Problem 1. A researcher is interested in knowing what proportion of college students get enough sleep each night. She takes a random sample of 200 college students and determines that 122 of them get enough sleep. Create a 95% confidence interval for the proportion of all college students who get enough sleep.

a. Construct the 95% confidence interval.

\[ \hat{p} = \frac{122}{200} = 0.61 \]

\[ z^* = 1.960 \]

\[ n = 200 \]

\[ \hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 0.61 \pm 1.96 \sqrt{\frac{0.61(1-0.61)}{200}} \]

\[ = 0.61 \pm 1.960 \sqrt{0.0163} \]

\[ = 0.61 \pm 0.0736 \]

b. We are 95% confident that the true proportion of all college students who get enough sleep is between 0.5364 and 0.6836.

b. Interpret your confidence interval from part a.

b. We are 95% confident that the true proportion of all college students who get enough sleep is between 0.5424 and 0.6776.

c. Based on the sample above, what sample size would be required so that the margin of error of a 95% confidence interval would be at most 0.04.

\[ n = \frac{z^*^2 \hat{p}(1-\hat{p})}{E^2} \]

\[ = \frac{1.96^2 \times 0.61 \times 0.39}{0.04^2} \]

\[ = \frac{3.8416 \times 0.2379}{0.0016} \]

\[ = 1021.73 \]

\[ n = 1022 \]

d. Assuming we hadn’t taken the sample listed above, what sample size would be required so that the margin of error of a 95% confidence interval would be at most 0.04.

\[ n = \frac{z^*^2 \hat{p}(1-\hat{p})}{E^2} \]

\[ = \frac{1.96^2 \times 0.5 \times 0.5}{0.04^2} \]

\[ = \frac{3.8416 \times 0.25}{0.0016} \]

\[ = 589.25 \]

\[ n = 590 \]
**Problem 1.** A researcher is interested in knowing what proportion of college students get enough sleep each night. She takes a random sample of 200 college students and determines that 122 of them get enough sleep. Create a 95% confidence interval for the proportion of all college students who get enough sleep.

a. Construct the 95% confidence interval.

b. Interpret your confidence interval from part a.

c. Based on the sample above, what sample size would be required so that the margin of error of a 95% confidence interval would be at most 0.04.

d. Assuming we hadn’t taken the sample listed above, what sample size would be required so that the margin of error of a 95% confidence interval would be at most 0.04.

\[
n = \frac{(z^*)^2 \cdot p(1-p)}{m^2}
\]

\[
z^* = 1.960, \quad p = 0.61, \quad m = 0.04
\]

\[
n \approx \frac{(1.960)^2 \cdot (0.61)(0.39)}{(0.04)^2}
\]

\[
n \approx 571.1979
\]

\[
\sqrt{n} = 572
\]
**Problem 1.** A researcher is interested in knowing what proportion of college students get enough sleep each night. She takes a random sample of 200 college students and determines that 122 of them get enough sleep. **Create a 95% confidence interval for the proportion of all college students who get enough sleep.**

a. Construct the 95% confidence interval.
b. Interpret your confidence interval from part a.
c. Based on the sample above, what sample size would be required so that the margin of error of a 95% confidence interval would be at most 0.04.
d. Assuming we hadn’t taken the sample listed above, what sample size would be required so that the margin of error of a 95% confidence interval would be at most 0.04.

\[
\begin{align*}
d. \quad n &\geq \frac{(z^*)^2 p (1-p)}{m^2} \\
&\geq \frac{(1.960)^2 (0.5)(0.5)}{(0.04)^2} \\
&\geq 600.25 \\
&n = 601
\end{align*}
\]

\[
z^* = 1.960 \\
p \rightarrow \text{use 0.50} \\
m = 0.04
\]
Problem 2. A researcher is interested in knowing what proportion of college students get enough sleep each night. She takes a random sample of 200 college students and determines that 122 of them get enough sleep. The researcher believes less than 65% of college students get enough sleep. Conduct a hypothesis test at the 0.05 significance level to test this.

