

# Methods of Mathematical Problem Solving

## Course Description

The kind of thinking that goes into solving math problems is different from the kind of thinking that goes into many other activities, but with the increasingly widespread use of mathematics in many diverse fields, understanding effective approaches to mathematical problem solving are more important than ever. Cognitive science has a lot to say about this, as do mathematicians such as George Pólya, author of the classic book "How to Solve It", among many others. This course is designed for learners who have been striving to achieve a better understanding in precalculus or calculus; it will aim to clear away some common misconceptions about math, teach effective ways to approach math problems drawing on modern cognitive science, and prepare learners for success in future math courses.

*"Do not worry about your problems with mathematics, I assure you mine are far greater."*

***Albert Einstein***

## Course Learning Objectives

By the end of this course, you will be able to:

- discover the key findings from neuroscience and cognitive psychology to illuminate the mechanisms of human learning
- analyze the characteristics of experts' knowledge to shape self-regulated learning
- apply Pólya's Framework for Mathematical Problem Solving to a variety of Math problems
- create an individual plan stemmed from research-based practices to enhance Math learning ability

## Instructor Information

**Instructor:** Sheila Tabanli (Dr. T)

**Email:** [sheila.tabanli@rutgers.edu](mailto:sheila.tabanli@rutgers.edu)

## Course Format

This course is delivered fully online synchronously via Zoom meetings and supplemented by asynchronous learning activities. To access the course, please visit [canvas.rutgers.edu](https://canvas.rutgers.edu) and log in using your NetID. The course will take place during the second 7 weeks of Spring 2022 semester on Tuesdays and Fridays between 10:20 am to 11:40 am. Typical 1 hour 20 minutes synchronous class time is divided into components of:

- Instructor-led mini-lessons
- Individual/Group activity to produce a deliverable
- Wrap-up as a class

### Course Meetings & Office Hours

- Class will meet on TF 10:20am-1:40am synchronously via [Zoom Course Meetings](#) (Password: MMPS) and will include asynchronous components as learning activities.
- You are invited to join the during office hours via [Zoom Office Hours](#) (Password: Office) on Tuesdays & Thursdays from 1pm-2pm and on Wednesdays from 11:40am-1pm.

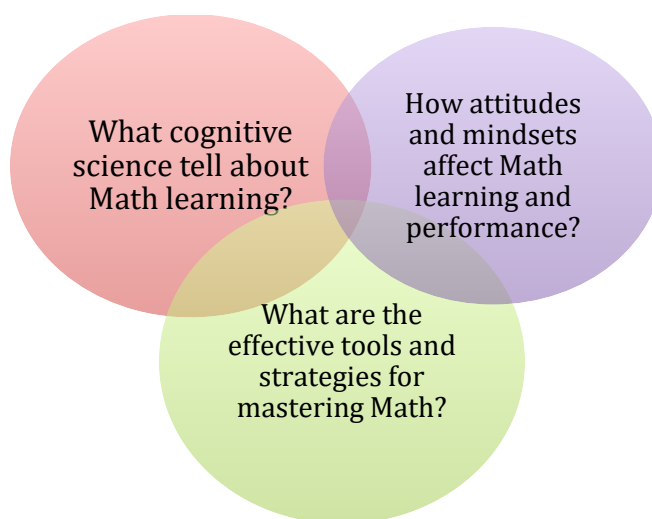
### Course Materials

- **Required Text(s), Videos, and Website Resources:** Most of our required resources are in the public domain and can be accessed from links provided in the course Canvas site.
- **Additional Materials:** These materials are placed in the “Optional Resources” of Canvas course.

### Course Curriculum

The course is built around 3 essential questions (**EQ**):

- What does cognitive science tell us about Math learning?
- How our attitudes and mindsets affect Math learning and performances?
- What are the effective tools and strategies for mastering Math?



We will utilize research-based methods to drive the learning outcomes while answering the essential questions. Each EQ corresponds to a module for our 7 weeks course. Every week, the activities include reading & synthesizing the information based on published research articles & excerpts from, producing critical & reflective writing based on the assigned questions, discussions & collaborations with peers and deliver presentations. You will be introduced to evidence-based learning practices and will be given opportunities (while earning credit for your work) to incorporate them into your way of thinking & study practices as self-regulated learners. We will apply the newly learned, evidence driven strategies more widely on actual Math problems including Precalculus and Calculus problems based on Rutgers' math curricula. One of the many advantages of completing the course requirements is to have a continued support while you are taking a Math course in Spring 2022 in the form of 1-1 instructor-student meetings.

### Grading Policy

This course is worth 2-degree credits and graded on a Pass (P)/No Credit (NC) basis. A Pass is awarded when 80% of assignments are completed successfully by following the assignment's individual guidelines.

No prior knowledge is required to succeed in the class; however, it is a performance-based class that you are expected to participate in all activities based on your best ability. No Credit is awarded when a course grade of below 80% is earned.

