Chapter 8 Worksheet

Math 160

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve the problem.

1) What do you conclude about the claim below? Do not use formal procedures or exact calculations. Use only the rare event rule and make a subjective estimate to determine whether the event is likely. 1) _____

Claim: An employee of a company is equally likely to take a sick day on any day of the week. Last year, the total number of sick days taken by all the employees of the company was 143. Of these, 52 were Mondays, 14 were Tuesdays, 17 were Wednesdays, 17 were Thursdays, and 43 were Fridays.

2) Write the claim that is suggested by the given statement, then write a conclusion about the claim. Do not use symbolic expressions or formal procedures; use common sense. 2) _____

A math teacher tries a new method for teaching her introductory statistics class. Last year the mean score on the final test was 73. This year the mean on the same final was 76.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Express the null hypothesis and the alternative hypothesis in symbolic form. Use the correct symbol (μ, p, σ) for the indicated parameter.

3) An entomologist writes an article in a scientific journal which claims that fewer than 14 in ten thousand male fireflies are unable to produce light due to a genetic mutation. Use the parameter p, the true proportion of fireflies unable to produce light. 3) _____

A) $H_0: p < 0.0014$ $H_1: p \geq 0.0014$

B) $H_0: p = 0.0014$ $H_1: p < 0.0014$

C) $H_0: p > 0.0014$ $H_1: p \leq 0.0014$

D) $H_0: p = 0.0014$ $H_1: p > 0.0014$

4) A psychologist claims that more than 6.1 percent of the population suffers from professional problems due to extreme shyness. Use p, the true percentage of the population that suffers from extreme shyness. 4) _____

A) $H_0: p < 6.1\%$ $H_1: p \geq 6.1\%$

B) $H_0: p > 6.1\%$ $H_1: p \leq 6.1\%$

C) $H_0: p = 6.1\%$ $H_1: p > 6.1\%$

D) $H_0: p = 6.1\%$ $H_1: p < 6.1\%$

5) A researcher claims that 62% of voters favor gun control. 5) _____

A) $H_0: p \neq 0.62$ $H_1: p = 0.62$

B) $H_0: p < 0.62$ $H_1: p \geq 0.62$

C) $H_0: p \geq 0.62$ $H_1: p < 0.62$

D) $H_0: p = 0.62$ $H_1: p \neq 0.62$

Assume that the data has a normal distribution and the number of observations is greater than fifty. Find the critical z value used to test a null hypothesis.

6) $\alpha = 0.05$ for a two–tailed test. 6) _____

A) ±1.96 B) ±2.575 C) ±1.645 D) ±1.764

7) $\alpha = 0.09$ for a right–tailed test. 7) _____

A) 1.34 B) ±1.96 C) ±1.34 D) 1.96

8) $\alpha = 0.05$ for a left–tailed test. 8) _____

A) –1.645 B) ±1.96 C) ±1.645 D) –1.96

9) $\alpha = 0.08$; H_1 is $\mu \neq 3.24$ 9) _____

A) ±1.75 B) ±1.41 C) 1.41 D) 1.75

Find the value of the test statistic z using $z = \dfrac{\hat{p} - p}{\sqrt{\dfrac{pq}{n}}}$ **.**

10) A claim is made that the proportion of children who play sports is less than 0.5, and the sample statistics include n = 1469 subjects with 30% saying that they play a sport. 10) _____

A) –31.29 B) –15.33 C) 15.33 D) 31.29

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

11) The claim is that the proportion of accidental deaths of the elderly attributable to residential falls is more than 0.10, and the sample statistics include n = 800 deaths of the elderly with 15% of them attributable to residential falls. 11) _____

A) 3.96 B) 4.71 C) –4.71 D) –3.96

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

Use the given information 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).

12) The test statistic in a right–tailed test is z = 0.52. 12) _____

A) 0.0195; reject the null hypothesis B) 0.3015; reject the null hypothesis

C) 0.3015; fail to reject the null hypothesis D) 0.6030; fail to reject the null hypothesis

13) The test statistic in a left–tailed test is z = –2.05. 13) _____

A) 0.0453 fail to reject the null hypothesis B) 0.0404; reject the null hypothesis

C) 0.0202; reject the null hypothesis D) 0.4798; fail to reject the null hypothesis

14) With H_1: $p \neq 0.501$, the test statistic is $z = 2.83$. 14) _____

A) 0.0046; fail to reject the null hypothesis
B) 0.0023; fail to reject the null hypothesis
C) 0.0046; reject the null hypothesis
D) 0.0023; reject the null hypothesis

Formulate the indicated conclusion in nontechnical terms. Be sure to address the original claim.

