Math 49 Fall 2019 / Fridays 1:15-4:00pm / Introduction to Number Theory
Prof. Darryl Yong / dyong@hmc.edu / Office: SHAN 2410

Course Description: Mathematicians often need to "think deeply about simple things" (Arnold Ross, 1906–2002). This course will help you develop that ability through collaborative inquiry in number theory. Topics may include factors, modular arithmetic, analytic number theory, algebraic number theory. No prerequisite knowledge of mathematics is required beyond high-school algebra.

Learning Objectives: As a result of participating in this class, each student will
1. Increase their metacognitive skills for learning,
2. Deepen their ability to learn with other students in small group inquiry,
3. Strengthen their ability to hypothesize, experiment, and look for mathematical patterns,
4. Become acquainted with some core topics in number theory.

My Teaching Philosophy: There is no such thing as a person who is innately "good at math"—I firmly believe that everyone in the class is fully capable of engaging and mastering the material through practice and productive struggle. I will try my best to make this class an inclusive space, where ideas, questions, and misconceptions can be discussed with respect. There is usually more than one way to see and solve a problem and we will all be richer if we can be open to multiple paths to knowledge. I am committed to creating a classroom environment that welcomes all students, regardless of race, gender, social class, religious beliefs, etc. We all have implicit biases, and I will try to continually examine my judgments, words and actions to keep our biases in check and treat everyone fairly. I hope that you all will do the same, that you will let me know if there is anything I can do to make sure everyone is encouraged to succeed in this class.

I also believe that there are many different ways to be good at math. Most mathematics classes emphasize being accurate (getting the right answer) and quick. These can be helpful skills, but there are not the only ones that professional mathematicians use in their work. Mathematicians also need to be able to look for patterns, make conjectures, persevere through confusing and ambiguous situations, clearly explain their thinking, follow other's thinking, visualize information, and more. This class is designed to help you become more aware of your own mathematical strengths and the strengths of others so that you can become a capable mathematician.

Pedagogical Approach: This course will probably be unlike any other math course you've taken so far for two main reasons. First, this class is designed so that you will learn from and with each other, not from me. As your instructor, I will spend very little time lecturing. Instead, you will be working in small groups on a set of mathematical tasks during each class period. I have designed these tasks to pique your curiosity, encourage you to make conjectures and look for patterns—in other words, these tasks are designed to engage you in doing mathematics the way that professional mathematicians do mathematics.

Second, this course is part of a community-campus partnership between the Claremont Colleges and the California Rehabilitation Center (CRC) in Norco, California. Most class meetings will take place at CRC. Claremont College students and CRC students will work together to tackle the mathematical tasks involved in this class. Although not a primary goal of this course, it is inevitable that we all also grapple with the complicated social, cultural, political and structural issues, histories, and power dynamics related to the prison industrial complex. All of us in this class will co-construct learning experiences for each other that will liberate and enrich us all.

Note to Claremont Colleges Students: The purpose of this partnership between the Claremont Colleges and CRC is to co-create rigorous learning and teaching experiences. As "outside" students, your role is not to "save," "help," or "serve," inside (CRC) students. This opportunity to learn together is a privilege and we must take it seriously. We must also be mindful of the boundaries of our relationships with each other: we will only address each other by our first names in this class; no contact will occur between inside and outside students aside from our class time; confidentiality will expected (but within limits—if anyone reveals intentions to hurt themselves or others, authorities will be notified). Outside students must abide by the dress code of the prison and bring their state ID to gain entry to the prison.

Required materials: There is no required textbook for this course. I will provide all of the necessary learning materials for this class. The materials were developed by Bowen Kerins, Al Cuoco, Glenn Stevens, and me.

How to Be Successful in this Class:
- Be respectful, open-minded, and responsible. Be on time.
- Believe that you have something to learn from everyone. Believe that you have mathematical strengths to offer to others.
- Stop and smell the roses. Getting the correct answer to a question is just the beginning. How does the question relate to others you've encountered? Why is your answer correct? Will your solution method always work? How do others think about this question? Be curious.
- If you finish all of the tasks that I prepare for each class, then I will not have done my job correctly. So, don't worry if you don't finish all the tasks. It is completely fine to dive deeply into one problem and not finish the rest.
- Remember that everyone works at a different pace. Give everyone the opportunity to express themselves.
- Don't be afraid to ask questions. Don't be afraid to say that you don't know something (yet).
- At times you may feel tempted to teach others. Fight it! Even when someone asks you to explain something, be careful of saying too much. Ask a question instead. Our goal is to give everyone the chance to discover things on their own as much as possible.
- Be mindful of your own emotions and the emotions of others while you're learning with each other. Frustration, joy, disappointment, amusement, anxiety, surprise are all natural feelings when learning.
- Operating this class in a prison requires that we adhere to the prison's rules, procedures, and circumstances. There will be times when we will need to be patient, flexible, and tolerant of change.
- Communicate openly with me, your instructor, about what you are experiencing and what you need to be successful.

Course Calendar: (subject to change)
Almost all the classes will take place at the CRC facility in Norco. Outside students will need to budget time for traveling to and from CRC each day. I am also available for individual meetings.

Friday, Sep 6 (Claremont)	Class #1 (Claremont Colleges students only)
Saturday, Sep 7 (Claremont)	Claremont Colleges students only—orientation and introduction
Friday, Sep 13 (CRC)	Class #1 (CRC students only)
Friday, Sep 20 (CRC)	Combined class #2
Friday, Sep 27 (CRC)	Combined class #3
Friday, Oct 4 (CRC)	Combined class #4
Friday, Oct 11 (CRC)	Combined class #5
Friday, Oct 18 (CRC)	Combined class #6
Friday, Oct 25 (CRC)	Combined class #7
Friday, Nov 1 (CRC)	Combined class #8
Friday, Nov 8 (CRC)	Combined class #9
Friday, Nov 15 (CRC)	Combined class #10
Friday, Nov 22 (CRC)	Combined class #11 (no class on Nov 29 due to Thanksgiving holiday)
Friday, Dec 6 (CRC)	Combined class #12
Friday, Dec 13(CRC)	Combined class #13 (Final sharing of results)

Homework and Exams: There is no homework in this class, except that I would like you to spend at least 30 minutes reflecting on the mathematics that you are learning in the class. You are welcome to continue your mathematical exploration after class, but do not do so that will impede your ability to work with others. For example, do not look up math books or web sites that might give away the results of what you're looking for.

There is no cumulative exam in this course, but I will ask you to complete a final reflection on your learning experience.

Your grade will be determined based on your participation in class, timely attendance, and the quality of your final reflection paper.