<b>Course Grade</b>	<b>Range</b>
Pass	80%-100%
Fail	Below 80%

### **Assessment Policy**

This course will require you to spend roughly the same amount of time on the instructional resources, activities, and assignments each week as you would in a traditional classroom course. The assignments are designed in a way so you may complete most of them during the synchronous classtime. The final project & presentation will be prepared & completed outside the classtime.

<b>Assessment</b>	<b>Weight</b>
Discussions	15%
Quizzes	20%
Writing Assignments & Surveys	20%
In-class CFU <sup>1</sup>	25%
Final Project & Presentation	20%
<b>Total</b>	<b>100%</b>

### **Discussion and Communication Guidelines<sup>2</sup>**

You are required to participate in the Discussions by posting to each topic with one original post and at least two substantive responses to other participants. A substantive response includes constructive commentary on the content of the post with added material based on readings and own experiences (“I agree!” Is not enough). I view these spaces as your places to talk amongst yourselves, and while I will check these spaces regularly, I may not post a response myself every time. To promote more productive and respectful discussions, see the guidelines below:

- **Understand that we are bound to make lots of mistakes in this class**, as anyone does when learning a new skill or a concept. Take risks and support others in their risk-taking.
- **Be aware of how much you are contributing to discussions**, and share responsibility for including all voices in the discussion. If you have an idea, don’t wait for someone else to say it; say it yourself. If you have a tendency to contribute often, give others the opportunity to contribute.

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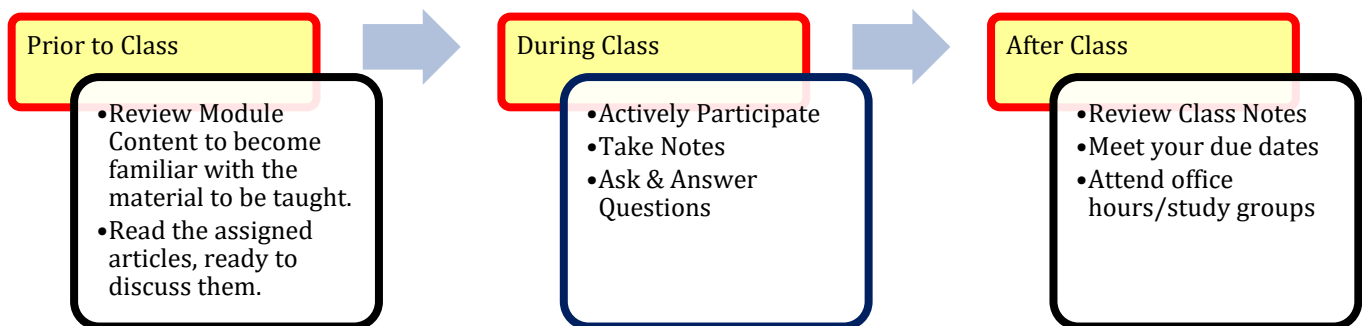
<sup>1</sup> Check For Understanding

<sup>2</sup> Adopted from UMich\_CRLT

- **Listen respectfully.** Don't interrupt or engage in private conversations while others are speaking. Use attentive, courteous language. Comments that you make (whether asking for clarification, sharing critiques, or expanding on a point) should reflect that you have paid attention to your peer's comments.
- **Take pairwork or small group work seriously.** Remember that your peers' learning is partly dependent upon your engagement.
- **Respect others' right to hold opinions and beliefs that differ from your own.** Be open to hearing their perspectives. Be open to changing your perspectives based on what you learn from others. Be okay with disagreement.
- **Writing for an academic purpose.** Your audience consists of your peers and professor. Academic style for grammar, spelling, and punctuation is always desirable, but it's ok to include occasional emoji as well, and it's ok to quote content you've found online by citing your source, and if you're not sure if it's appropriate, please email me.
- **Maintain a professional tone and civility:** Let's maintain a supportive online learning community where everyone feels welcome and where people can disagree amicably. Treat your instructor and fellow students with respect at all times, and in all communications.
- **Cite your sources:** When we have academic discussions, you must cite your sources to back up what you say. For the textbook or other course materials, include at least the title and page numbers or section heading. For online sources, include the site name and a link.
- **Back up your work:** Consider writing your academic posts in a word processor, where you can save your work, and then copying into the Canvas discussion.

### Your Learning Experience

All of us in the class, you, me, your peers, have a responsibility to create an environment in which we can all learn from each other. You are expected to attend all classes actively and participate in class so that we can all benefit from the insights and experiences that each person brings. ***Research on student engagement indicates an improvement in classroom performance based on the increased participation.*** Participation can also help you learn from each other, increasing comprehension through cooperation. We will be using Canvas Learning Management System for the course materials and announcements.





