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) Describe the process for testing hypothesis about two means when the samples are dependent. Compare this process to the methods of hypothesis testing for one mean in Chapter 8.

2) A researcher obtained independent simple random samples of men and women between the ages of 20 and 29. She finds that 35 of 410 men and 59 of 398 women suffered from insomnia at least once a week during the past year. Are the requirements for inference with the two–proportions z–test satisfied? Explain your answer.

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

3) A computer manufacturer randomly selects 2280 of its computers for quality assurance and finds that 2.72% of these computers are found to be defective.

A) 67 B) 60 C) 62 D) 65

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) $n_1 = 716$ $n_2 = 2359$
$x_1 = 132$ $x_2 = 701$

A) 0.271 B) 0.520 C) 0.542 D) 0.217

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 random sampling of sixty pitchers from the National League and fifty–two pitchers from the American League showed that 19 National and 7 American League pitchers had E.R.A's below 3.5.

A) z = 2.276 B) z = 24.906 C) z = 2.959 D) z = 300.796

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

6) The table shows the number of households burglarized in a sample of households with dogs and in a sample of households without dogs.
Do the data support the claim that a smaller proportion of households with pet dogs are burglarized? Assume that you plan to use a significance level of $\alpha = 0.01$ to test the claim that $p_1 < p_2$. (Use computer software to answer the question.)

	Household with Dog	Household without Dog
Number of households in sample	203	105
Number of households burglarized	21	10

A) z = 2.33; yes
B) z = ± 2.575; no
C) z = –2.575; yes
D) z = –2.33; no

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) $n_1 = 200$ $n_2 = 100$
$x_1 = 11$ $x_2 = 8$

A) 0.0201
B) 0.1011
C) 0.0012
D) 0.4020

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

8) A researcher finds that of 1000 people who said that they attend a religious service at least once a week, 31 stopped to help a person with car trouble. Of 1200 people interviewed who had not attended a religious service at least once a month, 22 stopped to help a person with car trouble. At the 0.05 significance level, test the claim that the two proportions are equal.

Determine whether the samples are independent or dependent.

9) The effect of caffeine as an ingredient is tested with a sample of regular soda and another sample with decaffeinated soda.

A) Independent samples
B) Dependent 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 paint manufacturer wishes to compare the drying times of two different types of paint. Independent 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.

Type A	Type B
$\bar{x}_1 = 76.9$ hrs	$\bar{x}_2 = 66.3$ hrs
$s_1 = 4.5$ hrs	$s_2 = 5.1$ hrs
$n_1 = 11$	$n_2 = 9$

Use a 0.01 significance level to test the claim that the mean drying time for paint type A is equal to the mean drying time for paint type B. Use the P-value method of hypothesis testing.

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

11) A researcher was interested in comparing the heights of women in two different countries. Independent simple random samples of 9 women from Country A and 9 women from Country B yielded the following heights (in inches).

Country A	Country B
65.3	64.1
60.2	66.4
61.7	61.7
65.8	62.0
61.0	67.3
64.6	64.9
60.0	64.7
65.4	68.0
59.0	63.6

The following 90% confidence interval was obtained for $\mu_1 - \mu_2$, the difference between the mean height of women in country A and the mean height of women in country B.

-4.21 in. $< \mu_1 - \mu_2 < -0.17$ in

What does the confidence interval suggest about the population means?

A) 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 height of women from country A and the mean height of women from country B.

B) The confidence interval includes only negative values which suggests that the mean height of women from country A is smaller than the mean height of women from country B.

C) The confidence interval includes only negative values which suggests that the mean height of women from country A is greater than the mean height of women from country B.

D) The confidence interval includes only negative values which suggests that the two population means might be equal. There doesn't appear to be a significant difference between the mean height of women from country A and the mean height of women from country B.

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 was interested in comparing the response times of two different cab companies. Companies A and B were each called at 50 randomly selected times. The calls to company A were made independently of the calls to company B. The response times were recorded and the summary statistics were as follows:

	Company A	Company B
Mean response time	7.6 mins	6.9 mins
Standard deviation	1.4 mins	1.7 mins

Use a 0.02 significance level to test the claim that the mean response time for company A differs from the mean response time for company B. 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 0.01 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 greater than the mean for the placebo population? Explain.

	t-Test: Two Sample for Means		
1		Variable 1	Variable 2
2	Mean	171.6392	168.7718
3	Known Variance	47.51672	41.08293
4	Observations	50	50
5	Hypothesized Mean Difference	0	
6	t	2.154057	
7	P(T>=t) one-tail	0.0158	
8	T Critical one-tail	1.644853	
9	P(T>=t) two-tail	0.0316	
10	t Critical two-tail	1.959961	

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

14)

X	5.7	7.0	9.3	7.9	6.8	5.7
Y	7.8	9.7	7.8	9.1	8.1	9.3

A) –1.6 B) –9.6 C) –1.0 D) –2.1

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	11	1	7	8	14
y	8	3	3	9	9

A) t = 1.292 B) t = 0.578 C) t = 2.890 D) t = 0.415

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) We wish to compare the means of two populations using paired observations. Suppose that $\overline{d} = 3.125$, $S_d = 2.911$, and n = 8, and that you wish to test the following hypothesis at the 5% level of significance:

H_0: $\mu_d = 0$ against H_1: $\mu_d > 0$.

