



A message from the Executive Director, Tom Young

Hello! Welcome back to another school year and another year of Math League competition!

This newsletter wraps up the 2017 – 2018 season, specifically the Summer Math Institute and the Coaches Conference, and looks forward to the 2018 – 2019 Math League season. Please read the newsletter thoroughly. You never know what tidbits of information you'll pick up.

The biggest change this year will be virtual sections. In a special May board meeting, the League approved this new method for qualifying for the State Tournament. The virtual sections will be finalized this fall at the September 30th board meeting. See the proposal below.

I applaud your commitment to high quality mathematics in the state of Minnesota!

Go Math League!

A message from Tom Kilkelly, Head of the Problem Writing Team

The problem writing team is well on its way in creating and vetting the problems for the 2018 – 2019 season. The team hopes to have all the meets, including the State Tournament, polished by the end of September.

We'd like to welcome our new problem writer Michael Tang. He joins the writing team of Mike Swenson, Jim Walker, Don Barry, Tom Kilkelly, and Martha Knutson.

Some Pictures from the 2018 Summer Math Institute



2018 Summer Math Institute

Each year, the Math League creates a Summer Math Institute for students entering 7th – 9th grade, and also entering 10th – 12th grade. This year's sessions were Advanced Problem Solving Techniques (7 – 9) and Counting Techniques (10 – 12).

Thanks go out to our teachers Stephanie Hegman, Leah Higginbotham, Carraig Hegi, and Ken Suman!! They were ably assisted by problem solving session teachers Dave Anderson, Julie Hasling, Heather Krumwiede, and Lewis Istok. And also making the experience great for our 40 students were RAs Nibir Sarma, Ashley Parent, Alex Pan, and Kelton Holsen.

Look for more information in subsequent newsletters about the 2019 sessions. Tentatively they are:

7 – 9 Mathematics and Art

10 – 12 Theory of Equations



2018 Coaches Conference

Each summer, the Math League sponsors a coaches conference to consult coaches on League business, teach the coaches new mathematical techniques, and provide coaches the opportunity to get to know each other.

On Thursday this year, Steven Dunbar was our guest speaker. Steven is the director of the AMC Competition and he led sessions on Geometry in competitive mathematics.

Thursday night, the attendees gathered together for dinner and a friendly, yet competitive, session of Escape Room. Friday morning was devoted to League business, teacher tidbits, coding of problems for our database, and exploration of the new math web site, Classpad.net.



Two Teacher Tidbits (presented at the Coaches Conference)

Look for more to come in subsequent newsletters!

1. A shortcut for changing repeating decimals to fractions

$$\frac{a}{b} = \frac{\text{Whole decimal-nonrepeating part}}{\text{"Whole place" - "nonrepeating place"}} \quad \text{subtract 1 in the denominator if the entire decimal repeats}$$

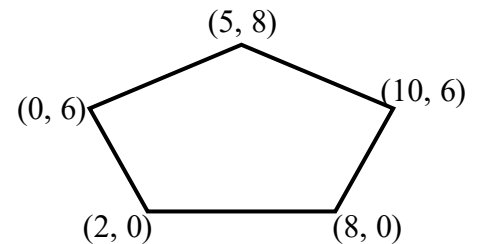
For example $0.\overline{6} = \frac{6-0}{10-1} = \frac{6}{9} = \frac{2}{3}$

For example $0.\overline{847} = \frac{847-8}{1000-10} = \frac{839}{990}$

2. A shortcut for finding the area of a polygon (known as surveyor's method or shoelace method)

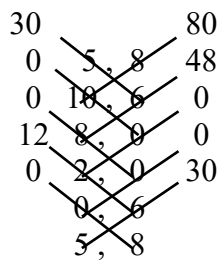
Given a polygon with its coordinates (see figure at right)

Start with one coordinate pair and write it down
Continue with others (in a clockwise or ccw direction)
and return to original pair



5, 8
10, 6
8, 0
2, 0
0, 6
5, 8

Connect the numbers with diagonals as shown and find the products



SUM the products on each side and take half the absolute value of the difference

$$\frac{|(30 + 12) - (80 + 48 + 30)|}{2} = 58 \quad \text{This is the area of the polygon}$$

Looking forward to this year, here is the motion that passed unanimously last May

Motion for moving to three tiers:

Move that, for the purpose of qualifying for the State Tournament, the schools in the league be organized into three tiers as outlined below. Each proposed tier is composed of 8 evenly-distributed virtual sections from different geographic regions across the state.

