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1. When the clinical trial of the XSORT method of gender selection is completed, a formal hypothesis test will be conducted with the alternative hypothesis of $p > 0.5$, which corresponds to the claim that the XSORT method increases the likelihood of having a girl, so that the proportion of girls is greater than 0.5. If you are responsible for developing the XSORT method and you want to show its effectiveness, which of the following P-values whould you prefer?

Choose the correct answer below.

- ○ A. 0.999
- ○ B. 0.95
- ○ C. 0.05
- ○ D. 0.01
- ○ E. 0.001
- ○ F. 0.5

2. Make a decision about the given claim. Do not use any formal procedures and exact calculations. Use only the rare event rule.

Claim: A coin favors heads when tossed, and there are 10 heads in 18 tosses.

Which of the following is correct?

- ○ A. There is not sufficient evidence to support the claim because there are substantially more heads than tails.
- ○ B. There is not sufficient evidence to support the claim because there are not substantially more heads than tails.
- ○ C. There does appear to be sufficient evidence to support the claim because there are not substantially more heads than tails.
- ○ D. There does appear to be sufficient evidence to support the claim because there are substantially more heads than tails.

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3. Make a decision about the given claim. Use only the rare event rule, and make subjective estimates to determine whether events are likely. For example, if the claim is that a coin favors heads and sample results consist of 11 heads in 20 flips, conclude that there is not sufficient evidence to support the claim that the coin favors heads (because it is easy to get 11 heads in 20 flips by chance with a fair coin).

Claim: The mean IQ score of students in a large math class is less than 123. A simple random sample of the students has a mean IQ score of 95.4.

Choose the correct answer below.

- ○A. Since the event is likely if the claim were true, there is not sufficient evidence to support the claim.
- ○B. Since the event is not likely if the claim were true, there is sufficient evidence to support the claim.
- ○C. Since the event is not likely if the claim were true, there is not sufficient evidence to support the claim.
- ○D. Since the event is likely if the claim were true, there is sufficient evidence to support the claim.

4. Examine the given statement, then express the null hypothesis H_0 and the alternative hypothesis H_1 in symbolic form.

The mean weight of women who won a beauty pageant is equal to 124 lb.

Which of the following is the hypothesis test to be conducted?

- ○A. $H_0: \mu = 124$
 $H_1: \mu \neq 124$
- ○B. $H_0: \mu \neq 124$
 $H_1: \mu = 124$
- ○C. $H_0: \mu = 124$
 $H_1: \mu < 124$
- ○D. $H_0: \mu < 124$
 $H_1: \mu = 124$
- ○E. $H_0: \mu > 124$
 $H_1: \mu = 124$
- ○F. $H_0: \mu = 124$
 $H_1: \mu > 124$

5. Examine the given statement, then express the null hypothesis H_0 and the alternative hypothesis H_1 in symbolic form.

High school teachers have incomes with a standard deviation that is more than $20,000.

Which of the following is the hypothesis test to be conducted?

- ○A. $H_0: \sigma = \$20{,}000$
 $H_1: \sigma < \$20{,}000$
- ○B. $H_0: \sigma = \$20{,}000$
 $H_1: \sigma \neq \$20{,}000$
- ○C. $H_0: \sigma = \$20{,}000$
 $H_1: \sigma > \$20{,}000$
- ○D. $H_0: \sigma < \$20{,}000$
 $H_1: \sigma = \$20{,}000$
- ○E. $H_0: \sigma > \$20{,}000$
 $H_1: \sigma = \$20{,}000$
- ○F. $H_0: \sigma \neq \$20{,}000$
 $H_1: \sigma = \$20{,}000$

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6. Examine the given statement, then express the null hypothesis H_0 and the alternative hypothesis H_1 in symbolic form.

More than 28% of Internet users pay bills online.

Which of the following is the hypothesis test to be conducted?

