KATM Bulletin

Kansas Association of Teachers of Mathematics

A Message from our President

Hi Kansas Math Educators!

It's difficult to believe that the end of the 2018-19 school year is in sight. It's been a fun year filled with new ideas, learning opportunities, and connections made. We've had opportunities to learn and connect with other KATM members at the October KATM conference in Manhattan, through Web Zone discussions and activities, and through social media outlets, such as the KATM Facebook page and on Twitter. From these opportunities, as well as the countless extra hours you all put in to better your students' education, Kansas math students are receiving exciting, real-world, and engaging ways to interact with mathematics.

As we finish up the school year, I invite you to stay connected with other KATM members through the KATM website, our Facebook page, and on Twitter. Summer is an ideal time to learn new ideas and strategies from a great network of Kansas math educators. Additionally, please consider applying for the Cecile Beougher Scholarship (elementary teachers only) and the Capitol Federal Savings Mathematics Teaching Enhancement Scholarship. These scholarships can be used for math materials for the classroom, as well as professional development for teachers. Looking ahead to next year, please plan on attending the fall 2019 KATM Conference in Chanute. We would love to have many of you register and apply to present a session at the conference, as well. Share ideas and learn from your Kansas math colleagues!

I am honored to have served as the KATM President for the 2018-19 school year. I have met so many great Kansas math educators and have seen the dedication you all have for your students! Best wishes for the rest of this school year, and I wish you all a restful and productive summer, recharging your batteries and planning more magical ways to positively impact the lives of your students!

Todd Flory
KATM President
toddflory@katm.org

April

2019

Inside this issue:

Election Results

President-Elect

Sara Schwerdtfeger —Hello, I am Sara Schwerdtfeger from Emporia, KS. As an Assistant Professor at Emporia State University in the Elementary Education department, I teach math and science methods to preservice elementary teachers. As Director of our Professional Develop School (PDS), I work with our partner schools to place student teachers and observe them teaching in the classroom. Experiencing math from the elementary teacher, university professor, as well as a PDS student teacher supervisor perspective has enabled me to broaden my definition of best practice in mathematics. I am interested in the President-Elect position to continue to promote the interest of learning and teaching mathematics in Kansas. My experiences teaching in Emporia Public School include 16 years of teaching 6th, 1st, 2nd, and 3rd grade. One of my passions in education is encouraging teachers to become involved in the curriculum selection process for schools. My degrees include a Ph.D. in Curriculum and Instruction with an emphasis in Mathematics Education from Kansas State University, as well as a Master's Degree in Elementary Education and a Master's level endorsement in Building Leadership from Emporia State University.

Vice President Middle School

Brittany Harrell—My name is Brittany Harrell and I am an eighth-grade math and AVID teacher at Liberty Memorial Central Middle School. I am a biracial woman raised in a biracial household in Lawrence, KS. I lead and identify as a lesbian woman. I became a teacher because growing up I never had a teacher that looked like me let alone understood varying cultures. Equity work is important to me because I believe many children have not been given the same access to resources and time/structure to achieve desired potential. I graduated from The University of Kansas in 2014 with a Bachelor's Degree in Mathematics and I was lucky enough to be a part of the UKanTeach Program. I have been working at LMCMS for the last 5 years. I love to collaborate with other math educators about what is best for our students and how we can incorporate different ideas. I am interested in serving in this position to bring another voice to the already amazing community of math educators. I look forward to helping in any way I can.

Vice President College

Carrie LaVoy—Carrie La Voy, Ph.D. is a multi-term lecturer in the department of Curriculum and Teaching at the University of Kansas. Dr. La Voy joined the School of Education full-time in the fall of 2010. Previously she worked as an adjunct faculty member at the University of Kansas, Johnson County Community College, Ottawa University, and Haskell Indian Nations University. These positions gave her the opportunity to teach both mathematics courses and education courses. Her professional background also includes teaching 8th grade mathematics, elementary gifted education, and pre-school education. At the University of Kansas, Dr. La Voy teaches mathematics methods courses for pre-service teachers at the elementary and secondary level. She also teaches graduate course in the department of Curriculum and Teaching. She is a member of KATM, NCTM, and AMTE. She currently serves as the faculty advisor for the student chapter of KU-KNEA and is the VP of College for KATM. Dr. La Voy's research interests include methods of differentiating assessment and instruction, and training pre-service and graduate teachers in mathematics education. She has received grants to support service learning and teacher mentoring programs at some of the high schools where her students complete field work. She has given many presentations related to mathematics education, including speaking at AMTE, NCTM, and KATM conferences.

