

# Mathematical Contests at Illinois

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# Math Contest Activities at UIUC: Overview

- Putnam Exam (December)
- Training sessions (Mondays/Tuesdays, 5 pm - 6 pm, 141 Altgeld)
- **U of I Mock Putnam Exam (Sept. 29, 5 pm - 7 pm, 245 Altgeld)  
PRIZE MONEY FOR TOP SCORERS.**
- U of I Undergraduate Math Contest (March 6, 2010)  
**PRIZE MONEY FOR TOP SCORERS.**
- U of I Putnam Newsletter  
**Subscriptions:** `ajh@uiuc.edu`
- UIUC Math Contests Website:  
`http://www.math.uiuc.edu/contests.html`

# UIUC Math Contests Website:

<http://www.math.uiuc.edu/contests.html>

- News, announcements:  
<http://www.math.uiuc.edu/~hildebr/putnam/>
- Materials from Putnam training sessions
- Problems and solutions to practice contests:  
<http://www.math.uiuc.edu/~hildebr/putnam/mockputnam.html>
- Problems and solutions to UIUC Undergraduate Math Contests:  
<http://www.math.uiuc.edu/~hildebr/putnam/undergradproblems.html>
- Resources: Books, journals and links to and online resources:  
<http://www.math.uiuc.edu/~hildebr/putnam/resources.html>

- Problem of the Week:

<http://www.math.uiuc.edu/~hildebr/pow/>

# Sample Problem of the Week

Solutions: <http://www.math.uiuc.edu/~hildebr/pow/>

*Show that, for every  $k$ , there exists a Fibonacci number whose decimal representation ends in  $k$  9's.*

The first few cases are:

$$F_{11} = 8\underline{9}$$

$$F_{52} = 329512800\underline{99}$$

$$F_{1498} = 5 \dots 46\underline{999} \text{ (312 digits)}$$

# The Putnam: Overview

- “World’s hardest math contest” (Time Magazine, Dec. 23, 2002)
- Official name: William Lowell Putnam Mathematical Competition
- Official website:  
<http://math.scu.edu/putnam>
- Held each year since 1938
- Open to undergraduates in U.S. and Canada
- Held first Saturday in December of each year simultaneously at colleges across North America
- 3753 participants in 2007
- 19 UIUC participants in 2007

# The Putnam: Details

- Prerequisites: Essentially none beyond calculus. Most problems require only high school level mathematics.
- No calculators, books, notes, etc.
- 12 problems, to be solved in 6 hours
- Morning and afternoon sessions of 3 hours/6 problems each
- Problems arranged by difficulty within each session
- Grading: 10 points per problem, 120 points total

# How hard is it? (Data from 2002)

- Maximal score: 120 points
- Top three scores (out of 3349): 116, 108, 106
- Median score: 1 point
- A score of 60 out of 120 (equivalent to solving half of the 12 problems) was enough to place in the top 2 percent.
- A score of 30 points (= 3 correct problems out of 12) was enough to place in the top 10 percent
- A score of 11 points (= 1.1 correct problems) was enough to place in the top third

# Prizes:

- \$2,500 for Ranks 1–5
- \$1,000 for Ranks 6–15
- \$250 for Ranks 16–25
- Honorable Mention for next 30–50

# Team scoring

- Each participant works individually (no team work!)
- A “Putnam team” consists of three participants from the same school
- The school’s team rank is determined by the sum of the individual ranks of the three team members
- The three team members must be named in advanced (by mid October). Rank is determined by the performance of those named to the team, not the top three scorers from the school. Thus, a good team performs depends largely on identifying likely top performers on the Putnam early in the semester.

