# Chapter 4: Counting Methods

## 4.1 Counting Principles

Investigate the Math Pg. 228 + pg. 225

Some definitions to get us started...

1. Fundamental Counting Principle: If there are *a* ways of performing one task and *b* ways of performing another, then there are a x b ways of performing both.

   ex. Rolling a regular die and tossing a coin

   6 x 2 = 12 different outcomes

2. sample space: all the different possible outcomes of an event

   ex. {1-H, 2H, 3H, 4H ... 5T, 6T}

   H = heads T = tails

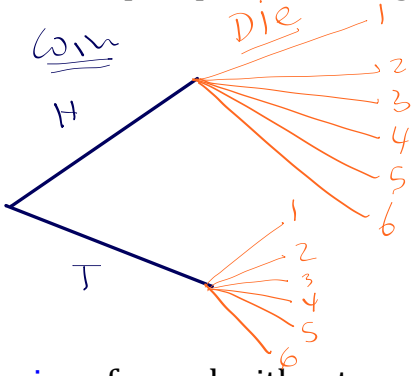
3. outcome table: A table that lists the sample space in an organized manner

   ex.

| Coin \ Die | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| H | H1 | H2 | H3 | H4 | H5 | H6 |
| T | T1 | T2 | T3 | T4 | T5 | T6 |

4. tree diagram: A diagram that lists the sample space in an organized manner

   ex. each growth layer represents a different event




5. conjecture: an inference or conclusion formed without proof or sufficient evidence

## EXAMPLE 1 Selecting a strategy to solve a counting problem

Hannah plays on her school soccer team. The soccer uniform 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?

For each choice of shirt, there are 3 choices of shorts } $3 \times 3 = 9$

## EXAMPLE 2 Solving a counting problem by extending the Fundamental Counting Principle

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

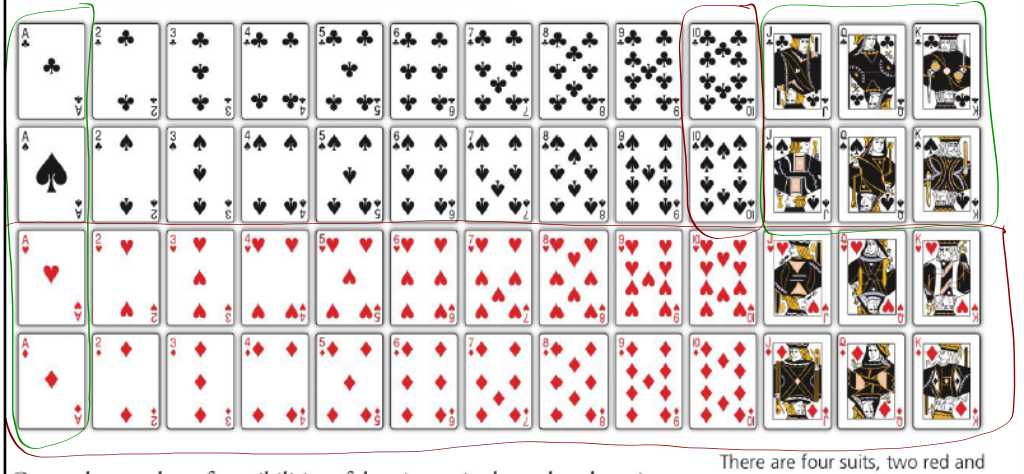
a) How many different three-digit codes are possible? $10 \times 10 \times 10 = 1000$

b) Suppose each digit can be used only once in a code. How many different codes are possible when repetition is not allowed? $10 \times 9 \times 8 = 720$

Your turn Pg. 231 a) $10^5$ b) $10 \cdot 9 \cdot 8 \cdot 7 \cdot 6$

## EXAMPLE 3 Solving a counting problem when the Fundamental Counting Principle does not apply

A standard deck of cards contains 52 cards as shown.



There are four suits, two red and two black, with 13 cards in each suit.

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

a) either a black face card or an ace

b) either a red card or a 10

a) OR = Union (both) +

black face + Ace

$6 + 4 = 10$

Homefun pg. 235 #2, 3, 5, 7, 8, 9, 15, 16, 17, 20

b) $n(R \cup 10)$

$= n(R) + n(10) - n(R \cap 10)$

$= 26 + 4 - 2$

$= 28$