a. What are the hypotheses?
   - $H_0: \hat{p} = 0.65$
   - $H_A: \hat{p} < 0.65$

b. What is the significance level?
   - $\alpha = 0.05$

c. What is the value of the test statistic?
   - $TS = \frac{\hat{p} - p_0}{\sqrt{p_0(1-p_0) / n}}$
   - $\hat{p} = \frac{122}{200} = 0.61$
   - $p_0 = 0.65$
   - $n = 200$
   - $TS = \frac{0.61 - 0.65}{\sqrt{0.65(1-0.65) / 200}}$
   - $TS = \frac{-0.04}{0.0337}$
   - $TS = -1.19$

d. What is the p-value?

f. What is the correct decision?

g. Does the hypothesis test agree with the confidence interval from question 1?
Problem 2. A researcher is interested in knowing what proportion of college students get enough sleep each night. She takes a random sample of 200 college students and determines that 122 of them get enough sleep. The researcher believes less than 65% of college students get enough sleep. Conduct a hypothesis test at the 0.05 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 1?

\[ d. \quad p-value = P(\hat{p} \leq 0.61 \mid p = 0.65) \]
\[ = P(z \leq -1.19) \]
\[ p-value = 0.1170 \]

\[ e. \quad 0.1170 > 0.05 \]
\[ p-value > \alpha \]

Fail to Reject \( H_0 \)
Problem 2. A researcher is interested in knowing what proportion of college students get enough sleep each night. She takes a random sample of 200 college students and determines that 122 of them get enough sleep. The researcher believes less than 65% of college students get enough sleep. Conduct a hypothesis test at the 0.05 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 1?

f. The data does not provide statistically significant evidence that the true proportion of all college students who get enough sleep is less than 0.65.

9. **Yes!** - Null value (0.65) is in the confidence interval - we failed to reject \( H_0 \)
Problem 3. A researcher is interested in knowing the average amount of time individuals in Cincinnati, Ohio spend commuting. She takes a random sample of 100 Cincinnati residents and asks them what their typical commute time is. She finds the average length of time for the residents in her sample is 32 minutes, with a standard deviation of 12 minutes. Create a 98% confidence interval for the average commute time of all Cincinnati residents.

a. Construct the 98% confidence interval.

\[
\bar{x} \pm t^* \left( \frac{s}{\sqrt{n}} \right)
\]

\[
\bar{x} = 32 \\
s = 12 \\
N = 100 \\
df = n-1 = 100-1 = 99 \\
t^* = 2.374
\]

\[
32 \pm (2.374) \left( \frac{12}{\sqrt{100}} \right) \\
32 \pm (2.374)(1.2) \\
32 \pm 2.8488 \\
32 - 2.8488 = 29.1512 \\
32 + 2.8488 = 34.8488
\]

98% CI: (29.1512, 34.8488)

b. We are 98% confident that the true avg. commute time for all residents of Cincinnati, Ohio is between 29.1512 minutes and 34.8488.
Problem 4. A researcher is interested in knowing the average amount of time individuals in Cincinnati, Ohio spend commuting. She takes a random sample of 100 Cincinnati residents and asks them what their typical commute time is. She finds the average length of time for the residents in her sample is 32 minutes, with a standard deviation of 12 minutes. The researcher believes the average commute time of all Cincinnati residents is greater than 30 minutes. Conduct a hypothesis test at the 0.02 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 3?

\[
\begin{align*}
H_0 & : \mu = 30 \\
H_a & : \mu > 30 \\
\text{Null value: } & M_0 = 30 \\
\text{Use: } & t = \frac{\bar{x} - M_0}{s/\sqrt{n}} \\
& \bar{x} = 32, M_0 = 30, S = 12, n = 100 \\
TS & = \frac{32 - 30}{12/\sqrt{100}} = \frac{2}{1.2} = 1.6667 \\
& \text{One tail, 99 degrees of freedom} \\
& 0.025 < p-value < 0.05
\end{align*}
\]
Problem 4. A researcher is interested in knowing the average amount of time individuals in Cincinnati, Ohio spend commuting. She takes a random sample of 100 Cincinnati residents and asks them what their typical commute time is. She finds the average length of time for the residents in her sample is 32 minutes, with a standard deviation of 12 minutes. The researcher believes the average commute time of all Cincinnati residents is greater than 30 minutes. Conduct a hypothesis test at the 0.02 significance level to test this.

a. What are the hypotheses?

b. What is the significance level?

c. What is the value of the test statistic?

d. What is the p-value?

e. What is the correct decision?

f. What is the appropriate conclusion/interpretation?

g. Does the hypothesis test agree with the confidence interval from question 3?

\[
\begin{align*}
\text{e. } & 0.025 < p\text{-value} < 0.05 \\
& p\text{-value} > 0.025 > 0.02 \\
& p\text{-value} > 0.02 \\
& p\text{-value} > \alpha \\
& \text{Fail to Reject } H_0
\end{align*}
\]

f. The data does not provide statistically significant evidence that the true avg. commute time for all Cincinnati residents is greater than 30 minutes.

g. Yes! Null value (30) is in the confidence interval.

