MA206, Lesson 9 - Size of Effect

Review: How do you calculate the standardized statistic for one proportion?
$z =$

Review: What is the R code for a two-tailed test with the z-statistic?

Define **Significance Level**

Define **Confidence Interval**

How do we interpret a (95%) confidence interval?

How do we calculate a confidence interval for one proportion theoretically?

What is the R code to find the multiplier for any significance level α?

What is the **Margin of Error?**

1) Students at Hope College were tested to see if they could determine the difference between tap water and bottled water. Of the 63 students tested, 42 correctly identified which water was which. A plausible value simulation was conducted with results represented in the table below.

a) What is the 95% confidence interval based on the results? Include an interpretation of your findings.

Null Hypothesis	0.52	0.53	0.54	0.55	0.56	0.57	0.68
p-value	0.0250	0.0330	0.0530	0.0850	0.0980	0.150	0.1840
Reject or Don't Reject							

Null Hypothesis	0.72	0.73	0.74	0.75	0.76	0.77	0.78
p-value	0.3130	0.2680	0.1920	0.1510	0.0930	0.0770	0.0490
Reject or Don't Reject							

b) What is the 90% Confidence Interval?

2) Most people are right handed, and even the right eye is dominant for most people. Developmental biologists have suggested that late-stage human embryos tend to turn their heads to the right. In a study reported in Nature (2003), German bio-psychologist Onur Güntürkün conjectured that this tendency to turn to the right manifests itself in other ways as well, so he studied kissing couples to see which side they leaned their heads to while kissing. He and his researchers observed kissing couples in public places such as airports, train stations, beaches, and parks in Germany. They were careful not to include couples who were holding objects such as luggage that might have affected which direction they turned. For each kissing couple observed, the researchers noted whether the couple leaned their heads to the right or to the left. They observed 124 couples, ages 13 to 70 years.

a) Identify the observational units in this study.

b) Identify the variable recorded in this study. Classify it as categorical or quantitative.

c) Suppose we want to know the true long-run proportion of couples that kiss right in Germany. Would this be a statistic or a parameter? What symbol is used to represent this proportion of the population?

d) Do we know the exact value of the long run proportion of couples kissing right based on the data? Explain.

e) State the appropriate null and alternative hypotheses, both in words and in terms of the parameter π, for testing the conjecture that kissing couples tend to lean their heads to the right more often.

Güntürkün's findings are compiled in the "Kissing.csv" dataset available on Teams. Load the data into R to analyze it, using the TidyVerse Tutorial and Course Guide to help with coding as needed.

f) Calculate the sample proportion of the observed couples who leaned their heads to the right while kissing. Also indicate the symbol used to denote this value.

g) Do we meet the validity conditions to conduct a theoretical test? Justify your answer.

h) If we wanted to do strength of evidence testing using theoretical methods, which test would we use?

i) Using the applet to simulate, assess the strength of evidence that the sample data provide for Güntürkün's conjecture that kissing couples tend to lean their heads to the right more often than they would by random chance. Report the approximate p-value and summarize your conclusion about this strength of evidence.

j) Now use theoretical methods to test whether the data provide evidence that the probability that a couple leans their heads to the right while kissing (π) is different from 0.60 ($H_a \neq$. (Note that this question changes both the null hypothesis and the alternate hypothesis) Report the standardized statistic, p-value, and comment on the strength of evidence.

k) Using theoretical methods, calculate the 95% confidence interval. Interpret your results.

l) Does your confidence interval include 0.50? Does it include 0.60? Explain how your answers relate to the strength of evidence tests conducted in 9 and 10 above.

m) Now suppose we were to use a significance level of 0.01 instead of 0.05. How would you expect the interval of plausible values to change: wider, narrower, or no change? Explain your reasoning.

n) Calculate the corresponding 99% confidence interval. Did it behave as expected?

o) Based on your 99% confidence interval, what can be said about the p-value for testing a null hypothesis of 0.78?

p) Can your results be generalized? Explain your reasoning.

3) In order to determine who would accept a Facebook friend request from someone they didn't know, a student researcher made up a phony Facebook profile that represented a female student at her college. She then sent out 118 friend requests and 61 of these accepted the request.

a) Do we meet validity conditions to use theoretical methods?

b) Find a 90% confidence interval for the proportion of all students that would accept a Facebook request from a female at their college that they did not know.

4) In order to determine who would accept a Facebook friend request from someone they didn't know, a student researcher made up a phony Facebook profile that represented a male student at her college. She then sent out 101 friend requests and 18 of these accepted the request.

a) Do we meet validity conditions to use theoretical methods?

b) Find a 99% confidence interval for the proportion of all students that would accept a Facebook request from a male at their college that they did not know.