

Canada/USA

MATHCAMP

2018 Year-End
Report

Mathcamp is a project of the Mathematics Foundation of America, EIN 57-1035414.

About Mathcamp



The **raison d'être of Mathcamp** is to take mathematically talented teenagers—many of whom will exhaust the resources of their high schools long before graduation—and deliver them the most powerful tool we know: *the opportunity to take charge of their own educations*. We offer an enormous range of course topics and formats, varying in pace and difficulty from ‘recreational’ to ‘graduate seminar.’ We offer support and guidance, and then students forge their own paths. “*Mathcamp is freedom,*” said one student: “*Freedom to do math all day, to think about abstract ideas without interruption, to be yourself every second of the day, and to do wonderful things beyond what you have done before. There are no walls at Mathcamp; you can do anything.*”



“After the fastest five weeks of my life at Mathcamp, I have grown so much, both academically and emotionally. I was able to bond quickly with both students and staff, and I loved having so many people around to talk to about math.”

– Serena An (Brookings, SD)

“Mathcamp is a life-changing experience. It is impossible to imagine how my life would be without it.”

– João Pedro de Carvalho (Brazil)

Mathcamp is flexibility and creativity. Beyond the intensive academic instruction that forms the core of Mathcamp, students pursue whatever intellectual or creative enterprise moves them, and the staff facilitate and encourage those pursuits. Students enjoy the natural beauty of the surrounding areas on weekend field trips; on campus, they sing in the Mathcamp choir, learn to salsa dance, play inner-tube water polo. The open atmosphere fosters intellectual vibrancy, inspires students to actualize their own ambitions, and crucially strengthens the bonds within the community.

Founded in 1993, Mathcamp has to date served 1,687 students from all over the world, representing all 50 U.S. states (plus Puerto Rico, D.C., and Guam!), 8 Canadian provinces, and 32 other countries, all sharing a common love of mathematics!



Looking back: Mathcamp 2018 at Mines



“There’s no place I’ve ever felt more welcome than at Mathcamp. Everyone here is super interesting, intelligent, and excited about math.”

– Caitlin Cook (Bowling Green, KY)



Mathcamp 2018 was held June 24–July 29 at Colorado School of Mines.

From Ada, Michigan, to Wilmette, Illinois, from Astana, Kazakhstan to Wałbrzych, Poland, this year’s campers came from 26 U.S. states, 3 Canadian provinces, and 8 other countries. There were 51 girls, 68 boys, and one non-binary student. We welcomed back 48 alums (including four students returning for their fourth summers!). We also welcomed 72 fantastic new campers, selected through a competitive application process (from 512 applicants!) based on their excellent essays, recommendations, and solutions to our Qualifying Quiz.

Challenge yourself with a Quiz problem!

For any positive integer n , its list of divisors contains all integers between 1 and n , including 1 and n itself, that divide n with no remainder; they are always listed in increasing order. For example, if $n = 20$, its list of divisors is 1, 2, 4, 5, 10, 20. In a fill-in-the-blank puzzle, we take the list of divisors, erase some of them and replace them with blanks, and ask what the original number was.

(a) For example, suppose we have the list

$$1, 2, _, _, _, 8, _, _.$$

Prove that there is only one way to fill in the blanks to get the list of divisors of a number n , and find n .

(b) Does there exist a fill-in-the-blank puzzle that has exactly 2018 solutions?

(c) For each value of n , the *very hard puzzle for n* is the one that leaves only the next-to-last divisor, replacing all the others with blanks. For example, the very hard puzzle for 10 is $_, _, 5, _$. It has two solutions: 10 and 15.

For which values of n does the very hard puzzle for n have no solutions other than n ?



“I’m leaving Mathcamp more inspired than I’ve been in a long time.”

– Srinidhi Narayanan (College Station, TX)



Math at Mathcamp 2018

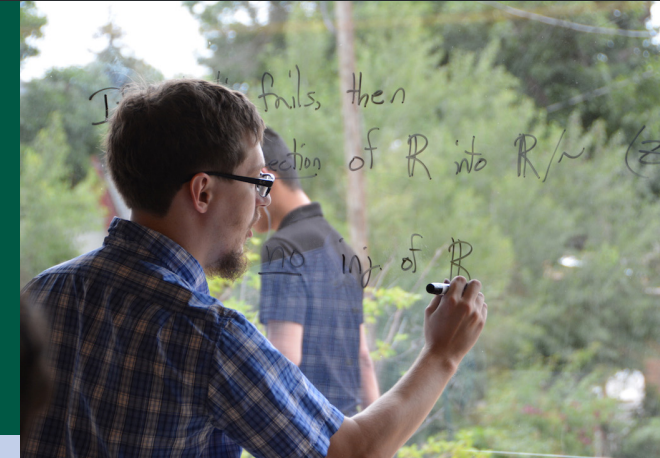


“Asking mentors and teachers for help on difficult questions never made me feel embarrassed, but empowered and curious to learn more.”

– Sean Li (Danville, CA)

Classes

On the first day of camp, each Mathcamp student chooses an academic advisor, whose role is to help address the question: *What kind of academic experience do you want to create this summer?* The possibilities aren't endless, but they're vast: from “Flag Algebras” to “Mathematical Art History” to “Differential Topology”, students had over **120 classes** to choose from. Here is just one example, from mentor Jonathan Love (“J-Lo”):



“Minus Choice, Still Paradoxes”

The Banach-Tarski paradox says that a ball can be broken into finitely many pieces, and using only translations and rotations, can be rearranged into two balls, each the same volume as the original. The “Axiom of Choice” is a crucial part of this construction, and historically some people have used Banach-Tarski as an argument against this axiom.

