Riverbend Community Math Center

Newsletter

Fall 2009

From the Executive Director

Welcome to another issue of the Riverbend Community Math Center Newsletter! Since our formation in 2006, we have been working to identify the math-related needs of our community and to develop programs that meet those needs.

In this edition of our newsletter, we are including articles about several of our summer events including the launch of a new Math Trail in downtown South Bend, a Middle School Teacher Workshop at Ivy Tech, the Math Circle Teacher Training Institute at Notre Dame, and the Math and Technology Academy.

This fall promises to be an exciting time for the Riverbend Community Math Center. In addition to the Math and Technology Academy and Family Math, we have added a Community Research Project to our weekly programs. The Riverbend Community Math Center is partnering with the Apprentice Academy in South Bend to offer two math classes that will help displaced workers to improve their skills. We are also working with local business leaders to develop hands-on activities that show middle school students how math, science, and technology are used in our community. These activities will be presented at an Expo as part of the annual Next Steps in Science, Math, and Technology Education Conference in April of 2010. We are looking for more businesses and organizations to participate in this project.

The Riverbend Community Math Center is working closely with teachers and administrators from South Bend Community School Corporation, the School City of Mishawaka, and from Penn-Harris-Madison School Corporation. In South Bend, we are working with administrators, curriculum leaders, and teachers to launch two new initiatives at Title 1 primary centers. These schools are introducing the *Everyday Counts Calendar Math* program as a way of working steadily throughout the school year on the core math concepts at each grade level. They are also adopting a new approach to problem solving that promotes student autonomy and builds communication skills relating to mathematics. In addition to these initiatives at the primary level, we will work with educators at Ivy Tech and teachers and administrators at the middle school level to identify strategies for improving math instruction in 5th through 8th grades.

The School City of Mishawaka is creating a new program to meet the needs of high ability math students and their teachers at each elementary school. During this year, we will spend time at each school, identify strategies for improving math instruction, and present a series of professional development sessions for teachers.

In Penn-Harris-Madison School Corporation, we are working with educational psychologist Dr. Julie Turner and her research group at Notre Dame to introduce teachers and administrators from Grissom Middle School to principles of motivation theory. These pedagogical principles have profound implications for effective instruction in all subject areas, and are likely to have a particularly transformative effect in mathematics classrooms.

We hope that you will be able to join us for another great semester!

Amanda Katharine Serenevy, Ph.D.

Math Trail

This summer, our math education specialist, Kat Caine, created a Math Trail for downtown South Bend. Math Trail questions ask participants to consider everything from the upright height of the gorilla statue by the Chocolate Cafe to the number of yards gained on the field in front of the Football Hall of Fame.

Samuel on the Math Trail

Kat leads a discussion of Math Trail solutions

In June, our Family Math participants tackled these and other questions as well as making up a few of their own. If you would like to try these questions with your family, the Math Trail brochure is available on our web page at http://riverbendmath.org/modules/Math_ Trail

Laura and Diego standing with the gorilla statue

This fall, we will be creating a Math and Science Trail featuring sculptures created by George Rickey which have been installed in the downtown area this year. The brochure for the Rickey Trail will be available on our web page in late October.

Middle School Math Workshop

Peggy Jones and Gwinn Royal

What do quilts, piles of marbles, and trail mix have in common? Well, math, of course! To be more specific, they are all creative tools for teaching math. That is what several members of our Riverbend Math Community learned in early June when they attended a Middle School Math Workshop presented by South Bend Community Schools, Ivy Tech, and our own Amanda Serenevy.

Along with about 20 local teachers, the Riverbend tutors-turned-students sat under the tutelage of several outstanding educators from our community. They were taught hands-on activities to promote mathematical intuition through experiential learning with the intent of guiding students naturally from pre-algebraic reasoning to algebraic concepts. We've long known that coins and money are useful math tools, but who knew that jumping origami frogs could be so helpful in teaching concepts like slope? Even Gulliver would have been impressed with the ratios our tutors derived from their very own giants and pixies. Some of the "real-world" activities related to the culinary arts. (How do you calculate the cost of trail mix or improvise when you're missing the measuring cup that you need?) The hula hoop project related to physical education. (The weight and size of the hoop really affect your workout!) Temperature sensors and motion detectors allowed us to explore physics concepts intuitively. (Is it humanly possible to accelerate at a constant rate?) We also explored on-line manipulatives and used software to produce charts and graphs. And, of course, we played games - to remind us that math education is serious fun!

Naturally, the discovery of so many new ideas and innovative teaching tools has sparked great excitement among our Riverbend tutors. We are anxious to share what we have learned. So ... don't be surprised if some of the upcoming fall Family Math activities sound vaguely familiar. Don't miss it! Be there or be square (or at least trapezoidal)!