# Team prizes

- \$25,000 for first place team
- \$20,000 for second place team
- \$15,000 for third place team
- \$10,000 for fourth place team
- \$5,000 for fifth place team
- Honorable Mention for teams ranked 6–10

# Top three teams

- 2008: Harvard, Princeton, MIT
- 2007: Harvard, Princeton, MIT
- 2006: Princeton, Harvard, MIT
- 2005: Harvard, Princeton, Duke
- 2004: MIT, Princeton, Duke
- 2003: MIT, Harvard, Duke
- 2002: Harvard, Princeton, Duke
- 2001: Harvard, MIT, Duke
- 2000: Duke, MIT, Harvard

- 1999: Waterloo, Harvard, Duke
- 1998: Harvard, MIT, Princeton
- 1997: Harvard, Duke, Princeton
- 1996: Duke, Princeton, Harvard
- 1995: Harvard, Cornell, MIT
- 1994: Harvard, Cornell, MIT
- 1993: Duke, Harvard, Miami U.–Ohio
- 1992: Harvard, Toronto, Waterloo
- 1991: Harvard, Waterloo, Harvey Mudd
- 1990: Harvard, Duke, Waterloo
- 1989: Harvard, Princeton, Waterloo

# Top 13 Putnam teams in 2002:

1. Harvard
2. Princeton
3. Duke
4. Berkeley
5. Stanford
6. Harvey Mudd
7. Caltech
8. Waterloo
9. MIT

10. Toronto

11. Brandeis

12. Colorado State

13. **UIUC**

# Ranked below UIUC Putnam Team in 2002:

- All other Big Ten schools
- All other Midwestern schools
- All public universities except Berkeley and Colorado State
- Elite private universities: Univ. of Chicago, Northwestern, ...
- Ivy league schools: Brown, Cornell, Yale, Univ. Pennsylvania, ...

# The UIUC Putnam Team Rank in recent years

- 2008: 30
- 2007: 107
- 2006: 27
- 2005: 79
- 2004: 34
- 2003: 55
- 2002: 13 (best in past 20 years)
- 2001: 14
- ...
- 1975: 8 (all time best)

# Top individual ranks by U of I students

1. Matt Cook (1988): Rank 13
2. A. Moy (1975): 14
3. Matt Cook (1989): 24
4. J. Walsh (1981): 27
5. J. Walsh (1982): 28
6. David Secrest (1987): 31
7. David Secrest (1986): 35
8. E. Cygan (1972): 38

9. R. LaSota (1978): 40
10. David Secrest (1985): 43
11. Brad Friedman (1997): 55

# How to enter the Putnam contest

- Each school must submit a list of its participants by mid October.
- Sign-up sheet (no obligation!) circulated at this presentation and during training sessions.
- If you sign up, you are guaranteed a spot. If you haven't signed up, you can likely to be able to participate anyway, **provided** there are enough "no-shows" from those who have signed up in advance. (This has always been the case here.)

# Fall Putnam training sessions

- **Coaches:** A.J. Hildebrand, Jeremy Rouse, Sujith Vijay
- **Two levels:** Basic (for those new to the contest scene) and advanced (for experienced contest takers and those who have participated in the basic sessions in the past).
- **Tentative schedule:** Mondays/Tuesdays, 5 pm - 6 pm, 141 Altgeld, beginning next week. Basic sessions on Mondays, advanced sessions on Tuesdays
- **Sample topics (for basic sessions):** Binomial coefficients, inequalities, generating functions, proofs by induction

- Very informal, no registration required, no grades, no homework, etc. You can switch from the basic to the advanced session, or vice versa, or attend both.
- Sessions are largely independent of each other.
- Materials posted on UIUC Math Contest website  
<http://www.math.uiuc.edu/contests.html>

# Practice Contests

- **U of I Mock Putnam Exam:** Tuesday, 9/29/2009, 5 pm - 7 pm. 245 Altgeld  
**PRIZE MONEY FOR TOP SCORERS.**  
This test will be similar in format and content to the Putnam, but somewhat easier. It will preempt the practice session on that day. The selection of U of I Putnam team members will be based, in part, on the performance on the Mock Putnam Exam.
- Additional practice tests may be offered later in the fall during the training sessions.
- Past Mock Putnam Exams:  
<http://www.math.uiuc.edu/~hildebr/putnam/mockputnam.html>