Solutions to odd numbered problems are provided in the back of the book.

Chapter 6:

Section 6-2: 1, 4, 5, 8, 12, 16, 18, 23, 30.

4. For a 92% confidence interval, α=0.08, and so α/2=0.04. The area to the left is then 1–.04=.96. Referring to Table A-2 we find that the area .96 corresponds to the z-score 1.75, which is the critical value.

8. The value of \( \hat{p} \) is 0.742 and the margin of error \( E = 0.030 \). The lower limit of the confidence interval is then \( \hat{p} - E \) which is 0.712 and the upper limit is then \( \hat{p} + E \) which is 0.772. The confidence interval is \( 0.712 < p < 0.772 \).

12. The upper limit of the interval is 0.927 and the lower limit of the interval is 0.887. Using the formulas above, \( \hat{p} = 0.907 \) and the margin of error \( E = 0.020 \).

16. On page 261, the table of confidence levels and critical values indicates that for a confidence level of 95%, the critical value is 1.96. The sample size \( n=500 \). The percent of successes is 80% and so \( \hat{p}=0.800 \) and \( \hat{q}=0.200 \). So the margin of error is

\[
E = z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}} = (1.96)\sqrt{\frac{(0.800)(0.200)}{500}} = (1.96)(0.006) = 0.011
\]

18. On page 261, the table of confidence levels and critical values indicates that for a confidence level of 99%, the critical value is 2.575. The sample size is \( n=1200 \) and the number of successes is 200, so \( \hat{p} = \frac{x}{n} = \frac{200}{1200} = 0.167 \) and \( \hat{q} = 1 - p = 0.833 \). So the margin of error is

\[
E = z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}} = (2.575)\sqrt{\frac{(0.167)(0.833)}{1200}} = (2.575)(0.011) = 0.028
\]
Sample Size for Left-Handed Golfers

a. On page 261, the table of confidence levels and critical values indicates that for a confidence level of 99%, the critical value is 2.575. No estimate is known for \( \hat{p} \). The margin of error is 0.025. Using the formula for sample size from p. 266, we find that

\[
n = \frac{[z_{\alpha/2}]^2 \cdot \hat{p} \cdot \hat{q}}{E^2} = \frac{[2.575]^2 \cdot 0.25}{0.025^2} = 2652.25
\]

We round up, so the minimum required sample size is \( n = 2653 \).

b. On page 261, the table of confidence levels and critical values indicates that for a confidence level of 99%, the critical value is 2.575. The estimate for \( \hat{p} \) is 0.150, which makes \( \hat{q} = 0.850 \). The margin of error is 0.025. Using the formula, we find that

\[
n = \frac{[z_{\alpha/2}]^2 \cdot \hat{p} \cdot \hat{q}}{E^2} = \frac{[2.575]^2 \cdot 0.150 \cdot 0.850}{0.025^2} = 1352.648
\]

We round up, so the minimum required sample size is \( n = 1353 \).

c. This would make the sample a self-selected sample, and people with a strong interest would be inclined to participate. It may occur that those who are left-handed would then be overrepresented, inflating the value of \( \hat{p} \).

Section 6-3: 10, 11, 16, 23, 26.

10. On page 261, the table of confidence levels and critical values indicates that for a confidence level of 99%, the critical value is 2.575. The sample size is \( n = 50 \), the sample mean is \( \bar{x} = 80.5 \) and the population standard deviation is \( \sigma = 4.6 \). The margin of error is

\[
E = z_{\alpha/2} \sigma / \sqrt{n} = (2.575) \cdot (4.6) / \sqrt{50} = 1.675
\]

This means the confidence interval is

\[
\bar{x} - E < \mu < \bar{x} + E
\]

\[
80.5 - 1.675 < \mu < 80.5 + 1.675
\]

\[
78.825 < \mu < 82.175
\]

16. The margin of error, \( E \), is 500 and the population standard deviation \( \sigma = 9877 \). For a 94% confidence interval, \( \alpha = 0.06 \), and so \( \alpha/2 = 0.03 \). We find the area to the left, which is 1 - 0.03 = 0.97. Referring to Table A-2 we find that the area .975 corresponds to the z-score 1.88, which is the critical value. Using the formula,

\[
n = \frac{z_{\alpha/2} \sigma^2}{E^2} = \frac{1.88 \cdot 9877^2}{500} = [37.138]^2 = 1379.195
\]

We round up, so the minimum required sample size is \( n = 1380 \).


The margin of error, \( E \), is 500 and the population standard deviation is conservatively estimated to be \( \sigma = 6250 \). On page 261, the table of confidence levels and critical values indicates that for a confidence level of 95%, the critical value is 1.96. Using the formula,

\[
n = \frac{z_{\alpha/2} \sigma^2}{E^2} = \frac{1.96 \cdot 6250^2}{500} = [24.5]^2 = 600.25
\]

We round up, so the minimum required sample size is \( n = 601 \).
2. Since the population appears to be normal, and \( \sigma \) is unknown, it is appropriate to use the t distribution. For a 95% confidence interval, \( \alpha = 0.05 \), and so \( \alpha/2 = 0.025 \). Since \( n = 10 \), the degrees of freedom \( \text{df} = n - 1 = 9 \). Using Table A-3, we see that \( t_{0.025} = 2.262 \).

16. Monitoring Lead in Air

We assume that the data is normally distributed. For a 95% confidence interval, \( \alpha = 0.05 \), and so \( \alpha/2 = 0.025 \). Since \( n = 6 \), the degrees of freedom \( \text{df} = n - 1 = 5 \). Using Table A-3, we see that \( t_{0.025} = 2.571 \). Calculating \( \bar{x} \) from the sample data gives

\[
\bar{x} = \frac{\Sigma x}{n} = \frac{9.23}{6} = 1.538
\]

Calculating the sample standard deviation from the data gives

\[
s = \sqrt{\frac{n\Sigma(x^2) - (\Sigma x)^2}{n(n - 1)}} = \sqrt{\frac{6 \cdot 32.520 - (9.23)^2}{6 \cdot 5}} = 1.914
\]

The margin of error is

\[
E = t_{0.025} \frac{s}{\sqrt{n}} = 2.571 \frac{1.914}{\sqrt{6}} = 2.009
\]

The confidence interval is

\[
\bar{x} - E < \mu < \bar{x} + E
\]

\[
1.538 - 2.009 < \mu < 1.538 + 2.009
\]

\[-0.471 < \mu < 3.547
\]

Yes, it would seem the confidence interval is not very good. One of the data values, 5.40, is extremely large, suggesting a skewed population or an outlier. Because of this, the assumption that the data is normal is not realistic.