

Student: _____
Date: _____

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Course: DSA 8301 May 2023

Assignment: Practice Problems - HT1

1. Explain the difference between the z-test for μ using rejection region(s) and the z-test for μ using a P-value.

Choose the correct answer below.

- ☐ A. In the z-test using rejection region(s), the test statistic is compared with critical values. The z-test using a P-value compares the P-value with the level of significance α .
- ☐ B. In the z-test using rejection region(s), the test statistic is compared with the level of significance α . The z-test using a P-value compares the P-value with critical values.
- ☐ C. The z-test using rejection region(s) is used when the population is not normal. The z-test using a P-value is used when the population is normal.
- ☐ D. The z-test using rejection region(s) is used when the population is normal. The z-test using a P-value is used when the population is not normal.

Answer: A.

In the z-test using rejection region(s), the test statistic is compared with critical values. The z-test using a P-value compares the P-value with the level of significance α .

2. The P-value for a hypothesis test is shown. Use the P-value to decide whether to reject H_0 when the level of significance is (a) $\alpha = 0.01$, (b) $\alpha = 0.05$, and (c) $\alpha = 0.10$.

P = 0.0913

(a) Do you reject or fail to reject H_0 at the 0.01 level of significance?

- ☐ A. Fail to reject H_0 because the P-value, 0.0913, is less than $\alpha = 0.01$.
- ☐ B. Reject H_0 because the P-value, 0.0913, is less than $\alpha = 0.01$.
- ☐ C. Fail to reject H_0 because the P-value, 0.0913, is greater than $\alpha = 0.01$.
- ☐ D. Reject H_0 because the P-value, 0.0913, is greater than $\alpha = 0.01$.

(b) Do you reject or fail to reject H_0 at the 0.05 level of significance?

- ☐ A. Fail to reject H_0 because the P-value, 0.0913, is greater than $\alpha = 0.05$.
- ☐ B. Reject H_0 because the P-value, 0.0913, is greater than $\alpha = 0.05$.
- ☐ C. Fail to reject H_0 because the P-value, 0.0913, is less than $\alpha = 0.05$.
- ☐ D. Reject H_0 because the P-value, 0.0913, is less than $\alpha = 0.05$.

(c) Do you reject or fail to reject H_0 at the 0.10 level of significance?

- ☐ A. Reject H_0 because the P-value, 0.0913, is greater than $\alpha = 0.10$.
- ☐ B. Reject H_0 because the P-value, 0.0913, is less than $\alpha = 0.10$.
- ☐ C. Fail to reject H_0 because the P-value, 0.0913, is greater than $\alpha = 0.10$.
- ☐ D. Fail to reject H_0 because the P-value, 0.0913, is less than $\alpha = 0.10$.

Answers C. Fail to reject H_0 because the P-value, 0.0913, is greater than $\alpha = 0.01$.

A. Fail to reject H_0 because the P-value, 0.0913, is greater than $\alpha = 0.05$.

B. Reject H_0 because the P-value, 0.0913, is less than $\alpha = 0.10$.

3. The P-value for a hypothesis test is shown. Use the P-value to decide whether to reject H_0 when the level of significance is (a) $\alpha = 0.01$, (b) $\alpha = 0.05$, and (c) $\alpha = 0.10$.

$P = 0.0531$

(a) Do you reject or fail to reject H_0 at the 0.01 level of significance?

- ☐ A. Reject H_0 because the P-value, 0.0531, is less than $\alpha = 0.01$.
- ☐ B. Fail to reject H_0 because the P-value, 0.0531, is less than $\alpha = 0.01$.
- ☐ C. Reject H_0 because the P-value, 0.0531, is greater than $\alpha = 0.01$.
- ☐ D. Fail to reject H_0 because the P-value, 0.0531, is greater than $\alpha = 0.01$.

(b) Do you reject or fail to reject H_0 at the 0.05 level of significance?

