Solution for Assignment 8

#8.62.

	under $1000	$1000 or more
Number of accidents	$n_1 = 32$	$n_2 = 41$
Number involving injuries	$x_1 = 10$	$x_2 = 23$
proportion of involving injuries	$\hat{p}_1 = \frac{10}{32}$	$\hat{p}_2 = \frac{23}{41}$

a) $\hat{p}_2 = \frac{23}{41}$

The margin of error: $1.96 \cdot \sqrt{\frac{\hat{p}_2(1-\hat{p}_2)}{n_2}} = 1.96 \cdot \sqrt{\frac{0.56 \cdot (0.44)}{41}} = 0.152$

b) By Def^n: $(\hat{p}_1 - \hat{p}_2) \pm z_{\frac{\alpha}{2}} \cdot \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$ where $z_{\frac{\alpha}{2}} = z_{\frac{0.05}{2}} = z_{0.025} = 1.96$

$= (0.31 - 0.56) \pm 1.96 \cdot \sqrt{\frac{0.31 \times 0.69}{32} + \frac{0.56 \times 0.44}{41}}$

$= (-0.25) \pm 1.96 \times 0.113$

$= (-0.471, -0.03)$

8.17

a) The point estimate for p is given as $\hat{p} = \frac{x}{n} = 0.78$ and the margin of error is approximately $1.96 \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}} = 1.96 \cdot \sqrt{\frac{0.78(0.22)}{1000}} = 0.026$

b) The poll's margin of error does not agree with the result of part a), because the sampling error was reported using the maximum margin of error using $p = 0.5$:

$1.96 \cdot \sqrt{\frac{\hat{p}\hat{q}}{n}} = 1.96 \cdot \sqrt{\frac{0.5(0.5)}{1000}} = 0.031$ or $\pm 3.1\%$

#8.18

a) Let $\overline{X}_1$ = Average rate for the Marriott hotel chain.

$\overline{X}_2$ = Average rate for the Radisson hotel chain.

$\overline{X}_3$ = Average rate for the Wyndham hotel chain.

Then $\overline{X}_1 \overset{\cdot}{\sim} N(170, \frac{17.5^2}{50})$

$\overline{X}_2 \overset{\cdot}{\sim} N(145, \frac{10^2}{50})$

$\overline{X}_3 \overset{\cdot}{\sim} N(150, \frac{16.5^2}{50})$

b) The point estimate for $\overline{X}_1$ is $\bar{x}_1 = \$170$

The margin of error is $1.96 \cdot SE = 1.96 \cdot \sqrt{17.5^2/50} = 4.85$

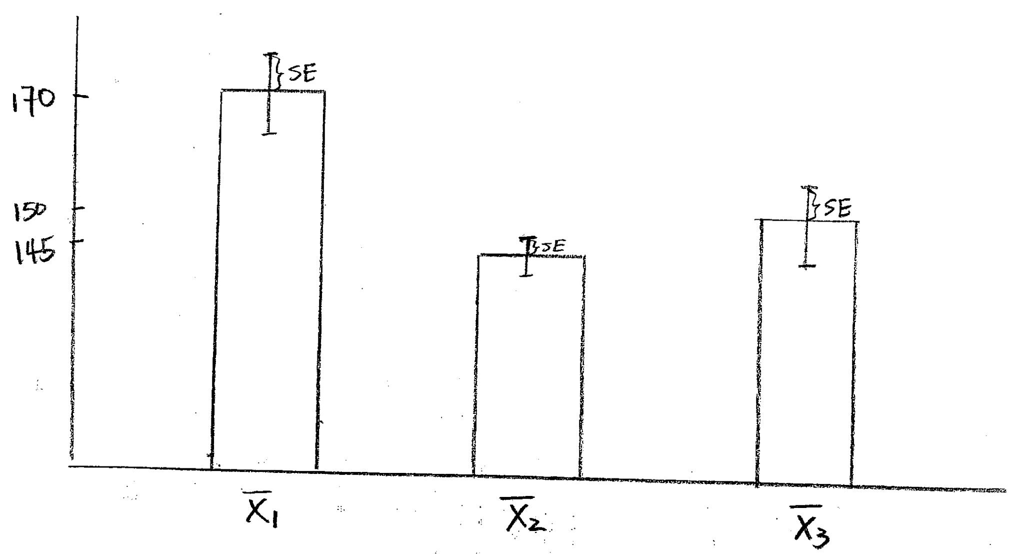
c) The point estimate for $\overline{X}_2$ is $\bar{x}_2 = \$145$

