Section 6-5

11. $z_{x=195.3} = \frac{195.3-182.9}{\frac{40.8}{\sqrt{16}}} = 1.22$ which has a probability of $1-0.8888 = 0.1112$ to the right of it. The elevator appears to be relatively safe because there is a very small chance that it will be overloaded with 16 male passengers. (Tech: 0.1121.)

16. a. $z_{x=0.8535} = \frac{0.8535-0.8565}{0.0518} = -0.06$ which has a probability of $1-0.4761 = 0.5239$ to the right of it. (Tech: 0.5231.)

    b. $z_{x=0.8535} = \frac{0.8535-0.8565}{\frac{0.0518}{\sqrt{465}}} = -1.25$ which has a probability of $1-0.1056 = 0.8944$ to the right of it. (Tech: 0.8941.) Instead of filling each bag with exactly 465 M&Ms, the company probably fills the bags so that the weight is as stated. In any event, the company appears to be doing a good job of filling the bags.

Section 6-7

5. The requirements are satisfied with a mean of $13 \cdot 0.4 = 5.2$ and the standard deviation of $\sqrt{13 \cdot 0.4 \cdot 0.6} = 1.766$. Therefore, $z_{x=2.5} = \frac{2.5-5.2}{\sqrt{13 \cdot 0.4 \cdot 0.6}} = -1.53$ which has a probability of 0.0630. (Tech: 0.0632.)

6. The requirement of $nq \geq 5$ is not satisfied. Normal approximation should not be used.

7. The requirement of $nq \geq 5$ is not satisfied. Normal approximation should not be used.

8. The requirements are satisfied with a mean of 10 and a standard deviation of $\sqrt{25 \cdot 0.4 \cdot 0.6} = 2.449$. Therefore, $z_{x=9.5} = \frac{9.5-10}{\sqrt{25 \cdot 0.4 \cdot 0.6}} = -0.20$ which has a probability of $1-0.4207 = 0.5793$ to the right of it. (Tech: 0.5809.)

20. $\mu = 420{,}095 \cdot 0.00034 = 142.83$, $\sigma = \sqrt{420{,}095 \cdot 0.000344 \cdot 0.999656} = 11.9492$

    $z_{x=135.5} = \frac{135.5-142.83}{\sqrt{420{,}095 \cdot 0.000344 \cdot 0.999656}} = -0.61$ which has a probability of 0.2709. (Tech using normal approximation: 0.2697; Tech using binomial: 0.2726.) Media reports appear to be wrong.

Section 7-2

14. a. $\hat{p} = \frac{490}{806} = 0.610$

b. $E = z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}} = 2.58\sqrt{\frac{\left(\frac{490}{806}\right)\left(\frac{316}{806}\right)}{806}} = 0.0443$

$\hat{p} - E < p < \hat{p} - E$

c. $0.610 - 0.0443 < p < 0.610 - 0.0443$

$0.566 < p < 0.654$

d. We have 99% confidence that the interval from 0.566 to 0.654 actually does contain the true value of the population proportion.

15. a. $\hat{p} = \frac{1083}{2518} = 0.430$

b. $E = z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}} = 1.65\sqrt{\frac{\left(\frac{1083}{2518}\right)\left(\frac{1435}{2518}\right)}{2518}} = 0.0162$

$\hat{p} - E < p < \hat{p} - E$

c. $0.430 - 0.0162 < p < 0.430 - 0.0162$

$0.414 < p < 0.446$

d. We have 90% confidence that the interval from 0.414 to 0.446 actually does contain the true value of the population proportion.

Section 7-3

18. The confidence interval does not contain the value of 4 years. The data appear to have a distribution that is far from normal, so the confidence interval might not be a good estimate of the population mean.

$$\overline{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}} 6.5 \pm 1.73 \cdot \frac{3.51}{\sqrt{20}}$$

$$5.1 \text{ years} < \mu < 7.9 \text{ years}$$

20. The sample data meet the loose requirement of having a normal distribution

$$\overline{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}} = 33.6 \pm 2.62 \cdot \frac{7.66998}{\sqrt{15}}$$

$$28.4 \text{ years} < \mu < 38.8 \text{ years}$$

Section 7-4

8. df = 49. $\chi_L^2 = 32.357$ (Tech: 31.555) and $\chi_R^2 = 71.420$ (Tech: 70.222).

$$\sqrt{\frac{(n-1)s^2}{\chi_R^2}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi_L^2}}$$

$$\sqrt{\frac{(50-1)0.587^2}{71.420}} < \sigma < \sqrt{\frac{(50-1)0.587^2}{32.357}}; \text{df} = 50$$

$0.486 < \sigma < 0.722$ (Tech: $0.490 < \sigma < 0.731$)

13.

$$\sqrt{\frac{(n-1)s^2}{\chi_R^2}} < \sigma < \sqrt{\frac{(n-1)s^2}{\chi_L^2}}$$

$$\sqrt{\frac{(7-1)0.36576^2}{12.592}} < \sigma < \sqrt{\frac{(7-1)0.36576^2}{1.635}} 0$$

$0.252 \text{ ppm} < \sigma < 0.701 \text{ ppm}$