Dear Kansas Math Teachers,

It's almost here....May! The craziest, most stressful, best month of the year! As we complete state assessments and begin to wind down another year, it's a great time to reflect on our successes and areas for growth. I know I've already decided that a focus on math talks combined with visual models is my focus for next year. What's yours? We would love to feature lesson plans and ideas from our members if you have an awesome idea you'd like to share! You can email me at jennywilcox@katm.org with any suggestions.

Sincerely,

Jenny Wilcox KATM Bulletin Editor

The KATM Bulletin needs submissions from K-12 teachers highlighting the mathematical practices listed above. Submissions could be any of the following:

◊ Lesson plans
◊ Classroom management tips
◊ Books reviews
◊ Classroom games
◊ Reviews of recently adopted resources
◊ Good problems for classroom use
◊

Email your submissions to our Bulletin editor:

jennywilcox@katm.org

Did you know that the KATM website has great NCTM resources available for members? Just another perk of being a KATM member!

- Elementary teachers currently have access to 17 NCTM articles covering a variety of topics such as writing code, perseverance, unit fractions and oral language.

- Middle level math teachers currently have a resource section containing 14 articles on varied topics such as proportional reasoning, visual reasoning and the standards for mathematical practice.

- High school educators have 11 articles to peruse on topics ranging from functions and geometric patterns to technology based geometry lessons.

Have you checked out what's happening on our KATM Facebook page? It's a great place to ask questions and have discussions about math topics that are important to Kansas math educators.

Assessment Begins When You Know What You Value

Will M. Dunn, Vice President High School
Twitter: @willmdunn

It is state assessment season.

Whatever feelings the preceding sentence induces in you, it can provide the perfect foil to reflect against one's own assessment practices. We, like the state, are assessors of our students. We, like the state, must choose the methods that make the most sense for our function and needs. Both parties must now what they value so their assessment practices are meaningful enterprises.

The state's goal is to describe multiple years' worth of a student's summative knowledge at one time and on one day. As teachers, ours is not the same goal. Our primary function is to teach, and the student's to learn, and any academic practice we bring into our classroom needs to reflect either or both of these. As such, I submit that our assessment practices should not exactly match the practices of the state. Our roles are different, and our actions should account for that difference.

A few (not really pioneering) values I hold regarding in-class assessment:
- Grades are disruptive to learning
- Assessment is primarily a learner's job - not the teacher's
- Reflection is necessary for student self-assessment
- Assessments form baselines, not finish lines

I try to use the phrase "assessment as learning" to encapsulate these points. That is, I want assessment practices to be engines that drive learning forward as part of the learning process. They do not represent an end to learning, instead they facilitate in-process learning. They are devices that highlight what a student knows generally well, what a student is still developing, and how these two pieces of information can the compass for moving forward. This helps me teach and it helps students learn.

There are absurdly many paradigms one can build to give comprehensive structure to those bullet points. I have structures in place that positively reinforce them in my room, but I couldn't have done it without knowing my values first. What do you value? Do your classroom practices and structures support your values? What changes can you make, or what changes would you recommend to others? I know I'd like to learn from you.

I could talk (and talk and talk and talk…) about each of the bulleted points above in much greater detail. In fact, I haven't made much of an argument yet at all (let alone a convincing one). If you wish to continue that conversation, please reach out to me at willdunn@katm.org or on Twitter at @willmdunn.

If you wish to learn more, please consider the following resources that have helped me immensely. Our state has many knowledgeable and willing individuals to offer. Some are among the lists be-

Books:
"Fair Isn't Always Equal", by Rick Wormeli
"Grading Smarter Not Harder" by Myron Dueck
"Hacking Assessment: 10 Ways to Go Gradeless in a Traditional Grades School", by Starr Sackstein

Twitter:
People-
@KentWire - Kent Wire, Asst. Superintendent, USD 413 Chanute, KS
@joykirr – Joy Kirr, Grade 7 ELA Educator, Elk Grove, IL
@MakeThemMastrIt – Jeffery Friedan, HS ELA Educator, Riverside, CA
@andburnett123 – Andrew Burnett, Grade 7 Math Educator, Newton, MA
@dolence_math – Sarah Dolence, Student Teacher, Overland Park, KS
@TG2Chat – Group of educators sharing and developing gradeless strategies across content areas.
@annarden – Ann Arden, HS Math Educator and Instructional Coach, Ottawa, Canada

