51.

1 Parameter of interest: $p_1 - p_2$ = true difference in proportions of those responding to two different survey covers (1 = Plain, 2 = Picture).

2 $H_0 : p_1 - p_2 = 0$

3 $H_a : p_1 - p_2 < 0$

4 $z = \dfrac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}\hat{q}\left(\frac{1}{m} + \frac{1}{n}\right)}}$

5 Reject H_0 if P-value < .10

6 $z = \dfrac{\frac{104}{207} - \frac{109}{213}}{\sqrt{\left(\frac{213}{420}\right)\left(\frac{207}{420}\right)\left(\frac{1}{207} + \frac{1}{213}\right)}} = -.1910$; P-value = .4247

7 Fail to Reject H_0. The data does not indicate that plain cover surveys have a lower response rate.

52. Let $\alpha = .05$. A 95% confidence interval is $\left(\hat{p}_1 - \hat{p}_2\right) \pm z_{\alpha/2}\sqrt{\left(\frac{\hat{p}_1\hat{q}_1}{m} + \frac{\hat{p}_2\hat{q}_2}{n}\right)}$

$$= \left(\tfrac{224}{395} - \tfrac{126}{266}\right) \pm 1.96\sqrt{\left(\frac{\left(\frac{224}{395}\right)\left(\frac{171}{395}\right)}{395} + \frac{\left(\frac{126}{266}\right)\left(\frac{140}{266}\right)}{266}\right)} = .0934 \pm .0774 = (.0160, .1708).$$

63. Let $\sigma_1^2 =$ variance in weight gain for low-dose treatment, and $\sigma_2^2 =$ variance in weight gain for control condition. We wish to test $H_0 : \sigma_1^2 = \sigma_2^2$ v. $H_a : \sigma_1^2 > \sigma_2^2$. The test statistic is $f = \dfrac{s_1^2}{s_2^2}$, and we reject H_0 at level .05 if $f > F_{.05,19,22} \approx 2.08$. $f = \dfrac{(54)^2}{(32)^2} = 2.85 \geq 2.08$, so reject H_0 at level .05. The data does suggest that there is more variability in the low-dose weight gains.

64. For the hypotheses $H_0 : \sigma_1 = \sigma_2$ versus $H_a : \sigma_1 \neq \sigma_2$, we find a test statistic of $f = 1.22$. At df = (47,44) ≈ (40,40), 1.22 < 1.51 indicates the P-value is greater than 2(.10) = .20. Hence, H_0 is not rejected. The data does not suggest a significant difference in the two population variances.