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

Find the P-value for the indicated hypothesis test.

1) 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. 1) ________

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

2) A random sample of 139 forty-year-old men contains 26% smokers. Find the P-value for a test of the claim that the percentage of forty-year-old men that smoke is 22%. 2) ________

A) 0.1271 B) 0.2542 C) 0.1401 D) 0.2802

3) A nationwide study of American homeowners revealed that 65% have one or more lawn mowers. A lawn equipment manufacturer, located in Omaha, feels the estimate is too low for households in Omaha. Find the P-value for a test of the claim that the proportion with lawn mowers in Omaha is higher than 65%. Among 497 randomly selected homes in Omaha, 340 had one or more lawn mowers. 3) ________

A) 0.0505 B) 0.1118 C) 0.0252 D) 0.0559

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 left-tailed test. 4) ________

A) ±1.96 B) ±1.645 C) -1.96 D) -1.645

5) $\alpha = 0.08$; H_1 is $\mu \neq 3.24$ 5) ________

A) 1.41 B) 1.75 C) ±1.75 D) ±1.41

6) $\alpha = 0.05$ for a two-tailed test. 6) ________

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

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).

7) With H_1: $p \neq 3/5$, the test statistic is $z = 0.78$. 7) ________

A) 0.4354; fail to reject the null hypothesis B) 0.4354; reject the null hypothesis
C) 0.2177 fail to reject the null hypothesis D) 0.2177; reject the null hypothesis

8) The test statistic in a left-tailed test is $z = -1.83$. 8) ________

A) 0.0336; reject the null hypothesis B) 0.0672; fail to reject the null hypothesis
C) 0.9664; fail to reject the null hypothesis D) 0.0672; reject the null hypothesis

9) The test statistic in a right-tailed test is $z = 0.52$. 9) ________

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

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

10) Claim: μ = 119. Sample data: n = 11, $\overline{x}$ = 110, s = 15.2. The sample data appear to come from a normally distributed population with unknown μ and σ. 10) _______

A) Neither B) Normal C) Student t

11) Claim: μ = 950. Sample data: n = 24, $\overline{x}$ = 997, s = 27. The sample data appear to come from a normally distributed population with σ = 30. 11) _______

A) Normal B) Neither C) Student t

12) Claim: μ = 77. Sample data: n = 22, $\overline{x}$ = 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. 12) _______

A) Student t B) Neither C) Normal

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.

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. 13) _______________

14) In a sample of 167 children selected randomly from one town, it is found that 37 of them suffer from asthma. At the 0.05 significance level, test the claim that the proportion of all children in the town who suffer from asthma is 11%. 14) _______________

15) 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 σ 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. 15) _______________

16) 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 at least half of all voters prefer the Democrat. 16) _______________

17) A random sample of 100 pumpkins is obtained and the mean circumference is found to be 40.5 cm. Assuming that the population standard deviation is known to be 1.6 cm, use a 0.05 significance level to test the claim that the mean circumference of all pumpkins is equal to 39.9 cm. 17) _______________

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.

18) Test the claim that for the population of history exams, the mean score is 80. Sample data are summarized as n = 16, $\overline{x}$ = 84.5, and s = 11.2. Use a significance level of α = 0.01. 18) _______________

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.

19) 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. 19) ______________

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.

20) In tests of a computer component, it is found that the mean time between failures is 520 hours. A modification is made which is supposed to increase the time between failures. Tests on a random sample of 10 modified components resulted in the following times (in hours) between failures. 20) ______________

518	548	561	523	536
499	538	557	528	563

At the 0.05 significance level, test the claim that for the modified components, the mean time between failures is greater than 520 hours. Use the P-value method of testing hypotheses.

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.

21) Test the claim that for the population of female college students, the mean weight is given by μ = 132 lb. Sample data are summarized as n = 20, $\bar{x}$ = 137 lb, and s = 14.2 lb. Use a significance level of α = 0.1. 21) ______________

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.