Hashtags-
#sblchat
#shiftthis
#tg2chat
#KSmathEd

Websites:
https://teachersgoinggradeless.com/

https://burnettmath.wordpress.com/2018/03/08/how-to-create-a-gradeless-math-classroom-in-a-school-that-requires-grades/

https://www.alfiekohn.org/

Honeycomb in the Mathematics Classroom
Sarah Dolence, Student teacher at Tonganoxie High School

Chapter eleven of *Mathematics in Nature: Modeling Patterns in the Natural World* by John A. Adam discusses the mathematics of honeycombs, bubbles, and mud cracks. The mathematics included in the section span a wide range of mathematical fields, such as geometry, linear algebra, vector calculus, and elementary calculus. At the core of these mathematical discussions are topics that are introduced and studied in high school geometry, trigonometry, and algebra classes. Honeycomb is something students are familiar with in the natural world, yet they have probably never stopped to consider *why* honeycomb is made of hexagons. In this paper, I will discuss how high school geometry and trigonometry classes can use ideas presented in this chapter to make math relevant and interesting while covering the Common Core Math Standards.

Why is Honeycomb Made Up of Hexagons?

In elementary school, students begin to identify where different polygons arise in nature and connect honeycomb to regular hexagons. However, students may not have pondered this natural occurrence further, and geometry classes can utilize this curiosity to give meaning to geometric concepts.

Honeycomb is a natural example of regular hexagons tessellating two-dimensional space. Geometry teachers can utilize this example to discuss tessellations and congruence, using standard **CCSS.MATH.CONTENT.HSG.CO.A.3: Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.** Teachers can incorporate technology like shape blocks or Geogebra to explore which regular polygons tessellate a plane, allowing students to discover that this only occurs for equilateral triangles, squares, and regular hexagons. Integrating opportunities to use these forms of technology connects with the practice standard **CCSS.MATH.PRACTICE.MP5: Use appropriate tools strategically.** It would be interesting for a teacher to allow students the opportunity to use both and explore the advantages and limitations of both forms of technology. Students could use congruence proof skills to verify these tessellations, and that honeycomb is composed of approximately congruent hexagons.

This activity could lead to the question "why isn't honeycomb made up of triangles, squares, or circles?" which further leads to the discussion of trying to maximize the volume of honeycomb while minimizing surface area or resources. Students could discuss the ratio of volume to surface area, in which they would want to maximize the ratio. Given the equation for the volume-to-surface area ratio

$$R(n) = \frac{1}{2}\cos\left(\frac{\pi}{n}\right),$$

where *n* is the number of sides of the polygon, students can explore the ratio of different platonic solids. (note that in (1), 1 is represented as the radius *r* of a circle). Geometry students may not be familiar with trigonometry functions like cosine, but this could allow for an interesting first look at a trig function and the chance to learn to evaluate trig functions using technology like graphing

calculators. Figure 2 demonstrates the different values students would find. This table allows an opportunity for students to make observations and predictions for the value of R(n) as n increases, or as the regular polygon has more sides. Students could see that as n increases, the polygon would begin to resemble a circle, and R(n) approaches 0.5, which can easily be proven to be the volume-to-surface area ratio of a circle. This connects to the practice standard **CCSS.MATH.PRACTICE.MP7: Look for and make use of structure**, as students look closely to discern a pattern within the data.

n		R(n)
3	0.5	0.25
4	0.707	0.354
5	0.809	0.405
6	0.866	0.433
8	0.924	0.462
10	0.951	0.476
…		

Figure 2-Volume-to-Surface Area Ratio of Regular Polygons (233)

Students can verify that honeycomb is composed of tessellated regular hexagons because it is the most efficient use of materials by examining n=3, n=4, and n=6 of Figure 2. The hexagon, with n=6, yields the highest volume-to-surface area ratio of the three. This would allow teachers to hit the practice standards **CCSS.MATH.PRACTICE.MP2: Reason abstractly and quantitatively** and **CCSS.MATH.PRACTICE.MP4: Model with mathematics.** Using this example allows students to explore connections between tessellations of regular polygons, functions, volume, and surface area.