- ☐ A. Reject H_0 because the P-value, 0.0531, is greater than $\alpha = 0.05$.
- ☐ B. Reject H_0 because the P-value, 0.0531, is less than $\alpha = 0.05$.
- ☐ C. Fail to reject H_0 because the P-value, 0.0531, is greater than $\alpha = 0.05$.
- ☐ D. Fail to reject H_0 because the P-value, 0.0531, is less than $\alpha = 0.05$.

(c) Do you reject or fail to reject H_0 at the 0.10 level of significance?

- ☐ A. Reject H_0 because the P-value, 0.0531, is greater than $\alpha = 0.10$.
- ☐ B. Fail to reject H_0 because the P-value, 0.0531, is less than $\alpha = 0.10$.
- ☐ C. Reject H_0 because the P-value, 0.0531, is less than $\alpha = 0.10$.
- ☐ D. Fail to reject H_0 because the P-value, 0.0531, is greater than $\alpha = 0.10$.

Answers D. Fail to reject H_0 because the P-value, 0.0531, is greater than $\alpha = 0.01$.

C. Fail to reject H_0 because the P-value, 0.0531, is greater than $\alpha = 0.05$.

C. Reject H_0 because the P-value, 0.0531, is less than $\alpha = 0.10$.

4. Find the P-value for a left-tailed hypothesis test with a test statistic of $z = -1.36$. Decide whether to reject H_0 if the level of significance is $\alpha = 0.10$.

P-value = (Round to four decimal places as needed.)

State your conclusion. Choose the correct answer below.

- ☐ Since $P \leq \alpha$, reject H_0 .
- ☐ Since $P > \alpha$, reject H_0 .
- ☐ Since $P > \alpha$, fail to reject H_0 .
- ☐ Since $P \leq \alpha$, fail to reject H_0 .

Answers 0.0869

Since $P \leq \alpha$, reject H_0 .

5. Find the P-value for the indicated hypothesis test with the given standardized test statistic, z . Decide whether to reject H_0 for the given level of significance α .

Right-tailed test with test statistic $z = 1.36$ and $\alpha = 0.05$

P-value = (Round to four decimal places as needed.)

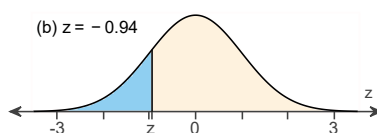
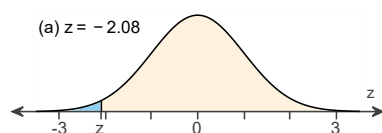
State your conclusion.

- ☐ Reject H_0
- ☐ Fail to reject H_0

Answers 0.0869

Fail to reject H_0

6. Match each P-value with the graph that displays its area without performing any calculations. Explain your reasoning. $P = 0.1736$ and $P = 0.0188$.



Graph (1) _____ displays the area for $P = 0.1736$ and graph (2) _____ displays the area for $P = 0.0188$ because the P-value (3) _____ the (4) _____

- (1) ☐ (a) (2) ☐ (a) (3) ☐ is equal to (4) ☐ absolute value of z .
- ☐ (b) ☐ (b) ☐ is related to ☐ shaded area.
- ☐ is equal to one minus
- ☐ is related to one minus

Answers (1) (b)

(2) (a)

(3) is equal to

(4) shaded area.

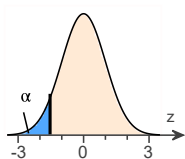
7. Find the critical value(s) for a left-tailed z-test with $\alpha = 0.07$. Include a graph with your answer.

The critical value(s) is(are) .

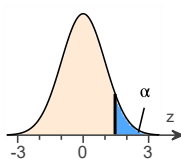
(Round to two decimal places as needed. Use a comma to separate answers as needed.)

Draw a graph of the rejection region. Choose the correct graph below.

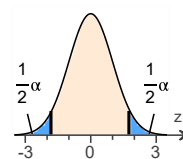
☐ A.



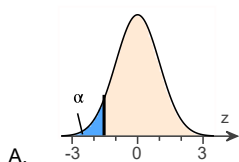
☐ B.



☐ C.



