

CAS MA111: Math Explorations, Fall 2024

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Logistics

Meetings: Tue, Thur 9:30-10:45, MCS B29; Fri 11:15-12:05 CAS 324

Note that I don't make much of a distinction between "Lecture" and Discussion sections. Please plan on attending both.

Text: [*Mathematics for Human Flourishing*](#) by Francis Su, ISBN: 978-0300237139. Although this book includes some math puzzles and problems, it's not a textbook. We will read it at a leisurely pace with time to reflect and discuss.

Drop-In Hours:

- Tues 4-5 p.m., Fri 2-3:30 p.m. in one of the collaborative spaces on the 4th floor of CDS (the blue one is my favorite). My office is 425. I'll message where we are on GroupMe.
- Note that I am supposed to reserve this Tuesday time for Department Meetings, but we don't have very many of them. In weeks that I have meetings, I'll announce alternatives to the Tuesday Drop-In hours.
- Drop-In Hours (formerly known as Office hours) are just that; feel free to stop by for any reason. There will always be puzzles to try and games to play. I enjoy hosting Drop-In Hours, and you aren't burdening me.
- I will also have some additional Zoom and in-person availability by appointment if these times don't work for you or if you need more privacy.

Communication: We will use Blackboard for assignments and GroupMe for general communication. Please use GroupMe instead of email whenever possible. Note that in general I will check GroupMe more frequently than email, and I will not check email/GroupMe on nights or weekends. If you have a question that a classmate may be able to help you with please send it to the whole group, especially at those times. For planning purposes, I'd appreciate it if you could DM me on GroupMe if you're going to miss class or be late.

Please sign up for our class GroupMe at <https://tinyurl.com/Mat111F24>.

Schedule of Major Assignments:

This schedule is subject to change, but I will try to stick to it. Reflections and the Paper are due at 9:30 a.m. on the Tuesdays listed below.

- **Every week, you decide times:** Out of Class Math Explorations
- **Every Friday:** Read chapter from Book
- **One Friday:** Lead class discussion of book with partner
- **September 24:** Reflection 1
- **October 22:** Paper (peer edit and rewrite due dates announced in class)
- **November 5:** Reflection 2
- **November 13- Joyful Finale:** Talk (you schedule)
- **End of semester:** Final Reflection and Conference

Joyful Finale: We will have a Joyful Finale during the assigned final exam slot, where there will be talks and time to celebrate our work. Please save the date when the schedule comes out. If you have a time conflict with a more traditional exam, please see if it's possible to take the other exam at another time, as it's not possible to recreate the Joyful Finale at another time.

Bulletin Course Description: An active class where students explore challenging mathematics problems, chosen from an array of topics, that can be solved in multiple ways. Includes making, testing, and modifying conjectures; constructing proofs; posing new problems; extensive classroom interaction; reflective and other writing. No prerequisite.

Approach to Learning

*Abbreviations in bold reference Hub Learning Outcomes: **QRII=Quantitative Reasoning II, OSC = Oral/Signed Communication, CI = Creativity/Innovation.** See below for outcome details.*

This course will immerse you in the joy and struggle of doing mathematics. With your classmates, you will explore challenging problems that can be solved in a variety of ways (**QRII-I, QRII-2, CI1, OSC1, OSC2**). You'll find patterns, make and test conjectures, justify your reasoning and pose and solve your own new problems (**QRII-3, CI1**). You'll make many mistakes, analyze them, and learn from them (**QRII-3, CI1**). You'll write about your work (**QRII-4, QRII-5, CI2**), present it (**QRII-4, OSC1, OSC2, OSC3**), and listen and learn from your classmates (**OSC2**). You'll be part of creating and maintaining a classroom community where we support, challenge, and celebrate each other, as we adapt the course to work for students in a variety of circumstances.

