

Goodseal Gazette

Carleton College
Northfield MN 55057

The newsletter for the Carleton mathematics and statistics community

6 October 2011
Vol. 30, No. 4

Colloquium Talk: How Math Made Modern Music Irrational

David Kung, from St. Mary's College of Maryland, will be at Carleton next Monday, October 10th, at 8:30 pm in Olin 141 to discuss math's influence on modern classical music. Here's an excerpt from his description of the talk:

The scale used by 20th century classical musicians is strikingly different from that used in Bach's time. In fact, over the past 500 years, a wide variety of scales have permeated Western music. Amazingly, none of them was in tune! In fact, in some sense, no piano is ever in tune.

Starting with a single vibrating string, we'll use some physics and mathematics to make sense of the various sounds a violin can make. Add to the mix a little music theory and some basic arithmetic, and we'll be able to construct several different scales and see what's wrong with each one.

Finally, by constructing the modern scale, we'll be able to answer the question posed in the title. Throughout the talk, these concepts will be illuminated with excerpts played on the violin, including passages from Bach, Mendelssohn, Tchaikovsky and a few more modern composers.

Director's Summer Program at the National Security Agency (NSA)

The Director's Summer Program (DSP) is the National Security Agency's (NSA's) premier outreach program to the nation's most outstanding

undergraduate mathematics majors. Each summer about two dozen exceptional students collaborate with each other and with NSA mathematicians on problems critical to the intelligence gathering and information assurance missions of the agency. Admission to the 12-week program is highly competitive. Applicants should have demonstrated superior mathematical aptitude. A full year of abstract algebra and analysis are strongly recommended. Some computer experience is desirable.

The DSP is held at NSA headquarters from late May through mid-August. Students are paid a competitive salary based their education level. In addition, students receive annual, sick and Federal Holiday leave. For additional information, please call Tonya Viola, Program Manager, at (301) 688-0983, or send e-mail to math@nsa.gov.

Annual All Science and Math Poster Session

Mark your calendars and join us for the annual celebration of student scholarship in science and math. The Annual All Science and Math Poster Session will be held on Wednesday, October 26, 2011, in room 236 of the Weitz Center from 3:45 p.m. to 5:15 p.m.

All students who have done research, at Carleton or elsewhere, are welcome to present and we encourage all to attend. This event has grown to over 60 posters presented and last year over 100 people attended. Registration is open and is done online at:

<http://serc.carleton.edu/cismi/students/register.html>.

Students are asked to register by Wednesday, October 12 to ensure that their poster is included in the brochure.

For questions about the poster session, please contact Ellen Haberoth. Sponsored by: The Carleton Chapter of Sigma Xi, the Howard Hughes Medical Institute (HHMI), and the Carleton Interdisciplinary Science & Math Initiative (CIS-MI).

Graduate Programs in Biostatistics at the University of Pennsylvania

The Graduate Group in Epidemiology & Biostatistics at the University of Pennsylvania has offered a Master of Science (MS) and Doctor of Philosophy (PhD) in Biostatistics since 2000. The program currently enrolls over 33 students and our graduates to date have found excellent placements in universities, industry and the government.

The Biostatistics Graduate Program is currently inviting applications for admission in Fall 2011. Full-time PhD students receive up to five years of full support, derived from a variety of sources including teaching and research assistantships and internships at nearby pharmaceutical companies. For further information, see: <http://www.cceb.upenn.edu/>.

National Science Foundation Graduate Research Fellowships for Math Majors

The National Science Foundation (NSF) is offering 80 fellowships to mathematics students pursuing graduate studies this year. This number is higher than any year in the past, and all graduate-school-bound seniors are encouraged to consider applying. The deadline is November 15, 2011. For more information, visit: <http://tinyurl.com/NSFGraduateResearchFellowships>

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PROBLEMS OF THE WEEK

1. As motivation for this problem, here's a standard result from geometry: A convex quadrilateral (four-sided figure) $ABCD$ can be inscribed in a circle (that is, all four vertices lie on the same circle) if and only if the sum of the (opposite) angles at A and at C is 180 degrees. Now for the problem: Let $ABCDEF$ be a convex hexagon, with the vertices A, B, C , etc. in counterclockwise order.

a) Suppose $ABCDEF$ can be inscribed in a circle. Does it follow that the sum of the three angles at A , at C , and at E is 360 degrees? Why?

b) Suppose the sum of the three angles at A , at C , and at E is 360 degrees. Does it follow that $ABCDEF$ can be inscribed in a circle? Why?

2. On a table in a dark room there are n hats, each numbered clearly with a different number from the set $\{1, 2, \dots, n\}$. A group of k intelligent students, with $k < n$, comes in to the room, and each student takes a hat at random and puts it on his or her head. The students go back outside, where they can see the numbers on each other's hats (but, naturally, no one can see her/his own hat number). Each student now looks carefully at all the other students and announces

i) the largest hat number that (s)he can see, as well as

ii) the smallest hat number that (s)he can see.

After all these announcements are made, what is the probability that *all* the students should be able to deduce their own hat numbers:

a) if $n = 6$, $k = 5$;

b) in general (as a function of n and k)?

An "experimental" solution, using technology, to last week's second problem arrived from John Snyder in Oconomowoc, WI. Alas, there's nothing else to report. Too much beautiful weather, maybe?
-Mark Krusemeyer