15) An entomologist writes an article in a scientific journal which claims that fewer than 4 in ten thousand male fireflies are unable to produce light due to a genetic mutation. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is to reject the null hypothesis, state the conclusion in nontechnical terms. 15) _____

A) There is not sufficient evidence to support the claim that the true proportion is less than 4 in ten thousand.
B) There is sufficient evidence to support the claim that the true proportion is greater than 4 in ten thousand.
C) There is sufficient evidence to support the claim that the true proportion is less than 4 in ten thousand.
D) There is not sufficient evidence to support the claim that the true proportion is greater than 4 in ten thousand.

16) A researcher claims that the amounts of acetaminophen in a certain brand of cold tablets have a standard deviation different from the $\sigma = 3.3$ mg claimed by the manufacturer. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is failure to reject the null hypothesis, state the conclusion in nontechnical terms. 16) _____

A) There is not sufficient evidence to support the claim that the standard deviation is equal to 3.3 mg.
B) There is not sufficient evidence to support the claim that the standard deviation is different from 3.3 mg.
C) There is sufficient evidence to support the claim that the standard deviation is equal to 3.3 mg.
D) There is sufficient evidence to support the claim that the standard deviation is different from 3.3 mg.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Section 8.3

Identify the null hypothesis, alternative hypothesis, test statistic, P–value, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

17) A manufacturer considers his production process to be out of control when defects exceed 3%. In a random sample of 85 items, the defect rate is 5.9% but the manager claims that this is only a sample fluctuation and production is not really out of control. At the 0.01 level of significance, test the manager's claim. 17) _____

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

18) An article in a journal reports that 34% of American fathers take no responsibility for child care. A researcher claims that the figure is higher for fathers in the town of Littleton. A random sample of 234 fathers from Littleton yielded 96 who did not help with child care. Test the researcher's claim at the 0.05 significance level. 18) _____

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the P–value for the indicated hypothesis test.

19) A manufacturer claims that fewer than 6% of its fax machines are defective. In a random sample of 97 such fax machines, 5% are defective. Find the P–value for a test of the manufacturer's claim. 19) _____

A) 0.3264 B) 0.1736 C) 0.1591 D) 0.3409

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

Section 8.4

Determine whether the given conditions justify testing a claim about a population mean μ.

20) The sample size is n = 24, σ = 6.43, and the original population is normally distributed. 20) _____

A) No B) Yes

21) The sample size is n = 17, σ is not known, and the original population is normally distributed. 21) _____

A) No B) Yes

22) The sample size is n = 53, σ = 14.2, and the original population is not normally distributed. 22) _____

A) No B) Yes

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Identify the null hypothesis, alternative hypothesis, test statistic, P–value, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

23) Various temperature measurements are recorded at different times for a particular city. The mean of 20°C is obtained for 60 temperatures on 60 different days. Assuming that $\sigma = 1.5$°C, test the claim that the population mean is 22°C. Use a 0.05 significance level. 23) _____

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

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

24) Claim: $\mu = 950$. Sample data: $n = 24$, $\bar{x} = 997$, $s = 27$. The sample data appear to come from a normally distributed population with $\sigma = 30$. 24) _____
A) Normal B) Neither C) Student t

25) Claim: $\mu = 119$. Sample data: $n = 11$, $\bar{x} = 110$, $s = 15.2$. The sample data appear to come from a normally distributed population with unknown μ and σ. 25) _____
A) Normal B) Student t C) Neither

26) Claim: $\mu = 77$. Sample data: $n = 22$, $\bar{x} = 101$, $s = 15.4$. The sample data appear to come from a population with a distribution that is very far from normal, and σ is unknown. 26) _____
A) Normal B) Student t C) Neither

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Assume that a simple random sample has been selected from a normally distributed population. Find the test statistic, P–value, critical value(s), and state the final conclusion.

27) Test the claim that the mean lifetime of car engines of a particular type is greater than 220,000 miles. Sample data are summarized as n = 23, $\bar{x}$ = 226,450 miles, and s = 11,500 miles. Use a significance level of $\alpha = 0.01$. 27) _____

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

28) Test the claim that the mean age of the prison population in one city is less than 26 years. Sample data are summarized as n = 25, $\bar{x}$ = 24.4 years, and s = 9.2 years. Use a significance level of $\alpha = 0.05$. 28) _____

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

Assume that a simple random sample has been selected from a normally distributed population and test the given claim. Use either the traditional method or P–value method as indicated. Identify the null and alternative hypotheses, test statistic, critical value(s) or P–value (or range of P–values) as appropriate, and state the final conclusion that addresses the original claim.

29) A light–bulb manufacturer advertises that the average life for its light bulbs is 900 hours. A random sample of 15 of its light bulbs resulted in the following lives in hours. 29) _____

995 590 510 539 739 917 571 555
916 728 664 693 708 887 849

At the 10% significance level, test the claim that the sample is from a population with a mean life of 900 hours. Use the P–value method of testing hypotheses.

