

New York Math Circle Fall 2016 Newsletter

In this issue

- Challenge Yourself!
- Director's Report
- Alumni News
- Current Students News

Challenge Yourself!

1. **MS A** One hundred students are assigned lockers 1 through 100. The student assigned to locker number 1 opens all 100 lockers. The student assigned to locker number 2 then closes all lockers whose numbers are multiples of 2. The student assigned to locker number 3 changes the status of all lockers whose numbers are multiples of 3 (e.g. locker number 3, which is open gets closed, locker number 6, which is closed, gets opened). The student assigned to locker whose numbers are multiples of 4, and so on for all 100 lockers. Which lockers will be left open?

2. **MS B** Explain using a combinatorial argument why permuting(arranging) 4 letters of PUZLES is equivalent to finding word jumbles of PUZZLE.

Hint: Arranging 4 different letters into 6 different spots is equivalent to finding the jumbles of 6 letters comprised of 4 different letters and 2 identical "blank letters"

3. **MS C** If I break an 8 inch stick randomly in two places, what is the probability that the three resulting pieces will form a triangle?

4. HS A Simplify the sum: $1 \times 1! + 2 \times 2! + \dots + 99 \times 99! + 100 \times 100!$.

5. **HS A** A point P is chosen in the interior of triangle ABC. Three lines are drawn through P such that there is a line parallel to each one of the triangle's sides. The intersection of the lines creates three smaller triangles with areas A_1, A_2 and A_3 . Find the area of $\triangle ABC$ in terms of A_1, A_2 and A_3 .

Director's Report



Dr. Kovan Pillai

Welcome to New York Math Circle's second newsletter!

This semester, we are happy to welcome Sebastian Stoenescu, Sheila Miller, Patricia Yee, and Jan Siwanowicz to our faculty, all of whom have both strong problem-solving math backgrounds and extensive classroom experience. Sebastian taught math for 13 years at Stuyvesant and is now pursuing graduate studies. Sheila is a professor of mathematics at CUNY. Patricia is a full-time math instructor at Brooklyn Technical HIgh School while Jan is a math team coach at NYC Lab Middle School. Both Patricia and Jan were also TAs in our High School Summer

Program for many years. It is our goal to continue to increase our offerings both on Saturdays and Sundays and to challenge students at any level.

Fall 2016 has presented some challenges for us. Due to a last-minute emergency, our Queens College Middle School instructor was unable to continue and we preferred to cancel the class rather than to sacrifice our high teaching standards. Fortunately, we have been able to hire a new instructor and can expand our offering at Queens College next semester. Secondly, we felt our HSD program wasn't targeting enough students so we decided to introduce a different kind of course to benefit our most advanced High School students. In Spring 2017 we will begin "**College Bridge**", a proof-based course that will focus on underlying structures in mathematics. Students registered for other classes at NYMC would be welcome to register and instructors will also be encouraged to attend!







Sheila Miller

Patricia Yee

Sebastian Stoenescu

Jan Siwanowicz

Support Us! It would be remiss of

It would be remiss of me not to mention some obstacles we face in our expansion. We strive to reduce administrative costs and have negotiated cheaper rental at **Queens College**. Although the Center for Mathematical Talent at NYU provides space for our programs free of charge, the increased number of low-income students applying to our program has made it even more necessary for us to seek outside donors as we are pledged to make our program affordable for all. Please become a supporter!



Newsletter from the New York Math Circle

Challenge Yourself!

Alumni News

6. HS A A polynomial P(x) leaves remainder 5 when divided by x + 1, -1 when divided by x - 1, and 1 when divided by x - 3. Find the remainder when P(x) is divided by (x + 1)(x - 1)(x - 3).

7. **HS B** What's wrong with this "proof"? $1 = \sqrt{1} = \sqrt{(-1)(-1)} = \sqrt{-1}\sqrt{-1} = i \cdot i = -1$

8. HS B The number 1000 is written on the board. Each minute a divisor of the number that is of the form 2^k is chosen and added to the number on the board. Prove that the number 2^{100} will eventually be written on the board.

9. **HS C** How many five-digit positive integers have the property that the digits do not decrease from left to right and no digit is exactly one more than the digit to its left?

10. Challenge by Lawrence Zimmerman and David Hankin

Perpendicular chords of a circle are at distances 3 and 5, respectively from the center. The chords divide the circle into four pieces. Consider the sum of the areas of the largest and smallest pieces, and the sum of the areas of the other two pieces. Find the difference between these two sums.

(This question is a slight modification of a problem from the 1997 - 1998 Hong Kong Preliminary Selection Contest.)

Email us solutions for questions at or above your last registered level (no HS C students answering MS A questions!). Everyone is welcome to attempt the Challenge problem. The first complete solution for each question will win an **NYMC tote bag**! No more than one prize per student.



Hannah Field

Alumni Spotlight - Hannah Field

by Alison Aun

Hannah Field is our alumni spotlight for this newsletter as she continues to demonstrate great academic achievement coupled with being a fun free-spirited young adult.

A physics major at MIT, Hannah's incredible journey into the world of mathematics began in the summer of 2010. That was the summer her Mom came upon the New York Math Circle's summer program as she hoped to find a program of interest for Hannah. In Hannah's own words, her experience at NYMC taught her "a new kind of math, the kind that made you think really hard, that kept you on your toes, that hid patterns and relations in unexpected places" Hannah was able to achieve her full academic potential through strong support from her teachers and NYMC instructors (Larry Zimmerman, Stan Kats, David Hankin, David Gomprecht and Fred Galli).

