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.

1) 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.

2) The health of employees is monitored by periodically weighing them in. A sample of 54 employees has a mean weight of 183.9 lb. Assuming that \( \sigma \) is known to be 121.2 lb, use a 0.10 significance level to test the claim that the population mean of all such employees weights is less than 200 lb.

Test the given claim. Use the P-value method or the traditional method as indicated. Identify the null hypothesis, alternative hypothesis, test statistic, critical value(s) or P-value, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

3) A simple random sample of 15-year old boys from one city is obtained and their weights (in pounds) are listed below. Use a 0.01 significance level to test the claim that these sample weights come from a population with a mean equal to 149 lb. Assume that the standard deviation of the weights of all 15-year old boys in the city is known to be 16.2 lb. Use the traditional method of testing hypotheses.

4) The mean resting pulse rate for men is 72 beats per minute. A simple random sample of men who regularly work out at Mitch's Gym is obtained and their resting pulse rates (in beats per minute) are listed below. Use a 0.05 significance level to test the claim that these sample pulse rates come from a population with a mean less than 72 beats per minute. Assume that the standard deviation of the resting pulse rates of all men who work out at Mitch's Gym is known to be 6.6 beats per minute. Use the traditional method of testing hypotheses.

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.

5) Claim: \( \mu = 981 \). Sample data: \( n = 24, \bar{x} = 972, s = 26 \). The sample data appear to come from a normally distributed population with \( \sigma = 28 \).

A) Neither  
B) Student t  
C) Normal

6) Claim: \( \mu = 120 \). Sample data: \( n = 11, \bar{x} = 100, s = 15.2 \). The sample data appear to come from a normally distributed population with unknown \( \mu \) and \( \sigma \).

A) Student t  
B) Neither  
C) Normal
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.

7) Test the claim that for the population of female college students, the mean weight is given by \( \mu = 132 \text{ lb} \). Sample data are summarized as \( n = 20, \bar{x} = 137 \text{ lb}, \) and \( s = 14.2 \text{ lb} \). Use a significance level of \( \alpha = 0.1 \).

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

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.

9) A test of sobriety involves measuring the subject’s motor skills. Twenty randomly selected sober subjects take the test and produce a mean score of 41.0 with a standard deviation of 3.7. At the 0.01 level of significance, test the claim that the true mean score for all sober subjects is equal to 35.0. Use the traditional method of testing hypotheses.

10) A manufacturer makes ball bearings that are supposed to have a mean weight of 30 g. A retailer suspects that the mean weight is actually less than 30 g. The mean weight for a random sample of 16 ball bearings is 28.4 g with a standard deviation of 4.5 g. At the 0.05 significance level, test the claim that the sample comes from a population with a mean weight less than 30 g. Use the traditional method of testing hypotheses.

11) A cereal company claims that the mean weight of the cereal in its packets is 14 oz. The weights (in ounces) of the cereal in a random sample of 8 of its cereal packets are listed below.

\[ 14.6, 13.8, 14.1, 13.7, 14.0, 14.4, 13.6, 14.2 \]

Test the claim at the 0.01 significance level.

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

12) The standard deviation of math test scores at one high school is 16.1. A teacher claims that the standard deviation of the girls’ test scores is smaller than 16.1. A random sample of 22 girls results in scores with a standard deviation of 13.2. Use a significance level of 0.01 to test the teacher’s claim.

13) A manufacturer uses a new production method to produce steel rods. A random sample of 17 steel rods resulted in lengths with a standard deviation of 4.5 cm. At the 0.10 significance level, test the claim that the new production method has lengths with a standard deviation different from 3.5 cm, which was the standard deviation for the old method.

14) In one town, monthly incomes for men with college degrees are found to have a standard deviation of $650. Use a 0.01 significance level to test the claim that for men without college degrees in that town, incomes have a higher standard deviation. A random sample of 22 men without college degrees resulted in incomes with a standard deviation of $926.
Answer Key

Testname: CH8BPRAC

1) \( H_0: \mu = 22; H_1: \mu \neq 22 \). 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.

2) \( H_0: \mu = 200; H_1: \mu < 200 \). Test statistic: \( z = -0.98 \). P-value: 0.1635. Fail to reject \( H_0 \). There is not sufficient evidence to support the claim that the mean is less than 200 pounds.

3) \( H_0: \mu = 149 \) lb
\( H_1: \mu \neq 149 \) lb
Test statistic: \( z = 0.91 \)
Critical values: \( z = \pm 2.575 \)
Do not reject \( H_0 \); At the 1% significance level, there is not sufficient evidence to warrant rejection of the claim that these sample weights come from a population with a mean equal to 149 lb.

4) \( H_0: \mu = 72 \) beats per minute
\( H_1: \mu < 72 \) beats per minute
Test statistic: \( z = -1.94 \)
Critical value: \( z = -1.645 \)
Reject \( H_0 \); At the 5% significance level, there is sufficient evidence to support the claim that these sample pulse rates come from a population with a mean less than 72 beats per minute.

5) C
6) A
7) \( \alpha = 0.1 \)
Test statistic: \( t = 1.57 \)
P-value: \( p = 0.1318 \)
Critical values: \( t = \pm 1.729 \)
Because the test statistic, \( t < 1.729 \), we fail to reject the null hypothesis. There is not sufficient evidence to warrant rejection of the claim that \( \mu = 132 \) lb.

8) \( \alpha = 0.05 \)
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.

9) \( H_0: \mu = 35.0; H_1: \mu \neq 35.0 \). Test statistic: \( t = 7.252 \). Critical values: \( t = -2.861, 2.861 \). Reject \( H_0 \). There is sufficient evidence to warrant rejection of the claim that the mean is equal to 35.0.

10) \( H_0: \mu = 30 \) g. \( H_1: \mu < 30 \) g. Test statistic: \( t = -1.422 \). Critical value: \( t = -1.753 \). Fail to reject \( H_0 \). There is not sufficient evidence to support the claim that the mean is less than 30 g.

11) \( H_0: \mu = 14 \) oz. \( H_1: \mu \neq 14 \) oz. Test statistic: \( t = 0.408 \). Critical values: \( t = \pm 3.499 \). Fail to reject \( H_0 \). There is not sufficient evidence to warrant rejection of the claim that the mean weight is 14 ounces.

12) Test statistic: \( \chi^2 = 14.116 \). Critical value: \( \chi^2 = 8.897 \). Fail to reject \( H_0 \). There is not sufficient evidence to support the claim that the standard deviation of the girls’ test scores is smaller than 16.1.

13) Test statistic: \( \chi^2 = 26.449 \). Critical values: \( \chi^2 = 7.962, 26.296 \). Reject \( H_0 \). There is sufficient evidence to support the claim that the standard deviation is different from 3.5.

14) Test statistic: \( \chi^2 = 42.620 \). Critical values: \( \chi^2 = 38.932 \). Reject \( H_0 \). There is sufficient evidence to support the claim that incomes of men without college degrees have a standard deviation greater than $650.