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← STAT 2910, section 91, Fall 2025

Assignment # 4 (Homework)

INSTRUCTOR
Abdulkadir Hussein
University of Windsor, Ontario CA

Due Date: MON, NOV 24, 2025 11:59 PM EST

REQUEST EXTENSION

Current Score: 137 / 139 POINTS | 98.6 %

Scoring and Assignment Information

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
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Instructions

This assignment contains chap 9, 10 problems

Assignment Submission

For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change the answer.

Assignment Scoring

Your last submission is used for your score.

1. **[4 / 4 Points]** DETAILS MY NOTES PREVIOUS ANSWERS ASK YOUR TEACHER PRACTICE ANOTHER

MendStatC4 9.E.001.

Find the appropriate rejection regions for the large-sample test statistic z in these cases. (Round your answers to two decimal places. If the test is one-tailed, enter NONE for the unused region.)

(a) A right-tailed test with $\alpha = 0.1$

$z >$ 1.28 ✓

$z <$ NONE ✓

(b) A two-tailed test at the 5% significance level

$z >$ 1.96 ✓

$z <$ -1.96 ✓

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 9.E.009.

A random sample of 100 observations from a quantitative population produced a sample mean of 26.9 and a sample standard deviation of 7.7. Use the p-value approach to determine whether the population mean is different from 28. Explain your conclusions. (Use $\alpha = 0.05$.)

State the null and alternative hypotheses.

- (●) $H_0: \mu = 28$ versus $H_a: \mu \neq 28$
- ( ) $H_0: \mu < 28$ versus $H_a: \mu > 28$
- ( ) $H_0: \mu \neq 28$ versus $H_a: \mu = 28$
- ( ) $H_0: \mu = 28$ versus $H_a: \mu < 28$
- ( ) $H_0: \mu = 28$ versus $H_a: \mu > 28$

✓

Find the test statistic and the p-value. (Round your test statistic to two decimal places and your p-value to four decimal places.)

$z =$ -1.43 ✓

p-value $=$ 0.1528 ✓

State your conclusion.

- ( ) The p-value is greater than alpha, so H_0 is not rejected. There is sufficient evidence to indicate that the mean is different from 28.
- (●) The p-value is greater than alpha, so H_0 is not rejected. There is insufficient evidence to indicate that the mean is different from 28.
- ( ) The p-value is less than alpha, so H_0 is rejected. There is sufficient evidence to indicate that the mean is different from 28.
- ( ) The p-value is less than alpha, so H_0 is rejected. There is insufficient evidence to indicate that the mean is different from 28.

✓

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 9.E.013.

The meat department of a local supermarket chain packages ground beef in trays of two sizes. The smaller tray is intended to hold 1 kilogram (kg) of meat. A random sample of 35 packages in the smaller meat tray produced weight measurements with an average of 1.01 kg and a standard deviation of 19 grams.

(a) If you were the quality control manager and wanted to make sure that the average amount of ground beef was indeed 1 kg, what hypotheses would you test?

- ○ H_0: $\mu = 1$ versus H_a: $\mu > 1$
- ○ H_0: $\mu = 1$ versus H_a: $\mu < 1$
- ○ H_0: $\mu < 1$ versus H_a: $\mu > 1$
- ◉ H_0: $\mu = 1$ versus H_a: $\mu \neq 1$
- ○ H_0: $\mu \neq 1$ versus H_a: $\mu = 1$

✔

(b) Find the p-value for the test and use it to perform the test in part (a). (Round your answer to four decimal places.)

p-value = 0.0018 ✔

State your conclusion. (Use $\alpha = 0.05$.)

- ○ Since the p-value is greater than 0.05, reject the null hypothesis.
- ◉ Since the p-value is less than 0.05, reject the null hypothesis.
- ○ Since the p-value is greater than 0.05, fail to reject the null hypothesis.
- ○ Since the p-value is less than 0.05, fail to reject the null hypothesis.

✔

(c) How would you, as the quality control manager, report the results of your study to a consumer interest group?

- ○ There is a 5% chance that any meat tray selected will weigh 1 kilogram.
- ○ There is a 95% chance that any meat tray selected will weigh 1 kilogram.
- ◉ There is sufficient evidence to indicate that the average amount of ground beef is different from 1 kilogram.
- ○ Since the sample average is greater than 1, all meat trays will weigh at least 1 kilogram.
- ○ There is insufficient evidence to indicate that the average amount of ground beef is different from 1 kilogram.

✔

Resources

Read It

MendStatC4 9.E.017.

Many companies are becoming involved in *flextime*, in which a worker schedules his or her own work hours or compresses work weeks. A company that was contemplating the installation of a flextime schedule estimated that it needed a minimum mean of 7 hours per day per assembly worker in order to operate effectively. Each of a random sample of 70 of the company's assemblers was asked to submit a tentative flextime schedule. If the mean number of hours per day for Monday was 6.7 hours and the standard deviation was 2.5 hours, do the data provide sufficient evidence to indicate that the mean number of hours worked per day on Mondays, for all of the company's assemblers, will be less than seven hours? Test using $\alpha = 0.05$. (Round your answers to two decimal places.)

1-2. Null and alternative hypotheses:

- ○ H_0: $\mu < 7$ versus H_a: $\mu > 7$
- ◉ H_0: $\mu = 7$ versus H_a: $\mu < 7$
- ○ H_0: $\mu = 7$ versus H_a: $\mu \neq 7$
- ○ H_0: $\mu = 7$ versus H_a: $\mu > 7$
- ○ H_0: $\mu \neq 7$ versus H_a: $\mu = 7$

✔

3. Test statistic: z = -1.00 ✔

4. Rejection region: If the test is one-tailed, enter NONE for the unused region.

$z >$ NONE ✔

$z <$ -1.65 ✔

5. Conclusion:

- ◉ H_0 is not rejected. There is insufficient evidence to indicate that the mean number of hours will be less than 7.
- ○ H_0 is rejected. There is sufficient evidence to indicate that the mean number of hours will be less than 7.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that the mean number of hours will be less than 7.
- ○ H_0 is rejected. There is insufficient evidence to indicate that the mean number of hours will be less than 7.