Answers - 1.48



8. Find the critical value(s) and rejection region(s) for the type of z-test with level of significance α . Include a graph with your answer.

Two-tailed test, $\alpha = 0.06$

The critical value(s) is/are $z =$.

(Round to two decimal places as needed. Use a comma to separate answers as needed.)

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

(Round to two decimal places as needed.)

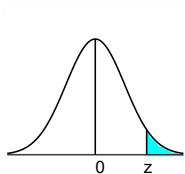
☐ A. The rejection region is $z <$.

☐ B. The rejection regions are $z <$ and $z >$.

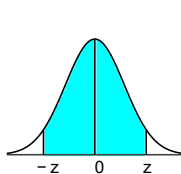
☐ C. The rejection region is $z >$.

Choose the correct graph of the rejection region below.

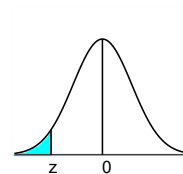
☐ A.



☐ B.

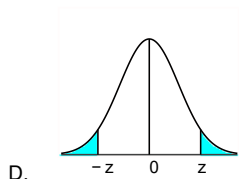


☐ C.



Answers - 1.88, 1.88

B. The rejection regions are $z <$ and $z >$.



9. Test the claim about the population mean, μ , at the given level of significance using the given sample statistics.

Claim: $\mu = 40$; $\alpha = 0.08$; $\sigma = 3.96$. Sample statistics: $\bar{x} = 39.1$, $n = 62$

Identify the null and alternative hypotheses. Choose the correct answer below.

- | | |
|--|--|
| <input type="radio"/> A. $H_0: \mu = 40$
$H_a: \mu > 40$ | <input type="radio"/> B. $H_0: \mu < 40$
$H_a: \mu = 40$ |
| <input type="radio"/> C. $H_0: \mu \neq 40$
$H_a: \mu = 40$ | <input type="radio"/> D. $H_0: \mu = 40$
$H_a: \mu < 40$ |
| <input type="radio"/> E. $H_0: \mu > 40$
$H_a: \mu = 40$ | <input type="radio"/> F. $H_0: \mu = 40$
$H_a: \mu \neq 40$ |

Calculate the standardized test statistic.

The standardized test statistic is .
(Round to two decimal places as needed.)

Determine the critical value(s). Select the correct choice below and fill in the answer box to complete your choice.
(Round to two decimal places as needed.)

- ☐ A. The critical values are \pm .
- ☐ B. The critical value is .

Determine the outcome and conclusion of the test. Choose the correct answer below.

- ☐ A. Reject H_0 . At the 8% significance level, there is enough evidence to reject the claim.
- ☐ B. Reject H_0 . At the 8% significance level, there is enough evidence to support the claim.
- ☐ C. Fail to reject H_0 . At the 8% significance level, there is not enough evidence to reject the claim.
- ☐ D. Fail to reject H_0 . At the 8% significance level, there is not enough evidence to support the claim.

Answers F. $H_0: \mu = 40$ $H_a: \mu \neq 40$

- 1.79

A. The critical values are \pm 1.75.

A. Reject H_0 . At the 8% significance level, there is enough evidence to reject the claim.

10. Test the claim about the population mean, μ , at the given level of significance using the given sample statistics.

Claim: $\mu \neq 5000$; $\alpha = 0.07$; $\sigma = 356$. Sample statistics: $\bar{x} = 5400$, $n = 45$

Identify the null and alternative hypotheses. Choose the correct answer below.

- | | |
|---|---|
| <input type="radio"/> A. $H_0: \mu \neq 5000$
$H_a: \mu = 5000$ | <input type="radio"/> B. $H_0: \mu \leq 5000$
$H_a: \mu \neq 5000$ |
| <input type="radio"/> C. $H_0: \mu \neq 5000$
$H_a: \mu \geq 5000$ | <input type="radio"/> D. $H_0: \mu = 5000$
$H_a: \mu \neq 5000$ |
| <input type="radio"/> E. $H_0: \mu \neq 5000$
$H_a: \mu \leq 5000$ | <input type="radio"/> F. $H_0: \mu \geq 5000$
$H_a: \mu \neq 5000$ |

Calculate the standardized test statistic.

