## 12-1 The Counting Principle

**Outcome:**

**Sample Space:** Set of all possible Outcomes

**Independent Events:** each letter or digit or object chosen does not affect the choices for the others

Ex) Coin → heads, → tails

**Example 1:** A menu has: **Bread**: white, wheat, rye
**Spread**: butter, mustard, mayo

How many different combinations?

| | | |
|---|---|---|
| white/butter | wheat/butter | rye/butter |
| white/mus | wheat/mus | rye/mus |
| white/may | wheat/mayo | rye/may |

9 combinations

**Fundamental Counting Principle:**

n ways • m ways

**Example 1 Revisited:**

$$\underset{\text{breads}}{3} \cdot \underset{\text{spreads}}{3} = \boxed{9 \text{ ways}}$$

**Example 2:** Kim won a contest. The prize was a restaurant gift card and tickets to a game. There were 3 restaurant choices and tickets for either a football, baseball, basketball or hockey game. How many different ways to select a restaurant and then a game?

$$\underset{\text{restaurants}}{3} \cdot \underset{\text{games}}{4} = \boxed{12 \text{ ways}}$$

**Example 3:** Many answering machines have codes to get your messages. How many codes possible for a 3-digit code? 4-digit code?

3digit * 0–9 10 #s

$\overline{10} \cdot \overline{10} \cdot \overline{10} = 1000$ ways

4 digit

$\overline{10} \cdot \overline{10} \cdot \overline{10} \cdot \overline{10} = \boxed{10{,}000 \text{ ways}}$

**Dependent Events:** The outcome of one event does affect the outcome of another.

**Example 4:** Mary wants to take 6 different classes next year. Assuming that each class is offered each period, how many schedules could she have?

Hours: 1st hr 2nd 3rd 4th 5th 6th

Choices: $6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = \_\_\_$

$\boxed{\text{OR}}$

$6!$