



A message from the Executive Director, Tom Young

Hello all! Good luck to you all this year!

Here's Newsletter #1 for the 2023 – 2024 season. In it, notice these items:

1. A message from Colin Gardner Springer
2. Meet Dates for this season 2023 – 2024
3. Practice Meets ZeroA and ZeroB
4. Letter of Intent (LOI) and entry fee checks
5. Section Assignments for 2023 – 2025
6. Odds and Ends for this season including updated Code of Conduct
7. Code of Conduct for this season
8. *Plan for next year for Math League 2.0*
9. Legislation to create scholarships for Math League students still being pursued

SMI Pictures!



1. A message from the HPWT (Head of the Problem Writing Team) Colin Gardner-Springer

I hope you're all as eager as we are for the 2023-24 Math League season!

Revised Policy allowing Posted Solutions

A resolution was passed at the recent board meeting allowing for the posting of solutions onsite upon completion of an event, without needing to wait for all schools to finish. We hope that immediate feedback encourages the learning process while problems are fresh in mind. Of course, problems and solutions aren't to be discussed or shared externally until all sites are done.

Problem Writing Team Changes

I'm excited to announce two new additions to our problem writing team!

Lee Trent, a graduate student at the U of M, has an accomplished resume: among other things she's been a TA for the Art of Problem Solving and founded and organized the first three Sonia Kovalevsky Math Days for Girls at Rose-Hulman Institute.

Alexander Zhu is an MSHSML alum, winning the Math Bowl at State in 2017-18. He's also been an assistant coach to the All-State Math Team, helping prepare our students for ARML, and has written his own Mock ARML test the past two years.

We're very lucky to both Don Barry and Roy Zhao both returning as problem writers. Don has filled many roles over the years, including as a longtime problem writer, teacher, former head problem writer for ARML, and much, much more. Roy is another MSHSML alumni and Math Bowl winner (2012-13). Currently a postdoctoral student at CalTech, he previously earned degrees from Princeton and Berkeley.

Finally, a hearty "Thank You" to retiring problem writers Jim Walker and Mike Swenson for their many years of contributions to our league as part of our problem writing team. We're enormously grateful to you both.

We hope you enjoy this year's problems; best of luck this season!

Colin Gardner-Springer

2. Meet Dates for 2023 - 2024

Meet 1	November 6, 2023
Meet 2	November 27, 2023
Meet 3	December 18, 2023
Meet 4	January 22, 2024
Meet 5	February 12, 2024
Tournament	March 11, 2024

3. Practice Meets 0A and 0B will be available

0A: Monday/Tuesday October 23/24 sign up opens Wednesday October 18

0B: Monday/Tuesday October 30/31 sign up opens Wednesday October 25

4. If you haven't already submitted your LOI or paid your entry fee, we ask you to attend to these quickly

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, 2024

Inquire at mathleague@augsborg.edu for applications

4. MN State HS Mathematics League Class and Section Assignments for 2023 – 2025

Every two years, the League revamps class and section assignments due to shifts in school populations, changes in number of participating schools, and changes in Class assignment due to past performance. The guiding language is found in the League Manual:

Class and Section Structure for State Tournament Qualification

For the purpose of qualifying for the State Tournament, the schools in the League will be organized into three Classes as outlined below. Each Class is composed of 8 Sections with schools placed in a Section based on similar geographic location.

Class Assignment

Placement of teams into Classes shall be based on enrollment numbers from the Minnesota State High School League for the upcoming two-year cycle. Class assignments will be for two-year cycles. The current two-year cycle ends in 2023.

The process utilized was:

- A. Use MSHSL enrollment data to rank schools according to size. Enrollments found at https://www.mshsl.org/sites/default/files/2023-03/csp_Enrollments%20by%20Alpha_2023-2024%20and%202024-2025.pdf
- B. We divide the number of schools (at this writing 158) into roughly 3 equal groups. The division into 3 groups may be affected by historical assignments, whether there exists a natural break, how uneven the groups can be, the movement of schools from a lower Class to a higher class due to performance, ...
- C. Then schools, whose performance causes them to be moved up, are moved up with a comparable number of schools moved down. The guiding language is:

After a two-year cycle is completed, adjustments in Classes are made based on the averages of the previous two years of performances. Class AA and A teams who average in the top 15 overall in the regular season in the previous two years would be moved to Class AAA for the following two years.

