Spring 2017 Math Circle

A Note to Families

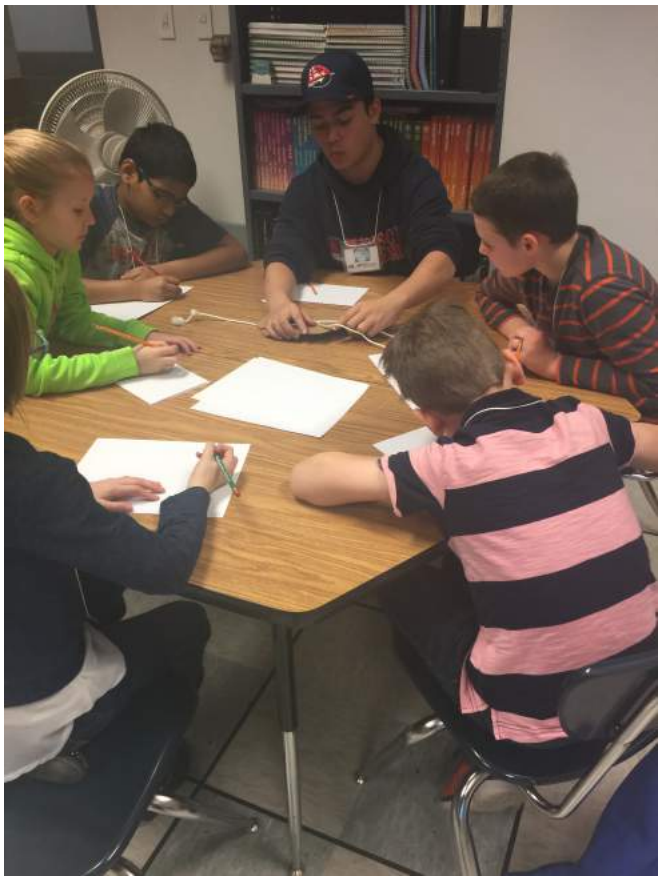
Thank you for participating in the Spring 2017 Shippensburg Area Math Circle. This session marks the end of our third year of Math Circle and we were thrilled to have 14 students registered and regularly attending Saturday morning math sessions. We really liked seeing students collaborating and working together alongside our Shippensburg University student leaders (Josue, Brad, and Drew). We really hope this was a positive experience for your child.

We will continue to build the Shippensburg Area Math Circle. We hope we can count on you to help spread the word on our future sessions. For more information about the Shippensburg Area Math Circle visit us at `http://webspace.ship.edu/lebryant/mathcircle`. In addition to family contributions, we thank our sponsors: Grace B Luhrs University Elementary School PTO, Shippensburg Intermediate School PTO, and the National Association of Math Circles.

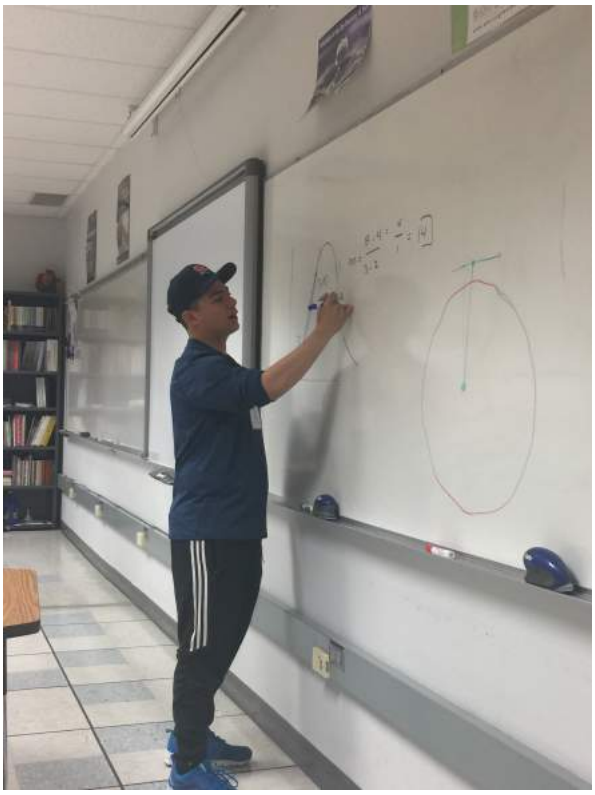
Below we include some notes about the activities we did, along with some links to learn more.