✔

Resources

Read It

MendStatC4 9.E.020.

Some sports that involve a significant amount of running, jumping, or hopping put participants at risk for Achilles tendinopathy (AT), an inflammation and thickening of the Achilles tendon. A study looked at the diameter (in mm) of the affected tendons for patients who participated in these types of sports activities Suppose that the Achilles tendon diameters in the general population have a mean of 5.95 millimeters (mm). When the diameters of the affected tendon were measured for a random sample of 35 patients, the average diameter was 9.90 with a standard deviation of 1.91 mm. Is there sufficient evidence to indicate that the average diameter of the tendon for patients with AT is greater than 5.95 mm? Test at the 5% level of significance.

State the null and alternative hypotheses.

- ○ H_0: $\mu = 5.95$ versus H_a: $\mu \neq 5.95$
- ○ H_0: $\mu = 5.95$ versus H_a: $\mu < 5.95$
- ○ H_0: $\mu < 5.95$ versus H_a: $\mu > 5.95$
- ○ H_0: $\mu \neq 5.95$ versus H_a: $\mu = 5.95$
- ◉ H_0: $\mu = 5.95$ versus H_a: $\mu > 5.95$ ✔

Find the test statistic and rejection region. (Round your answers to two decimal places. If the test is one-tailed, enter NONE for the unused region.)

test statistic	$z =$	12.23 ✔
rejection region	$z >$	1.65 ✔
	$z <$	NONE ✔

State your conclusion.

- ◉ H_0 is rejected. There is sufficient evidence to indicate that the average diameter of the tendon for patients with AT is greater than 5.95 mm.
- ○ H_0 is rejected. There is insufficient evidence to indicate that the average diameter of the tendon for patients with AT is greater than 5.95 mm.
- ○ H_0 is not rejected. There is insufficient evidence to indicate that the average diameter of the tendon for patients with AT is greater than 5.95 mm.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that the average diameter of the tendon for patients with AT is greater than 5.95 mm.

✔

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 9.E.024.

Independent random samples of 36 and 47 observations are drawn from two quantitative populations, 1 and 2, respectively. The sample data summary is shown here.

	Sample 1	Sample 2
Sample Size	36	47
Sample Mean	1.25	1.32
Sample Variance	0.0580	0.0540

Do the data present sufficient evidence to indicate that the mean for population 1 is smaller than the mean for population 2? Use one of the two methods of testing presented in this section. (Round your answer to two decimal places.)

z = -1.33 ✓

Explain your conclusions.

- ○ H_0 is rejected. There is sufficient evidence to indicate that the mean for population 1 is smaller than the mean for population 2.
- ○ H_0 is rejected. There is insufficient evidence to indicate that the mean for population 1 is smaller than the mean for population 2.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that the mean for population 1 is smaller than the mean for population 2.
- ◉ H_0 is not rejected. There is insufficient evidence to indicate that the mean for population 1 is smaller than the mean for population 2.

✓

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 9.E.027.

An experiment was planned to compare the mean time (in days) required to recover from a common cold for persons given a daily dose of 4 mg of vitamin C, μ_2 versus those who were not given a vitamin supplement, μ_1. Suppose that 35 adults were randomly selected for each treatment category and that the mean recovery times and standard deviations for the two groups were as follows.

	No Vitamin Supplement	4 mg Vitamin C
Sample size	35	35
Sample mean	6.5	5.3
Sample standard deviation	2.1	1.8

(a) Suppose your research objective is to show that the use of vitamin C reduces the mean time required to recover from a common cold and its complications. Give the null and alternative hypotheses for the test.

- ○ H_0: $(\mu_1 - \mu_2) = 0$ versus H_a: $(\mu_1 - \mu_2) \neq 0$
- ○ H_0: $(\mu_1 - \mu_2) \neq 0$ versus H_a: $(\mu_1 - \mu_2) = 0$
- ○ H_0: $(\mu_1 - \mu_2) < 0$ versus H_a: $(\mu_1 - \mu_2) > 0$
- ◉ H_0: $(\mu_1 - \mu_2) = 0$ versus H_a: $(\mu_1 - \mu_2) > 0$
- ○ H_0: $(\mu_1 - \mu_2) = 0$ versus H_a: $(\mu_1 - \mu_2) < 0$

✓

Is this a one- or a two-tailed test?

- ◉ one-tailed test
- ○ two-tailed test

✓

(b) Conduct the statistical test of the null hypothesis in part (a) and state your conclusion. Test using $\alpha = 0.05$. (Round your answers to two decimal places.)

z = 2.57 ✓

Conclusion:

- ◉ H_0 is rejected. There is sufficient evidence to indicate that Vitamin C reduces the mean recovery time.
- ○ H_0 is rejected. There is insufficient evidence to indicate that Vitamin C reduces the mean recovery time.
- ○ H_0 is not rejected. There is insufficient evidence to indicate that Vitamin C reduces the mean recovery time.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that Vitamin C reduces the mean recovery time.

✓

Resources

Read It

MendStatC4 9.E.038.

A random sample of $n = 1,400$ observations from a binomial population produced $x = 658$.

(a) If your research hypothesis is that p differs from 0.5, what hypotheses should you test?