Geometry students can go beyond a two-dimensional plane and use honeycomb to visualize relationships between two-dimensional cross sections and three-dimensional objects. The cell of the honeycomb is approximately a regular hexagonal prism with one open end and one trihedral apex. Visual models of the prism could be made using technology like a 3D Printer. This lesson could be connected to the standard **CCSS.MATH.CONTENT.HSG.GMD.B.4: Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.**

Modifications of the Honeycomb Lesson for Higher Level Classes

The beauty of using an example like honeycomb in a mathematics lesson is that it has applications to many different math classes. Equation (1) can be extended to a trigonometry classroom by allowing students to derive the ratio equation by considering a regular n-gon inscribed in a circle with an appropriate radius. While geometry students established that tessellations occur when there is no overlap of the vertices of adjacent regular polygons, trig students can further verify that equilateral triangles, squares, and regular hexagons are the only polynomials that tesselate a plane. From the fact that an integer multiple N of the interior vertex angle of phi for each polygon must equal 2pi radians, trig students can work to derive an equation where N is a function of n,

$$N = 2 + \frac{4}{n-2}.$$

From (2), $\frac{4}{n-2}$ must be a positive integer exceeding 2. Using a visual platform, like a graphing calculator or Desmos.com, students can see that this only holds true for n=3, n=4, and n=6.
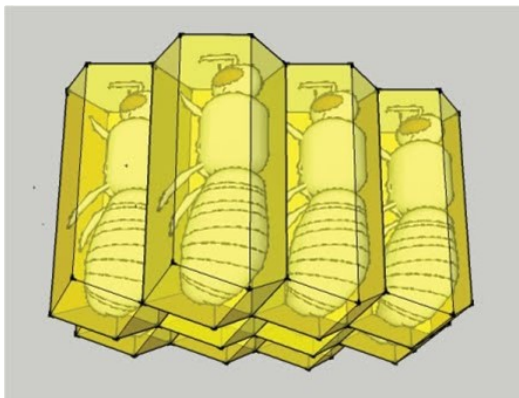
Geometry students found that the circle would be the most efficient shape to maximize the volume-to-surface area ratio, but of the polygons that tesselate the plane, the hexagon is the most efficient. Trig students can take the notion of ratios further than geometry students be finding the "efficiency" of the hexagonal honeycomb structure relative to circles. Adam states, "an arrangement of the perimeters for five hexagons may be used to obtain an area equivalent to 7 (235). Students could derive the area and perimeter of an escribed hexagon shown in Figure 4 and produce the hexagon-to-circle ratios of the area and perimeter. This could lead to a discussion about comprehending the meaning of what a ratio was (Spoiler Alert: the 7-hexagon structure has about 21% less perimeter than the 7 inscribed circles, and the 7-hexagon structure has approximately 10% more area that then 7 inscribed circular areas. That's quite a bit more area for a lot less perimeter! (236)).

Calculus students can also utilize the three-dimensional approximation of a honeycomb cell shown in Figure 3 to find the apex angle theta that minimizes the total surface area of the cell. Starting from the equation for

$$S = 6sh + \frac{3s^2}{2}\left(\sqrt{3}\csc\theta - \cot\theta\right),$$

the surface area S of the cell,

where s, the length of the sides of the hexagon, and h, the height, are constants. Students can use the first derivative test to find the minimum angle and confirm this angle as a minimum using the second derivative test.

Mathematics for All

I believe that math classrooms should allow students of all ability levels to succeed and push themselves in their reasoning. As schools continue to de-track math, it is important that teachers provide students with low-floor, high-ceiling tasks to engage all students. Using a concrete example like honeycomb can engage all students by calling them to think deeply about why natural phenomena occurs. These tasks can engage students at lower levels by allowing them to visualize something familiar and provide opportunities for higher-level students to push their knowledge and understanding deeper. For example, students can use the geometry of a single cell of Figure 3 to derive Equation (3), eliciting conversations about complex mathematical derivations. There are endless possibilities for a lesson when mathematics in our backyards are considered. Teachers should look for ways to incorporate these examples into their classroom as they connect back to the Common Core Math Standards and Practice Standards. I encourage and challenge all teachers to partner with students to find interesting mathematical examples in their everyday lives and incorporate these curiosities into math lessons.
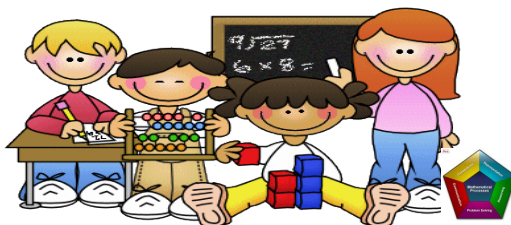
Works Cited