Class A teams who average in the top 50 in the regular season in the previous two years would be moved to Class AA for the following two years.

Teams that have been moved to a higher Class will be returned to the Class dictated by the most recently available enrollment numbers if the 2-year review dictates it. The teams will be moved if, during the two years they were moved to a higher Class, they did not maintain the standard by which they were moved up.

- D. These schools averaged in the top 15 and therefore were moved *(or stayed in) to Class AAA.

Wayzata HS/, Edina HS/, Mounds View HS/, Minnetonka Senior HS/, Century HS/, St. Paul Academy/, East Ridge HS/, Eastview HS/, Rosemount HS/, Southwest HS/, Spring Lake Park HS/, Blake School/, international School of Minnesota/

- E. The following schools averaged in the top 50 and therefore were moved * (or stayed in) to Class AA

St. Croix Lutheran HS, Minnehaha Academy, St. Agnes School, Eagle Ridge Academy, Marshall School, MN Valley Lutheran HS, Northern Cass, Schaeffer Academy, Holy Family Catholic High School Hermantown HS, St. Anthony Village, Totino-Grace HS, Orono HS, Cretin-Derham Hall HS, Mankato West HS, Highland Park HS, Tech HS, Mahtomedi H

- F. The following schools moved from Class AA to A by not maintaining an average in the top 50

Breck

- G. The following school was moved from Class AAA to Class AA to offset the placement of Blake, SPA, and international School of MN in AAA

Alexandria Area HS, Monticello HS, Cooper-Robbinsdale HS

- H. The following schools were moved from Class AA to Class A to offset the placement of St. Croix Lutheran, Minnehaha Academy, St. Agnes School, Eagle Ridge Academy, Marshall School, MN Valley Lutheran HS, Northern Cass, and Schaeffer Academy into Class AA

Waseca HS, Dassel-Cokato HS, Thief River Falls HS, Albany High School, Tri-City United, Fairmont HS, Proctor HS, Breck, Humboldt HS, Plainview-Elgin-Millville HS

- I. Teams were placed in sections based on geographic location, but also considered was past performance and relative sizes of schools.

- J. A map of the different classes can be found at

Class A

Class AA

Class AAA

<p>Class AAA Section 1</p> <p>Century HS Farmington John Marshall HS Lakeville North Lakeville South Mayo HS Owatonna HS</p>	<p>Class AA Section 1</p> <p>Faribault High School Minnesota Valley Lutheran Red Wing High School Mankato West High School Mankato East Senior High Saint Peter Schaeffer Academy</p>	<p>Class A Section 1</p> <p>Cotter High School La Crescent High School Lewiston-Altura High School Lincoln High School Lake City Plainview-Elgin-Millville St Charles High School Wabasha Kellogg Public Schools</p>
<p>Class AAA Section 2</p> <p>Eden Prairie HS Edina HS International School of MN Minnetonka Senior HS The Blake School Wayzata HS</p>	<p>Class AA Section 2</p> <p>Annandale High School Holy Family Catholi Hutchinson High School Marshall Senior High Mound Westonka High Orono Township Senior High</p>	<p>Class A Section 2</p> <p>Blue Earth Area Senior Fairmont Jr/Sr High School Lake Crystal Wellcome Mmorial Luverne High School Shattuck-St. Mary's School Tri-City United: High School Waseca</p>
<p>Class AAA Section 3</p> <p>Apple Valley Eagan HS East Ridge HS Eastview HS Park HS Rosemount Woodbury</p>	<p>Class AA Section 3</p> <p>Highland Park Senior High School Hill-Murray School Johnson Senior High School Mahtomedi High School Simley HS South St. Paul Secondary Washington Technology</p>	<p>Class A Section 3</p> <p>Atwater Cosmos Grove City School Dassel Cokato Lakeview High School MACCRAY Montevideo High School New London Spicer High School</p>
<p>Class AAA Section 4</p> <p>Harding HS North St Paul HS St Paul Academy St Thomas Academy-Visitation Stillwater Area HS Tartan HS White Bear Lake HS</p>	<p>Class AA Section 4</p> <p>Academy of Holy Angels Cretin-Derham Hall High School Eagle Ridge Academy Minnehaha Academy - HS St. Croix Lutheran Academy Saint Agnes School</p>	<p>Class A Section 4</p> <p>Breck School Hope Academy Humboldt High School Mounds Park Academy North Community High Parnassus Preparatory Charter</p>
<p>Class AAA Section 5</p> <p>Andover Champlin Park HS Elk River Maple Grove Senior HS Osseo St. Louis Park St. Michael Albertville</p>	<p>Class AA Section 5</p> <p>Columbia Heights High School DeLaSalle High School Thomas Edison High School Roosevelt High School South High School St. Anthony Middle School Totino-Grace High School</p>	<p>Class A Section 5</p> <p>Cannon Falls High School Chatfield High School Dover-Eyota High School Kenyon - Wanamingo High Lourdes High School Pine Island School District Zumbrota Mazeppa High School</p>
<p>Class AAA Section 6</p> <p>Bloomington Kennedy Burnsville HS Chanhassen/Chaska Hopkins HS Jefferson HS – Bloomington Southwest HS Washburn HS</p>	<p>Class AA Section 6</p> <p>Robbinsdale Cooper High Benilde-St. Margaret's Big Lake High School Foley High School Monticello High School Princeton High School Tech High</p>	<p>Class A Section 6</p> <p>Albany High School Bagley Breckenridge High School Hillcrest Lutheran Academy Nevis Public School Pelican Rapids</p>
<p>Class AAA Section 7</p> <p>Blaine HS Coon Rapids HS Irontdale HS Mounds View Roseville Area HS Spring Lake Park H</p>	<p>Class AA Section 7</p> <p>Chisago Lakes High School Cloquet Senior High Schoo Hermantown High School Hibbing Senior High School Marshall School Osceola High School Rock Ridge Public School</p>	<p>Class A Section 7</p> <p>Barnum High School Carlton Schools East Central Senior High School Esko High School Moose Lake Community School Mora High School Proctor Public Schools</p>
<p>Class AAA Section 8</p> <p>Bemidji Cambridge-Isanti HS Duluth East HS Moorhead HS Sartell Sauk Rapids</p>	<p>Class AA Section 8</p> <p>Alexandria Area High School Apollo High School Fergus Falls Public Schools Grand Rapids High School Northern Cass Public</p>	<p>Class A Section 8</p> <p>Badger HS Greenbush-Middle River H Mt. Iron-Buhl HS Nashwauk-Keewatin North Woods HS Thief River Falls</p>

