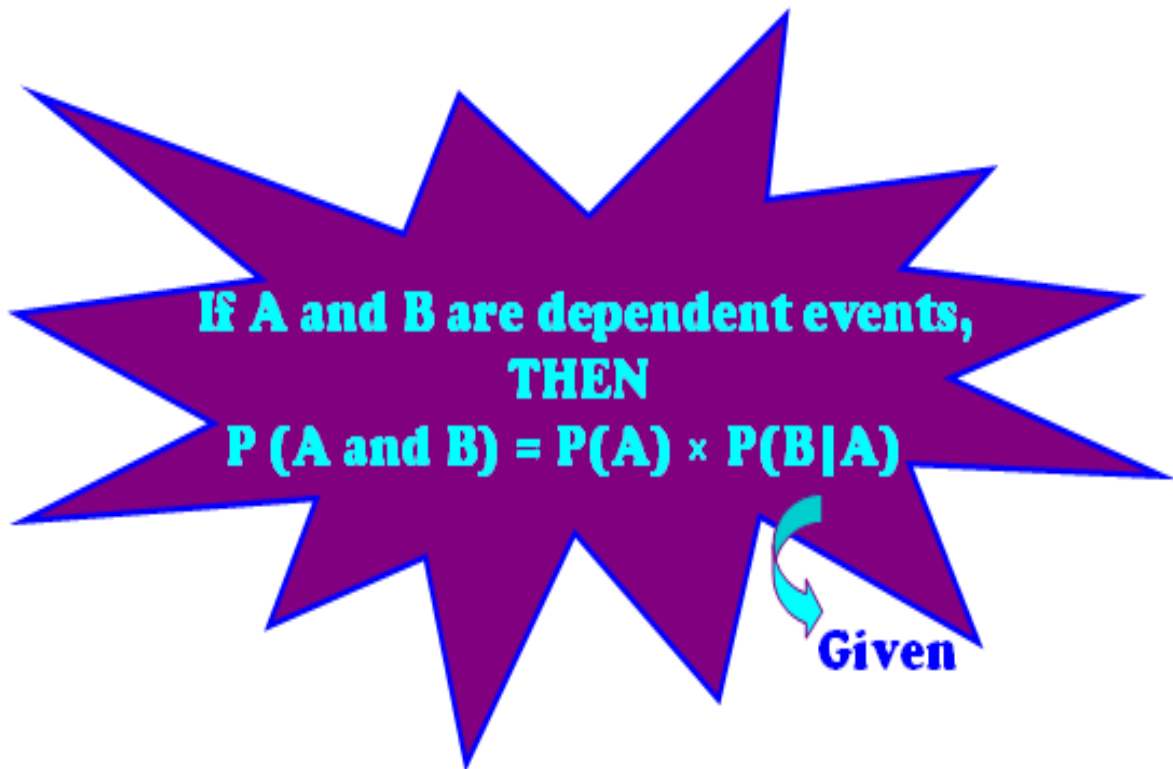


# Dependent Events

It is important to understand the difference between events that are **dependent** and those which are **independent**.

If the probability of the second event is affected by the outcome of the first event, then the two events are **dependent**.

**For example:** When drawing an object from a container, you can find the probability of drawing a particular object. If you do not replace the first object before drawing the second, then the second event is **dependent** on the first.



**Problem A:** 4 counters in total

**Three red and one white counter are placed in a bag. What is the probability of drawing two red counters, when the first one is not replaced before drawing the second?**

**Solution:**

Given that you picked a red one already how many red are left

$$\begin{aligned} P(\text{Red and Red}) &= P(\text{Red}) \times P(\text{Red}|\text{Red}) \\ &= \frac{3}{4} \times \frac{2}{3} \\ &= \frac{6}{12} \text{ Reduce} \\ &= \frac{1}{2} \end{aligned}$$

**Problem B:**

4 counters in total  
3 red  
1 white

**What is the probability of drawing a red followed by a white, if the first one is not replaced before drawing the second?**

**Solution:**

↙ given that you already pick out Red How many white left?

$$\begin{aligned}
P(\text{Red and White}) &= P(\text{Red}) \times P(\text{White}|\text{Red}) \\
&= \frac{3}{4} \times \frac{1}{3} \\
&= \frac{3}{12} \text{ always Reduce} \\
&= \frac{1}{4}
\end{aligned}$$

Without Replacement

$$\begin{aligned}
P(\text{Ace and Queen}) &= P(\text{Ace}) \times P(\text{Queen}|\text{Ace}) \\
&= \frac{4}{52} \times \frac{4}{51} \\
&= \frac{16}{2052} = \frac{4}{513}
\end{aligned}$$

$$\begin{aligned}
\text{B)} \quad P(\text{Ace and Ace}) &= P(\text{Ace}) \times P(\text{Ace}|\text{Ace}) \\
&= \frac{4}{52} \times \frac{3}{51} \\
&= \frac{12}{2652} = \frac{3}{513}
\end{aligned}$$

## Exercise 3.13 (Without Replacement)

# 1 ab

2) abc

3) abc

# 6 a b c d

# 7 abc