22) 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. 22) ______________

23) A public bus company official claims that the mean waiting time for bus number 14 during peak hours is less than 10 minutes. Karen took bus number 14 during peak hours on 18 different occasions. Her mean waiting time was 7.7 minutes with a standard deviation of 1.9 minutes. At the 0.01 significance level, test the claim that the mean waiting time is less than 10 minutes. Use the P-value method of testing hypotheses. 23) ______________

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.

24) 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 α = 0.01. 24) ______________

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.

25) A cereal company claims that the mean weight of the cereal in its packets is at least 14 oz. 25) _______

A) H_0: $\mu = 14$ H_1: $\mu < 14$
B) H_0: $\mu > 14$ H_1: $\mu \le 14$
C) H_0: $\mu = 14$ H_1: $\mu > 14$
D) H_0: $\mu < 14$ H_1: $\mu \ge 14$

26) The manufacturer of a refrigerator system for beer kegs produces refrigerators that are supposed to maintain a true mean temperature, μ, of 40°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. 26) _______

A) H_0: $\mu \neq 40°$ H_1: $\mu = 40°$
B) H_0: $\mu \ge 40°$ H_1: $\mu < 40°$
C) H_0: $\mu \le 40°$ H_1: $\mu > 40°$
D) H_0: $\mu = 40°$ H_1: $\mu \neq 40°$

27) 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. 27) _______

A) H_0: $p < 6.1\%$ H_1: $p \ge 6.1\%$
B) H_0: $p = 6.1\%$ H_1: $p < 6.1\%$
C) H_0: $p > 6.1\%$ H_1: $p \le 6.1\%$
D) H_0: $p = 6.1\%$ H_1: $p > 6.1\%$

28) 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. 28) _______

A) H_0: $p < 0.0014$ H_1: $p \ge 0.0014$
B) H_0: $p = 0.0014$ H_1: $p > 0.0014$
C) H_0: $p = 0.0014$ H_1: $p < 0.0014$
D) H_0: $p > 0.0014$ H_1: $p \le 0.0014$

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

29) 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. 29) _______

A) 31.29
B) -31.29
C) -15.33
D) 15.33

30) 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. 30) _______

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

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

31) A psychologist claims that more than 7.1% of adults suffer from extreme shyness. Identify the type II error for the test. 31) _______

A) Reject the claim that the percentage of adults who suffer from extreme shyness is equal to 7.1% when that percentage is actually greater than 7.1%.

B) Fail to reject the claim that the percentage of adults who suffer from extreme shyness is equal to 7.1% when that percentage is actually greater than 7.1%.

C) Fail to reject the claim that the percentage of adults who suffer from extreme shyness is equal to 7.1% when that percentage is actually less than 7.1%.

D) Reject the claim that the percentage of adults who suffer from extreme shyness is equal to 7.1% when that percentage is actually 7.1%.

32) A medical researcher claims that 3% of children suffer from a certain disorder. Identify the type I error for the test. 32) _______

A) Fail to reject the claim that the percentage of children who suffer from the disorder is equal to 3% when that percentage is actually different from 3%.

B) Reject the claim that the percentage of children who suffer from the disorder is different from 3% when that percentage really is different from 3%.

C) Reject the claim that the percentage of children who suffer from the disorder is equal to 3% when that percentage is actually 3%.

D) Fail to reject the claim that the percentage of children who suffer from the disorder is equal to 3% when that percentage is actually 3%.

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

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.

33) The maximum acceptable level of a certain toxic chemical in vegetables has been set at 0.4 parts per million (ppm). A consumer health group measured the level of the chemical in a random sample of tomatoes obtained from one producer. The levels, in ppm, are shown below. 33) _______________

0.31	0.47	0.19	0.72	0.56
0.91	0.29	0.83	0.49	0.28
0.31	0.46	0.25	0.34	0.17
0.58	0.19	0.26	0.47	0.81

Do the data provide sufficient evidence to support the claim that the mean level of the chemical in tomatoes from this producer is greater than the recommended level of 0.4 ppm? Use a 0.05 significance level to test the claim that these sample levels come from a population with a mean greater than 0.4 ppm. Use the P-value method of testing hypotheses. Assume that the standard deviation of levels of the chemical in all such tomatoes is 0.21 ppm.

