



**A message from the Executive Director, Tom Young**

Happy Holidays to all of you, coaches and students! The year 2019 is closing fast and the new year 2020 will soon be here. Best wishes to all of you!

You'll notice we have set the dates for the Summer Math Institute and Coaches Conference.

**SMI: June 28 – July 3 at Augsburg**

**Coaches Conference: July 9 and 10 at Augsburg**

I encourage you to participate in both! I also encourage you to read the rest of the newsletter, paying special attention to: the hints Tom Kilkelly has given about the next meet, the Video Contest, and the T-Shirt Contest.

Happy New Year!

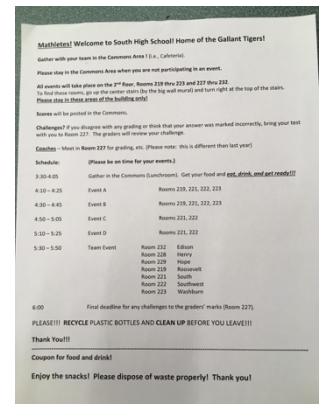
**Minneapolis Division Pictures from Meet 3**



**Washburn**



**Edison**



**Everyone gets a program of the times and events along with important messages**



**Henry**



**Hope Academy**



**Roosevelt**



**South**



**Southwest**

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

“Determine exactly” continues to draw a majority of the challenges at each meet.

Meet 3 was no exception with twelve of the nineteen challenges denied because an answer was not “exact, in simplest form” as stated in the League Manual.

Several examples are given in the manual to help illustrate what is meant by “exact, in simplest form”.

For instance,  $\frac{1}{4^2}$  should be simplified and written as  $\frac{1}{16}$

In Meet 4, the expression “determine exactly” is used in all the problems in Events A and B, half the problems in Events C and D, and five of the six problems on the Team Event, so BE PREPARED!

In five of the problems of Meet 4, I caution the mathletes to be concerned about extraneous solutions. In addition, be sure to review the topics to be covered in each event and revisit some applicable theorems.

**GOOD LUCK ON MEET 4!**

More pix from meet 3 from Minneapolis Division



# 2020 Summer Math Institute

June 28 – July 3, 2020 at Augsburg University



The League will offer two one-week programs of the Summer Mathematics Institute in 2020. Both programs run the same week: June 28 – July 3, 2020.

One is for students entering grades 7-9 in fall of 2020 and the other is for students entering grades 10-12 in fall of 2020. Topics for the week are yet to be determined. Watch the next newsletter for more information.

Students will investigate mathematical topics not typical taught in the regular high school curriculum. The 10-12 program is definitely aimed to prepare students for secondary mathematics competitions.

These are both one-week residential opportunities. Both programs are located at Augsburg University in Minneapolis. **Application deadline is April 15, 2020 or until the camp is full.** Returning students are eligible for a \$25 discount. Cost is \$600. Tuition includes room and board and a field trip experience. Check [mnmathleague.org](http://mnmathleague.org) later in January 2020 for an application.

Email [mathleague@augsborg.edu](mailto:mathleague@augsborg.edu) with questions.

## Summer Coaches Conference 2020

**Dates:** July 9 and 10

Many activities are being planned, including Hall of Fame Induction and Alumni gathering. If you know of alumni who might be interested, send us contact information. If you have nominees for the Hall of Fame, send them to [tyoung@district16.org](mailto:tyoung@district16.org)



## 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, 2020**

Applications can be found on our web site at: [http://mnmathleague.org/?page\\_id=1033](http://mnmathleague.org/?page_id=1033)

## AMC 10 and 12 Competitions coming sooner than usual!

The MN State HS Math League will **NOT** be offering the AMC 10 and AMC 12 due to financial constraints. Make sure your school signs you up. The AMC 10/12 A is Thursday, **January 30, 2020** and the AMC 10/12 B is Wednesday, **February 5, 2020**.



# MN State High School Math League

## **Math Team Video Contest**

1<sup>st</sup> place: \$200 to school's math team  
2<sup>nd</sup> place: \$150 to school's math team  
3<sup>rd</sup> 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.

