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# National Museum of Mathematics Awards Inaugural "Steven H. Strogatz Prize for Math Communication" to High School Students for Outstanding Projects that Celebrate the Universality of Math Using Tik Tok, Instagram, Visual Art, Writing, and Dance

## *MoMath's worldwide contest presents cash awards of 200 "Pi Dollars" (200 x 3.14159 = $628.32) to each winner*

New York, NY (June 15, 2020)—New York City's National Museum of Mathematics (MoMath), the only math museum in North America, has awarded the inaugural "Steven H. Strogatz Prize for Math Communication" to high school students for outstanding projects that celebrate the universality of math using social media (Tik Tok and Instagram), visual art, writing, and dance. The Museum's worldwide contest presents cash awards of 200 "Pi Dollars" (200 x 3.14159 = $628.32) to each winner, totaling more than $5,000 in total awards for 2020.

"MoMath is thrilled to award the first-ever Strogatz Prize to eight extraordinary high school students," said Cindy Lawrence, CEO and Executive Director of MoMath. "This contest was designed to celebrate students who use their imagination and creativity to share their love of math with the world. We hope that this friendly competition brought joy and excitement to all of our participants from around the world, especially during this challenging time."

The "Steven H. Strogatz Prize for Math Communication" is awarded based on content, creativity, and communication. Projects are accepted and judged in categories, which include video, audio, social media, art, writing, and performance. Among 46 entries were podcasts, articles, school newspaper columns, YouTube videos, websites, social media accounts, and songs, all of which promoted mathematical concepts in new and exciting ways.

“The judges were incredibly impressed by this inaugural year’s projects,” said Steven Strogatz, American mathematician and Jacob Gould Schurman Professor of Applied Mathematics at Cornell University. “To all the students who entered: you are all wonderful ambassadors for mathematics, and such imaginative math communicators. Congratulations to you all, and thank you for sharing your insight and creativity with us. These are tough acts to follow, but we’re certain we’ll be equally impressed next year!”

The winners, their projects, and the original call for entries can all be viewed here.

The following are the winners of the inaugural “Steven H. Strogatz Prize of Math Communication”:

## Social Media:

**Hamza E. Alsamraee**
**Centreville, VA**

Hamza Alsamraee loves Instagram – and he also loves math. But when he noticed that very few math pages existed on Instagram, he sought to change that by starting @daily_math, a page dedicated to intriguing problems and ideas about algebra, geometry, calculus, number theory, and other parts of math. “With high-quality educational posts, I hoped to build an Instagram community centered around a shared passion for math,” said Hamza.

The judges were impressed with the creativity of Hamza’s entry, expressed through its skillful use of visuals, history, and puzzles, all presented in attractive ways. His explanations of mathematical concepts are clear and insightful, and he is very interactive with his followers, even inviting them to post. The judges also commend him on his growth as a creator and communicator. His Instagram page has evolved from a focus on tricky integrals in the early days to doing more accessible problems now, and the visual presentation has evolved in tandem. With his engaging design choices, which foster clear communication, he is making increasingly good use of the strengths of the Instagram medium.

Hamza’s *Daily Math* accounts can be viewed on **Instagram** and **Tik Tok**.

## Art:

**Yvonne Hong**
**Toronto, ON**

“My math communication project, *Infinity Universe* is an illustrative yet mathematical depiction of the world in which we live,” wrote Yvonne Hong. “Every inanimate object illustrated represents a simple, yet ubiquitous concept in math: upon closer inspection, the monochromatic tree is a fractal Pythagoras tree, the galaxy in the background is

constructed using the Fibonacci sequence, and the planet and comet are both different variations of the Apollonian gasket. *Infinity Universe* promotes the universality of math communication through an abstraction of objects and phenomena that people all around our world are familiar with."

Carefully executed with great attention to detail, the painting submitted by Yvonne drew the judges in with its vibrant colors and hypnotic patterns. Moreover, the theme of infinity pervades the painting, just as it does in all of mathematics. But here, the suggestion of the infinite is magical and otherworldly rather than scientific and literal, and so may appeal to audiences not normally attracted to math.

Yvonne's *Infinity Universe* project can be viewed **here**.

Jonah Yoshida
**Honolulu, HI**

Jonah Yoshida's project is a pencil-and-paper infographic on graph theory. "I conceived of the idea when reading about how Arthur Cayley used trees to represent structures of hydrocarbons with n carbon atoms and 2n+2 hydrogen atoms," said jonah. "The entire structure imitates one of these hydrocarbons, ethane (n=2), and a unique application of graph theory is included inside each atom. I divided the page into two sections so that the hydrogens bonded to the left carbon contain puzzles and fun applications of graph theory, while the ones bonded to the right hydrogen focus more on direct applications, much like our brains' left and right hemispheres." For example, the Four Color Theorem (a fun application of graph theory to coloring maps and an longstanding research question) appears on the left, while the right side includes applications of graphs to computer science (neural networks and spanning trees) and electrical engineering (circuit diagrams).

The judges appreciated the ingenious design concept of this graphic, which underscores the universality and interdisciplinary spirit of graph theory. The words and imagery combine history, math, chemistry, and psychology, and the questions in the small text boxes invite the reader to do some research of their own.

Jonah's pencil-and-paper infographic on graph theory can be viewed **here**.

