on

1. Which hypothesis, the null or the alternative, is the status-quo hypothesis?

Choose the correct answer below.

- A. alternative hypothesis
- B. null hypothesis

2. What is the level of significance of a test of hypothesis?

Choose the correct answer below.

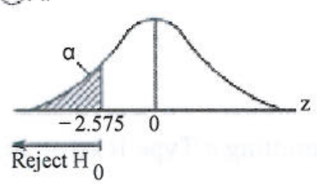
- A. The level of significance, α, is the probability of committing a Type II error, rejecting the null hypothesis when it is, in fact, true.
- B. The level of significance, α, is the probability of committing a Type I error, not rejecting the null hypothesis when it is, in fact, false.
- C. The level of significance, β, is the probability of committing a Type II error, rejecting the null hypothesis when it is, in fact, true.
- D. The level of significance, β, is the probability of committing a Type I error, rejecting the null hypothesis when it is, in fact, true.
- E. The level of significance, α, is the probability of committing a Type I error, rejecting the null hypothesis when it is, in fact, true.
- F. The level of significance, β, is the probability of committing a Type II error, not rejecting the null hypothesis when it is, in fact, false.

3. For each of the following rejection regions, sketch the sampling distribution for z and indicate the location of the rejection region, and determine the probability that a Type I error will be made.

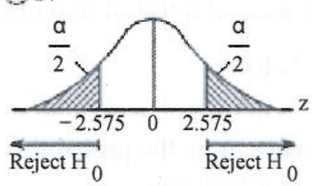
a. $z < -2.575$ or $z > 2.575$ **b.** $z > 1.96$ **c.** $z < -1.28$ **d.** $z < -2.33$

a. Which sketch below shows the sampling distribution for the rejection region $z < -2.575$ or $z > 2.575$?

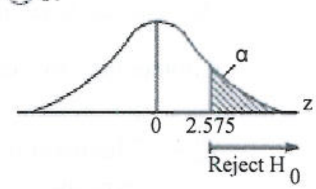
○ A.



○ B.



○ C.

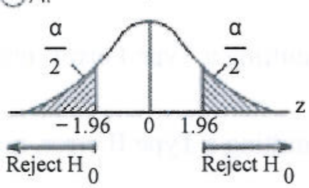


What is the probability that a Type I error will be made for $z < -2.575$ or $z > 2.575$?

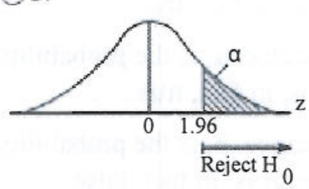
$\alpha =$ ☐ (Round to three decimal places as needed.)

b. Which sketch below shows the sampling distribution for the rejection region $z > 1.96$?

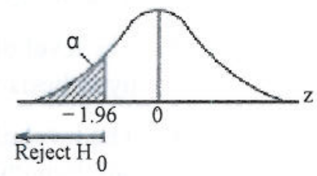
○ A.



○ B.



○ C.

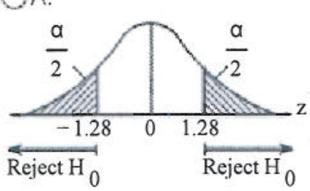


What is the probability that a Type I error will be made for $z > 1.96$?

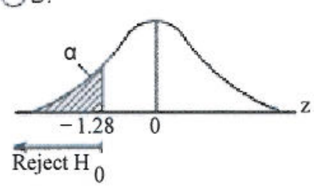
$\alpha =$ ☐ (Round to three decimal places as needed.)

c. Which sketch below shows the sampling distribution for the rejection region $z < -1.28$?

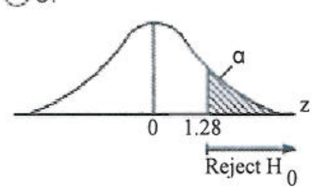
○ A.



○ B.



○ C.



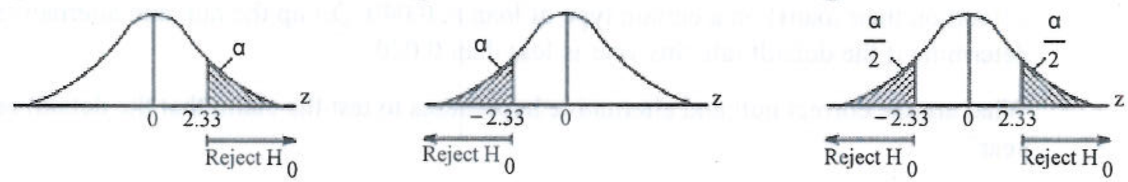
What is the probability that a Type I error will be made for $z < -1.28$?