Adam, J. A. (2006). *Mathematics in Nature: Modeling Patterns in the Natural World.* Princeton, New Jersey: Princeton University Press

Photos used: Figure 1 - https://www.mnn.com/earth-matters/animals/stories/5-things-that-probably-arent-killing-honeybees-and-1-thing-that

Figure 3 - http://rigelkent.blogspot.com/2010/04/mathematics-of-honeycomb-part-iii.html

KATM Cecile Beougher Scholarship
ONLY FOR ELEMENTARY TEACHERS!!

A scholarship in memory of Cecile Beougher will to be awarded to a practicing Kansas elementary (K-6) teacher for professional development in mathematics, mathematics education, and/or mathematics materials needed in the classroom. This could include attendance at a local, regional, national, state, or online conference/workshop; enrollment fees for course work, and/or math related classroom materials/supplies.

The value of the scholarship upon selection is up to $1000:

- To defray the costs of registration fees, substitute costs, tuition, books etc.,

- For reimbursement of purchase of mathematics materials/supplies for the classroom

An itemized request for funds is required. (for clarity)

REQUIREMENTS:

The successful candidate will meet the following criteria:

- Have a continuing contract for the next school year as a practicing Kansas elementary (K-6) teacher.

- Current member of KATM (if you are not a member, you may join by going to www.katm.org. The cost of a one-year membership is $15)

APPLICATION:

To be considered for this scholarship, the applicant needs to submit the following no later than June 1 of the current year:

1.   A letter from the applicant addressing the following: a reflection on how the conference, workshop, or course will help your teaching, being specific about the when and what of the session, and how you plan to promote mathematics in the future.

2.   Two letters of recommendation/support (one from an administrator and one from a colleague).

3.   A budget outline of how the scholarship money will be spent.

Notification of status of the scholarship will be made by July 15 of the current year. Please plan to attend the KATM annual conference to receive your scholarship. Also, please plan to participate in the conference.

SUBMIT MATERIALS TO:

Betsy Wiens
2201 SE 53rd Street
Topeka, Kansas 66609   *Go to www.katm.org for more guidance on this scholarship*

Capitol Federal Mathematics Teaching Enhancement Scholarship

Capitol Federal Savings and the Kansas Association of Teachers of Mathematics (KATM) have established a scholarship to be awarded to a practicing Kansas (K-12) teacher for the best mathematics teaching enhancement proposal. The scholarship is $1000 to be awarded at the annual KATM conference. The scholarship is competitive with the winning proposal determined by the Executive Council of KATM.

PROPOSAL GUIDELINES:

The winning proposal will be the best plan submitted involving the enhancement of mathematics teaching. Proposals may include, but are not limited to, continuing mathematics education, conference or workshop attendance, or any other improvement of mathematics teaching opportunity. The 1-2 page typed proposal should include

- A complete description of the mathematics teaching opportunity you plan to embark upon.
- An outline of how the funds will be used.

An explanation of how this opportunity will enhance your teaching of mathematics.

REQUIREMENTS:

The successful applicant will meet the following criteria:

- Have a continuing contract for the next school year in a Kansas school.
- Teach mathematics during the current year.

Be present to accept the award at the annual KATM Conference.

APPLICATION:

To be considered for this scholarship, the applicant needs to submit the following no later than **June 1 of the current year.**

- A 1-2 page proposal as described above.

Two letters of recommendation, one from an administrator and one from a teaching colleague.

PLEASE SUBMIT MATERIALS TO:

Betsy Wiens, Phone: (785) 862-9433, 2201 SE 53rd Street, Topeka, Kansas, 66609

The Kansas Learning First Alliance held its 2019 Spring meeting on April 11 at the KNEA headquarters in Topeka.

KLFA Chair, Laurie Curtis, called the meeting to order. Seventeen organizations were represented. Members introduced themselves and gave a brief description of their organizations.

