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

1) The owner of a football team claims that the average attendance at games is over 63,500, and he is therefore justified in moving the team to a city with a larger stadium. 1) C

A) $H_0: \mu < 63{,}500$ $H_1: \mu \geq 63{,}500$
B) $H_0: \mu > 63{,}500$ $H_1: \mu \leq 63{,}500$
C) $H_0: \mu = 63{,}500$ $H_1: \mu > 63{,}500$
D) $H_0: \mu = 63{,}500$ $H_1: \mu < 63{,}500$

2) A psychologist claims that more than 3.2 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. 2) D

A) $H_0: p = 3.2\%$ $H_1: p < 3.2\%$
B) $H_0: p < 3.2\%$ $H_1: p \geq 3.2\%$
C) $H_0: p > 3.2\%$ $H_1: p \leq 3.2\%$
D) $H_0: p = 3.2\%$ $H_1: p > 3.2\%$

Express the null hypothesis and the alternative hypothesis in symbolic form for a test to support this claim. Use the correct symbol (μ, p, σ) for the indicated parameter.

3) The manufacturer of a refrigerator system for beer kegs produces refrigerators that are supposed to maintain a true mean temperature, μ, of 48°F, ideal for a certain type of German pilsner. The owner of the brewery does not agree with the refrigerator manufacturer, and claims he can prove that the true mean temperature is incorrect. 3) A

A) $H_0: \mu = 48°$ $H_1: \mu \neq 48°$
B) $H_0: \mu \neq 48°$ $H_1: \mu = 48°$
C) $H_0: \mu \leq 48°$ $H_1: \mu > 48°$
D) $H_0: \mu \geq 48°$ $H_1: \mu < 48°$

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.

4) $\alpha = 0.05$ for a two-tailed test. 4) B

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

5) $\alpha = 0.09$ for a right-tailed test. 5) C

A) 1.96 B) ±1.96 C) 1.34 D) ±1.34

6) $\alpha = 0.05$ for a left-tailed test. 6) D

A) ±1.96 B) ±1.645 C) -1.96 D) -1.645

Find the value of the test statistic z:

7) The claim is that the proportion of drowning deaths of children attributable to beaches is more than 0.25, and the sample statistics include n = 575 drowning deaths of children with 172 of them attributable to beaches. 7) C

A) 2.62 B) -2.77 C) 2.72 D) -2.62

8) 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. 8) B

x = n.p = 800 * 0.15 = 120

A) -4.71 B) 4.71 C) 3.96 D) -3.96

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

9) An entomologist writes an article in a scientific journal which claims that fewer than 17 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. 9) D

A) There is not sufficient evidence to support the claim that the true proportion is less than 17 in ten thousand.
B) There is not sufficient evidence to support the claim that the true proportion is greater than 17 in ten thousand.
C) There is sufficient evidence to support the claim that the true proportion is greater than 17 in ten thousand.
D) There is sufficient evidence to support the claim that the true proportion is less than 17 in ten thousand.

10) The owner of a football team claims that the average attendance at games is over 561, and he is therefore justified in moving the team to a city with a larger stadium. 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. 10) D

A) There is not sufficient evidence to support the claim that the mean attendance is less than 561.
B) There is sufficient evidence to support the claim that the mean attendance is greater than than 561.
C) There is sufficient evidence to support the claim that the mean attendance is less than 561.
D) There is not sufficient evidence to support the claim that the mean attendance is greater than 561.

Assume that a hypothesis test of the given claim will be conducted. Identify the type I or type II error for the test.

11) A medical researcher claims that 12% of children suffer from a certain disorder. Identify the type I error for the test. 11) A

A) Reject the claim that the percentage of children who suffer from the disorder is equal to 12% when that percentage is actually 12%.
B) Reject the claim that the percentage of children who suffer from the disorder is different from 12% when that percentage really is different from 12%.
C) Fail to reject the claim that the percentage of children who suffer from the disorder is equal to 12% when that percentage is actually 12%.
D) Fail to reject the claim that the percentage of children who suffer from the disorder is equal to 12% when that percentage is actually different from 12%.

12) The principal of a school claims that the percentage of students at his school that come from single-parent homes is 16%. Identify the type II error for the test. 12) C

A) Reject the claim that the percentage of students that come from single-parent homes is equal to 16% when that percentage is actually less than 16%.
B) Fail to reject the claim that the percentage of students that come from single-parent homes is equal to 16% when that percentage is actually 16%.
C) Fail to reject the claim that the percentage of students that come from single-parent homes is equal to 16% when that percentage is actually different from 16%.
D) Reject the claim that the percentage of students that come from single-parent homes is equal to 16% when that percentage is actually 16%.

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

13) 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.

14) A poll of 1068 adult Americans reveals that 48% of the voters surveyed prefer the Democratic candidate for the presidency. At the 0.05 level of significance, test the claim that less than half of all voters prefer the Democrat.

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.

15) Use a significance level of $\alpha = 0.05$ to test the claim that $\mu = 32.6$. The sample data consist of 15 scores for which $\bar{x} = 41.6$ and $s = 8$. Use the traditional method of testing hypotheses.

16) Use a significance level of $\alpha = 0.01$ to test the claim that $\mu > 2.85$. The sample data consist of 9 scores for which $\bar{x} = 3.19$ and $s = 0.55$. Use the traditional method of testing hypotheses.

17) 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.

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

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

19) 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.

1) C
2) D
3) A
4) B
5) C
6) D
7) C
8) B
9) D
10) D
11) A
12) C
13) 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.
14) H_0: p = 0.5. H_1: p < 0.5. Test statistic: z = -1.31. P-value: p = 0.0951.
Critical value: z = -1.645. Fail to reject null hypothesis. There is not sufficient evidence to warrant rejection of the claim that at least half of all voters prefer the Democrat.
15) H_0: μ = 32.6. H_1: μ ≠ 32.6. Test statistic: t = 4.36. Critical values: t = ±2.145. Reject H_0. There is sufficient evidence to warrant rejection of the claim that the mean is 32.6.
16) H_0: μ = 2.85. H_1: μ > 2.85. Test statistic: t = 1.85. Critical value: t = 2.896. Fail to reject H_0. There is not sufficient evidence to support the claim that the mean is greater than 2.85.
17) H_0: μ = 14 oz. H_1: μ ≠ 14 oz. Test statistic: t = 0.408. Critical values: t = ±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.
18) α = 0.1
Test statistic: t = 1.57
P-value: p = 0.1318
Critical values: t = ±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 μ = 132 lb.
19) H_0: μ = 22; H_1: μ ≠ 22. Test statistic: z = -10.33. P-value: 0.0002. Because the P-value is less than the significance level of α = 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.