- (selected) $H_0: p = 0.5$ versus $H_a: p \neq 0.5$
- $H_0: p \neq 0.5$ versus $H_a: p = 0.5$
- $H_0: p < 0.5$ versus $H_a: p > 0.5$
- $H_0: p = 0.5$ versus $H_a: p > 0.5$
- $H_0: p = 0.5$ versus $H_a: p < 0.5$

(b) Calculate the test statistic and its p-value. (Round your test statistic to two decimal places and your p-value to four decimal places.)

z = -2.24

p-value = 0.0250

Use the p-value to evaluate the statistical significance of the results at the 1% level.

- H_0 is rejected since the p-value is not less than 0.01.
- H_0 is rejected since the p-value is less than 0.01.
- (selected) H_0 is not rejected since the p-value is not less than 0.01.
- H_0 is not rejected since the p-value is less than 0.01.

(c) Do the data provide sufficient evidence to indicate that p is different from 0.5?

- Yes, the data provide sufficient evidence to indicate that p is different from 0.5.
- (selected) No, the data do not provide sufficient evidence to indicate that p is different from 0.5.

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 9.E.046.

An experimenter has prepared a drug-dose level that he claims will induce sleep for at least 80% of people suffering from insomnia. After examining the dosage we feel that his claims regarding the effectiveness of his dosage are inflated. In an attempt to disprove his claim, we administer his prescribed dosage to 60 insomniacs and observe that 44 of them have had sleep induced by the drug dose. Is there enough evidence to refute his claim at the 5% level of significance?

State the null and alternative hypotheses.

- ○ H_0: $p < 0.80$ versus H_a: $p > 0.80$
- ○ H_0: $p < 0.80$ versus H_a: $p = 0.80$
- ○ H_0: $p = 0.80$ versus H_a: $p > 0.80$
- ◉ H_0: $p = 0.80$ versus H_a: $p < 0.80$ ✓
- ○ H_0: $p \neq 0.80$ versus H_a: $p = 0.80$

Find the test statistic and rejection region. (Round your answers to two decimal places. If the test is one-tailed, enter NONE for the unused region.)

test statistic	$z =$	-1.29	✓
rejection region	$z >$	NONE	✓
	$z <$	-1.65	✓

State your conclusion.

- ○ H_0 is rejected. There is sufficient evidence to refute the experimenter's claim.
- ○ H_0 is not rejected. There is sufficient evidence to refute the experimenter's claim.
- ◉ H_0 is not rejected. There is insufficient evidence to refute the experimenter's claim. ✓
- ○ H_0 is rejected. There is insufficient evidence to refute the experimenter's claim.

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 9.E.050.

Independent random samples of n_1 = 160 and n_2 = 160 observations were randomly selected from binomial populations 1 and 2, respectively. Sample 1 had 10 successes, and sample 2 had 114 successes.

(a) Suppose you have no preconceived idea as to which parameter, p_1 or p_2, is the larger, but you want to detect only a difference between the two parameters if one exists. What should you choose as the alternative hypothesis for a statistical test? The null hypothesis?

- ○ H_0: $(p_1 - p_2) = 0$ versus H_a: $(p_1 - p_2) > 0$
- ○ H_0: $(p_1 - p_2) < 0$ versus H_a: $(p_1 - p_2) > 0$
- ○ H_0: $(p_1 - p_2) = 0$ versus H_a: $(p_1 - p_2) < 0$
- ○ H_0: $(p_1 - p_2) \neq 0$ versus H_a: $(p_1 - p_2) = 0$
- ◉ H_0: $(p_1 - p_2) = 0$ versus H_a: $(p_1 - p_2) \neq 0$ ✓

(b) Calculate the standard error of the difference in the two sample proportions, $(\hat{p}_1 - \hat{p}_2)$. Make sure to use the pooled estimate for the common value of p. (Round your answer to four decimal places.)

0.0514 ✓

(c) Calculate the test statistic that you would use for the test in part (a). (Round your answer to two decimal places.)

z = -0.61 ✓

Based on your knowledge of the standard normal distribution, is this a likely or unlikely observation, assuming that H_0 is true and the two population proportions are the same?

- ○ This is an unlikely observation if H_0 is false, since it lies more than one standard deviation below $(p_1 - p_2) = 0$.
- ○ This is a likely observation if H_0 is false, since it lies more than one standard deviation below $(p_1 - p_2) = 0$.
- ○ This is a likely observation if H_0 is true, since it lies more than one standard deviation below $(p_1 - p_2) = 0$.
- ◉ This is a likely observation if H_0 is true, since it lies less than one standard deviation below $(p_1 - p_2) = 0$.
- ○ This is an unlikely observation if H_0 is true, since it lies less than one standard deviation below $(p_1 - p_2) = 0$. ✓

(d) *p-value approach:* Find the p-value for the test. (Round your answer to four decimal places.)

p-value = 0.5418 ✓

Test for a significant difference in the population proportions at the 1% significance level.

- ◉ H_0 is not rejected. There is insufficient evidence to indicate that there is a difference in the two population proportions.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that there is a difference in the two population proportions.
- ○ H_0 is rejected. There is sufficient evidence to indicate that there is a difference in the two population proportions.
- ○ H_0 is rejected. There is insufficient evidence to indicate that there is a difference in the two population proportions. ✓

(e) *Critical value approach:* Find the rejection region when α = 0.01. (Round your answer to two decimal places. If the test is one-tailed, enter NONE for the unused region.)

$z >$ 2.58 ✓

$z <$ -2.58 ✓

Do the data provide sufficient evidence to indicate a difference in the population proportions?

- ○ H_0 is rejected. There is insufficient evidence to indicate that there is a difference in the two population proportions.
- ◉ H_0 is not rejected. There is insufficient evidence to indicate that there is a difference in the two population proportions.
- ○ H_0 is rejected. There is sufficient evidence to indicate that there is a difference in the two population proportions.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that there is a difference in the two population proportions. ✓

Resources

Read It

MendStatC4 9.E.057.

