AUGUST 2019

Calcutta International School

Math Honor Society

2019 - 2020

Presents

THE MATH NEWSLETTER

MATH HONOR SOCIETY BOARD 2019-2020

PRESIDENT: Arjun Arora

Our sagacious president, Arjun Arora, has been a quintessential constituent of the Math Honor Society ever since its commencement in 2018. Arjun is a rather eccentric individual with a deep-seated love for Mathematics that he has been nurturing for years, culminating in him achieving this prestigious position at our club.

Arjun's perspicacious nature has allowed him to unearth a few of Mathematics' myriads of beautiful mysteries and impart its knowledge to his peers.

Although he is a man of many interests, his academic potential outshines all else, and his ambition to study Mathematics and Computer Science after school is what drives him today. He ensures his enthusiastic participation in extra-curricular activities like football, cricket, table tennis and badminton does not hamper his academic performance in the IB Diploma Programme and wishes to maintain this balance throughout his school life.

Arjun has a lot planned out for the Math Honor Society this year!

VICE-PRESIDENT: Srinjoy Majumdar

Our Vice President, Srinjoy Majumdar, seeks to transform the way students perceive the Math Honour Society throughout the course of the year. Notwithstanding Srinjoy's perception on the entertaining nature of creative mathematical pursuits, but also his aim to ***integrate*** his excessive passion for advanced mathematics into school curriculum will hopefully give students with similar talents a platform to express, innovate and apply their knowledge outside a controlled environment.

Aside from his understandably over-bearing, outspoken and untamed personality and his dry, unfunny, nerd-based humour, Srinjoy's interests vary from the Physical Sciences and Mathematics to the world of sports, comics, music, TV and Cinema (next time you meet him, be sure to ask him for his Spotify playlist, or his favourite TV series in the last week, or his last watched movie). His academic interests, however are his first and foremost priority, as he hopes to study Math and Physics in the future, after school at the top universities in the world, and his academic achievements are a sign of his uncontrollable potential, having received a Top of The World - Cambridge Learner award for 0580 Extended Mathematics IGCSE, at the age of 14 in the 9th Grade (something he won't ever let you forget), along with numerous Olympiad accolades, and various other proficiency awards.

Srinjoy currently resides in his haven of the IB 1 classroom, trying to balance his ambitious pursuits in self learning, his performance in the IB Diploma Programme, his multitude of extracurriculars, his unfinished list of shows and films as well as his null set of a social life. He apologizes for making you read so much, with not a single pop culture reference, and promises a multitude of opportunities through the Math Honour Society for the coming year.

SECRETARY: Rohan Banerjee

Our Secretary, Rohan Banerjee, wants to change people's perspective on math as not only number that we are forced to learn but the underlying patterns that are formed due the abstractions of basic addition and logic.
He is fueled by his laziness to find the easiest way out and least annoying way out(and most of the time the stupidest way).
Rohan has many interests mainly ranging STEAM subjects. He especially loves learning about the human brain and how people think. Another distinctive feature about Rohan is his inability to talk about himself positively without feeling immense pain.
Rohan wants the math honor society to help foster the interest of people on the topic of math

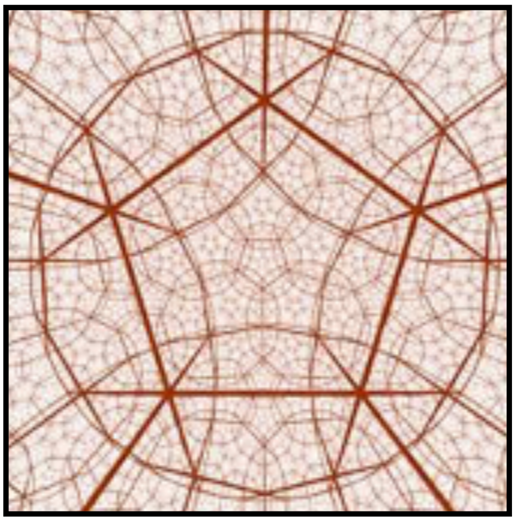
TEACHER-IN-CHARGE: Mrs Sarika Maiwall

OUR AGENDA

Some events have been planned for this session. To name a few:
-Inter-House debate regarding Mathematical ideas organised by us and the CIS Debate Club
-IIT Professor coming to talk about interesting topics in Mathematics
-Math Fest sponsored by Texas instruments with many Math-Centric events
-Training for competitions such as National Olympiads
-Remedial classes for those struggling with Mathematics
-Advanced classes for those curious about Mathematical topics beyond the scope of their syllabus
-Discussion sessions where the participants will come and talk about Mathematical ideas

What would you do for a million dollars?

