

Points & Angles

Newsletter of the Metropolitan Mathematics Club of Chicago
Volume XLIV No. 7, March 2010

The Most Important Misunderstood Concept in Geometry

Ken Indeck

Wheeling High School

By DON PORZIO

Dr. Ken Indeck feels that the most important misunderstood concept in geometry is scaling. Ken considers this particular talk his all-time favorite lecture for students. The concept of scaling is extremely powerful in its ability to explain topics in nature, in technology and in our economy as well. Even so, scaling is generally not understood by the otherwise well-educated adult. Ken plans to couple his talk with his lament of the passing of “favorite lectures” as a pedagogical technique and a suggestion for how to improve that situation.

Ken received his Bachelor of Arts from the University of Rochester, an M.A.U.S. from Occidental College, and a Ph.D. from the University of Illinois Urbana-Champaign. He has been a teacher and staff developer (Ken’s word) for more than three decades and though his subject area specialty by formal training is social studies, all his teaching has been done in the math and science domains. At various schools, Ken has started programs as diverse as Creative Writing, Chess, Scholastic Bowl and Teachers-for-Teachers. He has also served as state director for Illinois Science Olympiad and worked for 10 years with ISBE to help formulate the science portion of the Illinois state science assessment program. Currently, he is a mathematics teacher at Wheeling High School and is serving as treasurer both for Math Educators Exploring Computer Algebra Systems (MEECAS) and for the Illinois Association for Gifted Children (IAGC).

Special thanks to Texas Instruments and Ron Thomas for providing the appetizers at this month’s meeting.



From I-90 & Southbound I-294: Exit at I-190 West to O’Hare; Exit onto North Mannheim Rd.; Take Mannheim Rd. North 2.25 miles.

From Northbound I-294: Exit at West Touhy Ave.; Take Touhy Ave. to Mannheim Rd.; Turn right on Mannheim Rd.

Public Transit: Take the CTA Blue Line to the Rosemont Bus Terminal; Take Pace Bus #223 to Touhy Ave. & Lee Rd.; Walk East on Touhy to Mannheim Rd.

Friday, March 12, 2010


5:30 PM Doors Open, 6:00 PM Social Hour,
7:00 PM Dinner and Talk

Fountain Blue Banquets & Convention Center

2300 Mannheim Rd., Des Plaines
(847) 298-3636
\$34 for Members, \$39 for Nonmembers

Reserve by Noon, Monday, Mar. 8

reservations@mmchicago.org or (630)
907-5023, day or night, leave a voicemail.

 Since this meeting takes place during Lent, attendees may pre-order fish (tilapia) in place of chicken breast for an additional \$6, provided that the fish is pre-ordered at the time of reservation and that each fish pre-order is accompanied by an attendee’s name.

Points from the Interior

By PAUL CHRISTMAS

This year's MMC Conference of Workshops was again an overwhelming success. There were 670 registrants who signed up to attend three of the 105 sessions. Dan Hall, the site coordinator, made it seem like organizing conferences is his full time job. The staff at York made the attendees feel welcome and helped them get from room to room. John McConnell handled all the registration that included working to get everyone into as many first choices as possible. Not enough thanks can be given to Mary Wiltjer and Carol Nenne for their hours of work getting outstanding speakers (107), organizing the program, printing and mailing the program booklets, stuffing the packets for each attendee, and performing a thousand other jobs to make the day go smoothly. There are many members of MMC that would like to know where the two of them get the energy and time to do all the things they do and teach full time!!

MMC was really lucky to have Edward Burger as the presenter for our September meeting. Early in January Baylor University announced Ed was awarded the Robert Foster Cherry Award for Great Teaching. It is the only national teaching award presented by a college or university to an individual for exceptional teaching. The award is designed to honor great teachers, to stimulate discussion about the value of teaching, and to encourage departments and institutions to value their own great teachers. The award is the largest monetary award (\$200,000) to an individual. Williams College, Dr. Burger's home institution, receives \$25,000. Ed Burger went to Baylor in October to present his finalist lecture, "The Art of Exploring Invisible Worlds: Thinking Through the Fourth Dimension." Some of you may have seen Ed in the "Mathletes" segment of the 16-part video series "The Science of the Olympic Winter Games" on Today Show during the Winter Olympics.

This year's MMC Conference of Workshops was again an overwhelming success.



Points & Angles, Volume XLIV
Number 7, March 2010



Points & Angles, published nine times per school year, is the official publication of the Metropolitan Mathematics Club of Chicago. Founded in 1913, the Metropolitan Mathematics Club is the National Council of Teachers of Mathematics' first affiliate. The official club website: <http://mmchicago.org/>

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Improving Mathematics Teaching and Learning through Lesson Study

By LAURA KAPLAN

We were fortunate to have Dr. Akihiko Takahashi from DePaul University, a leading expert in his field, come to share his knowledge and experience with us. Akihiko first gave us an overview of the lesson study process, in which groups of teachers collaborate to plan, teach, observe, and discuss a lesson, which is referred to as a research lesson. We saw pictures from his many travels where he has observed teachers taking part in lesson study. There were pictures from Qatar, the second lowest country in the latest TIMSS. There were pictures from Singapore where we saw notes from a workshop indicating that the teachers there share the same challenges with their students that we do. We saw pictures from Thailand, where Akihiko had the opportunity to teach a research lesson in an outdoor classroom and ride an elephant. All over the world, teachers are trying to improve teaching and learning through lesson study.

