6-10 (p.206)
(a)

$$P(X > 500) = P(Z > \frac{500-470}{120}) = P(Z > 0.25) = 0.401$$

(b)

$$\begin{aligned}
P(-10 < \bar{X} - \mu < 10) &= P(\frac{-10}{\frac{\sigma}{\sqrt{n}}} < \frac{\bar{X}-\mu}{\frac{\sigma}{\sqrt{n}}} < \frac{10}{\frac{\sigma}{\sqrt{n}}}) \\
& P(\frac{-10}{\frac{120}{\sqrt{250}}} < Z < \frac{10}{\frac{120}{\sqrt{250}}}) \\
& P(-1.32 < Z < 1.32) \\
& 1 - 2P(Z > 1.32) \\
& 1 - 2(0.093) \\
& 0.814
\end{aligned}$$

6-14 (p. 207)
(a) Want $\sum_{i=1}^{n} X_i = 54$. What should n be? We want the expected value of the sum to be equal to 54 inches.

$$\begin{aligned}
E(\sum_{i=1}^{n} X_i) &= 54 \\
\sum_{i=1}^{n} E(X_i) &= 54 \\
\sum_{i=1}^{n} (0.5) &= 54 \\
(0.5)(n) &= 54 \\
n &= 108
\end{aligned}$$

(b)

$$\begin{aligned}
P(53.75 < \sum_{i=1}^{108} X_i < 54.25) &= P(\frac{53.75}{108} < \bar{X} < \frac{54.25}{108}) \\
& P(\frac{\frac{53.75}{108} - 0.5}{\frac{0.01}{\sqrt{108}}} < Z < \frac{\frac{54.25}{108} - 0.5}{\frac{0.01}{\sqrt{108}}}) \\
& P(-2.41 < Z < 2.41) \\
& 1 - 2P(Z > 2.41) \\
& 1 - 2(0.008) \\
& 0.984
\end{aligned}$$

6-20 (p. 214)
(a)

$$\begin{aligned} P(X \geq 7) &= \binom{10}{7}(0.5)^{10} + \binom{10}{8}(0.5)^{10} + \binom{10}{9}(0.5)^{10} + \binom{10}{10}(0.5)^{10} \\ &= (0.5)^{10}(\frac{10(9)(8)}{3(2)} + \frac{10(9)}{2} + 10 + 1) \\ &= 0.171875 \end{aligned}$$

(b) Here, we see the ambiguity when you don't use the continuity correction. Then it makes a difference whether you phrase the question as "7 or more" heads or "more than 6" heads. (This part of the problem serves to demonstrate why you should use the continuity correction; I would expect you to do this problem with the correction, as in part (c), if you encountered it on a quiz.)

$$\begin{aligned} P(p > \frac{7}{10}) &= P(Z > \frac{\frac{7}{10} - \frac{5}{10}}{\sqrt{\frac{0.5(0.5)}{10}}}) \\ &= P(Z > 1.26) \\ &= 0.104 \end{aligned}$$

OR (if you solved it thinking "more than 6" heads)

$$\begin{aligned} P(p > \frac{6}{10}) &= P(Z > \frac{\frac{6}{10} - \frac{5}{10}}{\sqrt{\frac{0.5(0.5)}{10}}}) \\ &= P(Z > 0.63) \\ &= 0.264 \end{aligned}$$

Notice the difference between the two and the answer in part (a).
(c)

$$\begin{aligned} P(p > \frac{6.5}{10}) &= P(Z > \frac{\frac{6.5}{10} - \frac{5}{10}}{\sqrt{\frac{0.5(0.5)}{10}}}) \\ &= P(Z > 0.95) \\ &= 0.171 \end{aligned}$$

So, with the use of the continuity correction with the binomial approximation, we get an answer very similar to the answer in part (a).

6-22 (p. 215)

$$\begin{aligned} P(-0.03 < p - E(p) < 0.03) &= P(\frac{-0.03}{\sqrt{\frac{\pi(1-\pi)}{n}}} < \frac{p - E(p)}{\sqrt{\frac{\pi(1-\pi)}{n}}} < \frac{0.03}{\sqrt{\frac{\pi(1-\pi)}{n}}}) \\ &= P(\frac{-0.03}{\sqrt{\frac{0.5(0.5)}{1500}}} < Z < \frac{0.03}{\sqrt{\frac{0.5(0.5)}{1500}}}) \end{aligned}$$

$$
\begin{aligned}
&= P(-2.32 < Z < 2.32) \\
&= 1 - 2P(Z > 2.32) \\
&= 1 - 2(0.010) \\
&= 0.98
\end{aligned}
$$

6-26 (p. 217)

(a) $N = 52$ cards, $n = 13$ cards (a bridge "hand")

$$
\begin{aligned}
P(\text{get at least 7 spades in bridge "hand"}) &= P(p > \frac{6.5}{13}) \\
&= P(Z > \frac{\frac{6.5}{13} - 0.25}{\sqrt{\frac{0.25(0.75)}{13}}\sqrt{\frac{52-13}{52-1}}}) \\
&= P(Z > 2.38) \\
&= 0.009
\end{aligned}
$$

$$
\begin{aligned}
P(\text{get at least 7 of one suit in a bridge "hand"}) &= 4P(getatleast7spadesinbridge``hand'') \\
&= 0.036
\end{aligned}
$$

(b) $N = 52$ cards, $n = 5$ (a poker "hand")

$$
\begin{aligned}
P(\text{get at least 2 aces in poker "hand"}) &= P(p > \frac{1.5}{5}) \\
&= P(Z > \frac{\frac{1.5}{5} - \frac{4}{52}}{\sqrt{\frac{\frac{4}{52}(\frac{48}{52})}{5}}\sqrt{\frac{52-5}{52-1}}}) \\
&= P(Z > 1.95) \\
&= 0.026
\end{aligned}
$$