$\alpha =$ ☐ (Round to three decimal places as needed.)

d. Which sketch below shows the sampling distribution for the rejection region $z < -2.33$?

3. (cont.)

○A. ○B. ○C.



What is the probability that a Type I error will be made for $z < -2.33$?

$\alpha =$ ☐ (Round to three decimal places as needed.)

4. A survey found that 65% of college students believe that their online education courses are as good as or superior to courses that use traditional face-to-face instruction.

a. Give the null hypothesis for testing the claim made by the survey.
b. Give the rejection region for a two-tailed test conducted at $\alpha = 0.10$.

a. What is the null hypothesis?

H_0: p [< / > / ≠ / =] ☐ (Type an integer or a decimal.)

b. What is the rejection region? Select the correct choice below and fill in any answer boxes to complete your choice.

(Round to three decimal places as needed.)

○A. $z <$ ☐

○B. $z <$ ☐ or $z >$ ☐

○C. ☐ $< z <$ ☐

○D. $z >$ ☐

5. Several years ago, a government agency reported the default rate (the proportion of borrowers who default on their loans) on a certain type of loan at 0.040. Set up the null and alternative hypotheses to determine if the default rate this year is less than 0.040.

What are the correct null and alternative hypotheses to test the claim that the default rate is less this year?

- A. $H_0: p < 0.040$
  $H_a: p = 0.040$
- B. $H_0: p = 0.040$
  $H_a: p \neq 0.040$
- C. $H_0: p \neq 0.040$
  $H_a: p = 0.040$
- D. $H_0: p = 0.040$
  $H_a: p > 0.040$
- E. $H_0: p > 0.040$
  $H_a: p = 0.040$
- F. $H_0: p = 0.040$
  $H_a: p < 0.040$

6. For the α and observed significance level (p-value) pair, indicate whether the null hypothesis would be rejected.

$\alpha = 0.025$, p-value $= 0.45$

Choose the correct conclusion below.

- A. Do not reject the null hypothesis since the p-value is not less than the value of α.
- B. Reject the null hypothesis since the p-value is not less than the value of α.
- C. Reject the null hypothesis since the p-value is less than the value of α.
- D. Do not reject the null hypothesis since the p-value is less than the value of α.

7. A study analyzes recent incidents involving terrorist attacks. Data on the number of individual suicide bombings that occurred in each of 20 sampled terrorist group attacks against a country is reproduced in the data table below. An Excel/DDXL printout is shown to the right. Complete parts **a** through **e**.

1	4	4	1	3	2	4	3	1	1
1	2	4	1	2	2	2	1	3	1

Count	20
Mean	2.15
Std Dev	1.182
Std Error	0.264
H_0	$\mu = 2.5$
H_a	$\mu \neq 2.5$
df	19
t Statistic	-1.29
p-value	0.2125
Conclusion	Fail to reject H_0 at alpha $= 0.10$

a. Do the data indicate that the true mean number of suicide bombings for all terrorist group attacks against this country differs from 2.5? Use $\alpha = 0.10$ and the Excel/DDXL printout to answer the question.

- A. Yes. The data show that the true mean number of suicide bombings differs from 2.5.
- B. No. The data do not show that the true mean number of suicide bombings differs from 2.5.

b. A 90% confidence interval for the mean, μ, of the population was found to be 2.15 ± 0.457. Answer the question in part **a** based on the 90% confidence interval.

- A. Yes. The data show that the true mean number of suicide bombings differs from 2.5.
- B. No. The data do not show that the true mean number of suicide bombings differs from 2.5.

c. Do the inferences derived from the test (part **a**) and the confidence interval (part **b**) agree? Explain why or why not.

- A. They disagree because the tests use a different value of α.
- B. They disagree because a hypothesis test is testing a different event than the confidence interval test.
- C. They agree because both tests use the same value of α.
- D. They agree because both tests use the same data set.

d. What assumption(s) about the data must be true for the inferences to be valid? Select all that apply.

- ☐ A. There cannot be any outliers.
- ☐ B. The sample must be greater than 5% of the population.
- ☐ C. The population must be approximately normal.
- ☐ D. The sample must be less than 10% of the population.

7.
(cont.)

e. Use a graph to check whether the assumption(s), part **d**, is (are) reasonably satisfied. Comment on the validity of the inference.

- A. The assumption(s) does (do) not seem reasonably satisfied. The data are skewed right.
- B. The assumption(s) does (do) not seem reasonably satisfied. The data are not random.
- C. The assumption(s) does (do) not seem reasonably satisfied. The data contain outliers.
- D. The assumption(s) seems (seem) reasonably satisfied.
- E. The assumption(s) does (do) not seem reasonably satisfied. The sample is small.

8.

When planning for a new forest road to be used for tree harvesting, planners must select the location to minimize tractor skidding distance. The skidding distances (in meters) were measured at 20 randomly selected road sites. The data are given below. A logger working on the road claims the mean skidding distance is at least 420 meters. Is there sufficient evidence to refute this claim? Use $\alpha = 0.05$.

351	480	406	435	453	575	549	439	281	197
390	294	186	264	274	399	314	310	139	429

Choose the correct answer below.

- A. Do not reject the claim. There is sufficient evidence to indicate that $\mu < 420$ meters.
- B. Reject the claim. There is insufficient evidence to indicate that $\mu < 420$ meters.
- C. Do not reject the claim. There is insufficient evidence to indicate that $\mu < 420$ meters.
- D. Reject the claim. There is sufficient evidence to indicate that $\mu < 420$ meters.

9. Suppose 67 of 113 randomly selected shoppers believe that "Made in the USA" means that 100% of labor and materials are from the United States. Let p represent the true proportion of consumers who believe "Made in the USA" means 100% of labor and materials are from the United States. Complete parts **a** through **e**.

a. Calculate a point estimate for p.

A point estimate for p is ☐. (Round to three decimal places as needed.)

b. A claim is made that $p = 0.50$. Set up the null and alternative hypotheses to test this claim. Choose the correct hypotheses below.

- A. $H_0: p \neq 0.50$ vs. $H_a: p = 0.50$
- B. $H_0: p = 0.50$ vs. $H_a: p > 0.50$
- C. $H_0: p = 0.50$ vs. $H_a: p \neq 0.50$
- D. $H_0: p > 0.50$ vs. $H_a: p = 0.50$
- E. $H_0: p < 0.50$ vs. $H_a: p = 0.50$
- F. $H_0: p = 0.50$ vs. $H_a: p < 0.50$

c. Calculate the test statistic for the test, part **b**.

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

d. Find the rejection region for the test if $\alpha = 0.05$.

The rejection region is [$z < -z_{\alpha}$ / $z < -z_{\alpha/2}$ or $z > z_{\alpha/2}$ / $z > z_{\alpha}$] where the critical value is ☐.

(Round to three decimal places as needed.)

e. Using the results, parts **c** and **d**, make the appropriate conclusion.

- A. Reject the null hypothesis because the test statistic is in the rejection region.
- B. Reject the null hypothesis because the test statistic is not in the rejection region.
- C. Do not reject the null hypothesis because the test statistic is in the rejection region.
- D. Do not reject the null hypothesis because the test statistic is not in the rejection region.

10. A business journal investigation of the performance and timing of corporate acquisitions discovered that in a random sample of 2,751 firms, 807 announced one or more acquisitions during the year 2000. Does the sample provide sufficient evidence to indicate that the true percentage of all firms that announced one or more acquisitions during the year 2000 is less than 31%? Use $\alpha = 0.01$ to make your decision.

What are the hypotheses for this test?

A. $H_0: p = 0.31$
$H_a: p \neq 0.31$

B. $H_0: p = 0.31$
$H_a: p > 0.31$

C. $H_0: p < 0.31$
$H_a: p = 0.31$

D. $H_0: p = 0.31$
$H_a: p < 0.31$

E. $H_0: p \neq 0.31$
$H_a: p = 0.31$

F. $H_0: p > 0.31$
$H_a: p \leq 0.31$

What is the rejection region? Select the correct choice below and fill in the answer box(es) to complete your choice.

(Round to two decimal places as needed.)

A. $z <$ ▢

B. $z <$ ▢ or $z >$ ▢

C. $z >$ ▢

Calculate the value of the z-statistic for this test.

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

What is the conclusion of the test?

[Reject / Do not reject] the null hypothesis because the test statistic [is / is not] in the rejection region. Therefore, there is [insufficient / sufficient] evidence at the 0.01 level of significance to indicate that the true percentage of all firms that announced one or more acquisitions during the year 2000 is less than 31%.

11. Independent random samples from approximately normal populations produced the results shown below. Complete parts **a** and **b**.

Full data set

Sample 1					Sample 2				
47	26	39	36	40	66	58	53	58	50
50	24	37	52	51	28	31	32	45	64

a. Do the data present sufficient evidence to conclude that $\mu_1 - \mu_2 \neq 0$? Use $\alpha = 0.10$.

Let μ_1 be the mean of population 1 and μ_2 be the mean of population 2. Select the correct hypotheses below.

- A. $H_0: \mu_1 - \mu_2 = 0, H_a: \mu_1 - \mu_2 > 0$
- B. $H_0: \mu_1 - \mu_2 = 0, H_a: \mu_1 - \mu_2 \neq 0$
- C. $H_0: \mu_1 - \mu_2 = 0, H_a: \mu_1 - \mu_2 < 0$

Now find the test statistic.

t = ☐ (Round to two decimal places as needed.)

Find the p-value.

p-value = ☐ (Round to two decimal places as needed.)

Choose the correct conclusion below.

- A. Reject H_0. There is sufficient evidence that the means differ.
- B. Do not reject H_0. There is insufficient evidence that the means differ.
- C. Reject H_0. There is insufficient evidence that the means differ.
- D. Do not reject H_0. There is sufficient evidence that the means differ.

b. Construct a 90% confidence interval for $(\mu_1 - \mu_2)$.

The confidence interval is (☐,☐).
(Round to three decimal places as needed.)

12. A study was done to determine the effect of rudeness on a victim's task performance. Students were randomly assigned to one of two experimental conditions, a rudeness condition and a control group. Each student was asked to write down as many uses for a brick as possible in five minutes. The number of different uses for a brick was recorded for each of the 60 students and the data is shown in the accompanying table. Conduct a statistical analysis (at $\alpha = 0.01$) to determine if the true mean performance level for students in the rudeness condition is lower than the true mean performance level for students in the control group.

Click the icon to view the data table.

Let μ_1 represent the mean performace level of the control group and μ_2 represent the mean performance level of the students in the rudeness condition group. Select the correct hypotheses below.

- A. $H_0: \mu_1 - \mu_2 = 0, H_a: \mu_1 - \mu_2 < 0$
- B. $H_0: \mu_1 - \mu_2 = 0, H_a: \mu_1 - \mu_2 \neq 0$
- C. $H_0: \mu_1 - \mu_2 = 0, H_a: \mu_1 - \mu_2 > 0$

Find the test statistic.

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

Find the critical value(s).

☐

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

Find the p-value.

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

Choose the correct conclusion below. Assume $\alpha = 0.01$.

[Do not reject / Reject] H_0. There is [sufficient / insufficient] evidence the true mean performance level for students in the rudeness condition is lower than the true mean performance level for students in the control group.

Data Table

Full data set

Control Group	Rudeness Condition

12. (cont.)

8	6	26
14	9	27
20	17	3
14	28	4
8	4	6
17	23	7
26	24	20
6	8	12
9	28	28
5	21	23

6	8	9
2	7	6
10	22	4
10	5	15
24	3	14
9	10	8
24	4	16
19	6	10
12	11	19
6	8	4

13. The data for a random sample of six paired observations are shown in the table.

a. Calculate $\bar{d}$ and s_d^2.
b. Form a 90% confidence interval for μ_d.
c. Test the null hypothesis $H_0: \mu_d = 0$ against the alternative hypothesis $H_a: \mu_d \neq 0$. Use $\alpha = 0.10$.

Pair	Population 1 Sample (Observation 1)	Population 2 Sample (Observation 2)
1	8	4
2	9	7
3	12	7
4	10	9
5	5	2
6	7	4

a. Calculate the difference between each pair of observations by subtracting observation 2 from observation 1. Find $\bar{d}$.

$\bar{d} =$ ☐

Calculate s_d^2.

$s_d^2 =$ ☐

b. What is the 90% confidence interval for μ_d?

Subtract observation 2 from observation 1 for each pair to determine each difference.

The 90% confidence interval for μ_d is (☐,☐).
(Round to three decimal places as needed.)

c. What is the appropriate conclusion of the hypothesis test at $\alpha = 0.10$?

- A. Reject H_0. There is insufficient evidence to indicate that $\mu_d \neq 0$.
- B. Do not reject H_0. There is insufficient evidence to indicate that $\mu_d \neq 0$.
- C. Do not reject H_0. There is sufficient evidence to indicate that $\mu_d \neq 0$.
- D. Reject H_0. There is sufficient evidence to indicate that $\mu_d \neq 0$.

14. The data for a random sample of 8 paired observations are shown in the table to the right.

a. What are the appropriate null and alternative hypotheses to test whether the mean for population 2 is larger than that for population 1?
b. Conduct the test identified in part **a** using $\alpha = 0.05$.
c. Find a 95% confidence interval for μ_d. Interpret this result.
d. What assumptions are necessary to ensure the validity of this analysis?

Pair	Population 1	Population 2
1	24	31
2	20	23
3	29	31
4	60	66
5	40	41
6	59	60
7	31	37
8	54	57

a. What are the hypotheses for $\mu_d = (\mu_1 - \mu_2)$?

- A. $H_0: \mu_d = 0$, $H_a: \mu_d < 0$
- B. $H_0: \mu_d = 0$, $H_a: \mu_d \neq 0$
- C. $H_0: \mu_d \neq 0$, $H_a: \mu_d = 0$
- D. $H_0: \mu_d = 0$, $H_a: \mu_d > 0$
- E. $H_0: \mu_d > 0$, $H_a: \mu_d = 0$
- F. $H_0: \mu_d < 0$, $H_a: \mu_d = 0$

b. Identify the rejection region for testing the hypotheses from part **a**. Select the correct choice below and fill in the answer box to complete your choice.

(Round to three decimal places as needed.)

- A. $t <$ ☐
- B. $t >$ ☐
- C. $|t| >$ ☐

Calculate the test statistic.

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

Give the appropriate conclusion for the test.

[Reject / Do not reject] H_0. Since the test statistic [is / is not] in the rejection region, there is [sufficient / insufficient] evidence to conclude that the mean for population 2 is greater than that for population 1.

c. The confidence interval for μ_d is (☐,☐).
(Round to two decimal places as needed.)

14.
(cont.) Interpret this result.

The interval [falls below / contains / falls above] 0, which [does not provide / provides] evidence that the mean for population 2 is greater than that for population 1.

d. What conditions are required for the test results to be valid? Select all that apply.

- ☐ A. The populations being sampled are approximately normal.
- ☐ B. The population of differences is approximately normal.
- ☐ C. The variances of the two populations are approximately the same.
- ☐ D. No assumptions are required.

---

15. Construct a 90% confidence interval for $(p_1 - p_2)$ in each of the following situations.

a. $n_1 = 400$; $\hat{p}_1 = 0.63$; $n_2 = 400$; $\hat{p}_2 = 0.55$.
b. $n_1 = 180$; $\hat{p}_1 = 0.31$; $n_2 = 250$; $\hat{p}_2 = 0.22$.
c. $n_1 = 100$; $\hat{p}_1 = 0.47$; $n_2 = 120$; $\hat{p}_2 = 0.59$.

a. The 90% confidence interval for $(p_1 - p_2)$ is (☐,☐).
(Round to the nearest thousandth as needed.)

b. The 90% confidence interval for $(p_1 - p_2)$ is (☐,☐).
(Round to the nearest thousandth as needed.)

c. The 90% confidence interval for $(p_1 - p_2)$ is (☐,☐).
(Round to the nearest thousandth as needed.)

16. A newspaper reported the results of a survey on the planning habits of men and women. In response to the question "What is your preferred method of planning and keeping track of meetings, appointments, and deadlines?" 54% of the men and 43% of the women answered "I keep them in my head." A nationally representative sample of 1,000 adults participated in the survey; therefore, assume that 500 were men and 500 were women. Complete parts **a** through **e**.

a. Set up the null and alternative hypotheses for testing whether the percentage of men who prefer keeping track of appointments in their head, p_1, is larger than the corresponding percentage of women, p_2. Choose the correct answer below.

- A. $H_0: p_1 - p_2 = 0$ versus $H_a: p_1 - p_2 < 0$
- B. $H_0: p_1 - p_2 = 0$ versus $H_a: p_1 - p_2 > 0$
- C. $H_0: p_1 - p_2 = 0$ versus $H_a: p_1 - p_2 \neq 0$

b. Compute the test statistic for the test.

☐ (Round to two decimal places as needed.)

c. Give the rejection region for the test, using $\alpha = 0.10$. Select the correct choice below and fill in the answer box(es) within your choice.

(Round to two decimal places as needed.)

- A. $z < -$ ☐
- B. $z =$ ☐
- C. $z >$ ☐
- D. $z < -$ ☐ or $z >$ ☐

d. Find the p-value for the test.

The p-value for the test is ☐. (Round to four decimal places as needed.)

e. Make an appropriate conclusion. Choose the correct answer below.

- A. Since the p-value is less than the given value of α, there is insufficient evidence to reject H_0.
- B. Since the p-value is less than the given value of α, there is sufficient evidence to reject H_0.
- C. Since the p-value is greater than the given value of α, there is insufficient evidence to reject H_0.
- D. Since the p-value is greater than the given value of α, there is sufficient evidence to reject H_0.