A. $H_0: p > 0.28$
$H_1: p = 0.28$

B. $H_0: p < 0.28$
$H_1: p = 0.28$

C. $H_0: p = 0.28$
$H_1: p \neq 0.28$

D. $H_0: p = 0.28$
$H_1: p > 0.28$

E. $H_0: p \neq 0.28$
$H_1: p = 0.28$

F. $H_0: p = 0.28$
$H_1: p < 0.28$

7. Find the critical z values. Assume that the normal distribution applies.

Two-tailed test; $\alpha = 0.02$

$z =$ ☐
(Round to two decimal places as needed. Use a comma to separate answers as needed.)

8. Find the critical z values. Assume that the normal distribution applies.

Right-tailed test; $\alpha = 0.02$

$z =$ ☐
(Round to two decimal places as needed. Use a comma to separate answers as needed.)

9. Find the critical z values. Assume that the normal distribution applies.

$\alpha = 0.005$; H_1 is $p < 0.21$

$z =$ ☐
(Round to two decimal places as needed. Use a comma to separate answers as needed.)

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10. Use the information given below to find the P-value. Also, use a 0.05 significance level and state the conclusion about the null hypothesis (reject the null hypothesis or fail to reject the null hypothesis).

The test statistic in a left-tailed test is $z = -1.80$.

What is the P-value?

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

State the conclusion about the null hypothesis. Choose the correct answer below.

- ○A. Fail to reject the null hypothesis. The P-value is greater than the level of significance.
- ○B. Reject the null hypothesis. The P-value is greater than the level of significance.
- ○C. Fail to reject the null hypothesis. The P-value is less than the level of significance.
- ○D. Reject the null hypothesis. The P-value is less than the level of significance.

11. Use the given information to find the P-value.

With $H_1: p \neq 1/5$, the test statistic is $z = -1.23$.

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

12. State the final conclusion in simple nontechnical terms.

Original claim: The proportion of male golfers is more than 0.4.
Initial conclusion: Fail to reject the null hypothesis.

Which of the following is the correct conclusion?

- ○A. There is sufficient evidence to support the claim that the proportion of male golfers is more than 0.4.
- ○B. There is not sufficient evidence to support the claim that the proportion of male golfers is more than 0.4.

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13. Identify the type I error and the type II error that corresponds to the given hypothesis.

The proportion of settled medical malpractice suits is 0.25.

Which of the following is a type I error?

- ○A. Reject the claim that the proportion of settled malpractice suits is 0.25 when the proportion is actually 0.25.
- ○B. Fail to reject the claim that the proportion of settled malpractice suits is 0.25 when the proportion is actually 0.25.
- ○C. Fail to reject the claim that the proportion of settled malpractice suits is 0.25 when the proportion is actually different from 0.25.
- ○D. Reject the claim that the proportion of settled malpractice suits is 0.25 when the proportion is actually different from 0.25.

Which of the following is a type II error?

- ○A. Fail to reject the claim that the proportion of settled malpractice suits is 0.25 when the proportion is actually 0.25.
- ○B. Fail to reject the claim that the proportion of settled malpractice suits is 0.25 when the proportion is actually different from 0.25.
- ○C. Reject the claim that the proportion of settled malpractice suits is 0.25 when the proportion is actually 0.25.
- ○D. Reject the claim that the proportion of settled malpractice suits is 0.25 when the proportion is actually different from 0.25.

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14. In a study of 12,000 car crashes, it was found that 6024 of them occurred within 5 miles of home (based on insurance company data). Use a 0.01 significance level to test the claim that more than 50% of car crashes occur within 5 miles of home. Use this information to answer the following questions.

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

A. $H_0: p < 0.5$
$H_1: p = 0.5$

B. $H_0: p = 0.5$
$H_1: p < 0.5$

C. $H_0: p \neq 0.5$
$H_1: p = 0.5$

D. $H_0: p > 0.5$
$H_1: p = 0.5$

E. $H_0: p = 0.5$
$H_1: p \neq 0.5$

F. $H_0: p = 0.5$
$H_1: p > 0.5$

b. What is the test statistic?

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

c. What is the P-value?

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

d. What is the conclusion?

- There is sufficient evidence to support the claim that more than 50% of car crashes occur within 5 miles of home.
- There is not sufficient evidence to support the claim that more than 50% of car crashes occur within 5 miles of home.

e. Are the results questionable because they are based on a survey sponsored by an insurance company?

