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Challenge Yourself!

1.**MS A** Four hundred students return to NYMC and each student gives a "Welcome Back" hug to each of the other students. How many hugs are there in total?

2.**MS A** Both NYM and 3C8 are three-digit numbers and NYM - 3C8 = 269. If 3C8 is divisible by 9, what number does NYM represent?

3. MS A What is the sum of the units digit of 4^{2018} and 3^{2018} ?

4.**MS B** The number 1X83Y4 is a multiple of 264. Find the missing digits X and Y.

5.**MS C** The sum of the lengths of the legs of a right triangle is 11, and the area of the triangle is 10. Find the length of the hypotenuse.

6.**MS C** Right $\triangle ABC$ has an acute angle with measure 15°, and the area of $\triangle ABC$ is 18. Find the perimeter of $\triangle ABC$.

7.HS A Find the sum:

 $1 \cdot 3 + 3 \cdot 5 + 5 \cdot 7 + \dots + 2015 \cdot 2017 + 2017 \cdot 2019$

8. **HSB** A chessmaster has 77 days to prepare for a tournament. She wants to play at least 1 game every day, but no more than 132 games in total. Prove that there is a sequence of successive days in which she plays precisely 21 games in total.

9. **HSB** Inside a room of area 5 you place 9 rugs each of area 1. Prove that the area of overlap of some two of them is at least 1/9.

Director's Report



Kovan Pillai

Welcome to New York Math Circle's sixth newsletter! Fall 2018 is off to a great start with our new Brooklyn program continuing to draw strong interest.

We have modified our College Bridge course: Misha taught "Inequalities in USAMO problems" for the first mini-course and we will continue with the USAMO theme in subsequent semesters. The second mini-course consisted of topics in probability by Dr. Lisa Hartung (a faculty member of the Courant), culminating with an application to the modeling of cancer growth.

We are heartened to learn that Dr. Gleb Pogudin's course was so wellreceived that a couple of students (William and Eli) continued to work on a research project with him even after the course finished.

Our new Summer Middle School program proved to be even more popular than the old format and we will continue with the two-week format next Summer.

We were devastated to hear the news that Fred Galli, one of our most popular instructors, passed away in October. He last taught for us this summer and we will remember him as an instructor who always went the extra mile for his students; he willingly substituted for absent colleagues and was a regular fixture in our High School Summer program. He will be sorely missed by staff and students.

REGISTER NOW

We rely on **donations** to balance our books, even allowing for the generous donation of space by NYU, as we give generous support for those students who can't afford our modest fees. We greatly appreciate any (tax-deductible) individual and corporate contributions to help offset the expense of providing this support:

DONATE NOW

Alumni News

Alumni Spotlight — Ann Caplin

By Alison Aun, Program Manager

Challenge Yourself!

10. **HS C** A gecko and an anti-gecko take a random walk on the faces of a cube, starting on opposite faces. How long, on average, will it be before the geckos walk onto the same face of the cube and annihilate each other?

11. College Bridge Prove that for x,y,z>-1 it is true that

$$\frac{1+x^2}{1+y+z^2} + \frac{1+y^2}{1+z+x^2} + \frac{1+z^2}{1+x+y^2} \ge 2.$$

12. College Bridge Prove that for all positive a, b, c it is true that

$$\frac{a}{(b+c)^2} + \frac{b}{(a+c)^2} + \frac{c}{(a+b)^2} \ge \frac{9}{4(a+b+c)}.$$

13. **College Bridge** Prove the Nesbitt's inequality: For positive real *a*, *b*, *c*,

$$\frac{a}{b+c} + \frac{b}{a+c} + \frac{c}{a+b} \geq \frac{3}{2}$$



Ann Caplin

Ann Caplin, our alumni spotlight, has always loved math and played with puzzles. Her passion for math began when she took her first NYMC class, MSC, six years ago as a 7th grader. She participated in all levels of NYMC's High School program and our College Bridge class.

Ann said, "NYMC has helped me explore lots of areas of math to find what interests me. Especially important to me is Larry Zimmerman's summer session going into 9th grade. It covered topics like proofs and number theory, and I had a lot of fun solving the problems."

