2008 - 2009

MATHEMATICS COLLOQUIUM SERIES
UNIVERSITY OF CENTRAL FLORIDA

Dr. Pawel Wocjan
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University of Central Florida

will speak on

Mutually Unbiased Bases in Square Dimensions

ABSTRACT: Two orthonormal bases B and B' of the Hilbert space C^d are called mutually unbiased if and only if |<v,v'>|^2=1/d for all v in B and all v' in B'. The question of determining the maximal number of pair-wise mutually unbiased bases for each dimension d is an open problem (the smallest unknown case is for d=6). This question can be considered as a generalization of the design-theoretic problem of determining the maximal number of mutually orthogonal Latin squares for a given size.

I will show that k=w+2 mutually unbiased bases can be constructed in any square dimension d=s^2 provided that there are w mutually orthogonal Latin squares of order s. The construction combines the design-theoretic objects (k,s)-nets (which can be constructed from w mutually orthogonal Latin squares of order s and vice versa) and generalized Hadamard matrices of size s. Using known lower bounds on the asymptotic growth of the number of mutually orthogonal Latin squares (based on number theoretic sieving techniques), we obtain that the number of mutually unbiased bases in dimensions d=s^2 is greater than s^1/14.8 for all s but finitely many exceptions. Furthermore, our construction gives more mutually orthogonal bases in many non-prime-power dimensions than the construction that reduces the problem to prime power dimensions.

DATE: **Thursday, October 23, 2008**

TIME: **11:30am – 12:30pm**

PLACE: **MAP 318**

Refreshments will be served.