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Welcome Back!

After a holiday season filled with family and sweets rather than problem sets and reading assignments, Winter Term is gearing up again at Carleton! The next ten weeks in the Math & Stats Department promise excitement and adventure: Advanced Linear Algebra proved to be such a big draw for students it was expanded from a single section to two, Gail Nelson is instructing students in advanced topics in analysis in her Real Analysis II course, another crop of statistics enthusiasts are learning to create models and address questions using data in Applied Regression Analysis. No matter what you're most interested in, the Math & Stats Department has something for everyone-- stay tuned via the Goodsell Gazette (published biweekly!) for the current goings-on in the CMC.

Carleton Teams Score Big in NCS Contest

Late last fall two teams of Carleton students competed in the annual NCS problem-solving contest. The results of the contest came in after the last Gazette of the fall went to press, but we're thrilled to announce that both Carleton teams finished in the top 10, out of 82 teams from more than 25 colleges and universities around the region. Congratulations to Jordan Cahn, Michelle Mastrianni, and Jacob Spear, who placed seventh, and to Marshall Ma, Ian Seong, and Ben Stone, who placed third.

If you're interested in competing in a problem-solving contest, then mark your calendar for the upcoming Konhauser Problemfest, which will be on February 27, 2016, and watch this space for more information. If you'd just like to know what problem-solving is all about, or if you'd like to try your hand at past Konhauser problems, come to our weekly problem-solving group, which meets Wednesdays from 4:30 to 5:30 pm in CMC 328.

Budapest Semesters Information Meeting

Interested in going to the Budapest Semesters in Mathematics next fall? The director, Professor Tina Garrett from St. Olaf, will be on campus to talk about the program and the application procedure at 4:00 p.m. on Tuesday, January 19 in CMC 206. Also on hand will be past participants to give their perspectives and talk about their experiences with the program.

The application deadline is February 5, so be sure to stop by if you'd like to learn more!

Mathematical Contest in Modeling

Want to solve real-world problems and compete for recognition and prizes? Come learn about the Mathematical Contest in Modeling! There will be an organizational meeting in CMC 301 on Monday, January 11 at 4:30 p.m. All experiences and levels are welcome, and pizza and refreshments will be provided! Email Rob Thompson (rthompson) for more information about the contest or if youâ€™re interested in participating but canâ€™t attend the meeting.

Writing Problems for Middle-High School Competition

Interstellar (http://in-ter-stel-lar.com/), an online academic competition for high school and middle school students, is

seeking problem writers and editors for their nation-wide competition in late March. If you like to review interesting mathematics problems - or to come up with some on your own - this could be a fun experience for you. If you're interested, please contact Eric Egge (eegge).

Job, Graduate & Internship Opportunities

Breakthrough Twin Cities: Summer 2016 Teaching Fellowship

Breakthrough Twin Cities prepares under-resourced students for college success and cultivates the next generation of educators. Each summer BTC seeks a talented group of undergraduate and high school students to apply for our paid nine-week Summer Teaching Fellowship. This internship offers great opportunities to lead and grow in a positive, accepting educational environment. In addition to teaching middle school students from the Twin Cities in math, science, writing or literature, Teaching Fellows will work closely with instructional coaches, program staff, and their peers to create high quality lessons and educational programming. The Teaching Fellowship offers you a chance to make a difference in the lives of young people, while you learn and grow as well!

Visit www.breakthroughtwincities.org for more information and for a link to the application. The early-action deadline is January 12th, and the regular-decision deadline is February 23rd.

National Museum of Mathematics: 2016-2017 Perspectives Program

Are you a math major looking for an interesting job that will allow you to develop deeper mathematical thinking and convey the joy of mathematics to others? Have you ever thought about what other career paths a math degree offers outside of academia? The National Museum of Mathematics is offering a one-year position as an Interpreter (docent) beginning in June 2016. MoMath strives to stimulate inquiry, spark curiosity, and reveal the wonders of mathematics through hands-on exploratory exhibits. You will spend time on the exhibition floor helping visitors have a rewarding experience during their time at the Museum. You will also participate and assist in the many programs and services that the Museum offers. This position requires a strong mathematical background, the ability to connect with people, and a comfort with hands-on education. It will provide you perspective to expand and deepen your mathematical knowledge to either continue your career in a museum setting or as an educator, or perhaps to return to school to obtain an advanced degree in mathematics.

