The Eighth Annual Harvard-MIT Mathematics Tournament

Saturday, February 19, 2005
February 19, 2005

Dear Participants, Faculty Sponsors, Parents, and Friends,

With great pleasure and pride we welcome you to the Eighth Annual Harvard-MIT Mathematics Tournament! Four hundred and seven students, from New England to Virginia, from Missouri to India, are here to participate in the nation’s largest student-run high school math competition.

We hope that you find today’s events enjoyable, challenging, and educational. We’ve aimed to create something for everyone at this tournament, and we anticipate that participants at all levels of experience will be suitably challenged. In the past months, problem writers have been working tirelessly to create the fun problems that you’ll encounter today. The Mini-Events, which were a big hit last year, are back once again, and we encourage you to sign up for one if you haven’t already done so.

While participation in this year’s tournament has been capped due to space constraints, we are already working to find a larger venue at which to host the tournament next year. With any luck, we won’t have to turn away any participants next year.

To the graduating seniors: we are always on the lookout for more college students to join our ranks. If you plan to attend a school in the Boston area next year, make sure to drop us a line (hmmt-request@mit.edu), and you can see what the Harvard-MIT Mathematics Tournament looks like from the organizers’ side.

If you have any complaints, questions, confusions, or just want to know a little more about what goes on behind the scenes, please talk to a staff member. We are all wearing nametags and stylish HMMT t-shirt. Most questions that arise during the tournament should be directed to James Harvey, our spokesperson, who will be in Lobby 10 for the majority of the day.

Good luck today and we hope to see you again in 2006!

Sincerely,

Alya Asarina & Jared Bass
Tournament Directors

Ricky Liu
Problem Czar

Tim Abbott
Chief of Staff
The HMMT welcomes this year’s participating groups:

★ The Academy for the Advancement of Science and Technology, Hackensack, NJ
★ The Albany Area Math Circle, Albany, NY
★ All Penn, ??
★ Baltimore County Math Team, Baltimore, MD
★ Bishop Guertin High School, ??
★ Boston Education Math Team, Boston, MA
★ Boston Latin School, Boston, MA
★ Cambridge Rindge and Latin School, Cambridge, MA
★ Central Jersey Math League, ?, NJ
★ Chelmsford High School, ??
★ Choate Rosemary Hall, Wallingford, CT
★ Evil Geniuses for a Better Tomorrow, MA
★ Florida Math Team, ??
★ Framingham High School, Framingham, MA
★ Handsome Boys Modeling School, ??
★ Hunter High School, New York, NY
★ James Madison High School, ??
★ Kent School, Kent, CT
★ Lexington High School, Lexington, MA
★ Lincoln-Sudbury Regional High School, Sudbury, MA
★ Loomis Chaffee School, Windsor, CT
★ Massachusetts Academy of Math & Science, Worcester, MA
★ Milton Academy, Milton, MA
★ Newton South High School, Newton, MA
★ Phillips Academy, Andover, MA
★ Phillips Exeter Academy, Exeter, NH
★ Redundant Redundancy, ??
★ Roxbury Latin, ??
★ Saint Paul’s School for Boys, ??
★ Sewickley Academy, ??
★ Suffolk County Lone Stars, ??
★ Swampscott High School, Swampscott, MA
★ The Winchendon School, ??
★ Thomas Jefferson High School for Science and Technology, Alexandria, VA
★ TS47, ??
★ Ward Melville High School, East Setauket, NY
★ West Windsor-Plainsboro High School South, Princeton Junction, NJ
★ Westford Academy, ??
★ Weymouth High School, Weymouth, MA
## The Day’s Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 - 8:45 am</td>
<td>Registration</td>
<td>Lobby 10</td>
</tr>
<tr>
<td>8:30 - 9:00 am</td>
<td>Alternate Team Meetings</td>
<td>Lobby 10</td>
</tr>
<tr>
<td>9:00 - 9:15 am</td>
<td>Welcome</td>
<td>34-101, 10-250, 26-100 simultaneously*</td>
</tr>
<tr>
<td>9:15 - 10:10 am</td>
<td>First Individual Round</td>
<td>26-100</td>
</tr>
<tr>
<td>9:20 - 10:15 am</td>
<td>First Individual Round</td>
<td>10-250, 34-101</td>
</tr>
<tr>
<td>10:10 - 10:15 am</td>
<td>5-min. break in 26-100</td>
<td></td>
</tr>
<tr>
<td>10:15 - 10:20 am</td>
<td>5-min. break in 10-250, 34-101</td>
<td></td>
</tr>
<tr>
<td>10:15 - 11:10 am</td>
<td>Second Individual Round</td>
<td>26-100</td>
</tr>
<tr>
<td>10:50 - 11:10 am</td>
<td>Proctor Meetings</td>
<td>4-270</td>
</tr>
<tr>
<td>11:20 - 12:20 pm</td>
<td>Team Round</td>
<td>Locations TBA</td>
</tr>
<tr>
<td>12:20 - 1:30 pm</td>
<td>Lunch</td>
<td>★ HMMT Lunch: Pizza order forms distributed to students at registration, or ★ Local Restaurants</td>
</tr>
<tr>
<td>1:40 - 2:40 pm</td>
<td>Mini Events</td>
<td>Locations TBA</td>
</tr>
<tr>
<td>2:50 - 4:10 pm</td>
<td>Guts Round</td>
<td>Kresge Auditorium</td>
</tr>
<tr>
<td>4:15 - 5:00 pm</td>
<td>Award Ceremony</td>
<td>Kresge Auditorium</td>
</tr>
</tbody>
</table>

**Notes:**

* Students should be in their individual round location by 9:00 am. They should be attending the Welcome address in these rooms.

