EXAMINABLE CONTENT FOR MAS334 (COMBINATORICS)

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This is the short version of this document, listing only the points from the notes that are starred (as explained below). There is also a long version that lists all definitions and results in the notes, whether or not they are starred.

For starred definitions, you may be required to state the definition in the exam. For singly starred results, you may be required to state the result in the exam. For doubly starred results, you may be asked to reproduce the proof in the exam. You may also be asked to prove something where the required argument is a step in one of these specified proofs.

Although you will not be examined directly on the unstarred points, understanding those points may nonetheless be helpful for solving problems posed in the exam.

- * Binary sequences (Definition 1.3)
- * Number of binary sequences (Proposition 1.5)
- * Power set (Definition 1.6)
- * Size of power set (Proposition 1.8)
- * The set F_kA of lists with distinct entries (Definition 1.9)
- ** The size of F_kA (Proposition 1.11)
- * Binomial coefficients (Definition 1.12)
- ** Number of subsets of given size (Corollary 1.13)
- ** Pascal's identity (Proposition 1.19)
- * Gappy sets (Definition 1.21)
- ** Number of gappy sets (Proposition 1.23)
- * Number of strictly positive solutions (Proposition 2.1)
- * Number of nonnegative solutions (Proposition 2.4)
- ** Number of grid routes (Problem 2.7)
- * Pigeonhole principle (Proposition 4.2)
- * Inclusion-Exclusion Principle (Theorem 5.3)
- * Derangements (Definition 5.8)
- * Proportion of derangements (Proposition 5.11)
- * Number of coprime numbers (Problem 5.12)
- * Matching problems (Definition 6.1)
- * Row and column sets (Remark 6.5)
- * Rook polynomial and coefficients (Definition 7.2)
- * Linear board (Example 7.5)
- * Diagonal board (Example 7.6)
- * Full board notation (Definition 7.9)
- * Rook placements and permutations (Proposition 7.10)
- ** Blocking and stripping relation (Theorem 8.1)
- * Fully disjoint splitting (Definition 8.5)
- ** Factoring rook polynomials (Theorem 8.7)
- * Last rook coefficient of complementary board (Theorem 10.3)
- * Types of plausibility (Definition 11.2)
- * Solvable matching problems are plausible (Lemma 11.5)
- * Transversals (Definition 12.6)
- * Hall's Theorem for transversals (Proposition 12.8)
- * Team allocation problems (Definition 12.10)
- * Plausibility for team allocation (Definition 12.11)

** Hall's Theorem for team allocation (Proposition 12.13)
* Consistent tournament (Example 13.5)
* Winning line (Definition 13.6)
* Winning line (Example 13.8)
** Every tournament has a winning line (Proposition 13.9)
* Score sequence (Definition 13.10)
* Odd modular tournaments (Example 13.12)
* Realisable score sequence (Definition 13.14)
* Plausibility for score sequences (Definition 13.19)
** Every realisable sequence is plausible (Lemma 13.20)
* Landau's Theorem: every plausible sequence is realisable (Theorem 13.22)
* Latin rectangles (Definition 14.1)
* Wide latin rectangles can be squared (Theorem 14.8)
* Multiplicity and excess (Definition 14.10)
* Plausibility for latin rectangles (Definition 14.18)
* Extendable rectangles are plausible (Proposition 14.19)
* Plausible latin rectangles can be fully extended (Theorem 14.22)
* $\mathbb{Z}/p$ is a field (Proposition 14.35)
* Block design (Definition 15.1)
* Relations between parameters (Proposition 15.4)
* In any block design, we have $v \leq b$ (Proposition 15.5)
* Quadratic residues (Definition 15.8)
* Properties of quadratic residues (Lemma 15.12)
* The sets D and D_x (Definition 15.13)
* Size of the sets D_x (Lemma 15.14)
* The quadratic residue design is a block design (Theorem 15.16)