

## MathPath: building community with middle schoolers who love math

—DAVID CLARK, MATT DELONG, CODI GAUGER, LARA PUDWELL, JULIE VEGA, AND APRIL VERSER

### What is MathPath?

**MathPath (mathpath.org)** is a national residential summer camp for 11–14-year-olds who love mathematics. Each July since 2002, over 100 students have come from around the country (and the world) for four action-packed weeks of interactive classes, lectures, and fun activities. They are joined by college-aged counselors, as well as older staff, who work together to build an intentional mathematical community over four short weeks. The camp's location rotates between different college campuses across the country.

### Forming Our Academic Community

The mission of MathPath is “to inspire and advance mathematically gifted middle school age students through a residential summer program.” To do so, we emphasize enrichment over acceleration and discovery over rote learning. MathPath values rigorous mathematical thinking, communication, active participation, and a balanced experience between learning and exploration. Through our community, campers meet a variety of mathematical role models.

A student application to MathPath includes our Qualifying Test. This test, which changes each year, contains problems that are self-contained, require very little prerequisite knowledge, and intentionally range from very accessible to quite challenging. We encourage students to spend a few weeks completing the test, hoping that they will take the time to think deeply about the problems over the course of many days. Questions explore basic number theory, combinatorics, geometry, and other areas of mathematics. Students are told that our assessment of their submissions considers the quality

### Sample Problem from the Qualifying Test

- Demonstrate that for each  $n \geq 2$  there is an  $n$ -digit number divisible by 7 all of whose digits are 1s or 2s.
- Now show that for each  $n \geq 2$  there is an  $n$ -digit number divisible by 7 all of whose digits are 8s or 9s.
- Find one other pair of digits (not including 0 or 7) for which this occurs.



*MathPath 2023 faculty, staff, and students.*

of their writing and their display of mathematical habits of mind.

Our academic weeks at camp run Tuesday through Saturday. Each week, campers take two week-long breakout courses and attend a variety of plenary sessions. The menu of offerings for the breakout courses changes each week. Courses are taught by college faculty, many of whom fly in for a week or more and live in the dorm with the students and other staff. Although some courses are offered every year—such as introductory number theory, basic combinatorics, and induction—most course offerings are dependent upon the specialties and interests of the faculty.

The academic program at MathPath extends far beyond breakout courses and is designed to provide students with a well-rounded introduction to concepts and ideas that we believe that every budding mathematician should know but are rarely taught in school. Students are presented with 20 lectures on the history of mathematics, which takes them from cave markings to cutting-edge results. Each academic day includes a morning plenary, akin to a colloquium seminar, given either by one of our faculty or a visiting guest. Each afternoon includes a half-hour interactive lesson on mathematical writing. We also emphasize fun problem solving, both with an all-camp Problem of the Day as well as with Saturday puzzle-hunts and other problem-solving activities. We hope that the full range of academic activities at MathPath helps the students develop their mathematical foundations while exposing them to new mathematical topics, applications, and possibilities.

### Forming Our Social Community

Since MathPath is residential, building a tight-knit community is essential. By living, learning, playing, and working together, strong bonds are formed among students, between students and staff/faculty, and among staff/faculty members.

We focus on developing students as whole individuals, rather than just as mathematicians, so we provide plenty of opportunities for social interaction while counselors and staff are there to give students guidance. We believe that moving around and regular breaks are essential to keeping students

engaged during their academic classes and building connections in the community. We also help students develop through program-wide activities, held a couple of times per week. These activities center topics such as identity, imposter syndrome, stress, learning styles, inequity in mathematics, and more. Optional small group activities are also provided as opportunities for those students and staff who are interested to dive deeper into discussion.

We host larger-scale activities on the weekends to explore local attractions, such as a large museum, a theme park, or a natural wonder. These all-program trips allow for the MathPath community to build shared experiences, inside jokes, and other feelings unique to the close-knit community of a residential summer program.

## Opportunities to Get Involved

With participants ranging in age from 11 to 81, MathPath is one of the most vertically integrated mathematics communities of which we know. Students, staff, and faculty all learn new things and make new connections at camp. There is an inevitable sense of humor that grows from living in a community full of middle schoolers for a month while they joke and play, explore beautiful ideas, and take part in genuine and supportive conversation about communication, learning, personal growth, and more.

Whether their first MathPath summer was as a member of the faculty and staff or as a student, once people experience MathPath, they frequently return to participate in future years. How do you get involved for the first time? Each spring, MathPath hires over a dozen counselors (typically undergraduate mathematics majors), as well as senior staff assistants (typically mathematics graduate students or high school teachers). We also hire faculty to teach week-long breakout courses. If you're interested in experiencing MathPath firsthand, make sure to check out the employment section on our website or suggest it to students interested in counselor positions.



*MathPath 2023 orientation.*

Students tend to learn about us by word of mouth. If you know a middle schooler who loves mathematics, please point them in our direction. We offer need-based financial aid, including travel support, so that any student who is mathematically ready for MathPath can join us.

Finally, MathPath holds an annual fundraising campaign specifically to help support tuition and travel for those with financial need. Donations can be made at any time via our website ([mathpath.org](http://mathpath.org)), and a financial gift, in any amount, helps students who love mathematics find their place in a larger mathematical community as they learn and grow with others.

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*David Clark (financial director), Matt DeLong (academic director), Codi Gauger (assistant camp director), Lara Pudwell (executive director), Julie Vega (student life director), and April Verser (camp director and director of admissions) are the senior staff of MathPath 2023. You can learn more about them and about the camp at [mathpath.org](http://mathpath.org).*



*Free time with Zometools.*



*An all-camp field trip to the Oregon coast.*