6 Combinatorics Cheatsheet

6.1 Overview

- * **Combinatorics** is a field of mathematics concerned with:
 - o 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.
 - o 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 \ast ...

6.2.3 Unordered Arrangements

 $TODO: \ subset, \ k\text{-combination}, \ multiset, \ k\text{-comb} \ of \ a \ multiset, \ k\text{-perm} \ of \ a \ multiset, \ binomial \ coefficient$

* ...

6.2.4 Multinomial Coefficients

* ..

6.2.5 The Twelvefold Way

Twelvefold way

* ..

6.3 Inclusion-Exclusion Principle

PIE

TODO: PIE, Möbius Inversion