A. The results are not questionable because there are so many samples in the study.

B. The results might be questionable because the sponsor might have a self-serving interest in the results.

C. The results are not questionable as long as the null hypothesis is not rejected.

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15. In a recent poll of 750 randomly selected adults, 589 said that it is morally wrong to not report all income on tax returns. Use a 0.05 significance level to test the claim that 75% of adults say that it is morally wrong to not report all income on tax returns. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. Use the P-value method. Use the normal distribution as an approximation of the binomial distribution.

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

A. $H_0: p = 0.25$
$H_1: p < 0.25$

B. $H_0: p = 0.75$
$H_1: p > 0.75$

C. $H_0: p = 0.25$
$H_1: p > 0.25$

D. $H_0: p = 0.75$
$H_1: p < 0.75$

E. $H_0: p = 0.75$
$H_1: p \neq 0.75$

F. $H_0: p = 0.25$
$H_1: p \neq 0.25$

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

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

Identify the conclusion about the null hypothesis and the final conclusion that addresses the original claim.

☐ H_0. There ☐ sufficient evidence to warrant rejection of the claim that 75% of adults say that it is morally wrong not to report all income on tax returns.

16. In a study of 420,066 cell phone users, 177 subjects developed brain cancer. Test the claim that cell phone users develop brain cancer at a rate that is different from the rate of 0.0340% for people who do not use cell phones. Because this issue has such great importance, use a 0.005 significance level. Use this information to answer the following questions.

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

A. $H_0: p = 0.00034$
$H_1: p < 0.00034$

B. $H_0: p = 0.00034$
$H_1: p \neq 0.00034$

C. $H_0: p > 0.00034$
$H_1: p = 0.00034$

D. $H_0: p = 0.00034$
$H_1: p > 0.00034$

E. $H_0: p \neq 0.00034$
$H_1: p = 0.00034$

F. $H_0: p < 0.00034$
$H_1: p = 0.00034$

b. What is the test statistic?

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

c. What is the P-value?

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

d. What is the conclusion?

- There is sufficient evidence to support the claim that cell phone users develop brain cancer at a rate that is different from the rate of 0.0340% for people who do not use cell phones.
- There is not sufficient evidence to support the claim that cell phone users develop brain cancer at a rate that is different from the rate of 0.0340% for people who do not use cell phones.

e. Should cell phone users be concerned about brain cancer?

A. Yes, the study suggests that a cell phone user is at a higher risk for brain cancer than a non cell phone user.

B. No, the study does not suggest that a cell phone user is at a higher risk for brain cancer than a non cell phone user.

C. No conclusion is possible because the percentage of the population that develops brain cancer is very small.

17. In a study of pregnant women and their ability to correctly predict the sex of their baby, 59 of the pregnant women had 12 years of education or less, and 42.4% of them correctly predicted the sex of their baby. Use a 0.01 significance level to test the claim that these women have no ability to predict the sex of their baby, and the results are not significantly different from those that would be expected with random guesses. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim. Use the P-value method. Use the normal distribution as an approximation of the binomial distribution.

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

A. $H_0: p = 0.5$
$H_1: p > 0.5$

B. $H_0: p = 0.424$
$H_1: p \neq 0.424$

C. $H_0: p = 0.424$
$H_1: p < 0.424$

D. $H_0: p = 0.5$
$H_1: p < 0.5$

E. $H_0: p = 0.424$
$H_1: p > 0.424$

F. $H_0: p = 0.5$
$H_1: p \neq 0.5$

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

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

Identify the conclusion about the null hypothesis and the final conclusion that addresses the original claim.

☐ H_0. There ☐ sufficient evidence to warrant rejection of the claim that these women have no ability to predict the sex of their baby. The results for these women with 12 years of education or less suggests that their percentage of correct predictions ☐ very different from results expected with random guesses.

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18. Test the claim that 9% of a candy maker's candies are red. Use a 0.05 significance level. Use the data in the table to the right to answer the following questions.

