Open University
Winter Combinatorics Meeting

Wednesday 26 January 2005

Timetable

10:50 - 10:55	Welcome and introduction Prof Alan Bassindale Pro-Vice-Chancellor (Research and Staff)
11:00 - 11:40	Jana Šiagiová, Slovak University of Technology, Bratislava *Large vertex-transitive and Cayley graphs of diameter two*
11:45 - 12:25	Peter Rowlinson, University of Stirling *Star complements in finite graphs*
12:30 - 13:55	Lunch
14:00 - 14:40	Jan Saxl, University of Cambridge *Some combinatorial applications of the classification of the finite simple groups*
14:45 - 15.25	Aleš Drápal, Charles University, Prague *Amalgamations of Latin trades*
15:30 - 15:55	Tea/Coffee (in M Block, Room Q229)
16:00 - 16:40	Ralph Stanton, University of Manitoba, Canada *Considerations on small packing numbers*

Large vertex-transitive and Cayley graphs of diameter two
Jana Šiagiová, Slovak University of Technology, Bratislava

The *degree-diameter problem* is to determine, for each d and k, the largest order $n_{d,k}$ of a graph of maximum degree d and diameter $\leq k$.

As the problem appears to be hard in general, many investigations have focused on special classes of graphs. In our talk we present constructions of the currently largest known vertex-transitive graphs of diameter two and given degree. We also construct large Cayley graphs of diameter two for infinite sequences of degrees related to prime powers.

Some applications of the presented methods will be discussed as well.

Star complements in finite graphs
Peter Rowlinson, University of Stirling

Let G be a finite graph of order n with an eigenvalue μ of multiplicity k. A *star complement* for μ in G is an induced subgraph of G of order $n - k$ without μ as an eigenvalue. The talk will be concerned with relations between star complements and graph structure, in the context of extremal strongly regular graphs and exceptional graphs.

Some combinatorial applications of the classification of the finite simple groups
Jan Saxl, University of Cambridge

The classification of finite simple groups has found many applications in many areas of mathematics. In this talk we shall concentrate on some applications with combinatorial flavour. In particular, we shall discuss distance transitive graphs, and linear spaces (in particular projective planes) under suitable symmetry conditions.

Amalgamations of Latin trades
Aleš Drápal, Charles University, Prague

A *Latin trade* is a pair of two partial Latin squares which are defined at the same positions, agree in no position, and have coinciding aggregate content for each row and each column. Every Latin trade yields an oriented surface, and this geometric interpretation offers various ways how to generate all Latin trades from basic ones by amalgamation. Some other, less geometric ways of amalgamation will be discussed as well.

Considerations on small packing numbers
Ralph Stanton, University of Manitoba. Canada

It is well known that the maximum number of k-sets from a v-set with no repeated pairs satisfies the relation

$$D(2, k, v) \leq \left\lfloor \frac{v}{k} \left\lfloor \frac{(v-1)}{(k-1)} \right\rfloor \right\rfloor$$

However, this bound, while excellent for larger values of k is very weak for k "small" with regard to v, specifically when $k^2 - k + 1 < v$.

I will discuss the very accurate "weight bound" for this second situation and show by example how it can be of use in also discussing values of the minimal coverings of v for such values.

This is largely an expository lecture and no previous background will be assumed.