Activities

Rational Tangles: Fractions & Jump Ropes We started with two jump ropes and only two moves: twist and rotate. By using only those two moves, the tangles we made in the ropes could be undone. This was because we made a twist and rotate change the fraction number of the rope and we could work with those fractions to get back to zero. Students used number pattern recognition to consider questions like: are all fraction numbers possible? can we always get a tangle back to 0? what kinds of numbers do we get from doing patterns? If you are interested in learning more about these tangles read: `http://www.geometer.org/mathcircles/tangle.pdf`.

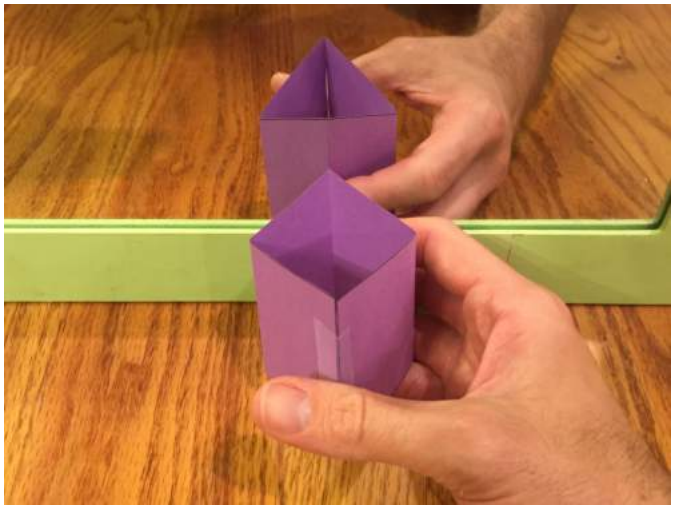


Calculus on Skis We all enjoy having fun in the snow. Math Circle student leader Josue Murrillo used a simple example of a skier going up and down mountains to introduce some key ideas in calculus. The students worked on examples leading toward a definition of *slope of a tangent line.* We were all so impressed with how well the students did at this session that Josue presented about our Math Circle (and this lesson in particular) at the Mathematical Association of America regional meeting at Kutztown University on April 1, 2017. The other mathematicians and students who were at the meeting enjoyed seeing Josue's fun take on this topic.



We also observed Pi Day this spring (even though we did not meet on March 14, the actual Pi Day). We used grids to make "Pi City" landscapes, visualizing the decimal expansion of pi. Of course, nobody's drawing was complete because pi (also known as π) is a number whose decimal expansion is never ending!

Impossible Cylinders Inspired by the amazing designs of engineering professor Kokichi Sugihara, we made some impossible cylinders. These cylinders seemed to change shape before our very eyes! These shapes were not actually impossible, instead, each relied on using forced perspective to see things differently. That's a good life lesson- two people may be looking at the exact same thing but have completely different perceptions! Sugihara's video *Ambiguous Optical Illusion* received second prize in the Neural Correlate Society's 2016 best illusion of the year contest. We recommend viewing the Sugihara's illusions at `https://www.youtube.com/watch?v=oWfFco7K9v8` (If the link does not work, simply search on youtube.com for "Ambiguous Cylinder Illusion")



K'NEX Connections Shippensburg University Teacher Education department chair and professor, Dr. Christine Royce, generously donated her time for a fun day of building! We got to build K'NEX kits including: towers, DNA models, moving fans, and various shapes. By working at each station, everyone was able to try the different building kits and even work together to finish the more complex ones. We loved seeing the teamwork at play here. Dr. Royce has worked with the company K'NEX to create education kits and lesson plans that maximize student engagement and align to national education standards. We greatly appreciate having the support of K'NEX for this session- they even gave free sample kits to the participants!

Some Recommendations

Math Kangaroo & Hour of Code Is your child interested in mathematical competitions or coding? Then we highly recommend checking out the international math competition "Math Kangaroo" for students in grades K-12. The website has lots of information, including registration instructions and testing sites. `http://mathkangaroo.org/mk/default.html` We also think your child might enjoy an Hour of Code, a computer science activity where students try one hour of computer coding, using one of the online tutorials at the following website `https://code.org/student` In our experience, after one hour your child will be excited to keep on going!

Interesting websites with great math content:
Math Pickle `http://mathpickle.com/`
Math for Love `http://mathforlove.com/`

There are *many* games and books out there that promote mathematical and logical thinking. In our last Math Circle meeting of the Spring 2017 semester, we had a FAMILY GAME DAY and families got to try out all sorts of games and building kits.