# Final Reflection on My 2021 Summer Enrichment Experience at Stanford Pre-Collegiate Summer Institute

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This summer from July 26th to August 6th, I attended the Number Theory class at the Stanford Pre-Collegiate Summer Institute. My course focused primarily on the functions of natural numbers and integers, and how those were utilized in everyday applications.

**First Week: Introduction to Number Theory**

During the first week of class, we were taught that to count, I have to perceive the occurrence within those numbers. I was elucidated to this approach by denoting set Z with two slashes which represented an infinite set of integers, and other letters which represented the remaining sets of numbers. I was fascinated by the versatility of numbers and the capability of arithmetic to encode properties of integers, prime numbers, or other number sets in some manner. We also briefly went over the real-life applications of Number Theory. The use of prime and composite numbers can identify errors in coding and generate random/quasi-random numbers, which can be highly advantageous when producing uniform samples of the hypercube (an n-dimensional analogue of a square and a cube).

**Second Week: Additional New Theorems and Real-Life Applications of Number Theory**

During the second week of class, we started with a midterm exam, which covered topics from the first week (Euclidean algorithm, Cartesian products, etc.). Later in the week, we learned about the Chinese Remainder Theorem and the proofs that substantiate it. Invented by Chinese mathematician Sun-tzu, the Chinese Remainder Theorem states that knowing the remainder of the Euclidean division of an integer n by several integers can determine the unique remainder of the division of n by the product of these integers. We also dug deeper into encryption cryptography, specifically, how the understanding of prime numbers' properties can be utilized in encrypting messages. Not only that but all the information of everyday security can be encrypted immediately with this practical knowledge.

**Outside of Class**

Many student life events took place during the two weeks at Stanford's Pre-collegiate summer institute. I joined the Stanford Undergraduate Admission Talk, where I was familiarized with preparing essays for college applications. There was also a Talent Show, where more than 30 students submitted recordings of their astounding performances. Students played instruments, composed music, introduced their pets, and created digital artworks; I was absolutely stunned by the talents of these individuals. One submission that stood out to me, however, was a traditional Chinese paper-cutting of a swan. The end product was just so beautiful! On the last day, a commencement ceremony was held to conclude the students' time at Stanford. It was a bittersweet moment when the instructors opened up about how amazing they thought we students were and that they appreciated our hard work in dedicating time and effort to daily classes.

**Final Thoughts**

During the two weeks at my Number Theory class, I have learned an abundant amount of materials and discovered a passion for this new branch of mathematics. Previously, the only occasions that I have momentarily utilized Number Theory was in math competitions, yet that was just a little part of the wide reach that it covers. Subsequent to taking this class, I feel confident that I can apply this concept to everyday problems, and I acquired plenty of knowledge that I envision to be helpful in the future. I am so thankful to my instructor, Dr. Peter Koroteev, for providing such an astounding presentation to this course, and ultimately to the Garwin Family Foundation for their support and recompense for me to grow in a new field of mathematics; it was an encounter that I will always remember.