The margin of error is $1.96 \cdot SE = 1.96 \sqrt{10^2/50} = 2.77$

d) The point estimate for $\overline{X}_3$ is $\bar{x}_3 = \$150$

The margin of error is $1.96 \cdot SE = 1.96 \sqrt{16.5^2/50} = 4.57$

e)



#8.31 With $n = 40$, $\bar{x} = 3.7$ and $S = 0.5$, $\alpha = 0.01$, a 99% confidence interval for μ is approximated by

$$\bar{x} \pm 2.58 \cdot \frac{s}{\sqrt{n}} = 3.7 \pm 2.58 \cdot \frac{0.5}{\sqrt{40}}$$

$$= 3.7 \pm 0.204$$

$$= (3.496, 3.904)$$

In repeated sampling, 99% of all intervals constructed in this manner will enclose μ. Hence, we are fairly certain that this particular interval contains μ. (In order for this to be true, the sample must be randomly selected).

#8.33 given $\alpha = 0.01$, we have (point estimator) $\pm Z_{\frac{\alpha}{2}} \cdot$ (standard error of the estimator)

a) $$= \bar{x} \pm Z_{\frac{\alpha}{2}} \cdot \frac{\sigma}{\sqrt{n}} = 1.01 \pm Z_{\frac{\alpha}{2}} \cdot \frac{0.18}{\sqrt{35}}$$

where $Z_{\frac{\alpha}{2}} = Z_{0.01/2} = Z_{0.005} = \frac{2.57 + 2.58}{2} = 2.575$

then, CI for the average weight of all packages : (0.933, 1.087)

b) In repeated sampling, 99% of all intervals constructed in part a) will enclose μ. Hence, we are fairly contain that this particular interval contain μ.

c) No; $\mu = 1$ is a possible value for the population mean.
so If "1 pound" falls into the CI in part a), then the CI for μ should concern the quality control department.

#8.43

a) The parameter to be estimated is μ, the mean score for the posttest for all BACC classes. The 95% confidence interval is approximately

$$\bar{x} \pm 1.96 \cdot \frac{s}{\sqrt{n}} = 18.5 \pm 1.96 \cdot \frac{8.03}{\sqrt{365}} = 18.5 \pm .824 = (17.676, 19.324)$$

b) The parameter to be estimated is μ, the mean score for the posttest for all traditional classes. The 95% confidence interval is approximately

$$\bar{x} \pm 1.96 \cdot \frac{s}{\sqrt{n}} = 16.5 \pm 1.96 \cdot \frac{6.96}{\sqrt{298}} = 16.5 \pm 0.79 = (15.71, 17.29)$$

c) Now we are interested in the difference between posttest means, $\mu_1 - \mu_2$, for BACC versus traditional classes. The 95% confidence interval for $\mu_1 - \mu_2$ is approximately

$$(\bar{x}_1 - \bar{x}_2) \pm 1.96 \cdot \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} = (18.5 - 16.5) \pm 1.96 \sqrt{\frac{8.03^2}{365} + \frac{6.96^2}{298}}$$

$$= (2.0 \pm 1.142)$$

$$= (0.858, 3.142)$$

d) Since the confidence interval in part c) has two positive endpoints, it does not contain the value $\mu_1 - \mu_2 = 0$. Hence, it is not likely that the means are equal. It appears that there is a real difference in the mean scores.