

MATH OUTSIDE THE BUBBLE



“How would you, like, start on the concept of algebra?”

Sophia D. Merow

If you haven't heard of Gracie Cunningham, a.k.a. “Math Isn't Real” Girl, rest assured: the relation between the two of you is symmetric. Before August 2020, when she (in the words of her Twitter bio) “went viral accidentally for trying to ask...[her] friends about how math came to be,” then 16-year-old Cunningham was aware of two mathematicians, total: Pythagoras, thanks to her relative enjoyment of and engagement in Ms. Smith's geometry class freshman year, and Eugenia Cheng.

Cunningham didn't know it as she recorded and posted a 60-second TikTok¹ video on August 23, but her face would soon be paired with Cheng's atop think pieces and news briefs across the internet.

In the video in question (see <https://bit.ly/31Fss9Y>), Cunningham muses about mathematics while doing her makeup ahead of a shift at Wegmans. “I just wanted to tell you guys about how I don't think math is real,” she says. It exists as a school subject, Cunningham concedes, and Pythagoras is among those who launched the

discipline, but how? The teen fires off a series of questions as she applies concealer. “How would you, like, start on the concept of algebra?” Dab, dab. “Like what did you need it for?” Blend. “You know?”

Unlikely on its face to attract eyeballs in a medium better known for dance moves than inquiries into the origins of mathematics, Cunningham's video started racking up views when the since-suspended Twitter account @aleturner shared it, with a pretty damning assessment: “this is the dumbest video ive ever seen.” Curiosity piqued by this promise of superlative inanity, social media users watched the video, commented on it, and pushed it out to their own networks. A cascade ensued, and by the time *Vice* reported on Cunningham's unwitting rise to online prominence on September 10 (see <https://bit.ly/2Qog7v4>), the video had garnered 1.3 million views.

By then Cunningham had posted a follow-up (see <https://bit.ly/3cZVQUn>). “I would like to be smart this time,” she begins the August 26 re-do, laughing, “because I didn't know that was going to go viral.”

She enumerates her questions this go-around: “My first question is, how did people know what they were looking for when they started theorizing about formulas? Because I wouldn't know what to look for if I'm making up math.” And then, “Question number two: Once they did find

Sophia D. Merow is a freelance writer and editor. Her email address is sdmerow@gmail.com.

¹*TikTok is an app that allows users to create and share short videos.*

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Figure 1. Artist @glosstia1’s homage to Cunningham’s follow-up video. (“THIS IS SO GOOD OMG I LOVE THIS,” tweeted Cunningham in response.)

these formulas, how did they know that they were right? Because, how?”

The rest of Cunningham’s questions express not curiosity about the genesis of math but perplexity at the reaction—unexpectedly extensive, alternately derisive and encouraging—to her first video. For it wasn’t just @aleturner who had harsh words and didn’t hesitate to broadcast them. Hence, “Number three: Why is everybody being really mean to me on Twitter?” Nor was everybody piling on with insults. Jordan Ellenberg came to Cunningham’s defense, as did Steven Strogatz (see Figure 2). Cue “number seven: Why are the only people who are disagreeing with me the

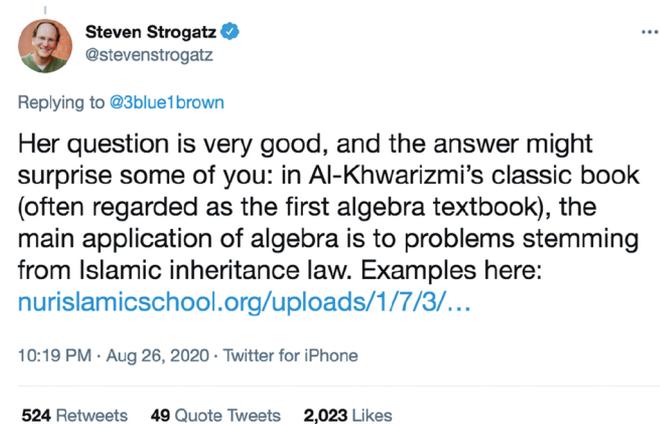


Figure 2. Cornell University mathematician Steven Strogatz weighs in on Cunningham’s query.²

²“Probably we are reading too much into her question,” Strogatz wrote of the Cunningham episode in a March 2021 email, “but I still think it was a question that came from genuine curiosity.”

ones who are dumb and the physicists and mathematicians are agreeing with me?”

