



A message from the Executive Director, Tom Young

Will we ever get over the pandemic?! A week ago, the word omicron was not in my vocabulary.

Meet Two went pretty well, and the number of coaches verifying answers incorrectly was way down. Scores were good! We did have two challenges regarding the form of an integer. See Colin Gardner – Springer’s column.

Meet Three is Monday and Tuesday December 13th and 14th. New time slots will go from 2:30 to 4 and 4- 5:30 **The time slot sign up will be open Wednesday December 8th at 8 am** A pdf of the problems will be sent out early Friday, December 10th. Some divisions are meeting in person and therefore the answers are included in the pdf. Be extra careful not to let answers out.

We’ve hired a new Associate Director, Sharin Park. A big welcome to her! See her bio below. Sharin replaces Lisa Olson, who is seeking other avenues for her talents.

RECRUITMENT VIDEO Project (no submissions yet!)

I have a goal of increasing the number of participating schools and I’d like your help. I’d like to compile film footage of students and coaches participating in and talking about Math League. My thought is to edit the footage together and send it to ADs, principals, and superintendents in the state, advertising our great activity. We’d have to get the video to students somehow, also.

So, help by taking iPhone videos, or ask the film students in your school to make Math Team one of their projects. See a more detailed list of ideas for footage later in newsletter. Get Creative! Tell your story! Good luck in Meet Three! Go Math Team!

Introducing our new Associate Director, Sharin Park

Hello, my name is Sharin Park and I’m so excited to join the Minnesota Math League as the Associate Director! I began my career in the field of education as a teacher. From there, I shifted into the research field where I primarily focused on research-practice partnerships in the field of education and distributive leadership in schools. Currently, I work as the Director of Parent Programming at Jeremiah Program - a leading national non-profit in the two-generational field. I’m a proud graduate of Rochester Century High School and the University of Minnesota, and have my M.S.Ed from Johns Hopkins University and the University of Pennsylvania.



Excited to connect with all of you soon.

A message from Colin Gardner – Springer, Head of Problem Writing Team (HPWT)

Congratulations on a strong Meet 2 performance!

We received challenges from a couple of students who entered an alternate form as their answer (for instance $2/1$ rather than 2). These were denied based on guidance in the League Manual: “challenges of whether the response is an acceptable form of the answer should not occur as all answers are integers ... no other answer should be deemed acceptable.” Your answer should be one of the integers $\{\dots, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, \dots\}$: it could be negative, zero, or very large, but should not include any fractional component and must be entered as a number, not an expression.

Performance historically drops as meets progress through the season. No doubt this is related to the continued introduction of advanced topics, and the cumulative nature of subject matter. In order to be successful, students need to familiarize themselves with the topics covered in each meet, some of which are not traditionally covered in school.

As a starting point, in Meet 3, problem A1 will be a system of linear equations in two variables, B1 relates to the area and perimeter of quadrilaterals, C1 assumes knowledge of the Law of Sines, and D1 requires solving an equation involving radicals. Of course, other topics are also covered, but if you know these you should be able to score at least one point per event!

While Math League problems rely on the topics list specified, at a more fundamental level it is our goal to familiarize students with a variety of problem-solving techniques. Meet 3 will include at least four word problems, requiring students to translate English sentences into mathematical equations. This skill comes up over and over: I’d encourage everyone to review and fully understand how to solve A3 from Meet 1 and A2 and A3 from Meet 2, whether or not you plan to take Event A at Meet 3. We’ll highlight other problem-solving techniques in future newsletter columns.

Good luck on Meet 3, and we’ll look forward to seeing you back in the New Year!

RECRUITMENT VIDEO Project Suggestions

1. Take footage of students solving an individual event. We will make a montage of several students solving problems and superimpose a timer in the corner.
2. Tell your story: Why did you get involved? What do you like about it? How do you deal with success and failure? What do you do for practice?
3. Describe and get footage of your Math League t – shirt if you have one.
4. What are your goals for the future? How will Math League help you attain them?
5. What are your goals for the League for this year?
6. What could be better about the League?