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

Do one of the following, as appropriate: (a) Find the critical value $z_{\alpha/2}$, (b) find the critical value $t_{\alpha/2}$, (c) state that neither the normal nor the t distribution applies.

34) 99%; n = 17; σ is unknown; population appears to be normally distributed. 34) _______

A) $t_{\alpha/2} = 2.898$ B) $z_{\alpha/2} = 2.583$ C) $t_{\alpha/2} = 2.921$ D) $z_{\alpha/2} = 2.567$

35) 98%; $n = 7$; $\sigma = 27$; population appears to be normally distributed. 35) _______

A) $t_{\alpha/2} = 1.96$ B) $t_{\alpha/2} = 2.575$ C) $z_{\alpha/2} = 2.33$ D) $z_{\alpha/2} = 2.05$

36) 90%; $n = 9$; $\sigma = 4.2$; population appears to be very skewed. 36) _______

A) $z_{\alpha/2} = 2.365$
B) Neither the normal nor the t distribution applies.
C) $z_{\alpha/2} = 2.306$
D) $z_{\alpha/2} = 2.896$

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

37) Carter Motor Company claims that its new sedan, the Libra, will average better than 21 miles per gallon in the city. 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. 37) _______

A) There is not sufficient evidence to support the claim that the mean is greater than 21 miles per gallon.
B) There is not sufficient evidence to support the claim that the mean is less than 21 miles per gallon.
C) There is sufficient evidence to support the claim that the mean is greater than 21 miles per gallon.
D) There is sufficient evidence to support the claim that the mean is less than 21 miles per gallon.

38) A skeptical paranormal researcher claims that the proportion of Americans that have seen a UFO, p, is less than 2 in every ten thousand. 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. 38) _______

A) There is sufficient evidence to support the claim that the true proportion is greater than 2 in ten thousand.
B) There is sufficient evidence to support the claim that the true proportion is less than 2 in ten thousand.
C) There is not sufficient evidence to support the claim that the true proportion is greater than 2 in ten thousand.
D) There is not sufficient evidence to support the claim that the true proportion is less than 2 in ten thousand.

Find the number of successes x suggested by the given statement.

39) Among 700 adults selected randomly from among the residents of one town, 16.4% said that they favor stronger gun-control laws. 39) _______

A) 116 B) 113 C) 114 D) 115

40) Among 880 people selected randomly from among the eligible voters in one city, 51.9% were homeowners. 40) _______

A) 452 B) 460 C) 457 D) 462

Assume that you plan to use a significance level of $\alpha = 0.05$ to test the claim that $p_1 = p_2$. Use the given sample sizes and numbers of successes to find the pooled estimate $\bar{p}$. Round your answer to the nearest thousandth.

41) $n_1 = 100$ $n_2 = 100$ 41) _______
$x_1 = 33$ $x_2 = 36$

A) 0.310 B) 0.345 C) 0.380 D) 0.241

Assume that you plan to use a significance level of α = 0.05 to test the claim that $p_1 = p_2$. Use the given sample sizes and numbers of successes to find the z test statistic for the hypothesis test.

42) $n_1 = 172$ $n_2 = 163$ 42) _______

$x_1 = 63$ $x_2 = 58$

A) z = 0.199 B) z = 0.371 C) z = 4.928 D) z = 2.653

43) A random sampling of sixty pitchers from the National League and fifty-two pitchers from the American League showed that 10 National and 14 American League pitchers had E.R.A's below 3.5. 43) _______

A) z = -1.715 B) z = -8.641 C) z = -103.167 D) z = -1.319

Solve the problem.

