MA284
Week 12: Matrices and Review

Start of ...

PART 4: Review

Th set of topics that we studied includes:

1. The additive and multiplicative principles;
2. Sets; the Principle of **Inclusion/Exclusion** (PIE) and its applications;
3. **Binomial Coefficients** (& lattice paths, bit-strings, & Pascal's triangle);
4. Permutations and Combinations;
5. **Stars and Bars**, and the NNI Equations and Inequalities;
6. Algebraic V **Combinatorial** Proofs;
7. Derangements;
8. Counting functions;

9. Graph Theory: motivation and basic definitions;
10. Isomorphisms between graphs.
11. Important families of graphs (Cycle graphs, K_n, $K_{n,n}$, etc.)
12. Planar & non-planar graphs; chromatic numbers, **Euler's formula**,
13. Convex polyhedra, and Platonic solids;
14. Graph Colouring; Greedy and Welsh-Powell algorithms;
15. Eulerian and Hamiltonian graphs;
16. Trees, including spanning trees, and decision trees.
17. Matrices of Graphs.

ie Labels don't matter.

P_n - path graphs.

chromatic numbers

adjacency + Distance Matrix

Cheat sheet for graphs!

New section on BB:

Exam Prep

There are **8** questions on the final MA284 exam: you should attempt *all* eight. 4 questions are worth 13 marks, and 4 are worth 12.

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Tips:

- The questions on the exam are roughly in the order in which we covered the topics in class.
- 4 questions are on combinatorics, and 4 are on graph theory.
- The Principles of Addition, Multiplication, and Inclusion/Exclusion are essential to most of the combinatorics questions.
- Good idea to review the homework exercises.
- For graph theory, you need to know how to
  - sketch a graph given the edge and vertex sets;
  - determine if the graph is, e.g., bipartite, planar, connected, a tree (ie no cycles)
  - find an Eulerian path/circuit.
  - compute the chromatic number
  - calculate the radius and diameter.