Review Session

Things need to know:

- Observational Studies & Experimental Studies
- Explanatory Variable & Response Variable
- Treatment
Review Session

Things need to know:

Sampling

Simple Random Sampling
Cluster Random Sampling
Stratified Random Sampling
Margin of Error

approximate margin of error = \( \frac{1}{\sqrt{n}} \times 100\% \)
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Things need to know:

Bias: sampling bias, nonresponse bias & response bias
sampling bias – convenience sample & volunteer sample
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Things need to know:

**Sample Space**
The probability of each individual outcome is between 0 and 1. The total of all the individual probabilities equals 1.

**Event**
The probability of an event A, denoted by P(A), is obtained by adding the probabilities of the individual outcomes in the event.

When all the possible outcomes are equally likely,

\[ P(A) = \frac{\text{number of outcomes in event } A}{\text{number of outcomes in the sample space}} \]
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Things need to know:

Complement of an Event - - - \( A^c \)

\[
P(A^c) = 1 - P(A)
\]
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Things need to know:

**Intersection** of Two Events - - - $A \cap B$

\[ P(A \cap B) = P(A \mid B) \times P(B) \]

If $A$ and $B$ are *independent*, then

\[ P(A \cap B) = P(A) \times P(B). \]
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Things need to know:

**Union** of Two Event - - - $A \cup B$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B).$$

If $A$ and $B$ are **disjoint**, then

$$P(A \cup B) = P(A) + P(B).$$
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Things need to know:

Conditional Probability

\[ P(A \mid B) = \frac{P(A \cap B)}{P(B)} \]
**Independent Events**

Events $A$ and $B$ are independent if

- $P(A \mid B) = P(A)$; or
- $P(B \mid A) = P(B)$; or
- $P(A \cap B) = P(A) \times P(B)$. 

Random Variable (discrete & continuous)
Probability Distribution
The probability distribution of a discrete random variable assigns a probability \( P(x) \) to each possible value \( x \).

The **mean** for a discrete random variable is

\[
\mu = \sum xP(x)
\]

The **standard deviation** for a discrete random variable is

\[
\sigma = \sqrt{\sum (x - \mu)^2 P(x)}
\]
The probability distribution of a continuous random variable assigns probabilities to each possible interval. Graphically, the probability for the random variable falling in certain interval is the area underneath the (density) curve for the corresponding interval.
Normal Distribution

z-Score Table (cumulative probabilities for standard normal distribution)

z-score

\[ z = \frac{x - \mu}{\sigma}, \]
Binomial Distribution

Probability Distribution of A Binomial Random Variable

\[ P(x) = \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}, \quad x = 0, 1, 2, \ldots, n \]

The mean is

\[ \mu = np \]

The standard deviation is

\[ \sigma = \sqrt{np(1-p)} \]