44) The table shows the number satisfied in their work in a sample of working adults with a college education and in a sample of working adults without a college education. Assume that you plan to use a significance level of α = 0.05 to test the claim that $p_1 > p_2$. Find the critical value(s) for this hypothesis test. Do the data provide sufficient evidence that a greater proportion of those with a college education are satisfied in their work? 44) _______

	College Education	No College Education
Number in sample	147	142
Number satisfied in their work	78	70

A) z = ± 1.96; no B) z = 1.96; yes C) z = -1.645; yes D) z = 1.645; no

Assume that you plan to use a significance level of α = 0.05 to test the claim that $p_1 = p_2$, Use the given sample sizes and numbers of successes to find the P-value for the hypothesis test.

45) $n_1 = 50$ $n_2 = 75$ 45) _______

$x_1 = 20$ $x_2 = 15$

A) 0.0146 B) 0.0001 C) 0.0032 D) 0.1201

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 samples are independent and that they have been randomly selected

46) A marketing survey involves product recognition in New York and California. Of 558 New Yorkers surveyed, 193 knew the product while 196 out of 614 Californians knew the product. At the 0.05 significance level, test the claim that the recognition rates are the same in both states. 46) _______________

47) Use the given sample data to test the claim that $p_1 < p_2$. Use a significance level of 0.10. 47) _______________

Sample 1	Sample 2
$n_1 = 462$	$n_2 = 380$
$x_1 = 84$	$x_2 = 95$

48) Seven of 8500 people vaccinated against a certain disease later developed the disease. 18 of 10,000 people vaccinated with a placebo later developed the disease. Test the claim that the vaccine is effective in lowering the incidence of the disease. Use a significance level of 0.02. 48) _______________

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

Construct the indicated confidence interval for the difference between population proportions $p_1 - p_2$. Assume that the samples are independent and that they have been randomly selected.

49) $x_1 = 29$, $n_1 = 45$ and $x_2 = 33$, $n_2 = 46$; Construct a 90% confidence interval for the difference between population proportions $p_1 - p_2$. 49) _______

A) $0.453 < p_1 - p_2 < 0.835$
B) $-0.233 < p_1 - p_2 < 0.087$
C) $0.835 < p_1 - p_2 < 0.454$
D) $0.484 < p_1 - p_2 < 0.805$

50) In a random sample of 300 women, 50% favored stricter gun control legislation. In a random sample of 200 men, 28% favored stricter gun control legislation. Construct a 98% confidence interval for the difference between the population proportions $p_1 - p_2$. 50) _______

A) $0.109 < p_1 - p_2 < 0.331$
B) $0.132 < p_1 - p_2 < 0.308$
C) $0.120 < p_1 - p_2 < 0.320$
D) $0.136 < p_1 - p_2 < 0.304$

Determine whether the samples are independent or dependent.

51) The effectiveness of a new headache medicine is tested by measuring the amount of time before the headache is cured for patients who use the medicine and another group of patients who use a placebo drug. 51) _______

A) Dependent samples
B) Independent samples

52) The accuracy of verbal responses is tested in an experiment in which individuals report their heights and then are measured. The data consist of the reported height and measured height for each individual. 52) _______

A) Independent samples
B) Dependent samples

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

Test the indicated claim about the means of two populations. Assume that the two samples are independent simple random samples selected from normally distributed populations. Do not assume that the population standard deviations are equal. Use the traditional method or P-value method as indicated.

53) A researcher wishes to determine whether people with high blood pressure can reduce their blood pressure, measured in mm Hg, by following a particular diet. Use a significance level of 0.01 to test the claim that the treatment group is from a population with a smaller mean than the control group. Use the traditional method of hypothesis testing. 53) _______________

Treatment Group	Control Group
$n_1 = 35$	$n_2 = 28$
$\bar{x}_1 = 189.1$	$\bar{x}_2 = 203.7$
$s_1 = 38.7$	$s_2 = 39.2$

54) A researcher was interested in comparing the GPAs of students at two different colleges. Independent random samples of 8 students from college A and 13 students from college B yielded the following GPAs: 54) ______________

College A	College B	
3.7	3.8	2.8
3.2	3.2	4.0
3.0	3.0	3.6
2.5	3.9	2.6
2.7	3.8	4.0
3.6	2.5	3.6
2.8	3.9	
3.4		

Use a 0.10 significance level to test the claim that the mean GPA of students at college A is different from the mean GPA of students at college B. Use the P-value method of hypothesis testing.
(Note: $\overline{x}_1 = 3.1125$, $\overline{x}_2 = 3.4385$, $s_1 = 0.4357$, $s_2 = 0.5485$.)

