KEY TERMS

- **Probability:** a mathematical tool used to study randomness that deals with the chance (the likelihood) of an event occurring
- <u>"AND":</u> the term that creates a new event out of two events, A and B, where the new event consists of only those outcomes that are in both events, event A and event B
 P(A and B)
- <u>"OR":</u> the term that creates a new event out of events A and B where the new event consists all outcomes that are only in event A, that are only in event B, or that are in both
 P(A or B)
- <u>Conditional probability ("given that"):</u> the probability that event A will occur given that event B has already occurred
 - \circ P(A|B) = P(A & B)/P(B)
- Independent events: when one event does not affect the chance the other occurs
 P(A|B) = P(A)

Illowsky, B., & Dean, S. (2018). Introductory statistics. Gould, R., & Ryan, C. N. (2015). Introductory statistics: Exploring the world through data. Pearson.

The below table contains a sample of 100 randomly selected salinity & electrical conductivity data points from the Mokauea loko i'a data collected on June 1, 2020.

	Electrical Conductivity				
		Group A	Group B	Group C	Total
Salinity	Group 1	2	0	0	
	Group 2	22	0	0	
	Group 3	0	51	25	
	Total				

Due to the range in values for salinity & electrical conductivity, the table is organized by groups for each parameter. The groups represent the following values:

Salinity

- Group 1: 20 to 20.999 PSU
- Group 2: 21 to 21.999 PSU
- Group 3: 22+ PSU

Electrical Conductivity

- Group A: 34 to 35.999 mS/cm
- Group B: 36 to 37.999 mS/cm
- **Group C:** 38+ mS/cm

EXERCISE 1: "AND"

If a data point is chosen randomly from this June 1, 2020 sample, what is the probability that the data point has a salinity between 20 to 20.999 PSU and an electrical conductivity between 34 to 35.999 mS/cm? Report your answer as a percentage.

If a data point is chosen randomly from this June 1, 2020 sample, what is the probability that the data point has a salinity in Group 3 and an electrical conductivity in Group C? Report your answer as a percentage.

EXERCISE 2: "OR"

If a data point is chosen randomly from this June 1, 2020 sample, what is the probability that the data point has a salinity of 21 to 21.999 PSU or 22+ PSU? Report your answer as a percentage.

If a data point is chosen randomly from this June 1, 2020 sample, what is the probability that the data point has a salinity in Group 3 or Group C? Report your answer as a percentage.

EXERCISE 3: Conditional Probability ("Given That")

What is the probability of a data point having a salinity of 22+ PSU given that it has an electrical conductivity of 38+ mS/cm? Report your answer as a percentage.

What is the probability of a data point having an electrical conductivity in Group A given that it has a salinity in Group 2? Report your answer as a percentage.

EXERCISE 4: Independent Events

Determine whether a data point being in Group 3 is independent of being in Group C.

Determine whether a data point being in Group 2 is independent of being in Group A.