POINTS AND ANGLES

Newsletter of the Metropolitan Mathematics Club of Chicago

NCTM Charter 1 Metropolitan Mathematics Club of Chicago 1913

Volume XL January 2006 No. 5

Rules of Engagement

Robin Levine-Wissing and Tim Wierenga

BY RICH RUKIN

Are your students giving you that "deer in the headlights" look? Are they waiting for you to give them the answer? Are they trampling each other to get out the door? Have we got a session for you! Create a 5-star standard of engaging mathematics students. Develop a toolbox of strategies and techniques that engage students in reflection, questioning, and mathematical learning. Everyone will be active in the presentation through discussion and debate.

Robin has a Bachelor's Degree in Mathematics/Education from American University in Washington, D.C., a Master's Degree in Communication Sciences from Kean University of New Jersey, A Type 75 Administrative Leadership Certificate from North Central College in Naperville and 60 post-graduate hours in mathematics and technology. Robin has taught mathematics for 28 years in six states, she is currently the Instructional Supervisor for Mathematics at Glenbrook North High School in Northbrook. Robin received the 1993 Presidential Award for Excellence in Mathematics Teaching as well as the 1998 Tandy Technology Award. She is a T^3 National Instructor and a College Board Advanced Placement Consultant as well as an AP Statistics reader. Her interests are with integrating technology into mathematics classes and professional and staff development.

Tim has a Bachelor's in Education from Northwestern University and a Masters in Mathematics from Illinois State University. Tim has been on the faculty at Naperville North High School since 1984, serving as a Mathematics teacher, Mathematics Instructional Coordinator, and Assistant Principal for Curriculum and Instruction. Tim has done presentations on Curriculum Process, Portfolios, Calculus, and Trigonometry at NCSM, ICTM, and the National Academy for the Sciences.

Also, for our January meeting, we would like to thank the publisher McDougal-Littell for agreeing to provide complimentary wine with dinner.

REMEMBER!! You can earn CPDU credits for attending dinner meetings!

Date: Friday, January 13, 2006
Time: 5:30 p.m. Doors Open
6:00 p.m. Social Hour
7:00 p.m. Dinner and Talk
Place: Fountain Blue Banquets & Convention Center
2300 Mannheim Rd.
Des Plaines, IL
(847) 298-3636
Cost: Members $31
Nonmembers $37

RESERVATION DEADLINE
Monday, January 9th, by noon, please!
TO RESERVE:
Call Evanston Math Department at (847) 424-7600 or
email: reservations@mmcchicago.org
Requests for special meals must be made in advance.

From Southbound I-294 & Eastbound I-290:
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; Exit at Touhy Ave. & Lee Rd.; Walk East on Touhy to Mannheim Rd.

INSIDE...

Points from the Interior

BY JOHN DIEHL

Happy New Year! It is the time for reflection and resolution, and I'll try to apply that to our profession today. I hope you were able to attend our December meeting. Luckily, it was one night after the big snow and travel was better than it might have been! Don't miss our January 11 meeting. I know Robin and Tim have a presentation that will get you thinking about the Mathematics classroom! And…don't forget our workshop on January 28!

My reflections on teaching Mathematics led me to the concept of big changes: choices, decisions, or tools that made a major impact on teaching, for me and many others. No doubt, everyone would have a different list, and I would enjoy hearing others. For now, here are mine.

1. A choice made when I was very young but impacted later – the decision to create an AP Calculus course. Early in my teaching career, I had the opportunity to teach the course. What a stimulating experience! And guess what? I really learned what the subject was about.
2. The development of the scientific calculator. I didn't own one until graduate school and I thought it was an amazing tool.
3. Computer programming- BASIC, FORTRAN, APL, punched cards, syntax errors – fascinating!
4. The personal computer. If programming was big, having a computer on your own desk was huge!!
5. The graphing calculator. What can I say? I was so blessed to attend an institute when it was brand new, and my life was changed dramatically.
6. Geometry software. Sketchpad and Cabri allow us to explore geometry in such new and exciting ways. I believe we have a great start in using these tools to change the way we teach, but there is potential for so much more.
7. AP Statistics. This new course was created in 1997. I was so fortunate to have another topic full of new challenges and opportunities.
8. Statistics software. Computer software and sophisticated calculator software have made statistics a much better discipline than it was in the 70s and 80s. It's not just crunching numbers, it's now the entire study.
9. CAS. Sophisticated algebra systems have the potential to be the next big thing. We are on our way. There is still much to be done.
10. Most of all---the amazing educators I have met. No changes take place without people with vision, and people to make the vision happen. My career, especially the last 16 years, has taken me to wonderful places with the chance to interact with so many gifted educators. I am grateful.

My resolution: Don't stop now. More changes, more people, more places, more tools. Hope to see you along the way.