Why is lesson study so widely used in all corners of the world? Stigler and Hiebert, authors of *The Teaching Gap*, noted that Japanese mathematics lessons better exemplify current U.S. reform ideas than do typical U.S. mathematics lessons. NCTM has had a focus on problem solving since the 1970s. They emphasized the difference between a problem and an exercise and stressed that problem solving should not be an isolated part of the curriculum. George Polya describes a classroom in which the student is doing the work while

the teacher helps the student, not too much and not too little. The student who is unable to do anything on his own should be given at least the illusion of independent work.

After observing some American lessons, a Japanese teacher commented, "American teachers are so kind. They give everything to the students." To wit, we then see an example from a Japanese 6th grade textbook in which there is only one problem on the whole page. The problem involves the multiplication of a fraction by a fraction and there is no solution accompanying it. When these textbooks were first introduced in Japan, it was quite different from what Japanese teachers were used to. They used lesson study to help them adjust to the new focus of their curriculum.

It is important for universities to provide opportunities for teachers to not only learn math, but to develop expertise for teaching math. Indeed, the Japanese have three levels of teachers. At level 1, teachers can tell students important basic ideas of mathematics such as facts, concepts, and procedures. At level 2, teachers can explain the meanings and reasons of the important basic ideas of mathematics in order for students to understand them. And finally at level 3, teachers can provide students opportunities to understand these basic ideas, and support their learning so that the students become independent learners. While American universities try to teach

all levels at once, only levels 1 and 2 should be attained through the university, while experience and professional development lead a teacher to level 3. Japanese teachers attain level 3 through lesson study.

Lesson study can take different forms. In a school-based lesson study all teachers from a single school establish a school-wide lesson study goal and form several sub-groups take part in the process. This approach aids a school in achieving systematic and consistent instructional and learning improvement in the school as a whole and in developing a common vision of education at the school through teacher collaboration. Schools can use lesson study to introduce new methods or materials to the curriculum. In a cross-district lesson study the group is made up of volunteers from several different schools and districts. This group can develop new ideas for teaching chosen topics, investigate curriculum sequences and contents, and/or developing curriculum.

Akihiko left us with a way for us to experience lesson study, although he emphasized that watching a video does not take the place of a live observation of a research lesson. The APECwiki website, http://brd.apecwiki.org/index.php/Lesson_Study has a number of videos and lessons for public viewing.

After observing some American lessons, a Japanese teacher commented, "American teachers are so kind. They give everything to the students."



Upcoming Event Details

Mathematics Educators Exploring Computer Algebra Systems (MEE-CAS) Meetings, New Trier High School, Northfield Campus, 9AM–12PM:

Workshop Challenge, April 10. Writing CAS questions for high-stakes tests.
<http://meeecas.org/>

2010 NCTM Annual Meeting and Exposition, San Diego, CA, April 21–24. Connections: Linking Concepts and Context. The meeting will address the challenges that teachers face every day, including: engaging and motivating students, addressing diverse learning styles, balancing state testing and student understanding, using technology in the classroom, and more! You'll also be able to learn from more than 700 presentations and experience the latest teaching products in the exhibit hall.
<http://www.nctm.org/sandiego>



USACAS6, Northfield, IL, June 26–27. Sixth U.S. conference on CAS. See page 8.
<http://usacas.org/6>

Physics and Mathematics

BY LISA PARKER

With the promise of a *pun*-ishing sense of humor, we were certainly entertained and enlightened by Richard Stalmack's presentation on February 5th. Specifically, Richard told us that a person is motivated to do math when it has some meaning. Therefore, he proceeded to share thought-provoking problems and interesting activities that demonstrated how a teacher could motivate their students to engage in mathematics.

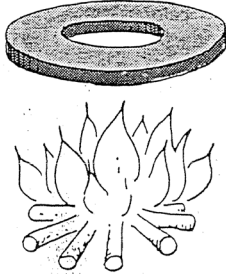
Richard stated that physics and mathematics are two subjects sharing a common language. He began with a cartoon of a whiz at physics on a diving board. The whiz was calculating what his speed would be when he hits the water in the pool. Richard provided the formula for final velocity:

$$\begin{aligned}v_f^2 &= v_0 + 2g\Delta x \\ &= 0 + 2\left(-32\frac{\text{ft}}{\text{s}^2}\right)(-50 \text{ ft}) \\ &= 3220\frac{\text{ft}^2}{\text{s}^2} \\ v_f &\approx 57\frac{\text{ft}}{\text{s}} \approx 39 \text{ mph}\end{aligned}$$

The discussion continued with a cartoon of a physicist skydiving and screaming "equations for a falling body," followed up by a pun about terminal velocity.

Richard shared two quotes. One was by Stephen Hawking, "Equations are just the boring part of mathematics. I attempt to see things in terms of geometry." The other was by Isaac Newton, "In learning the sciences examples are more important than precepts."

Richard posed a problem: A metal disc with a hole is heated until the iron expands.



The diameter of the hole will:

- A. Decrease
- B. Increase
- C. Remain the same.

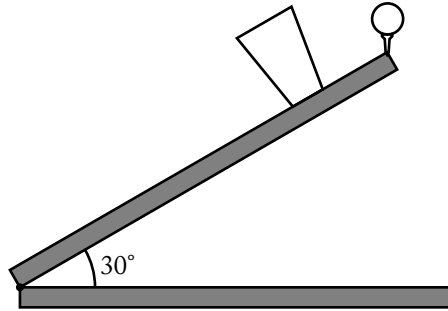
He explained the solution in two ways using geometry. The first, cut the disc into smaller pieces, apply heat, and each piece expands in all directions. When the pieces are put back together, there will be a larger hole. The second, cut the disc and “stretch” it into a straight linear bar. Apply heat and the expansion will occur greater in the longer dimension therefore increasing the circumference.

