

- ① A random sample of 200 New York State voters included 88 Republicans, while a random sample of 300 California voters produced 141 Republicans.
Write a 95% confidence interval for the true difference in the proportion of Republicans in NY state and California.

$(-0.119, 0.059)$

With 95% confidence the true prop. difference in Rep in NY + Cali will be between

USCT

- ② Who talks more—men or women? Researchers equipped random samples of 56 male and 56 female students from a large university with a small device that secretly records sound for a random 30 seconds during each 12.5-minute period over 2 days. Then they counted the number of words spoken by each subject during each recording period and, from this, estimated how many words per day each subject speaks. The female estimates had a mean of 16,177 words per day with a standard deviation of 7520 words per day. For the male estimates, the mean was 16,569 and the standard deviation was 9108.

Construct and interpret a 95% confidence interval for the difference between the true means.

$\bar{X}_F = 16,177 \quad S_F = 7520$

$\bar{X}_M = 16,569 \quad S_M = 9108$

Calc $(-3521, 2737)$

Formula $(-3555, 2771)$

w/ 95% confidence the interval from -3555 and 2771 will contain the true mean diff of female words spoken per day and male spoken per day.

- ③ Does music help or hinder memory? Many students at Matt's school claim they can think more clearly while listening to their favorite kind of music. Matt believes that music interferes with thinking clearly. To find out which is true, Matt recruits 84 volunteers and randomly assigns them to two groups. The "Music" group listens to their favorite music while playing a "match the animals" memory game. The "No Music" group plays the same game in silence. Here are some descriptive statistics for the number of turns it took the subjects in each group to complete the game (fewer turns indicate a better performance):

Group	Sample size	Mean	SD
Music	$n_1 = 42$	$\bar{x}_1 = 15.833$	$s_1 = 3.944$
No music	$n_2 = 42$	$\bar{x}_2 = 13.714$	$s_2 = 3.550$

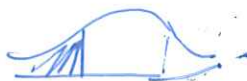
Matt wants to know if listening to music affects the average number of turns required to finish the memory game for students like these.

- (a) State appropriate hypotheses for performing a significance test. Be sure to define the parameters of interest.
(b) Check if the conditions for performing the test are met.
(c) Complete the hypothesis test

$H_0: \mu_M = \mu_N$

$H_a: \mu_M < \mu_N$

$t = 2.58$
 $p = 1 - 0.9942$
 $= 0.0058$



The parameter of interest is the mean diff in turns it took to complete memory game

Conditions - SRS
independent
normal - sample
st. dev. use T

with a p-value as low as .0058, we can reject H_0 and support the claim that the mean # turns will be less w/ music than w/o music

$-392 \pm 2.004 \left(\sqrt{\frac{7520^2}{56} + \frac{9108^2}{56}} \right)$

$-392 \pm 363.01 (-3555.01, 2771)$

4

Preventing peanut allergies A recent study of peanut allergies—the LEAP trial—explored the relationship between early exposure to peanuts and the subsequent development of an allergy to peanuts. Infants (4 to 11 months old) who had shown evidence of other kinds of allergies were randomly assigned to one of two groups. Group 1 consumed a baby-food form of peanut butter. Group 2 avoided peanut butter. At 5 years old, 10 of 307 children in the peanut-consumption group were allergic to peanuts, and 55 of 321 children in the peanut-avoidance group were allergic to peanuts.¹⁴

- (a) Does this study provide convincing evidence of a difference at the $\alpha = 0.05$ significance level in the development of peanut allergies in infants like the ones in this study who consume or avoid peanut butter?
- (b) Based on your conclusion in part (a), which mistake—a Type I error or a Type II error—could you have made? Explain your answer.
- (c) Should you generalize the result in part (a) to all infants? Why or why not?

$G_1 - w/PB \quad 10/307 = .033$
 $G_2 - w/o PB \quad 55/321 \rightarrow \text{allergy}$
 $.17$

Parameter of interest is the diff. in proportion of children who acquire peanut allergies.

Conditions \rightarrow SRS - random assignment
independ - children dev allergy indep of others

num: $n\hat{p} \geq 10 \checkmark$
 $n\hat{q} \geq 10 \checkmark$

$H_0: p_1 = p_2$

$H_a: p_1 \neq p_2$

$P_1 =$ peanut exposed

$P_2 =$ peanut not exposed

$z = -5.71$

$p = 0 \Rightarrow$ Reject H_0

Since $P > \alpha$ and is less than $\alpha = .05$ we can reject the Null that the proportions would be equal and support the alternate hypothesis that the prop. of children who develop a peanut allergy is different.

B) Potential for Type I since we rejected the H_0

C) Can not generalize - volunteer sample