POINTS AND ANGLES
Volume XL, Number 5, January 2006
Points and 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://www.mmcchicago.org/

Correspondence may be directed to the editor:

Kristen Clegg
517 Wildflower Way
Streamwood, IL 60107
kristenclegg@comcast.net

Using Simulation to Learn and Do Statistics

BY GEORGE PRYJMA

On a blustery November evening, Allan Rossman, Professor of Statistics at California Polytech-San Luis Obispo, Fellow of the American Statistical Society, and President-Elect of the International Association for Statistical Education, was warmly welcomed to the MMC by our own President-Elect Richard Rukin. Saying that he checked Chicago on weather.com before leaving California, Allan lamented that he only now fully understood the meaning of "wind chill."

Allan gave us an overview of the evening's 3 main themes: statistical significance, sampling distributions, and statistical confidence. (Because of space limitations, only two examples will be presented in this summary.) Allan promised a plethora of examples to show the power of simulations in helping students understand the basic statistical concepts of sampling, significance levels, and confidence intervals.

To illustrate statistical significance using randomization tests, Allan chose Butler and Baumeister's (1998) "Friendly Observers" study. Studied was the effect of having an observer with a vested interest on skilled performance (a video game). Subjects played a video game 11 times, with only a win in the last game resulting in a small cash prize. Subjects were randomly divided into 2 groups: in group A, an observer would also win a prize if the subject won; in group B, the observer had no vested (financial) interest in his player's performance. The researchers conjectured that subjects in group B would do better than those in group A, because B's observers would not exert the "win" pressure on their subjects that would be exerted on group A subjects. The results were:

	A (share)	B (no share)	total
win	3	8	11
lose	9	4	13
totals	12	12	24

Do these results support the conjecture? Is $3/12 < 8/12$? Yes, but the key question is, "How often would such an extreme result occur just by chance if there was no effect of the observer's vested interest (in a subject's win). The just by chance in this experiment is the random assignment of subjects to group A or B. That is the basis of the inference." The simulation analysis is to assume that "winners" and "losers" would have performed as they did without regard to the group they were placed in.

Allan stressed the importance of having students do hands-on simulations to help them better understand the processes and underlying assumptions used in simulations. For this experiment, he created decks of 24 cards, 11 black to represent "win" and 13 red to represent "lose". Students would shuffle their card decks and then randomly deal 12 cards into an "A" pile and 12 into a "B" pile. The number of winners in the piles were recorded and the question asked was, "how often were there 3 or fewer winners in the "A" pile, solely due to random assignment?" Allan then simulated this experiment 1,000 times using a cute Applet (available on www.rossmanchance.com/applets) that showed cards being shuffled! With 1,000 trials, only 45 yielded 3 or less winners for group A. This is pretty strong evidence that there is indeed a significant difference between the two groups, because results by random assignments are unlikely to produce this difference. Allan also showed us the "Fisher's exact results" test that yielded a p-value of about 0.0498 (the probability of these extreme results based on random assignment to a group).

Allan used a Stickgold and Hobson (2000) study of the effect of sleep deprivation on performance to illustrate the application of simulation with quantitative data. 21 subjects were divided into 2 groups: 11 experienced sleep deprivation; 10 did not. Data collected from a pre- and post-test on a visual discrimination test yielded a 15.92 point difference in improvement from pre- to post mean scores between the two groups (the sleep deprived group improving much less than the other group). Using minitab to compute ALL 352,716 possible random assignments of the results for the 21 subjects into the two groups, a total of 2,533 outcomes resulted in difference of the means of at least 15.92. Thus the exact probability of achieving the experimental results by random assignment is 2533/352716 or about 0.0072. Looks like "pulling all-nighters" is not a very good idea!

Allan ended his most edifying, interesting, and entertaining talk with a few important conclusions. Simulations are both very helpful as tools for learning statistics and for analysis. Preceded by hands-on simulations that use carefully guided activities, they help students develop an intuitive understanding of fundamental statistical concepts. As tools for analysis, simulations take advantage of computing power that was not available to the "fathers of statistics," who had to rely on normal distribution models for analysis. Simulations may change the curriculum for Statistics 101!

Allan, thank you for a superb talk. I feel badly for those who missed it and have to rely on this very inadequate summary for a taste of what you did for us. Readers may communicate with Professor Rossman at arossman@calpoly.edu.

What is a Straight Line?

Phillip Mallinson
MMC, December 9, 2005

BY CAROL NENNE

What is a straight line? It seems like a fairly easy question – as Phillip Mallinson said, we all came in knowing the answer. Or did we? What about straight lines on surfaces that we don't normally consider as "straight?"

To investigate this, the idea of LOGO turtle-graphics was used, where a "turtle" walks in a straight path, leaving a trail behind it. The question was then raised as to what a straight line would look like on a cylinder of infinite height. One possibility is a circular path around the cylinder (figure 1). To illustrate this, a segment was drawn on a transparency, perpendicular to one edge of the transparency. When the transparency was rolled to form a cylinder, the straight line path became a circle.

Another possibility is that the line could be a helix (figure 2). This was shown by rolling the transparency at an angle. A third possibility is what we commonly think of as a straight line (figure 3). This is formed when the line is drawn parallel to generator of the cylinder.

