UNIT 2: COUNTING METHODS

Section 2.1: Counting Principles

Example 1: (p. 68)

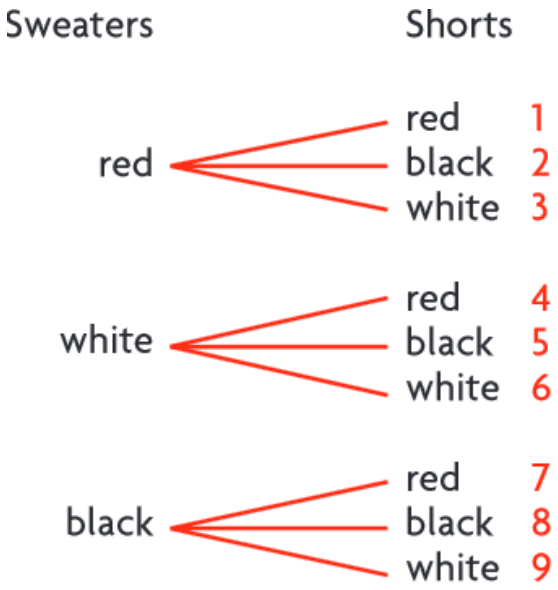
Hannah plays on her school soccer team. The soccer uniforms has:

- three different sweaters: red, white, and black and
- three different shorts: red, white, and black.

How many different variations of the soccer uniform can the coach choose from for each game?

In other words, what is the *sample space*, the different possible outcomes.

Strategy 1: Tree Diagram



NOTE: A tree diagram works but not an efficient method when working with a large sample space.

Strategy 2: FUNDAMENTAL COUNTING PRINCIPLE (FCP)

If one task can be performed in *a* ways,

a second task can be performed in *b* ways,

and a third task can be performed in *c* ways,

then the number of ways to perform all the tasks together is: $a \times b \times c$

For the example above,

U = (# of sweaters) X (# of shorts)

=

If the coach plans on adding 2 different pairs of socks, black or white, how many variations of uniforms will there be?

U = _____ X _____ X _____ = _____

Example 2:

The school cafeteria advertises that it can serve up to 24 different meals consisting of one item from each of the three categories:

Fruit:	Apples (A), Bananas(B) or Cantaloupe(C)
Sandwiches:	Roast Beef (R) or Turkey (T)
Beverages:	Lemonade (L), Milk (M), Orange Juice (O) or Pineapple Juice (P)

Is their advertising correct?

_____ choices for fruit

_____ choices for sandwich

_____ choices for beverage

→

Distinguish between the words AND/OR

ways to choose a fruit (and) a sandwich (and) a beverage,

↳ (MULTIPLY individual selections)

3 fruit choices x 2 sandwich choices x 4 beverage choices

= 24 possibilities

ways to choose a fruit (or) a sandwich (or) a beverage

↳ (ADD individual selections)

3 fruit choices + 2 sandwich choices + 4 beverage choices

= 9 possibilities

Fundamental Counting Principle

Arrangements Without Restrictions

Example 3:

A store manager has selected 4 possible applicants for two different positions at a department store. In how many ways can the manager fill the positions?

_____ and _____

# of choices for position 1 and # of choices for position 2

# of ways to fill the positions _____

Example 4:

How many ways can the letters in the word PENCIL be arranged?

Idea: We have 6 objects and 6 possible positions to occupy

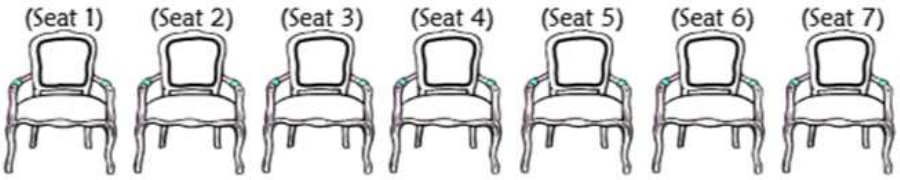
___ ___ ___ ___ ___ ___

Fundamental Counting Principle

Arrangements With Restrictions

Example 5:

In how many ways can a teacher seat 4 boys and three girls in a row of 7 seats if a boy must be seated at each of the row?



Restriction: a boy must be in each end seat.

- Fill seats 1 and 7 first
- Then fill remaining seats

Example 6: (p. 69)

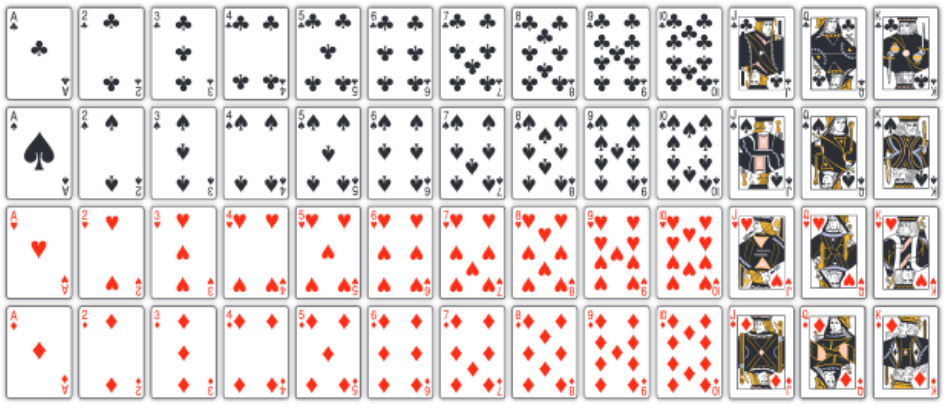
A luggage lock opens with the correct three-digit code. Each wheel rotates through the digits 0 to 9.

a) How many different three-digit codes are possible (if repetition is allowed)?

b) Suppose each digit can be used only once in a code. How many different codes are possible when repetition is NOT allowed?

Example 7: FCP vs. Principle of Inclusion/Exclusion (ex.3, p. 70)

A standard deck of cards contains 52 cards as shown.



Count the number of possibilities of drawing a single card and getting:

a) either a black face card or an ace

a)

b) either a red card or a 10

b)

Practice Questions:

P. 73-75, #3,6,7,8,9ab,11ab,14,16ab