Imagine you have completed an extra-ordinary feat and have been offered a million dollars for it. You've also been offered an award that gives you global recognition. Do you take it? Or do you leave it, just satisfied with the fact that you achieved something some of the brightest minds of the world struggled with for decades? Welcome to the intriguing and crazy world of mathematics!



In 2000, the Clay Mathematics Institute of Cambridge, Massachusetts, laid out seven of the most challenging problems in the field of mathematics with at the time and offered a $1 million reward to anyone who could solve one. These problems are known as the seven Millennium Problems. Some of these problems point to extremely useful practical applications, like engineering better spaceships, more effective drug treatments, and tougher cyber-security encryption standards. Other problems are merely for intellectual satisfaction, rather than practical use - however, they are still difficult to solve.

One of the seven Millenium Problems is the Poincaré Conjecture, named after the French mathematician Henri Poincaré. He stated that if you took any 4-dimensional shape (that has no holes) and that fits within some finite space, then you could mathematically squash it into a 3-dimensional sphere, but his statement had no proof, and finding the proof or disproving this conjecture would get you a million dollars.

Consequently, a person called Grigoriy Perelman solved it in 2002 and won the Fields Medal — the mathematical equivalent to the Nobel Prize — for his work. Astonishingly, he refused both the Fields Medal and the $1 million reward, just happy knowing the fact that the problem had been solved.

This leaves us with only 6 problems left to solve, and even fully understanding any of these problems is extremely difficult. Let alone solving them

If you would like to do further research on the topic here's a link to the Clay Mathematics Institute's website about the millennial problems:

https://www.claymath.org/millennium-problems

~Shree Singhi 10B

Ramanujan: The Indian God of Mathematics

Srinivasa Ramanujan was born on 22 December 1887 in Madras, India. In spite of having no formal education in pure math, he ended up making significant contributions in the fields of number theory, infinite series, and continued fractions. He often spent time working on problems and in 1913, began maintaining correspondence with Cambridge mathematician Godfrey H. Hardy, who after realizing Ramanujan's genius, arranged for him to travel to Cambridge.

Once, when Hardy went to visit Ramanujan, he rode in a taxi-cab with the number 1729. He remarked that the number seemed rather dull and boring to which Ramanujan replied:

"No, it's a very interesting number; it is the smallest number expressible as the sum of two cubes in different two ways."

A number that can be expressed as a sum of two cubes in n different ways is now called the nth Taxicab number, named after this famous incident.

Here are a few:

$$2=13+13$$

$$1729=13+123 \qquad = 93+103$$

$$87539319=1673+4363 \qquad = 2283+4233$$

$$= 2553+4143$$

He compiled the vast lot of his discoveries into 4 notebooks where he showed no derivations, simply the results. The 4 notebooks amounted to more than 800 pages! His fourth notebook, containing his work from the last year of his life, was lost but rediscovered in 1976, to the excitement mathematicians all around the world.

He died in 1920 at the age of 32 due to a liver disease, after which his works were compiled giving more than 3000 identities, equations and theorems, later studied by mathematicians across the globe. In 2011, on his 125th anniversary, his birthday 22nd December was chosen to be celebrated every year as National Mathematics Day

~ Vikhyat Agarwal 10B

Let's add some complexity

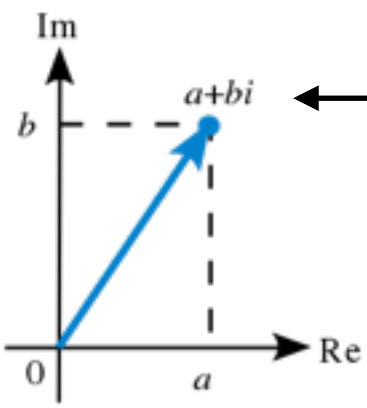
In math class, when we learn about square numbers, we are told that they are always positive. It makes sense - negative multiplied by another negative number is positive. To generalize it, if $x$is any number from $-\infty$ to ∞ ,x^2 is positive. So arises the question – what if $x^2 = -1$. What is $\pm\sqrt{-1}$? Now don't worry, mathematicians have already answered this question and have heavily expanded on it. (Fun fact: Italians used to do a lot of math in this field to show off in social gatherings… I know, weird).