In the last few years, many research studies have shown that the purported benefits of hormone replacement therapy (HRT) do not exist, and in fact, that hormone replacement therapy actually increases the risk of several serious diseases. A four-year experiment involving 4320 women was conducted at 32 medica centres. Half of the women took placebos and half took a prescription drug, a widely prescribed type of hormone replacement therapy. There were $x_1 = 49$ cases of dementia in the hormone group and $x_2 = 22$ in the placebo group. Is there sufficient evidence to indicate that the risk of dementia is higher for patients using the prescription drug? Test at the 1% level of significance. (Round your answers to two decimal places.)

1-2. Null and alternative hypotheses:

- ○ $H_0: (p_1 - p_2) < 0$ versus $H_a: (p_1 - p_2) > 0$
- ◉ $H_0: (p_1 - p_2) = 0$ versus $H_a: (p_1 - p_2) > 0$
- ○ $H_0: (p_1 - p_2) \neq 0$ versus $H_a: (p_1 - p_2) = 0$
- ○ $H_0: (p_1 - p_2) = 0$ versus $H_a: (p_1 - p_2) \neq 0$
- ○ $H_0: (p_1 - p_2) = 0$ versus $H_a: (p_1 - p_2) < 0$

✔

3. Test statistic: $z =$ 3.23 ✔

4. Rejection region: If the test is one-tailed, enter NONE for the unused region.

$z >$ 2.33 ✔

$z <$ NONE ✔

5. Conclusion:

- ○ H_0 is rejected. There is insufficient evidence to indicate that the risk of dementia is higher for patients using the prescription drug.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that the risk of dementia is higher for patients using the prescription drug.
- ○ H_0 is not rejected. There is insufficient evidence to indicate that the risk of dementia is higher for patients using the prescription drug.
- ◉ H_0 is rejected. There is sufficient evidence to indicate that the risk of dementia is higher for patients using the prescription drug.

✔

Resources

Read It

MendStatC4 9.E.061.

What is the *p*-value for a test of hypothesis?

- ○ The *p*-value is the probability of observing a test statistic as extreme as or more extreme than the observed value, regardless of whether or not H_0 is true.
- ◉ The *p*-value is the probability of observing a test statistic as extreme as or more extreme than the observed value, if in fact H_0 is true.
- ○ The *p*-value is the maximum tolerable risk of incorrectly rejecting H_0.
- ○ The *p*-value is a single number calculated from the sample data.
- ○ The *p*-value is the actual risk of committing a Type II error, if H_0 is rejected based on the observed value of the test statistic.

✓

How is it calculated for a large-sample test?

- ○ Divide the sample standard deviation by the square root of the sample size.
- ○ Divide the difference between the sample mean and population mean by the standard error.
- ○ Use a table to find the test statistic corresponding to the assigned alpha level.
- ○ Find the area in the tail beyond the test statistic. If the test is one-sided, this is half the *p*-value and must be doubled. If the test is two-sided, this is the *p*-value.
- ◉ Find the area in the tail beyond the test statistic. If the test is one-sided, this is the *p*-value. If the test is two-sided, this is half the *p*-value and must be doubled.

✓

Resources

Read It

MendStatC4 9.E.070.

In a study to assess various effects of using a female model in automobile advertising, 100 men were shown photographs of two automobiles matched for price, colour, and size, but of different makes. One of the automobiles was shown with a female model to n_1 = 50 of the men (group A), and both automobiles were shown without the model to the other n_2 = 50 men (group B). In group A, the automobile shown with the model was judged as more expensive by x_1 = 39 men in group B, the same automobile was judged as the more expensive by x_2 = 28 men. Do these results indicate that using a female model increases the perceive cost of an automobile? Use a one-tailed test with α = 0.05. (Round your answers to two decimal places.)

1-2. Null and alternative hypotheses:

- (selected) H_0: $(p_1 - p_2) = 0$ versus H_a: $(p_1 - p_2) > 0$
- H_0: $(p_1 - p_2) \neq 0$ versus H_a: $(p_1 - p_2) = 0$
- H_0: $(p_1 - p_2) < 0$ versus H_a: $(p_1 - p_2) > 0$
- H_0: $(p_1 - p_2) = 0$ versus H_a: $(p_1 - p_2) \neq 0$
- H_0: $(p_1 - p_2) = 0$ versus H_a: $(p_1 - p_2) < 0$

3. Test statistic: z = 2.34

4. Rejection region: If the test is one-tailed, enter NONE for the unused region.

$z >$ 1.65

$z <$ NONE

5. Conclusion:

- H_0 is not rejected. There is insufficient evidence to indicate that using a female model increases the perceived cost of an automobile.
- H_0 is not rejected. There is sufficient evidence to indicate that using a female model increases the perceived cost of an automobile.
- H_0 is rejected. There is insufficient evidence to indicate that using a female model increases the perceived cost of an automobile.
- (selected) H_0 is rejected. There is sufficient evidence to indicate that using a female model increases the perceived cost of an automobile.

Resources

Read It

MendStatC4 10.E.011.

The following n = 10 observations are a sample from a normal population.

7.4 7.1 6.5 7.5 7.6 6.3 6.8 7.7 6.4 7.0

(a) Find the mean and standard deviation of these data. (Round your standard deviation to four decimal places.)

mean	7.03
standard deviation	0.5165

(b) Find a 99% upper one-sided confidence bound for the population mean μ. (Round your answer to three decimal places.)

7.491

(c) Test H_0: μ = 7.5 versus H_a: μ < 7.5. Use α = 0.01.

State the test statistic. (Round your answer to three decimal places.)

t = -2.878

State the rejection region. (If the test is one-tailed, enter NONE for the unused region. Round your answers to three decimal places.)

t > NONE

t < -2.821

State the conclusion.

