Name_____ Course Number:_____ Section Number:_____

Directions: Answer the questions and solve the problems in the spaces provided, or attach paper. Circle the correct choice for each response set.

Provide an appropriate response.

1) Discuss the assumptions for constructing confidence intervals or hypothesis testing for two means from dependent samples.

2) In a random sample of 500 people aged 20–24, 22% were smokers. In a random sample of 450 people aged 25–29, 14% were smokers. A 95% confidence interval for the difference between the proportion of 20–24 year olds and the proportion of 25–29 year olds who are smokers is $0.032 < p_1 - p_2 < 0.128$.

Which of the following statements give a correct interpretation of this confidence interval?

I. We can be 95% confident that the interval 0.032 to 0.128 contains the true difference between the two population proportions.

II. There is a 95% chance that the true difference between the two population proportions lies between 0.032 and 0.128.

III. If the process were repeated many times, each time selecting random samples of 500 people aged 20–24 and 450 people aged 25–29 and each time constructing a confidence interval for $p_1 - p_2$, 95% of the time the true difference between the two population proportions will lie between 0.032 and 0.128.

IV. If the process were repeated many times, each time selecting random samples of 500 people aged 20–24 and 450 people aged 25–29 and each time constructing a confidence interval for $p_1 - p_2$, 95% of the time the confidence interval limits will contain the true difference between the two population proportions.

A) I and III B) II and IV C) II and III D) I and IV

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

3) Among 880 people selected randomly from among the eligible voters in one city, 52.3% were homeowners.

A) 458 B) 465 C) 462 D) 460

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.

4) $n_1 = 100$ $n_2 = 100$
$x_1 = 39$ $x_2 = 41$

A) 0.400 B) 0.280 C) 0.360 D) 0.440

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 z test statistic for the hypothesis test.

5) A report on the nightly news broadcast stated that 10 out of 145 households with pet dogs were burglarized and 23 out of 187 without pet dogs were burglarized.

A) z = −0.003 B) z = −1.632 C) z = −0.653 D) z = −2.774

Find the critical z value(s) for the given hypothesis test.

6) The table shows the number of smokers in a random sample of 500 adults aged 20–24 and the number of smokers in a random sample of 450 adults aged 25–29. Do the data provide sufficient evidence that the proportion of smokers in the 20–24 age group is different from the proportion of smokers in the 25–29 age group? Assume that you plan to use a significance level of $\alpha = 0.10$ to test the claim that $p_1 \neq p_2$. (Use computer software to answer the question.)

	Age 20–24	Age 25–29
Number in sample	500	450
Number of smokers	110	63

A) z = ± 1.96; no B) z = ± 1.645; yes
C) z = 1.28; no D) z = ± 1.28; yes

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 P–value for the hypothesis test.

7) $n_1 = 50$ $n_2 = 50$
$x_1 = 8$ $x_2 = 7$

A) 0.1201 B) 0.2206 C) 0.7794 D) 0.8799

Use the traditional method to test the given hypothesis. Assume that the samples are independent and that they have been randomly selected

8) In a random sample of 360 women, 65% favored stricter gun control laws. In a random sample of 220 men, 60% favored stricter gun control laws. Test the claim that the proportion of women favoring stricter gun control is higher than the proportion of men favoring stricter gun control. Use a significance level of 0.05.

Determine whether the samples are independent or dependent.

9) The effectiveness of a headache medicine is tested by measuring the intensity of a headache in patients before and after drug treatment. The data consist of before and after intensities for each patient.

A) Dependent samples B) Independent samples

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.

10) 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.

Treatment Group	Control Group
$n_1 = 101$	$n_2 = 105$
$\bar{x}_1 = 120.5$	$\bar{x}_2 = 149.3$
$s_1 = 17.4$	$s_2 = 30.2$

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

11) A paint manufacturer made a modification to a paint to speed up its drying time. Independent simple random samples of 11 cans of type A (the original paint) and 9 cans of type B (the modified paint) were selected and applied to similar surfaces. The drying times, in hours, were recorded. The summary statistics are as follows.

