4.6 Combinations

Learning Targets – day 2:

1. Solving counting problems involving combinations with "cases" to consider.

2. Solving counting problems involving combinations as part of using the FCP.

3. Counting combinations from several sets.

4. Using combinations to solve a "sorting" problem.

FCP with Combinations:
In these counting problems, the basic set up is FCP: we have tasks or decisions, and we count (some or all of) the number of choices for each task or decision using combinations.

Example:
The neighbourhood pizza parlour offers the following options when ordering pizza:

Thin, thick, or stuffed crust
Regular or spicy sauce
4 types of cheese
10 types of meat toppings
12 types of vegetable toppings

How many different pizzas can be made that have 2 different meat toppings, 2 different vegetable toppings, and one kind of cheese?

Assuming that every pizza comes with only one kind of cheese, how many different 2-topping pizzas can be made?

Method #1: Consider cases

Method #2: group all toppings together and "choose 2"

Example:
At the local high school, eight grade 12 students, six grade 11 students, four grade 10 students, and two grade 9 students form the SRC. An athletics committee of four students is being formed. How many different committees can be formed if:

    a)   one student from each grade must be on the committee?

    b)   the SRC president must be on the committee, but the Secretary can not?

    c)   all of the grade 9s are excluded, with no other restrictions?

    d)   The committee must be at least half grade 12s?

Example:
Using a standard deck of 52 cards, how many different 5-card hands can be formed so that:

    a)   three cards are red and two cards are black?

    b)   there are exactly three clubs?

c) there are two kings and three Aces?

d) there are a majority of face cards?

Example:
A shipment of 25 different books needs to be sorted into three boxes. One box can hold 10 books, one can hold 8 books and one can hold 7 books. In how many different ways can the books be sorted into the boxes if the order of the books within each box doesn't matter?