University of Lethbridge
Department of Mathematics
and Computer Science

Number Theory & Combinatorics Seminar

Monday — March 18, 2013
Room: B660
Time: 12:00 to 12:50 p.m.

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The asymptotic existence of orthogonal designs

Abstract: A *complex orthogonal design* of order n and type $(s_1, \ldots, s_k)$, denoted $COD(n;\ s_1, \ldots, s_k)$, is a matrix X with entries from $\{0, \epsilon_1 x_1, \ldots, \epsilon_k x_k\}$, where the x_i's are commuting variables and $\epsilon_j \in \{\pm 1, \pm i\}$ for each j, that satisfies

$$XX^* = \left(\sum_{i=1}^{k} s_i x_i^2\right) I_n,$$

where X^* denotes the conjugate transpose of X and I_n is the identity matrix of order n.

A complex orthogonal design in which $\epsilon_j \in \{\pm 1\}$ for all j is called an *orthogonal design*, denoted $OD(n;\ s_1, \ldots, s_k)$. An orthogonal design (=OD) in which there is no zero entry is called a *full* OD. Equating all variables to 1 in any full OD results in a *Hadamard* matrix.

In this seminar, we show that for any n-tuple $(s_1, \ldots, s_k)$ of positive integers, there exists an integer N such that for each $n \geq N$, there is an $OD\Big(2^n(s_1 + \cdots + s_k); 2^n s_1, \ldots, 2^n s_k\Big)$. This is a joint work with professor Hadi Kharaghani.

EVERYONE IS WELCOME!

Visit the seminar web page at
http://www.cs.uleth.ca/~nathanng/ntcoseminar/