$i$is defined as $\sqrt{-1}$ .This leads to a group of numbers called 'imaginary numbers'. Due to i's value, it has many interesting properties. i is the only value where the additive inverse is equal to its multiplicative inverse. The additive inverse: the number a added to another number to equal 0 which is $-a$. The multiplicative inverse: the number a multiplied with another number to get 1 which is $\frac{1}{a}$. The additive inverse of i is $-i$ and multiplicative inverse is $\frac{1}{i}$ which is also $-i$ since

$$\frac{1}{\sqrt{-1}} \times \frac{\sqrt{-1}}{\sqrt{-1}} = \frac{\sqrt{-1}}{-1} = -i.$$

When an imaginary number is added to a real number (1,2,3,4) it forms a complex number such as $3 + 2i$. These are generally represented in the form $a + bi$. They can also be represent in the form$e^{i\theta}$ where e is Euler's constant and θ is the angle. The formula that relates the 2 forms is $e^{i\theta} = r(cos(\theta) + i\,sin(\theta))$. r is the absolute of the complex number . This is called the $cis(\theta)$(yes).

Complex numbers are, however, a nuanced topic which several intricacies, and if you wish to learn more about them, you may find it useful to visit resources such as Khan Academy.



Visualization of complex numbers X-axis are real numbers and Y-axis are imaginary numbers

~Rohan Banerjee 10A

Care for a Challenge?

Easy

A bat and a ball cost a dollar and 10 cents. If the bat costs 1 dollar more than the ball. What is the price of each?

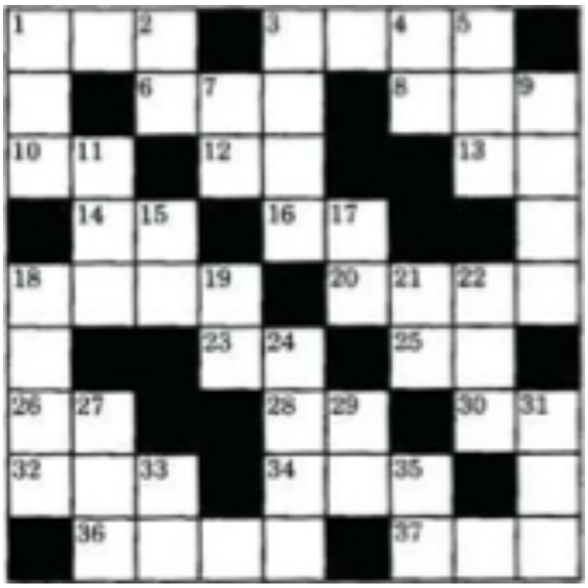
Medium

In a geometric series (for example:1, 3, 9, 27), find the product of the first 9 terms if the 5^{th} term is 10

Hard

Is $2^{2109} - 1$ a prime number?

CROSSWORD



ACROSS

1. 34-Across minus 22-Down
3. Nine times 1-Across
6. Five times 17-Down
8. Three times 29-Down
10. 23-Across plus 7-Down
12. Digits of 19-Down reversed
13. 29-Down minus 7-Down
14. Three less than 28-Across
16. Seven more than 33-Down
18. Six hundred more than 9-Down
20. Digits of 18-Down rearranged
23. Two more than 7-Down
25. One more than 12-Across
26. 13-Across plus 21-Down
28. 10-Across plus 2-Down
30. Two more than 26-Across
32. Five times 28-Across
34. Two times 11-Down
36. Eight times 37-Across
37. Digits of 5-Down reversed

DOWN

1. Digits of 32-Across reversed
2. 23-Across plus 25-Across
3. Five hundred more than 24-Down
4. 14-Across minus 21-Down
5. 1-Across plus 8-Across
7. One-sixth of 16-Across
9. Seven times 31-Down
11. Consecutive digits in ascending order
15. 23-Across plus 21-Down
17. Digits of 35-Down reversed
18. Six times 1-Down
19. Seven times 23-Across
21. One less than 2-Down
22. 36-Across minus 3-Across
24. Digits of 18-Across rearranged
27. 6-Across minus 35-Down
29. 19-Down minus 25-Across
31. 11-Down minus 12-Across
33. Three less than 17-Down
35. Four more than 4-Down

Send your answers to arjunarora2001@gmail.com and win a prize!

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