



MathILy-Er 2025 Final Report

Preface

This was the eleventh year of MathILy-Er. Despite beginning the summer with some logistical nightmares, we were happy to have the program close to MathILy and had great students who grew a lot mathematically.

Program Preparations

Promotions

Electronic: Individual emails were sent to prior participants and promising applicants. Web traffic varied from 7,700–32,700 hits/month, with about 45% of the traffic from abroad. The second-most popular page (after the MathILy home page) is the application page, accounting for about 10% of website visits.

Print: We printed 1000 fliers in 2024–2025. About 500 dated fliers were sent to contests that responded to the Minion's queries about fliers.

Other Activities: We held a {MathILy, MathILy-Er, MathILy-EST} Yearly Gather at the Joint Mathematics Meetings, where participants team-solved four Jonah-designed nonabelian SET puzzles, the last of which used the solutions to the other three. There were at least 90 participants, of whom around 25% were program alums, and all 13 nine-person tables were populated. In early April sarah-marie offered an Art of Problem Solving Math Jam on Multibackwards Numbers that included a {MathILy, MathILy-Er} Q&A. There were about 55 people in the room at most times, and about 280 came/went over the 90 minutes.

Applications and Admissions

Statistics: We received 2506 Short Forms, 919 Not-as-Short Forms, 811 EARs, and 690 completed applications. We admitted 44 students, for an admissions rate of 15% including both MathILy and MathILy-Er. Of those, 32 chose to attend. Thus, our current yield rate is roughly 72% (a decrease from last year).

Demographics: Applicants originated from at least 42 US states and 44 foreign countries (representing North/South America, Western/Eastern Europe, East/Central/Southeast Asia, West/South Africa, and the Middle East). The data in the following table was measured where possible and approximated otherwise; the final row reflects a post-program demographic survey.

Percentage	Female	NB	East Asian	South Asian	Latinx and indigenous	Middle Eastern	Black
Short Forms	33%	0.5%	41%	19%	4%	10%	1%
EARs	29%	1%	57%	15%	3%	3%	1%
Attending	47%	3%	47%	22%	3%	0	0%

Financial Aid: We awarded \$2700 in financial aid to MathILy-Er participants and used a grant from the AMS Young Scholars Program (Epsilon Fund) for this purpose.

Personnel

Academic: Lead Instructors were Dr. Corrine Yap (Visiting Assistant Professor at Georgia Tech, Ph.D. Rutgers University, 2023), Dr. Alice Mark (Senior Lecturer at Vanderbilt University, Ph.D. University of Texas at Austin, 2015). Apprentice Instructors were Jessie Tan (graduate student at UC Berkeley, MathILy 2014), Lixin Zheng (graduate student at University of Maryland), and Noa Hunter (graduate student at University of Notre Dame). Week of Chaos Lead Instructors were Dr. Jonah Ostroff (Associate Teaching Professor at University of Washington, Ph.D. Brandeis University, 2013), and Dr. Brian Freidin (Lecturer at University of San Diego, Ph.D. Brown University, 2018), and Week of Chaos Apprentice Instructors were Kye Shi (graduate student at UCLA, MathILy 2015–16).

Administrative: The Director-Er was Dr. Corrine Yap. The excellent {MathILy, MathILy-Er} Minion was again the ever-capable Madison Stuart (Smith College B.A. 2006 in Mathematics and German; graduate work in information science at the University of Michigan). The PRiME FACToRs were Matthew Walloch (B.S. in Mathematics, Georgia Tech) and Nathan Bickel (B.S. in Mathematics and Computer Science, University of South Carolina, beginning graduate student at Iowa State University). The PRiME FACToRS had academic roles as well.

Advisory Amalgam: These individuals were available for advice on academic and practical aspects of MathILy-Er.

[Dr. Douglas J. Shaw](#), mathematics faculty at University of Northern Iowa

[Dr. Ruth Haas](#), (retired) mathematics faculty at University of Hawaii

[James Cocoros](#), mathematics faculty at Hunter High School

[Dr. Dylan Shepardson](#), mathematics faculty at Mount Holyoke College

[Dr. Carol E. Fan](#), operations researcher (currently Operations Data Science Lead at Apple)

[Dan Zaharopol](#), Executive Director of [BEAM](#)

[Dr. James Tanton](#), mathematician

[Dr. Joshua Greene](#), mathematics faculty at Boston College

[Dr. Emily Peters](#), mathematics faculty at Loyola University Chicago

[Wing L. Mui](#), Seattle-area comic store owner, artist, and former mathematics teacher

[Dr. Thomas Hull](#), mathematics faculty at Franklin&Marshall College

[Dr. Josh Laison](#), mathematics faculty at Willamette University

Student Demographics

U.S. States and Districts represented by MathILy-Er students, roughly from east to west: Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, North Carolina, Wisconsin, Texas, Oregon, Washington, and California.

