Practice problems.

1. The body temperatures of 10 randomly selected healthy adults were as follows.  
97.8 98.4 98.9 98.4 98.6 98.5 98.8 98.6 98.2 98.0  
The distribution of these 10 random observations is approximately normal. Find the 98% confidence interval estimate for average healthy adults’ body temperature.

2. A large public opinion polling agency plans to conduct a national survey to determine the proportion of employed adults who fear losing their job within the next year. They found that 35 out of 100 randomly selected employed adults were fear losing their job within the next year. Find the 95% confidence interval estimate for the proportion of the population of employed adults who fear losing their job within the next year.

3. A group of researchers wish to see whether the average length of pregnancy for women that are put on a special diet will be less than 265 days or not. A random sample of 81 women were put on a special diet just before they became pregnant, yields an average of 263 days and a sample standard deviation of 10 days. Is the evidence statistically significant at the 5% level to indicate that the average length of pregnancy for women put on this special diet is less than 265 days? Also, find the p-value of the test.

4. In a survey at Youngstown City, one question asked the total 1997 income of the householder for estimating the average householder’s income. (The householder is the person in whose name the dwelling unit is owned or rented.) A pilot study indicated that the standard deviation of income is $7000. How large a sample of households would enable you to estimate the mean income of Youngstown householders within a margin of error of $1000 with 95% confidence?

5. Response to an advertising display was measured by counting the number of people who purchased the product out of the total number exposed to the display. If 250 purchased the product out of a total of 1000 exposed, estimate the proportion of all persons exposed who will buy the product. Use a 95% confidence interval.

6. A research paper by Squires et al. (1978) assessed the acute effects of alcohol on auditory brainstem potentials in humans. Six volunteers participated in the study. The latency (delay) in response to an auditory stimulus was measured before and after an intoxicating dose of alcohol. The measurements of the latency of peak responses (in milliseconds after the stimulus onset) in the six subjects were as follows:

<table>
<thead>
<tr>
<th>Treatment \ Individual's ID</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before alcohol</td>
<td>3.85</td>
<td>3.81</td>
<td>3.60</td>
<td>3.68</td>
<td>3.78</td>
<td>3.83</td>
</tr>
<tr>
<td>After alcohol</td>
<td>3.82</td>
<td>3.95</td>
<td>3.80</td>
<td>3.87</td>
<td>3.88</td>
<td>3.94</td>
</tr>
</tbody>
</table>

Use a paired-sample t-test to test the significance of the difference at the $\alpha = 0.05$. Also, state the assumption that is needed for using the test procedure.

7. Shopping at secondhand stores is becoming more popular and has even attracted the attention of business schools. A study of customers’ attitudes toward secondhand stores interviewed samples of shoppers at two secondhand stores of the same chain in two cities of different sizes. The breakdown of the respondents by sex is as follows.

<table>
<thead>
<tr>
<th></th>
<th>Large city</th>
<th>Small city</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>Women</td>
<td>230</td>
<td>160</td>
</tr>
</tbody>
</table>

Use the $\chi^2$ test to see whether there is a significant relation between the gender distribution of customers and the size of city?

8. Test performance is to be compared for students from two different high schools. Two independent random samples are taken from two high schools. Sample from school A has 36 students and yielded a sample mean of 3.27 and standard deviation of 6.7. Sample from school B has 60 students and yielded a sample mean of 3.5 and standard deviation of 5.97. Assume the two population variances are the same. At 0.05 level of significance, test whether the difference of the average test scores between the two schools is statistically significant.
Answers:

1. 98.42 ± 0.31 or (98.11, 98.73)
2. 35% ± 9.4% or (25.6%, 44.4%)
3. \( z = -1.8 < c.v. = -1.645 \), reject Ho, p-value = 0.0359 (or use a t-test)
4. 189
5. 25% ± 2.7% or (22.3%, 27.7%)
6. \( t = -3.48 < c.v. = -2.571 \), reject Ho
7. chi-square test statistic = 34.5 > c.v. = 3.841, reject Ho
8. \( t = -0.16 \) with p-value > 0.05 failed to reject Ho