The standardized test statistic is .
(Round to two decimal places as needed.)

Determine the critical value(s). Select the correct choice below and fill in the answer box to complete your choice.
(Round to two decimal places as needed.)

- ☐ A. The critical values are \pm .
- ☐ B. The critical value is .

Determine the outcome and conclusion of the test. Choose from the following.

- ☐ A. Fail to reject H_0 . At the 7% significance level, there is not enough evidence to reject the claim.
- ☐ B. Reject H_0 . At the 7% significance level, there is enough evidence to reject the claim.
- ☐ C. Reject H_0 . At the 7% significance level, there is enough evidence to support the claim.
- ☐ D. Fail to reject H_0 . At the 7% significance level, there is not enough evidence to support the claim.

Answers D. $H_0: \mu = 5000$ $H_a: \mu \neq 5000$

7.54

A. The critical values are \pm 1.81.

C. Reject H_0 . At the 7% significance level, there is enough evidence to support the claim.

11. A random sample of 82 eighth grade students' scores on a national mathematics assessment test has a mean score of 275. This test result prompts a state school administrator to declare that the mean score for the state's eighth graders on this exam is more than 270. Assume that the population standard deviation is 33. At $\alpha = 0.01$, is there enough evidence to support the administrator's claim? Complete parts (a) through (e).

(a) Write the claim mathematically and identify H_0 and H_a . Choose the correct answer below.

- ☐ A. $H_0: \mu = 270$ (claim)
 $H_a: \mu > 270$
- ☐ B. $H_0: \mu = 270$
 $H_a: \mu > 270$ (claim)
- ☐ D. $H_0: \mu \geq 270$ (claim)
 $H_a: \mu < 270$
- ☐ E. $H_0: \mu \leq 270$
 $H_a: \mu > 270$ (claim)

(b) Find the standardized test statistic z.

z = (Round to two decimal places as needed.)

(c) Find the P-value.

P-value = (Round to three decimal places as needed.)

(d) Decide whether to reject or fail to reject the null hypothesis.

- ☐ Fail to reject H_0
- ☐ Reject H_0

(e) Interpret your decision in the context of the original claim.

At the 1% significance level, there (1) _____ enough evidence to (2) _____ the administrator's claim that the mean score for the state's eighth graders on the exam is more than 270.

- (1) ☐ is not (2) ☐ support
☐ is ☐ reject

Answers E. $H_0: \mu \leq 270$ $H_a: \mu > 270$ (claim)

1.37

0.085

Fail to reject H_0

(1) is not

(2) support

12. The lengths of time (in years) it took a random sample of 32 former smokers to quit smoking permanently are listed. Assume the population standard deviation is 5.4 years. At $\alpha = 0.03$, is there enough evidence to reject the claim that the mean time it takes smokers to quit smoking permanently is 14 years? Complete parts (a) through (e).

8.6	22.5	12.9	15.9	21.4	8.3	22.3	20.2
8.8	20.5	21.2	13.9	12.9	11.9	14.8	7.9
18.3	9.9	13.7	16.1	13.5	19.9	12.9	21.2
19.8	14.2	15.3	16.2	16.1	14.5	9.1	18.3

(a) Identify the claim and state the null hypothesis and alternative hypothesis.

- ☐ **A.** $H_0: \mu > 14$
 $H_a: \mu \leq 14$ (claim)
 ☐ **B.** $H_0: \mu \geq 14$ (claim)
 $H_a: \mu < 14$
- ☐ **D.** $H_0: \mu \leq 14$ (claim)
 $H_a: \mu > 14$
☐ **E.** $H_0: \mu = 14$ (claim)
 $H_a: \mu \neq 14$

(b) Identify the standardized test statistic. Use technology.

$z =$ (Round to two decimal places as needed.)

(c) Find the P-value. Use technology.