- HT: Failed to Rej. \( H_0 \)
Problem 5. Suppose we believe tenured faculty members vote more than non-tenured faculty. We collect data from 200 tenured faculty and 200 non-tenured faculty using simple random sampling. Of the tenured faculty members surveyed, 167 voted in the 2012 Presidential election. Of the non-tenured faculty surveyed, 138 voted in the 2012 Presidential election. Consider the tenured faculty Group A and the non-tenured faculty Group B. Create a 90% confidence interval for the difference between the proportion of tenured faculty and non-tenured faculty who voted in the 2012 election.

a. Construct the 90% confidence interval.

b. Interpret your confidence interval from part a.

\[ \left( \hat{p}_A - \hat{p}_B \right) \pm (z^*) \sqrt{\frac{\hat{p}_A (1-\hat{p}_A)}{n_A} + \frac{\hat{p}_B (1-\hat{p}_B)}{n_B}} \]

\[ \left( 0.835 - 0.69 \right) \pm \left( 1.645 \right) \sqrt{\frac{0.835(1-0.835)}{200} + \frac{0.69(1-0.69)}{200}} \]

\[ 0.145 \pm 1.645 \times 0.0419 \]

\[ 0.145 \pm 0.0690 \]

\[ 0.076 \text{ to } 0.214 \]
Problem 5. Suppose we believe tenured faculty members vote more than non-tenured faculty. We collect data from 200 tenured faculty and 200 non-tenured faculty using simple random sampling. Of the tenured faculty members surveyed, 167 voted in the 2012 Presidential election. Of the non-tenured faculty surveyed, 138 voted in the 2012 Presidential election. Consider the tenured faculty Group A and the non-tenured faculty Group B. Create a 90% confidence interval for the difference between the proportion of tenured faculty and non-tenured faculty who voted in the 2012 election.

a. Construct the 90% confidence interval.
b. Interpret your confidence interval from part a.

b. We are 90% confident that the true difference between the proportion of all tenured faculty who vote and the proportion of all non-tenured faculty who vote is between 0.076 and 0.214.
Problem 6. Suppose we believe tenured faculty members vote more than non-tenured faculty. We collect data from 200 tenured faculty and 200 non-tenured faculty using simple random sampling. Of the tenured faculty members surveyed, 167 voted in the 2012 Presidential election. Of the non-tenured faculty surveyed, 138 voted in the 2012 Presidential election. Consider the tenured faculty Group A and the non-tenured faculty Group B. **Conduct a hypothesis test at the 0.10 significance level to test this.**

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 5?

\[
\hat{P}_{\text{pooled}} = \frac{S_A + S_B}{n_A + n_B}
\]

\[
= \frac{167 + 138}{200 + 200} = \frac{305}{400} = 0.7625
\]
Problem 6. Suppose we believe tenured faculty members vote more than non-tenured faculty. We collect data from 200 tenured faculty and 200 non-tenured faculty using simple random sampling. Of the tenured faculty members surveyed, 167 voted in the 2012 Presidential election. Of the non-tenured faculty surveyed, 138 voted in the 2012 Presidential election. Consider the tenured faculty Group A and the non-tenured faculty Group B. Conduct a hypothesis test at the 0.10 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 5?

\[
TS: \frac{\hat{p}_A - \hat{p}_B}{\sqrt{\frac{\hat{p}_{pooled}(1-\hat{p}_{pooled})}{n_A} + \frac{\hat{p}_{pooled}(1-\hat{p}_{pooled})}{n_B}}}
\]

\[
TS = \frac{0.835 - 0.69}{\sqrt{(0.7625)(0.2375) + (0.7625)(0.2375)}}
\]

\[
TS = \frac{0.145}{0.0426} = 3.40
\]
Problem 6. Suppose we believe tenured faculty members vote more than non-tenured faculty. We collect data from 200 tenured faculty and 200 non-tenured faculty using simple random sampling. Of the tenured faculty members surveyed, 167 voted in the 2012 Presidential election. Of the non-tenured faculty surveyed, 138 voted in the 2012 Presidential election. Consider the tenured faculty Group A and the non-tenured faculty Group B. Conduct a hypothesis test at the 0.10 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 5?