- ○ H_0 is not rejected. There is insufficient evidence to conclude that the mean is less than 7.5.
- ○ H_0 is not rejected. There is sufficient evidence to conclude that the mean is less than 7.5.
- ◉ H_0 is rejected. There is sufficient evidence to conclude that the mean is less than 7.5.
- ○ H_0 is rejected. There is insufficient evidence to conclude that the mean is less than 7.5.

(d) Do the results of part (b) support your conclusion in part (c)?

- ◉ Yes
- ○ No

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 10.E.013.

Industrial wastes and sewage dumped into our rivers and streams absorb oxygen and thereby reduce the amount of dissolved oxygen available for fish and othe forms of aquatic life. One state agency requires a minimum of 5 parts per million (ppm) of dissolved oxygen in order for the oxygen content to be sufficient to support aquatic life. Six water specimens taken from a river at a specific location during the low-water season (July) gave readings of 4.8, 5.2, 5.0, 5.0, 5.1, anc 4.7 ppm of dissolved oxygen. Do the data provide sufficient evidence to indicate that the dissolved oxygen content is less than 5 ppm? Test using $\alpha = 0.05$.

State the null and alternative hypotheses.

- (selected) H_0: $\mu = 5$ versus H_a: $\mu < 5$
- H_0: $\mu = 5$ versus H_a: $\mu \neq 5$
- H_0: $\mu < 5$ versus H_a: $\mu > 5$
- H_0: $\mu < 5$ versus H_a: $\mu = 5$
- H_0: $\mu \neq 5$ versus H_a: $\mu = 5$

State the test statistic. (Round your answer to three decimal places.)

t = -0.439

State the rejection region. (If the test is one-tailed, enter NONE for the unused region. Round your answers to three decimal places.)

$t >$ NONE

$t <$ -2.015

State the conclusion.

- H_0 is rejected. There is insufficient evidence to conclude that the dissolved oxygen content is less than 5 ppm.
- H_0 is not rejected. There is sufficient evidence to conclude that the dissolved oxygen content is less than 5 ppm.
- H_0 is rejected. There is sufficient evidence to conclude that the dissolved oxygen content is less than 5 ppm.
- (selected) H_0 is not rejected. There is insufficient evidence to conclude that the dissolved oxygen content is less than 5 ppm.

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 10.E.017.

Organic chemists often purify organic compounds by a method known as fractional crystallization. An experimenter wanted to prepare and purify 4.85 g of aniline. Ten 4.85 g quantities of aniline were individually prepared and purified to acetanilide. The following dry yields were recorded.

3.83	3.78	3.89	3.84	3.88
3.37	3.62	4.02	3.70	3.84

Estimate the mean grams of acetanilide that can be recovered from an initial amount of 4.85 g of aniline. Use a 95% confidence interval. (Round your answers t three decimal places.)

3.649 g to 3.905 g

Resources

Read It

MendStatC4 10.E.027.

Independent random samples of $n_1 = 19$ and $n_2 = 12$ observations were selected from two normal populations with equal variances.

	Population	
	1	**2**
Sample Size	19	12
Sample Mean	34.7	32.3
Sample Variance	4.5	5.8

(a) Suppose you wish to detect a difference between the population means. State the null and alternative hypotheses for the test.

- ○ $H_0: (\mu_1 - \mu_2) \neq 0$ versus $H_a: (\mu_1 - \mu_2) = 0$
- ○ $H_0: (\mu_1 - \mu_2) < 0$ versus $H_a: (\mu_1 - \mu_2) > 0$
- ◉ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) \neq 0$
- ○ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) < 0$
- ○ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) > 0$

✓

(b) Find the rejection region for the test in part (a) for $\alpha = 0.01$. (If the test is one-tailed, enter NONE for the unused region. Round your answers to three decimal places.)

$t >$ 2.756 ✓

$t <$ -2.756 ✓

(c) Find the value of the test statistic. (Round your answer to three decimal places.)

$t =$ 2.913 ✓

(d) Find the approximate p-value for the test.

- ◉ p-value < 0.010
- ○ 0.010 < p-value < 0.020
- ○ 0.020 < p-value < 0.050
- ○ 0.050 < p-value < 0.100
- ○ 0.100 < p-value < 0.200
- ○ p-value < 0.200

✓

(e) Conduct the test and state your conclusions.

- ○ H_0 is rejected. There is insufficient evidence to conclude that there is a significant difference between the population means.
- ○ H_0 is not rejected. There is sufficient evidence to conclude that there is a significant difference between the population means.
- ○ H_0 is not rejected. There is insufficient evidence to conclude that there is a significant difference between the population means.
- ◉ H_0 is rejected. There is sufficient evidence to conclude that there is a significant difference between the population means.

✓

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 10.E.034.

An experiment studied the efficacy of using 95% ethanol or 20% bleach as a disinfectant in removing bacterial and fungal contamination when culturing plant tissues. The experiment was repeated 15 times with each disinfectant, using eggplant as the plant tissue being cultured. Five cuttings per plant were placed on a petri dish for each disinfectant and stored at 25°C for four weeks. The observation reported was the number of uncontaminated eggplant cuttings after the four-week storage.

Disinfectant	**95% Ethanol**	**20% Bleach**
Mean	3.77	4.82
Variance	2.78092	0.17145
n	15	15

Pooled variance 1.47619

(a) Are you willing to assume that the underlying variances are equal?

- ○ Yes
- ◉ No

✓

(b) Using the information from part (a), are you willing to conclude that there is a significant difference in the mean numbers of uncontaminated eggplants for the two disinfectants tested? (Use μ_1 for 95% ethanol disinfectant and μ_2 for 20% bleach disinfectant. Use $\alpha = 0.05$.)

State the null and alternative hypotheses.

