

# Combinatorics

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## Class Discussion

Combinations with repetitions

## Warm Up

**Exercise 1.** How many 5-digit numbers with only odd digits exist?

**Exercise 2.** There are two mathematics teachers and ten English teachers at a school. They want to form a homework committee out of eight people. No committee can survive without a mathematician. In how many ways can they form a survivable committee?

## Problem Set

**Exercise 3.** How many six digit numbers are there that have at least one odd digit?

**Exercise 4.** New Nevada license plates contain one letter, then 3 digits, then another letter. What is the maximum number of cars that can be registered in New Nevada?

**Exercise 5.** Tanya has 20 students, out which she needs to build a team of 6 for HMMT. In how many ways can she do this? In how many ways can she build 2 teams?

**Exercise 6.** Are there more 7 digit numbers containing the digit one or not containing the digit one?

**Exercise 7.** Find the sum of all 7-digit numbers you can get by permuting the digits one through seven.

**Exercise 8.** Tanya has 20 students at her math club. The club needs to elect a president, a vice-president and a secretary. In how many ways can they do it? In how many ways can they do it if it is allowed for the vice-president and the secretary to be the same person?

**Exercise 9.** Tanya's secretary needs to send out 5 invitation letters for Tanya's math party. In a hurry she messed up the letters and the envelopes. Every letter was mailed to a wrong person. In how many ways could the secretary have messed up?

**Exercise 10.** A faulty car odometer proceeds from digit 3 to digit 5, always skipping the digit 4, regardless of position. For example, after traveling one mile the odometer changed from 000039 to 000050. If the odometer now reads 002005, how many miles has the car actually traveled?

**Exercise 11.** A group of hikers went for a hike in a park. At the first bench half of them and one half of one hiker stopped for rest and decided not to continue. At the second bench one half of the remaining group and one half of a hiker stopped for a snack and decided not to continue. At the last bench a similar thing happened. After three benches only one hiker was continuing the trip. How many hikers started the trip?