

Points & Angles

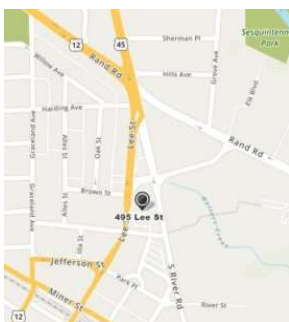
Newsletter of the Metropolitan Mathematics Club of Chicago
Volume XLIX No. 4 Dec. 2019/Jan. 2020

The Future of Math Enrichment

January Speaker Douglas O’Roark



At the Des Plaines Elks Club:



Friday, January 24, 2020

Doors Open/Social Hour: 5:45 PM

Dinner & Talk: 7:00 PM

Des Plaines Elks Club

495 Lee Street, Des Plaines

\$33 for Members, \$38 for Nonmembers

Reserve by noon, Monday, January 20

Online at mmcchicago.org

or by phone at 847-486-4291

Math contests are unquestionably the most prevalent form of math enrichment. Why? We’ll explore other approaches to helping kids build a passion for mathematics outside of the school classroom. We’ll consider the pros and cons of different approaches, particularly in light of how we can inspire a broader range of children to love our subject. This will be a personal call to action and call for reflection directed specifically at teachers in metropolitan Chicago.

Douglas O’Roark is the Executive Director of the Math Circles of Chicago, which serves more than 1,000 students at its eight sites and three summer programs. At DePaul’s STEM Center, Doug leads a research project concerning teacher professional development and Formative Assessment Lessons in collaboration with Math for America. Previously, he led the Secondary Math component of the UChicago Urban Teacher Education Program and was the founding teacher at Walter Payton High School. He was given the Radio Shack National Teacher Award, the MAA’s Sliffe Award for Distinguished Math Teaching, and the ICTM Rine Secondary Math Teaching Award. Both the City of Chicago Math League and Payton have awards named in his honor.

December Dinner Meeting Talk – Bridget Tenner

by Steve Starr

For Dr. Bridget Tenner, our December MMC speaker, the evening must have seemed like something of a homecoming. In his introduction, Steve Viktora recalled how, as a student at New Trier, she had impressed her teachers and classmates with her abilities and love of mathematics. Just one example: She used the first TI-92 to appear at the school in order to create a cycloid animation!

As a former MMC Scholarship winner and now a Professor of Mathematics at DePaul University, Dr. Tenner returned to MMC to share her mathematical insights and delights with “Bijections: Sometimes It Counts Not to Count”.

She started the evening by talking about some of her favorite kinds of mathematics – conspicuously crossing out “arithmetic,” then going on to name puzzles and games, constructions, crafts such as origami and logic puzzles – all of which seemed to lead naturally to her chosen field, combinatorics, “a study of discrete situations”. Counting all possibilities in a given situation is sometimes easy but more often difficult and tedious. Combinatorics provides concepts to make dealing with these problems easier: “Sometimes it counts not to count”!

Dr. Tenner’s talk centered on the uses of one concept often used in combinatorics: bijections. A bijection gives a one-to-one correspondence between one set of objects and another set, and it can sometimes clarify some feature of one of the sets. A key feature of a bijection is that both sets in correspondence must have an equal number of elements.

Dr. Tenner gave three demonstrations of the power of bijections. First, suppose anyone in a class (including you!) may be chosen at random to play a part in a play. What is the probability that you’ll be chosen? If we know how many parts there are and how many people are in the class, it’s pretty straightforward to determine the chance that you’ll be picked. But what if the number of parts could be anything from 0 to the entire class? At first, this might seem daunting (not to say tedious); think of all the possible groupings!

But bijections come to the rescue! For any scenario where you are cast in the play, there is a naturally corresponding scenario where you are not picked. There are several natural ways to match these scenarios up. One way would be to match up a set S containing you with the set obtained by removing you from S . Therefore, either you’re in the cast, or you’re not, and the probability is exactly $\frac{1}{2}$!

If that alone wasn’t proof enough of the power of bijective analysis, Dr. Tenner had more. Classic problems, such as tiling a checkerboard with 2×1 dominos, can also be tackled using bijections. Consider a checkerboard with two opposite corner squares removed, leaving 62 squares. Can it be tiled with 2×1 dominos? At first glance, yes, because there are still an even number of squares. But considering the bijection from a domino to two adjacent tiles, we see that each domino must cover a black and a white square. The two opposite corners of a checkerboard are the same color, so the 62 squares left are 30 of one color and 32 of the other, so it’s impossible to cover the board with domino tiles.

And a final problem: At a sold-out, assigned-seat event, a person arrives who’s forgotten their ticket. They just randomly take an empty seat. Everyone else that comes in later is very non-confrontational, and if they find their seat is occupied, they also just sit somewhere else. Of course, if their assigned seat is open, they take it. What is the probability the last person to arrive sits in their assigned seat? For that matter, what is the probability that the n th person will sit in their ticketed seat?

Those of us who attended Friday’s talk were shown how to use bijections to clarify the problem, and we know the answer! If you weren’t there, be sure to come to the next MMC dinner, and someone will certainly share some bijective thinking.

Dr. Tenner concluded with an observation which was so wonderfully demonstrated in her talk: In mathematics, creativity, coupled with scratch work, actually counts for a lot! In the brief Q&A period afterwards, the idea of bijections was mentioned as an example of the elegance of mathematics, where a concept such as this offers a succinct approach to otherwise thorny topics. Dr. Tenner supported that notion by observing that bijective proofs are held in such high esteem among mathematicians that many theorems proven by elaborate or cumbersome means are often appended with the comment: “A bijective proof is not yet known...”

Points from the Interior

by Matthew Moran

Greetings MMC Members,

Since I have been out of the classroom for a few years now, it has been a while since I've had a good "When are we ever going to use this?" conversation. While spending some time with my eleven-year-old nephew this past weekend, I had one of these rare, in the wild, teachable moments. My nephew knows me well enough as a skeptical, cynical, quantitative person that he expected a sympathetic ear when he shared the atrocities that were being committed upon him in his English class.

He complained, "We have to diagram sentences. When am I ever going to need that?!?" Assuming I might come back with what a waste of time it is diagramming sentences and how that is taking valuable time away from class time that should be used to learn about long division, he was surprised by my response. I told him that Natural Language Processing (NLP) engineers use those skills frequently and that they are very useful in today's quest to automate everything and let AI wash over the world.

This is a big part of NLP. We can use off-the-shelf models, or train our own, that can take text input and spit out part of speech tags and dependency graphs that represent the relationships between the entities in the sentence. If you want to train your own model, you need to feed the network lots of data about your text, which will require someone to accurately diagram the sentences! If an engineer doesn't train their own model, they are left with a task that still requires them to lean on their 6th-grade English skills in order to make use of all the output from the model.

I wonder if the sentence-diagramming, curmudgeon English teachers have embraced this new opportunity to keep kids laboring over their grammar textbooks? Is anyone selling their grammar lessons as NLP engineering curriculum? I hope so.

As we finish up 2019 and wrap the awkward to say "twenty-tens" decade, I wish you a restful, relaxing year-end. Hopefully you don't have too many papers to grade over winter break. Don't forget to mark your calendar for Friday, January 24, 2020, as MMC will be hosting our very own Douglas O'Roark for a talk on The Future of Math Enrichment. Doug has been thinking about and working on math enrichment for years, so this is a talk you won't want to miss. While you have that calendar out, make sure to clear April 1 - 4, 2020, for the NCTM Centennial Meeting at McCormick Place.

November Board Notes

by Beth Ann Ball

The MMC Board of Directors met on Tuesday, November 12, at 6:30 p.m. at Oak Park-River Forest High School in Oak Park, IL.

The new business involved NCTM 2020. We will be advertising NCTM 2020 through social media and in the folders for the MMC Conference. MMC has a few free registrations available for the NCTM conference that we will be raffling at dinner meetings and the conference, if someone attends and adds one year of membership.

The conference of workshops is scheduled for Saturday, February 1, at Stevenson High School in Lincolnshire, IL. Fewer booklets will be mailed; however, the full booklet and registration are available on the MMC website.

A group of MMC active members are working to spread the news of MMC to mathematics teachers in the Chicago metropolitan area.

The next scheduled MMC Board meeting will be on Tuesday, February 8, at 6:30 p.m. at Maine South High School in Park Ridge, IL. MMC members are welcome to attend any board meeting. If anyone is interested in attending the next board meeting, please contact Matt Moran at matthew.j.moran@gmail.com.

MMC Awards Lifetime Membership

by Carrie Fraher

Congratulations to MMC's newest Lifetime Member, Paul Christmas!

