Math News

Vol. XXV, No. 2 November, 2010

Bulletin Boards

Students are encouraged to check the bulletin boards around the Mathematics hallway periodically. Information regarding KME activities, the semiannual problem-solving contest, graduate schools, and other items of interest is available.

A Weighty Problem Solved

Refer to the "weighty" problem presented in the previous issue of *Math News* and see how your solution compares to ours.

Begin by weighing a red and a white against a blue and a white. If the scales balance, then there is a heavy and light weight on each side of the scale. Remove the red and blue weights to determine which white weight is the heavier of the two. This will then allow you to determine which of the other two weights is heavy and which is light and consequently you will then know which is heavy and which is light in the pair that was not selected.

If the scales do not balance on the first weighing, the white weight on the "heavy" side of the scale is the heavier of the two white weights. Now weigh the original red-blue weight on the heavy side of the scale against the mate of the red-blue weight on the opposite side of the scale. If the scales balance both weights are heavy. If not, you will know which is heavy and which is light. This information will then allow you to correctly identify the remaining two weights.

Professor Out and About

Professor Mark Hughes recently presented an invited lecture on "Bernoulli Numbers" at St. Francis University in Loretto, PA. A brief synopsis follows.

Formulas for sums of squares or cubes, etc... of the integers 1 through n have been used for finding areas and volumes since the time of Archimedes. Attempts at finding a formula for general powers were made by Fermat, Pascal and others. Jakob Bernoulli saw a pattern in the complicated formulas and he was able to devise a clever algorithm for generating sums of powers equations. A key part of this algorithm is a collection of numbers now called Bernoulli numbers. Also explored was an early application of Bernoulli numbers due to Abraham De Moivre. Together with James Stirling, an approximation for n! was developed which greatly simplified probability calculations. De Moivre also developed the normal approximation to binomial probabilities with which all students of statistics class are familiar.

Spring Course Offerings

Students are invited to examine the list of course offerings available for the Spring semester and meet with academic advisors. Registration runs from November 1st through the

236-Calculus I	MTRF	8:00am-8:50am	R. Forsythe
236-Calculus I	MTRF	11:00am-11:50am	G. Wojnar
237-Calculus II	MTRF	11:00am-11:50am	F. Barnet
237-Calculus II	MTRF	2:00pm-2:50pm	F. Barnet
238-Calculus III	MTRF	8:00am-8:50am	M. Hughes
380-Int. Prob. and Stat.	MWF	10:00am-10:50am	R. Forsythe
432-Differential Eq.	TR	2:00pm-3:15pm	R. Forsythe
435-Numerical Analysis	TR	3:30pm-4:45pm	L. Hegde
436-Math. Physics	MWF	9:00am-9:50am	M. Hughes
451-Modern Higher Alg.	TR	12:30pm-1:45pm	G. Wojnar
465-Theory of Numbers	MWF	12:00pm-12:50pm	M. Hughes
470-Math. Models & App.	TR	9:30am-10:45am	F. Barnet
482-App. Nonpar. Stat.	MWF	11:00am-11:50am	L. Revennaugh

Food For Thought

Suppose you have to cook six large grilled-cheese sandwiches for three minutes on each side. The pan you are using can only accommodate four sandwiches at a time. Determine the minimum cooking time for the six sandwiches. Don't wait to read the answer in the next issue of *Math News*; find the answer yourself!

Möbius Strip Built at Nanoscale Level

Scientists at Arizona State University have used DNA origami to create a Möbius structure measuring only 50 nanometers. Relying on DNA self-assembly, they used a long, single stranded segment of DNA, used as a structural scaffold and guided through base pairing to assume a desired shape. Short, chemically synthesized "staple strands," composed of complementary bases, are used to hold the structure in place.

The team demonstrated the topological flexibility of a Möbius form using a folding and cutting—or DNA Kirigami—technique. It is composed of eleven double helices, assembled in parallel. Each double-helical length has a twist of 180 degrees along its central axis, before it reconnects with itself. The central helix circles around the length of the strip once. The other helices circle twice, while also twisting around the core helix by 180 degrees before reconnecting to close the Möbius loop.

For more information, see "Folding and Cutting DNA into Reconfigurable Topological Nanostructures," which appeared in Nature Nanotechnology (October 4, 2010).

Math News is published for students, faculty, staff, and administrators by the Department of Mathematics.