\[ P(Z < 3.40) = 0.9997 \]
\[ P(Z > 3.40) = 1 - P(Z < 3.40) \]
\[ = 1 - 0.9997 \]
\[ = 0.0003 \]

\[ 0.0003 < 0.10 \]
\[ p-value < \alpha \]

\[ \boxed{\text{Reject } H_0} \]
Problem 6. Suppose we believe tenured faculty members vote more than non-tenured faculty. We collect data from 200 tenured faculty and 200 non-tenured faculty using simple random sampling. Of the tenured faculty members surveyed, 167 voted in the 2012 Presidential election. Of the non-tenured faculty surveyed, 138 voted in the 2012 Presidential election. Consider the tenured faculty Group A and the non-tenured faculty Group B. Conduct a hypothesis test at the 0.10 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 5?

f. The data does provide statistically significant evidence that the true proportion of all tenured faculty who vote is greater than the true proportion of all non-tenured faculty who vote.

g. Yes! - CI doesn't include 0 (only includes pos. values) - HT rejects H0 (which states prop are equal)
Problem 7. Suppose we want to determine if there is a difference between the price of a textbook on Amazon and the price of the same textbook at the UCLA bookstore. We sampled 201 UCLA courses. Of those, 68 required books could be found on Amazon. For each of these 68 books, we recorded the price of the book at the UCLA bookstore, the price of the book on Amazon, and the difference between the two (UCLA bookstore minus Amazon). The average difference in our sample was $3.58, with a standard deviation of $13.42. Create a 96% confidence interval for the average difference between the UCLA bookstore price and the Amazon price.

a. Construct the 96% confidence interval.

\[
\bar{X}_{\text{diff}} = \$3.58 \\
S_{\text{diff}} = \$13.42 \\
N_{\text{diff}} = 68 \\
df = n - 1 = 67 \\
t^* = 2.099
\]

\[
\bar{X}_{\text{diff}} \pm (t^*) \left( \frac{S_{\text{diff}}}{\sqrt{N_{\text{diff}}}} \right) \\
3.58 \pm (2.099) \left( \frac{13.42}{\sqrt{67}} \right) \\
3.58 \pm (2.099)(1.6274) \\
3.58 \pm 3.4159
\]

\[
3.58 - 3.4159 = 0.1641 \\
3.58 + 3.4159 = 6.9959
\]

96% CI: ($0.16, $7.00)

b. We are 96% confident that the true average difference between the Amazon textbook price and the UCLA bookstore textbook price is between $0.16 and $7.00.
Problem 8. Suppose we want to determine if there is a difference between the price of a textbook on Amazon and the price of the same textbook at the UCLA bookstore. We sampled 201 UCLA courses. Of those, 68 required books could be found on Amazon. For each of these 68 books, we recorded the price of the book at the UCLA bookstore, the price of the book on Amazon, and the difference between the two (UCLA bookstore minus Amazon). The average difference in our sample was $3.58, with a standard deviation of $13.42. Conduct a hypothesis test at the 0.04 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 7?

\[
A. H_0: M_{\text{diff}} = 0 \\
H_a: M_{\text{diff}} \neq 0
\]

b. \( \alpha = 0.04 \)

c. \( T_S = \frac{\bar{X}_{\text{diff}} - M_{\text{diff}}}{S_{\text{diff}} / \sqrt{n_{\text{diff}}}} \)

\[
T_S = \frac{3.58 - 0}{13.42 / \sqrt{68}} = \frac{3.58}{1.6274} = 2.1998
\]
Problem 8. Suppose we want to determine if there is a difference between the price of a textbook on Amazon and the price of the same textbook at the UCLA bookstore. We sampled 201 UCLA courses. Of those, 68 required books could be found on Amazon. For each of these 68 books, we recorded the price of the book at the UCLA bookstore, the price of the book on Amazon, and the difference between the two (UCLA bookstore minus Amazon). The average difference in our sample was $3.58, with a standard deviation of $13.42. Conduct a hypothesis test at the 0.04 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 7?