Paul attended his first MMC dinner meeting 52 years ago at a restaurant on the west side of Chicago. His District 214 colleagues encouraged him to attend MMC and contributed to his passion for life-long learning in the field of mathematics education. In his first year of teaching, Paul was chosen to attend ICTM and the National NCTM Conference. After that strong start, Paul realized that professional conferences kept him interested in education. He built relationships with colleagues from other schools, which enabled him to share experiences and seek professional growth.

Paul began his work with MMC by helping Sally Dodge with the Conference of Workshops. He moved into a leadership position after that and has been an integral part of the organization for more than 50 years. Finding speakers for MMC dinner meetings has been one of his favorite roles. Paul has given suggestions and served on many speaker committees. He has convinced many speakers to travel to Chicago and share their message with our group.

Since Paul has been with MMC for so long, I was curious about his hopes for the future of the club. Paul instantly shared the importance of the Saturday Conference of Workshops. It is bringing quality professional development to teachers from all over this region at a price that is extremely reasonable. Paul also shared his vision to keep bringing young teachers into the organization and to keep them involved. You can see him in action hosting student teachers at MMC dinner meetings and inviting local teachers to join us when he meets them at other events. When he was president, Paul held special conferences for first-year teachers, so they could share their challenges and meet new colleagues to exchange solutions. This offered a judgement-free zone for open communication and follow-up sessions were held as well.

Paul has a rich educational history including the University of Illinois, Olivet Nazarene University, Western Michigan University, and the University of Maryland, where he took classes during a sabbatical. At Maryland, he studied under Jim Fey and experienced a paradigm shift about the best ways to use technology in the classroom. Paul also credited Michael Serra for exciting him about how to best teach geometry. The development of Sketchpad and later Desmos also created great opportunities to use technology in explorative ways in the classroom. Paul hopes that all teachers will fuel their level of excitement for the subject matter and pass it along to their students.



MMC is Co-Hosting NCTM's Centennial Annual Meeting & Exposition in Chicago and YOU Could Be a Big Winner!

At all of MMC's events between now and NCTM 100 (April 1 - 4, 2020, at McCormick Place in Chicago), one registration to the conference will be raffled off!

To be entered in each MMC event's raffle, you will need to:

- 1.) attend the MMC event.
- 2.) become a member or extend your membership in MMC for one year at the event.

Registration for NCTM 100 is open at www.nctm.org/100.

Early bird registration rates are currently available! Group rates are also available!

Do you have a student who is interested in becoming a math teacher?

MMC Scholarship for High School Seniors

The Metropolitan Mathematics Club of Chicago is offering a \$2,000 scholarship for a high school senior who will pursue a career in the teaching of mathematics. In addition, up to two Filliman Scholarships may be awarded for the same amount (funded by a gift from the Filliman estate). The selected students, their parents, and their sponsoring teachers will be invited to the May 15th MMC dinner meeting, at which time the scholarship recipients will be honored.

A selection committee of MMC members appointed by the Board of Directors will determine the scholarship awards. To be eligible, an applicant must be sponsored by a current member of MMC, submit the application, have an official transcript sent, request a letter of recommendation from a mathematics teacher, and respond to the prompts in point E below. All materials must be received by March 6, 2020. Feel free to email your submissions. You will receive a reply, so you know that it is being considered. The committee will evaluate applications and will make a recommendation to the Board of Directors as to the awarding of the scholarship.

The guidelines used for selection shall be:

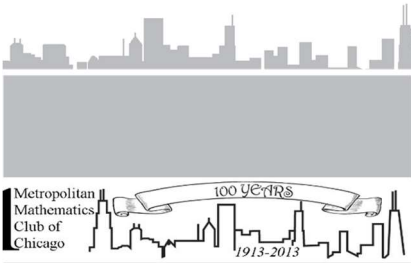
- A. Demonstration of overall academic scholarship with an inclusion of at least eight semesters of college preparatory mathematics (A minimum cumulative grade point average of 3.0, where A = 4.)
- B. A statement of the intention to pursue a career in mathematics teaching
- C. Indication of participation in extra-curricular activities, especially those that may have a positive influence on a teaching career
- D. A letter of recommendation from a math teacher who is familiar with the applicant's academic performance and his or her potential as a mathematics teacher (The teacher must be an MMC member.)
- E. A short response from the candidate (1-2 paragraphs) to each of the following prompts:
 - a. What qualities do you possess that will help you in a teaching career?
 - b. Describe a teacher who has had an impact on your education.
 - c. Was there a time when you struggled with a concept in a math (or other) class? What did you do?
 - d. What was your favorite math class? Why?
 - e. Describe your favorite math problem. What makes it so great?
 - f. What excites you about mathematics?
 - g. Why do you want to teach mathematics? *This response may be longer than the others if necessary.*