But it turns out that paradoxical decompositions (breaking something into finitely many pieces and rearranging them into two copies of the original) exist even without the Axiom of Choice! This class will discuss some of these constructions, which are all based in group theory, and see what specific role Choice plays in the Banach-Tarski case.

“Mathcamp is an environment where one can truly explore the strange and wonderful world of mathematics free from any outside pressure besides one's own endless curiosity.”

– Nicholas Jenkins (Gastonia, NC)



Projects

The Project Fair is when everyone's work outside classroom hours comes together, showcasing strategies in Secret Objective Chess, displaying mathematical art, or presenting posters on Schubert Calculus. After hours and hours of preparation and practice talks, several students even taught their own classes: “A Slice of PIE”, “Curse of Dimensionality”, and “Dirichlet Series”.



Outside the Classroom at Mathcamp 2018



“Mathcamp is a place where you can be yourself. It feels more like home than anywhere else.”

– Milan Haiman (New York, NY)



Field Trips

Mathcamp returned to Colorado for the first year since 2002, and field trips took full advantage of the setting. We saw fossils at Dinosaur Ridge, got splashed while whitewater rafting, explored downtown Denver, and did tons of beautiful hiking in the Rocky Mountains.



Activities

As is tradition, campers stayed cool with liquid nitrogen ice cream, solved evil math problems at relays, wrote the camp yearbook, sang the alma mater (“Nonabelian”), and sported our unofficial uniform: sarongs. For a challenge, try to solve the puzzle below, “Piglet’s Pen Pals,” from this year’s puzzle hunt, another annual tradition.

“Mathcamp is the only place you can talk math with anyone anywhere — whether during a meal, on a hike, in a game of cards, or late into the night... a priceless five weeks I will treasure forever.”

– Haneul Shin (River Edge, NJ)

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Supporting Mathcamp



Mathcamp 2019 will take place this summer at Lewis & Clark College in Portland, Oregon for five exciting weeks, from June 23 to July 28. We look forward to welcoming new campers and alumni of all kinds of backgrounds, from all over the world, who all share a love of math!



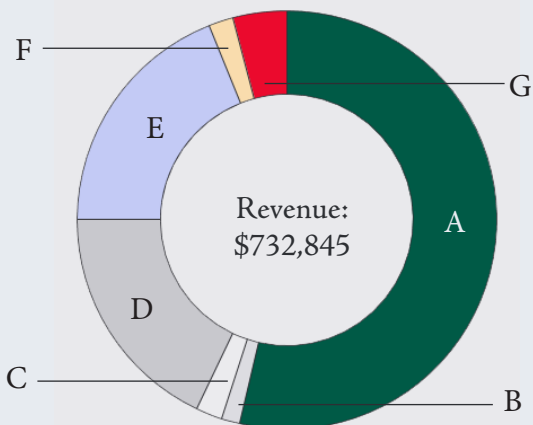
Fiscal Year 2017-18 Revenue

A Program Tuition + Fees	\$ 393,250
B Scholarships - AMS	\$ 10,000
C Scholarships - NSF	\$ 15,000
D Scholarship Fund Gifts	\$ 131,710
E Unrestricted Individual Gifts	\$ 138,742
F Corporate Donations	\$ 13,980
G In-Kind Donations	\$ 30,163

Mathcamp gives an incredible intellectual and social experience to incredible kids, and one of our guiding principles is that camp should be accessible to every qualified student – no matter what their financial circumstances. Admission to camp is need-blind, and in 2018, *31 out of 120 students came on full scholarships.*

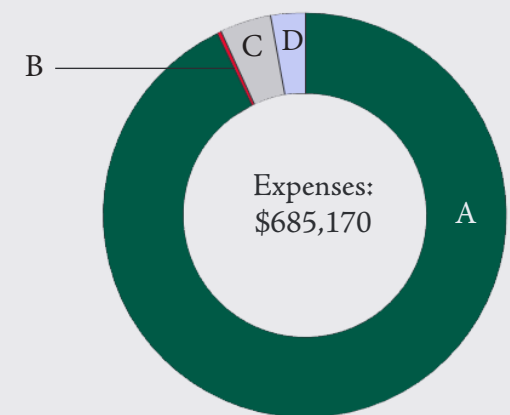
Fiscal Year 2017-18 Expenses

A Mathcamp 2018	\$ 636,276
+ College Campus - 39%	
+ Staff Salaries - 34%	
+ Other Camp Expenses - 27%	
B Alumni Programming	\$ 2,177
C Administrative	\$ 28,340
D Fundraising	\$ 18,377



Donations keep Mathcamp open to all.

Mathcamp is *free* for U.S. and Canadian families with household incomes of \$65,000 and below, and we even offer *travel grants* to cover plane tickets to camp. Need-based financial aid is also available for middle-income families and international students. About \$25,000 of our \$150,000+ aid budget comes from the National Science Foundation and the American Mathematical Society, and the rest comes from the program's supportive alumni, families, and friends.



Give today: www.mathcamp.org/donate