** Individual and Team Round protests must be made in writing no later than 12:30 pm for morning events and 3:45 pm for afternoon events. All protests should be brought to ____________________________ in Lobby 10.
Rules & Prizes

*Individual and Team Awards*
Prizes will be given to the ten highest-scoring individuals (regardless of choice of tests), the top three scorers on each individual event separately, the five highest-scoring teams on the Team Round, and the five highest-scoring teams on the Guts Round. Several honorable mentions may also be named in each category. Small prizes will also be given out for mini-event winners: the top three teams in relays and Rigor Mortis, the top three individuals in Buzz, and the top four individuals in the combinatorial games tournament.

*The School Sweepstakes Award*
Prizes will be awarded to the five highest-scoring schools. Each school’s sweepstakes score is its top team score, which in turn is determined by summing the six highest individual scores, the Team Round score, and the Guts score (for a maximum of 1400).

*Calculators and Other Computational Aids*
You may not use books, notes, calculators, pocket organizers, slide-rules, abaci, or any other computational aids. Similarly you may not use graph paper, rulers, protractors, compasses, architectural tools, or any other drawing aids. These restrictions do not apply to the Guts Round.

*Grading Policy*
- Answers must be simplified and exact unless otherwise specified. For example, 22/7 and 3.14 are not acceptable substitutes for pi.
- Rational numbers should be given in lowest terms.
- Radicals must be simplified if possible, so that the radicand contains no fractions and is not divisible by the square of any positive integer other than one. Also, denominators should be rationalized.
- Correct mathematical notation must be used.
- *No* partial credit will be given unless otherwise specified.

*Protests*
If a student believes that an answer given on the answer key is incorrect, he must go to the designated Appeals Room and submit an appeal before 12:30 if the protest concerns a morning event and before 3:45 if the protest concerns an afternoon event.

*Tiebreakers*
*HMMT reserves the right to change the following policy until the day of the contest.*

If two papers have the same score, an item analysis will be performed. The paper which has correct answers on harder problems, as determined by the item analysis, will be declared the winner. If a tie remains after item analysis, the tie will not be broken.

Tie-breaking/item analysis algorithm:
1) Most questions correctly answered.
2) Last correct answer occurring latest.
3) Iterate step two with the next correct answer. If the tie is not for the top three places, let it stand.
4) First wrong (*not* blank) answer occurring latest.
5) Iterate step four with the next wrong answer.
6) If two contestants answered the same questions with the same ones correct, the tie stands and the less psychic contestant (think of a number...) will be mailed a will be mailed a trophy later.

*Decisions of the coordinators of the Harvard-MIT Math Tournament are final.*
**Tournament Director**
Alya Asarina, __________
Jared Bass, ____________

**Chief of Staff**
Tim Abbott, ____________

**Business Director**
Michael Lieberman, __________

**Chief Judge**
Gregory Price

**Spokesperson**
James Harvey

**Problem Czar**
Ricky Liu

**Webmaster**
Roger Hanna
Bob Zhao

**Registration Director**
Katherine Lai

**Graphics Designers**
Reid Barton
Yuran Lu
Petra Pajtas

**Problem Writers & Reviewers**
David Aaronson, Jae Bae, Reid Barton, Steve Byrnes, Gabriel Carroll, Ben Conlee, Elizabeth Goodman, Mike Hamburg, Neil Herriot, Andrei Jorza, Ian Le, Joel Lewis, Mark Lipson, Tiankai Liu, Anatoly Preygel, Rocco Repetski, Adam Rosenfield, Jon Sasmor, Elena Udovina, David Vincent, Tony Zhang.

**Mini-Events Directors**
Eve Drucker, Jonathan Sasmor (*Buzz*)
Joia Herta (*Logic Puzzles*)
Daniel Rosenbloom (*Mathematical Weakest Link*)
Inna Zakharevich (*Relays*)
Jonathan Liu (*Rubik’s Cube*)
MIT Admissions (*Tours*)

**Additional Staff**

**Many Thanks**
The Harvard Math Department Office, the Undergraduate Mathematics Office at MIT (especially Debbie & Joanne), Trevor Bass, Bonnie Currier, Bill Finkenkeller, June Kapitan, Karen Robinson, Hartley Rogers, Cliff Taubes, Chris Thibert, Matt Thrasher, Amali Vaz, the Harvard Classrooms Office, and… the Unknown Problem-Writer.

*Our sincere gratitude goes out to all those who helped, but have been accidentally left out of this list!*
Feedback Form.
Please hand in at the end of the day to James Harvey. If you need more room, use the back of this form.

1) Name, school, e-mail (optional):
2) Are you a student, teacher, or parent?
3) How many times have you attended the HMMT? Please list years.

4) Where did you hear about the HMMT? Please list all sources.

5) Overall, how enjoyable was the HMMT? How does the HMMT compare to other math competitions that you have attended? If you have attended the HMMT multiple times, how did this year’s tournament compare to those of previous years?

6) Which Mini-Event(s) after the Guts Round did you participate in or observe?

7) Which events did you like? Which did you dislike? How could the events be improved?

8) Did you experience anything unpleasant or annoying? If so, how could it have been avoided?

9) We are thinking of expanding the HMMT in the future to include a wider range of events. If we added an additional day to the tournament, during which participants would present their mathematical research, would you stay for this second day? What sorts of events would make a second day worthwhile?

10) A question for team coordinators: Did you participate in the School Networking Program? If so, did you contact the school with which you were paired? Was this communication helpful?

We thank you for your opinion and hope to see you next year! Remember: if you are a senior and you go to college in the Boston area next year, you can help run the HMMT! Contact hmmt-request@mit.edu for more details.