Be Creative!

All State Team Update

This fall the Minnesota All-State Math Team (MN Math Team) participated in two tournaments, each for the first time: the Yale Math Competition (aka Math Majors of America Tournament for High Schools, or MMATHS) 2021 and the Berkeley Math Tournament (BMT) 2021.

Yale Math Competition (aka MMATHS 2021)

[MMATHS 2021](#) was held Saturday, 30 October online. The MN Math Team fielded three subteams: MN Red (Matthew Chen, Evan Erickson, Linden Lee, Minkai Li, Luke Patefield, Aurora Wang), MN Orange (Golden Peng, Michael Rascher, Devang Sharma, Jerry Zhang, Henry Zheng; yes, only 5 mathletes), and MN Yellow (Nathan Elango, Keerthi Kaashyap, Izzi Lauer, Laasya Aki, Robin Liu, Adhvaith Sridhar).

The contest consists of a single 12-question, 75-minute individual exam on algebra, geometry, number theory, and combinatorics, and a 75-minute “Mathathon” team exam with 7 sequentially completed problem packets of increasing difficulty.

Team event (not overall team) results: MN Orange (25th of 80 teams), MN Red (32nd), MN Yellow (71st). Top individual results (listed alphabetically by last name within a given score): Linden Lee (5th overall of 400+ mathletes, normalized rounded score 10/10), Evan Erickson (9/10), Matthew Chen (7/10), Minkai Li (7/10), Nathan Elango (6/10), Luke Patefield (6/10), Golden Peng (6/10), Michael Rascher (6/10), Jerry Zhang (6/10), Henry Zheng (6/10). An overall (combining team and individual events) ranking was not provided by MMATHS; however, assuming the team event and individual event sum is equally weighted, Coach MacLennan calculates the rankings would be: MN Red (13th of 80 teams), MN Orange (31st), and MN Yellow (63rd).

Special thanks to former MN Math Team tri-captain Jason Wang, a first-year student at Yale who serves as the MMATHS Head Problem Writer and alerted us to MMATHS 2021.

Berkeley Math Competition (BMT 2021)

BMT 2021 was held Saturday and Sunday, 20-21 November online. The MN Math Team fielded a single subteam: MN Gold (Matthew Chen, Nathan Elango, Linden Lee, Alexandra Levinshteyn, Robin Liu, and Kevin Yang). Our entry was rather last-minute, so mathlete preparation (review of past exams) was minimal, but we gained a good sense of the tournament.

The contest consists of two individual events (selected from Algebra, Calculus, Discrete, and Geometry), a Power (topical theme) team event and a Guts team event. Alas, full individual and team results and rankings were unavailable as we go to press.

HMMT Fall/November 2021

The MN Math Team had hoped to participate in the Harvard-MIT Math Tournament (HMMT Fall/November), which is a “closed” tournament (teams are invited based on past performance or subject to lottery); however, though we have fared well in past HMMT Spring/February events, the team has never participated in an official HMMT Fall/November event, having been shut out in the lottery in both 2019 and 2021. (We did participate in the 2020 event, which was open due to the pandemic.) HMMT is a longstanding tournament and well-run. We will continue to try to gain entry and do well once we do so that we are invited back; however, we will also continue to explore alternative events in order to provide opportunities for Minnesota mathletes to compete at the national level.

The Impact of Math Team

The call went out in the summer of 2020 to Math League alumni to Share Your Story. Stay tuned for another story in the next newsletter.

Summer Coaches Conference 2022 Hall of Fame Induction Date: TBD

We've had to postpone our 40-year celebration due to the pandemic. Hopefully we will be able to hold a celebration this August honoring our new Hall of Famers and toasting to another 40 years!

