towards elementary school), *Mathematics Teaching in the Middle School*, *Mathematics Teacher* (for high school teachers), or *Journal for Research in Mathematics Education*.

In addition, the NCTM web site has a number of members-only features including an online journal devoted to more high-tech tools for all levels, and NCTM publishes many books, monographs, and yearbooks of interest. Now when you join or renew an existing individual membership online, you can choose to have a rebate sent back locally to UETCTM. New NCTM members or members renewing after a lapse of at least a year earn UETCTM a $5 rebate; renewing NCTM members earn us a $3 rebate. Go to www.nctm.org for more information, and when you fill out the online membership form, select Upper East Tennessee Council of Teachers of Mathematics from the drop-down menu for the state.

Franklin Math Bowl is Fast Approaching!

The 2009 Franklin Math Bowl will be held on Saturday, **November 14**, from 8:30-3:00. The Bowl is a contest for students in sixth through eighth grades and is held on the ETSU campus. Students compete in individual tests and in problem solving tests in teams of up to four. Each school can send up to two teams of four plus two alternates for each division (sixth, seventh, regular eighth grade math, and algebra). The Bowl is sponsored by ETSU's math department, University School, and UETCTM.

Registration is $5 per student, which pays for trophies and printing the tests. If you didn't receive an invitation in the mail, registration forms are also available on the website http://www.etsu.edu/math/fmb.

More information about the contest and copies of some old tests are also posted there. For questions, contact Daryl Stephens at stephen@etsu.edu or 423-439-6973. The registration deadline of October 19 has passed, but with a $20 late fee you can still get in. The Bowl can always use volunteers to help grade or proctor the tests; if you would be willing to help, please contact Daryl also.

Upper East Tennessee Council of Teachers of Mathematics
Membership Application

Complete and return to Jerry Whitaker with a check for $10 made payable to **: UETCTM**. Completed Application and check may be mailed to:

Jerry Whitaker
Mathematics Curriculum Coordinator
Washington County Schools
405 W. College Street
Jonesborough, TN 37659

Name: ____

Home Address: ____

____

Home Phone: (____) _____ - ___________

School: __________________________

School Address: ________________________________

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School Phone: (____) _____ - ____________

Email Address: _______________________

Officers of UETCTM for 2009/2010	**President** Val Love Math Coach Kingsport City Schools vlove@k12k.com (423) 943-2704	**President Elect** Ryan Nivens Assistant Professor Center of Excellence in Mathematics and Science Education East Tennessee State University Johnson City, TN 37614 nivens@etsu.edu (423) 439-7529
Past President Dayna Smithers Division of Mathematics Northeast State Technical Community College PO Box 246 Blountville, TN 37617 (423) 354-2502 dbsmithers@northeaststate.edu	**Secretary** Kris Krautkremer Robinson Middle School Kingsport City Schools kkrautkremer@k12k.com	**Treasurer** Jerry Whitaker Mathematics Curriculum Coordinator Washington County Schools (423) 434-4903 whitakerj@wcde.org

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ETSU

Department of Curriculum and Instruction

Att. Ryan Nivens

Box 70684

Johnson City, TN 37614-1709