Type A	Type B
$\bar{x}_1 = 75.9$ hrs	$\bar{x}_2 = 65.6$ hrs
$s_1 = 4.5$ hrs	$s_2 = 5.1$ hrs
$n_1 = 11$	$n_2 = 9$

The following 98% confidence interval was obtained for $\mu_1 - \mu_2$, the difference between the mean drying time for paint cans of type A and the mean drying time for paint cans of type B: $4.69 \text{ hrs} < \mu_1 - \mu_2 < 15.91 \text{ hrs}$

What does the confidence interval suggest about the population means?

A) The confidence interval includes only positive values which suggests that the mean drying time for paint type A is smaller than the mean drying time for paint type B. The modification does not seem to be effective in reducing drying times.

B) The confidence interval includes 0 which suggests that the two population means might be equal. There doesn't appear to be a significant difference between the mean drying time for paint type A and the mean drying time for paint type B. The modification does not seem to be effective in reducing drying times.

C) The confidence interval includes only positive values which suggests that the two population means might be equal. There doesn't appear to be a significant difference between the mean drying time for paint type A and the mean drying time for paint type B. The modification does not seem to be effective in reducing drying times.

D) The confidence interval includes only positive values which suggests that the mean drying time for paint type A is greater than the mean drying time for paint type B. The modification seems to be effective in reducing drying times.

Perform the indicated hypothesis test. Assume that the two samples are independent simple random samples selected from normally distributed populations. Also assume that the population standard deviations are equal ($\sigma_1 = \sigma_2$), so that the standard error of the difference between means is obtained by pooling the sample variances .

12) A researcher wishes to determine whether the blood pressure of vegetarians is, on average, lower than the blood pressure of nonvegetarians. Independent simple random samples of 85 vegetarians and 75 nonvegetarians yielded the following sample statistics for systolic blood pressure:

Vegetarians	Nonvegetarians
$n_1 = 85$	$n_2 = 75$
$\overline{x}_1 = 124.1$ mmHg	$\overline{x}_2 = 138.7$ mmHg
$s_1 = 38.7$ mmHg	$s_2 = 39.2$ mmHg

Use a significance level of 0.01 to test the claim that the mean systolic blood pressure for vegetarians is lower than the mean systolic blood pressure for nonvegetarians. Use the P–value method of hypothesis testing.

Use the computer display to solve the problem.

13) When testing for a difference between the means of a treatment group and a placebo group, the computer display below is obtained. Using a 0.05 significance level, is there sufficient evidence to support the claim that the treatment group (variable 1) comes from a population with a mean that is different from the mean for the placebo population? Explain.

	t-Test: Two Sample for Means		
1		Variable 1	Variable 2
2	Mean	65.10738	66.18251
3	Known Variance	8.102938	10.27387
4	Observations	50	50
5	Hypothesized Mean Difference	0	
6	t	-1.773417	
7	P(T<=t) one-tail	0.0384	
8	T Critical one-tail	1.644853	
9	P(T<=t) two-tail	0.0768	
10	t Critical two-tail	1.959961	

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

14)

X	250	198	220	182	252	279	302
Y	206	130	195	153	222	244	284

A) 35.6 B) 21.4 C) 46.3 D) 213.6

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.

15)

x	6.8	5.4	3.6	9.7	5	11.3	8.1	5.7
y	5	5.1	4.7	5	5.4	6	4.2	4

A) t = 6.792 B) t = 0.998 C) t = 0.845 D) t = 2.391

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.

16) Suppose you wish to test the claim that μ_d, the mean value of the differences d for a population of paired data, is greater than 0. Given a sample of n = 15 and a significance level of $\alpha = 0.01$, what criterion would be used for rejecting the null hypothesis?

A) Reject null hypothesis if test statistic > 2.624.

B) Reject null hypothesis if test statistic > 2.977 or < –2.977.

C) Reject null hypothesis if test statistic < 2.624.

D) Reject null hypothesis if test statistic > 2.602.

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.

17) The table below shows the weights of 9 subjects before and after following a particular diet for two months.

