

## Final Reflection on My 2021 Summer Enrichment Experience at Awesome Math

By Jason Qin

With the Garwin Family Foundation Scholarship, I had the wonderful opportunity to attend the 2021 AwesomeMath summer program, a 3-week intensive math camp. These three weeks I examined the topics of Number Sense and Algebra 2.5, as I wanted to dive deeper into the foundations of numbers and math. These two topics pave the way for our understanding of modern mathematics, as equations, rules, and numbers in general are the building blocks for everything. The AwesomeMath program built off my foundation of mathematics from school and introduced interesting concepts that I would not have learned otherwise.

Through these past 3 weeks, I've developed a further appreciation and understanding of mathematics, solidified with proofs and curiosity. All the new concepts, no matter how trivial, taught in my classes were backed up with proofs. Some of the topics covered and proven in class were things that I had always known to be true but never proven, such as the fact that there are infinite primes, the Fundamental Theorem of Algebra, or even that not all algebraic rings are fields (and how to tell whenever a given ring is a field). The courses facilitated the concept of "just knowing the answer isn't enough" and that rigorous proofs are always superior to getting the right answer. Every Saturday would be a test covering the topics we learned that week, and getting the full solution rewarded you with 7 points but just knowing the answer or guessing the solution would give a 0 or 1. I really enjoyed the rigorous proof-based side of mathematics that the AwesomeMath program encouraged, as this makes the whole experience of solving problems and asking "why?" to be all the more fun and rewarding. I've always loved and been involved in mathematics from a young age, and the AwesomeMath summer program has given me an amazing outlet to exercise creativity and problem solving.

Going into the classes of number theory and Algebra, I didn't expect that much tangible use like the geometry topics that I've been used to. However, in these classes, I've been able to grasp a deeper understanding of mathematics and its applications to the other fields. In one example, for my Algebra class, the instructor posted a problem dealing with hexagons and circles, which would have been very "complex" to do the normal Euclidean geometry way (looking back, I'm not even sure if it's possible using our knowledge of geometry). To our surprise, the instructor introduced a solution (not an easy solution) using actual complex numbers and their properties in the complex plane, and this has completely changed the way I view number theory and algebra.

Similar to last year, I have had the amazing opportunity to meet likeminded people and grow intellectually with my peers. There were many opportunities to work together on problems and work together with aspiring students heavily involved in mathematics. On the final day of the program, we participated in a math "competition" for my Number Sense class, where there would be multiple teams of students working together on problems and trying to come up with solutions before the other teams. Through the AwesomeMath discord server, I could meet

students of all backgrounds from all the various classes and talk with them about random life things, social events/games, or even various math topics (not just limited to number theory or algebra). There would be channels with daily problems from all of the classes with incredibly smart students from all over the globe collaborating and sharing their ideas (there was even a channel discussing the International Mathematics Olympiad questions). Even outside of the classroom, not just limited to number theory and algebra, I was constantly involved in mathematics and learned a lot through these random problem discussions, and of course I fell in love with geometry again during a discussion of the nine-point circle.

In addition to collaborating with other students on math problems, the AwesomeMath summer program also had multiple opportunities for social events held over Zoom. These would range from online games like skribbl.io and Gartic phone, to collaborative puzzles and escape rooms. I have been able to meet so many aspiring students both in and outside the classroom and experienced a part of the world that's outside the community of Southern Illinois.

I'm very grateful to the Garwin Family Foundation for providing this amazing opportunity! I have truly been able to pursue my passions and further my understanding and love for mathematics!