Math 299: Problem Solving in Mathematics **Fall 2025**

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Math 299 is designed to help students learn how to solve mathematical problems using their acquired knowledge of mathematical content and problem-solving skills. During the semester, we will develop a bank of mathematical facts and ideas and learn various approaches for solving new and nonroutine problems. Near the end of the semester, the students in the class will take the Putnam exam. The 86th Putnam Competition will take place on Saturday, December 6th. There will be a morning session from 8:00 am to 11:00 am consisting of six problems, then an afternoon session from 1:00 pm to 4:00 pm also consisting of six problems. Granted, the timing of this exam is not ideal so plan ahead with your schedule for this date. The two paragraphs below are taken from the Wikipedia page on the history of the Putnam exam.

The William Lowell Putnam Mathematical Competition, often abbreviated to Putnam Competition, is an annual mathematics competition for undergraduate college students enrolled at institutions of higher learning in the United States and Canada (regardless of the students' nationalities). It awards a scholarship and cash prizes ranging from $250 to $2500 for the top students and $5000 to $25000 for the top schools, plus one of the top five individual scorers (designated as Putnam Fellows) is awarded a scholarship of up to $12000 plus tuition at Harvard University (Putnam Fellow Prize Fellowship), the top 100 individual scorers have their names mentioned in the American Mathematical Monthly (alphabetically ordered within rank), and the names and addresses of the top 500 contestants are mailed to all participating institutions. It is widely considered to be the most prestigious university-level mathematics competition in the world, and its difficulty is such that the median score is often zero or one (out of 120) despite being primarily attempted by students specializing in mathematics. [Roughly 3800 students from more than 500 colleges and universities take part in the exam.]

The competition was founded in 1927 by Elizabeth Lowell Putnam in memory of her husband William Lowell Putnam, who was an advocate of intercollegiate intellectual competition. The competition has been offered annually since 1938 and is administered by the Mathematical Association of America.

This description of the Putnam exam may be rather intimidating. However, no matter how you perform on the exam, the learning process during the semester is a valuable experience and will be helpful for tackling other problems that you encounter during your college studies. Your only resources for the exam are paper, a writing utensil, and your acquired knowledge. Hence, during the semester, you should be careful not to rely too much on other resources, especially the Internet and AI. Being stuck on a problem for long periods of time can be frustrating, but there are mental benefits (sometimes intangible) that occur when pondering difficult questions. (I sometimes use the analogy of riding in a car for 10 miles versus walking 10 miles; you may reach the same destination, but different muscles are involved and you notice more scenery along the way when walking.)

Our class meets 11:30 am to 12:50 pm on Tuesdays during the fall semester. The course is graded Credit/No Credit. Credit will be awarded based on your weekly participation in class and turning in assignments, as well as taking the Putnam exam on December 6. Class time will be spent learning some mathematical content, discussing problem solving strategies, and working on problems. Further problems will given for you to work on outside of class, preferably on your own without using other resources. For the record, you are not expected to be able to solve all of the problems presented. In fact, you may find most of the problems very challenging. Here are some possible scenarios:

1. You are able to solve the problem on your own.
2. You are able to solve the problem on your own after given a hint.
3. You are able to solve the problem on your own after given a second hint.
4. You are unable to solve the problem even with some hints, but you are able to read and understand someone else's solution.
5. You are not able to understand the solution; it is too complicated or it involves mathematical concepts you have never studied.

For cases (1)–(4), you should to be able to recreate the solution on your own several days later. In any case, just do your best to ponder the ideas and build trust in yourself. Learn what you can and avoid becoming discouraged. Even if you solve very few problems during the semester, it does not mean that you are stupid or bad at math. You may feel that you are not learning anything, but you are actually learning something even if you cannot put it into words; it is more qualitative than quantitative.