d. \( t = 2.1998 \)

\[ df = n-1 = 68 - 1 = 67 \]

(Use df = 60)

\[ 2.099 < T < 2.390 \]

\[ 0.02 < p\text{-value} < 0.04 \]
Problem 8. Suppose we want to determine if there is a difference between the price of a textbook on Amazon and the price of the same textbook at the UCLA bookstore. We sampled 201 UCLA courses. Of those, 68 required books could be found on Amazon. For each of these 68 books, we recorded the price of the book at the UCLA bookstore, the price of the book on Amazon, and the difference between the two (UCLA bookstore minus Amazon). The average difference in our sample was $3.58, with a standard deviation of $13.42. **Conduct a hypothesis test at the 0.04 significance level to test this.**

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 7?

- **e.** $0.02 < p\text{-value} < 0.04$
  - **p-value** $< 0.04$
  - **p-value** $< \alpha$
  - [Reject H₀]

- **f.** The data does provide statistically significant evidence that on avg. there is a difference between the price of a textbook on Amazon and the price of a textbook at the UCLA bookstore.
Problem 8. Suppose we want to determine if there is a difference between the price of a textbook on Amazon and the price of the same textbook at the UCLA bookstore. We sampled 201 UCLA courses. Of those, 68 required books could be found on Amazon. For each of these 68 books, we recorded the price of the book at the UCLA bookstore, the price of the book on Amazon, and the difference between the two (UCLA bookstore minus Amazon). The average difference in our sample was $3.58, with a standard deviation of $13.42. Conduct a hypothesis test at the 0.04 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 7?

9. Yes! - null value (0) wasn't in the interval - we rejected Ho
Problem 9. An instructor decided to create two different versions of the same exam, Version A and Version B. Prior to passing out the exams, she shuffled the exams together to ensure each student received a random version. Of the 30 students who took Version A, the average score was a 79.4, with a standard deviation of 14. Of the 27 students who took Version B, the average score was a 74.1, with a standard deviation of 20. Because she wants to ensure that the exam was fair to all students, she would like to evaluate whether the difference observed in the groups is so large that it provided convince evidence that Version B was more difficult (on average) than Version A. Consider the students who took Version A to be Group A and the students who took Version B to be Group B. Create a 99% confidence interval for the difference between the average scores on Version A and Version B.

a. Construct the 99% confidence interval.

b. Interpret your confidence interval from part a.

\[
\begin{align*}
\text{Group A: Version A} & \quad \text{Group B: Version B} \\
\n\bar{x}_A &= 79.4 & \bar{x}_B &= 74.1 \\
S_A &= 14 & S_B &= 20 \\
& & & \\
\left(\bar{x}_A - \bar{x}_B\right) & \pm t^* \sqrt{\frac{(S_A)^2}{n_A} + \frac{(S_B)^2}{n_B}} \\
(79.4 - 74.1) & \pm (2.779) \sqrt{\frac{14^2}{30} + \frac{20^2}{27}} \\
5.3 & \pm 12.84 \\
\end{align*}
\]

99.9% CI: (-7.54, 18.14)

5.3 - 12.84 = -7.54
5.3 + 12.84 = 18.14
Problem 9. An instructor decided to create two different versions of the same exam, Version A and Version B. Prior to passing out the exams, she shuffled the exams together to ensure each student received a random version. Of the 30 students who took Version A, the average score was a 79.4, with a standard deviation of 14. Of the 27 students who took Version B, the average score was a 74.1, with a standard deviation of 20. Because she wants to ensure that the exam was fair to all students, she would like to evaluate whether the difference observed in the groups is so large that it provided convince evidence that Version B was more difficult (on average) than Version A. Consider the students who took Version A to be Group A and the students who took Version B to be Group B. Create a 99% confidence interval for the difference between the average scores on Version A and Version B.

a. Construct the 99% confidence interval.
b. Interpret your confidence interval from part a.

