

Introduction to Combinations and Permutations

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As a veteran math competition teacher, I was always asked by students and parents to solve some challenging math problems they encountered at school or company. I found out that the large portion of the questions belongs to combinator problems which are both fascinating and challenging because school usually does not cover this branch of mathematics. The subject is hard to explain and deserves its own importance in Mathcounts and AMC competition.

This summer I take the liberty to teach this class. Student will have a chance to learn basic and advanced combination and permutation techniques and will experience and solve many wonderful combinator problems in very short time. The problems include balls, dice, coins, cube, blackjack, Diophantine equations, coupling problem, crown diamond setting.

This short session will cover:

- 1) Factorials, permutation and combination
- 2) Fundamental Counting Principle and Bijection, Sticks and Stones
- 3) Blackjack Probabilities
- 4) Inclusive-Exclusive principle: Coupling Problem
- 5) Binomial Expansion and Pascal Triangle
- 6) Burnside's Lemma

Student will have fun and gain mathematical insights to this wonderful and inspiring subject. Attached is sample test I compiled. Try it out and have fun!

This is my favorite book I cut my teeth on combinatorics:

