The null and alternative hypotheses are given. Determine whether the hypothesis test is left-tailed, right-tailed, or two-tailed. What parameter is being tested?

H_0: $\sigma = 130$
H_1: $\sigma < 130$

Is the hypothesis test left-tailed, right-tailed, or two-tailed?

- Left-tailed test
- Two-tailed test
- Right-tailed test

What parameter is being tested?

- Population mean
- Population standard deviation
- Population proportion

#1

(a) Determine the null and alternative hypotheses, (b) explain what it would mean to make a type I error, and (c) explain what it would mean to make a type II error.

Three years ago, the mean price of a single-family home was \$243,717. A real estate broker believes that the mean price has increased since then.

#2

(a) Which of the following is the hypothesis test to be conducted?

- A. $H_0: \mu = \$243{,}717$; $H_1: \mu \neq \$243{,}717$
- B. $H_0: \mu = \$243{,}717$; $H_1: \mu > \$243{,}717$
- C. $H_0: \mu = \$243{,}717$; $H_1: \mu < \$243{,}717$

(b) Which of the following is a type I error?

- A. The broker rejects the hypothesis that the mean price is \$243,717, when it is the true mean cost.
- B. The broker fails to reject the hypothesis that the mean price is \$243,717, when the true mean price is greater than \$243,717.
- C. The broker rejects the hypothesis that the mean price is \$243,717, when the true mean price is greater than \$243,717.

(c) Which of the following is a type II error?

- A. The broker fails to reject the hypothesis that the mean price is \$243,717, when the true mean price is greater than \$243,717.
- B. The broker rejects the hypothesis that the mean price is \$243,717, when it is the true mean cost.
- C. The broker fails to reject the hypothesis that the mean price is \$243,717, when it is the true mean cost.

ding to the report, the mean monthly cell phone bill was \$48.15 three years ago. A researcher suspects that the mean monthly cell phone bill is different today.

#3

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

H_0: σ = \$48.15; H_1: σ < \$48.15

H_0: μ = \$48.15; H_1: $\mu \neq$ \$48.15

H_0: σ = \$48.15; H_1: $\sigma \neq$ \$48.15

H_0: μ = \$48.15; H_1: μ > \$48.15

plain what it would mean to make a Type I error. Choose the correct answer below.

The sample evidence did not lead the researcher to believe the mean monthly cell phone bill is different from \$48.15, when in fact the mean bill is different from \$48.15.

The sample evidence led the reseacher to believe the mean monthly cell phone bill is higher than \$48.15, when in fact the mean bill is \$48.15.

The sample evidence led the researcher to believe the mean monthly cell phone bill is different from \$48.15, when in fact the mean bill is \$48.15.

plain what it would mean to make a Type II error. Choose the correct answer below.

The sample evidence did not lead the researcher to believe the mean monthly cell phone bill is different from \$48.15, when in fact the mean bill is different from \$48.15.

The sample evidence did not lead the researcher to believe the mean monthly cell phone bill is higher than \$48.15, when in fact the mean bill is higher than \$48.15.

The sample evidence led the researcher to believe the mean monthly cell phone bill is different from \$48.15, when in fact the mean bill is different from \$48.15.

#4

Suppose the null hypothesis is rejected. State the conclusion based on the results of the test.

Three years ago, the mean price of a single-family home was $243,712. A real estate broker believes that the mean price has increased since then.

Which of the following is the correct conclusion?

- A. There is sufficient evidence to conclude that the mean price of a single-family home has not changed.
- B. There is not sufficient evidence to conclude that the mean price of a single-family home has not changed.
- C. There is sufficient evidence to conclude that the mean price of a single-family home has increased.
- D. There is not sufficient evidence to conclude that the mean price of a single-family home has increased.

The mean consumption of fruit three years ago was 98.7 pounds. A dietician believes that fruit consumption has risen since then.

#5

(a) Determine the null and alternative hypotheses. Which of the following is correct?

- A. $H_0: \mu = 98.7$; $H_1: \mu \neq 98.7$
- B. $H_0: \mu = 98.7$; $H_1: \mu > 98.7$
- C. $H_0: \mu = 98.7$; $H_1: \mu < 98.7$

(b) Suppose sample data indicate that the null hypothesis should be rejected. State the conclusion of the researcher. Which of the following is the conclusion that could be reached?

- A. There is sufficient evidence to conclude that the mean consumption of fruit has risen.
- B. There is not sufficient evidence to conclude that the mean consumption of fruit has stayed the same.
- C. There is sufficient evidence to conclude that the mean consumption of fruit has stayed the same.
- D. There is not sufficient evidence to conclude that the mean consumption of fruit has risen.

(c) Suppose, in fact, the mean consumption of fruits is 98.7 pounds. Did the researcher commit a type I or type II error?

- A. The researcher committed a type I error because he rejected the null hypothesis when it was true.
- B. The researcher committed a type II error because he accepted the alternative hypothesis when the null hypothesis was true.
- C. The researcher committed a type II error because he rejected the null hypothesis when it was true.
- D. The researcher committed a type I error because he accepted the alternative hypothesis when the null hypothesis was true.

If we tested this hypothesis at the $\alpha = 0.1$ level of significance, what is the probability of committing this error?

cturer of a certain engine treatment claims that if you add their product to your engine, it will be protected from excessive wear. An infomercial claims that a woman drove 3 hours without oil, thanks to the engine treatment. A
sted engines in which they added the treatment to the motor oil, ran the engines, drained the oil, and then determined the time until the engines seized. Complete parts (a) and (b) below.

ne the null and alternative hypotheses that the magazine will test.

6

▼ 3

▼ 3

ines took exactly 18 minutes to seize. What conclusion might the magazine make based on this evidence?

fomercial's claim is true.

fomercial's claim is not true.

A health administration recommends that individuals consume 1000 mg of calcium daily. After an advertising campaign aimed at male teenagers, a dairy association states that male teenagers consume more than the recommended daily amount of calcium. To support this statement, the association obtained a random sample of 40 male teenagers and found that the mean amount of calcium consumed was 1015 mg, with a standard deviation of 100 mg. Is there significant evidence to support the statement of the association at the $\alpha = 0.05$ level of significance?

Choose the correct hypotheses.

#7

H_0: ☐ ☐ 1000

H_1: ☐ ☐ 1000

Find the test statistic.

$t_0 =$ ☐

(Round to two decimal places as needed.)

Find the P-value.

The P-value is ☐.

(Round to three decimal places as needed.)

What conclusion can be drawn?

- A. Reject H_0. There is not sufficient evidence to conclude that male teenagers consume less than the recommended daily amount of calcium.
- B. Do not reject H_0. There is not sufficient evidence to conclude that male teenagers consume more than the recommended daily amount of calcium.
- C. Reject H_0. There is sufficient evidence to conclude that male teenagers consume less than the recommended daily amount of calcium.
- D. Do not reject H_0. There is sufficient evidence to conclude that male teenagers consume more than the recommended daily amount of calcium.

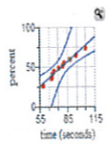
The mean waiting time at the drive-through of a fast-food restaurant from the time an order is placed to the time the order is received is 85.2 seconds. A manager devises a new drive-through system that she believes will decrease wait time. As a test, she initiates the new system at her restaurant and measures the wait time for 10 randomly selected orders. The wait times are provided in the table. Complete parts (a) and (b) below.

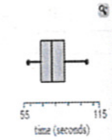
105.1	81.3
69.1	94.7
58.5	87.7
75.5	70.5
67.7	79.9

(a) Because the sample size is small, the manager must verify that the wait time is normally distributed and the sample does not contain any outliers.

The normal probability plot and boxplot are shown. Are the conditions for testing the hypothesis satisfied?

- A. No, the sample is not normally distributed and contains outliers.
- B. No, the sample contains outliers.
- C. Yes, the conditions are satisfied.
- D. No, the sample is not normally distributed.





(b) Is the new system effective? Conduct a hypothesis test using the P-value approach and a level of significance of $\alpha = 0.01$.

First determine the appropriate hypotheses.

H_0: ☐ ☐ 85.2
H_1: ☐ ☐ 85.2

Find the test statistic.

$t_0 = \square$
(Round to two decimal places as needed.)

Find the P-value.

#8

The P-value is $\square$.
(Round to three decimal places as needed.)

Use the $\alpha = 0.01$ level of significance. What can be concluded from the hypothesis test?

- A. The P-value is less than the level of significance so there is sufficient evidence to conclude the new system is effective.

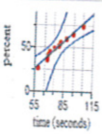
The mean waiting time at the drive-through of a fast-food restaurant from the time an order is placed to the time the order is received is 85.2 seconds. A manager devises a new drive-through system that she believes will decrease wait time. As a test, she initiates the new system at her restaurant and measures the wait time for 10 randomly selected orders. The wait times are provided in the table. Complete parts (a) and (b) below.

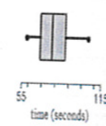
105.1	81.3
69.1	94.7
58.5	87.7
75.5	70.5
67.7	79.9

B. No, the sample contains outliers.

C. Yes, the conditions are satisfied.

D. No, the sample is not normally distributed.





(b) Is the new system effective? Conduct a hypothesis test using the P-value approach and a level of significance of $\alpha = 0.01$.

First determine the appropriate hypotheses.

H_0: ▼ ▼ 85.2
H_1: ▼ ▼ 85.2

Find the test statistic.

$t_0 = \square$
(Round to two decimal places as needed.)

#8 part 2

Find the P-value.

The P-value is $\square$.
(Round to three decimal places as needed.)

Use the $\alpha = 0.01$ level of significance. What can be concluded from the hypothesis test?

A. The P-value is less than the level of significance so there is sufficient evidence to conclude the new system is effective.

B. The P-value is greater than the level of significance so there is sufficient evidence to conclude the new system is effective.

C. The P-value is less than the level of significance so there is not sufficient evidence to conclude the new system is effective.

D. The P-value is greater than the level of significance so there is not sufficient evidence to conclude the new system is effective.

Real estate taxes are used to fund local education institutions, police protection, libraries, and other local public services. A household's real estate tax bill is based on the value of the house. In a recent year, the mean real estate tax bill per $1,000 assessed value for all households in a certain country was $8.62. A random sample of 50 rural households results in a sample mean real estate bill per $1,000 assessed value of $6.04 with a standard deviation of $5.95. Use the level of significance $\alpha = 0.05$. Complete parts (a) and (b).

(a) Based on the histogram and boxplot shown, why is a large sample necessary to conduct a hypothesis test about the mean?

Click the icon to view the graphs.

- A. The real estate tax bill distribution is roughly normal with outliers.
- B. The real estate tax bill distribution is skewed right with outliers.
- C. The real estate tax bill distribution is a uniform distribution.
- D. The real estate tax bill distribution is skewed left with outliers.

(b) Conduct a hypothesis test using the P-value approach and a level of significance of $\alpha = 0.05$ to determine if the evidence suggests the mean real estate bill for rural households per $1,000 assessed value differs from that of all households.

Choose the correct hypotheses.

H_0: ▾ ▾ 8.62
H_1: ▾ ▾ 8.62

Find the test statistic.

$t_0 = \square$
(Round to two decimal places as needed.)

Find the P-value.

The P-value is $\square$.
(Round to three decimal places as needed.)

Use the level of significance $\alpha = 0.05$. What can be concluded from the hypothesis test?

- A. The evidence suggests that rural households have a lower mean real estate tax bill.
- B. The evidence suggests that rural households have a different mean real estate tax bill.

#9

Real estate taxes are used to fund local education institutions, police protection, libraries, and other local public services. A household's real estate tax bill is based on the value of the house. In a recent year, the mean real estate tax bill per $1,000 assessed value for all households in a certain country was $8.62. A random sample of 50 rural households results in a sample mean real estate bill per $1,000 assessed value of $6.04 with a standard deviation of $5.95. Use the level of significance $\alpha = 0.05$. Complete parts (a) and (b).

- A. The real estate tax bill distribution is roughly normal with outliers.
- B. The real estate tax bill distribution is skewed right with outliers.
- C. The real estate tax bill distribution is a uniform distribution.
- D. The real estate tax bill distribution is skewed left with outliers.

(b) Conduct a hypothesis test using the P-value approach and a level of significance of $\alpha = 0.05$ to determine if the evidence suggests the mean real estate bill for rural households per $1,000 assessed value differs from that of all households.

Choose the correct hypotheses.

H_0: ▼ ▼ 8.62
H_1: ▼ ▼ 8.62

Find the test statistic.

$t_0 =$ ☐
(Round to two decimal places as needed.)

Find the P-value.

The P-value is ☐.
(Round to three decimal places as needed.)

Use the level of significance $\alpha = 0.05$. What can be concluded from the hypothesis test?

- A. The evidence suggests that rural households have a lower mean real estate tax bill.
- B. The evidence suggests that rural households have a different mean real estate tax bill.
- C. The evidence does not suggest that rural households have a different mean real estate tax bill.
- D. The evidence does not suggest that rural households have a lower mean real estate tax bill.