Richard advised us to not rely on words or equations until you can picture the idea they represent. He included three demonstrations in his presentation. The first demonstration caused us to consider the effect that mass has on acceleration. He launched two darts, one of them carrying a weight, at the floor. We were asked to observe which dart reached the floor first. We concluded that the lighter dart hit the floor first and he explained that the weighted dart had a greater mass and therefore a smaller acceleration.

Perhaps the demonstration that gathered the

most interest was the one Richard had constructed especially for us. He had cut a board in half, attaching a hinge at one end and a golf tee at the other. Upon the board near the tee he affixed a small cup and elevated that end by 30° .

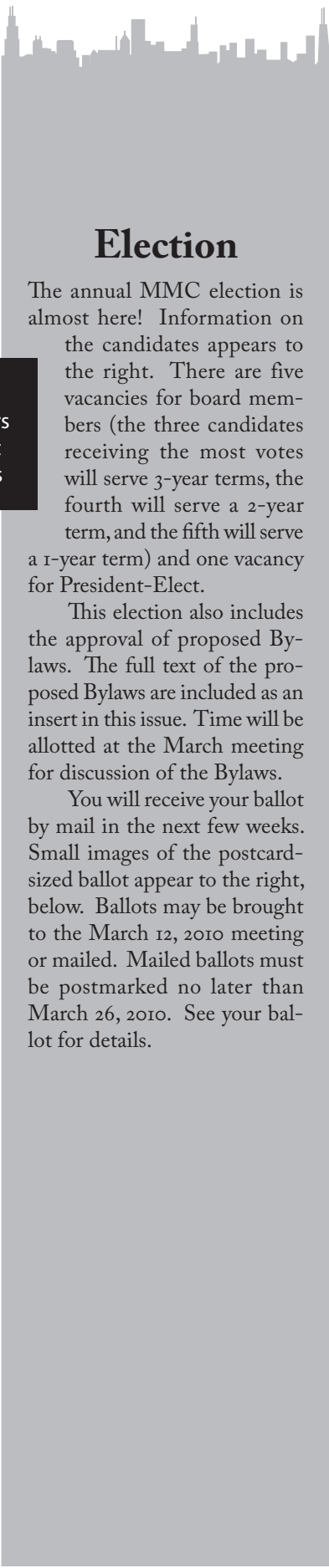
Physics and mathematics are two subjects sharing a common language.



Richard placed a golf ball upon the tee and knocked the support out from under the elevated half of the board. When the board fell, the golf ball fell into the cup!



Richard concluded with a quote about mathematicians and physicists. Like mathematicians, physicists also look for patterns, but ultimately, in physics whether the patterns have meaning, and whether they have any value, depends on how the threads of those patterns interweave with the physical situation. In physics, observation of real world phenomena provides meaning.



Election

The annual MMC election is almost here! Information on the candidates appears to the right. There are five vacancies for board members (the three candidates receiving the most votes will serve 3-year terms, the fourth will serve a 2-year term, and the fifth will serve a 1-year term) and one vacancy for President-Elect.

This election also includes the approval of proposed Bylaws. The full text of the proposed Bylaws are included as an insert in this issue. Time will be allotted at the March meeting for discussion of the Bylaws.

You will receive your ballot by mail in the next few weeks. Small images of the postcard-sized ballot appear to the right, below. Ballots may be brought to the March 12, 2010 meeting or mailed. Mailed ballots must be postmarked no later than March 26, 2010. See your ballot for details.

Vote on:
• 5 Board Members
• 1 President-Elect
• Proposed Bylaws

2010 Candidate for President-Elect

Ismael Zamora
Hinsdale South HS, Darien
(13 years teaching, member of MMC, ICTM, NCTM)

I have had the honor of being an MMC board member for the past 3 years and would be honored to be considered for the office of President. This organization is the best continuous professional development I have had as a teacher. Thank you for your consideration.

Candidate for President-Elect
Ismael Zamora
Hinsdale South HS, Darien
(13 years teaching, member of MMC, ICTM, NCTM)

I have had the honor of being an MMC board member for the past 3 years and would be honored to be considered for the office of President. This organization is the best continuous professional development I have had as a teacher. Thank you for your consideration.

Candidates for Board Member
(more information in the March 2010 *Points & Angles*)

| | |
|-----------------------|-----------------|
| Sheila Hardin | Doug O'Rourke |
| Laura Kaplan | Kevin S. Wiland |
| Stephanie Levin-Stern | Mary Wittjer |
| Thomas McDougall | |

Proposed Bylaws
A copy of the proposed Bylaws was included in the March 2010 *Points & Angles*.

Detach the ballot card below and bring it to the March 12, 2010 MMC meeting or mail it in.
Mailed ballots must be postmarked by March 26, 2010. Don't forget the 28¢ stamp!

Place Stamp Here

MMC
c/o Phil GARNER
2295 CORTWOOD DR.
GLENDALE, IL 60026

MMC
c/o Phil GARNER
2295 CORTWOOD DR.
GLENDALE, IL 60026

Metropolitan Mathematics Club of Chicago 2010 Election Ballot

Bring this ballot to the March 12, 2010 MMC meeting or mail it in.
Mailed ballots must be postmarked by March 26, 2010. Don't forget the 28¢ stamp!

