STA 275 Practice Problems 4

1. Suppose a random sample of 25 six-year old girls was obtained with a mean height of 43 inches and a standard deviation of heights equal to 6.5 inches.

Suppose a physician is interested in the test $H_o : \mu = 44$ in versus $H_a : \mu \neq 44$ in. Using the usual testing procedure, conduct the test using $\alpha = 0.10$ and state your conclusion in the context of the problem. What assumptions must be true in order for the testing procedure to be valid? Please explain.

2. A sample of 40 sales receipts from the University Bookstore has $\overline{X} = \$118$ and $S = \$15.40$.

a. Use these values to conduct a hypothesis test of $H_o : \mu = \$120$ versus $H_a : \mu < \$120$ using $\alpha = 0.05$.
b. What is the probability of rejecting H_o when H_o is really true?
c. Compute the P-value for this test and state your conclusion in the context of the problem.

3. Five years ago, the average size of farms in a state was 160 acres. From a recent survey of 37 farms, the mean and standard deviation were found to be 180 acres and 36 acres, respectively. Suppose that farm sizes are normally distributed. Is there strong evidence that the average farm size is larger than it was 5 years ago? Please explain.

4. True or false? If $\alpha =$ P(Type I error) and $\beta =$ P(Type II error), then $\alpha + \beta = 1$. Please explain why you think your answer is correct.

5. While estimating a population proportion p using a large sample, one reports that the point estimate of p is $\hat{p} = 0.32$ and $\sqrt{\hat{p}(1 - \hat{p})/n} = 0.08$.

a. Find the sample size n that was used in the study.
b. Conduct the test $H_o : p = 0.3$ versus $H_a : p > 0.3$ using $\alpha = 0.01$.

6. Identify the following as either independent or matched pair samples.

a. Fifteen people are studied to determine the effects of a diet program on weight loss. Weight measurements are taken before and after the twelve week diet program. Some of the individuals actually gained weight at the end of the twelve week period.
b. A random sample of forty race horses is obtained with the objective of determining if race times are influenced by training techniques. Training technique A is applied to twenty horses and training technique B is applied to the remaining twenty.
c. Radon measurements were taken in homes during the winter and the summer. Twenty-five houses were chosen for this study. Eighteen homes during the winter and five homes during the summer had radon levels that exceeded the recommended level.

7. An apple grower wishes to evaluate a new spray that is claimed to reduce the loss due to the damage of insects. In doing so, she performs an experiment with thirty trees by treating fifteen of the trees with the new spray and the other fifteen with the standard spray. From the data of yield (in lbs) of those trees, the following statistics were obtained.

	Standard Spray	New Spray
Mean	233	260
Standard deviation	19	32

a. Do these data substantiate the claim that a higher yield should result from the new spray? State the assumptions you make and test using $\alpha = 0.05$. What is the P-value?
b. Construct a 95% confidence interval for the difference in mean yields using the new and standard spray.
c. Using your results in part **b.**, would you reject or retain the null hypothesis that the mean yield using the new spray is 40 lbs larger than the mean yield using the standard spray? Please explain.
d. In the context of the problem, list all the assumptions you made in order to answer **a**, **b**, and **c**.

8. Measurements of left- and right-hand gripping strengths of 9 left handed writers are recorded.

					Person				
	1	2	3	4	5	6	7	8	9
Left Hand	140	90	125	130	95	121	85	97	131
Right Hand	138	87	110	132	96	120	86	90	129

a. Do the data provide strong evidence that people who write with their left hand have a greater gripping strength in the left hand than in the right hand? Please explain.
b. Construct a 90% CI for the mean difference between gripping strengths.
c. In the context of the problem, list all the assumptions you made in order to answer **a** and **b**.

9. To study the relationship between blood pressure and exercise, women who were fifty years of age were randomly selected and agreed to participate in a modest training program. Five women were included in the study and exercised daily for a predetermined amount of time.
Let x = length of each workout (minutes) and y = systolic blood pressure (mm Hg) measured at the end of a thirty day period for each participant. The data are given in the following table:

x (min)	y (mm Hg)
5	145
25	140
30	130
10	145
45	120

a. Construct a scatterplot of the data.
b. Compute the sample correlation coefficient.
c. Do x and y have a positive or negative relationship? Please explain.
d. Find the equation of the least squares line.
e. Do the intercept and slope have meaningful interpretations in this problem? Please explain.