- ○ H_0: $(\mu_1 - \mu_2) = 0$ versus H_a: $(\mu_1 - \mu_2) < 0$
- ○ H_0: $(\mu_1 - \mu_2) = 0$ versus H_a: $(\mu_1 - \mu_2) > 0$
- ○ H_0: $(\mu_1 - \mu_2) \neq 0$ versus H_a: $(\mu_1 - \mu_2) = 0$
- ◉ H_0: $(\mu_1 - \mu_2) = 0$ versus H_a: $(\mu_1 - \mu_2) \neq 0$
- ○ H_0: $(\mu_1 - \mu_2) < 0$ versus H_a: $(\mu_1 - \mu_2) > 0$

✓

State the test statistic. (Round your answer to three decimal places.)

t = -2.367 ✓

State the p-value.

- ○ p-value < 0.010
- ○ 0.010 < p-value < 0.020
- ◉ 0.020 < p-value < 0.050
- ○ 0.050 < p-value < 0.100
- ○ 0.100 < p-value < 0.200
- ○ p-value > 0.200

✓

State the conclusion.

- ○ H_0 is not rejected. There is insufficient evidence to conclude that there is a significant difference in the mean numbers of uncontaminated eggplants for the two disinfectants used.
- ◉ H_0 is rejected. There is sufficient evidence to conclude that there is a significant difference in the mean numbers of uncontaminated eggplants for the two disinfectants used.
- ○ H_0 is rejected. There is insufficient evidence to conclude that there is a significant difference in the mean numbers of uncontaminated eggplants for the two disinfectants used.
- ○ H_0 is not rejected. There is sufficient evidence to conclude that there is a significant difference in the mean numbers of uncontaminated eggplants for the two disinfectants used.

✓

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 10.E.037.

Industrial wastes and sewage dumped into our rivers and streams absorb oxygen and thereby reduce the amount of dissolved oxygen available for fish and othe forms of aquatic life. One state agency requires a minimum of 5 parts per million (ppm) of dissolved oxygen in order for the oxygen content to be sufficient to support aquatic life. A pollution control inspector suspected that a river community was releasing amounts of semitreated sewage into a river. To check his theory, he drew five randomly selected specimens of river water at a location above the town, and another five below. The dissolved oxygen readings (in parts per million) are as follows.

Above Town	4.8	5.3	5.0	5.0	5.0
Below Town	5.1	4.7	5.0	4.9	5.0

(a) Do the data provide sufficient evidence to indicate that the mean oxygen content below the town is less than the mean oxygen content above? Test using $\alpha = 0.05$. (Use μ_1 for the population mean for the above town location and μ_2 for the population mean for the below town location.)

State the null and alternative hypotheses.

- ○ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) < 0$
- ○ $H_0: (\mu_1 - \mu_2) \neq 0$ versus $H_a: (\mu_1 - \mu_2) = 0$
- ◉ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) > 0$
- ○ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) \neq 0$
- ○ $H_0: (\mu_1 - \mu_2) < 0$ versus $H_a: (\mu_1 - \mu_2) > 0$

✓

State the test statistic. (Round your answer to three decimal places.)

t = 1.285 ✗

State the rejection region. (If the test is one-tailed, enter NONE for the unused region. Round your answers to three decimal places.)

$t >$ 1.860 ✓

$t <$ NONE ✓

State the conclusion.

- ○ H_0 is not rejected. There is sufficient evidence to indicate that the mean content of oxygen below town is less than the mean content above town.
- ○ H_0 is rejected. There is sufficient evidence to indicate that the mean content of oxygen below town is less than the mean content above town.
- ◉ H_0 is not rejected. There is insufficient evidence to indicate that the mean content of oxygen below town is less than the mean content above town.
- ○ H_0 is rejected. There is insufficient evidence to indicate that the mean content of oxygen below town is less than the mean content above town.

✓

(b) Suppose you prefer estimation as a method of inference. Estimate the difference in the mean dissolved oxygen contents (in ppm) for locations above and below the town. Use a 95% confidence interval. (Use $\mu_1 - \mu_2$. Round your answers to three decimal places.)

-0.162 ✓ ppm to 0.322 ✓ ppm

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 10.E.047.

Chronic anterior compartment syndrome is a condition characterized by exercise-induced pain in the lower leg. Swelling and impaired nerve and muscle function also accompany this pain, which is relieved by rest. Researchers conducted an experiment involving 10 healthy runners and 10 healthy cyclists to determine whether there are significant differences in pressure measurements within the anterior muscle compartment for runners and cyclists. In addition to the compartment pressures, the level of creatine phosphokinase (CPK) in blood samples, a measure of muscle damage, was determined for each of n_1 = 10 runners and n_2 = 10 cyclists before and after exercise. The data summary—CPK values in units/liter—is as follows.

	Runners		Cyclists	
Condition	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Before Exercise	254.66	115.43	171.7	60.66
After Exercise	284.79	132.64	176.4	64.58
Difference	30.13	21.02	4.7	6.95

(a) Test for a significant difference in mean CPK values for runners and cyclists before exercise under the assumption that $\sigma_1^2 \neq \sigma_2^2$; use α = 0.05.

State the null and alternative hypotheses.

- (selected) $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) \neq 0$
- $H_0: (\mu_1 - \mu_2) \neq 0$ versus $H_a: (\mu_1 - \mu_2) = 0$
- $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) < 0$
- $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) > 0$
- $H_0: (\mu_1 - \mu_2) < 0$ versus $H_a: (\mu_1 - \mu_2) \neq 0$

State the test statistic. (Round your answer to three decimal places.)

t = 2.012

State the rejection region. (If the test is one-tailed, enter NONE for the unused region. Round your answers to three decimal places.)

$t >$ 2.160

$t <$ -2.160

State the conclusion.