- President-Elect: (vote for one)**
 Ismael Zamora
- Board Members: (vote for five)**
- | | |
|--|--|
| <input type="checkbox"/> Sheila Hardin | <input type="checkbox"/> Doug O'Rourke |
| <input type="checkbox"/> Laura Kaplan | <input type="checkbox"/> Kevin S. Wiland |
| <input type="checkbox"/> Stephanie Levin-Stern | <input type="checkbox"/> Mary Wittjer |
| <input type="checkbox"/> Thomas McDougall | |
- Proposed Bylaws:**
 Approve Do Not Approve

2010 Candidates for the Board

Sheila Hardin

Oak Park and River Forest HS, Oak Park
(14 years teaching, member of MMC, ICTM, NCTM)

During the past three years I have enjoyed becoming a part of the MMC organization. The speakers are strong and interesting, providing new information and affirmation about the work we do. I am also impressed with the January conference and the variety of topics that it provides to teachers. I would be proud to be more involved with such a well run, professional organization.

Laura Kaplan

Highland Park HS, Highland Park
(6 years teaching, member of MMC, ICTM, NCTM, Chicago Lesson Study Group, Chicago North Lesson Study Group)

I believe MMC makes the Chicago area the greatest in the country in which to teach, offering unsurpassed opportunities for professional development and intellectual discourse. Having met so many amazing educators and seen so many inspiring speakers, I would be honored to serve on the board and to give back to this wonderful and important organization.

Stephanie Levin-Stern

Fenton HS, Bensenville
(15 years teaching, member of MMC, NCTM)

I joined MMC while student teaching, upon the advice of professors and my cooperating teacher, Hope Martin. The meetings and workshops have been very valuable to me as an educator. I am able to keep up with current educational trends, new mathematic gizmos, and maintain and create friendships. I could think of no greater honor than giving back to an organization that has given so much to me and others.

Thomas McDougal

DePaul University, Chicago
(21 years member of MMC; member of NCTM, Chicago Lesson Study Group, ASCD)

MMC is a valuable and influential force for helping improve math education. It is an honor to be considered for the board. In addition to high school teaching, I have experience with curriculum development, served as an elementary school math coach, organized and led workshops on curriculum and assessment, studied curricula of Singapore and Japan, and currently help lead the Chicago Lesson Study Group.

Doug O'Roark

University of Chicago, Chicago
(19 years teaching, member of MMC, ICTM, NCTM, NCSM, NABT, NSTA)

I've been inspired by my experience in MMC over the last 20 years. In my new role in the Urban Teacher Education Program I'm eager to connect more Chicago Public School teachers with MMC.

Kevin S. Wiland

Larkin HS, Elgin
(10 years teaching, member of MMC, ICTM, NCTM, NCSM)

When I began my career in education, John McConnell and many others at Glenbrook South encouraged me to attend MMC meetings. I quickly became a true believer that MMC is a rare professional organization consisting of many outstanding educators. I was the organization's webmaster for two years and would be honored to serve on the board to help continue MMC's long history of excellence.

Mary Wiltjer

Glenbrook South HS, Glenview
(17 years teaching, member of MMC, ICTM, NCTM, NCSM)

I have felt privileged to be involved with MMC over the last decade. I enjoy the challenges and benefits of both Membership Coordinator and Conference Co-chair. It is fantastic to be a part of an organization with such a rich history and a brilliant future. MMC's commitment to professional development is unparalleled. I'd love to continue working with MMC on the Board.



Vote!



Sixth U.S.A. Conference on CAS

June 26–27, 2010

New Trier H.S.
Northfield, IL

Registration (includes
continental breakfast,
box lunch, snack, and
conference shirt):
\$195 (before May 7)
\$250 (on or after May 7)

More information
available at
<http://usacas.org/6>

MMC Scholarship

The Metropolitan Mathematics Club of Chicago is offering a \$1,500 scholarship for a high school senior who will pursue a career in the teaching of mathematics. In addition, up to two Filliman Scholarships may also 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 7th MMC dinner meeting at which time the scholarship recipients will be honored.

A selection committee of MMC members appointed by the Executive Board will determine the scholarship awards. To be eligible, an applicant must submit the application, have an official transcript sent, and request a letter of recommendation from a member of the MMC such that all of the materials are received by March 12, 2010. The committee will establish its own guidelines for evaluating applications, and will make a recommendation to the Executive Board as to the awarding of the scholarship. No member of the selection committee may nominate nor recommend a candidate.

The scholarship application form, along with the requirements, were included as an insert in the December issue of this newsletter.

MMC Conference of Workshops

**On January 30th, another great conference was had,
& we know who's to THANK for that!**

All the speakers (because what would there be if you weren't so generous with your time and talents), **the attendees** (because with whom do you share if you're not there),

the stuffers (because without them our folders would be empty)

all the volunteers (because how would we get our coffee, food, folders and such),

York High School (because it would be really cold without a warm, generous place),

Dan Hall (because without him there would be no York High School and all the wonderful things that happened there, including lunch, technology, all the math dept. helpers, lights, etc.),

& **John McConnell**, (because without him there'd be 105 empty sessions & over 670 lost participants).

(If we forgot you, sorry ... but still thanks so much!)