2022 Summer Math Institute

Dates TBD at Augsburg University

The League hopes to offer two one-week programs of the Summer Mathematics Institute in 2022. The pandemic will shape our decision; we think we can offer the program, but perhaps not a residential one.

One would be for students entering grades 7-9 in fall of 2022. **The topic would be Infinity.** The other would be for students entering grades 10-12 in fall of 2022. **The topic would be Writing and Solving ARML Power Contest Questions.**

Stay tuned!

The Roberts Award Scholarship

The Roberts Award Scholarship(s) were established in honor of the League founder, Dr. Wayne Roberts of Macalester College.

The Scholarship(s) are offered to help offset the costs for students interested in attending an out-of-state math opportunity. They are offered once each year. A set amount of funds will be available each year, and multiple awards are possible.

Deadline to apply for this season is April 30, 2022

Applications can be found on our web site at: http://mnmathleague.org/?page_id=1033

Other Math Competitions to check out

[Mathworks Math Modeling Challenge](#)

[Modeling the Future Challenge](#)

[SCUDEM](#)

[CoMAP High School Mathematical Contest in Modeling](#)

[CoMAP Mathematical Contest in Modeling](#)

[Math Madness](#)

[Purple Comet](#)

[ARML Local](#)

[ARML Power Contest](#)

[USAMTS](#)



MN State High School Math League Math Team Video Contest

1st place: \$200 to school's math team

2nd place: \$150 to school's math team

3rd place: \$100 to school's math team

Video Guidelines:

Produce a 90 second video explaining why you like to be involved in the Math League. Videos might include: student interviews, teacher endorsements, sample problems, or video of practices/meets.

Video Entry Submission:

**Videos are due to the Math League Office
(mathleague@augsborg.edu)
by *March 1st, 2022.***

- **Videos contest entries must be sent and approved by the school math team coach.**
- **Winning schools will be notified by March 7, 2022.**
- **Winning videos will be shown at the State Tournament on March 14, 2022, uploaded to the Math League Facebook page, and may be used for other promotional purposes.**

Questions? Email mathleague@augsborg.edu

Coaching Tips from Bill Skerbitz, Wayzata coach (student tips next newsletter)

"Secrets to Success" for coaches:

- Teach to the topic list! Do your research as a coach - look at old math league problems/solutions, look at similar problems from Art of Problem Solving books and from old AMC questions (and from any other resources) - it's often helpful to look up the derivations/proofs of key ideas to better prepare your students for how/why certain ideas might be used, and study/learn those ideas for yourself. And by "look at," I mean "work through for yourself" and then compare your work to published or suggested solutions.
- Teach to the topic list! But - study old problems to see novel uses of the topics ... for example, "cevians" are a topic on meet 2 ... but it might be helpful to go a little deeper and study what's special about cevians in special triangles (isosceles, equilateral, right, etc.) ... not just "what is a cevian," but also, "how might we use these properties?"
- Teach to the topic list! But make sure you accommodate the wide variation in your students' backgrounds and skills - a number of younger students who have to do events A and B might not have learned many of the geometry topics yet!
- Teach to the topic list! We give lots of work time during our weekly 90-minute practices, but we also make sure we talk about the topics on the topic list!
- Most math team coaches are also teachers - for those of us who teach mathematics, we often stress "showing our work." But in math league, the LESS work one shows, the more efficient one can be during a 12-minute event. So coach the students to write enough to come up with a solution, but there is no need to write more than that!
- If you have more than 8 students - give students a way to work their way onto the "scoring" team. A head-to-head playoff, or scores on previous meets, etc. Use the pdf builder on the scoring website to create playoff events for a given meet.
- Read Polya's "How to Solve It" (and incorporate his advice)!
- Bring food (but maybe not during a pandemic).
- Give goals based on students' abilities - For example - if a beginning student studies the topic list, they ought to be able to get one of the first two questions correct, so aim for 1 to 3 points per event for beginners, and celebrate their successes.

