6 Combinatorics Cheatsheet

6.1 Overview

- **Combinatorics** is a field of mathematics concerned with:
  - Arrangements of elements of a set into patterns satisfying specific rules, generally referred to as *discrete structures*.
  - The existence, enumeration, analysis, classification and optimization of discrete structures.
  - Generalizations and specializations of relations between discrete structures.

6.2 Permutations and Combinations

6.2.1 Basic Counting Principles

TODO: addition, multiplication, subtraction, bijection, pigeonhole, double counting

6.2.2 Ordered Arrangements

TODO: string, tuple, sequence, map (function), k-permutation, circular permutation

- ...

6.2.3 Unordered Arrangements

TODO: subset, k-combination, multiset, k-comb of a multiset, k-perm of a multiset, binomial coefficient

- ...

6.2.4 Multinomial Coefficients

- ...

6.2.5 The Twelvefold Way

Twelvefold way

- ...

6.3 Inclusion–Exclusion Principle

PIE

TODO: PIE, Möbius Inversion