MTH 115 Practice Problems 3

1. *USA Today* reported that 36% of adult drivers admit that they often or sometimes talk on a cell phone when driving. This estimate was based on data from a sample of 1004 adult drivers.

a. What is the value of $\widehat{p}$, the sample proportion?
b. The half-width of a 95% confidence interval for p was computed to be 0.03. Do you agree with this calculation? Explain.
c. The CI mentioned above may be used to estimate the population proportion p. What is the margin of error (E)?
d. In a future study, how many adult drivers should be in a sample so that margin of error when estimating p is 0.01 with 95% confidence?

2. Consider the problem of estimating the population mean height of 5-year old boys. Suppose a sample of 46 boys yields that following results (x_i = height of the ithth boy in the sample):

$$\sum_{i=1}^{46} x_i = 1845 \text{ inches} \quad \text{and} \sum_{i=1}^{46} (x_i - \overline{x})^2 = 5379 \text{ square inches}$$

a. The sample mean is often called a point estimator of the population mean. Using the information provided, compute a point estimate of μ.
b. The sample standard deviation is often called a point estimator of the population standard deviation. Using the information provided, compute a point estimate of σ.
c. How many five-year old boys need to be sampled in order to be 90% certain that the population mean height is estimated to within 0.25 inches?

3. By measuring the heights of 62 six-year old girls selected at random, an investigator determined that a 90% CI for the population mean height μ of six-year-old girls was (42.2 inches, 46.1 inches). Answer the following questions with "Yes", "No", or "Can't Tell" and give a brief explanation.

a. Can you describe how the above CI was constructed?
b. Does the population mean lie in the above CI?
c. Does the sample mean lie in the above CI?
d. Was the sample standard deviation used to help build the above CI?
e. Will an interval having a 99% confidence level be narrower than (42.2 in, 46.1 in)?

4. Problem 27 on page 385 of the textbook.

5. 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 different than it was 5 years ago? Please explain by:

a. Conducting the appropriate hypothesis test using $\alpha = 0.05$.
b. Constructing the appropriate 95% CI.

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? Conduct a hypothesis test using $\alpha = 0.05$. Be sure to write your conclusion in the context of the problem.
b. Construct a 95% confidence interval for the difference in mean yields using the new and standard spray.
c. In the context of the problem, list all the assumptions you made in order to answer parts **a** and **b**.

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**.