- Get your school/students involved in the AMC exams.
- Get an early start on getting middle school students interested in the AMC 8 and/or in Jr. High math league, math counts, etc. and keep communication open between high school and middle school coaches.
- Make sure students see that you hold high standards for yourself as a coach - most humans learn by example, so take advantage of the opportunity to be an example for your students - be organized, thoughtful, accommodating, patient, and encouraging.
- By all means, avoid giving the impression that you don't care about how the team does or about how an individual does on their events.
- On the flip side, be careful not to do too much FOR your students.
- Students generally can do more than we think they can - we do them no favors when we "protect" them from new knowledge that we might think is beyond their abilities. A lesson encouraging failure and perseverance is much more useful than a lesson encouraging avoidance and one's own perceptions of inadequacy. So - encourage them and then GET OUT OF THEIR WAY! (But - as a teacher/coach, the more knowledge/understanding you have about something, the more targeted encouragement you can provide.)

Coaching Resources

- Art of Problem Solving, [Volume 1](#) and [Volume 2](#) (Sandor Lehoczky and Richard Rusczyk)
- Art of Problem Solving website in general ([Alcumus](#), [Forums](#), etc.)
- [Competition Math For Middle School \(Jason Batterson\)](#)
- [Treasure Trove of State, National, and International Contests and Questions](#)
- [AMC Questions and Solutions](#)
- Youtube channels: [3blue1brown](#), [numberphile](#), [james tanton](#)

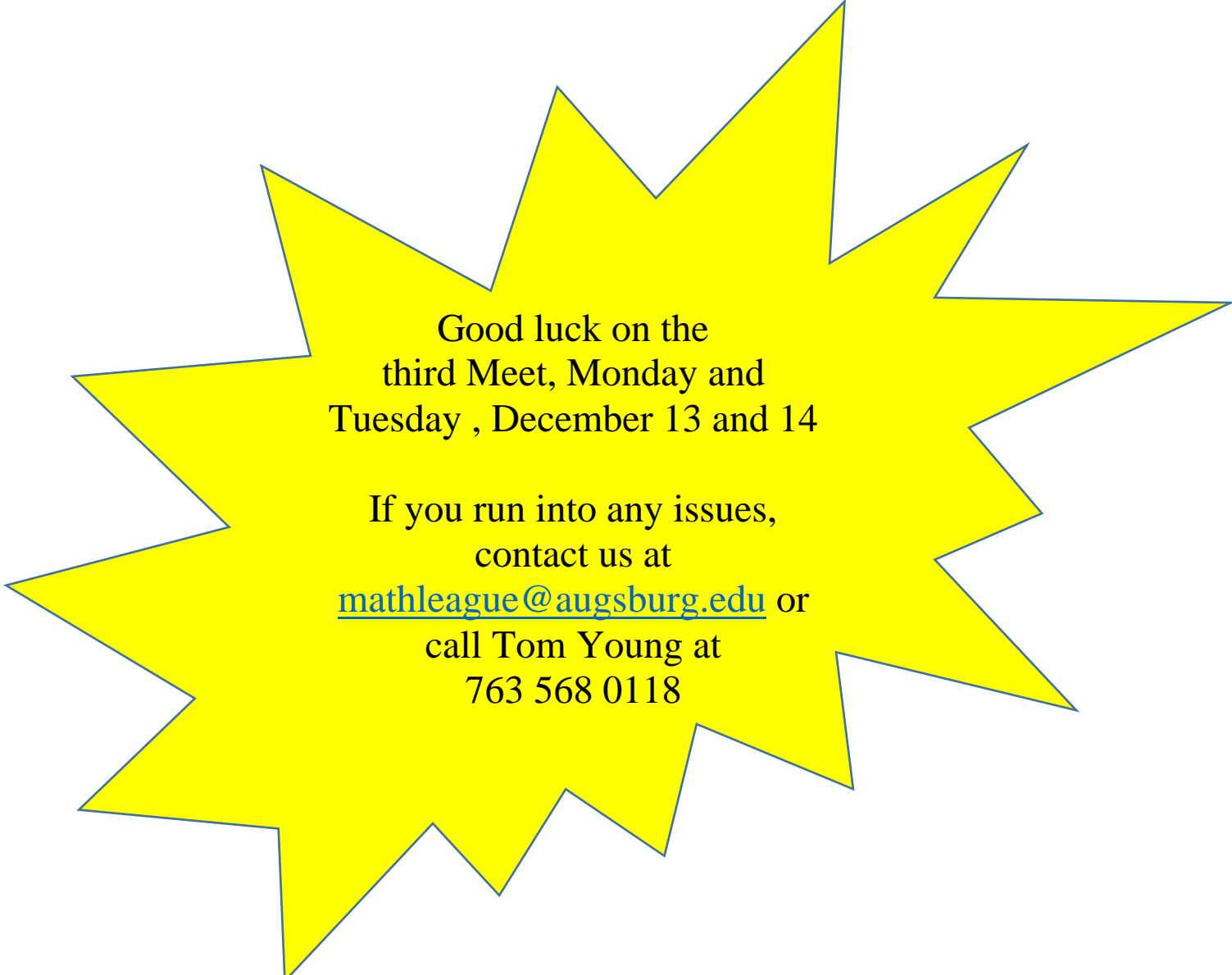
Free Texts from the Summer Math Institute!!