## GOAL SETTING

- S** Specific
- M** Measurable
- A** Achievable
- R** Realistic
- T** Timely



### Student Code of Conduct & Academic Integrity

Please refer to the website <http://studentconduct.rutgers.edu/student-conduct-processes/university-code-of-student-conduct/> for Rutgers University code of student conduct. All Rutgers students are expected to abide by the **Rutgers academic integrity policy**.

If you are in doubt about any issue related to plagiarism or academic dishonesty, please discuss it with your instructor. Consult the following tips on how to avoid accidental plagiarism:

- [Don't Plagiarize! Document Your Research](#)
- [Resources for Students: Identifying and Avoiding Academic Dishonesty](#)

### Expectations and Other Course Policies

#### What you can expect of your instructor:

I will communicate with you through the announcements in Canvas or via my RU email. If you have a question that you feel may help other students as well, please post your question in the “Class Help: Ask a Question about this Course” discussion thread. If you have a personal concern or question you would like to talk about, please send me an email directly. During the work week, I will respond to personal emails, or your posts directed to me within **48 hours**. I will review communication over the weekend, but I will respond on Monday to most situations. Please allow a full 48 hours before emailing me again about the same question or issue, and on Monday for inquiries sent over the weekend. I will work to foster community through online discussions, assignment feedback, etc. I will post grades within 5 days of the due date of the assignment, unless otherwise stated.

#### What I expect of you:

Expect to spend between 2 and 4 hours a week with this course. It is necessary for you to check your email and Canvas content & announcements regularly. I expect you to ask questions if something is unclear.

#### Netiquette:

Rules of style or Netiquette (network etiquette) are expected by communicating through Zoom meetings, breakout rooms, messages and discussions. These are the guidelines set forth by Rutgers Learning Centers.

- **Respect:** Whether the class is online or on-site, respect is essential. It allows all involved parties to focus on the objective and prevents distracting disagreements. Be sure to use a polite tone, read before responding and be constructive with your criticism.
- **Use Proper Formatting, Punctuation and Grammar:** The same rules of English apply in an online classroom setting. Capitalize letters when necessary, use appropriate punctuation and avoid using slang and abbreviations. You'll demonstrate your personal values.

- **Be Honest:** Because tone is difficult to convey online, sarcasm or humor can easily be misinterpreted. Something written for a laugh may offend others. If you are unsure whether your message will be misconstrued, consider using an emoticon to lighten the tone.
- **Go to Your Teacher First:** If you have a disagreement or issue with a fellow classmate, go to your teacher before the situation escalates. It's best to make your teacher aware of the situation.
- **Stay on Topic and Keep it Brief:** Online classes often require a lot of reading, and when responding, it may be difficult to decide where to start. Focus your comments into short topics to keep the discussion flowing. Avoid being too wordy, instead say what you need to say without veering off topic.

**Active Engagement:** You are expected to attend all synchronous classes; attendance will be taken in Canvas and daily work are assigned to be submitted during the synchronous classtime. Note that your engagement and interactions with your peers are crucial to your learning in our course.

**Missing work:** Canvas is set to automatically record a "0" for any assignment that has no submission once the due date passes. This setting is intended to help you have an accurate picture of your current grade. To make up for the missed work, advanced notice is required, and you will be assigned a make up.

### **XP Points (aka Extra Credit)**

There will be ample opportunities to earn XP points (extra credit points) through the weeks of learning in the format of exemplary peer interactions, engagement, participation, leadership and presentation performances. You have the opportunity to raise your final course grade by up to a total of 2%. If you do turn in everything on-time, you will earn an XP point of 5% for the overall course grade.

### **Technical Support**

Information about course access and support for technical issues is available from the Rutgers OIT Help Desk. If you do not have the appropriate technology for financial reasons, please email Dean of Students [deanofstudents@echo.rutgers.edu](mailto:deanofstudents@echo.rutgers.edu) for assistance. If you are facing other financial hardships, please visit the Office of Financial Aid at <https://financialaid.rutgers.edu/>

Learning remotely presents new challenges. For assistance with learning how to address these challenges, please consult the resources available here: [https://rlc.rutgers.edu/remote\\_instruction](https://rlc.rutgers.edu/remote_instruction). Also visit the [Rutgers Student Tech Guide](#) page for resources available to all students. (Email: [help@oit.rutgers.edu](mailto:help@oit.rutgers.edu))

### **Testing Services**

See [here](#) for full disability policies and procedures. Students with disabilities requesting accommodations must present a [Letter of Accommodations \(LOA\)](#) to me as early in the semester as possible. See [here](#) for more information on requesting accommodations.

### **Student-Wellness Services**

All of these services are being provided remotely.

- [Counseling, ADAP, & Psychiatric Services \(CAPS\)](#)
- [Crisis Intervention](#)
- [Report a Concern](#)
- [Violence Prevention & Victim Assistance \(VPVA\)](#)
- [Disability Services](#)