Partial Solution for Chapter 8

§8.1 1.

4. The boxplot reveals that there is an outlier and so a $z$-interval should not be used.

6. The plotted points are all within the bounds of the normal probability plot, which also has a generally linear pattern. The boxplot shows that there are no outliers. A $z$-interval can be used.

12. (a) For 90% confidence interval, the critical value is $z_{0.05} = 1.645$, so the CI is $(58.27, 60.13)$.
   (b) the CI is $(58.36, 60.04)$.
   (c) the CI is $(57.88, 60.52)$.

14. (a) For 94% confidence interval, the critical value is $z_{0.03} = 1.88$, so the CI is $(115.85, 130.15)$.
   (b) the CI is $(113.77, 132.23)$. Decreasing the sample size increases the margin of error.
   (c) the CI is $(117.53, 128.47)$. Decreasing the level of confidence decreases the margin of error.
   (d) No, because the sampling distribution of $\bar{X}$ is not normal.
   (e) If there is an outlier, we should not use this approach to compute a C.I. Since outlier will increase the sample mean, the confidence interval might overstate the population mean.

18. (a) $\bar{x} = 48.33$
   (c) C.I is $(42.00, 54.66)$

32. (a) For 98% confidence, we use $z_{0.01} = 2.33$. Then the required sample size is

\[
n = \left( \frac{z_{0.01} \times \sigma}{E} \right)^2 = 351.8
\]

which we round up to 352 cars.
   (b) $n = 1407.2$, which we round up to 1408 cars.

§8.2 4. (a) For 98% confidence interval, $\alpha/2 = 0.01$. If $n = 20$, then $df = 19$, the critical value is $t_{0.01} = 2.539$, so the CI is $(45.5, 54.5)$.
   (b) the CI is $(44.6, 55.4)$.
   (c) the CI is $(46.3, 53.7)$.
   (d) No, because in all cases the sample size is small $n < 30$ and so the population must be normally distributed.
   (e) If there is an outlier, we should not use this approach to compute a C.I. Since outlier will increase the sample mean, the confidence interval might overstate the population mean.

6. (a) For 90% confidence interval, $\alpha/2 = 0.05$. If $n = 40$, then $df = 39$, the critical value is $t_{0.05} = 1.685$, so the CI is $(32.78, 37.42)$. 
(b) the CI is (33.66, 36.54). Increasing the sample size decreases the margin of error.
(c) the CI is (31.76, 38.44). Increasing the level of confidence increases the margin of error.
(d) For a small sample the population must be normally distributed.

12. \( \bar{x} = 10.03, S = 4.98 \), The C.I is (8.08, 11.98)

14. (a)
   (c) C.I is (37.856, 49.543)

17.

22. C.I is (23.56, 32.39)

26. (a) The outlier is the age at death of 18.
   (b) C.I is (59.1, 78.7)
   (c) C.I is (65.3, 80.3)

§8.3 4. C.I is (0.307, 0.360)
   6. C.I is (0.567, 0.633)

12. (a) \( n\hat{p}(1 - \hat{p}) = 543 \geq 10. \)
   (b) \( \hat{p} = 0.5648 \). For 92% confidence, \( z_{\alpha/2} = z_{0.04} = 1.75 \), C.I is (0.546, 0.683)
   (c) For 96% confidence, \( z_{\alpha/2} = z_{0.02} = 2.05 \), C.I is (0.543, 0.586).
   (d) Increase the level of confidence

14. (a) \( \hat{p} = 0.2060 \). For 95% confidence, \( z_{\alpha/2} = z_{0.025} = 1.96 \), C.I is (0.20, 0.212)
   (b) \( \hat{p} = 0.143 \), \( z_{\alpha/2} = z_{0.025} = 1.96 \), C.I is (0.137, 0.149)
   (c) Since the confidence intervals do not overlap, it does appear that the percentage of Americans with high school diplomas who are obese is greater than the percentage of Americans with 4 or more years of college who are obese.

17.

20. (a) \( n = \hat{p}(1 - \hat{p}) \left( \frac{z_{\alpha/2}}{E} \right)^2 = 1268.99 \sim 1269. \)
   (b) \( n = 1413.8 \), which we round up to 1414.