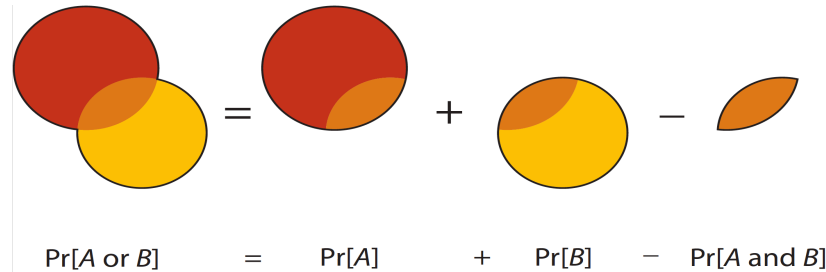# Two other probability fundamentals are:

- Addition: P[A or B]=P[A]+P[B]-P[A AND B]

$$P[A \bigcup B] = P[A] = P[B] - P[A \bigcap B]$$



Pr[*A or B*]　　=　　Pr[*A*]　　+　　Pr[*B*]　　−　　Pr[*A and B*]

- Multiplication:

  P[A AND B] = P[A|B]*P[B] =P[B|A]*P[A] → P[A]P[B]

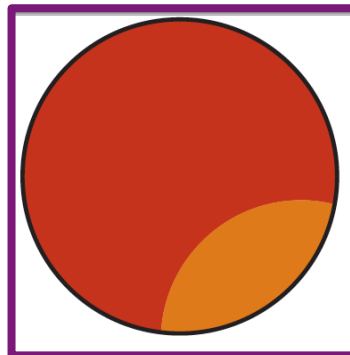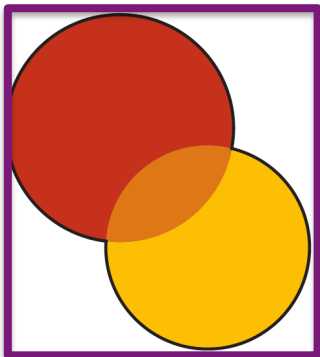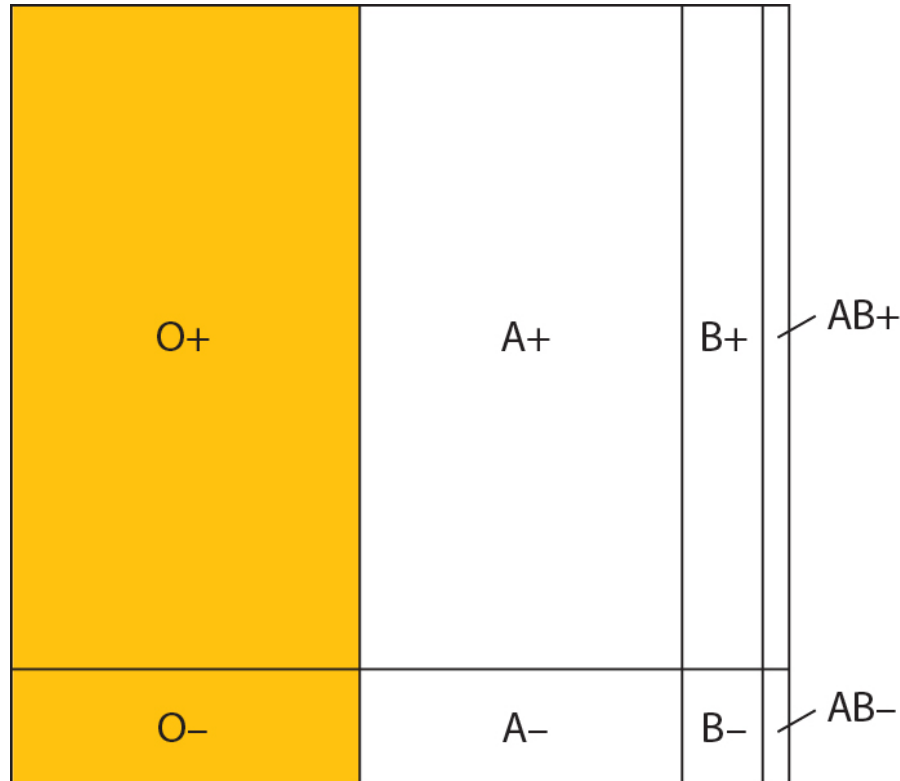$$P[A \bigcap B] = P[A \mid B]P[B] = P[B \mid A]P[A] \xrightarrow{\textit{IFFindependent}} P[A]P[B]$$

## Table 5.5-1: Additional rule (mutually exclusive)

| Blood Type | Probability |
|------------|-------------|
| O+ | 0.374 |
| O- | 0.066 |
| A+ | 0.357 |
| A- | 0.063 |
| B+ | 0.085 |
| B- | 0.015 |
| AB+ | 0.034 |
| AB- | 0.006 |

# Manipulating Probabilities

## Sometimes easier to visualize using Venn:

| Blood Type | Probability |
|---|---|
| O+ | 0.374 |
| O- | 0.066 |
| A+ | 0.357 |
| A- | 0.063 |
| B+ | 0.085 |
| B- | 0.015 |
| AB+ | 0.034 |
| AB- | 0.006 |



Pr[O- **or** O+] =

# 2. Multiplication

- Independence

> *Two events are independent if the occurrence of one gives no information about whether or not the second will occur*

- Dependence

> *The probability or outcome of one event changes because of the outcome of a second event*