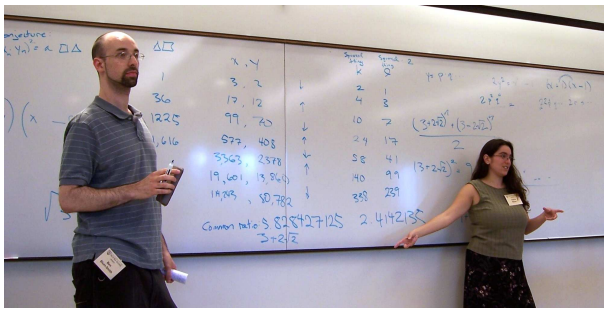
Math Circle Institute

Jesse Johnson and Gwinn Royal

What happens when you put 30 mathematicians in a room for five days? Once started with a math problem, off we went, unstoppable, staying up way past our bedtimes, and eating our way through miles of cafeteria food.

Bob and Tammy use a convenient napkin to examine details of a mathematical argument

The annual Math Circle Teacher Training Institute is organized by Bob and Ellen Kaplan of the Boston Math Circle, along with Amanda Serenevy of the Riverbend Community Math Center. Bob and Ellen are a dynamic and passionate pair, brilliant in their mathematical knowledge and insightful in their approach to education. They believe that anyone can learn and love math. The Kaplans' philosophy involves "encouraging the students to better shape the questions we pose, ... let[ing] their intuition loose in the search for insights, and ... [working] collegially rather than competitively." The Kaplans teach and cultivate independence, authentic discovery, inquiry, and confidence in our abilities to figure out whatever we wonder about. They encourage invention and our own adaptation of the advanced math that genuinely interests us for our classes.



Ben and Alexa talk us through the twists and turns of their late-night conversation about triangular and square numbers

This year's participants were 27 teachers, engineers, tutors, programmers, principals, parents, philosophers, and 3 incredible high school students. Each day, we gathered to participate in, plan, and teach math circles. We articulated the big problems we see in education and collectively brainstormed some really powerful solutions. We observed each other teach, helped each other plan, solved problems together and debriefed about what we were learning. Late night gaming and philosophical discussions were inspired by the tremendous synergy that resulted from the daily math discussions and planning sessions. Over the course of one week, we tackled great problems (posing more than we could answer), taught 25 workshops to 50 kids on topics we prepared the day before, and talked about how to transform math education in our communities.

Since the workshop, many new math circles are in the works, from Portland, Oregon to Fairfax, Virginia. These new circles are targeting students of all ages and all ranges of mathematical ability and enthusiasm. Some are training new math circle facilitators, and reaching out to women, undergraduates, professional programmers, children and adults.

Jesse tackles a Rubik's Cube during a break

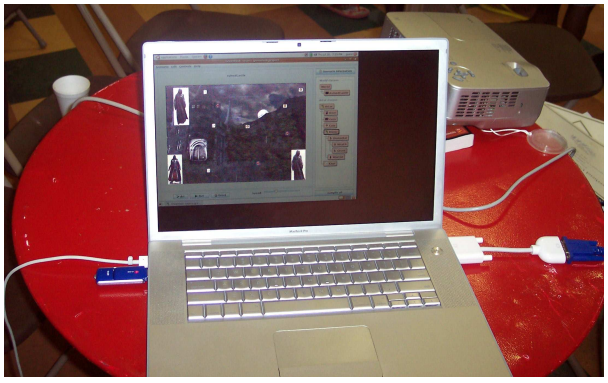
We are incorporating the math circle approach into our classrooms. We are attending, teaching and presenting at conferences. We are writing blogs, taking more math classes, studying new math on our own, forming study groups, editing and writing about math education. We're learning more about origami math. We are building and growing our online community.

And we can't wait for next year's math camp.

Math and Technology Academy

Our Summer Math and Technology Academy is slightly different from our usual Academy program in that it includes a three week intensive period where students meet four times per week. Students in this summer's Academy pursued many exciting projects and presented their results at our end of summer Math and Technology Fair.

Sean learned how to program simple video games using Java. He designed a game that requires the player to collect gems, coins, and keys without being caught by the Dementors.



Sean's Java game

Justin and Josh A. worked with Charles on programming robots, solving Rubik's Cubes, and building electric circuits.

Josh, Charles, and Justin take a break from programming robots to solve Rubik's Cubes

Josh W. spent most of his time working on puzzles and games with Diane.

Becca worked diligently on progressing through her algebra book, but she also enjoyed playing math games with Diane and worked with Mike on some challenge problems.