- Carol & Mary

P.S. Start getting your workshops ready for January 2011! As you know, we'll be in touch.

| | | | |
|--|-------|--|--|
| 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 ADDRESS | | | |
| 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 <u>Points & Angles</u> when it is posted on the web site, often before paper copies are mailed. You will no longer receive <u>Points & Angles</u> by mail. | | MEMBERSHIP TYPE Check one: | |
| <input type="checkbox"/> Electronic-Only Membership | | <input type="checkbox"/> 1 year (\$27) <input type="checkbox"/> student, 1 yr (\$15) | |
| | | <input type="checkbox"/> 2 years (\$50) <input type="checkbox"/> 1 st yr teacher, 1 yr (\$15) | |
| | | <input type="checkbox"/> 3 years (\$70) <input type="checkbox"/> retired, 1 yr (\$20) | |
| FORM USE Check one: | | MEMBERSHIP COST \$ | |
| <input type="checkbox"/> New Membership <input type="checkbox"/> Renewal | | DONATIONS | |
| <input type="checkbox"/> Former Member <input type="checkbox"/> Change of Address | | SCHOLARSHIP FUND \$ | |
| | | SPEAKER FUND \$ | |
| | | TOTAL AMOUNT OF CHECK \$ | |

Make check payable to MMC

Mail completed form and check to:

329 Michael Manor
Glenview, IL 60025

MMC Membership and Change of Address Form

MMC



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Insert

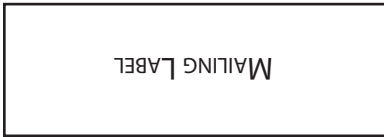
- Proposed Bylaws

Upcoming Events

| | | |
|--|---|--|
| <p>Fri., Mar. 12</p> <p>Sat., Apr. 10</p> <p>Apr. 21-24</p> <p>Fri., May 7</p> <p>Jun. 26-27</p> | <p>Ken Indeck</p> <p>Northfield, IL</p> <p>San Diego, CA</p> <p>Zal Usiskin</p> <p>Northfield, IL</p> | <p>The Most Misunderstood Concept in Geometry</p> <p><i>MEECAS: Workshop Challenge</i></p> <p><i>NCTM Annual Meeting and Exposition</i></p> <p>The Geometry of Shape and the Shape of Geometry</p> <p><i>USACAS6</i></p> <p><i>(See also "Upcoming Event Details" on page 4)</i></p> |
|--|---|--|

Send upcoming event items to ilg@chicagomath.org 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.



METROPOLITAN MATHEMATICS CLUB OF CHICAGO
 c/o MMC
 329 Michael Manor
 Glenview, IL 60025

Proposed Bylaws

See the March issue of *Points & Angles* for more information.

Article I—Name

This organization shall be called the Metropolitan Mathematics Club of Chicago and shall be referred to herein as the “Club.”

Article II—General

Section 2-1: Purpose and Affiliation. The Club is a nonprofit organization incorporated under the laws of the State of Illinois as an organization for charitable and educational purposes under Section 501(c)(3) of the Internal Revenue Code of 1986 as now enacted or as it may be hereafter amended, and referred to herein as the “Code.” The purpose of the organization shall be to encourage an active interest in mathematics; to afford a medium of interchange of views regarding mathematics and the teaching of mathematics; and to further the cooperative study of problems relating to mathematics and the teaching of mathematics at all levels.

The Club is an affiliate of the National Council of Teachers of Mathematics and the Illinois Council of Teachers of Mathematics.

Section 2-2: Use of Receipts. The Club, being organized exclusively for charitable and educational purposes, may make distributions to organizations that qualify as exempt organizations under Section 501(c)(3) of the Code.

No part of the net earnings of the Club shall inure to the benefit of, or be distributable to, its Directors, Officers, or other private persons, except that the Club shall be authorized and empowered to pay reasonable compensation for services rendered and to make payments and distributions in furtherance of the purposes set forth in Article II, Section 2-1, above.

Section 2-3: Legislative Activities. No substantial part of the activities of the Club shall be for the purpose of carrying propaganda, or otherwise attempting to influence legislation. None of the activities shall consist of participating in, or intervening in (including the publishing or distribution of statements) any political campaign on behalf of any candidate for public office.

Section 2-4: Non-Discrimination. The Officers, Directors, committee members, employees and the persons to be served by the

Club shall be selected entirely on a non-discriminatory basis with respect to age, sex, race, religion, and national origin.

Section 2-5: Prohibited Acts. Nothing herein shall authorize the Club, directly or indirectly, to engage in or include among its purposes, any activities mentioned as unlawful or not permitted to be carried on in the General Not-For-Profit Corporation Act of the State of Illinois by a corporation exempt from Federal income tax under section 501(c)(3) of the Code or by a corporation, contributions to which are deductible under Section 170(c)(2) of the Code.

Article III—Membership

Section 3-1: Membership Criteria. Any person who is interested in mathematics is eligible for membership in the Club. Payment of annual dues qualifies that person as a voting member.

Section 3-2: Dues. The rate(s) of annual dues for the Club shall be determined by the Board of Directors. No change in annual dues shall become effective until the beginning of the fiscal year following approval of such a change.

Section 3-3: Lifetime Membership. The Board of Directors may award lifetime memberships in the Club. Persons awarded lifetime memberships qualify as voting members and shall not be required to pay annual dues.

Article IV—Meetings of Members

The Club shall meet at least four times a year. The dates shall be set by the Board of Directors.

Article V—Board of Directors

Section 5-1: General Powers. The affairs of the Club shall be conducted by the Board of Directors or managed under the direction of the Board of Directors.

Section 5-2: Number and Qualifications. The President-Elect, President, and Past President shall be considered Directors of the Club. The number of Directors of the Club shall be no less than twelve (12) and no more than eighteen (18). All Directors shall maintain current membership in the Club.