Dr. Ken Suman, a retired mathematics professor at Winona State University, has been our lead teacher in the 10th – 12th grade SMI for the past two years. In 2018, students at SMI studied Counting Techniques and in 2019, they studied the Theory of Equations.

Dr. Suman wrote texts for the classes, specifically with Math League in mind. These texts are a goldmine of information. Dr. Suman has willingly shared his expertise and suggested that the texts be available to all Math Leaguers.

To that end, the pdfs of the texts can be found at scoringmnmathleague.org under the Coaches Corner tab. Then click on Topic Resources and you'll see the links.

PowerPoints available to help remind you of how to run a meet. They're posted on mnmathleague.org website under For Coaches link



Good luck on the
third Meet, Monday and
Tuesday, December 13 and 14

If you run into any issues,
contact us at
mathleague@augsborg.edu or
call Tom Young at
763 568 0118

Problem Corner

an effort to spur conversation

If you'd like to contribute a problem or send in a solution, email tomyoungmathman@gmail.com

Student solutions encouraged!

Newsletter #28 Puzzler:

From the Putnam exam <https://kskedlaya.org/putnam-archive/1997.pdf>

A rectangle, HOMF, has sides $HO = 11$ and $OM = 5$. A triangle ABC has H as the intersection of the altitudes, O the center of the circumscribed circle, M the midpoint of BC, and F the foot of the altitude from A. What is the length of BC?

SOLUTION

The centroid G of the triangle is collinear with H and O (Euler line), and the centroid lies two-thirds of the way from A to M. Therefore, H is also two-thirds of the way from A to F, so $AF = 15$. Since the triangles BFH and AFC are similar (they're right triangles and

$$\angle HBC = \pi/2 - \angle C = \angle CAF),$$

$$\text{we have } BF/FH = AF/FC$$

$$\text{or } BF \cdot FC = FH \cdot AF = 75.$$

$$\text{Now } BC^2 = (BF + FC)^2 = (BF - FC)^2 + 4BF \cdot FC,$$

$$\text{but } BF - FC = BM + MF - (MC - MF) = 2MF = 22,$$

$$\text{so } BC = \sqrt{22^2 + 4 \cdot 75} = \sqrt{784} = 28.$$

Newsletter #29 Puzzler: <https://artofproblemsolving.com/community/c6h1978318p13737096>

Find M, the smallest positive multiple of 32 such that all of its digits are either 6 or 1