PSTAT 5LS FALL 2008
PRACTICE FINAL

A formula sheet will be provided.
Tables will be provided.

QUESTION 1

The water diet requires one to drink two cups of water every half hour from when one gets up until one goes to bed, but otherwise allows one to eat whatever one likes. Four adult volunteers agree to test the diet. They are weighed prior to the diet and after six weeks on the diet. The weights (in pounds) are as follows.

<table>
<thead>
<tr>
<th>Person</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight before the diet</td>
<td>180</td>
<td>125</td>
<td>240</td>
<td>150</td>
</tr>
<tr>
<td>Weight after six weeks</td>
<td>170</td>
<td>130</td>
<td>215</td>
<td>152</td>
</tr>
</tbody>
</table>

For the population of all adults, assume that the weight loss after six weeks on the diet (weight before beginning the diet minus weight after six weeks on the diet) is normally distributed with mean $\mu$.

(i) By conducting a suitable hypothesis test, determine if the diet leads to weight loss. Test at significance level 0.10. Use the 4-step method.

(ii) Find a 95% confidence interval for $\mu$ based on these data.

QUESTION 2

The Virginia Department of Environmental Quality (VDEQ) uses probabilistic monitoring to regulate the water quality of streams in the Commonwealth of Virginia. Of the 85 Eastern Virginia Sites (group 1), 17 do not meet minimum requirements. Of the 80 units sampled in Western Virginia Sites (group 2), 24 do not meet minimum requirements. Assume the data can be treated as independent simple random samples. Test whether the proportions of streams that fail to meet minimum requirements in the two areas are equal or not.

QUESTION 3

A national polling agency conducted a poll in which an SRS of 3000 Americans that are registered to vote were contacted regarding whether additional taxes should be imposed on gasoline to encourage individuals to purchase more fuel efficient automobiles. The agency obtained answers from 1200 Americans and found that 580 would vote for the proposed taxes. Let $p$ represent the proportion of registered voters that would vote for the proposed taxes.

(i) Find a 90% confidence interval for $p$.

(ii) How large a sample $n$ would you need to estimate $p$ with margin of error 0.01 with 95% confidence?
QUESTION 4
A new diet has been developed for raising beef cows. Two random samples of size nine are independently selected, and one is given the standard diet and the other is given the new diet. After 18 weeks, the weight gain was measured, and it was found that $\bar{x}_1 = 30$ with $s_1 = 8$ and $\bar{x}_2 = 26$ with $s_2 = 6$. Let $\mu_1$ and $\mu_2$ represent the mean weight gain we would observe for the entire population of beef cows when on, respectively, a new diet and a standard diet. Assume that two-sample $t$ procedures are safe to use.

(i) A 99% confidence interval for $\mu_1 - \mu_2$ is (use the conservative value for the degrees of freedom).

(ii) Test the following hypotheses and state your conclusion.

$$H_0: \mu_1 = \mu_2; \quad H_a: \mu_1 > \mu_2$$

QUESTION 5
Exercise 8.3

QUESTION 6
The average age of trees in a large local park is 60 years with a standard deviation of 2.2 years. A simple random sample of 400 trees is selected, and the sample mean age $\bar{x}$ of these trees is computed.

(i) Find the probability that the average age $\bar{x}$ of the 400 trees is more than 60.1 years.

(ii) State the parameter of interest.

QUESTION 7
Event A has probability 0.4. Event B has probability 0.5.

(i) If A and B are disjoint, find the probability that both events occur.

(ii) If A and B are disjoint, find the probability of A or B.

QUESTION 8
Exercise 4.25

QUESTION 9

(i) Exercise 4.45

(ii) Check your skills pp116-118

END OF PRACTICE FINAL