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

Construct the indicated confidence interval for the difference between the two population means. Assume that the two samples are independent simple random samples selected from normally distributed populations. Do not assume that the population standard deviations are equal.

55) Independent samples from two different populations yield the following data. $\overline{x}_1 = 260$, $\overline{x}_2 = 314$, $s_1 = 75$, $s_2 = 33$. The sample size is 399 for both samples. Find the 85% confidence interval for $\mu_1 - \mu_2$. 55) _______

A) $-55 < \mu_1 - \mu_2 < -53$
B) $-62 < \mu_1 - \mu_2 < -46$
C) $-60 < \mu_1 - \mu_2 < -48$
D) $-70 < \mu_1 - \mu_2 < -38$

56) A paint manufacturer wished to compare the drying times of two different types of paint. Independent simple random samples of 11 cans of type A and 9 cans of type B were selected and applied to similar surfaces. The drying times, in hours, were recorded. The summary statistics are as follows. 56) _______

Type A	Type B
$\overline{x}_1 = 76.5$ hrs	$\overline{x}_2 = 63.0$ hrs
$s_1 = 4.5$ hrs	$s_2 = 5.1$ hrs
$n_1 = 11$	$n_2 = 9$

Construct a 98% confidence interval for $\mu_1 - \mu_2$, the difference between the mean drying time for paint of type A and the mean drying time for paint of type B.

A) 7.88 hrs $< \mu_1 - \mu_2 <$ 19.12 hrs
B) 7.95 hrs $< \mu_1 - \mu_2 <$ 19.05 hrs
C) 8.02 hrs $< \mu_1 - \mu_2 <$ 18.98 hrs
D) 8.18 hrs $< \mu_1 - \mu_2 <$ 18.82 hrs

State what the given confidence interval suggests about the two population means.

57) A researcher was interested in comparing the amount of time spent watching television by women and by men. Independent simple random samples of 14 women and 17 men were selected, and each person was asked how many hours he or she had watched television during the previous week. The summary statistics are as follows. 57) _______

Women	Men
$\bar{x}_1 = 11.9$ hrs	$\bar{x}_2 = 14.3$ hrs
$s_1 = 3.9$ hrs	$s_2 = 5.2$ hrs
$n_1 = 14$	$n_2 = 17$

The following 99% confidence interval was obtained for $\mu_1 - \mu_2$, the difference between the mean amount of time spent watching television for women and the mean amount of time spent watching television for men: $-7.33 \text{ hrs} < \mu_1 - \mu_2 < 2.53 \text{ hrs}$.

What does the confidence interval suggest about the population means?

A) The confidence interval limits include 0 which suggests that the two population means might be equal. There does not appear to be a significant difference between the mean amount of time spent watching television for women and the mean amount of time spent watching television for men.

B) The confidence interval includes only positive values which suggests that the mean amount of time spent watching television for women is larger than the mean amount of time spent watching television for men.

C) The confidence interval limits include 0 which suggests that the two population means are unlikely to be equal. There appears to be a significant difference between the mean amount of time spent watching television for women and the mean amount of time spent watching television for men.

D) The confidence interval includes only negative values which suggests that the mean amount of time spent watching television for women is smaller than the mean amount of time spent watching television for men.

The two data sets are dependent. Find $\bar{d}$ to the nearest tenth.

58) 58) _______

A	68	58	58	63	51
B	24	27	28	25	22

A) 34.4 B) 44.7 C) 20.6 D) 43.0

Find s_d.

