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### **Challenge Yourself!**

1. MSA How many triangles can you find?



2. **MSA** Alex had some marbles. On his birthday, his father doubled the number of Alex's marbles. Alex gave 5 marbles to his best friend. Then he divided the remaining marbles into three equal groups to share with his two brothers and himself. If Alex ended up with 11 marbles, what was the original number of marbles that Alex had before his birthday?

3. **MSB** Move two matchsticks to form two identical equilateral triangles. The matchsticks can't be broken or overlapped.



4. **MSB** Draw the square shown in Figure 1, which is sectioned off to make five pieces. When you rearrange these same five pieces, in the manner shown in Figure 2, a hole will appear in the center of the square. The square in Figure 1 is made up of 49 smaller square. The square in Figure 2 has only 48 small squares. Where did the square go?



# Director's Report



Kovan Pillai

Welcome to New York Math Circle's eighth newsletter! Fall 2019 has brought a number of new workshops: MS and HS contest topic courses, in which we explore the mathematical content of various MS and HS contests; we have also created our first Elementary School workshop on a trial basis; we will introduce more of these workshops according to the demand.

Summer 2019 presented a venue challenge – owing to the 3-year window replacement project at the Courant Institute, we had to find an alternative location; Stuyvesant School kindly offered to house both our MSHS and our HS programs over the summer and were helpful in enabling them to run smoothly. Unfortunately, they are also facing construction work next summer so the hunt is on for a new summer venue – we welcome any help from the NYMC community in this regard.

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



Spring 2020 registration is now open:



### **Challenge Yourself!**

5. **MSC** Given a list of n integers, prove that one of the integers is a multiple of n or there is a string of several integers in a row whose sum is a multiple of n.

6. **HSA** Without using a calculator, find the largest prime factor of 1,000,027.

7. **HSA** How many lattice points are exactly 25 units from the origin?

8. **HSB** Find  $tan(\pi/5)$  as an *exact* value.

9. HSB Find the last 6 digits of  $1999^{1999}$ .

10. **HSB** Find the first 2 digits of  $99^{10}$ .

11. **HSC** Prove that there are no equilateral triangles such that every vertex has integer coordinates

12. HSC Prove that 37 is a factor of (102014+102015+2)20161

13. **College Bridge** Find all pairs of digits a and b such that the irreducible fraction b/a equals the decimal fraction  $\underline{a}.\underline{b}$ 

14. **College Bridge** In a class, each boy is friends with at least one girl. Show that there exists a group of at least half of the students, such that each boy in the group is friends with an odd number of the girls in the group..

# Student News

## Student Spotlight — Milan Haiman

By Alison Mak, Program Manager



Milan at the Acropolis

We are happy to present Milan Haiman as our alumni spotlight for this newsletter. Currently a freshman at MIT, Milan is also a 2019 IMO gold medalist! We would like to congratulate him on a well-deserved accomplishment.

Milan's journey into mathematics began at a very young age as he discovered his love for mathematics. His mom often challenged him with sequence probelms as early as in elementary school. His love for math continued throughout school and he participated in many math programs such as NYMC, MathPath, Mathily, Canada/USA Mathcamp, and Math-M-Addicts.

NYMC was one of the first mathematics programs he attended outside school. He was only in 5th grade when he joined. His instructor at NYMC encouraged him to apply to an outside summer camp for the summer of 2013. He then continued to participate in other math programs. He was also involved in Stuyvesant's High School math team and NYC Math Team for most of his high school years. One of his favorite things about attending math programs and being a a part of math teams is meeting new people with the same math passion as himself. He loves the social experience and culture of this community.

Milan's recommendation to our current younger students: It is really important to spend time on things you enjoy. Focus on what you really like to do (it definitely doesn't have to be math) and try to find people you like to be with. You will then be much happier when working towards your goals.

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#### Where are they Now?

Hanna Yang, NYMC student from 2015-2016 will major in Mathematics at MIT.
Milan Haiman, NYMC student from 2012-2017 will major in Mathematics at MIT.
Daniel Acosta, NYMC student from 2013-2017 will major in Applied Mathematics at Harvard.
Raphie Rosen, NYMC student in 2018 will major in Mathematics at University of Chicago.
Ron Nissim, NYMC student from 2016-2018 is currently majoring in Mathematics at NYU.
Matthew Kendall, NYMC student from 2016-2018 will major in Mathematics at Columbia University.
Abraham Derival, NYMC student from 2016-2018 is currently majoring in Chemical Engineering at the University of Pennsylvania.
Eli Paul, NYMC student from 2016-2018 will be majoring in mathematics at Caltech.
Isabella Tran, NYMC student from 2012-2016 is currently majoring in Business Administration at Northeastern University.
Joy Aun, NYMC student from 2010-2015 is currently majoring in Mechanical Engineering at University of Michigan.
Kadhir Pillai, NYMC student from 2010-2015 is majoring in Computer Science at Carnegie Mellon
Daniel Brous, NYMC student from 2017-2019 will major in Mathematics at University of Chicago

Where are YOU now? Please contact us at info@nymathcircle.org - we'd love to hear from you!