9th Week Update

This will be the last Gazette of Fall Term -- the next issue will come out on January 5. So far this fall, the Carleton Math & Stats Department has begun a weekly tea series, numerous talks have been given, a few independent comps students presented their findings, and several students have participated in mathematics- and statistics-related conferences and competitions. There isn't too much going on this week, but read on to find out about study abroad opportunities, to get updates on jobs, internships and summer opportunities, and to take a crack at this issue's Problem of the Fortnight. Good luck with the end of term, everyone! Have a great winter break!

Estimathon!

When: Tuesday, November 14, 4pm
Where: CMC 206

A very exciting event is happening in the Math and Stats Department! The event is "Estimate This!", where you work in a team to estimate strange and interesting numbers. The best estimators win prizes! With nothing but your own raw estimation talent, you can tackle questions like "How many birdies were there in the 2017 US Open?" or "What is the maximum occupancy of Hong Kong Disneyland?" or "How much potassium is in an average banana (in grams)?" Everyone is welcome at this event! Just show up, join a team, and start guessing. If you are feeling competitive, you can organize a team a head of time.

Seeing Math - Math Art Exhibit

When: November 10, 2017 - January 15, 2017
Where: St. Olaf College - Flaten Art Museum

Mathematics has been a profound source of inspiration for artists across time and cultures. Seeing Math brings together six emerging and established artists who explore and reframe mathematical concepts in concrete and poetic ways. Operating at the rich intersection of math and art, these artists use painting, crochet, photography, computer-generated imagery, video, and installation to make visible concepts such as infinity, algorithms, and the fourth dimension. Museum Hours: MTWF 10-5, Th 10-8, Su noon-4. The
museum is closed Nov. 22-26 and Dec. 20- Jan. 2.

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# Budapest Experience

Are you interested in going on the Budapest Semesters in Mathematics or Budapest Semesters in Mathematics Education study abroad program next summer or fall? If you are, your first step is to apply here at Carleton! Applications are now available and can be found at the Math & Stats Department's website under Resources > Off-Campus Opportunities. In order to receive full consideration, your application for the program is due to the Carleton Math & Stats Department by January 29. We will be having an information session on Thursday, January 18 at 4 pm and watch for more details in the upcoming Gazette. Contact Gail Nelson (gnelson) with any questions.

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# Upcoming Events

**Week 10, Tuesday, November 14, 4:00 - 5:00pm**

Estimathon - CMC 206

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# Job & Internship Opportunities

**Still looking for a winter break job?**

Mike Tie is looking for a few students to help him patch lab computers, move computers, and pull network and power cables. No experience needed. 40 hours per week. Contact Mike Tie (mtie@carleton.edu, cmc305).

**Valparaiso University, REU**

The 2018 Valparaiso Experience in Research by Undergraduate Mathematicians (VERUM) program provides an opportunity for rising sophomore and junior students to engage in a first research experience in mathematics. Applications from rising seniors without prior research experience may also be considered. The VERUM program is looking for exceptional students who want a research experience that will help them to decide if graduate studies in the mathematical sciences should be part of their future plans. Being committed to graduate study is not a prerequisite for this program, but rather a desired outcome. First generation college students, minority students, and women are particularly encouraged to apply. More details about the projects and the program, as well as application instructions and the 2018 VERUM poster/flyer, can be found at [www.valpo.edu/mst/verum](http://www.valpo.edu/mst/verum).

**Caltech, Wave Fellows Programs**

The WAVE Fellows program provides support for talented undergraduates intent on pursuing a Ph.D. to conduct a 10-week summer research project at Caltech. The program aims to foster diversity by increasing the participation of underrepresented students in science and engineering Ph.D. programs. The program is extended, but not limited, to underrepresented minorities, women, first-generation college students, geographically underrepresented students, educationally or financially disadvantaged students, and students with disabilities. Eligibility: Students must be current sophomores through non-graduating
seniors and must be U.S. citizens or permanent residents, or have DACA status. A minimum GPA of 3.2 is required. Competitive applicants will have prior research experience and can articulate how their research interests align with Caltech’s research areas. Support: WAVE Fellows will receive a $6000 award for the ten-week program and an additional $500 housing/travel supplement. Online applications are due January 12, 2018. For more information, visit: http://www.sfp.caltech.edu/programs/wavefellows

AT&T
Technology has the power to make the impossible possible. From mobile apps to revolutionary devices, AT&T is pushing the limits of innovation. What does it feel like to develop life-changing ideas? This is your chance to find out. This program for software development is focused on transforming college graduates into skilled technologists. Here, you’ll be part of a strong network and learn alongside a group of highly motivated peers just like yourself. It's a collaborative environment full of learning opportunities designed to help you evolve your capabilities, challenge your strengths and reach your fullest potential. Whether you’re in the full-time program or the 10-week internship, you’ll team up with our internal technology experts. You’ll work on high-value projects to help shape the future of products and services like Cloud Services, API & Developer Programs, Open Source, Responsive Web Design, and Software Defined Networking. Applying to the Software Development Program means you will be considered for either Software Engineer or Business Analyst --- being placed based on your input and experience identified throughout the interview process. To qualify you must be a rising senior. For more information, visit: http://att.jobs/careers/college/full-time-development-programs/technology-development-programs

New York Yankees, Quantitative Analyst Opportunities
The New York Yankees are seeking talented students for a couple of positions within the Baseball Operations department. They are looking to fill the following positions for the coming year: Associate, Quantitative Analysis: a year-long position intended for recent graduates (including those graduating in December 2017 or May 2018 and Summer Intern, Quantitative Analysis: a summer-only position intended for current students (undergraduate or graduate). Both positions will give students hands-on experience with quantitative projects related to player evaluation, player development, and/or in-game strategy. We are looking for students with strong quantitative reasoning, familiarity with statistical programming, and a passion for baseball. Unfortunately, these positions cannot be offered to students who will require visa sponsorship. Any interested students should apply via the links above. For specific questions, feel free to reach out to (tfeder@yankees.com) directly.
Problems of the Fortnight

As far as I know, this is the last Gazette of the term, so you have lots of time for the problems below; solutions should reach me some time in 2017, or possibly at the very beginning of 2018.

1. For the purposes of this problem, say a positive integer is rich if it has at least 2017 different prime factors. (So the smallest rich integer is the product $2 \cdot 3 \cdot 5 \cdot 7 \cdot \ldots \cdot p_{2017}$ of the first 2017 primes $p_1 = 2, p_2 = 3, p_3 = 5, \ldots$.) If there exists positive integers $N$ and $k$ such that every positive integer greater than $k$ is the sum of at most $N$ rich integers (that is, any sufficiently large integer is the sum of at most $N$ rich integers), find (with proof) the smallest such $N$. If there is no such $N$, show why not.

2. a) Find, with proof, all (real-valued) functions $f$ with the following properties:
   \[ f(x) \text{ is defined for all real } x; \ f \text{ is continuous at } x = 1; \ f(x^2) = xf(x) \text{ for all real } x. \]
   b) If we drop the condition that $f$ is continuous at $x = 1$, will there be additional functions that have the other properties?

Essentially correct solutions to the first (cyclist) problem posed October 27 came in from Alief Moulana, Yuki Segawa, and John Snyder; Alief should stop by CMC 217 to collect a B.B.O.P. item. So far, the only solution to the second problem (about distances from points to parallel lines) came from Mathematica maven John Snyder, and I’m still hoping that one or more solutions “by hand” will come in as well … Good luck with all your end-of-term endeavors, and have a great winter break!

- Mark Krusemeyer