Why indeed?

One mathematician who responded favorably to Cunningham’s TikToks was Eugenia Cheng, Cambridge PhD, scientist-in-residence at the School of the Art Institute of Chicago, and author of such books as *How to Bake π* and *The Art of Logic*.³ Cheng tackled each of Cunningham’s questions in turn in a two pager she posted online (see <https://bit.ly/3tNf7iK>). She touches on the ability of formulas to capture an infinity of instances, logic as a framework for deciding whether something is right or not, the multitude of non-Euclidean geometries, Twitter trolls’ zeal for belittling young women, the failure of typical math education to address questions like Cunningham’s, the relationship between math and self-esteem... Cheng was motivated to craft her response because she thinks many are put off math when their questions about it—its utility, its origins, its purpose—are dismissed.

“The questions that children and teenagers can ask about math may sound naive, but they’re really deep and extremely difficult to answer,” Cheng told Carol Off, the host of the Canadian interview show *As It Happens* (see <https://bit.ly/3d43gG4>). “And I think that we need to encourage people to respect questions that can’t be answered rather than making people feel stupid for being unable to answer those questions.”

This past fall, Colorado Academy math teachers Neethi Venkateswaran and Pete Horsch asked their trigonometry classes to watch Cunningham’s videos and then read Cheng’s response and that of Harvey Mudd mathematician and *Mathematics for Human Flourishing* author Francis Su (see <https://bit.ly/31LxAt6>). Venkateswaran was “floored” by the reactions her students articulated on an online discussion board as they completed the homework assignment and in an all-class conversation the following day.

“So many ideas resonated with them,” she wrote on a forum for social justice mathematics educators (see <https://bit.ly/2Ps108c>). “Particularly, they felt relief at seeing someone...voicing questions that they had been too nervous to ever ask themselves.” Students expressed yearning for a richer experience of mathematics, one that integrated the subject with the humanities, considered multiple approaches to problems, acknowledged that even the austere queen of the sciences is itself subjective.

Venkateswaran plans to repeat the exercise at the start of each school year.

Cheng’s activities, too, have been influenced by the “Math Isn’t Real” episode. “I received so many appreciative messages from adults who said that this is the first time

³Gracie Cunningham was aware of Cheng because of YouTuber Drew Gooden’s testy 10-minute response (see <https://bit.ly/31bQ0Pa>) to the Tech Insider video Cheng did arguing that the best way to cut a bagel is along a Möbius strip (see <https://bit.ly/20S0zzB>).

anyone had helped them feel like they're not just stupid for asking questions like that," Cheng told me in an email. And all such interactions inform her ongoing outreach work. "I am working on a new project in that direction," she wrote, "but can't announce it yet."

And Gracie Cunningham? "Has your view of/appreciation for math changed at all as a result of the whole viral-math-related-TikTok experience?" I asked her via Twitter direct message.⁴

"i mean i definitely think about it more," the teen replied.



Sophia D. Merow

Credits

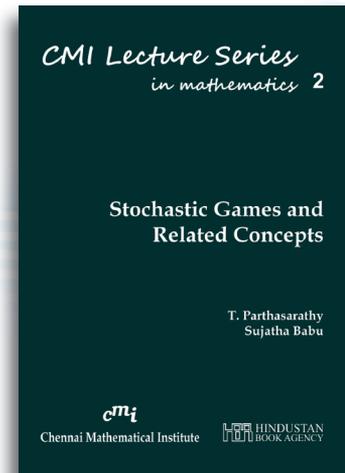
Figure 1 is by Sam (@glosstia).

Figure 2 is used with permission from Steven Strogatz.

Author photo is by Igor Tolkov.

⁴Despite a first contact in October 2020, it wasn't until January 2021, when the initial shock of virality had worn off, that Cunningham agreed to answer a handful of questions to inform this column. She saw the piece before it went to press.

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