- (selected) H_0 is not rejected. There is insufficient evidence to indicate a difference in mean CPK values for runners and cyclists before exercise.
- H_0 is not rejected. There is sufficient evidence to indicate a difference in mean CPK values for runners and cyclists before exercise.
- H_0 is rejected. There is sufficient evidence to indicate a difference in mean CPK values for runners and cyclists before exercise.
- H_0 is rejected. There is insufficient evidence to indicate a difference in mean CPK values for runners and cyclists before exercise.

Find a 95% confidence interval estimate (in units/L) for the corresponding difference in means. (Round your answers to three decimal places.)

-6.110 units/L to 172.030 units/L

(b) Test for a significant difference in mean CPK values for runners and cyclists after exercise under the assumption that $\sigma_1^2 \neq \sigma_2^2$; use α = 0.05.

State the null and alternative hypotheses.

- $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) < 0$
- (selected) $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) \neq 0$
- $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) > 0$
- $H_0: (\mu_1 - \mu_2) \neq 0$ versus $H_a: (\mu_1 - \mu_2) = 0$
- $H_0: (\mu_1 - \mu_2) < 0$ versus $H_a: (\mu_1 - \mu_2) \neq 0$

State the test statistic. (Round your answer to three decimal places.)

t = 2.323

State the rejection region. (If the test is one-tailed, enter NONE for the unused region. Round your answers to three decimal places.)

$t >$ 2.160 ✔

$t <$ -2.160 ✔

State the conclusion.

- ○ H_0 is rejected. There is insufficient evidence to indicate a difference in mean CPK values for runners and cyclists after exercise.
- ○ H_0 is not rejected. There is sufficient evidence to indicate a difference in mean CPK values for runners and cyclists after exercise.
- ◉ H_0 is rejected. There is sufficient evidence to indicate a difference in mean CPK values for runners and cyclists after exercise.
- ○ H_0 is not rejected. There is insufficient evidence to indicate a difference in mean CPK values for runners and cyclists after exercise.

✔

Find a 95% confidence interval estimate (in units/L) for the corresponding difference in means. (Round your answers to three decimal places.)

7.260 ✔ units/L to 209.160 ✔ units/L

(c) Test for a significant difference in mean CPK values for runners before and after exercise. (Use μ_1 for after exercise and μ_2 for before exercise.)

State the null and alternative hypotheses.

- ○ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) > 0$
- ○ $H_0: (\mu_1 - \mu_2) \neq 0$ versus $H_a: (\mu_1 - \mu_2) = 0$
- ○ $H_0: (\mu_1 - \mu_2) < 0$ versus $H_a: (\mu_1 - \mu_2) \neq 0$
- ◉ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) \neq 0$
- ○ $H_0: (\mu_1 - \mu_2) = 0$ versus $H_a: (\mu_1 - \mu_2) < 0$

✔

State the test statistic. (Round your answer to three decimal places.)

$t =$ 4.533 ✔

State the rejection region. (If the test is one-tailed, enter NONE for the unused region. Round your answers to three decimal places.)

$t >$ 2.262 ✔

$t <$ -2.262 ✔

State the conclusion.

- ○ H_0 is rejected. There is insufficient evidence to indicate a difference in mean CPK values for runners before and after exercise.
- ◉ H_0 is rejected. There is sufficient evidence to indicate a difference in mean CPK values for runners before and after exercise.
- ○ H_0 is not rejected. There is insufficient evidence to indicate a difference in mean CPK values for runners before and after exercise.
- ○ H_0 is not rejected. There is sufficient evidence to indicate a difference in mean CPK values for runners before and after exercise.

✔

(d) Find a 95% confidence interval estimate for the difference in mean CPK values (in units/L) for cyclists before and after exercise. (Use $\mu_1 - \mu_2$, with μ for after exercise and μ_2 for before exercise. Round your answers to three decimal places.)

-0.271 ✔ units/L to 9.671 ✔ units/L

Does your estimate indicate that there is no significant difference in mean CPK levels for cyclists before and after exercise?

- ○ Since the interval does not contain the value $(\mu_1 - \mu_2) = 0$, we cannot conclude that there is a significant difference between the means.
- ○ Since the interval does not contain the value $(\mu_1 - \mu_2) = 0$, we can conclude that there is a significant difference between the means.
- ◉ Since the interval contains the value $(\mu_1 - \mu_2) = 0$, we cannot conclude that there is a significant difference between the means.
- ○ Since the interval contains the value $(\mu_1 - \mu_2) = 0$, we can conclude that there is a significant difference between the means.

✔

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 10.E.048.

An advertisement for a popular supermarket chain claims that it has had consistently lower prices than four other full-service supermarkets. As part of a survey conducted by an "independent market basket price-checking company," the average weekly total, based on the prices (in $) of approximately 95 items, is given for two different supermarket chains recorded during 4 consecutive weeks in a particular month.

Week	Advertiser ($)	Competitor ($)
1	254.18	256.13
2	240.52	255.60
3	231.96	255.17
4	234.12	261.13

(a) Is there a significant difference in the average prices for these two different supermarket chains? (Use $\alpha = 0.05$. Round your answers to three decimal places.)

1-2. Null and alternative hypotheses:

- ○ H_0: $\mu_d < 0$ versus H_a: $\mu_d > 0$
- ○ H_0: $\mu_d \neq 0$ versus H_a: $\mu_d = 0$
- ◉ H_0: $\mu_d = 0$ versus H_a: $\mu_d \neq 0$
- ○ H_0: $\mu_d = 0$ versus H_a: $\mu_d > 0$
- ○ H_0: $\mu_d = 0$ versus H_a: $\mu_d < 0$

✓

3. Test statistic: t = -3.033 ✓

4. Rejection region: If the test is one-tailed, enter NONE for the unused region.

$t >$ 3.182 ✓

$t <$ -3.182 ✓

5. Conclusion:

- ○ H_0 is rejected. There is insufficient evidence to indicate that the means are different.
- ○ H_0 is rejected. There is sufficient evidence to indicate that the means are different.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that the means are different.
- ◉ H_0 is not rejected. There is insufficient evidence to indicate that the means are different.