One of the benefits of this being a Hub course with learning outcomes in creativity and communication is that we are not bound by a list of topics that everyone in the class must "cover," as is typical in many mathematics courses. In this class you'll choose problems that are interesting to you and at the right level for you – so that you can stay at your "learning edge," where you're challenged and sometimes frustrated, but not bored or lost or overwhelmed. You will practice giving talks, using a format that's relevant to you. This is a class where you can

take risks and make choices, where you and your classmates may learn different things.

To facilitate creativity and risk taking, the course will be feedback focused; there will be no grades on classwork – the feedback you get and give will be focused on learning and improvement. As long as you thoughtfully and consistently engage in the course, you can do well. See below for details.

Please note that you are welcome in this class whether you love math or hate it, whether you are an accomplished public speaker or afraid of public speaking, whether you are an extrovert or an introvert, etc. However, this class requires your active engagement in creating it and being part of it. If you want a course where you can be a mostly passive spectator, then this isn't the right course for you. I will do my best in the first week to give you a sense of what to expect and to answer your questions (I cannot give you a full sense because students are an integral part of creating the course, so I don't know yet exactly what it will be).

Details about Course Structure and Assessment

Exploration Notebook

- I will give you a notebook at the beginning of the semester (if you want it). This notebook is for you to explore and play with math; it's raw material for discussions, reflections, and more formal work.
- I like bound graph paper notebooks for this purpose, but you can use whatever type of physical or electronic notebook works for you, as long as it facilitates open-ended exploration, without erasing past work.

Grade Guidelines

Feedback is critical to helping you learn; grades are not. There is a lot of research that shows that students pay less attention to feedback if there is a grade attached. In designing the assessment system, my hope is to relieve enough anxiety about grades so that you can focus on learning, rather than on scheming to get a good grade.

At the end of the semester we'll have a conference where we'll collaboratively decide your grade. The table below lists guidelines for the grades A, B, and C, and there are more details on the categories after it. You need to complete everything on the list for a particular grade. However, if your work doesn't match the guidelines exactly, you can propose grades with plusses/minuses and/or explain why you think you've done equivalent work.

	Commitment Level (Grade)		
	High (A)	Solid (B)	Reduced (C)
1. Active Member of Classroom Community	Consistently	Mostly	Sometimes
2. Out of Class Math Exploration	At least 3 hours per week	At least 2 hours per week	At least 12 hours per semester
3. Reflections	All satisfactory, later ones incorporate feedback from earlier ones	At least two of three satisfactory, incorporates feedback from earlier ones	At least half of this work satisfactory
4. Paper	Satisfactory, rewrites based on feedback if necessary	Satisfactory, rewrites based on feedback if necessary	
5. Talk	Satisfactory	Satisfactory	Satisfactory

1. Active Member of Classroom Community

- Helping build and sustain the classroom community is central to this course. This category includes engaging in all activities during class, listening respectfully to other students and helping strengthen their thinking and their skills, sharing your thinking and letting others help you improve, and other forms of engagement both in and out of class.
- After the first or second book discussion, individual or pairs of students will facilitate the book discussions.

2. Out of Class Math Exploration:

- Most homework for math classes consists of tasks: read this material, watch this video, do these problems, etc. You are done with your homework when you've finished all the tasks. Thus, math classes are necessarily curated in favor of tasks that can be done in a particular amount of time, and students often don't get much exposure to the kind of mathematical thinking that mathematicians do, which involves things like posing your own problems, exploring paths that don't work, taking a long time to solve a problem, and not solving a problem but still learning a lot.
- It can be very hard for students to prioritize homework that isn't task oriented, especially when your schedule is full of papers and problem sets from your other courses. Thus, in order to turn creative mathematical exploration into something that can fit in with all the tasks you have to do, you'll time your out of class Math Exploration Time. Your "task" is making the time to explore, and then exploring. Sometimes you'll have many breakthroughs and insights, sometimes you'll spend the whole time on a

strategy that doesn't work. In either of these cases, and many more, you'll have completed your "task," no matter what are the "results."