59) The differences between two sets of dependent data are 15, 27, 3, 3, 12. Round to the nearest tenth. 59) _______

A) 9.9 B) 7.9 C) 12.9 D) 19.8

Assume that you want to test the claim that the paired sample data come from a population for which the mean difference is $\mu_d = 0$. Compute the value of the t test statistic. Round intermediate calculations to four decimal places as needed and final answers to three decimal places as needed.

60) 60) _______

x	33	34	29	33	32	27	33	32
y	31	30	35	33	33	32	33	31

A) $t = -1.480$ B) $t = -0.523$ C) $t = -0.185$ D) $t = 0.690$

Determine the decision criterion for rejecting the null hypothesis in the given hypothesis test; i.e., describe the values of the test statistic that would result in rejection of the null hypothesis.

61) Suppose you wish to test the claim that μ_d, the mean value of the differences d for a population of paired data, is different from 0. Given a sample of n = 23 and a significance level of $\alpha = 0.05$, what criterion would be used for rejecting the null hypothesis? 61) _______

A) Reject null hypothesis if test statistic > 2.069 or < -2.069.
B) Reject null hypothesis if test statistic > 1.717 or < -1.717.
C) Reject null hypothesis if test statistic > 2.074 or < -2.074.
D) Reject null hypothesis if test statistic > 1.717.

Construct a confidence interval for μ_d, the mean of the differences d for the population of paired data. Assume that the population of paired differences is normally distributed.

62) If $\overline{d} = 3.125$, $S_d = 2.911$, and n = 8, determine a 95 percent confidence interval for μ_d. 62) _______

A) $2.264 < \mu_d < 3.986$
B) $2.264 < \mu_d < 5.559$
C) $0.691 < \mu_d < 5.559$
D) $0.691 < \mu_d < 3.986$

63) A test of abstract reasoning is given to a random sample of students before and after they complete a formal logic course. The results are given below. Construct a 95% confidence interval for the mean difference between the before and after scores. 63) _______

Before	74	83	75	88	84	63	93	84	91	77
After	73	77	70	77	74	67	95	83	84	75

A) $1.0 < \mu_d < 6.4$
B) $1.2 < \mu_d < 5.7$
C) $0.2 < \mu_d < 7.2$
D) $0.8 < \mu_d < 6.6$

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

Use the traditional method of hypothesis testing to test the given claim about the means of two populations. Assume that two dependent samples have been randomly selected from normally distributed populations.

64) A coach uses a new technique in training middle distance runners. The times for 8 different athletes to run 800 meters before and after this training are shown below. 64) _______________

Athlete	A	B	C	D	E	F	G	H
Time before training (seconds)	115.7	114.6	110.8	108.9	115.8	110.7	114.6	110.5
Time after training (seconds)	116.3	113.3	108.4	109.7	114	110.8	111	106.6

Using a 0.05 level of significance, test the claim that the training helps to improve the athletes' times for the 800 meters.

65) Ten different families are tested for the number of gallons of water a day they use before and after viewing a conservation video. At the 0.05 significance level, test the claim that the mean is the same before and after the viewing. 65) _______________

Before	33	33	38	33	35	35	40	40	40	31
After	34	28	25	28	35	33	31	28	35	33

66) A coach uses a new technique to train gymnasts. 7 gymnasts were randomly selected and their competition scores were recorded before and after the training. The results are shown below. 66) _______________

Subject	A	B	C	D	E	F	G
Before	9.5	9.4	9.5	9.4	9.6	9.4	9.5
After	9.6	9.6	9.5	9.3	9.7	9.7	9.3

Using a 0.01 level of significance, test the claim that the training technique is effective in raising the gymnasts' scores.

