Stat 151.003 Fall 2006 (Kozdron)
Solutions to Assignment #5

Page 340 #10: We compute the sample mean for these 8 data points as

$$\overline{X} = \frac{60+56+60+55+70+55+60+55}{8} = \frac{471}{8} = 58.875.$$

We compute the sample variance as

$$S^2 = \frac{\sum X^2 - \frac{(\sum X)^2}{n}}{n-1} = \frac{27911 - \frac{471^2}{8}}{7} = 25.84$$

so that the sample standard deviation is $S = 5.08$. A 90% confidence interval for the mean for the salaries of substitute teachers in the region is given by

$$\left(\overline{X} - t_{0.05,7} \cdot \frac{S}{\sqrt{n}}, \overline{X} + t_{0.05,7} \cdot \frac{S}{\sqrt{n}}\right)$$

or

$$\left(58.875 - 1.895 \cdot \frac{5.08}{\sqrt{8}}, 58.875 + 1.895 \cdot \frac{5.08}{\sqrt{8}}\right)$$

or

$$(55.5, 62.3).$$

Page 340 #12: An approximate 99% confidence interval for the true mean time taken to change a water pump based on the average of these 6 employees is given by

$$\left(\overline{X} - t_{0.005,5} \cdot \frac{S}{\sqrt{n}}, \overline{X} + t_{0.005,5} \cdot \frac{S}{\sqrt{n}}\right)$$

or

$$\left(18 - 4.032 \cdot \frac{3}{\sqrt{6}}, 18 + 4.032 \cdot \frac{3}{\sqrt{6}}\right)$$

or

$$(13.06, 22.94).$$

Page 340 #20: We compute the sample mean for these 10 data points as

$$\overline{X} = \frac{61+12+6+40+27+38+93+5+13+40}{10} = \frac{335}{10} = 33.5.$$

We compute the sample variance as

$$S^2 = \frac{\sum X^2 - \frac{(\sum X)^2}{n}}{n-1} = \frac{18117 - \frac{335^2}{10}}{9} = 766.06$$

so that the sample standard deviation is $S = 27.7$. A 98% confidence interval for the true mean AQI for these metropolitan areas is

$$\left(\overline{X} - t_{0.01,9} \cdot \frac{S}{\sqrt{n}}, \overline{X} + t_{0.01,9} \cdot \frac{S}{\sqrt{n}}\right)$$

or

$$\left(33.5 - 2.821 \cdot \frac{27.7}{\sqrt{10}}, (33.5 - 2.821 \cdot \frac{27.7}{\sqrt{10}}\right)$$

or

$$(8.8, 58.2).$$

Page 346 #4: The point estimate for the proportion of obese people living in Miami is $\hat{p} = \frac{27}{100}$. An approximate 90% confidence interval for the true proportion of obese people in Miami is therefore given by

$$\left(\hat{p} - z_{0.05}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\,,\, \hat{p} + z_{0.05}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right)$$

or

$$\left(\frac{27}{100} - 1.645\sqrt{\frac{27/100 \cdot 73/100}{100}}\,,\, \frac{27}{100} - 1.645\sqrt{\frac{27/100 \cdot 73/100}{100}}\right)$$

or

$$(0.197, 0.343).$$

Page 359 #14: An approximate 99% confidence interval for the true mean weight of minivans based on the average of these 40 minivans is given by

$$\left(\overline{X} - z_{0.005} \cdot \frac{S}{\sqrt{n}}\,,\, \overline{X} + z_{0.005} \cdot \frac{S}{\sqrt{n}}\right)$$

or

$$\left(4150 - 2.576 \cdot \frac{480}{\sqrt{40}}\,,\, 4150 - 2.576 \cdot \frac{480}{\sqrt{40}}\right)$$

or

$$(3954.5, 4345.5).$$

Page 359 #20: The point estimate for the proportion of workers who ride the bus to work each day is $\hat{p} = \frac{53}{75}$. An approximate 95% confidence interval for the true proportion of workers who ride the bus to work each day is

$$\left(\hat{p} - z_{0.025}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\,,\, \hat{p} + z_{0.025}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right)$$

or

$$\left(\frac{53}{75} - 1.96\sqrt{\frac{53/75 \cdot 22/75}{75}}\,,\, \frac{53}{75} - 1.96\sqrt{\frac{53/75 \cdot 22/75}{75}}\right)$$

or

$$(0.604, 0.810).$$