

Problem Solving in Math

Math 43900 Section 01

Fall 2014

The Putnam Competition

The seventy-fifth annual William Lowell Putnam Mathematical Competition will take place on Saturday, December 6, 2014. Every year, around 4000 US & Canadian undergraduates participate in the competition.

The competition consists of two three-hour sessions (morning and afternoon), with each session having six problems. The problems are hard, not because they are made up of lots of parts, or involve extensive computation, or require very advanced mathematics to solve. They are hard because they each require a moment of cleverness, intuition and ingenuity to reach a solution. Typically, the median score out of 120 (10 possible points per question) is 1! The Putnam Competition may be the most challenging and rewarding tests of mathematical skill that you will ever encounter.

The Problem Solving in Math seminar

To help prepare for the Putnam Competition, the math department runs the 1 credit course Math 43900. If you are signed up for Math 43900, then you are also signed up to participate in the Putnam competition on December 6. This year, the details of the course are as follows:

- **Instructor:** David Galvin, 248 Hayes-Healy, dgalvin1@nd.edu.
- **Meetings:** Tuesdays, 3.30pm-4.20pm, Hayes-Healy 129, starting August 26 (just a short organizational meeting), ending December 2 (the last Tuesday before the competition).
- **Office hours:** Email me for an appointment.
- **Text:** There is no required text. The following books (one available online through the library, the others on reserve at the Math library) are worth looking at. First, two classics that deal with the art of problem-solving:
 - *Problem-solving through problems* by Larson (QA 43 .L37 1983)
 - *How to solve it* by Pólya (QA 11 .P6 2004).

Next, a doorstep filled with problems and strategies for the Putnam itself:

- *Putnam and beyond* by Gelca and Andreescu (online).

Finally, three books that exhaustively catalog all Putnam Competitions up to 2000:

- *The William Lowell Putnam Mathematical Competition 1985-2000: problems, solutions, and commentary* by Kedlaya, Poonen and Vakil (QA 43 .W5425 2002)
- *The William Lowell Putnam Mathematical Competition problems and solutions: 1938-1964* by Gleason, Greenwood and Kelly (QA 43 .W54)
- *The William Lowell Putnam Mathematical Competition problems and solutions: 1965-1984* by Alexanderson, Klosinski and Larson (QA 43 .W542 1985).

- **Course website:** http://www3.nd.edu/~dgalvin1/43900/43900_F14/index.html. This is where announcements, problem sets, etc., will be posted. Also, I've put here the problems & solutions for the Putnam Competitions from 2001 on. (NB - when following this link straight from a pdf file of the general arrangements, the tilde in front of `dgalvin1` sometimes causes a problem; if so just enter it by hand.)
- **Course organization:** Each meeting will (usually) be built around a specific theme (pigeon-hole principle, induction & recursion, inequalities, probability, etc.). We'll begin by talking about the general theme, then spend time trying to solve some relevant problems. At the end of each meeting I'll hand out a set of problems on that theme, that you can cut your teeth on. Sometimes we'll begin the next session with presentations of solutions to some of those problems. On occasional meetings, I might give out a problem set at the beginning, and have everyone pick a problem or two to work on individually for the meeting period (a sort of "mock Putnam").
- **Grading and homework:** The grade for the class will be determined solely by active participation in class (participating in class discussions, occasionally presenting problem solutions on the board) and by participation in the 2014 Putnam Competition. I'll give out a problem set at the end of each meeting, usually with many problems; I don't expect anyone to work on all the problems, but I do expect *everyone* to work on at least *some* of the problems each week, and to be prepared to talk about their progress at the beginning of the next meeting.
- **Honor code:** It's perfectly fine to collaborate with your colleagues on problems (although I do encourage you to try many problems on your own, since the Putnam Competition itself is an individual competition). You have all taken the Honor Code pledge, to not participate in or tolerate academic dishonesty. For this course, that means that if you use a source to help you solve a problem (such as discussion with a colleague, or consulting a book or online resource), you should acknowledge that in your write-up or oral presentation.

Acknowledgement: I drew on Ravi Vakil's Putnam page (<http://math.stanford.edu/~vakil/putnam07/index.html>) while writing this page.