## Performance:

**Katarina Cheng**
**Santa Monica, CA**

To express the universality of math, Katarina Cheng translated it into another universal language: dance. "Just as dance exists as a part of many cultures around the globe to express abstract ideas and emotions through movement, mathematics defies cultural

lines to express abstract ideas through structures and forms on the page," she wrote in her project description. Her video "Dancing the Dihedral Group" sought, through dance, "to represent the visual symmetries, primarily those of a square," and, through words, "how they translated into algebra, primarily the group D8 ."

The judges commend Katarina for the elegance of her communication in the video. Especially notable was the esthetic of minimalism — in how the video is shot, and the choice of clothing, background, and colors — all of which mesh perfectly with the minimal esthetic of group theory. The integration of the math graphics with the dance moves was also carried out gracefully. Although others in the past have recognized the similarities between math and dance, few have conveyed that analogy with such finesse in the execution. The dancing and music were artfully minimal too. The overall effect is to reinforce the central idea of beauty in simplicity.

Katarina's "Dancing the Dihedral Group" performance can be viewed **here**.

## Video:

**Zoe Markman**
**New York, NY**

Zoe Markman created a visual proof of the "sum of squares formula" by cleverly using three wooden 3-D pyramids that fit together. Each pyramid consisted of a total of $1^2 + 2^2 + \ldots + n^2$ identical wooden cubes; thus, its volume visually represented the sum of the squares of all the whole numbers from 1 to n. To find a formula for this sum of squares, Zoe manipulated and rearranged the three pyramids to form a rectangular prism, whose volume could then be easily calculated to obtain the desired formula for the sum of squares.

The judges agreed with Zoe that this sort of visual, hands-on manipulative "provides a deeper understanding of math than that provided by a written project. Since you can observe, hold, and manipulate the pyramids (even more so in person), the audience is able to understand why the formula works rather than just taking it at face value and accepting that it was true arbitrarily. Second, the presentation could be understood even by people without a significant knowledge of math. It put what looks like an intimidating problem in terms that are easily digestible." Zoe even tested the presentation on friends who said they didn't like math. That's a good practice in any form of communication. Overall, this project is modest but extremely well done and produces a very pleasurable "Aha!" moment for many viewers; indeed, it led one of the judges to understand the "sum of squares formula" in a whole new way!

Zoe's visual proof of the "sum of squares formula" can be viewed **here**.

## Writing:

**Rohan Jha**
**Livingston, NJ**

"The purpose of Math Musings, the magazine I started in high school, was to show that math is everywhere, yet many times we are not aware of it," wrote Rohan Jha. "It is behind some of the music we play, or how nature uses it for its own optimal benefit, or it could be behind a fancy card trick, or math could help us reduce the ubiquitously observed annoyance of traffic jams during peak hours." The magazine tries to humanize and enliven math in various ways: by telling anecdotes about famous mathematicians; by challenging fellow students with fun puzzles; or by leading them some deeper ideas, such as a lily pad puzzle that leads to the notion of backward recursion in finance. With clear illustrations and step-by-step instructions for magic tricks and other activities, Rohan attempts to make math fun for everyone…and succeeds admirably.

Rohan's publication of Math Musings can be viewed **here**.

**Sarah Thau**
**New York, NY**

"Limericks and poetry are not a typical way to convey information about math, but I think it makes it more palatable than learning functions by rote," admits Sarah Thau. "Who doesn't love a limerick?" So Sarah created a series of short rhyming poems to list some basic properties of linear, quadratic, trigonometric, polynomial, rational, and other types of functions encountered in algebra and precalculus, and illustrated the pages with examples.

The judges were tickled by the playfulness of this entry. Limericks are a lighthearted form of poetry in which creativity comes from working within constraints and overcoming them delightfully—and much the same can be said of math! Indeed, as Sarah wrote, "I love math and am always trying to solve problems but this was a new type of problem to tackle. One that didn't need any algebra or modeling. Each poem became a problem to solve as I tried to figure out words to make each function type's properties rhyme neatly." The poems illuminate the distinctive properties of the various kinds of functions, and draw readers in through a unique, creative, and memorable way of communicating mathematical ideas.

Sarah's series of short rhyming poems can be viewed **here**.

**Kyna Airriess**
**Coronado, CA**

The project submitted by Kyna Airriess is a "zine" based on a quote from *A Mathematician's Lament*, a polemical essay by high school teacher Paul Lockhart.

“There is nothing as dreamy and poetic, as radical, subversive, and psychedelic, as mathematics,” wrote Lockhart. Reading Lockhart’s essay, says Kyna, “contributed to my own conversion from ardent math-hater to aspiring mathematician; I’d never heard someone describe math, the subject of unfeeling calculations, with words like ‘poetic’ and ‘radical.’ It was a long time before I began to see these traits for myself, but today I self-identify as a math nerd, and I want to study math in college.”

In the zine, each of Lockhart’s memorable adjectives—dreamy, poetic, subversive, and psychedelic—is illustrated and connected to math ideas, using symbols, history, color, and imagery. The judges were impressed by the passionate energy conveyed by the zine’s words and design. The overall effect achieves what Kyna intended: to embody “what those of us who love math want the world to understand. It isn’t about cold calculations at all— it’s a field full of creativity and beauty, and it is just as infused with humanity as any other.”

Kyna’s zine can be viewed **here**.

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