✓

(b) What is the approximate p-value for the test conducted in part (a)?

- ○ p-value < 0.010
- ○ 0.010 < p-value < 0.020
- ○ 0.020 < p-value < 0.050
- ◉ 0.050 < p-value < 0.100
- ○ 0.100 < p-value < 0.200
- ○ p-value > 0.200

✓

(c) Construct a 99% confidence interval for the difference in the average prices for the two supermarket chains. (Round your answers to two decimal places.)

$ -49.19 ✓ to $ 15.57 ✓

Interpret this interval.

- ○ Since 0 does not fall in the confidence interval, there is insufficient evidence to indicate that the means are different.
- ◉ Since 0 falls in the confidence interval, there is insufficient evidence to indicate that the means are different.
- ○ Since 0 falls in the confidence interval, there is sufficient evidence to indicate that the means are different.
- ○ Since 0 does not fall in the confidence interval, there is sufficient evidence to indicate that the means are different.

✔

Resources

Read It

MendStatC4 10.E.057.

A random sample of $n = 15$ observations was selected from a normal population. The sample mean and variance were $\bar{x} = 3.99$ and $s^2 = 0.3211$. Find a 90% confidence interval for the population variance σ^2. (Round your answers to three decimal places.)

0.190 ✔ to 0.684 ✔

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 10.E.058.

A random sample of size $n = 7$ from a normal population produced these measurements: 1.2, 3.6, 1.7, 1.8, 3.3, 3.0, 3.0.

(a) Calculate the sample variance, s^2. (Round your answer to five decimal places.)

$s^2 =$ 0.86143 ✔

(b) Construct a 95% confidence interval for the population variance, σ^2. (Round your answers to three decimal places.)

0.358 ✔ to 4.177 ✔

(c) Test H_0: $\sigma^2 = 0.8$ versus H_a: $\sigma^2 \neq 0.8$ using $\alpha = 0.05$. State your conclusions.

State the test statistic. (Round your answer to four decimal places.)

$\chi^2 =$ 6.4607 ✔

State the rejection region. (If the test is one-tailed, enter NONE for the unused region. Round your answers to four decimal places.)

$\chi^2 >$ 14.4494 ✔

$\chi^2 <$ 1.2373 ✔

State the conclusion.

- ○ H_0 is rejected. There is insufficient evidence to indicate that the population variance is different from 0.8.
- ◉ H_0 is not rejected. There is insufficient evidence to indicate that the population variance is different from 0.8.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that the population variance is different from 0.8.
- ○ H_0 is rejected. There is sufficient evidence to indicate that the population variance is different from 0.8.

✔

(d) What is the approximate p-value for the test in part (c)?

- ○ p-value < 0.010
- ○ $0.010 < p$-value < 0.020
- ○ $0.020 < p$-value < 0.050
- ○ $0.050 < p$-value < 0.100
- ○ $0.100 < p$-value < 0.200
- ◉ p-value > 0.200

✔

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It

MendStatC4 10.E.066.

Independent random samples from two normal populations produced the variances listed here.

Sample Size	Sample Variance
21	54.9
22	32.2

(a) Do the data provide sufficient evidence to indicate that σ_1^2 differs from σ_2^2? Test using $\alpha = 0.05$.

State the null and alternative hypotheses.

- ○ H_0: $\sigma_1^2 = \sigma_2^2$ versus H_a: $\sigma_1^2 < \sigma_2^2$
- ○ H_0: $\sigma_1^2 = \sigma_2^2$ versus H_a: $\sigma_1^2 > \sigma_2^2$
- ◉ H_0: $\sigma_1^2 = \sigma_2^2$ versus H_a: $\sigma_1^2 \neq \sigma_2^2$
- ○ H_0: $\sigma_1^2 \neq \sigma_2^2$ versus H_a: $\sigma_1^2 = \sigma_2^2$
- ○ H_0: $\sigma_1^2 < \sigma_2^2$ versus H_a: $\sigma_1^2 > \sigma_2^2$

✓

State the test statistic. (Round your answer to two decimal places.)

F = 1.70 ✓

State the rejection region. (Round your answer to two decimal places.)

F > 2.10 ✗

State the conclusion.

- ○ H_0 is rejected. There is sufficient evidence to indicate that σ_1^2 differs from σ_2^2.
- ◉ H_0 is not rejected. There is insufficient evidence to indicate that σ_1^2 differs from σ_2^2.
- ○ H_0 is rejected. There is insufficient evidence to indicate that σ_1^2 differs from σ_2^2.
- ○ H_0 is not rejected. There is sufficient evidence to indicate that σ_1^2 differs from σ_2^2.

✓

(b) Find the approximate p-value for the test.

- ○ p-value < 0.010
- ○ 0.010 < p-value < 0.020
- ○ 0.020 < p-value < 0.050
- ○ 0.050 < p-value < 0.100
- ○ 0.100 < p-value < 0.200
- ◉ p-value > 0.200

✓

Interpret its value.

- ◉ Since the p-value is not less than 0.05, there is insufficient evidence to indicate that σ_1^2 differs from σ_2^2.
- ○ Since the p-value is less than 0.05, there is sufficient evidence to indicate that σ_1^2 differs from σ_2^2.
- ○ Since the p-value is less than 0.05, there is insufficient evidence to indicate that σ_1^2 differs from σ_2^2.
- ○ Since the p-value is not less than 0.05, there is sufficient evidence to indicate that σ_1^2 differs from σ_2^2.

✓

You may need to use the appropriate appendix table or technology to answer this question.

Resources

Read It