5. Odds and Ends for this season

a. Addressing Winter Break Conflicts

If a school does not meet during the December 18th week, that school can administer Meet 3 on Thursday the 14th or Friday the 15th . Exceptions like this reinforce the importance of the Code of Conduct that students need to adhere to.

b. Divisions can decide which of the four ways to administer a meet.

The method chosen may vary from meet to meet. **Schools are required to gather together at Meet 5.**

The four ways to administer a meet are:

- i. Gather as a division at a common site and administer the tests the “old” way. The “old” way is defined as giving students a paper copy of the tests, correcting them at the site, and coaches entering the scores via the scoring website.
 - ii. Gather at individual schools and administer the test the “new” way. The “new” way is defined as giving students a paper copy of the tests, allowing them to enter their answers online via the scoring website, and coaches verify the scores after the events are finished.
 - iii. Gather some of the schools at a common site and allow the other schools in the division to gather at their own school and use a “hybrid” method to deliver the meet. Schools gathered at the common site will use the “old” way while the schools gathering at their own school will use the “new” way.
 - iv. Gather schools at a common site and allow the schools to use the “new” way to administer the meet. This can be done if the division is confident that the site has sufficient Internet capability and the students have the device capability to do the meet online the “new” way.
- c. Given that schools will be doing meets in different ways and at different times, coaches should stress the importance of not discussing the problems until all schools are finished. Coaches can, however, release solutions when all schools in the division are finished.
- d. All events A through D and the team event are NO calculator. Also, all answers will be integers. Coaches should stress this with their students. An integer is defined as a number from the set $\{\dots -3, -2, -1, 0, 1, 2, 3\dots\}$. Answers written in the form of a fraction will not be correct. For example, $6/2$ will not be considered correct nor will $3/1$.

Minnesota State High School Mathematics League Code of Conduct and Media Release

Code of Conduct

As a student participating in the Minnesota State High School Mathematics League, I understand and accept the following responsibilities when participating in all events:

- I will respect the rights of others and will treat others with courtesy.
- I will be fully responsible for my actions and the consequences of those actions.
- I will respect the property of others.
- I will respect and obey the rules of my school, and the laws of my community, state and country.
- I will show respect for and abide by the decisions of the competition officials.