#9
Part 2

A math teacher claims that she has developed a review course that increases the scores of students on the math portion of a college entrance exam. Based on data from the administrator of the exam, scores are normally distributed with $\mu = 517$. The teacher obtains a random sample of 1800 students, puts them through the review class, and finds that the mean math score of the 1800 students is 524 with a standard deviation of 118. Complete parts (a) through (d) below.

(a) State the null and alternative hypotheses. Let μ be the mean score. Choose the correct answer below.

- A. $H_0: \mu = 517, H_1: \mu > 517$
- B. $H_0: \mu < 517, H_1: \mu > 517$
- C. $H_0: \mu > 517, H_1: \mu \neq 517$
- D. $H_0: \mu = 517, H_1: \mu \neq 517$

(b) Test the hypothesis at the $\alpha = 0.10$ level of significance. Is a mean math score of 524 statistically significantly higher than 517? Conduct a hypothesis test using the P-value approach.

Find the test statistic.

$t_0 = \square$

(Round to two decimal places as needed.)

Find the P-value.

The P-value is $\square$.

(Round to three decimal places as needed.)

#10

Is the sample mean statistically significantly higher?

- Yes
- No

(c) Do you think that a mean math score of 524 versus 517 will affect the decision of a school admissions administrator? In other words, does the increase in the score have any practical significance?

- No, because the score became only 1.35% greater.
- Yes, because every increase in score is practically significant.

(d) Test the hypothesis at the $\alpha = 0.10$ level of significance with $n = 400$ students. Assume that the sample mean is still 524 and the sample standard deviation is still 118. Is a sample mean of 524 significantly more than 517? Conduct a hypothesis test using the P-value approach.

A math teacher claims that she has developed a review course that increases the scores of students on the math portion of a college entrance exam. Based on data from the administrator of the exam, scores are normally distributed with $\mu = 517$. The teacher obtains a random sample of 1800 students, puts them through the review class, and finds that the mean math score of the 1800 students is 524 with a standard deviation of 118. Complete parts (a) through (d) below.

○ No

(c) Do you think that a mean math score of 524 versus 517 will affect the decision of a school admissions administrator? In other words, does the increase in the score have any practical significance?

○ No, because the score became only 1.35% greater.

○ Yes, because every increase in score is practically significant.

(d) Test the hypothesis at the $\alpha = 0.10$ level of significance with $n = 400$ students. Assume that the sample mean is still 524 and the sample standard deviation is still 118. Is a sample mean of 524 significantly more than 517? Conduct a hypothesis test using the P-value approach.

Find the test statistic.

$t_0 = \square$
(Round to two decimal places as needed.)

Find the P-value.

The P-value is $\square$.
(Round to three decimal places as needed.)

#10 part 2

Is the sample mean statistically significantly higher?

○ No

○ Yes

What do you conclude about the impact of large samples on the P-value?

○ A. As n increases, the likelihood of rejecting the null hypothesis increases. However, large samples tend to overemphasize practically insignificant differences.

○ B. As n increases, the likelihood of not rejecting the null hypothesis increases. However, large samples tend to overemphasize practically significant differences.

○ C. As n increases, the likelihood of rejecting the null hypothesis increases. However, large samples tend to overemphasize practically significant differences.

○ D. As n increases, the likelihood of not rejecting the null hypothesis increases. However, large samples tend to overemphasize practically insignificant differences.

Based on interviews with 87 SARS patients, researchers found that the mean incubation period was 4.2 days, with a standard deviation of 14.8 days. Based on this information, construct a 95% confidence interval for the mean incubation period of the SARS virus. Interpret the interval.

The lower bound is ☐ days. (Round to two decimal places as needed.)

The upper bound is ☐

#77

what is the confidence interval

☐

Compute the critical value $z_{\alpha/2}$ that corresponds to a 94% level of confidence.

$z_{\alpha/2} = \square$

(Round to two decimal places as needed.)

#12

A researcher wishes to estimate the proportion of adults who have high-speed Internet access. What size sample should be obtained if she wishes the estimate to be within 0.04 with 95% confidence if
(a) she uses a previous estimate of 0.36?
(b) she does not use any prior estimates?

(a) $n = \square$ (Round up to the nearest integer.)

(b) $n = \square$

#13