- The goal of this part of the course is to consistently make time for math exploration out of class. I will be reasonable about ways in which you may not have exactly the same number of hours each week. If you get really involved in a problem and spend ten hours on it – great! But it doesn't count for three weeks of exploration time (but if you are an hour short the next week, fine). If you get sick and can't work for a week, skip it and focus on healing. If you have a longer-term issue, talk to me (only sharing what details you want to share).
- For your out of class exploration time, you can work with others from class or alone, as you wish (and sometimes you can work with people not in our class). Often Drop-In Hours can count as Out of Class Math Exploration Time if you spend it exploring math. What doesn't count is doing homework for your other math/math adjacent classes (although sometimes these classes can inspire problems you work on in your Exploration time).

3. Reflections

- There will be three structured reflection assignments. You have your choice of whether to write reflections more often (e.g. a weekly journal) and assemble them to turn in at each assignment time, or to treat the reflections as major assignments.
- Some of the topics that may be included in reflection assignments:
 - A problem or problems you've worked on, with photos of your work from your notebook or other places.
 - Readings from the book

- Interesting mistakes
 - How class is going
 - Reflection on your math education
- Working on Reflections does not count as Out of Class Math Exploration time.

4. Paper

- The paper is an opportunity to deepen your understanding of a problem or set of problems that you're interested in. You will get feedback from both peers and from me, and you can submit new versions until we are both satisfied with the extent of your exploration and with your understanding.
- You can use Out of Class Math Exploration Time to work on the paper (including writing it), but it may take more time than that.

5. Talk

- Toward the end of the semester you'll give a ten-minute talk on a topic of your choice that is related to the course. Previous topics have included new math problems; applications of math to students' majors, hobbies, or passions; and reflections on math education in various contexts. You'll have class time to rehearse their talk in small groups and get feedback.
- The week that you're doing the most work for your talk, you can skip Out of Class Math Exploration Time or use it for talk preparation (depending on your topic; talk prep might or might not be Math Exploration).

Flexibility/Late Papers:

- Please note that I have three classes and 90 students this semester. My aim is to give each student substantive feedback throughout the semester, while also taking good care of myself. I've scheduled the assignments to give myself a reasonable pace for providing feedback. Turning in your assignments on time will help me keep on pace, and I appreciate it.
- However, I don't want you to endanger your health or be tempted to cheat because a due date is approaching and you're too sick, or in the middle of an emergency, or too overwhelmed to take care of yourself and get your work in on time.
- If you need to turn in an assignment up to a week late, please fill out [this form](#). However, don't use this option to routinely assume the due date is a week later; use it when you need it.
- If you are further behind and need to turn in an assignment more than a week late, please contact me to make a plan.

Five Promises

1. Wholeness: You and I are whole human beings, who are embodied, have complex emotions, are embedded in networks of relationships, and have responsibilities and interests beyond this course. We have identities and histories that impact how we see ourselves and how others see us. My first promise to you is to see you as a whole person, to honor you, and to value your physical and mental wellbeing independent of your performance in this class.

2. Power/Trust: As your professor, I have power in our relationship, and my second promise to you is to be responsible and accountable in using this power. I will start by trusting you and assuming that you want to learn and are doing the best that you can do right now. I don't expect you to start by trusting me, but I hope that I will earn your trust. It is possible that I will lose trust in you, but I will not expect this outcome.

3. Success: I want you to do well in class, and I will work with you to meet your access needs (whether or not you have official accommodations). I know that sometimes issues in other parts of your life can make it hard for you to do your best work and that you are more than what I see in this class. If you are struggling, I will start by assuming there is a good reason for those struggles.

4. Boundaries: My fourth promise is to set boundaries so that I can take care of myself. I can only see you as a whole person if I also see myself as a whole person. In order to be both energetic and calm as your teacher, I need rest and time for myself and for my relationships.

