The Fundamental Counting Principle

These notes are intended as a summary of section 8.1 (p. 686 – 689) in your workbook. You should also read the section for more complete explanations and additional examples.

Example (not in workbook)
A hardware store has two styles of kitchen cabinets and three finishes that the cabinets come in. How many different finished kitchen cabinets are possible?

Example 1 (sidebar p. 687)
A fan has 3 settings: off, low, high. How many ways are there to set 3 fans?

These two examples illustrate the fundamental counting principle.

Fundamental Counting Principle

Suppose that an event A can occur in m ways and, after it has occurred, event B can occur in n ways. Then the number of ways that both A and B can occur is $m \times n$ ways.

So, for the first example (kitchen cabinets):

And for the second example (fan):

Note: This can be extended to include any number of consecutive events.

Example 2 (sidebar p. 688)
For an online banking account, the minimum security standards require a password to have 2 letters followed by 5 digits. All letters and digits may be used more than once. How many passwords are possible?

Example (not in workbook)

1. How many different 3-digit numbers can be made using the digits 1, 2, 3, 4, 5, 6, 7, without repetition.

2. How many of these are even?

3. How many are odd?

4. How many are greater than 300?

Example (not in workbook)
In how many different orders can someone play 4 CDs?

The expression $4\times3\times2\times1$ can be expressed as $4!$ (read as 4 factorial). This is known as **factorial notation**.

Factorial Notation

In general, *n* factorial is

$$n!=n(n-1)(n-2)...(3)(2)(1)$$

Note:

1. Factorials are not defined for negative numbers.
2. $0!=1$
3. Factorial notation can be evaluated on your graphing calculator by pressing MATH then PRB then 4.

Example (not in workbook)
Evaluate:

a) $\frac{7!}{5!}$

b) $\dfrac{10!}{4!6!}$

c) $\dfrac{(n+2)!}{n!}$

Homework: #1, 3 – 12, 16 in the section 8.1 exercises (p. 689 – 693). Answers on p. 694.
#3 in the section 8.2 exercises (p. 701 – 705). Answers on p. 706.