- a. The highest scoring team from each section is invited to the state tournament. In addition, 2 wild card teams per tier are invited to the state tournament. The wild card teams are the two highest scoring teams in the Tier that didn't win a section.
- b. Therefore, 10 teams from each Tier receive automatic bids. Thirty teams are thusly invited to the state tournament. The rest of the tournament field is filled out by choosing the next 6 to 10 highest scoring teams from across the state (regardless of Tier) for a full state tournament complement of 38 teams.
- c. The Hibbing Rule would be eliminated as a method for making it to the state tournament.
- d. The use of the alpha, beta, and gamma system at the state tournament would be eliminated. Teams would compete in the tier to which they are assigned.
- e. Placement of teams into tiers shall be based on enrollment numbers from the Minnesota State High School League for the upcoming two-year cycle. Tier assignments would be for two-year cycles, beginning with the 2019-2020 season; the 2018-2019 tier assignments will be only for one year. Adjustments in tiers are made based on the averages of the previous two years of performances. Tier 2 and 3 teams who average in the top 15 (overall) in the regular season in the previous two years would be moved to Tier 1 for the following two years. Tier 3 teams who average in the top 50 in the regular season in the previous two years would be moved to Tier 2 for the following two years. Initial placement of teams for the 2018-2019 season will be based on results of the 2016-2017 and 2017-2018 seasons.
- f. Teams that have been moved to a higher tier will be returned to their original tier if the 2-year review dictates it. The teams will be moved to their original tier if, during the two years they were moved to a higher tier, they did not maintain the standard by which they were moved up. For instance, if a tier 2 or tier 3 team was moved to tier 1 due to being in the top 15 (average over 2 years) but did not maintain that top 15 regular season average, the team would be returned to tier 2 or, correspondingly, tier 3. Also, if a tier 3 team was moved to tier 2 due to being in the top 50, but did not maintain the top 50 status for the two years they were moved up, the team would be moved back to tier 3.
- g. Any school will have the option "play up" to a higher Tier. Initial tier placements will be released by October 1 of the beginning of the two-year period. Teams must declare their intent to "play up" prior to October 15.
- h. Placement of schools added to the League in the middle of a tier assignment cycle shall be at the discretion of the Executive Committee or its designee.

Further, be it moved that the large school tier, Class 3A, be composed of the following schools

Class 3A Section 1

Century HS
John Marshall HS
Mayo HS
Lakeville Schools
Cotter HS
Rosemount HS
Apple Valley HS
Owatonna HS

Class 3A Section 3

Park HS
East Ridge HS
Eagan HS
Eastview HS
St Thomas - Visitation
Woodbury HS
Henry Sibley HS
Harding HS

Class 3A Section 5

Champlin Park HS
Park Center Senior HS
Armstrong HS
Maple Grove Senior
Osseo Senior HS
Rogers HS
Mounds View HS

Class 3A Section 7

Anoka HS
Blaine HS
Spring Lake Park HS
Coon Rapids HS
Andover HS
Elk River HS
Irondale HS

Class 3A Section 2

Shakopee Sr HS
Eden Prairie HS
Minnetonka Senior
Edina HS
Wayzata HS
The Blake School
St Louis Park HS

Class 3A Section 4

North St Paul HS
Central HS
Roseville Area HS
Stillwater Area HS
White Bear Lake HS
Tartan HS
Highland Park HS
St Paul Academy

Class 3A Section 6

Blmngtn Jefferson HS
Minneapolis South HS
Southwest HS
Washburn HS
Kennedy HS
Hopkins HS
Burnsville HS

Class 3A Section 8

Moorhead HS
St.Johns Prep
Duluth East HS
Cambridge-Isanti HS
St Michael-Albertville
Sauk Rapids-Rice HS
Tech HS
Buffalo HS

Move that the middle-sized school tier, Class 2A, be composed of the following schools

Class 2A Section 1

Austin HS
Faribault HS
Red Wing HS
Northfield HS
Osceola HS
Waseca HS
Stewartville HS
Shattuck St.M

Class 2A Section 3

Simley HS
South St Paul HS
Johnson HS
Hill Murray HS
Como Park HS
Washington Tech HS
Mahtomedi HS

Class 2A Section 5

Columbia Heights HS
Fridley HS
DeLaSalle HS
Patrick Henry HS
St. Anthony Village HS
Totino-Grace HS
Edison HS
Academy Holy Angels