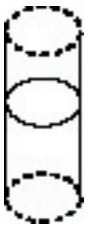

Figure 1

Figure 2

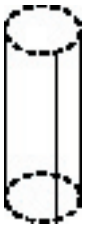

Figure 3

This led to a discussion of the uniqueness of lines on a surface such as a cylinder. Do two distinct points determine a unique line on a surface such as this? Do they ever? Is it always true that the shortest path between two points on the line forms a path on the line? A lively discussion of the properties and definition of a line on a cylindrical surface ensued.

We then delved into parallel lines. Do they exist on a cylindrical surface? Given a line and a point not on the line, how many lines parallel to the given line through the given point exist? One, many, none? This led to a questioning of the basic idea of parallel lines. How do we define parallel lines? As lines that don't have a point of intersection or as lines that are the same distance apart? It soon became clear that how we define parallel lines determines the answer to the original question.

Phillip then moved the discussion into lines on other surfaces. How would we define a line on a single nape cone? Initially we looked at a circle, similar to that on the cylinder (figure 4). But what if the line was drawn at an angle? In that case it seemed as though the line actually intersected itself, possibly more than once (figure 5). This idea created quite a discussion. Phil then "flattened" the cone, creating it from transparency grid paper with one quadrant cut out. As an extension, we investigated whether you have different results if you cut out more than one quadrant before forming the cone. Using the lines on the grid paper, it was clear that parallel lines intersect on the cone before once again becoming parallel.

Figure 4

Figure 5

We then moved on to other surfaces. What about a negatively curved surface such as a lampshade? What about a sphere? What about a cube? If you start at a point on an edge of the cube, other than a vertex, and move with a constant slope to form a line, what does the "line" look like? In the first example Phillip demonstrated, the line extended through all six faces of the cube before coming back to the same point at which it began. So what about lines with other slopes? In another example, the line crossed only four faces, but intersected itself three times before coming back to the same point. The question then became whether or not it could it cross exactly five faces? Under what conditions does it cross four or six faces? What if there were two parallel paths, each on a different side of a vertex? Will they intersect? Where? What if the distance between them becomes infinitely smaller? Could the path form a helix if the line has a slope less than one?

At the beginning of his talk, Phillip Mallinson told us that we came in knowing the answer to "What is a Straight Line?" and that his goal was that we leave confused. Whether we were confused or just had a whole lot more questions than answers, this talk certainly gave us a chance to think "outside the line" and stretch our understanding of a basic concept.

- Featuring a CAS (Computer Algebra Systems) Strand
- Located at the Hyatt Regency McCormick Place
- This will take the place of the 2006 ICTM Confeence

MMC Problems for January

In this part we look at a few extensions of classical problems from algebra.

1) Two rivers, the Little and the White, flow into Lake Millwood. Leaves a dock on the Little River, a boat goes 24 miles to the lake, wanders around the lake for 2 hours, then goes 32 miles up the White River to a second dock. The total trip took 8 hours. If the boat had taken 10 hours, it would have covered 18 extra miles in the lake. Find the rates of the two rivers, if the Little River flows 2 miles per hour faster than the White River.

2) At the same time, two friends Emza and Impsa left their houses and met at Orora. Had Emza started an hour earlier and Impsa half an hour later, they would have met 45 minutes earlier. If Emza had started half an hour later and Impsa had started an hour earlier, they would have met 1 mile closer to Emza's house than Orora. Find the speed of each person.

Michael Keyton
IMSA
keyton@imsa.edu

MMC Membership and Change of Address Form

Mail to: MMC
415 S. Ridgeland Ave. #2
Oak Park, IL 60302

Make check payable to MMC.

Please use a different form for each person.

Name _____

Address ☐ _____

_____

Phone _____

School _____

Address ☐ _____

_____

Phone _____

E-Mail _____

Check preferred mailing address above.

☐ Change of Address

Membership: ☐ New ☐ Renewal

Choose one:

☐ 1 year ($20) _____

☐ 2 year ($35) _____

☐ 3 year ($50) _____

☐ 1st year teacher ☐
☐ retired ☐ ($10) _____
☐ student ☐

Donations:

Scholarship Fund _____

Speaker Fund _____

Total amount of check: _____

NOTICES & REMINDERS

Mark the Date

Saturday, January 28th

in your assignment notebook!

MMC Conference
of Workshops

at Hinsdale Central High School

WE NEED YOU! VOLUNTEER!!

Volunteer to help at the NCTM Regional Meeting
in Chicago September 20-22, 2006

It takes great people like you to make the conference
a success! Contact either Gwen Zimmermann
(gzimmerm@hinsdale86.org) or Laura DiMarco
(ldimarco@hinsdale86.org) for more information.
(or phone 630.570.8421)

HTTP://WWW.MMCCHICAGO.ORG/

Old issues of POINTS AND ANGLES, summaries of talks given at MMC meetings, the MMC Scholarship application, job openings and people looking for jobs, and more!

If you would like a notice or reminder to appear in POINTS AND ANGLES, please email the text you would like to appear to kristenclegg@comcast.net no later than the date of the MMC meeting preceding the issue in which you would like it to appear. All notices are subject to editing.

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

MAILING LABEL

METROPOLITAN MATHEMATICS CLUB OF CHICAGO
c/o MMC
415 S. Ridgeland Ave. #2
Oak Park, IL 60302

STAMP