Section 5-3: Election and Terms of Office. Members of the Club shall elect Directors

to succeed those whose terms are expiring, to hold office for a term of three years or until their successors are elected. There is no limit to the number of terms a person may serve as a Director.

Regular terms of office for Directors of the Club shall be for periods of three years. Terms shall be so fixed at the start or upon any increase in or decrease in the number of Directors, so that approximately an equal number of regular terms shall expire at each annual election. The initial term of a Director elected during an increase or decrease in the number of Directors may be for a term other than three years. The membership shall be notified of the length of the term of each Director prior to the election of said Director. No decrease in the number of Directors shall have the effect of shortening the term of an incumbent Director.

Section 5-4: Vacancies. Any vacancy on the Board of Directors shall be filled by a majority vote of the Directors at the time the election is held to fill the vacancy. Each person so elected by the Board shall serve for the unexpired term of the person he or she replaces.

Section 5-5: Compensation. No Director shall receive any salary, fee, payment, honorarium or other compensation or thing of value from the Club or other party for their service as Directors other than reasonable expenses. Nothing herein shall be construed to prevent a Director from receiving any compensation for duties other than as a Director.

Section 5-6: Regular Meetings of the Board of Directors. The Board of Directors shall meet no less than three times each year at such time and place as determined by resolution of the Board of Directors. The Board meetings shall be open to all members of the Club and the Board shall report all salient actions to the members.

Directors may participate in any meeting through the use of a conference telephone or similar communications equipment by means of which all persons participating in the meeting can hear each other, and such participation in a meeting shall constitute presence in person at the meeting.

If so resolved by the Board, a teleconference shall constitute an appropriate place for holding a meeting. The Board of

Directors may make such rules and regulations covering its meetings as it may in its discretion determine necessary.

Section 5-7: Special Meetings of the Board of Directors. Special meetings of the Board may be called by the President or by any two (2) Directors. The purpose of such meeting shall be stated with the request, and no other business shall be transacted except that for which the meeting has been called.

Section 5-8: Notice of Meetings. Notice of the time, place and purpose of all meetings shall be given at least five (5) days before the time fixed for the meeting. Notice shall be mailed (to an address as shown on the membership records of the Club), electronically sent, or given personally by or at the direction of the President or Secretary to each Director. If mailed, such notice shall be deemed to be delivered when deposited in the United States mail so addressed, with postage thereon prepaid, not less than three days prior to the commencement of the above-stated notice period.

Section 5-9: Quorum. Two thirds (2/3) of the Directors constituting the Board, one of whom must be an Officer, shall be a quorum for the transaction of business; provided, however, that if less than a quorum of the Directors is present, a majority of the Directors present may adjourn the meeting to another date, time and place without further notice, and the Secretary shall give notice to the absent Directors of the date, time and place of the adjourned session of the meeting.

Section 5-10: Consent/Electronic Voting. Action required or permitted by law to be taken at a Board meeting may be taken without a meeting if the action is taken by all members of the Board. The action shall be evidenced by one or more written consents describing the action taken, signed, either physically or electronically, by each Director and included in the minutes filed with the Club records reflecting the action taken. Such action shall be effective when the last Director signs the consent, unless the consent specifies a different effective date. Said consent may be circulated and consented to electronically.

Section 5-11: Conflict of Interest. Each Director shall disclose to the Club in writing any personal interest which such Director or a member of his or her immediate family may have in any matter pending before the Board or in which the Club may have

an interest, and shall refrain from participating in any decision in such matter.

Section 5-12: Resignation and Removal. A Director may resign at any time by giving a written notice to the President or Secretary of the Club.

Any Director who is absent from two (2) consecutive regular Board meetings without excuse (explanatory correspondence to the President or Secretary), will be automatically removed from the Board and a vacancy declared for the unexpired term of said Director's position.

Any Director may be removed from office, with or without cause, by a two-thirds (2/3) vote of all Directors constituting the Board, at any regular or special meeting, provided a quorum is present, that it appears that such Director has been and will be unable to act as Director or is otherwise disqualified, and that written notice of the meeting is delivered to all Directors entitled to vote on removal of Directors as designated in Section 5-8. Such notice shall state that a purpose of the meeting is to vote upon the removal of one or more Directors as named in the notice. Only the named Director or Directors may be removed at such meeting.

Article VI—Elections

Section 6-1: Nominations. The Past-President shall appoint a Nominating Committee of not less than three members. It shall be the duty of the nominations committee to nominate at least one member for each elected position to be filled on the Board of Directors and for the Office of President-Elect. No member of the nominating committee may appear on the list of nominees. All nominees must meet the qualifications for the position for which they are nominated.

The Nominating Committee shall nominate for the position of Director any person who has been a member of the Club for at least two (2) full years, and for the Office of President-Elect any person who has been a member for at least three (3) full years.

The Board of Directors shall approve the slate for Officers and Directors prior to the announcement of the slate to the membership.

Section 6-2: Ballots. Ballots shall include a place for write-in candidates for all positions.

Ballots shall be sent by United States mail to all current members at least sixty

(60) days prior to the last meeting of members in the fiscal year, and shall be due at least thirty (30) and not more than sixty (60) days after mailing. Ballots may be returned by mail or in person on or before the date of the election.

Section 6-3: Results. The Past President and at least two members designated by the Past President shall tally the votes. The persons with a plurality of the votes shall be elected President-Elect and Directors.

The Directors and the President-Elect shall take office in the month of the last meeting of members in the fiscal year.

Article VII—Officers

Section 7-1: Elections and Terms of Office.