b. We are 99.1% confident that the true difference between the avg. score on version A and the avg. score on version B is between -7.54 points and 18.14 points.
Problem 10. An instructor decided to create two different versions of the same exam, Version A and Version B. Prior to passing out the exams, she shuffled the exams together to ensure each student received a random version. Of the 30 students who took Version A, the average score was a 79.4, with a standard deviation of 14. Of the 27 students who took Version B, the average score was a 74.1, with a standard deviation of 20. Because she wants to ensure that the exam was fair to all students, she would like to evaluate whether the difference observed in the groups is so large that it provided converge evidence that Version B was more difficult (on average) than Version A. Consider the students who took Version A to be Group A and the students who took Version B to be Group B. Conduct a hypothesis test at the 0.01 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 9?

\[ H_0: \mu_A = \mu_B \]
\[ H_A: \mu_A > \mu_B \]

b. \( \alpha = 0.01 \)

c. \( T_S = \frac{\bar{X}_A - \bar{X}_B}{\sqrt{\frac{(S_A)^2}{n_A} + \frac{(S_B)^2}{n_B}}} = \frac{79.4 - 74.1}{\sqrt{\frac{(14)^2}{30} + \frac{(20)^2}{27}}} \]
\[ = \frac{5.3}{4.1204} = 1.271 \]

Shelby Cummings  Week 10  Page 10 of 10
Problem 10. An instructor decided to create two different versions of the same exam, Version A and Version B. Prior to passing out the exams, she shuffled the exams together to ensure each student received a random version. Of the 30 students who took Version A, the average score was a 79.4, with a standard deviation of 14. Of the 27 students who took Version B, the average score was a 74.1, with a standard deviation of 20. Because she wants to ensure that the exam was fair to all students, she would like to evaluate whether the difference observed in the groups is so large that it provided convincing evidence that Version B was more difficult (on average) than Version A. Consider the students who took Version A to be Group A and the students who took Version B to be Group B. Conduct a hypothesis test at the 0.01 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 9?

d. \( t = 1.147 \)

\[
\text{df} = \min (n_A - 1, n_B - 1) \\
= \min (30 - 1, 27 - 1) \\
= \min (29, 26) \\
= 26
\]

One-tailed.

1.058 < TS < 1.315

0.10 < p-value < 0.15
Problem 10. An instructor decided to create two different versions of the same exam, Version A and Version B. Prior to passing out the exams, she shuffled the exams together to ensure each student received a random version. Of the 30 students who took Version A, the average score was 79.4, with a standard deviation of 14. Of the 27 students who took Version B, the average score was 74.1, with a standard deviation of 20. Because she wants to ensure that the exam was fair to all students, she would like to evaluate whether the difference observed in the groups is so large that it provided convincing evidence that Version B was more difficult (on average) than Version A. Consider the students who took Version A to be Group A and the students who took Version B to be Group B. Conduct a hypothesis test at the 0.01 significance level to test this.

a. What are the hypotheses?
b. What is the significance level?
c. What is the value of the test statistic?
d. What is the p-value?
e. What is the correct decision?
f. What is the appropriate conclusion/interpretation?
g. Does the hypothesis test agree with the confidence interval from question 9?

\[ 0.10 < p-value < 0.15 \]
\[ p-value > 0.10 > 0.01 \]
\[ p-value > 0.01 \]
\[ p-value > \alpha \]
Fail to Reject \( H_0 \)
Problem 10. An instructor decided to create two different versions of the same exam, Version A and Version B. Prior to passing out the exams, she shuffled the exams together to ensure each student received a random version. Of the 30 students who took Version A, the average score was a 79.4, with a standard deviation of 14. Of the 27 students who took Version B, the average score was a 74.1, with a standard deviation of 20. Because she wants to ensure that the exam was fair to all students, she would like to evaluate whether the difference observed in the groups is so large that it provided convincing evidence that Version B was more difficult (on average) than Version A. Consider the students who took Version A to be Group A and the students who took Version B to be Group B. Conduct a hypothesis test at the 0.01 significance level to test this.

a. What are the hypotheses?

b. What is the significance level?

c. What is the value of the test statistic?

d. What is the p-value?

e. What is the correct decision?

f. What is the appropriate conclusion/interpretation?

g. Does the hypothesis test agree with the confidence interval from question 9?

f. The data does not provide statistically significant evidence that the true avg. score on version A is greater than the true avg. score on version B.

9. Yes! CI - included \( \bar{x} \) in interval, HT - failed to rej. \( H_0 \).