Weights (g) of a Sample Bag of Candy

Red	Blue	Brown	Green	Yellow
0.997	0.799	0.965	0.859	0.963
0.743	0.967	0.754	0.792	0.904
0.756	0.964	0.849	0.863	0.707
0.953	0.841	0.894	0.765	0.796
0.777	0.848	0.856	0.779	0.977
0.998	0.802	0.948	0.776	0.916
0.896	0.992	0.845	0.891	0.799
0.804	0.703	0.954	0.948	
0.748	0.955	0.977		
0.768		0.921		

a. Find the sample proportion of candies that are red.

red = ☐

(Round to three decimal places as needed.)

b. Which of the following is the hypothesis test to be conducted?

- ○A. $H_0: p < 0.09$, $H_1: p = 0.09$
- ○B. $H_0: p = 0.09$, $H_1: p < 0.09$
- ○C. $H_0: p = 0.09$, $H_1: p \neq 0.09$
- ○D. $H_0: p \neq 0.09$, $H_1: p = 0.09$
- ○E. $H_0: p > 0.09$, $H_1: p = 0.09$
- ○F. $H_0: p = 0.09$, $H_1: p > 0.09$

c. What is the test statistic?

z = ☐

(Round two decimal places as needed.)

d. What is the P-value?

P-value = ☐

(Round to four decimal places as needed.)

e. Use the results above to test the claim that 9% of the candy maker's candies are red.

- ○ There is not sufficient evidence to warrant rejection of the claim that 9% of the candy maker's candies are red.
- ○ There is sufficient evidence to warrant rejection of the claim that 9% of the candy maker's candies are red.

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19. Test the following claim. Identify the null hypothesis, alternative hypothesis, test statistic, critical value(s), conclusion about the null hypothesis, and final conclusion that addresses the original claim.

A manual states that in order to be a hit, a song must be no longer than three minutes and ten seconds (or 190 seconds). A simple random sample of 40 current hit songs results in a mean length of 252.5 sec. Assume the population standard deviation of song lengths is 53.5 sec. Use a 0.01 significance level to test the claim that the sample is from a population of songs with a mean greater than 190 sec. What do these result suggest about the advice given in the manual?

What are the null and alternative hypotheses?

○A. $H_0: \mu < 190$ sec
$H_1: \mu > 190$ sec

○B. $H_0: \mu > 190$ sec
$H_1: \mu = 190$ sec

○C. $H_0: \mu > 190$ sec
$H_1: \mu < 190$ sec

○D. $H_0: \mu = 190$ sec
$H_1: \mu > 190$ sec

What is the value of the test statistic?

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

Identify the critical value(s) of z.

$z =$ ☐
(Round to two decimal places as needed. Use a comma to separate answers as needed.)

☐ H_0. There ☐ sufficient evidence to support the claim that the sample is from a population of songs with a mean greater than 190 sec. This result suggest that the advice given in the manual ☐ sound.

20. A sample of 27 blue jellybeans with a mean weight of 0.8590 g was taken. Assume that σ is known to be 0.0565 g. Consider a hypothesis test that uses a 0.05 significance level to test the claim that the mean weight of all jellybeans is equal to 0.8565 g (the weight necessary so that bags of jellybeans have the weight printed on the package). Assume the weight of jellybeans is normally distributed.

(a) What is the test statistic?

☐ (Round to two decimal places as needed.)

(b) What are the critical values?

☐

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

(c) What is the P-value?

☐ (Round to four decimal places as needed.)

(d) What is the final conclusion?

- ○A. Fail to reject H_0. There is not sufficient evidence to warrant rejection of the claim that the mean weight of jellybeans is equal to 0.8565 g.
- ○B. Fail to reject H_0. There is sufficient evidence to warrant rejection of the claim that the mean weight of jellybeans is equal to 0.8565 g.
- ○C. Reject H_0. There is sufficient evidence to warrant rejection of the claim that the mean weight of jellybeans is equal to 0.8565 g.
- ○D. Reject H_0. There is not sufficient evidence to warrant rejection of the claim that the mean weight of jellybeans is equal to 0.8565 g.