5. Joy, Wonder, and Connection: My last promise is to share my love of math with you and to teach in a joyful way that promotes wonder and helps us connect with each other

More Policies and Information

Attendance: Our classes will be active, and attendance is very important. Please plan on coming to class, on time, whenever you are able to. If you miss class, check Blackboard.

If there's something in your life that's interfering with your ability to engage in the course, please feel free to talk to me about it, to see if there's a way I can help

make the class work better for you. You only need to share the details you want to share. You don't need to bring me a doctor's note; I don't read them. Please note that I have considerable experience with chronic illness and how it impacts academic life.

Academic Conduct: All writing for this course must be solely your own, unless the assignment is explicitly a group assignment. Larger assignments will include an acknowledgement section, where you can credit your classmates by name for ideas you learned from them or work you did together, and if allowed, you can also cite external resources you used. Plagiarism will be addressed according to the [Boston University Academic Conduct Code](#). We will discuss academic conduct as it applies to specific assignments when appropriate.

Internet, AI, Other External Resources: In many cases, I do not want you to do internet searches or use AI tools such as ChatGPT, as they will remove the joy and learning involved in solving a problem by yourself or with classmates. However, I was away last year, and have not taught much since AI tools have become widely available. I am open to exploring with you how these tools might support course goals.

Incompletes: If you have health issues, an emergency, or find yourself in other difficult circumstances that affect your performance in the course, you may be eligible for an incomplete, where you would finish the work after the semester ends. Please feel free to talk to me about this possibility.

Access Needs/Accommodations: I am committed to doing what I can to make the class accessible to you, whether or not your access needs are officially documented. Please feel free to talk to me about ways we can make the class work better for you.

If you have a documented disability or believe you might have a disability that requires accommodations, please contact the Office for Disability Services (ODS) at (617) 353-3658 or access@bu.edu to coordinate any reasonable accommodation requests. ODS is located at 19 Buick Street.

Changes: I reserve right to make changes to this syllabus to better meet the needs of students in the class. If appropriate, students might have input into these changes. Any changes will be clearly documented with sufficient notice for students to adapt.

Hub Learning Outcomes:

Intellectual Toolkit: Creativity/Innovation [CI]

- **CI1:** Students will demonstrate understanding of creativity as a learnable, iterative process of imagining new possibilities that involves risk-taking, use of multiple strategies, and reconceiving in response to feedback, and will be able to identify individual and institutional factors that promote and inhibit creativity.
- **CI2:** Students will be able to exercise their own potential for engaging in creative activity by conceiving and executing original work either alone **or** as part of a team.

Communication: Oral/Signed Communication [OSC]

- **OSC1:** Students will be able to craft and deliver responsible, considered and well-structured oral and/or signed arguments using media and modes of expression appropriate to the situation.
- **OSC2:** Students will demonstrate an understanding that oral/signed communication is generally interactive, and they should be able to attend and respond thoughtfully to others.

- **OSC3:** Students will be able to speak/sign effectively in situations ranging from the formal to the extemporaneous and interact comfortably with diverse audiences.

Quantitative Reasoning II [QRII]:

- **QRII-1:** Students will frame and solve complex problems using quantitative tools, such as analytical, statistical, or computational methods.
- **QRII-2:** Students will apply quantitative tools in diverse settings to answer discipline-specific questions or to engage societal questions and debates.
- **QRII-3:** Students will formulate, and test an argument by marshaling and analyzing quantitative evidence.
- **QRII-4:** Students will communicate quantitative information symbolically, visually, numerically, or verbally.
- **QRII- 5:** Students will recognize and articulate the capacity and limitations of quantitative methods and the risks of using them improperly.

Other Outcomes (e.g., School, Department, and/or Program Outcomes)

This course counts as an elective course for the Pure and Applied Mathematics track and the Statistics track of the Mathematics Major, as well as for the Joint Mathematics and Mathematics Education Major.

WELCOME!