KSDE Assistant Director of K12 Accreditation, Jeanette Nobo, presented, "KESA: Present and Future." KESA (Kansas Education Systems Accreditation) seeks to focus accreditation efforts on a school *system (district) rather than individual buildings. The district doesn't exist without its schools and teachers, therefore, involving the whole system is critical to the success of the process. Jeanette noted there has been a learning curve for many regarding the complexity of the KESA process. "It's a process that should be seamless with what else is going on in a district," Nobo said. She updated attendees on the extensive training that continues to be provided across the state and asked organization representatives for their feedback on the process. The department accredited 7 systems in 2018; five private systems and two public. Eight public systems are in the final process this year along with 14 private ones. KESA focuses on a Continuous Improvement Cycle for System Redesign that involves data collection, determination of goals, implementation and analysis of results followed by a new cycle of data collection/ examination. Nobo also discussed the KSDE school redesign process (Mercury, Gemini, Apollo) which is separate from, but not excluded from, KESA. Jeanette's presentation is available on the* KLFA website.

Leah Fliter (Kansas Association of School Boards) and Mark Desetti (Kansas National Education Association) summarized the passage of SB 16, the Gannon school finance fix legislation. Governor Laura Kelly signed the bill into law. Oral arguments before the Kansas Supreme Court are May 9 and a decision is anticipated within several weeks. If the Court approves the roughly $360 million of inflationary adjustments in SB 16, the Gannon case could be resolved, although most observers expect the Court to retain jurisdiction until the final proposed payout in Fiscal Year 2023.

Kansas Children's Service League (KCSL) President/CEO, Dona Booe, highlighted her organization's work to support healthy families. KCSL has its roots in the Kansas Children's Home Society (KCHS) and The Christian Service League (CSL). The two agencies merged in 1926. During the 1940s and throughout the 1960s, KCSL's most visible work was infant adoption. By the 1970s, KCSL developed a broader range of services to meet the changing needs of children and families. Booe said that although society's instinct is to rescue individual children from negative family situations and child abuse, more impact can be made through strengthening families in order to prevent the circumstances that lead to child abuse and neglect. She likened KCSL's efforts to immunization against disease. "Child maltreatment is a public health issue, not a social class issue," Booe said. Protective factors include resilience to stress, social connections, child development knowledge, concrete supports in crisis and parent/child attachment. KCSL's newest focus is on family-friendly work policy that benefits not only employees but employers. Booe's presentation is available here.

Kansas Lieutenant Governor, Lynn Rogers, briefed the group on the bipartisan successes of the first part of the 2019 legislative session. He lauded the passage of the school finance law and the possibility of Medicaid expansion in Kansas. The lieutenant governor urged attendees to encourage public servants to run for office and stressed allegiance to Kansas rather than a political party.

Kathleen Mercer, Individual Plans of Study Coordinator for the Kansas Department of Education, reviewed the IPS process. She stressed that individual plans of study are not intended to "pigeonhole" students but rather to help them be intentional in planning for post-secondary success. Mercer's presentation is available here.

The meeting adjourned at 2:30 pm. Throughout the day member representatives were requested to suggest ideas for topics and presenters for the 2019-2020 KLFA year. Meetings for next year will be held at the KNEA building on August 29th, October 17th, January 23rd, and April 9th. All organizations are encouraged to have their representative present at each meeting.

Do you like what you find in this Bulletin? Would you like to receive more Bulletins, as well as other benefits?

Consider becoming a member of KATM.

For just $15 a year, you can become a member of KATM and have the Bulletin e-mailed to you as soon as it becomes available. KATM publishes 4 Bulletins a year. In addition, as a KATM member, you can apply for two different $1000 scholarship.

Current members—-refer three new members and you get one free year of membership!

Join us today!!! Complete the form below and send it with your check payable to
KATM to:
Margie Hill
KATM-Membership
15735 Antioch Road
Overland Park, Kansas 66221

Name_____

Address_____

City_____

State_____

Zip_____

Home Phone_____

HOME or PERSONAL EMAIL:

_____

Are you a member of NCTM? Yes____ No____
Position: (Cirlce only one)
     Parent
     Teacher::   Level(s)_____
     Dept. Chair
     Supervisor
     Other

Referred by: _____
_____
KANSAS ASSOCIATION MEMBERSHIPS
Individual Membership: $15/yr. ____
 Three Years: $40 ____
Student Membership: $ 5/yr. ____
Retired Teacher Membership: $ 5/yr. ____
First Year Teacher Membership:$5/yr. ____
Spousal Membership: $ 5/yr. ____
(open to spouses of current members who hold a regular Individual Membership in KATM)