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21. When 14 different second-year medical students measured the systolic blood pressure of the same person, they obtained the results listed below (in mmHg). Assuming that the population standard deviation is known to be 10 mmHg, use a 0.05 significance level to test the claim that the mean blood pressure level is less than 140 mmHg. Hypertension is defined to be a blood pressure level that is too high because it is 140 mmHg or greater. Assume the blood pressure levels are normally distributed. Based on the hypothesis test results, can it be safely concluded that the person does not have hypertension?

138 140 135 140 120 125 130 130 140 144 143 130 140 150

(a) Identify the null hypothesis and alternative hypothesis.

A. $H_0: \mu = 140$ versus $H_1: \mu \neq 140$

B. $H_0: \mu = 140$ versus $H_1: \mu < 140$

C. $H_0: \mu = 140$ versus $H_1: \mu > 140$

(b) Identify the test statistic.

☐

(Round the final answer to two decimal places as needed. Round all intermediate values to two decimal places.)

(c) Identify the P-value.

☐ (Round to four decimal places as needed.)

(d) What is the final conclusion?

A. Fail to reject H_0. There is sufficient evidence to support the claim.

B. Fail to reject H_0. There is not sufficient evidence to support the claim.

C. Reject H_0. There is not sufficient evidence to support the claim.

D. Reject H_0. There is sufficient evidence to support the claim.

(e) Can it be safely concluded that the person does not have hypertension?

○ No

○ Yes

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22. Test the following claim. Identify the null hypothesis, alternative hypothesis, test statistic, P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

A simple random sample of 55 screws supplied by a certain manufacturer is obtained, and the length of each screw is measured. The sample mean is found to be 0.872 in. Assume that the standard deviation of all such lengths is 0.018 in, and use a 0.05 significance level to test the claim that the screws have a mean length equal to 7 / 8 in (or 0.875 in), as indicated on the package labels. Do the screw lengths appear to be consistent with the package label?

What are the null and alternative hypotheses?

A. $H_0: \mu = 0.875$
$H_1: \mu > 0.875$

B. $H_0: \mu = 0.875$
$H_1: \mu < 0.875$

C. $H_0: \mu = 0.875$
$H_1: \mu \neq 0.875$

D. $H_0: \mu \neq 0.875$
$H_1: \mu = 0.875$

What is the value of the test statistic?

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

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

☐ H_0. There ☐ sufficient evidence to warrant rejection of the claim that the screws have a mean length equal to 0.875 in, as indicated on the package labels.

23. Determine whether the following hypothesis test involves a sampling distribution of means that is a normal distribution, Student t distribution, or neither.

Claim: $\mu = 2.27$. Sample data: $n = 32$, $\bar{x} = 4.64$, $s = 0.84$. The sample data comes from a population that is normally distributed with unknown μ and σ.

What kind of sampling distribution of means does the hypothesis test involve?

A. Student t distribution

B. Neither Student t nor normal distribution

C. Normal distribution

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24. Determine whether the hypothesis test involves a sampling distribution of means that is a normal distribution, Student t distribution, or neither.

Claim about the diameter of a steel rod: $\mu < 0.22$ in. Sample data: $n = 45$, $\bar{x} = 0.12$ in, $s = 0.28$ in. The sample data appear to come from a population with a distribution that is very far from normal, and σ is unknown.

What kind of sampling distribution does the hypothesis test involve?

- ○ Neither normal nor Student t
- ○ Normal
- ○ Student t

25. Assume that a simple random sample has been selected from a normally distributed population and test the given claim. Identify the null and alternative hypotheses, test statistic, P-value, critical value(s), and state the final conclusion that addresses the original claim.

A simple random sample of 25 filtered 100 mm cigarettes is obtained, and the tar content of each cigarette is measured. The sample has a mean of 19.0 mg and a standard deviation of 3.77 mg. Use a 0.05 significance level to test the claim that the mean tar content of filtered 100 mm cigarettes is less than 21.1 mg, which is the mean for unfiltered king size cigarettes. What do the results suggest, if anything, about the effectiveness of the filters?

