

MATH 1187H: Honors Problem Solving

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Think deeply of simple things.
—Arnold Ross

This course offers an experience in mathematical problem solving by exposing students to “Olympiad” style problems. These problems, selected to motivate discussion about famous mathematical results, may require sustained focus over a period of time. Students will have an opportunity to further develop their skills in competitive problem solving by participating in the Putnam Competition in December and/or other competitions, such as the Rasor-Bareis-Gordon Competition at the OSU in the spring. The problem solving skills introduced in the course make connections with advanced mathematics, and provide essential skills for a broad range of careers in academia and beyond.

Our classroom discussion will be centered on weekly problem sets. In the first hour of the class, students will work to solve this problem set; in the second hour, they will present their solutions and we will discuss them. Following this, students will write up the solution to at least one problem at home and submit it before the next class. These problems are difficult. Some can be solved in minutes (if you’re familiar with the concepts), while others can take days or even weeks. In one hour, most students should try only one or two of them.

Initially we will spend more time discussing problems from elementary algebra, geometry, and trigonometry. Shortly thereafter, we will turn to more advanced topics, like combinatorics, number theory, linear and abstract algebra and analysis. However, the problem sets may cover any area of mathematics from day one.

If a problem set covers an area of mathematics you have not yet learned, such as abstract algebra or analysis, just try your best. Students are encouraged to collaborate and discuss problems with each other, and share ideas and hints. Each student must write their own solution. The solution needs to be typed in L^AT_EX and submitted in PDF.

L^AT_EX is the standard typesetting programming language used in math and other scientific papers; this is a valuable tool for students who want to pursue a career in science and engineering. More information on L^AT_EX can be found [here](#) and [here](#).

References: The main reference for the class will be the weekly problem sets described above; to prepare them, I may draw on problems from previous competitions, the problem sets I used in this class last year, unpublished problem sets from MATH 1187H prepared by Prof. Matthew Stone in 2023-24 and various other references, like the ones listed below.

- Andreescu, Dospinescu, *Problems From the Book*, XYZ Press, 2008 (covering algebra, number theory, and combinatorics);
- Gelca, Andreescu, *Putnam and Beyond*, Springer, 2007 (also covering real analysis, geometry and trigonometry);
- Videos and syllabus from MATH 4000-*Problem Solving for Putnam*, Fall 2020, by Cezar Lupu at Texas Tech University;
- The CMU *2024 Putnam Seminar* by Po-Shen Loh; and
- The MIT 18.A34 *Mathematical Problem Solving (Putnam Seminar)* by Yufei Zhao.

Prerequisites: No prior math competition experience is required, and beginners are welcome.

Class schedule: The class will take place on Thursdays 4:10 - 6:00 pm in the Enarson Classroom Bldg, room 312. The weekly schedule and office hours will be available on the class website. My office is in Math Tower 456.

Participation and Grading: The class will be more like a seminar than a lecture; regular attendance, and friendly and dynamic participation in problem solving and discussions is expected and encouraged. The grade is based on problem sets submissions.

Statements required by College of Arts and Sciences Ad Hoc Committee on State and Federal Policy, and the College of Arts and Sciences Curriculum Committee

Statement on intellectual diversity: Ohio State is committed to fostering a culture of open inquiry and intellectual diversity within the classroom. This course will cover a range of information and may include discussions or debates about controversial issues, beliefs, or policies. Any such discussions and debates are intended to support understanding of the approved curriculum and relevant course objectives rather than promote any specific point of view. Students will be assessed on principles applicable to the field of study and the content covered in the course. Preparing students for citizenship includes helping them develop critical thinking skills that will allow them to reach their own conclusions regarding complex or controversial matters.

Statement on academic misconduct: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7 (B)). For additional information, see the Code of Student Conduct.

Statement on religious accommodations: Ohio State has had a long-standing practice of making reasonable academic accommodations for students’ religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student’s religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students’ sincerely held religious beliefs and

practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the Civil Rights Compliance Office. (Policy: Religious Holidays, Holy Days and Observances)

Statement on disability services: The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. If you

are ill and need to miss class, including if you are staying home and away from others while experiencing symptoms of a viral infection or fever, please let me know immediately. In cases where illness interacts with an underlying medical condition, please consult with Student Life Disability Services to request reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.