Countries outside of the U.S., roughly from east to west: Brazil, Japan, South Korea, China, and Hong Kong.

Gender breakdown: 14 cis female, 17 cis male, 1 trans female.

Age: There were eight 14-year-olds, fifteen 15-year-olds, eight 16-year-olds, and one 17-year-old. Five student birthdays fell within the program.

Academic background: 14 students had taken some Calculus before the start of the program; 4 had taken some Number Theory; 3 had taken some Linear Algebra; 3 had not yet taken Precalc.

Previous summer programs: 3 had attended MathPath, 12 had attended AwesomeMath, 6 had attended CTY, and 1 had attended the G2 Math Program.

What Happened at MathILy-Er 2025?

Academics

Classes: Each weekday we had 4 hours of morning class, 1 hour of Daily Gather, and 3 hours of evening problem session, for at least 8 contact hours per day. Weekends varied, but Saturdays usually consisted of 4 hours of morning class and 1.5–2 hours of Life Seminar. Mathematical conversations also occurred outside of class.

The basic curricular structure was two weeks of core curriculum, called Root Class (after the Root of a graph theoretic tree, and after the idea that the material strengthens student grounding much as the roots of a tree do), followed by one week of short topical classes, called the Week of Chaos, followed by two weeks of a focused topic, called Branch Class (after branches of mathematics, and after the idea that tree branches grow from a strong trunk nourished by roots).

Root Class: The 32 students were split into two Root classes, one taught by Corrine and Jessie with some assistance from Nathan, and the other taught by Alice and Lixin with some assistance from Matthew. The material in Root Class included Farey and Stern-Brocot sequences, linear algebra over \mathbb{F}_2 , enumerative combinatorics, graph theory, combinatorial game theory, and disease modeling. Students also learned and practiced various proof techniques. All the material was treated with full proofs given by the students.

Week of Chaos: Students indicated which of 39 potential topics they would be excited to learn about, from which instructors decided on a list of 18 classes offered. These were: 99% can't SOLVE this! (complexity theory, Kye), Algebraists Anonymous (abstract algebra, Noa), Complaints in Noir Films (point-set topology, Noa), Counting to the Extreme (extremal combinatorics, Corrine), Escape the Labyrinth (finite state automata, Kye), Hole Punchers and Hair Curlers (fractal dimension, Brian), Parties and Queues (cardinality, Brian), Pomelo-addicts (AKA Prime Number Systems) (p-adics, Lixin), Pomelo-Picking Procedures (voting theory, Jonah), Power Counting (generating functions, Lixin), Proofwang (proof writing, Matthew and Nathan), Quackternions (quaternions, Noa), Strategic Planning Initiatives for Interstellar Felines Counteracting Autocratic Regimes aka SPIFICAR (combinatorial designs, Corrine), Surreal Numbers: A Story in Five Acts (surreal numbers, Lixin), The Alternating Sign Meowbox/Musicbox Conjecture (alternating sign matrices, Jonah), University Politics (chip-firing on graphs, Brian), What is the shape of a sentence? (grammar and fractals, Kye).

Student preferences guided placement of each student into 5 classes. 11/18 of these classes used specific material from the Root curriculum, and each main topic in the Root curriculum was used in at least one class.

Branch Class: During the last two weeks of the program, students took one of two Branch classes. The courses were What to Expect When You're Expecting the Unexpected (discrete probability) taught by Corrine and Lixin with assistance from Matthew, and The Geometry of Our Dreams (non-Euclidean geometry) taught by Alice and Noa with assistance from Nathan. Both Branch classes used linear algebra and Sage.

Pedagogy: All classes were conducted through inquiry-based learning, with time split between instructor-led discussion, work in groups at the board, and student presentations. Students were assigned to take comprehensive notes for future class reference, which were reviewed by an instructor and then copied and distributed to the class.

