Minnesota State High School Mathematics League

Newsletter

Issue #30 January 7, 2022

A message from the Executive Director, Tom Young

I'm weary of the pandemic. A week from now, omicron may force schools to go virtual, or shut down for a week because there will be no one healthy enough to teach or learn! This too shall pass.

Meet Four is Monday and Tuesday January 24th and 25th. Popular time slots will go from 2:30 to 4 and 4- 5:30 That seemed to work well for Meet 3.

The time slot sign up will be open Wednesday January 19th at 8 am

A pdf of the problems will be sent out early Friday, January 21st. Some divisions are meeting in person and therefore the answers are included in the pdf. Be extra careful not to let answers out.

Important nuts and bolts information

Meet 4: Nothing changed here. Some divisions are meeting in person.

Meet 5: Meeting in person is not discouraged. If the division meets in person, events and team test should be administered and graded as they were pre-pandemic. Scores should be entered via the Meet Op > Score Entry menu. Meet 5 awards will be mailed like last year, once all challenges are judged. Event D will be variations on the November 2021 AMC 12 A and B. The tests and solutions can be found at AMC12 A and AMC12 B.

State Tournament: At the executive committee meeting in December, the committee decided to plan an in-person tournament. Instead of gathering for a lunch banquet, teams will be given lunches to eat in their assigned team room. Masks will be required for all. No virtual participation will be allowed; if a team member tests positive for Covid, an alternate must be chosen to attend. If a team cannot muster enough participants, their spot in the tournament will be vacated. Individuals unable to attend the Invitational will vacate their spots in the Invitational. More information on state tournament procedures will be included in the information given to qualifying teams

RECRUITMENT VIDEO Project (one submission!)

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 Four! Go Math Team!

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

With the New Year underway and our season more than half complete, it's the perfect time to look back at some season statistics through Meet 3!

Overall, half of students have scored 3 or more on events this year, with half scoring 0, 1, or 2 (out of 7). One in six students scored 5 or more, with one in 25 being awarded a perfect 7!

My takeaways? For starters, getting a single problem correct is to be commended - remember that these Meets are taken by the state's top mathletes. Scoring 3 or more on an event is particularly impressive, and scores of 5 or 7 are truly exceptional. After each Meet, take time to review and understand the problems you missed.

As always, for Meet 4 you'll need to be familiar with the specified topics list (and topics from prior Meets). Reviewing problems from past years is an excellent place to start - the only way to get really good at solving problems is by solving (or trying to solve) a lot of them!

To get you started, some topics which will definitely be covered on Meet 4 include rational expressions (such as square and cube roots), areas of circles and sectors, arithmetic sequences, and equations of circles (and other conic sections).

Problem Solving Technique of the Month: Draw a Picture!

For geometry problems, if no diagram is given your starting point should nearly always be to create one: doing so is tremendously valuable in understanding the problem. It may take a few tries to fully represent the given information.

Even if a diagram was provided, you'll almost certainly want to add more information to it - locate circle centers, draw additional line segments, etc. Keep in mind what you're trying to determine, and be sure to incorporate all of the information given - how could they be connected?

This technique isn't limited to geometry problems … as you're reading a problem feel free to doodle or sketch anything which could help represent and ultimately solve it.

Stay warm, and enjoy Meet 4!

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!

A Message, from students, to be **shared** with all Math League Students

Mathing it Forward

Evan Erickson, Minkai Li, and Kevin Yang

On Volunteering in Math

Why should you volunteer?

Before we talk about how you can volunteer, we should discuss why you should volunteer. We will list a few of the most prominent reasons we captains believe in the value of paying it forward (although there are certainly more)!

First, you can help instill your passion for math in others. We're confident everyone has fond memories of math, from cracking that one tricky problem to making close friends and debating with them about the best method to approach a particular problem. Along the way, there were probably some pretty important people that cultivated your love of math. You can do the same! In that way, you're paying forward all the time someone else once invested in you. There is also something deeply gratifying about seeing someone you helped start to build the same love of math you have, as they chatter excitedly about a problem or furiously scribble down notes.

Second, it helps you learn math. Teaching math can be one of the best ways to learn it. Nobel prize-winning physicist Richard Feynman's favorite technique to learn the complex material of physics was trying to explain and teach it to others in a simple, concise manner ("trying to explain it to a five-year-old"). When you can fully explain a topic, you understand the motivation of the technique and the intuition and type of problems that demand that problem-solving technique. Teaching math is the perfect practice!