In addition to the application form (at mmcchicago.org), applicants must also send:

- 1. A letter of recommendation from a mathematics teacher, *preferably not sent through the applicant**
- 2. A current transcript for seven semesters of high school*
- 3. Responses to the prompts in point E above

**Letters of recommendation and transcripts may be sent by separate mail or email.*

Send to: Carrie Fraher
Glenbrook South High School
4000 West Lake Avenue
Glenview, IL 60026
cfraher@glenbrook225.org



Metropolitan Mathematics Club Of Chicago

Affiliate of ICTM & NCTM

MMC CONFERENCE OF WORKSHOPS

for all teachers of grades K-14

SATURDAY, FEBRUARY 1, 2020

ADLAI E. STEVENSON HIGH SCHOOL

Lincolnshire, Illinois

*Full program booklet and registration is online at
www.mmcchicago.org.*

Choose from a variety of workshops, including:

TASKS THAT PROMOTE COLLABORATIVE LEARNING

DESMOS AND THE 5 PRACTICES

BUILDING NUMBER SENSE

COMPARING LINEAR, EXPONENTIAL & QUADRATIC FUNCTIONS IN ALGEBRA

WHO WANTS PANCAKES? GOOD TASKS INTO RICH LEARNING EXPERIENCES

WHAT CAN KNITTING TEACH STUDENTS ABOUT MATH?

TEACHING FOR SUCCESS! MATHEMATICS INSTRUCTION IN 2020 AND BEYOND MATH TEAM PROBLEMS YOUR STUDENTS (AND YOU) SHOULD KNOW HOW TO DO

7 OF OUR FAVORITE PROBLEMS FOR AP CALCULUS

PROBABILITY JEOPARDY

CONTEXT IS CRITICAL: K-5 THREE-ACT MATH TASKS

COUNTING COLLECTIONS: A POWERFUL ROUTINE YOUR STUDENTS WILL LOVE

HELPING STUDENTS TO MAKE THE TRANSITION TO HIGH SCHOOL ALGEBRA

WORD PROBLEMS OVER SEVERAL MILLENIA

"MATCH THE GRAPH" WITH ROBOTS

UNLOCKING THE BEAUTY OF MATHEMATICS THROUGH STUDENTS' PASSIONS

ALGEBRA & GEOMETRY ACTIVITIES WITH THE TI-INNOVATOR ROVER

DESIGNING A TEXTBOOK-FREE COURSE (OR UNIT)

POWERFUL TEACHING STRATEGIES TO MAKE LEARNING STICK

PICKING UP STEAM TO BUILD A STUDENT-LED MATH CLASSROOM

For more information, contact

Peter DeCraene (mmcconfregistrar@gmail.com)

Maryjoy Heineman (heinemanm@eths202.org)

Nicolette Norris (nickianorris@gmail.com)

Rose Sterr (rsterr@benet.org)

**Register early for the best selection
of workshop sessions!**

Registration deadline is January 15, 2020!

Officers

Matthew Moran, President
Serg Cvetkovic, President-Elect
Mary Wiltjer, Past President
Sheila Hardin, Board Chair
Beth Ann Ball, Secretary
Carol Nenne, Treasurer

Directors

Beth Ann Ball (2018-2021)
Maine South H.S., Park Ridge

Steve Condie (2018-2021)
Illinois Math & Science Academy
(retired), Aurora

Serg Cvetkovic (2017-2020)
Thomas Kelly H.S., Chicago

Peter DeCraene (2017-2020)
Evanston Township H.S. Evanston

Carrie Fraher (2018-2021)
Glenbrook South H.S., Glenview

Joyce Gajda (2019-2020)
Oak Park & River Forest H.S., Oak Park

Sheila Hardin (2017-2020)
Oak Park & River Forest H.S., Oak Park

Aimee Hart (2019-2022)
New Trier H.S., Winnetka

Maryjoy Heineman (2019-2022)
Evanston Township H.S., Evanston

Janice Krouse (2019-2022)
Illinois Mathematics & Science Academy, Aurora

Danielle Leibowitz (2018-2021)
Mundelein H.S., Mundelein

Matthew Moran (2017-2020)
Chicago Public Schools (retired)