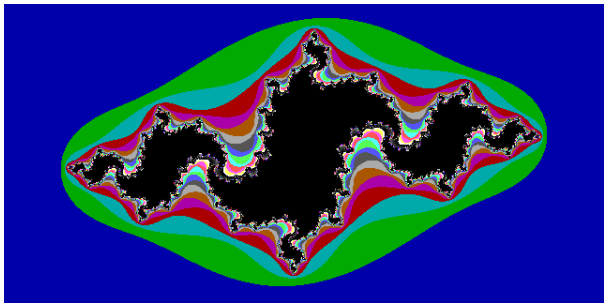
Thomas explored programs in the Sugar computer environment, including the cartoon builder program. He also enjoyed learning to solve a Rubik's Cube, working on Mike's Challenges, and programming robots.

Mike posing math challenges to several Academy participants

Danae explored fractals on the computer. She also learned basic programming in Turtle Logo and wrote several programs to create different shapes.

Dominique worked on solving Rubik's Cubes, learned to program using Turtle Logo, and designed fractals using Fractint.

Fiona focused on fractals for her summer project. She learned how to use the computer program Fractint to create them, and explored some of the mathematics behind the intricate designs.



A fractal

Sierra worked with games such as Uno, the Chocolate Factory logic game, and addition facts puzzles.

Rebekah studied geometry this summer. "I personally like geometry because I use it everyday!". She also made a poster which helped her learn her multiplication and addition facts.

Rebekah presents her geometry poster

Ashley learned how to measure angles, and how to figure out the number of degrees in regular polygons. She used what she learned to fold modular origami polyhedra and intricate polygonal boxes.

Mayola learned how to play Yahtzee and how to keep score.

Alexis, Mayola's older brother, worked on math challenges, programmed robots, and built electric circuits to control lights or a fan.

Diego also worked with robots over the summer. He used the touch sensor, the sound sensor, and the ultrasonic sensor in his designs. Diego learned about how to add binary numbers and how to translate base ten numbers into binary. He designed and built a binary adding machine using a breadboard, integrated logic circuits, wires, and other components to build a binary adding machine.

Zoe worked on solving a Rubik's Cube, explored fractals using the computer program Fractint, and programmed a robot.

Zoe shows the Tribot that she learned to program

Chad learned to play Uno and Yahtzee, programmed robots, played math games on the computer, and constructed a pyramid with blocks.

Gabrielle learned how to use pictorial models to show fraction equivalence and operations with fractions.

Brooklyn worked on games and numbers up to 100.

Laura used blocks to make a pyramid, worked on learning to tell time, and used inch-worms to learn about measurement.

Andrea studied pre-algebra topics including proportions, fractions, and converting percents into decimals.

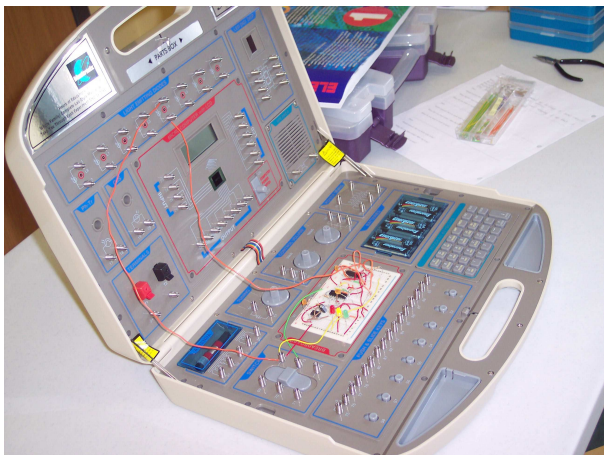
Leora designed some very innovative robots during the Summer Math and Technology Academy. She also learned the game *Catz, Ratz, and Batz* which allowed her to practice her multiplication facts.

Diane teaching *Catz, Ratz, and Batz* to Becca and Leora

Carsten spent most of his time creating intricate robots and other geared machines. He accomplished his goal of figuring out how to use the tank treads in several creative ways.

Brent Williams, Jr. focused on learning computer programming relating to the Lego Mindstorm Robots. He completed all of our Turtle Logo programming challenges. He went on to learn how to program Lego Mindstorms using the NXC language.

Deepu worked with Ray "Techno-man" to design an elaborate circuit that controls a stop light. He began by controlling LED lights and then hooked up his breadboard to a more realistic stop light. Deepu's circuit used 555 timers, capacitors, integrated logic circuits, and other electronics components. Deepu also timed many stop lights around town and adapted his circuit to emulate the timing as closely as possible.



Deepu's circuit for controlling a stop light

All of the students worked very hard and had lots of fun this summer. Congratulations to everyone!