*See winning videos by*

Following us on Facebook "Minnesota State High School Mathematics League" @MNSHSML



### Video Entry Submission:

Videos are due to the Math League Office  
([mathleague@augsborg.edu](mailto:mathleague@augsborg.edu))  
by *March 1<sup>st</sup>, 2020.*

- Videos contest entries must be sent and approved by the school math team coach.
- Winning schools will be notified by March 6, 2020.
- Winning videos will be shown at the State Tournament on March 9, 2020, uploaded to the Math League Facebook page, and may be used for other promotional purposes.

Questions? Email [mathleague@augsborg.edu](mailto:mathleague@augsborg.edu)



## MN State High School Math League

# 2020 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.

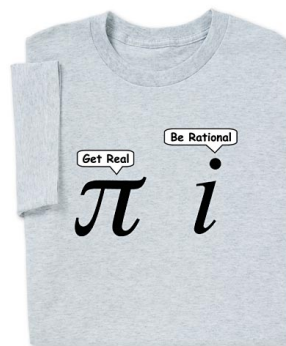
The design should include the words:

“MN State High School Math League”

“State Tournament”

“March 9, 2020”

- Email your *original* design by **Feb. 10<sup>th</sup>** to: [mathleague@augsborg.edu](mailto:mathleague@augsborg.edu)
- Accepted file format: pdf only
- Include your name, grade and school in the email submission.
- Winner will be notified by Feb. 17<sup>th</sup> via email.



Email [mathleague@augsborg.edu](mailto:mathleague@augsborg.edu) with questions

# Newsletter 16 Puzzle

## Problem Corner

an effort to spur conversation

If you'd like to contribute a problem or send in a solution, email [tyoung@district16.org](mailto:tyoung@district16.org)

Student solutions encouraged!



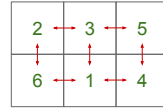
Entries open: 24/06/19  
Entries close: 30/06/19



puzzle number  
**101**

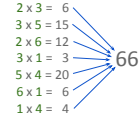
Bob writes the numbers 1 to 6 in a grid like the one on the right.

He then multiplies together every pair of adjacent numbers. Finally, he adds up all seven of the answers he has made.



In this example Bob's total was 66.

He then moves the numbers around and tries again.

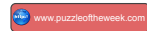


**What is the largest total Bob can make?**

**Extension:** What is the lowest total Bob can make?  
**Extension<sup>2</sup>:** What if Bob tried using the numbers 1 to 8 in a 2x4 grid?

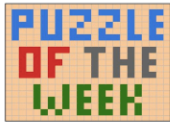


Puzzle created by Bob Vertes, author of "Fun Math Games and Puzzles" published by the Association of Teachers of Mathematics (ATM).



<https://drive.google.com/file/d/1n2FI9o5ywpw7of4HlkRAZWWh43aGxJWBY/view>

## And Solution



The Lost Timetable Puzzle

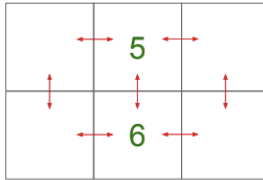
101  
★★★★★

Answer: 100

This is not a simple puzzle. If we were to test all the possible ways in which we could put the six numbers into the grid then there would be 120 combinations to check.

The first step in simplifying the puzzle is to realise that the numbers in the middle column are multiplied by 3 other numbers, whereas the corners are only multiplied by just 2.

Therefore, the largest numbers (5 and 6) must go in the middle column in order to maximise the total.



It's actually possible to check all the possibilities at this stage because with 5 and 6 in the middle column there are only 12 possible combinations left (excluding reflections).

However, we could apply a little more logic first. The remaining 4 numbers can be "paired off" in just three different ways, as shown below. Keeping the pairs as 1,2 and 3,4 is clearly the best way of maximising our total.

[https://drive.google.com/file/d/1PPkY\\_sO6R4XCpnTqDBNYa-gk8KIMNfP8/view](https://drive.google.com/file/d/1PPkY_sO6R4XCpnTqDBNYa-gk8KIMNfP8/view)

## New Puzzle:

In Meet Three, Team Event #4 stated:

In  $\triangle ABC$ ,  $m\angle B = 2m\angle A$ ,  $AB = 4$ , and  $AC = 3$ . Determine exactly the value of  $\cos A$ .

**What if, instead, it had stated:**

In  $\triangle ABC$ ,  $AB = p$ , and  $AC = q$ . Prove or disprove that there exists, among all possible such triangles, a triangle where  $\angle B$  is twice the measure of  $\angle A$ .

**Can you prove or disprove that?**