Furthermore, as a student participating in the Minnesota State High School Mathematics League, I understand the importance of honesty and fair play. I accept and agree to the following:

For the upcoming Math League season, I can use a computer, phone, or other WI – FI enabled device to access the League site during competition.

I will not use a calculator of any kind for individual events A – D nor Team events. Calculators are not allowed on any event. I can use a language translator on my phone if my first language is not English.

I will not use any outside help while participating during a meet. This includes, but is not limited to, accessing other web sites, notes, or books, or asking someone for help to solve the problems. I am not allowed to use graph paper, compasses, protractors, or rulers. **I am limited to using my own mathematical knowledge, clean scratch paper, and a writing utensil.**

I will not share any of the problems, answers or solutions from any of the events with anyone outside of my school until the final results for the meet are posted on the League website.

I understand that cheating or other dishonest behavior on my part is serious and will result in my disqualification at the current meet. I will also be barred from participation at the next scheduled meet as a further consequence for dishonest behavior. Large scale cheating or other dishonest behavior as a scoring team will result in the disqualification of the entire team at the current meet and the next scheduled meet.

By signing this statement, I acknowledge that I have read and agree to the above responsibilities.

Student's Signature

Grade

Date

Parent/Guardian's Signature

Date

Media Release

On occasion, the Minnesota State High School Mathematics League may allow news media to cover League events, and the League may wish to use your child's photo or voice for promotional and educational reasons: in newsletters, posters, or brochures, on the League web site, or in other media coverage. If you do not want your child's picture and/or voice to be used in League publicity materials or media coverage, please check the box below and sign:

I do NOT want my child's photograph and/or voice to be used in League publicity materials or media coverage.

Parent/Guardian's Signature

Date

New Competition Structure for 2024 – 2025 and beyond

Overview: Due to the pandemic and the shifting nature of the League Operations the League Office thought it was necessary to evaluate our current operations to see if they fit the reality of today. In order to get the best data, the League Office distributed a survey that went out to all coaches, hosted an in-person retreat with 15+ coaches and the Executive Committee, and dedicated the majority of the Coaches Conference to this topic. Based on the robust discussions over the last few months, the Executive Committee drafted this proposal which the Board approved October 1st. These changes will go into effect in the 2024 – 2025 season

Timeline: These changes, adopted by the Board, will be implemented for the 2024-2025 school year.

Part 1: The structure of meets will be changed from 4 individual events to 3 individual events, *with all students participating in all individual events.*

Rationale:

- Allows 9th and 10th grade students more access for advanced questions.
- Keeps the time frame for In-Person Meets the same
- Eliminates the disparity of choosing different events for different students.
- Retains the process of selecting the scoring team ahead of time.
- Allows for easier substitutions when students are absent.

Specific Details:

- The 3 individual events will each have 5 questions.
 - Each question will be worth 1 point.
 - There will be two “quickie questions” per event.
 - Power scoring will still be in place.
- Coaches will still need to set their scoring team prior to the Meet start.
 - No more than 6 of the 8 scoring team members shall be beyond the 10th grade (as is currently the case).
- Team Event Scoring
 - There will be 6 questions on the team event.
 - Each question will be worth 5 points.
 - A perfect team score at one meet will be 150 points.
- The topic list will be revised and submitted to the board for approval at a future meeting.
- Additional practice materials will be created, perhaps including a reorganizing of the problem archive.
- Coaches might be able to select a Junior Varsity team in the scoring system (implementation pending)

Part 2: Implement a “Guess the Interval” for Meet 1 and Meet 5.

Rationale: This event will increase competition fun for all students and the team aspect and bonding amongst students.

Specific Details:

- The League Office will create and provide an overview, scoring instructions, and instructional video on how to implement it.
- This will not be a part of the scoring system.
- This event will be available as an in-person, virtual, and hybrid version for Meet 1.
- This event will take place live at Meet 5.

6. Legislation to create scholarships for Math League students!!

Four State Senators (Hoffman, Abeler, Kupec, and Gustafson) have introduced legislation to offer scholarships to Math League students.

The bill asks for sixty \$5000 scholarships to be awarded in each of the next four years to students with 3 years of experience in the League and who attend a Minnesota college.

Senate File 2217 (SF2217) has currently been referred to the Higher Education committee.