$P =$ (Round to three decimal places as needed.)

(d) Decide whether to reject or fail to reject the null hypothesis and (e) interpret the decision in the context of the original claim at the 3% level of significance.

- ☐ **A.** Reject H_0 . There is sufficient evidence to reject the claim that the mean time it takes smokers to quit smoking permanently is 14 years.
 ☐ **B.** Reject H_0 . There is not sufficient evidence to reject the claim that the mean time it takes smokers to quit smoking permanently is 14 years.
- ☐ **C.** Fail to reject H_0 . There is not sufficient evidence to reject the claim that the mean time it takes smokers to quit smoking permanently is 14 years.
 ☐ **D.** Fail to reject H_0 . There is sufficient evidence to reject the claim that the mean time it takes smokers to quit smoking permanently is 14 years.

Answers E. $H_0: \mu = 14$ (claim) $H_a: \mu \neq 14$

1.47

0.141

C.

Fail to reject H_0 . There is not sufficient evidence to reject the claim that the mean time it takes smokers to quit smoking permanently is 14 years.

13. A company that makes cola drinks states that the mean caffeine content per 12-ounce bottle of cola is 35 milligrams. You want to test this claim. During your tests, you find that a random sample of thirty 12-ounce bottles of cola has a mean caffeine content of 33.3 milligrams. Assume the population is normally distributed and the population standard deviation is 6.5 milligrams. At $\alpha = 0.10$, can you reject the company's claim? Complete parts (a) through (e).

(a) Identify H_0 and H_a . Choose the correct answer below.

- ☐ A. $H_0: \mu \leq 35$
 $H_a: \mu > 35$
- ☐ B. $H_0: \mu = 33.3$
 $H_a: \mu \neq 33.3$
- ☐ C. $H_0: \mu = 35$
 $H_a: \mu \neq 35$
- ☐ D. $H_0: \mu \leq 33.3$
 $H_a: \mu > 33.3$
- ☐ E. $H_0: \mu \neq 35$
 $H_a: \mu = 35$
- ☐ F. $H_0: \mu \neq 33.3$
 $H_a: \mu = 33.3$

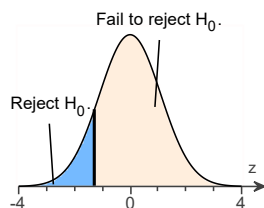
(b) Find the critical value(s). Select the correct choice below and fill in the answer box within your choice.

(Round to two decimal places as needed.)

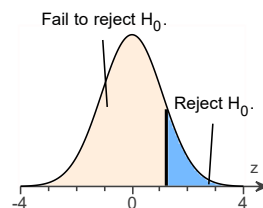
- ☐ A. The critical values are \pm .
- ☐ B. The critical value is .

Identify the rejection region(s). Choose the correct answer below.

☐ A.



☐ B.



(c) Find the standardized test statistic.

$z =$ (Round to two decimal places as needed.)

(d) Decide whether to reject or fail to reject the null hypothesis.

- ☐ A. Since z is in the rejection region, fail to reject the null hypothesis.
- ☐ B. Since z is not in the rejection region, reject the null hypothesis.
- ☐ C. Since z is in the rejection region, reject the null hypothesis.
- ☐ D. Since z is not in the rejection region, fail to reject the null hypothesis.

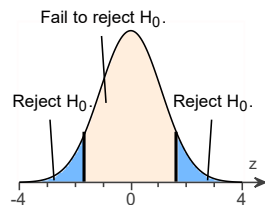
(e) Interpret the decision in the context of the original claim.

At the 10% significance level, there (1) _____ enough evidence to (2) _____ the company's claim that the mean caffeine content per 12-ounce bottle of cola (3) _____ milligrams.

- (1) ☐ is not
☐ is
- (2) ☐ support
☐ reject
- (3) ☐ is equal to
☐ is different from
☐ is less than
☐ is greater than

Answers C. $H_0: \mu = 35$ $H_a: \mu \neq 35$

A. The critical values are \pm 1.64.



C.