Feedback: Students received feedback in several ways. Class presentations were met with immediate feedback from instructors and students, both for mathematical correctness and style. Students received written comments on their problem solutions, almost always on the following day. Near the end of Root and Branch classes, students wrote introspective self-evaluations on their progress at MathILy-Er which were read and discussed by the instructors. Then, individual interviews were held with the students to discuss what they had written, as well as other areas for improvement.

Daily Gathers: The instructors gave one Daily Gather each. Math Movies were shown during the Daily Gather time once per week in four of the weeks. The remaining Daily Gathers were given by visiting mathematicians, two of whom were from {MathILy, MathILy-EST} and the remaining eight of whom were external visitors.

Extracurriculars

Life Seminars: Five Life Seminars were held over the weekends, each with a general theme but with a lot of time for open questions. The first was on miscellaneous life matters, such as writing emails and imposter syndrome. The second focused on college, the third on mathematical careers, and the fourth on applying to MathILy.

All-program activities: On the first Sunday afternoon, after life seminar the program played orthogonal questions while eating cake for a student's birthday celebration. On the third Sunday, we walked to Sugaree Ice Cream in Wayne to celebrate National Ice Cream Day.

Social activities: This year, the students played a lot of games including Catchphrase, Spacecats Fight Fascism, Codenames, and Spot It. Several students and one instructor were also into (Rubik's) cubing and could be found teaching other students and instructors about different cube-solving techniques. At Eastern, students regularly used the tennis courts and occasionally used the soccer fields when they were not in use by other programs.

Administrative Matters

Power Outage: A massive storm came through the Philly area the night before staff arrived. On the morning of staff arrivals, Eastern emailed informing us that power was out on campus and two power lines behind our dorm, Hainer Hall, had also fallen down. After some hours of uncertainty and communication between Eastern's conference services, Corrine, Madison, and sarah-marie, MathILy-Er

was moved to Haverford for the first week of the program. On Saturday morning of the first week, Eastern contracted a school bus to move all students from Haverford to Eastern. While students and instructors did morning class at Eastern, the PRiME FACToRs and some Eastern staff members moved everyone's luggage using a 15-passenger van.

Campus Locations: Haverford is located in Haverford, Pennsylvania, a suburb of Philadelphia. The town is walkable and safe, and the SEPTA station is a 15-minute walk or a 5-minute drive from the middle of the Haverford campus. The campus itself is an arboretum with several nature trails.

Eastern is in St. Davids, another suburb of Philadelphia and about a 20-minute drive from Haverford. The campus is about a 5-minute drive from a SEPTA station but the lack of sidewalks on streets adjacent to campus make it difficult to walk anywhere. Downtown Wayne is about a 25-minute walk away and is internally walkable.

Facilities: Both campuses were small and easy to navigate. We were assigned our own dormitories with air-conditioned rooms. The lounges at Haverford were spacious and having multiple lounge spaces allowed different activities to go on at once. Our classroom building at Eastern was right next to the dining hall, which was convenient for people rushing from breakfast and for having a short lunch time.

COVID-19 Protocols: All students and staff took rapid tests on arrival and every day for the first five days. In the meantime, we remained unmasked around each other. The only place on campus where we regularly encountered people from outside our program was the dining hall, and we masked there. We also ate all our meals outside, or in a separate room from the dining hall.

Post-Processing

Post-program staff meetings: After the official end of the program, the staff met to discuss and evaluate various aspects of the program. We will update some of the staff documentation and curriculum documents based on this discussion.

Finances summary:

The income from student fees (some discounted) was \$161,604.

Donations from Jane Street for visitor travel were \$820.

Our Epsilon Grant award was \$5,000, of which \$2,700 was used.

Total MathILy-Er income: \$167,424.

Administrative expenses (insurance, fliers, etc.) totaled approximately \$4239.

Total wages (instructors, PRiMEs, Minion, Directors) were approximately \$45,397.

Wage-related administrative costs (payroll taxes, etc.) were \$2757.

Travel costs (visitors, instructors) were \$3,309.

Program expenses (supplies) were approximately \$3,271.

Site expenses from Eastern University were \$109,207.

Total MathILy-Er expenses: \$168,180.

The net loss of approximately \$756 was less than expected, primarily because of lower than expected travel expenses.