9.3.1/9.3.2

Probability

Definitions

- **<u>Outcome</u>**: The result of a trial, like flipping a coin, selecting an object, spinning a wheel, or rolling a die
- **<u>Sample</u>** Space: All the possible outcomes
- **<u>Event</u>**: Any outcome (or group of outcomes)
- **<u>Probability</u>**: notated P(event), tells you how likely it is that the event

Definitions

- **Equally likely outcome**: Outcomes of an experiment that have the same probability of occurring.

Are the events equally likely?

- Tossing a coin
- Choosing a candy from a bag of Skittles
- Drawing a queen from a standard 52-card deck
- Rolling two dice and taking the sum
- Guessing all 6 numbers in a state lottery

Theoretical

- The probability (percentage or fraction) that an outcome SHOULD occur
- All outcomes are equally likely to occur
- $P(event) = \frac{\#\ of\ favorable\ outcomes}{\#\ in\ the\ sample\ space}$

Experimental

- The probability (percentage or fraction) that represents the outcome of an experiment
- $P(event) = \frac{\#\ of\ times\ outcome\ occured}{total\ \#\ of\ trials\ in\ experiment}$

Probability Distribution

- A T-chart that organizes the outcome and its corresponding probability

Outcome *(x)*	Probability *P(x)*	Outcome *(x)*	Probability *P(x)*
2		8	
3		9	
4		10	
5		11	
6		12	
7			

Probability Function P(x)

- A function P that assigns a real number to each outcome in the sample space S subject to the following conditions:

1. $0 \leq P(x) \leq 1$ for every outcome *x*

2. The sum of the probabilities must equal 1

3. $P\{\ \} = 0$

- **<u>Complement of an event</u>**: all outcomes in the sample space that are not in the event.
- For example, if the event is rolling a number less than 3 on a die, the complement of the event is rolling the numbers 3 – 6.
- $P(event) + P(complement) = 1$
- $P(complement) = 1 - P(event)$

- To find the probability of two events occurring together, you have to decide whether one event occurring affects the other event.
- When the occurrence of one event affects how a second event can occur, then the events are **dependent**. If not, the events are **independent**.

Are these events dependent or independent?

- Roll a die then spin a spinner.
- Pick one card then a second (without replacing the first card)
- You pick a coin from a jar. You replace it and select again.

Compound Events

- If A & B are independent events, then the probability that they will happen together is $P(A \; and \; B) = P(A) \cdot P(B)$
- If two events cannot happen at the same time, they are called **mutually exclusive**. The probability they will happen together is 0. $P(A \; and \; B) = 0$
- When events have at least one outcome in common, they are called **overlapping events**

- Peanut M&Ms come in blue, brown, red, yellow, green, and orange.
  - Find the proportion of the color blend and use it to complete the chart.

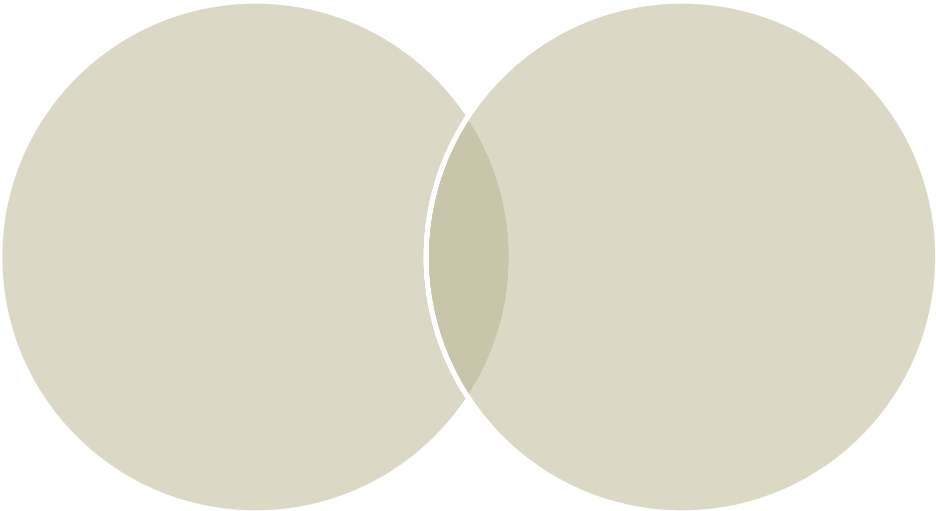
Color	Blue	Brown	Red	Yellow	Green	Orange
Prop.						

  - Using this information, what is the probability that two candies chosen from the bag are both yellow?
  - What is the probability that one is orange and the other is blue?
  - What is the probability that neither candy chosen is red?

“OR” Probabilities

- Probability of mutually exclusive events:

$$P(A\ or\ B) = P(A) + P(B)$$



"OR" Probabilities

Probability of Overlapping Events:

$$P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$$