1. Problem 8.16 from the Moore text

a) Given: \( n = 440; \ f = 23; \ \hat{p} = \frac{23}{440} = .05227 \); \( p = .10 \)

\[
\sigma = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{.10(90)}{440}} = .0143
\]

b) \( H_0: p = .10 \)
\( H_a: p < .10 \) (less than 10% have adverse symptoms)

\[
Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p(1-p)}{n}}} = \frac{.05 - .10}{.0143} = -3.50
\]

\( p < .0002; \) if \( \alpha = .01, \) then \( Z^* = -2.326 \)

Reject the null hypothesis. Yes, the experiment provides strong evidence that significantly fewer than 10% of patients experience side effects when taking this pain reliever.

2. Problem 8.18 from the Moore text

Given: 639 file complaints; 54 complainers left the HMO voluntarily;

\[
\hat{p} = \frac{54}{639} = .0845
\]

Construct a 90% confidence interval – \( Z^* = 1.645 \)

\[
c.i. = \hat{p} \pm Z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = .0845 \pm 1.645 \left( \sqrt{\frac{.0845(.9155)}{639}} \right) = .0845 \pm 1.645(.011) = .0845 \pm .0181 = .0664, .1026
\]

We have 90% confidence that the proportion of complainers who leave the HMO voluntarily is between .08 and .10. In other words, from 8 to 10% of complainers leave the HMO voluntarily.
3. Problem 8.42 from the Moore text

a) Skip
b) Group 1 = no radar; Group 2 = radar

\[ \hat{p}_1 = \frac{5690}{12931} = .44; \hat{p}_2 = \frac{1051}{3285} = .32 \]

95% c.i. = \((\hat{p}_1 - \hat{p}_2) \pm Z * \sqrt{\left( \frac{\hat{p}_1 (1 - \hat{p}_1)}{n_1} \right) + \left( \frac{\hat{p}_2 (1 - \hat{p}_2)}{n_2} \right)}\)

= \((.44 - .32) \pm 1.96 \sqrt{\left( \frac{.44(.56)}{12931} \right) + \left( \frac{.32(.68)}{3285} \right)} = .12 \pm 1.96(.00924) = .12 \pm .02 = .10 to .14

We have 95% confidence that the difference between the proportion of cars speeding when radar is not present and when radar is present is between .10 and .14. In other words, between 10% and 14% more drivers speed when radar is not present compared to when radar is present.

c) We wouldn’t have independent samples because the behavior of one driver in a cluster affects the behavior (the speed) of other drivers.

4. Problem 8.44 from the Moore text

a) Skip
b) Given: 58 of 102 male athletes (group 1) graduate and 37 of 45 female athletes (group 2) graduate

\[ \hat{p}_1 = \frac{58}{102} = .57; \hat{p}_2 = \frac{37}{45} = .82 \]

H₀: \( p_1 = p_2 \)
H₁: \( p_1 < p_2 \)

\[ \hat{p} = \frac{f_1 + f_2}{n_1 + n_2} = \frac{58 + 37}{102 + 45} = \frac{95}{147} = .65 \]

\[ Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1 - \hat{p}) \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}} = \frac{.57 - .82}{.65(.35)\left( \frac{1}{102} + \frac{1}{45} \right)} = \frac{-.25}{.0854} = -2.93 \]

p-value = .0017

Yes, significant evidence exists that a smaller proportion of male athletes graduate than female athletes.