1) A
2) B
3) D
4) D
5) C
6) A
7) A
8) A
9) C
10) C
11) A
12) B
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 = 0.11. H_1: p ≠ 0.11. Test statistic: z = 4.61. P-value: p = 0.0001.
Critical values: z = ±1.96. Reject null hypothesis. There is sufficient evidence to warrant rejection of the claim that the proportion of all children in the town who suffer from asthma is 11%.
15) H_0: μ = 200; H_1: μ < 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.
16) 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.
17) H_0: μ = 39.9; H_1: μ ≠ 39.9. Test statistic: z = 3.75. P-value: 0.0002. Reject H_0. There is sufficient evidence to warrant rejection of the claim that the mean equals 39.9 cm.
18) α = 0.01
Test statistic: t = 1.607
P-value: p = 0.1289
Critical values: t = ±2.947
Because the test statistic, t < 2.947, we do not reject the null hypothesis. There is not sufficient evidence to warrant rejection of the claim that the mean score is 80.
19) H_0: μ = 900 hrs. H_1: μ ≠ 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.
20) H_0: μ = 520 hrs. H_1: μ > 520 hrs. Test statistic: t = 2.612.
0.01 < P-value < 0.025. Reject H_0. There is sufficient evidence to support the claim that the mean is greater than 520 hours.
21) 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.
22) H_0: μ = 35.0. H_1: μ ≠ 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.
23) H_0: μ = 10 min. H_1: μ < 10 min. Test statistic: t = -5.136. P-value < 0.005. Reject H_0. There is sufficient evidence to support the claim that the mean is less than 10 minutes.

24) $\alpha = 0.01$
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.
25) A
26) D
27) D
28) C
29) C
30) B
31) B
32) C
33) H_0: $\mu = 0.4$ ppm
H_1: $\mu > 0.4$ ppm
Test statistic: $z = 0.95$
P-value: 0.1711
Do not reject H_0; At the 5% significance level, the data do not provide sufficient evidence to support the claim that the mean level of the chemical in tomatoes from this producer is greater than the recommended level of 0.4 ppm.
34) C
35) C
36) B
37) C
38) D
39) D
40) C
41) B
42) A
43) D
44) D
45) A
46) H_0: $p_1 = p_2$. H_1: $p_1 \neq p_2$.
Test statistic: $z = 0.97$. Critical values: $z = \pm 1.96$.
Fail to reject the null hypothesis. There is not sufficient evidence to warrant rejection of the claim that the recognition rates are the same in both states.
47) H_0: $p_1 = p_2$. H_1: $p_1 < p_2$.
Test statistic: $z = -2.41$. Critical value: $z = -1.28$.
Reject the null hypothesis. There is sufficient evidence to support the claim that $p_1 < p_2$.
48) H_0: $p_1 = p_2$. H_1: $p_1 < p_2$.
Test statistic: $z = -1.80$. Critical value: $z = -2.05$.
Fail to reject the null hypothesis. There is not sufficient evidence to support the claim that the vaccine is effective in lowering the incidence of the disease.
49) B
50) C
51) B
52) B

53) H_0: $\mu_1 = \mu_2$.
H_1: $\mu_1 < \mu_2$.
Test statistic: t = -1.477.
Critical value: -2.473.
Do not reject the null hypothesis. There is not sufficient evidence to support the claim that the treatment group is from a population with a smaller mean than the control group.

54) H_0: $\mu_1 = \mu_2$
H_1: $\mu_1 \neq \mu_2$
Test statistic: t = -1.506
0.1 < P-value < 0.2
Do not reject H_0. At the 10% significance level, there is not sufficient evidence to support the claim that the mean GPA of students at college A is different from the mean GPA of students at college B.

55) B
56) A
57) A
58) A
59) A
60) B
61) C
62) C
63) C

64) H_0: $\mu_d = 0$. H_1: $\mu_d > 0$.
Test statistic t = 2.227. Critical value: t = 1.895.
Reject H_0. There is sufficient evidence to support the claim that the training helps to improve the athletes' times for the 800 meters.

65) H_0: $\mu_d = 0$. H_1: $\mu_d \neq 0$.
Test statistic t = 2.894. Critical values: t = ±2.262.
Reject H_0. There is sufficient evidence to warrant rejection of the claim that the mean is the same before and after viewing.

66) H_0: $\mu_d = 0$. H_1: $\mu_d < 0$
Test statistic t = -0.880. Critical value: t = -3.143.
Fail to reject H_0. There is not sufficient evidence to support the claim that the technique is effective in raising the gymnasts' scores.