The Officers of the Club shall be President, President-Elect, Past-President, Secretary, and Treasurer. Officers shall meet the requirements established by the Club and by NCTM for affiliate groups. The President-Elect shall be elected by the members and shall be elevated to the positions of President and Past President in successive years on a date set by the Board of Directors. The Secretary and Treasurer shall be elected annually by a majority vote of the Directors, following the elevation of the President at the annual meeting of the Board of Directors. The Secretary and Treasurer shall each hold Office until his or her successor has been duly elected and qualified or until his or her death, resignation, or removal in the manner hereinafter provided.

Section 7-2: Vacancies. A vacancy in any Office because of resignation, death, removal, disqualification or otherwise, shall be filled by a majority vote of the Directors constituting the Board for the unexpired portion of the term.

Section 7-3: Resignation and Removal. An Officer may resign at any time by giving a written notice to the President or Secretary of the Club.

Any Officer who is absent from two (2) consecutive regular Board meetings without excuse (explanatory correspondence to the President or Secretary), will be automatically removed from Office and a vacancy declared for the unexpired term of said Officer's position.

Any Officer may be removed from Office, with or without cause, by a two-thirds (2/3) vote of all Directors constituting the Board, at any regular or special meeting, provided a quorum is present, that it appears that such Officer has been and will

be unable to act as Officer or is otherwise disqualified, and that written notice of the meeting is delivered to all Directors entitled to vote on removal of Officers as designated in Section 5-8. Such notice shall state that a purpose of the meeting is to vote upon the removal of one or more Officers as named in the notice. Only the named Officer or Officers may be removed at such meeting.

Section 7-4: Compensation. No Officer shall receive any salary, fee, payment, honorarium or other compensation or thing of value from the Club or other party for their service as Officer other than reasonable expenses. Nothing herein shall be construed to prevent an Officer from receiving any compensation for duties other than as an Officer.

Section 7-5: President-Elect. The President-Elect shall be responsible for the organization and execution of the program for the meetings of the Club for the following year. The President-Elect shall exercise such other powers and perform such other duties as may be assigned by the Board of Directors not inconsistent with provisions of law or these Bylaws.

Section 7-6: President. The President shall convene regularly scheduled and special meetings of the Board of Directors, and shall preside or arrange for another Officer to preside at each meeting in the following order: Past President, President-Elect, Secretary, and Treasurer. The President shall be an ex-officio member of all committees, shall with the consent and approval of the Board appoint any committees not otherwise provided, and shall execute with the Secretary or any Officer of the Club authorized by the Board, any contracts or other instruments which the Board has approved. The President shall perform such duties as customarily pertain to the Office of President or as directed by resolution of the Board of Directors not inconsistent with provisions of law or these Bylaws.

Section 7-7: Past President. The Past President shall have and exercise all the powers, authority, and duties of the President during the President's absence and shall act when the President is unable to fulfill the duties of that Office. The Past President shall chair the Nominating Committee that will nominate members for elected positions as stipulated in Article VI, Section 6-r. The Past President shall exercise such other powers and perform such other

duties as may be assigned by the Board of Directors not inconsistent with provisions of law or these Bylaws.

Section 7-8: Secretary. The Secretary shall be responsible for keeping records of proceedings and actions of the Board of Directors, including overseeing the taking of minutes at all board meetings.

The Secretary shall be responsible for issuing notices of all meetings of the Board of Directors and distributing copies of minutes and the agenda to each Director. The Secretary shall be responsible for the custody of the corporate books, records, files, membership records and contracts, assuring that such corporate records are maintained. The Secretary shall attest to all contracts or other instruments approved by the Board and signed by the President or his/her designee and shall exercise such other powers and perform such other duties as may be assigned by the Board of Directors not inconsistent with provisions of law or these Bylaws.

Section 7-9: Treasurer. The Treasurer shall be the financial Officer of the Club. The Treasurer, or the Treasurer's designee, shall have the custody of all funds and securities of the Club, shall keep full and accurate accounts of receipts and disbursements in books belonging to the Club, and shall deposit all monies and other valuable effects in the name of the Club in such depositories as may be designated by the Board. The Treasurer, or the Treasurer's designee, shall disburse the funds of the Club as may be ordered by the Board and shall render to the Board at the regular meetings of the Board an account of all transactions and of the financial condition of the Club. Such reports shall be available to members of the Club. The Treasurer, or the Treasurer's designee, shall see that all required state and federal reports are filed in a timely manner. The Treasurer shall exercise such other powers and perform such other duties as may be assigned by the Board of Directors not inconsistent with provisions of law or these Bylaws.

Section 7-10: Conflict of Interest. Each Officer shall disclose to the Club in writing any personal interest which such Officer or a member of his or her immediate family may have in any matter pending before the Board or in which the Club may have an interest, and shall refrain from participating in any decision in such matter.

Article VIII—Finances and Contracts

Section 8-1: Fiscal Year. The fiscal year of the Club shall be fixed by resolution of the Board of Directors.

Section 8-2: Deposit Accounts. All funds shall be held in depositories which are insured by the Federal Government and approved by the Board of Directors. The title of the accounts shall include the name of the Club. The Board of Directors shall annually approve those persons authorized as signatories on Club accounts. Those persons authorized as signatories on accounts shall be bonded to an amount equal to the anticipated funds for the fiscal year at a cost to be borne by the Club.

Section 8-3: Financial Audits. An internal audit of the organization's books and records shall be completed annually by a committee appointed by the Board of Directors upon recommendation of the Finance Committee. An external audit and/or compilation shall be completed as required by state and federal reporting standards, and all required state and federal reports shall be filed.

