LTCC Advanced Course

Title: Enumerative Combinatorics

Format: Extensive: ten hours, in five two-hour weekly sessions

Level: Advanced

Syllabus: Core material:

1. Formal power series: convergence, operations thereon, asymptotics, multivariate versions. Labelled vs. unlabelled counting.

2. Linear recurrences.

3. Rota's twelvefold way: binomial coefficients, Stirling numbers, partitions.

4. Inclusion-exclusion. Posets, Möbius inversion.

5. Lagrange inversion. Trees, Cayley's formula. Prüfer codes, parking functions.

6. q-integers and q-series. Permutation statistics. Linear subspaces and q-analogues, lattice paths.

Optional material, to be covered as time and interest permit:

7. Polyhedra: counting faces, counting lattice points. Hyperplane arrangements.

8. The matrix-tree theorem. Sandpiles, graph parking functions.

9. Determinantal formulae, Lindstrom-Gessel-Viennot.

10. Species, informally. Combinatorial Hopf algebras.

Lecturer Details:
Lecturer: Dr Alex Fink
Lecturer home institution: Queen Mary University of London