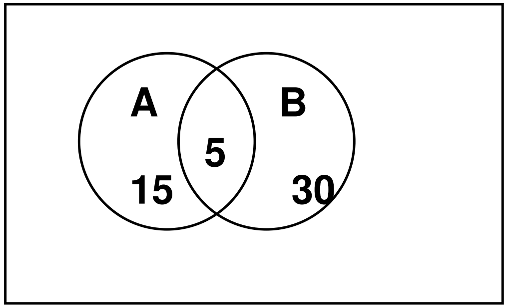
Conditional Probability



$$
\begin{aligned}
P(A) &= \frac{N(A)}{N(A \cup B)} = 20/50 = 0.40 \\
P(B) &= \frac{N(B)}{N(A \cup B)} = 35/50 = 0.70 \\
P(A \cap B) &= 5/50 = 0.10 \\
P(A \cup B) &= 50/50 = 1.00
\end{aligned}
$$

Conditional Probability Continued

$$P(A|B) = \frac{N(A \cap B)}{N(B)} = 5/35 = 0.14 = \frac{P(A \cap B)}{P(B)} = \frac{0.10}{0.70}$$

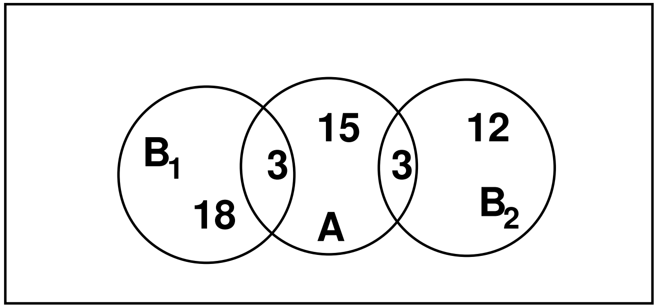
$$P(B|A) = \frac{N(A \cap B)}{N(A)} = 5/20 = 0.25 = \frac{P(A \cap B)}{P(A)} = \frac{0.10}{0.40}$$

$P(A, B) = P(A \cap B)$ is the joint probability of the occurrence of $A = A_i$ and $B = B_j$, so:

$$P(A|B) = \frac{P(A, B)}{P(B)}$$

$$P(B|A) = \frac{P(A, B)}{P(A)}$$

Mutually Exclusive Events



$$P(A|B) \quad = \quad \frac{N(A \cap B_1) \ + \ N(A \cap B_2)}{N(B)} = \frac{P(A, B_1) + P(A, B_2)}{P(B)}$$

Since, $P(A, B) \ = \ \frac{P(A|B)}{P(B)} \ = \ \frac{P(B,A)}{P(A)}$,

$$\begin{aligned} P(A|B) \quad &= \quad \frac{P(B|A)P(A)}{P(B)} \\ &= \quad \frac{6/21 \cdot 15/50}{30/50} \ = \ 0.14 \ (as\ before) \end{aligned}$$