Section 8.3

36.  

a. 

1. \( p = \text{true proportion of all nickel plates that blister under the given circumstances.} \)

2. \( H_0: p = .10 \)

3. \( H_1: p > .10 \)

4. 
\[
 z = \frac{\hat{p} - p_0}{\sqrt{p_0(1 - p_0)/n}} = \frac{\hat{p} - .10}{\sqrt{.10(90)/n}}
\]

5. Reject \( H_0 \) if \( z \geq 1.645 \)

6. \[
 z = \frac{14/100 - .10}{\sqrt{.10(90)/100}} = 1.33
\]

7. Fail to Reject \( H_0 \). The data does not give compelling evidence for concluding that more than 10% of all plates blister under the circumstances.

The possible error we could have made is a Type II error: Failing to reject the null hypothesis when it is actually true.

b. \( \beta(.15) = \Phi\left[ \frac{.10 - .15 + 1.645\sqrt{.10(90)/100}}{\sqrt{.15(.85)/100}} \right] = \Phi(-.02) = .4920 \). When \( n = 200, \)

\[
\beta(.15) = \Phi\left[ \frac{.10 - .15 + 1.645\sqrt{.10(90)/200}}{\sqrt{.15(.85)/200}} \right] = \Phi(-.60) = .2743
\]

c. \[
n = \left[ \frac{1.645\sqrt{.10(90)} + 1.28\sqrt{.15(.85)}}{.15 -.10} \right]^2 = 19.01^2 = 361.4, \text{ so use } n = 362
\]

39.  

a. We wish to test \( H_0: p = .02 \text{ v. } H_0: p < .02 \); only if \( H_0 \) can be rejected will the inventory be postponed. The lower-tailed test rejects \( H_0 \) if \( z \leq -1.645 \). With \( \hat{p} = \frac{15}{1000} = .015 \), \( z = -1.01 \), which is not \( \leq -1.645 \). Thus, \( H_0 \) cannot be rejected, so the inventory should be carried out.

b. 
\[
\beta(.01) = 1 - \Phi\left[ \frac{.02 - .01 - 1.645\sqrt{.02(98)/1000}}{\sqrt{.01(99)/1000}} \right] = 1 - \Phi(0.86) = .1949
\]
Section 8.4

45. Using $\alpha = .05$, $H_0$ should be rejected whenever P-value < .05.
   d. P-value = .001 < .05, so reject $H_0$

   e. .021 < .05, so reject $H_0$.

   f. .078 is not < .05, so don’t reject $H_0$.

   g. .047 < .05, so reject $H_0$ (a close call).

   h. .148 > .05, so $H_0$ can’t be rejected at level .05.
49. Use Table A.8.
   a. $P(t > 2.0)$ at 8df = .040
   b. $P(t < -2.4)$ at 11df = .018
   c. $2P(t < -1.6)$ at 15df = 2(.065) = .130
   d. by symmetry, $P(t > -0.4) = 1 - P(t > .4)$ at 19df = 1 - .347 = .653
   e. $P(t > 5.0)$ at 5df < .005
   f. $2P(t < -4.8)$ at 40df < 2(.000) = .000 to three decimal places

51. The p-value is greater than the level of significance $\alpha = .01$, therefore fail to reject $H_0$ that $\mu = 5.63$. The data does not indicate a statistically significant difference in average serum receptor concentration between pregnant women and all other women.

55. $p =$ proportion of all physicians that know the generic name for methadone.
   $H_0: p = .50$ v. $H_a: p < .50$. We can use a large sample test if both $np_0 \geq 10$ and $n(1 - p_0) \geq 10$; 102(.50) = 51, so we can proceed. $\hat{p} = \frac{47}{102}$, so
   $$z = \frac{\frac{47}{102} - .50}{\sqrt{\frac{.50(1-.50)}{102}}} = -0.39 = -.79.$$
   We will reject $H_0$ if the p-value < .01. For this lower tailed test, the p-value = $\Phi(z) = \Phi(-.79) = .2148$, which is not < .01, so we do not reject $H_0$ at significance level .01.

56. $\mu =$ the true average percentage of organic matter in this type of soil, and the hypotheses are $H_0: \mu = 3$ v. $H_a: \mu \neq 3$. With $n = 30$, and assuming normality, we use the t test: $t = \frac{\bar{x} - 3}{s/\sqrt{n}} = \frac{2.481 - 3}{.295/\sqrt{30}} = -1.759$. The p-value = $2[\Phi( t > 1.759 )] = 2(.041) = .082$. At significance level .10, since .082 < .10, we would reject $H_0$ and conclude that the true average percentage of organic matter in this type of soil is something other than 3. At significance level .05, we would not have rejected $H_0$. 