Objective: In this lesson, you will apply the general multiplication rule in a uniform probability model and interpret the answer in terms of the model.

Read the knowledge article and answer the following:

Independent Events and the Multiplication Rule

How do we find the combined probability of independent events? ______________________________________

The multiplication rule may be written mathematically as ____________________________________________

An independent event is an event whose occurrence has ____________________________________________

Stated mathematically, events $A$ and $B$ are independent if any one of the following is true:

$P(A|B) = ______$

$P(B|A) = ______$

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

Example
If you flip two coins, how many possible outcomes are there? __________

Is heads-tails the same outcome as tails-head? __________

If you flip a coin three times (three independent events), how many possible outcomes? _______

The chance of getting three heads in a row is $\frac{1}{8}$. 

<table>
<thead>
<tr>
<th>First Coin</th>
<th>Second Coin</th>
<th>Third Coin</th>
<th>End Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>heads</td>
<td>heads</td>
<td>heads</td>
<td>HHH</td>
</tr>
<tr>
<td></td>
<td>tails</td>
<td>tails</td>
<td>HHT</td>
</tr>
<tr>
<td>tails</td>
<td>heads</td>
<td>heads</td>
<td>HTH</td>
</tr>
<tr>
<td></td>
<td>tails</td>
<td>tails</td>
<td>HTT</td>
</tr>
<tr>
<td>heads</td>
<td>heads</td>
<td>THH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tails</td>
<td>THT</td>
<td></td>
</tr>
<tr>
<td>tails</td>
<td>heads</td>
<td>TTH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>tails</td>
<td>TTT</td>
<td></td>
</tr>
</tbody>
</table>
Dependent Events (Conditional Probability)

A dependent event is __________________________________________________________________________

The conditional probability of $A$ given $B$ is written ________________________________

$P(A|B)$ is the probability that event $A$ will occur given that the event $B$ has already occurred.

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

Drawing cards:

The probability that the second card is an ace given that the first card is an ace is an example of a conditional probability, $P(ace \, on \, second \, draw \, | \, ace \, on \, first \, draw)$.

The symbol $|$ is read as "________________".

The probability of drawing two aces from a deck as stated is__________________________.

Example

Match the scenarios to the type of event they fall under. Drag the items on the left to the correct location on the right.

- independent events
- dependent events

- the probability of getting heads on one coin and getting heads on another coin
- the probability of selecting a red apple and the probability of selecting a green apple when drawing two apples from a basket with replacement
- the probability of selecting a T-shirt from a closet and the probability of selecting another T-shirt from the same closet without replacement
Example

A red die and a black die are rolled at the same time. The probability of getting a 6 on the red die is $\frac{1}{6}$, and the probability of getting a 3 on the black die is $\frac{1}{6}$. Given that the two events are independent, what is their combined probability?

- The combined probability is $\frac{1}{36}$.
- The combined probability is $\frac{1}{12}$.
- The combined probability is $\frac{1}{18}$.
- The combined probability is $\frac{1}{24}$.

Example

From a team of five students, you choose two students at random without replacement. Calculate the probability that the first student selected is the team leader and the second is the assistant team leader.

- $\frac{1}{25}$
- $\frac{1}{16}$
- $\frac{1}{12}$
- $\frac{1}{20}$