What are the hypotheses?

○A. $H_0: \mu > 21.1$ mg
$H_1: \mu < 21.1$ mg

○B. $H_0: \mu < 21.1$ mg
$H_1: \mu \geq 21.1$ mg

○C. $H_0: \mu = 21.1$ mg
$H_1: \mu \geq 21.1$ mg

○D. $H_0: \mu = 21.1$ mg
$H_1: \mu < 21.1$ mg

Identify the test statistic.

☐ (Round to three decimal places as needed.)

Identify the P-value.

☐ (Round to four decimal places as needed.)

Identify the critical value(s).

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

State the final conclusion that addresses the original claim. Choose the correct answer below.

○A. Reject H_0. There is sufficient evidence to support the claim that the mean tar content of filtered 100 mm cigarettes is less than 21.1 mg.

○B. Fail to reject H_0. There is sufficient evidence to support the claim that the mean tar content of filtered 100 mm cigarettes is less than 21.1 mg.

○C. Fail to reject H_0. There is insufficient evidence to support the claim that the mean tar content of filtered 100 mm cigarettes is less than 21.1 mg.

○D. Reject H_0. There is insufficient evidence to support the claim that the mean tar content of filtered 100 mm cigarettes is less than 21.1 mg.

What do the results suggest, if anything, about the effectiveness of the filters?

25. (cont.)

A. The results do not suggest that the filters are not effective.

B. The results suggest that the filtered cigarettes have the same tar content as unfiltered king size cigarettes.

C. The results do not suggest that the filters are effective.

D. The results suggest that the filters increase the tar content.

E. The results are inconclusive because the sample size is less than 30.

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26. For the following claim, find the null and alternative hypotheses, test statistic, P-value, critical value, and draw a conclusion. Assume that a simple random sample has been selected from a normally distributed population. Answer parts **a-e.**

Claim: The mean IQ score of statistics professors is less than 129.
Sample data: $n = 14$, $\bar{x} = 133$, $s = 3$. The significance level is $\alpha = 0.05$.

a. Choose the correct null hypothesis (H_0) and alternative hypothesis (H_1).

- ○ A. $H_0: \mu < 129$ $H_1: \mu = 129$
- ○ B. $H_0: \mu = 129$ $H_1: \mu < 129$
- ○ C. $H_0: \mu < 129$ $H_1: \mu > 129$
- ○ D. $H_0: \mu = 129$ $H_1: \mu \neq 129$

b. Determine the test statistic t.

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

c. Find the P-value.

Choose the correct range of P-values.

- ○ A. 0.05 < P-value < 0.10
- ○ B. 0.01 < P-value < 0.025
- ○ C. 0.005 < P-value < 0.01
- ○ D. 0.025 < P-value < 0.05
- ○ E. P-value > 0.10
- ○ F. P-value < 0.005

d. Find the critical value using a t-distribution table.

☐ (Round to three decimal places as needed.)

e. What is the conclusion?

- ○ A. Fail to reject the null hypothesis and do not support the claim that $\mu < 129$.
- ○ B. Reject the null hypothesis and do not support the claim that $\mu < 129$.
- ○ C. Fail to reject the null hypothesis and support the claim that $\mu < 129$.
- ○ D. Reject the null hypothesis and support the claim that $\mu < 129$.

27. The heights were measured for nine supermodels. They have a mean of 66.9 in. and a standard deviation of 1.5 in. Use the traditional method and a 0.01 significance level to test the claim that supermodels have heights with a mean that is greater than the mean of 63.6 in. for women from the general population.

Choose the correct answer below.

- ○A. Reject H_0 since the test statistic 6.600 is greater than the critical value 2.896.
- ○B. Do not reject H_0 since the test statistic 0.152 is not greater than the critical value 2.896.
- ○C. Reject H_0 since the test statistic 0.152 is not greater than the critical value 2.896.
- ○D. Do not reject H_0 since the test statistic 6.600 is greater than the critical value 2.896.

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28. Assume that a simple random sample has been selected from a normally distributed population and test the given claim. Identify the null and alternative hypotheses, test statistic, P-value, critical value(s), and state the final conclusion that addresses the original claim.