Here was our rationale:

The Minnesota State High School Mathematics League is a nonprofit dedicated to challenging Minnesota students to deepen their problem-solving skills through extracurricular mathematics. The League looks to create sixty \$5000 scholarships for a total of \$300,000 each year for the next 4 years.

We feel a scholarship program would benefit students, high schools, Minnesota colleges, and the state of Minnesota in general.

The benefits for the students would be:

- 1. Access to financial support for their college education, reducing their financial burden.
- 2. Increased motivation to excel in mathematics, which could have a positive impact on their future careers.

The benefits for the Minnesota state high school mathematics league would be:

- 3. Increased reputation and recognition as a supportive organization of math education in the state.
- 4. Potential increase in participation in the league's programs, as students may be more incentivized to excel in mathematics.

The benefits for the colleges in the state of Minnesota would be:

- 5. Increased interest from high-achieving math students thereby attracting a stronger pool of applicants.
- 6. Potential increase in collaboration and partnerships with the league, leading to more resources and opportunities for students.

The benefits for Minnesota in general would be:

- 7. Increased support for education, which could have a positive impact on the state's future workforce.
- 8. Increase in the number of high-achieving math students staying in the state for college, contributing to the state's economy.

Allocating the scholarships

We would allocate the scholarships as follows: Each class of teams (A, AA, AAA) would be ranked by their team scores. The top twenty teams in each class would each receive a scholarship to be awarded to a senior attending a Minnesota college. If the school did not have an eligible senior, the scholarship would then fall to the next school in ranking.

Needs to be done

1. Letters (or emails) of support need to be written to your state legislator!!

Here is a sample letter:

I support legislation to create a scholarship fund for Minnesota State High School Mathematics League participants. I ask for your vote on Senate bill SF2217 and/or House bill HF2670

My name is _____ and I live at _____. You are my state senator/representative for District _____

The scholarship fund will help the league and the state in many ways. It helps the league recruit and retain participants. The financial burden for students would be eased. It reinvests in the state college and university system, awarding money only to those students who attend a state university. Students would be more likely, I feel, to stay in the great state of Minnesota.

Please help us support excellence in mathematics in Minnesota!

With regards,

Signature _____

2. Progress of the bill can be found at:

[Progress of Math Team Scholarship Bill](#)

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 #38

$$\begin{aligned}1 + 4 &= 5 \\2 + 5 &= 12 \\3 + 6 &= 21 \\8 + 11 &= ?\end{aligned}$$

Solution (controversial) = 96 reason? $A + B \cdot \gg A + AB$

Puzzle #39 OEIS A363381

Consider an n by n array of unit squares. How many ways can the $n \times n$ array be broken into n groups of n unit squares where each of the n groups is identical but whose orientation within the array may be different? Note: if there are multiple ways to orient a certain grouping, the grouping is only counted once.

For instance, given a 2×2 array of unit squares, there are two ways to group the unit squares into 2 groupings of 2 unit squares in each grouping. Using letters to represent the squares, they are

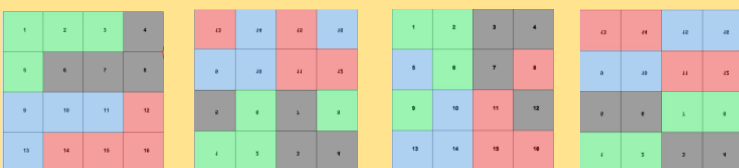
FF or FH
HH HF

Note: FF and FH
 HH FH

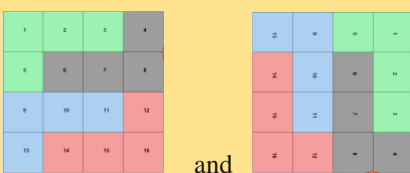
are considered equivalent because this fundamental grouping in the array is a 1 by 2 bar that can be oriented different ways but therefore are only counted once.

For another example, given a 4×4 array of 16 unit squares, how many ways can the 16 squares be grouped into 4 groups of 4, where each group is identical?

Here are some such groupings



NOTE:



are considered equivalent because the fundamental grouping is L-shaped but can be oriented different ways. It is therefore only counted once.

It turns out there are 60 ways to group a 4×4 array. See OEIS page A363381 at <https://oeis.org/search?q=a363381&go=Search>

Open question: In how many ways can an $n \times n$ array where $n \geq 9$ be grouped into n identical groups of n unit squares?

Prime conjecture by Andrew Young: For $n = \text{prime} > 2$, there is only one way to group the squares. Can you prove this for all primes?