**Week 6 and 7 Exercise solutions**
**STT 421: Summer, 2004**
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**6.37**

NOTE: The solutions assume that the alternative hypotheses $H_a$ are two-sided, i.e., specify $\mu \neq \mu_0$. Otherwise we can't answer the questions.

(a) Since 34 is inside the interval, we cannot reject $H_0$.

(b) Since 36 is outside the interval, we can reject $H_0$.

**6.69**

(a)

$$z = \frac{541.4 - 525}{100/\sqrt{100}} = 1.64.$$

The p-value is 0.0505, which is larger than 0.05, so $H_0$ is not rejected.

(b)

$$z = \frac{541.5 - 525}{100/\sqrt{100}} = 1.65.$$

The p-value is 0.0495, which is smaller than 0.05, so $H_0$ is rejected.

**7.13**

(a) 49 d.f.

(b) We can use either 40 d.f. (this is the conservative choice) or 50 d.f. For 40 d.f., the values are 1.303 and 1.604, and the right tail probabilities are 0.1 and 0.05. For 50 d.f., the values are 1.299 and 1.676, with corresponding right tail probabilities 0.1 and 0.05.

(c) The p-value is between 0.1 and 0.2.

(d) The value 1.65 is not staistically significant at either the 0.10 or 0.05 levels.

**7.59**

(a) Let $\mu_1$ stand for the mean rent of one bedroom apartments, and let $\mu_2$ stand for the mean rent of two bedroom apartments. Then the alternative hypothesis can be specified as $H_a\colon \mu_1 - \mu_2 < 0$, and the null hypothesis as $H_0\colon \mu_1 - \mu_2 = 0$. Of course, there are several equivalent ways to specify the hypotheses. For example, the "=" in $H_0$ could be replaced by "$\geq$." Or the hypotheses could be specified in terms of the means themselves rather than the differences, e.g., $H_a\colon \mu_1 < \mu_2$.

(b) The test statistic is

$$t = \frac{531 - 609}{\sqrt{\frac{82.79^2}{10} + \frac{89.31^2}{10}}} \approx \frac{-78}{38.51} \approx -2.03.$$

The p-value is between 0.025 and 0.05. The null hypothesis would be rejected for $\alpha = 0.05$, but not for $\alpha = 0.01$.

(c) No. Even if we reject $H_0$, we're just concluding that the mean rent for two bedroom apartments is more than the mean rent for one bedroom apartments. It's still possible that there are some expensive one bedroom apartments that have a higher rent than some two bedroom apartments. In fact, the most expensive one bedroom apartment in the data set costs \$650, while the least expensive two bedroom apartment in the data set costs \$495.

**8.2**

First we compute $\tilde{p} = (X + 2)/(n + 4)$ to be $489/815 = 0.6$. Since we want a 99% confidence interval, we use $z^* = 2.57$. (We can also use 2.58 or 2.576.) The interval is

$$0.6 \pm 2.57\sqrt{(0.6)(0.4)/815}.$$