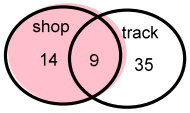
Notes 10.6 Dependent Events and Conditional Probability

**Conditional Probability**

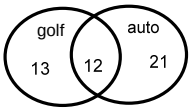
The conditional probability of event B, given event A, denoted by P(B|A), is given by:

Probability of B given A.

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)} \quad \text{where } P(A) \neq 0$$




$14+9+35$
$23+35$
$= 58$




Example 1: Find the probability that a randomly selected student:

a) runs track given that the student is in shop. P(T|S) $= \frac{P(T \text{ and } S)}{P(S)} = \frac{\frac{9}{58}}{\frac{23}{58}}$

$\frac{9}{23}$

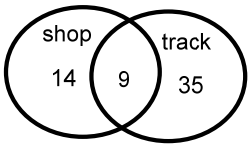
$= \frac{9}{58} \div \frac{23}{58}$

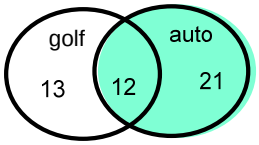
$= \frac{9}{58} \cdot \frac{58}{23}$

$= \boxed{\frac{9}{23}}$

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)} \quad \text{where } P(A) \neq 0$$

$13+12+21$
$= 46$




b) is in auto given that the student golfs. P(A|G) $= \frac{P(A \text{ and } G)}{P(G)} = \frac{\frac{12}{46}}{\frac{25}{46}} \left(\cdot \frac{46}{46}\right) = \boxed{\frac{12}{25}}$

c) P(S|T) $= \frac{9}{44}$

d) P(G|A) $= \frac{12}{33}$

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)} \quad \text{where } P(A) \neq 0$$

Example 2:

a) Given $P(B|A)=\frac{2}{7}$ and $p(A \text{ and } B)=\frac{1}{4}$, find P(A)

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

$\frac{2}{7}=\frac{\frac{1}{4}}{x}$

$\frac{7}{2}\cdot\frac{2}{7}x=\frac{1}{4}\cdot\frac{7}{2}$

$x=\frac{7}{8}$

$P(A)=\frac{7}{8}$

b) Given $P(A \text{ and } B)=\frac{2}{5}$ and $P(A)=\frac{1}{2}$ find P(B|A)

$P(B|A)=\frac{\frac{2}{5}}{\frac{1}{2}}\cdot\frac{10}{10}=\frac{4}{5}$

$4+7+3+2=16$

Example 3:

A bag contains 4 red, 7 blue, 3 purple and 2 white marbles. On two consecutive draws, find the probability of:

a) drawing a red, then a blue with replacement $\frac{4}{16}\cdot\frac{7}{16}=\frac{1}{4}\cdot\frac{7}{16}=\frac{7}{64}$

b) drawing a red, then a blue without replacement $\frac{4}{16}\cdot\frac{7}{15}=\frac{1}{4}\cdot\frac{7}{15}=\frac{7}{60}$

c) drawing 2 purples without replacement $\frac{3}{16_8}\cdot\frac{2}{15_5}=\frac{1}{40}$

d) drawing a blue, then a white with replacement $\frac{7}{16}\cdot\frac{2}{16}=\frac{7}{128}$

e) drawing a blue, then purple without replacement $\frac{7}{16}\cdot\frac{3}{15}=\frac{7}{80}$