12-4.

Predictor	Coef	SE Coef	T	P
Constant	-123.1	157.3	-0.78	0.459
X1	0.7573	0.2791	2.71	0.030
X2	7.519	4.010	1.87	0.103
X3	2.483	1.809	1.37	0.212
X4	-0.4811	0.5552	-0.87	0.415

S = 11.79   R-Sq = 85.2%   R-Sq(adj) = 76.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	4	5600.5	1400.1	10.08	0.005
Residual Error	7	972.5	138.9		
Total	11	6572.9			

a) $\hat{y} = -123.1 + 0.7573x_1 + 7.519x_2 + 2.483x_3 - 0.4811x_4$

b) $\hat{\sigma}^2 = 139.00$

c) $se(\hat{\beta}_0) = 157.3$, $se(\hat{\beta}_1) = 0.2791$, $se(\hat{\beta}_2) = 4.010$, $se(\hat{\beta}_3) = 1.809$, and

$se(\hat{\beta}_4) = 0.5552$

d) $\hat{y} = -123.1 + 0.7573(75) + 7.519(24) + 2.483(90) - 0.4811(98) = 290.476$

11-40

95 percent confidence intervals for coefficient estimates

	Estimate	Standard error	Lower Limit	Upper Limit
CONSTANT	13.3202	2.57172	7.98547	18.6549
Taxes	3.32437	0.39028	2.51479	4.13395

a) $2.51479 \le \beta_1 \le 4.13395$.

d)

$$38.253 \pm 6.3302$$
$$31.9228 \le y_0 \le 44.5832$$

9-106 a) $\alpha=0.05$

n=100 $\beta = \Phi\left(z_{0.05} + \frac{0.5-0.6}{\sqrt{0.5(0.5)/100}}\right) = \Phi(1.65 - 2.0) = \Phi(-0.35) = 0.3632$

$$Power = 1 - \beta = 1 - 0.3632 = 0.6368$$

n=150 $\beta = \Phi\left(z_{0.05} + \frac{0.5-0.6}{\sqrt{0.5(0.5)/100}}\right) = \Phi(1.65 - 2.45) = \Phi(-0.8) = 0.2119$

$$Power = 1 - \beta = 1 - 0.2119 = 0.7881$$

n=300 $\beta = \Phi\left(z_{0.05} + \frac{0.5 - 0.6}{\sqrt{0.5(0.5)/300}} \right) = \Phi(1.65 - 3.46) = \Phi(-1.81) = 0.03515$

$$Power = 1 - \beta = 1 - 0.03515 = 0.96485$$

b) α=0.01

n=100 $\beta = \Phi\left(z_{0.01} + \frac{0.5 - 0.6}{\sqrt{0.5(0.5)/100}} \right) = \Phi(2.33 - 2.0) = \Phi(0.33) = 0.6293$

$$Power = 1 - \beta = 1 - 0.6293 = 0.3707$$

n=150 $\beta = \Phi\left(z_{0.01} + \frac{0.5 - 0.6}{\sqrt{0.5(0.5)/100}} \right) = \Phi(2.33 - 2.45) = \Phi(-0.12) = 0.4522$

$$Power = 1 - \beta = 1 - 0.4522 = 0.5478$$

n=300 $\beta = \Phi\left(z_{0.01} + \frac{0.5 - 0.6}{\sqrt{0.5(0.5)/300}} \right) = \Phi(2.33 - 3.46) = \Phi(-1.13) = 0.1292$

$$Power = 1 - \beta = 1 - 0.1292 = 0.8702$$

Decreasing the value of α decreases the power of the test for the different sample sizes.

c) α=0.05

n=100 $\beta = \Phi\left(z_{0.05} + \frac{0.5 - 0.8}{\sqrt{0.5(0.5)/100}} \right) = \Phi(1.65 - 6.0) = \Phi(-4.35) \cong 0.0$

$$Power = 1 - \beta = 1 - 0 \cong 1$$

The true value of p has a large effect on the power. The further p is away from p_0 the larger the power of the test.

d)

$$n = \left(\frac{z_{\alpha/2}\sqrt{p_0(1-p_0)} - z_\beta \sqrt{p(1-p)}}{p - p_0} \right)^2$$

$$= \left(\frac{2.58\sqrt{0.5(1-0.50)} - 1.65\sqrt{0.6(1-0.6)}}{0.6-0.5} \right)^2 = (4.82)^2 = 23.2 \cong 24$$

$$n = \left(\frac{z_{\alpha/2}\sqrt{p_0(1-p_0)} - z_\beta \sqrt{p(1-p)}}{p - p_0} \right)^2$$

$$= \left(\frac{2.58\sqrt{0.5(1-0.50)} - 1.65\sqrt{0.8(1-0.8)}}{0.8-0.5} \right)^2 = (2.1)^2 = 4.41 \cong 5$$

The true value of p has a large effect on the sample size. The further p is away from p_0 the smaller the sample size that is required.