Subject	A	B	C	D	E	F	G	H	I
Before	168	180	157	132	202	124	190	210	171
After	162	178	145	125	171	126	180	195	163

Construct a 99% confidence interval for the mean difference of the "before" minus "after" weights.

A) $-0.6 < \mu_d < 20.4$ B) $2.4 < \mu_d < 17.4$

C) $2.8 < \mu_d < 17.0$ D) $4.51 < \mu_d < 15.7$

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.

18) 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.

Subject	A	B	C	D	E	F	G
Before	9.6	9.7	9.7	9.4	9.7	9.5	9.5
After	9.7	9.9	9.7	9.3	9.8	9.8	9.3

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

Test the indicated claim about the variances or standard deviations of two populations. Assume that both samples are independent simple random samples from populations having normal distributions.

19) A random sample of 16 women resulted in blood pressure levels with a standard deviation of 22.7 mm Hg. A random sample of 17 men resulted in blood pressure levels with a standard deviation of 20.1 mm Hg. Use a 0.05 significance level to test the claim that blood pressure levels for women vary more than blood pressure levels for men.

20) Two types of flares are tested and their burning times are recorded. The summary statistics are given below. Use a 0.05 significance level to test the claim that the burning times for Brand X flares have the same variance as the burning times for Brand Y flares.

Brand X	Brand Y
$n = 35$	$n = 40$
$\bar{x} = 19.4$ min	$\bar{x} = 15.1$ min
$s = 1.4$ min	$s = 0.8$ min

1) 1) Samples must be simple random and data must be dependent.
   2) The number or pairs must either exceed 30, or the pairs of values should have differences from a population that is approxomately normal.
2) D
3) D
4) A
5) B
6) B
7) C
8) H_0: $p_1 = p_2$. H_1: $p_1 > p_2$.
   Test statistic: z = 1.21. Critical value: z = 1.645.
   Fail to reject the null hypothesis. There is not sufficient evidence to support the claim that the proportion of women favoring stricter gun control is higher than the proportion of men favoring stricter gun control.
9) A
10) H_0: $\mu_1 = \mu_2$.
    H_1: $\mu_1 < \mu_2$.
    Test statistic: t = −8.426.
    Critical value: t = −2.364.
    Reject the null hypothesis. There is sufficient evidence to support the claim that the treatment group is from a population with a smaller mean than the control group.
11) D
12) H_0: $\mu_1 = \mu_2$
    H_1: $\mu_1 < \mu_2$
    Test statistic: t = −2.367
    0.005 < P−value < 0.01 (by Table A−3); P−value = 0.0096 (by STATDISK & TI−84+ calculator).
    Reject H_0. At the 1% significance level, there is sufficient evidence to support the claim that the mean systolic blood pressure for vegetarians is lower than the mean systolic blood pressure for nonvegetarians.
13) No, the P−value for a two−tail test is 0.0768, which is greater than the significance level of 0.05. There is not sufficient evidence to support the claim that the two population means are different.
14) A
15) D
16) A
17) A
18) 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.
19) H_0: $\sigma_1 = \sigma_2$ H_1: $\sigma_1 > \sigma_2$
    Test statistic: F = 1.2754.
    Critical F value = 2.352 (by Table A−5).
    P−value = 0.3168 (by STATDISK & TI−84+ calculator).
    Fail to reject the null hypothesis. There is not sufficient evidence to support the claim that blood pressure levels for women vary more than blood pressure levels for men.

20) H_0: $\sigma_1^2 = \sigma_2^2$ H_1: $\sigma_1^2 \neq \sigma_2^2$

Test statistic: F = 3.0625.
Critical value: F at 30, 40 = 1.9429 (by Table A–5); CV F = 1.921619 (by STATDISK).
P–value = 0.0009 (by STATDISK); P–value = 9.1298397E–4 (by TI–84+ calculator).
Reject the null hypothesis. There is sufficient evidence to warrant rejection of the claim that the burning times for Brand X flares have the same variance as the burning times for Brand Y flares.