There is also a possibility of an 18-month position that combines one year of working on the Museum floor with an additional six months in other positions within the Museum organization, affording the opportunity to learn about not-for-profit administration. All candidates must have a GPA of 3.5 or higher with a major in mathematics. Interested candidates should email a cover letter; a current resume; three references; salary requirements (noting that MoMath is a not-for-profit); and a newly-written 150- to 500-word essay describing an experience that shaped his/her view of mathematics to info@momath.org. The words "MoMath Â Perspective" must be included in the subject line of the email.

REU: Modeling and Simulation in Systems Biology at UConn Health

Technological advances in the measurement of molecular events within cellular bodies make it possible to obtain detailed information about the wide variety of dynamic processes that control the development and functioning of organisms. Accordingly, the scientific focus of this program is on the development, implementation, and application of mathematical algorithms to processes in biology and biomedicine. Applicants must have a strong mathematical background and some programming experience; background in the life sciences, chemistry, or physics is preferred. Apply by February 14th at https://cqm.uchc.edu/biomath. The program is limited to US citizens and permanent residents. Questions? Send them to biomathreu@uchc.edu or call 860-679-3783.

REU: 2016-2017 Summer Science Fellowship

Are you a first- or second-year student interested in pursuing a career or a PhD in science or mathematics/statistics? Consider applying for a 2016-2017 Summer Science Fellowship! The goal of the Summer Science Fellowship is to broaden participation of historically underrepresented groups (including gender, ethnicity, socioeconomic background, and disabilities) in the sciences/math. Carleton Summer Science Fellows will have the opportunity to work in a research lab either at Carleton or at another institution for two summers with a summer stipend of $4300. Summer Science Fellows will be expected to enroll in the 1 credit Science Fellows Research Colloquium in the spring before and the fall following their research experience. Questions? Send them to Jennifer Wolff at jwolff@carleton.edu.

Problems of the Fortnight

Welcome back for winter term! Most of the every-other-week routine is unchanged: There should be two problems in each issue of the *Gazette*; you'll have about a week and a half to do them, and correct solutions are eligible for prizes from the B.B.O.P. (not the musical genre, but the Big Box O' Prizes). Solutions can be submitted on paper (to my box in the CMC) or by e-mail (either in the body of an e-mail to me or as a pdf attachment; no other attachments, please). There are two changes: Gail Nelson is passing the editorial baton, if there is such a thing, to me (Mark) as of this issue, and solutions are now due by noon on Tuesday of the next *Gazette* week - in this case, by noon on Tuesday, January 19. (Solutions that come in later but before my own solutions are posted will still be considered, but I probably won't be able to acknowledge them in that Friday's *Gazette*.) Although I tend to get behind on this, I'll try to return all solutions with (supportive) comments. People submitting incorrect solutions will not be identified in public, so don't hesitate to submit something even if you're not sure whether it's right. (On the other hand, to be eligible for a prize, a solution should show reasoning, not just an answer.) By the way, the problems are not necessarily in order of difficulty for you - for one thing, their difficulty may depend on what you happen to have seen!

Here are the first two problems of the term:

1. If you factor the number 2016 that all of a sudden we are encountering everywhere, you may notice that it can be written as $32 \cdot 63$, so it's of the form $2^k(2^{k+1}-1)$ for $k=5$. Now if only 63 were prime, 2016 would be the sum of all its proper divisors, that is, a *perfect* number. (For example, for $k=2$, $2^{k+1}-1=7$ is prime, and $2^k(2^{k+1}-1)=28$ is a perfect number, the sum of its divisors $1,2,4,7,14$.) Instead, because 63 is composite, the sum of all the proper divisors of 2016 is larger than 2016, that is, 2016 is *abundant*. Now for the question: Does there exist a (positive integer) multiple of 2016 which is *not* abundant? If so, find the smallest such multiple; if not, show that none exists.

2. Consider a half-disk in the plane, say the top half of the unit disk:

$$\{(x,y)|x^2+y^2 \leq 1, y \geq 0\}.$$

Find the smallest possible area of a triangular region that contains this half-disk and whose base includes the interval $[-1,1]$ along the x-axis (which is the base of the half-disk).

- Mark Krusemeyer

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