Math 160 - Quiz 11 Name________________________________

Due Thursday, May 9th

Use the 5 step method of hypothesis testing to test the claims given below. Use both the Critical Value and P value methods.

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 σ = 1.5°C, test the claim that the population mean is 22°C. Use a 0.05 significance level. 1) ______________

2) 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. 2) ______________

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.

3) 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. 3) ______________

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.

4) Test the claim that for the adult population of one town, the mean annual salary is given by μ = \$30,000. Sample data are summarized as n = 17, $\bar{x}$ = \$22,298, and s = \$14,200. Use a significance level of α = 0.05. 4) ______________

5) 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. 5) ______________

6) 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 years, and s = 9.2 years. Use a significance level of α = 0.05. 6) ______________

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

7) 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 14.1. Use a significance level of 0.01 to test the teacher's claim. 7) ______________

8) 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 2.1 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. 8) ______________

9) 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 \$971. 9) ______________

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

10) Use the given sample data to test the claim that $p_1 > p_2$. Use a significance level of 0.01. 10) ______________

Sample 1	Sample 2
$n_1 = 85$	$n_2 = 90$
$x_1 = 38$	$x_2 = 23$

11) Use the given sample data to test the claim that $p_1 < p_2$. Use a significance level of 0.10. 11) ______________

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

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.

12) $x_1 = 30$, $n_1 = 66$ and $x_2 = 36$, $n_2 = 87$; Construct a 95% confidence interval for the difference between population proportions $p_1 - p_2$. 12) ______

A) $-0.148 < p_1 - p_2 < 0.643$
B) $-0.118 < p_1 - p_2 < 0.199$
C) $0.296 < p_1 - p_2 < 0.613$
D) $0.266 < p_1 - p_2 < 0.643$

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.

13) Two types of flares are tested and their burning times are recorded. The summary statistics are given below. 13) ______

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

Construct a 95% confidence interval for the differences between the mean burning time of the brand X flare and the mean burning time of the brand Y flare.

A) $3.2 \text{ min} < \mu_X - \mu_Y < 5.4 \text{ min}$
B) $3.6 \text{ min} < \mu_X - \mu_Y < 5.0 \text{ min}$
C) $3.5 \text{ min} < \mu_X - \mu_Y < 5.1 \text{ min}$
D) $3.8 \text{ min} < \mu_X - \mu_Y < 4.8 \text{ min}$

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. 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 .

14) 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. 14) ______

Women	Men
$\bar{x}_1 = 12.6$ hr	$\bar{x}_2 = 16.5$ hr
$s_1 = 4.1$ hr	$s_2 = 4.7$ hr
$n_1 = 14$	$n_2 = 17$

Construct a 95% confidence interval 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.

A) $-7.30 \text{ hrs} < \mu_1 - \mu_2 < -0.50 \text{ hrs}$
B) $-6.62 \text{ hrs} < \mu_1 - \mu_2 < -1.18 \text{ hrs}$
C) $-7.45 \text{ hrs} < \mu_1 - \mu_2 < -0.35 \text{ hrs}$
D) $-7.18 \text{ hrs} < \mu_1 - \mu_2 < -0.62 \text{ hrs}$

Use the 5 step method of hypothesis testing to test the claims given below. Use both the Critical Value and P value methods.

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 .

15) 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: 15) ____________

	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.

16) A researcher was interested in comparing the resting pulse rates of people who exercise regularly and the pulse rates of those who do not exercise regularly. Independent simple random samples of 16 people who do not exercise regularly and 12 people who exercise regularly were selected, and the resting pulse rates (in beats per minute) were recorded. The summary statistics are as follows. 16) ____________

Do Not Exercise	Do Exercise
$\bar{x}_1$ = 73.0 beats/min	$\bar{x}_2$ = 69.2 beats/min
s_1 = 10.1 beats/min	s_2 = 8.4 beats/min
n_1 = 16	n_2 = 12

Use a 0.025 significance level to test the claim that the mean resting pulse rate of people who do not exercise regularly is greater than the mean resting pulse rate of people who exercise regularly. Use the traditional method of hypothesis testing.