Upon graduating from Stuyvesant HS, Ann attended Caltech. Ann plans to major in Bioengineering and will continue to take a lot of Computer Science and math classes. She has an interest in molecular programming, synthetic biology and systems biology. Outside of school, Ann enjoys research and sometimes plays Dance Dance Revolution. She was previously part of the Competitive Computing Club in Stuyvesant and did some summer bioinformatics research.

When we asked Ann if she could give our current younger NYMC students some recommendations, she suggested students focus "on a few things that interest you the most and branching out from there, exploring each of these areas to find subdisciplines that you find really engaging. I would also make sure you fit some kind of program, like NYMC, that meets regularly, into your schedule. That way, even if things get busy, you'll always have some time allotted for exploring your interests." Ann also recommends for enjoyment, math books, like Elementary Number Theory by Underwood Dudley. "I found that it helps build discipline in terms of being able to teach yourself things and trying to make sure you understand every step of a proof/explanation."

We would also like to thank Ann for donating \$375 to New York Math Circle so other students, who may need financial aid, can also attend and benefit from the program. We wish Ann the best at Caltech!

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In Memoriam: Fred Galli

By Salvatore Catalano, AP of Mathematics, FDR



Fred Galli

Mortality is a difficult reality to accept. Whether it is the loss of a friend or loved one, or one's own mortality, how to reflect on this inevitable loss can be a challenge. When the loss is of a person who touched the lives of hundreds, including your own, the need to reflect and come together as a community to mourn and celebrate the life lost is even more important.

On Saturday afternoon, October 6, 2018, surrounded by his family and friends, Mr. Fred Galli passed away. He had just turned 60 years old. And for so much of his life, he left his imprint on the lives and experience of so many. I want to reflect on a just a few of the ways he contributed to our community.

Fred Galli graduated from Brooklyn Technical High School where his math team coach was Larry Zimmerman. Mr. Zimmerman's inspirational teaching and coaching led to a lifelong friendship and mentoring. Together, Larry and Fred collaborated in creating the first South Brooklyn Invitational Mathematics Competition (SBIMC).

What began as a competition between four local schools in 2010, funded out of Mr. Galli's own pocket, has grown to include over 30 teams and benefit from professional sponsorships including Pearson. SBIMC is now hosted at Franklin D Roosevelt (FDR) High School in Brooklyn, NY, and resembles the rigor and format of the best math competitions hosted nationwide. Math teams from all five boroughs attend this now all-day event. These teams get to learn from each other, spurred by a healthy sense of competition, to achieve the honor of taking home the SBIMC cup.

This was only the beginning of Fred Galli's contributions to our math and science educators community. With a successful background in engineering and software development, Mr. Galli participated in the creation of a STEAM program at FDR High School. This four-year program includes capstone projects and grants 15 college credits. The program now supports nine computer classes and over 200 students over a four-year period.

Fred Galli gave as much informally has he did formally to our community. He spent endless hours with high school juniors every Friday, engaging them in daily math issues and cultivating in them a love of mathematics. Working hands-on with then on paper manipulations, playing advanced card games, and building out high school level mathematical puzzles, Mr. Galli kindled a passion for mathematics in these teenagers that would stay with them long after graduation.

These are just a handful of examples. But what they illustrate is that Fred Galli embodied what every teacher aspires to be. He was a mentor to his students and his peers. Fred would go above and beyond expectations, using his creativity to find new and engaging ways to bring math to life for all of us. He was a good man and friend; the kind of friend who couldn't get to the punchline of his own joke because we would be laughing too hard. Fred Galli would tell you how he felt no matter who you were because he believed in honesty above all else. To FDR students, he was a quintessential 'Math God'. To the FDR Mathematics department, he was our cornerstone, both figuratively and literally (his classroom was the corner room on the fourth floor). To me, Fred Galli will continue to be all the above and more. And his contributions will live on in every student who walks through FDR's math hallway. That is a true gift, and a life worth celebrating.