Finally, this should in no way be the main driving force, but volunteering in math tends to look good on college apps. When you do something you feel passionate about, you tend to put more time into the activity. When you put more time into the activity, you tend to make a more significant impact (maybe helping each student more, helping a larger number of students, creating more useful material, etc.) As a happy byproduct, you've likely made yourself a stronger college applicant by making an impact on something you're passionate about. For more college applications advice on living your life in a "good" way with the happy byproduct of being a stronger college applicant (from an individual far more qualified than us), read here, MIT's "Applying Sideways" article.

How can you volunteer?

Hopefully, we've convinced you that you should volunteer (if you have any questions, feel free to contact us, our contact info is at the bottom). But what are concrete ways you can volunteer? We've listed a few ways you could go about it, but these are just some suggestions. Feel free to look into other ways as well!

First: tutoring a neighbor, family friend, younger sibling, etc. Whether this student is struggling with their homework or probing the strange waters of "competition math," you can help lead the way. Hopefully, regardless of what they are learning, you try to infuse (even just a tiny amount) of the beauty and appreciation for math you have.

Second: Helping out at a local elementary or middle school math team. Perhaps you're helping coach a team you used to participate in, or you form a team if one doesn't exist. You might create hints to certain problems, explain solutions, or even create your own curriculum. It's up to you! (This was the way Evan and Minkai both started volunteering, coaching at their local middle school Mathcounts teams.)

Third: Helping out at existing organizations. There are plenty of great organizations that are always looking for more dedicated and passionate volunteers. Feel free to Google them or use other sites to find them! Because we are corrupt individuals looking to exploit our minimally powerful leadership positions for our own gain, we will highlight two organizations we are a part of (though certainly there are other valuable organizations besides these two). Kevin is VP of events for TutoringMN, which provides free virtual year-round classes. If you are interested in being a tutor, you can find more information here. Minkai and Evan co-founded MNMOC, the Minnesota Mathematical Online Camp, a free virtual summer camp for middle schoolers. To ensure the camp can run for years to come, MNMOC is looking for individuals who are willing to help at the camp this summer: either running logistics for the camp, explaining certain concepts as a lecturer, or working as a TA in small groups with students and helping explain problems. You'll have plenty of help from Minkai and Evan if you join. If you are interested, please email us.

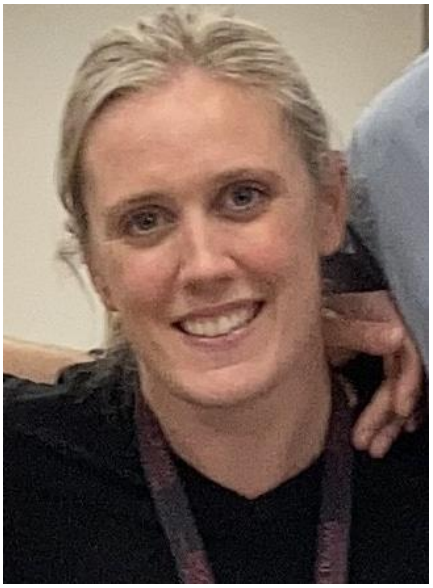
Evan Erickson: evanberickson@gmail.com
Minkai Li: minkai.li64@gmail.com
Kevin Yang: kevineyang271@gmail.com

The Impact of Math Team

The call went out in the summer of 2020 to Math League alumni to Share Your Story. Here is one alumnus who shared

Kirsten Young

2007 Graduate of Spring Lake Park HS



Undergraduate Degree: BA in German and Biology at St Olaf
Graduate Degree: Doctor of Osteopathy, Des Moines University
Residency: Beaumont Hospitals Detroit

Currently works as : Emergency Medicine Physician in Salt Lake City

I can't recall the first time I heard about math team, but I must have been a child. I remember my dad solving test problems at home, and I would hang out in his classroom after school while the team practiced.

Once I was in high school, I immediately joined (events A and D always). It was a space where I was surrounded by people who all had new and interesting perspectives on how to come to the same conclusion. During my undergraduate years at St. Olaf college, where I majored in biology and German, I continued to use this experience of listening to other people's ideas and expertise. This remained vital as I obtained my Doctor of Osteopathic Medicine degree. I am now an emergency medicine physician based in Utah, and am expecting my first child with my wonderful husband. I am grateful for my math team experience (thanks dad!) and all that I learned from it.