A safety administration conducted crash tests of child booster seats for cars. Listed below are results from those tests, with the measurements given in hic (standard head injury condition units). The safety requirement is that the hic measurement should be less than 1000 hic. Use a 0.05 significance level to test the claim that the sample is from a population with a mean less than 1000 hic. Do the results suggest that all of the child booster seats meet the specified requirement?

718 670 1168 638 580 666

What are the hypotheses?

A. $H_0: \mu > 1000$ hic
$H_1: \mu < 1000$ hic

B. $H_0: \mu = 1000$ hic
$H_1: \mu < 1000$ hic

C. $H_0: \mu = 1000$ hic
$H_1: \mu \geq 1000$ hic

D. $H_0: \mu < 1000$ hic
$H_1: \mu \geq 1000$ hic

Identify the test statistic.

☐ (Round to three decimal places as needed.)

Identify the P-value.

☐ (Round to four decimal places as needed.)

Identify the critical value(s).

☐

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

State the final conclusion that addresses the original claim.

☐ H_0. There is ☐ evidence to support the claim that the sample is from a population with a mean less than 1000 hic.

Do the results suggest that all of the child booster seats meet the specified requirement?

A. The results are inconclusive.

B. Yes, because the majority of the sample measurements are less than 1000 hic.

C. There is strong evidence that the mean is less than 1000 hic, but one of the booster seats has a measurement that is greater than 1000 hic.

D. There is not strong evidence that the mean is less than 1000 hic, and one of the booster seats has a measurement that is greater than 1000 hic.

29. Calculate the test statistic, find the critical value(s) of χ^2, and use a χ^2 distribution table to find the limits containing the P-value. Determine whether there is sufficient evidence to support the given alternative hypothesis.

Test H_0: $\sigma = 18$ versus H_1: $\sigma < 18$, given that $\alpha = 0.01$, $n = 18$, and $s = 14$.

Compute the test statistic.

$\chi^2 =$ ☐ (Round to three decimal places as needed.)

Find the critical value(s).

☐

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

Find the limits containing the P-value.

- ○A. $0.1 < \text{P-value} < 0.9$
- ○B. $0.01 < \text{P-value} < 0.025$
- ○C. $0.005 < \text{P-value} < 0.01$
- ○D. $0.05 < \text{P-value} < 0.1$

Is there sufficient evidence to support the alternative hypothesis?

- ○A. Yes, because the test statistic is within the critical region and the P-value is less than or equal to the level of significance.
- ○B. No, because the test statistic is outside the critical region and the P-value is greater than the level of significance.
- ○C. Yes, because the test statistic is outside the critical region and the P-value is greater than the level of significance.
- ○D. No, because the test statistic is within the critical region and the P-value is less than or equal to the level of significance.

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30. Use a 0.025 significance level to test the claim that peanut candies have weights that vary more than plain candies. The standard deviation for the weights of plain candies is 0.166. A sample of 91 peanut candies has weights with a standard deviation of 0.31.

Do peanut candies have weights that vary more than those of plain candies?

- A. Since H_0: $\sigma > 0.166$ is rejected, the weights vary more for peanut candies.
- B. Since H_0: $\sigma = 0.166$ is not rejected, the weights do not vary more for peanut candies.
- C. Since H_0: $\sigma = 0.166$ is rejected, the weights vary more for peanut candies.
- D. Since H_0: $\sigma > 0.166$ is not rejected, the weights do not vary more for peanut candies.

31. A simple random sample of pulse rates of 25 women from a normally distributed population results in a standard deviation of 13.1 beats per minute. The normal range of pulse rates of adults is typically given as 60 to 100 beats per minute. If the range rule of thumb is applied to that normal range, the result is a standard deviation of 10 beats per minute. Use the sample results with a 0.01 significance level to test the claim that pulse rates of women have a standard deviation equal to 10 beats per minute.

[ ] H_0. There [ ] sufficient evidence to warrant rejection of the claim that pulse rates of women have a standard deviation equal to 10 beats per minute.