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Section 8.5

Find the critical value or values of χ^2 based on the given information.

30) $H_0: \sigma = 8.0$ 30) _____
$n = 10$
$\alpha = 0.01$
A) 21.666 B) 23.209 C) 1.735, 23.589 D) 2.088, 21.666

31) $H_1: \sigma > 3.5$ 31) _____
$n = 14$
$\alpha = 0.05$
A) 24.736 B) 5.892 C) 23.685 D) 22.362

32) $H_1: \sigma < 0.14$ 32) _____
$n = 23$
$\alpha = 0.10$
A) 30.813 B) 14.848 C) –30.813 D) 14.042

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Use the traditional method to test the given hypothesis. Assume that the population is normally distributed and that the sample has been randomly selected.

33) A machine dispenses a liquid drug into bottles in such a way that the standard deviation of the contents is 81 milliliters. A new machine is tested on a sample of 24 containers and the standard deviation for this sample group is found to be 26 milliliters. At the 0.05 level of significance, test the claim that the amounts dispensed by the new machine have a smaller standard deviation. 33) _____

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

34) Heights of men aged 25 to 34 have a standard deviation of 2.9. Use a 0.05 significance level to test the claim that the heights of women aged 25 to 34 have a different standard deviation. The heights (in inches) of 16 randomly selected women aged 25 to 34 are listed below. Round the sample standard deviation to five decimal places. 34) _____

62.13	65.09	64.18	66.72	63.09	61.15	67.50	64.65
63.80	64.21	60.17	68.28	66.49	62.10	65.73	64.72

H0: _____

H1: _____

Test Statistic: _____

P–value: _____

Critical value(s): _____

Conclusion on Null Hypothesis:

Conclusion on Claim:

1) If the employees were equally likely to take sick days on any day of the week, the probability of obtaining such a distribution of sick days would be extremely small. Therefore, by the rare event rule, we conclude that the claim that an employee of the company is equally likely to take a sick day on any day of the week is probably not correct.
2) The claim is that the new teaching method is more effective than the old method and that on average students will score higher when she uses the new teaching method than when she uses the old teaching method. The small difference in the two means is not strong evidence that the new method is more effective. Even if both methods were equally effective, such a difference could easily occur by chance.
3) B
4) C
5) D
6) A
7) A
8) A
9) A
10) B
11) B
12) C
13) C
14) C
15) C
16) B
17) H_0: $p = 0.03$. H_1: $p > 0.03$. Test statistic: $z = 1.57$. P–value: $p = 0.0582$.
Critical value: $z = 2.33$. Fail to reject null hypothesis. There is not sufficient evidence to warrant rejection of the manager's claim that production is not really out of control.
18) H_0: $p = 0.34$. H_1: $p > 0.34$. Test statistic: $z = 2.27$. P–value: $p = 0.0116$.
Critical value: $z = 1.645$. Reject null hypothesis. There is sufficient evidence to support the researcher's claim that the proportion for fathers in Littleton is higher than 34%.
19) D
20) B
21) B
22) B
23) H_0: $\mu = 22$; H_1: $\mu \neq 22$. Test statistic: $z = -10.33$. P–value: 0.0002. Because the P–value is less than the significance level of $\alpha = 0.05$, we reject the null hypothesis. There is sufficient evidence to warrant rejection of the claim that the population mean temperature is 22°C.
24) A
25) B
26) C
27) $\alpha = 0.01$
Test statistic: $t = 2.6898$
P–value: $p = 0.0066$
Critical value: $t = 2.508$
Because the test statistic, $t > 2.508$, we reject the null hypothesis. There is sufficient evidence to accept the claim that $\mu > 220{,}000$ miles.
28) $\alpha = 0.05$
Test statistic: $t = -0.87$
P–value: $p = 0.1966$
Critical value: $t = -1.711$
Because the test statistic, $t > -1.711$, we do not reject the null hypothesis. There is not sufficient evidence to support the claim that the mean age is less than 26 years.

29) H_0: $\mu = 900$ hrs. H_1: $\mu \neq 900$ hrs. Test statistic: $t = -4.342$. P–value < 0.01. Reject H_0. There is sufficient evidence to warrant rejection of the claim that the sample is from a population with a mean life of 900 hours. The light bulbs do not appear to conform to the manufacturer's specifications.
30) C
31) D
32) D
33) Test statistic: $\chi^2 = 2.370$. Critical value: $\chi^2 = 13.091$. Reject the null hypothesis. There is sufficient evidence to support the claim that the new machine produces a lower standard deviation.
34) Test statistic: $\chi^2 = 9.2597$. Critical values: $\chi^2 = 6.262, 27.488$. Fail to reject H_0. There is not sufficient evidence to support the claim that heights of women aged 25 to 34 have a standard deviation different from 2.9 in.