

**A.P. Statistics**  
**Assignment 8.7**

**Remember to show your thinking through your work.**

- 1) Your local newspaper contains a large number of advertisements for unfurnished one-bedroom apartments. You choose 10 at random and calculate that their mean monthly rent is \$540 and that the standard deviation of their rents is \$80.  
(a) What is the standard error of the mean?

- (b) What are the degrees of freedom for a one-sample t statistic?

- 2) Here are estimates of the daily intakes of calcium (in milligrams) for 38 women between the ages of 18 and 24 years who participated in a study of women's bone health:

808	882	1062	970	909	802	374	416	784	997
651	716	438	1420	1425	948	1050	976	572	403
626	774	1253	549	1325	446	465	1269	671	696
1156	684	1933	748	1203	2433	1255	1100		

- (a) Are the t procedures appropriate for this data? Explain.

- (b) Find a 95% confidence interval for the mean.

- (c) Eliminate the two largest values and answer parts (a) and (b) again.

- 3) The cost of health care is the subject of many studies that use statistical methods. One such study estimated that the average length of service for home health care among people over the age of 65 who use this type of service is 96.0 days with a standard error of 5.1 days. Assuming that the degrees of freedom are large, calculate a 90% confidence interval for the true mean length of service.

- 4) A table gives the number of medical doctors per 100,000 people for each of the 50 states. It does not make sense to use the t procedures (or any other statistical procedures) to give a 95% confidence interval for the mean number of medical doctors per 100,000 people in the population of the American states. Explain why not.

- 5) Researchers studying the learning of speech often compare measurements made on the recorded speech of adults and children. One variable of interest is called the voice onset time (VOT). Here are the results for 6-year-old children and adults asked to pronounce the word "bees." The VOT is measured in milliseconds and can be either positive or negative.

Group	n	$\bar{x}$	s
Children	10	-3.67	33.89
Adults	20	-23.17	50.74

- (a) What is the standard error of the sample mean VOT for the 20 adult subjects?

- (b) What is the standard error of the difference  $\bar{x}_{\text{children}} - \bar{x}_{\text{adults}}$  between the mean VOT for children and adults?

- (c) The researchers were investigating whether VOT distinguishes adults from children. State  $H_0$  and  $H_a$  and carry out a two-sample t-test. Give a P-value and report your conclusions.

- (d) Give a 95% confidence interval for the difference in mean VOTs when pronouncing the word "bees." Explain why you knew from your result in (c) that this interval would contain 0 (no difference).

- 6) In a study of the effectiveness of weight-loss programs, 47 subjects who were at least 20% overweight took part in a group support program for 10 weeks. Private weighings determined each subject's weight at the beginning of the program and 6 months after the program's end. The matched pairs t-test was used to assess the significance of the average weight loss. The paper reporting the study said, "The

subjects lost a significant amount of weight over time,  $t(46) = 4.68, p < 0.01$ ." It is common to report the results of statistical tests in this abbreviated style.

(a) Why was the matched pairs statistic appropriate?

(b) Explain to someone who knows no statistics but is interested in weight-loss programs what the practical conclusion is.

(c) The paper follows the tradition of reporting significance only at fixed levels such as  $\alpha = 0.01$ . In fact, the results are more significant than " $p < 0.01$ " suggests. What can you say about the P-value of the t-test?

7) High levels of cholesterol in the blood are not healthy in either humans or dogs. Because a diet rich in saturated fats raises the cholesterol level, it is plausible that dogs owned as pets have higher cholesterol levels than dogs owned by a veterinary research clinic. "Normal" levels of cholesterol based on the clinic's dogs would then be misleading. A clinic compared healthy dogs it owned with healthy pets brought to the clinic to be neutered. The summary statistics for blood cholesterol levels (milligrams per deciliter of blood) appear below:

<b>Group</b>	<b>n</b>	<b>x</b>	<b>s</b>
<b>Pets</b>	26	193	68
<b>Clinic</b>	23	174	44

(a) Is there strong evidence that pets have a higher mean cholesterol level than clinic dogs? Carry out a complete test.

(b) Give a 95% confidence interval for the difference in mean cholesterol levels between pets and clinic dogs.

(c) What assumptions must be satisfied to justify the procedures you used in (a) and (b)?