

For the Love of (Sharing) Math
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Interviewee: Nadia Lafrenière

What is the optimal way to wrap a Christmas gift? Slice a ham sandwich? Find true love? These might not sound like math questions, but they can be! Specifically, they are a few of the math questions my professor, Nadia Lafrenière, addressed as a student radio host while she attended university. From radio shows to city tours to classroom teaching, Nadia discovers and shares math. She expresses her enthusiasm for the subject and compassion for other people by teaching students, advocating for education access, researching algebraic combinatorics, and inviting everyone to engage with math, no matter their background.

Nadia seeks out teaching opportunities because she believes all students can learn. While she was earning her Ph.D. at the Université du Québec à Montréal (University of Quebec at Montreal), she started teaching high school and undergraduate students as a way to positively impact her local community. Now at Dartmouth, she teaches combinatorics and calculus to graduate and undergraduate students. She knows students come into her class at different levels, and her goal is for each student, irrespective of their previous knowledge, to improve. She aims to challenge each student enough that they are learning something but not so much so that they give up.

If students are to learn, they need an opportunity to study. This principle galvanized Nadia and her university classmates to protest a local policy change in Quebec that would have made public education more expensive. The policy change would have put pressure on students to choose among only those fields of study leading to lucrative jobs. Fundamental research—like math, physics, and the humanities—requires long, intensive studies, so it does not guarantee a high-paying job right out of college. Nadia banded together with her classmates to defend students' ability to freely choose any field of study. For two years, she and a handful of other organizers built a coalition to protest the policy change. Ultimately, they mobilized 400,000 students to strike and successfully stopped the policy change after voting into office new local leaders. The protest required monumental effort, but what the students lacked in resources they made up for in numbers. Participants represented a broad swath of Quebec's students, and their mobilization reflects Nadia's driving conviction, which is that universities work best for societies when diverse people can access them.

Nadia took advantage of her own access to education to study a field she loves and can share—combinatorics. Her Bachelor's degree gave her a broad understanding of mathematics, which she still uses today in her teaching and whenever her research interfaces with branches of math parallel to combinatorics. She considered several possible fields for research and settled on combinatorics because it is an opportunity to push beyond presently known mathematics by trying to answer questions that are approachable even to people with little math background. For instance, she can describe her research questions about card-shuffling to anyone familiar with playing cards, even though she needs abstract heavyweights like representation theory to be able to answer them. She chose a research area of easy questions with hard answers.

Discussing her research is just one way that Nadia brings math to many audiences; she also creates programs that encourage people to find math in their daily lives. For instance, she curated and runs a walking tour of Montreal that highlights math-related sites in the city. She teaches a version of the tour to high school students, emphasizing a paradox about traffic. With a younger audience in mind,

she co-wrote a theater play in which mathematicians face constraints as they travel. Nadia invites people to engage with math by incorporating it with movement, art, and radio.

The best advice Nadia has received as a mathematician came from the subject of her favorite episode as a radio host. On the episode, she discussed the dissertation of Piper Harron, a professor of mathematics active in radical intersectional feminism. Harron, in the thesis, gives twofold advice: first, feel free to join a math research effort even if you do not fully understand the research yet, and second, just because someone is talking about a subject does not mean they know everything about it. Taken together, these are an invitation to get involved in math even if you feel intimidated. Nadia extended that invitation to me as her student and extends it broadly in her work as a scholar and educator. For Nadia, teaching and learning are two sides of the same coin; in her words, “the other part of learning is sharing what you learn.”

Autobiography

Mary Versa Clemens-Sewall is a senior math major and Arabic minor at Dartmouth College. She enjoys math that challenges her to think harder and to collaborate with her peers. She will be working in data science next year, bringing critical thinking skills from her math classes, which spanned algebra, analysis, combinatorics, logic, and more. She has held various roles in math education, too, including tutor, proof-writing assistant, study group leader, and after-school math club instructor. She believes math class should teach the creative problem solving skills that draws mathematicians to the subject in the first place—that is, the skill of nimbly switching between concentrating on an overarching path and its minute details or, put another way, eyes to see both the forest and the trees.