Hannah's enthusiasm in math continued as she was hired as a Teacher's Assistant for our rigorous High School Summer Program 2015. Not only did Hannah contribute priceless knowledge to ur students by assisting the instructors, but the summer was helpful in developing her teaching skills under the guidance of NYMC's instructors. Hannah recently taught two popular classes at MIT Splash, based on a lecture she gave and revised at the NYMC. In addition, Hannah was also responsible for editing and designing the NYMC summer newsletter.

Some of Hannah's mathematical accomplishments include a perfect score on the AMC 8 (2011) and also participation in USAJMO (2011, 2012), USAMO (2014) and MOSP (2014). Congratulations also to Hannah for being a USAPhO semi-finalist (2014, 2015), member of the US Physics Team (2015) and a National Merit Scholarship recipient. In 2016, Hannah was named a Johnson and Johnson Scholar.

We wish Hannah the best at MIT! You're an inspiration to all of us!



Hannah with David Hankin and Larry Zimmerman

Alumni News (cont.)

The following alumni responded to our **online survey** - if you want to be included in our next newsletter, please contact us.

Brian Riedel, an alumni of NYMC from 2009-2011, is now studying at Carnegie Mellon University. He received honorable mention in the last two years at the William Lowell Putnam Mathematical Competition. He has also participated in multiple math competitions including ARML, NYSML, USAMO, AIME, Putnam Exam (in college), PUMaC and Virginia Tech Competition.

Max Fishelson, former NYMC student during the period 2010–2015, graduated from Stuyvesant H.S. and has been attending MIT since September 2016. He participated in multiple math competitions including ARML, NYSML, USAMO, USAJMO, AIME, Local MATHCOUNTS, Chapter MATHCOUNTS, State MATHCOUNTS, NYCIML, NYML, HMMT and PUMAC. Some of Max's recent achievements include being qualified for USAMO in 2015 and 2016, co-captain of NYC and Stuyvesant's math teams from 2014–2016, and co-captain of the nationwide ARML math team, winning 7th place in 2015.

Zachary Marcone, a current student at Columbia University, participated in NYMC's HS Summer Program in 2013. He participated in AMC, the Suffolk County Math Contest, and the Suffolk County Math Tournament. Congratulations to Zachary on receiving the Rabi Scholar at Columbia University, the most prestigious math/science undergraduate recognition in the institution.

Adam Granger, a student at NYMC from 2013–2016 started attending Manhattan College in Fall 2016. Some of his notable achievements include the National Honor Society, Lasalle Honor Society, and Presidential Merit Scholarship at Manhattan College.

Congratulations to **Alisher Khodjaniyazov**, a student at Brooklyn Studio Secondary School, for winning 2nd place in the Tashkent District Math Olympiad. He was enrolled at NYMC during 2014–2015, stating NYMC HS Summer Program was "one of the best math experiences I had in my life. You are surrounded by people who love math every day for more than 5 hours." Best of luck at Stony Brook University!

A current student at MIT and alumni of NYMC (2011-2012), **Justine Jang**, participated in in ARML, AIME, Local MATH-COUNTS, Chapter MATHCOUNTS, and State MATHCOUNTS.

Previously a student at NYMC in 2011, **Edward Fan** graduated from Trinity H.S. and started attending MIT in the Fall of 2016. Edward participated in AIME, Local MATHCOUNTS, Chapter MATHCOUNTS, and State MATHCOUNTS competitions.

Best wishes to **Dessie DiMino** for her acceptance to CalTech in the Fall of 2016. She was a NYMC student in 2011–2012, and participated in the Local MATHCOUNTS competition. Dessie plans to major in computer science at CalTech. She was involved in the Garcia MRSEC summer research program, an Intel Semifinalist (Tissue Engineering) and attended the Girls Who Code Summer Immersion Program.

Congratulations to Joseph Mogrovejo, alumni of NYMC in 2011, for his acceptance to CUNY Hunter College!

Current Students News

Congratulations to our NYMC mathletes! Based on responses to a recent online survey, the following NYMC students excelled in local, regional and national math competitions:

Math Kangaroo: Paul Gutkovich and Jai Shah

Purple Comet: Alisha Grover

KSEA NMSC: Peridot Park

Local MathCounts: Paul Gutkovich, Ahmed Shekhani, Serina Hu, Liam Kronman, Ella Kronman, Calvin Aw, Peridot Park and Alexander Soiefer

State MathCounts: Ahmed Shekhani, Serina Hu and Calvin Aw

Chapter MathCounts: Ahmed Shekhani, Serina Hu and Calvin Aw

SBIMC: Alisha Grover

NYSML: Ahmed Shekhani, Serina Hu and Liam Kronman

NYML: Paul Gutkovich, Adele Smolansky, Alisha Grover and Calvin Aw

AMC8: Paul Gutkovich, Liam Kronman, Ella Kronman, Jason Huang, Olivia Fung and Peridot Park

AMC10: Liam Kronman and Peridot Park

NYCIML: Paul Gutkovich, Serina Hu, Adele Smolansky, Alisha Grover and Calvin Aw

AIME: Chelsea Chen, Michelle He, Jonathan Zhang

USAMO or USAJMO: Liam Kronman, Ella Kronman, Serina Hu, Brian Huang, Vaughan McDonald

Other: Casey Chin - ranked first in her school (The Lower Lab School P.S.77) in the Math Olympiads.

Keep up the good work!. We know there are many more accomplished students out there - if you wish to be included in the next newsletter, please respond to our next online survey.

Spring Plans

Registration for the **2017 Spring Program** is now open! You can register here:

