

Math 100: Problem Solving

Math 100 is a course in problem solving. The problems are more varied and unexpected than in a typical undergraduate mathematics course. Often an original or imaginative step is required. Some variations of topics from year to year are expected. Topics may include: explicit summations of series, spherical trigonometry, advanced Euclidean geometry, elementary number theory, combinatorial problems, inequalities, continued fractions. There is a lot of classroom discussion. Homework is assigned regularly and makes a large contribution to the course grade. One three-hour final is given.

Catalog Description

100. Problem Solving. (Formerly numbered 192.) Lecture, three hours. Prerequisite: course 31A with grade of C- or better. Problem-solving techniques and mathematical topics useful as preparation for Putnam Examination and similar competitions. Continued fractions, inequalities, modular arithmetic, closed form evaluation of sums and products, problems in geometry, rational functions and polynomials, other nonroutine problems. Participants expected to take Putnam Examination. P/NP grading.

Schedule of Lectures

Lecture	Sections	Topics
Week 1		Inequalities (Cauchy-Schwarz, weighted AM-GM inequality)
Week 2		Inequalities, cont'd (Minkowski inequality, Carleman inequality)
Week 3		Inequalities, continued (Jensen's inequality, Holder's inequality)
Week 4		Elementary number theory (Fundamental theorem of arithmetic, Euclidean algorithm; related problems)
Week 5		Elementary number theory, continued (Fermat's little theorem, Wilson's theorem; congruence)
Week 6		Nonlinear recurrence relations.
Week 7		Combinatorial problems.
Week 8		Problems involving polynomials and rational functions.
Week 9		Problems in geometry.
Week 10		Problems in advanced calculus.