Section 8-4: Contracts. The Board of Directors has the authority to enter into contracts on behalf of the organization. The Board may authorize any Officer(s) or agent(s) to enter into any contract or execute and deliver any instrument in the name of and on behalf of the Club; such authority may be general or confined to specific instances.

Section 8-5: Loans. No loans shall be contracted on behalf of the Club and no evidences of indebtedness shall be issued in its name unless authorized by a resolution of the Board. Such authority may be general or confined to specific instances.

Section 8-6: Checks and Drafts. All checks, drafts or other offers for the payment of money, notes or other evidences of indebtedness issued in the name of the Club shall be signed by such Officer(s) or agent(s) of the Club and in such manner as shall be determined by resolution of the Board.

Article IX – Committees and Task Groups

Section 9-1: Creation of Committees and Task Groups. The Board of Directors, by a resolution adopted by a majority of the Directors constituting the Board, may designate one or more committees or task groups. These committees and task groups may not act on behalf of the Club or bind

it to any action, but shall act in an advisory capacity and may only make recommendations to the Board or its Officers. The names and responsibilities of such committees shall be set forth by resolution of the Board. The Board shall establish a Finance Committee whose responsibilities include financial oversight.

Section 9-2: Membership. The President, with the approval of the Board, shall appoint all members of committees and task groups. The President, subject to the approval of the Board, shall appoint the chair of each committee or task group. The chair of each committee or task group shall be a Director. Membership on committees or task groups is not limited to those currently serving on the Board.

Each member of a committee or task group shall continue as such until his or her successor is appointed, unless the committee or task group is terminated, or unless such member is removed from such committee or task group, or unless such member shall cease to qualify as a member thereof.

Vacancies in the membership of any committee or task group may be filled by appointments made in the same manner as provided in the case of the original appointments.

Additional members of committees and task groups may be appointed at any time by the President with a majority vote of the Board of Directors.

The President shall serve as an ex-officio member of all committees and task groups.

Section 9-3: Meetings. Committees and task groups shall meet at such time and place as determined by the committee membership. Committee and task group meetings shall be open to all members of the Club and the Board and shall report all salient actions to the Board.

Members may participate in any meeting through the use of a conference telephone or similar communications equipment by means of which all persons participating in the meeting can hear each other, and such participation in a meeting shall constitute presence in person at the meeting.

If so resolved by the committee or task group, a teleconference shall constitute an appropriate place for holding a meeting. The committee or task group may make such rules and regulations covering its

meetings as it may in its discretion determine necessary.

Section 9-4: Resignation and Removal. A committee or task group member may resign at any time by giving a written notice to the chair of the committee.

Any committee or task group member who is absent from two (2) consecutive regular meetings without excuse (explanatory correspondence to the committee chair or secretary), will be automatically removed from the committee or task group.

Any committee or task group member may be removed, with or without cause, by a two-thirds (2/3) vote of the Directors present at any regular or special meeting, provided a quorum is present, that it appears that such committee or task group member has been and will be unable to act as a member or is otherwise disqualified, and that written notice of the meeting is delivered to all Directors entitled to vote on removal of members as designated in Section 5-8. Such notice shall state that a purpose of the meeting is to vote upon the removal of one or more members as named in the notice. Only the named member or members may be removed at such meeting.

Section 9-5: Quorum. A majority of the appointed members constituting the committee or task group shall be a quorum for the transaction of business; provided, however, that if less than a majority of the members is present, a majority of the members present may adjourn the meeting to another date, time and place without further notice, and the chair of the committee shall give notice to the absent members of the date, time and place of the adjourned session of the meeting.

Article X—Acts of the Board

Those resolutions of the Board of Directors which establish specific objectives, which commit the Club to specific responsibilities, and which otherwise set policy for the Club, shall be called Acts of the Board.

A record of all current acts will be maintained by the secretary and made available, upon request, to all Club members.

Article XI—Parliamentary Authority

The rules contained in "Robert's Rules of Order, Revised" shall govern in all cases to which they are applicable and in which

they are not inconsistent with these Bylaws.

Article XII – Indemnification of Directors and Officers

The Club shall indemnify all Directors and Officers of the Club, and his or her heirs, executors or administrators shall be indemnified and reimbursed for expenses necessarily incurred by him or her in connection with the defense or reasonable settlement of any action, suit or proceeding in which he or she is made a party by reason of his or her being or having been a Director or Officer of the Club resulting from any act, error or omission made in the exercise of such person's policy or decision-making responsibilities if such person was acting in good faith and within the scope of such person's official functions and duties, unless such damage or injury was caused by the reckless, willful or wanton misconduct of such person.

Article XIII—Dissolution of the Club

If at any time the Club shall cease to carry out the purpose as herein stated, all assets and property held by it, whether in trust or otherwise, shall, after the payment of its liabilities, be paid over to an organization selected by the Board of Directors, which has similar purposes and has established its tax-exempt status under Section 501(c)(3) of the Code, and such assets and property shall be applied exclusively for such charitable, scientific, and educational programs.

Article XIV—Petition and Referendum

Each member of the Club shall have the right to petition the Board on any Club matter. If the Board does not concur and the petitioner secures the signature of 25 members of the Club, then the Board must submit the issue to the membership for a referendum.

Article XV—Amendments to Bylaws

These Bylaws may be amended by a majority of the members voting at any time, provided notice of the proposed amendment(s) shall have been sent to every member, and during one meeting of members sufficient time has been provided for a discussion of the proposed amendment(s). Ballots may be returned by mail or in person.