Class 2A Section 7

Grand Rapids HS
Hibbing HS
Chisago Lakes HS
North Branch HS
Cloquet HS
Duluth Denfeld HS
Marshall School
Hermantown HS

Class 2A Section 2

Hutchinson HS
Delano
St. Peter HS
Dassel-Cokato HS
Mankato West HS
Mankato East HS
Marshall HS

Class 2A Section 4

Minnehaha Academy
Holy Family Catholic
Cretin-Derham Hall
Richfield HS
Roosevelt HS
Mound Westonka HS
Orono HS

Class 2A Section 6

Big Lake HS
Cooper HS
Foley HS
Monticello HS
Apollo HS
Int. Sch MN/Eg Ridge
Benilde-St Margaret's

Class 2A Section 8

Bemidji
Alexandria Area HS
Detroit Lakes HS
Fergus Falls HS
Thief River Falls HS
Sartell HS
Rocori
Sauk Rapids-Rice

Move that the small-sized school tier, Class 1A, be composed of the following schools

Class 1A Section 1

Lake City
Chatfield HS
Dover-Eyota HS
LaCrescent-Hokah HS
Lewiston-Altura HS
Plview-Elgin-Millville
St Charles HS
Wabasha/Kellogg HS

Class 1A Section 3

New London-Spicer
Adrian HS
Lakeview HS
Luverne Jr Sr HS
Montevideo HS
MACCRAY HS
BOLD HS

Class 1A Section 5

Lourdes HS
Zumbrota-Mazepa
Cannon Falls HS
Kenyon-Wanamingo
Triton HS
Pine Island HS
Goodhue HS

Class 1A Section 7

Barnum HS
Esko HS
Moose Lake HS
Willow River HS
Mora HS
Proctor HS
Carlton HS
East Cntral Secondary

Class 1A Section 2

Fulda HS
Fairmont HS
Blue Earth Area HS
Lke Crystl/Wlcm Mem
MN Valley Lutheran
Jackson County Central HS
Tri-City United HS

Class 1A Section 4

Providence Academy
Hope Academy
Parnassus Prep
Humboldt HS
Mounds Park Acad.
St Croix Lutheran
St. Paul Preparatory

Class 1A Section 6

Breckenridge HS
Pelican Rapids HS
Albany HS
Cathedral HS
Atwtr-Csms-Grve City
Park Rapids HS
Nevis HS

Class 1A Section 8

Badger HS
Grnbush-Middle River
Mesabi East HS
Mt. Iron-Buhl HS
International Falls HS
Eveleth-Gilbert HS
North Woods HS

follow us on Facebook "Minnesota State High School
Mathematics League" @MNSHSML and
Twitter @MNHSMathLeague

Problem Corner

an effort to spur conversation

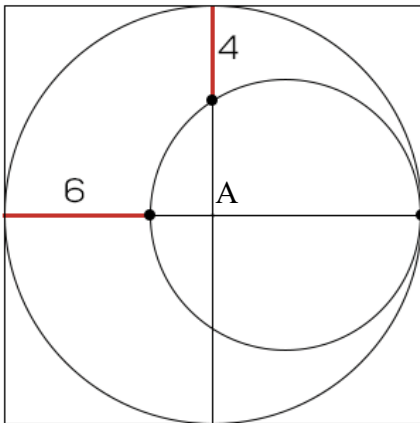
If you'd like to contribute a problem
or send in a solution, email
tyoung@district16.org

Student solutions
encouraged!

A solution to the problem from Newsletter 6

Old Problem: <https://math.stackexchange.com/questions/658449/interesting-geometry-problem-square-and-two-circles>

Given a square with center A, and two circles as drawn, what is the area of the square?



Solution:

If a is half of the side then with the power of the point of the middle point and with respect to smaller circle we have:

$$(a-6)a=(a-4)^2 \Rightarrow a=8 \Rightarrow \text{Area}=16^2=256$$

New Problem

<http://www.universityofcalicut.info/SDE/VI%20Sem.%20B.Sc%20Maths%20-%20Additional%20Course%20in%20lie%20of%20Project%20-Theory%20of%20equations%20&%20fuzzy%20set.pdf>

If $\alpha + \beta + \chi = 1$, $\alpha^2 + \beta^2 + \chi^2 = 2$, and $\alpha^3 + \beta^3 + \chi^3 = 3$ Find $\alpha^4 + \beta^4 + \chi^4$