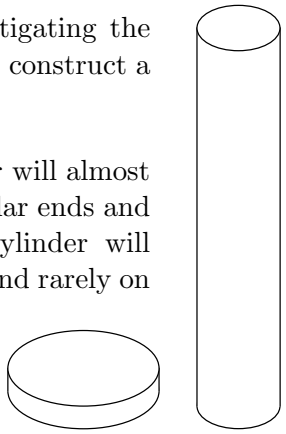
Community Research Project

3-Sided Dice

This semester the Math Center is kicking off a new program: a Community Research Project. Meet us downtown on Sundays from 4 to 5pm (starting September 13th) to work on the project. People of all ages are welcome to participate in our research. At the end of the semester, we will submit our results for publication in a journal.

This semester we will be investigating the following question: How can we construct a fair three-sided cylindrical die?

For example, a "short" cylinder will almost always land on one of the circular ends and rarely on the side. A tall cylinder will almost always land on its side and rarely on an end. How should we construct the die so that if we label the ends with "1" and "2" and the side with "3" each number will have an equal chance of coming up?

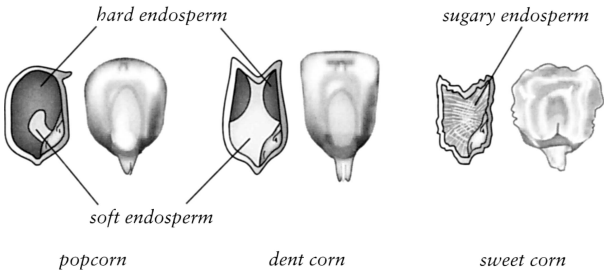


short tall

Puzzler

Popcorn Explosion!

Kernels of popcorn pop when the water and oil contained in the kernel is superheated past the boiling point. The heat and steam softens the hard proteins and starches inside the kernel. Because the hull of popcorn is moisture-proof, the pressure of the steam builds until the internal pressure is approximately 7 times the external pressure of the atmosphere. At that point, the hull explodes! When the hull ruptures, the steam expands the proteins of the endosperm into an airy foam which cools into the puffed flake.



Its abundant hard endosperm helps popcorn contain the steam pressure that eventually explodes it. (Source: Harold McGee, *On Food and Cooking*)

How much un-popped popcorn would you need to buy to fill up your whole living room with popped popcorn?

Useful Information (maybe)

- Volume of a sphere: $V = \frac{4}{3}\pi r^3$
- Volume of a rectangular solid: $V = L \cdot W \cdot H$
- Volume of a cylinder: $V = \pi r^2 h$
- 1 cup = 8 fluid ounces
- 1 gallon = 16 cups
- 1 liter = 4.22675284219673 cups
- Atmospheric pressure at mean sea level at the latitude of Paris, France: 14.696 psi
- Optimal temperature for popping popcorn: 190°C
- Moisture level for optimal popping: 14 to 15% moisture by weight
- The cultivated strain of corn typically used for popcorn is called *Zea mays averta*.

Upcoming Events

All of the events listed below are free and open to the public. Some events require pre-registration. Find registration forms and more details on our web page (http://riverbendmath.org/) or by contacting Amanda (amanda@riverbendmath.org; 574-339-9111).

Math and Technology Academy

217 S. Michigan Street
Tuesdays/Thursdays from 6 – 8 pm
Sundays from 2 – 4 pm

Sep: 8, 10, 13, 15, 17, 20, 22, 24, 27, 29
Oct: 1, 4, 6, 8, 13, 15, 18, 20, 22, 25, 27, 29
Nov: 1, 3, 5, 8, 10, 12, 15, 17, 19, 22
Dec: 1, 3, 6, 8, 10, 13, 15, 17

Family Math and Community Research

217 S. Michigan Street
Family Math: 1 – 2 pm
Community Research: 4 – 5 pm

Sep: 13, 20, 27 Oct: 4, 18, 25
Nov: 1, 8, 15, 22 Dec: 6, 13

Contributions

The Riverbend Community Math Center is a publicly supported not-for-profit organization. We appreciate any donations of cash, goods or services you are able to provide. If you have questions or would like to donate services or materials, feel free to contact Amanda Serenevy at (574) 339−9111.

Thank you for fostering enthusiasm for mathematics in our community!

Please make your check payable to:

Riverbend Community Math Center
1021 Queensboro
Mishawaka, IN 46544

Contributions to the Riverbend Community Math Center, a tax-exempt organization under Section 501(c)(3) of the Internal Revenue Code, are deductible for computing income and estate taxes. A receipt will be provided for all contributions for tax purposes.

Riverbend Community Math Center

Contact Information

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