Spreading the word about Math League

Greetings from Rena Erickson, our Social Media Manager.

Here's a list of things that would help in spreading the word about Math League in the virtual world:

* Following the League's pages on Facebook, Instagram, and Twitter
* Liking & commenting on posts (makes me feel good & it helps with the algorithms)
* **Sending pictures of your team to mnhsmlsm@gmail.com**
* Sending math-related articles/videos that are social media-friendly.
* **Sharing stories about YOU, coaches making the League possible.**

Thanks for helping me share the awesomeness that is Math League.

Rena

Summer Coaches Conference 2022
Hall of Fame Induction Dates: August 11 - 12

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

Make plans to attend!!

2022 Summer Math Institute

June 26 – July 1 Residential Camp for 10th – 12th graders
June 27 – July 1 Day Camp for 7th – 9th graders

The League plans to offer two one-week programs of the Summer Mathematics Institute in 2022. So far, it's full speed ahead!!

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

MN State High School Math League

2022 State Tournament T-shirt Design Contest

Prize: **$50 VISA Gift Card and a Free T-shirt**

How to enter:

Submit a one-color design for the t-shirt front.
The design should include the words:

MN State High School Math League
State Tournament
March 14, 2022

- Email your design by **Feb. 1st** to: mathleague@augsburg.edu
- Accepted file format: pdf only
- Include your name, grade and school in the email submission.
- Winner will be notified by Feb. 17th via email.

Since the state tournament is on PI Day, designs incorporating that fact will get heightened attention!

Email mathleague@augsburg.edu with questions

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@augsburg.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@augsburg.edu

Student Tips from Bill Skerbitz, Wayzata coach

"Secrets to Success" for students:

- DO the problems, especially old math league problems. Of course, AMC and other contest problems are good as well. Speaking of which, following along as someone else does the problem (live, via video, or in a solutions manual) is not the same as doing the problem for yourself. So DO the problems.

- We learn mathematics by working on problems we don't know how to do. As tempting as it is, avoid spending your time "practicing" problems you already know how to do.

- As Keith Devlin stated in his "Devlin's Angle" blog recently: (grossly paraphrased) If you're not making mistakes, you're probably working on problems that are too easy for you!

- So, making a mistake does not mean you are "bad at math," as students like to say. Instead, learn from mistakes - what erroneous assumptions led to the mistake? And how might we prevent ourselves from making the mistake again? Was it a lack of understanding of key concepts or theorems? Was it sloppy arithmetic? (When my students stand in awe that I survived a whole calculus problem without making a mistake, I tell them that I'm no different from them - I've just made a few thousand more mistakes than they have and therefore I have a better sense of what to look for to avoid them ... and I CHECK MY WORK!)

- Even if you know how to solve a problem, or even if you do it correctly, study published or suggested solutions. There are typically many ways to solve problems, and some techniques might "click" better for an individual, might be more efficient or "clever," or might end up being useful in another context.

- Follow George Polya's advice: try to solve a problem you've already solved in another way.

- When you are in a position in which you do not know what to do, DO SOMETHING!

- Corollary from Tom Young: **When you're stuck, don't *stop* thinking, START thinking!**

- In geometry in particular - draw a diagram that is LARGE enough to be useful and know the specific theorems mentioned in the topic lists!

- In trigonometry - BEWARE of the QUADRANT and know the specific identities mentioned in the topic lists!

- PRACTICE - Try to do at least one, if not two, of each of your events each day, and set a timer for 12 (or 15) minutes. Check the solutions afterward. Studying the topic list without trying to do any problems will not work very well.

- Work with friends/peers - conversation and community are important parts of learning!

Good luck on the
fourth Meet, Monday and
Tuesday, January 24 and 25

If you run into any issues,
contact us at
mathleague@augsburg.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 #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

Solution: the smallest positive multiple, ***M***, is 11616

if ***M*** has one or two or three digits all candidates fail
if ***M*** has four digits .Note ***M = …16***. Then ***M = 1116, 1616, 6116, 6616*** all of which fail
if ***M*** has five digits. ***M*** =11116 which is the first possible, fails
Then ***M*** =11616

Newsletter #30 Puzzler:

Searching the OEIS (oeis.org) for "open questions", I found this interesting statement. If you can close the discussion, kudos and renown to you!

It is an **open question** whether any two distinct Pythagorean Triples can have the same product of their sides.