Nicolette Norris (2019-2022)
Chicago Vocational Academy, Chicago

Steven Starr (2019-2022)
Lakeview H.S. (retired), Chicago

Mary Wiltjer (2019-2022)
Glenbrook South H.S., Glenview

Officials

Community Relations and Development
Aimee Hart

Conference Co-Chairs Nicolette Norris
Rose Sterr

Conference Registrar Peter DeCraene

Finance Committee Chair open

Historian PaulChristmas

Membership Coordinator Mary Wiltjer

NCTM/ICTM Affiliate Steve Condie
Representative

Points & Angles Editor Sara Curran

Publicity and Posters PaulChristmas

Scholarship Chair Carrie Fraher

Social Media Chair Danielle Leibowitz

Webmaster Peter DeCraene

2019-2020 MMC Dinner Meeting Incentive Programs

“Bring a Friend” Nights: Bring someone who has never attended an MMC dinner meeting, and introduce them to MMC! Both you and your guest(s) will receive \$5 off your dinner costs. There is a limit of 2 guests per meeting for the reduced cost, but you can still invite more people to come with you! This incentive is good for the next meeting on January 24 with Douglas O’Roark.

“New(er) Teacher” Program: Are you a teacher in your first 5 years of teaching? If so, you can take advantage of this incentive! Pick up a new(er) teacher card at registration and bring it back to be verified each time you attend a dinner meeting. Attend 3 meetings this year, and get your 4th meeting at half price!

Thank you to our generous members who are sponsoring this program.

**Please be sure to register all attendees using the reservations link on the website.
Mention the incentive when you check in at the meeting to take advantage of these programs.**

**Is your membership current? Check your mailing label to see when your membership expires.
You can renew by mail with the form below or renew in person at the next dinner meeting.**

NAME		PREFERRED CONTACT Check one: <input type="checkbox"/> Home <input type="checkbox"/> Work	
HOME ADDRESS			
CITY	STATE	ZIP	
HOME PHONE	HOME E-MAIL		
EMPLOYER			
WORK ADDR			
CITY	STATE	ZIP	
WORK PHONE	WORK E-MAIL		
ELECTRONIC-ONLY MEMBERSHIP Check the box below for electronic-only membership. You will receive an email with a direct link to each issue of <i>Points & Angles</i> when it is posted on the web site, often before paper copies are mailed. You will no longer receive <i>Points & Angles</i> by mail. <input type="checkbox"/> Electronic-Only Membership		MEMBERSHIP TYPE Check one: <input type="checkbox"/> 1 year (\$35) <input type="checkbox"/> student*, 1 yr (\$22) <input type="checkbox"/> 2 years (\$65) <input type="checkbox"/> 1 st yr teacher*, 1 yr (\$22) <input type="checkbox"/> 3 years (\$90) <input type="checkbox"/> retired, 1 yr (\$28)	
FORM USE Check one: <input type="checkbox"/> New Membership <input type="checkbox"/> Renewal <input type="checkbox"/> Former Member <input type="checkbox"/> Change of Address		MEMBERSHIP COST \$	
* The student and 1 st -year teacher memberships are only available as electronic-only.		DONATIONS	
		SCHOLARSHIP FUND \$	
		SPEAKER FUND \$	
		TOTAL AMOUNT OF CHECK \$	

Make check payable to **MMC**

MMC Membership and Change of Address Form
Mail completed form and check to:
MMC
7339 W. Ibsen St.
Chicago, IL

Upcoming Events

Fri., Jan. 24	Douglas O’Roark	The Future of Math Enrichment
Sat., Feb. 1		MMC Conference of Workshops, Lincolnshire
Fri., Mar. 6	Eli Luberoff	Creating Interesting Ways for Students to be Right and Wrong Desmos Workshops
Sat., Mar. 7	Eli Luberoff	
Wed.-Sat., April 1-4, 2020		NCTM Centennial Annual Meeting: Celebrate 100 Years— Looking Back and Moving Forward, Chicago
Fri., May 15	Zalman Usiskin	Some Great Middle and High School Mathematics Lessons Few People Teach

Send upcoming event items to sburnett_308@yahoo.com no later than the date of the MMC dinner meeting preceding the issue in which the item should appear. All items are subject to editing.

Your membership renewal date appears in the upper right corner of the label