What decision rule would you use?

A) Reject H_0 if test statistic is greater than −1.895 and less than 1.895.

B) Reject H_0 if test statistic is greater than 1.895.

C) Reject H_0 if test statistic is less than 1.895.

D) Reject H_0 if test statistic is greater than −1.895.

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

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

A) $1.2 < \mu_d < 5.7$ B) $0.8 < \mu_d < 6.6$

C) $0.2 < \mu_d < 7.2$ D) $1.0 < \mu_d < 6.4$

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 in training middle distance runners. The times for 8 different athletes to run 800 meters before and after this training are shown below.

Athlete	A	B	C	D	E	F	G	H
Time before training (seconds)	114.3	110.1	111.8	109	113.7	108	110.5	119.7
Time after training (seconds)	114.9	108.8	109.4	109.8	111.9	108.1	106.9	115.8

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

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) Use the summary statistics below to test the claim that the samples come from populations with different variances. Use a significance level of 0.05.

Sample A	Sample B
$n = 28$	$n = 41$
$\bar{x}_1 = 19.2$	$\bar{x}_2 = 23.7$
$s = 5.07$	$s = 5.35$

20) When 25 randomly selected customers enter any one of several waiting lines, their waiting times have a standard deviation of 5.59 minutes. When 16 randomly selected customers enter a single main waiting line, their waiting times have a standard deviation of 2.15 minutes. Use a 0.05 significance level to test the claim that there is more variation in the waiting times when several lines are used.

1) When the samples are dependent, the differences are computed for each pair of values. Then the mean and standard deviation are computed. The process proceeds exactly like the process in Chapter 8 for testing hypothesis about one mean with the t–distribution. The test statistic is $t = \frac{\overline{d} - \mu_d}{\frac{s_d}{\sqrt{n}}}$. The hypotheses are H_0: $\mu_d = 0$. H_1: $\mu_d \neq 0$. The process includes drawing the distribution, shading the reject region(s), finding the critical values, computing the test statistic, rejecting or failing to reject the null hypothesis, and writing the conclusion.
2) The requirements are satisfied. The samples are both simple random samples. The samples are independent of each other. There are at least 5 successes and at least 5 failures in each sample.
3) C
4) A
5) A
6) D
7) D
8) H_0: $p_1 = p_2$. H_1: $p_1 \neq p_2$.
Test statistic: z = 1.93. Critical values: z = ±1.96.
Fail to reject the null hypothesis. There is not sufficient evidence to warrant rejection of the claim that the two proportions are equal.
9) A
10) H_0: $\mu_1 = \mu_2$
H_1: $\mu_1 \neq \mu_2$
Test statistic: t = 4.873
P–value < 0.01 (by Table A–3); P–value = 0.0002 (by STATDISK); P–value = 1.637738E–4 (by TI–84+ calculator).
Reject H_0. At the 0.01 significance level, there is sufficient evidence to warrant rejection of the claim that the mean drying time for paint type A is equal to the mean drying time for paint type B.
11) B
12) H_0: $\mu_1 = \mu_2$
H_1: $\mu_1 \neq \mu_2$
Test statistic: t = 2.248
0.02 < P–value < 0.05 (by Table A–3); P–value = 0.0268 (by STATDISK & TI–84+ calculator).
Do not reject H_0. At the 2% significance level, there is not sufficient evidence to support the claim that the mean response time for company A differs from the mean response time for company B.
13) No, the P–value for a one–tail test is 0.0158, which is larger than the significance level of 0.01. There is not sufficient evidence to support the claim that the mean for the treatment group is greater than the mean for the placebo group.
14) A
15) A
16) B
17) C
18) 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.

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

Test statistic: F = 1.1135.
Upper critical F value = 2.0693 (by Table A–5).
P–value = 0.7803 (by STATDISK & TI–84+ calculator).
Fail to reject the null hypothesis. There is not sufficient evidence to support the claim that the samples come from populations with different variances.

20) H_0: $\sigma_1 = \sigma_2$ H_1: $\sigma_1 > \sigma_2$
Test statistic: F = 6.7600.
Upper critical F value: 2.2878 (by Table A–5).
P–value = 0.0002 (by STATDISK); P–value = 1.9164339E–4 (by TI–84+ calculator).
Reject H_0. There is sufficient evidence to support the claim that there is more variation in the waiting times when several lines are used.