- 1.43

D. Since z is not in the rejection region, fail to reject the null hypothesis.

(1) is not

(2) reject

(3) is equal to

35

14. A weight loss program claims that program participants have a mean weight loss of at least 10 pounds after 1 month. You work for a medical association and are asked to test this claim. A random sample of 30 program participants and their weight losses (in pounds) after 1 month is listed in the table below. Assume the population standard deviation is 3. At $\alpha = 0.08$, do you have enough evidence to reject the program's claim? Complete parts (a) through (e).

5.6	6	6.4	6.7	7.1	7.4	7.7	8.1	8.2	8.7
8.9	9	9.2	9.3	9.5	9.8	10.3	10.3	10.4	10.5
10.8	11.1	11.5	11.7	11.8	12.3	12.5	12.6	13.1	15.7

(a) Identify H_0 and H_a . Choose the correct answer below.

- ☐ A. $H_0: \mu = 10$
 $H_a: \mu \neq 10$
- ☐ B. $H_0: \mu \leq 10$
 $H_a: \mu > 10$
- ☐ C. $H_0: \mu \geq 10$
 $H_a: \mu < 10$
- ☐ D. $H_0: \mu < 10$
 $H_a: \mu \geq 10$
- ☐ E. $H_0: \mu \neq 10$
 $H_a: \mu = 10$
- ☐ F. $H_0: \mu > 10$
 $H_a: \mu \leq 10$

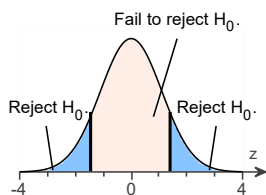
(b) Find the critical value(s). Select the correct choice below and fill in the answer box within your choice.

(Round to two decimal places as needed.)

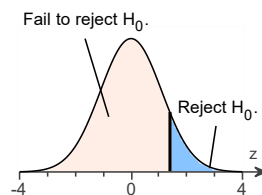
- ☐ A. The critical values are \pm .
- ☐ B. The critical value is .

Identify the rejection region(s). Choose the correct answer below.

☐ A.



☐ B.



(c) Find the standardized test statistic.

$z =$ (Round to two decimal places as needed.)

(d) Decide whether to reject or fail to reject the null hypothesis.

- ☐ A. Since z is not in the rejection region, fail to reject the null hypothesis.
- ☐ B. Since z is not in the rejection region, reject the null hypothesis.
- ☐ C. Since z is in the rejection region, reject the null hypothesis.
- ☐ D. Since z is in the rejection region, fail to reject the null hypothesis.

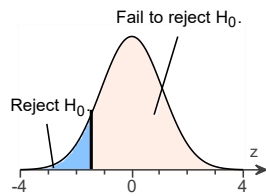
(e) Interpret the decision in the context of the original claim.

At the 8% significance level, there (1) _____ enough evidence to (2) _____ the program's claim that program participants have a mean weight loss (3) _____ pounds after 1 month.

- (1) ☐ is ☐ is not
- (2) ☐ reject ☐ support
- (3) ☐ greater than ☐ greater than or equal to ☐ equal to ☐ less than or equal to

Answers C. $H_0: \mu \geq 10$ $H_a: \mu < 10$

B. The critical value is -1.41.



C.
-0.47

A. Since z is not in the rejection region, fail to reject the null hypothesis.

(1) is not

(2) reject

(3) greater than or equal to

10

15. When $P > \alpha$, does the standardized test statistic lie inside or outside of the rejection region(s)? Explain your reasoning.

Choose the correct answer below.

- ☐ A. Inside; When the standardized test statistic is outside the rejection region, $P < \alpha$.
- ☐ B. Inside; When the standardized test statistic is outside the rejection region, $P > \alpha$.
- ☐ C. Outside; When the standardized test statistic is inside the rejection region, $P > \alpha$.
- ☐ D. Outside; When the standardized test statistic is inside the rejection region, $P < \alpha$.

Answer: D. Outside; When the standardized test statistic is inside the rejection region, $P < \alpha$.