Chapter 8: One-sample hypothesis tests

$X = \begin{cases} 1 & \text{if an adult Internet user pays to download music} \\ 0 & \text{if " " " " does not pay to download music} \end{cases}$

$X \sim \text{Bernoulli}(p)$

Paying for music downloads. If you use the Internet, have you ever paid to access or download music? This was one of the questions of interest in a recent *Pew Internet and American Life Project Survey* (Oct. 2010). In a representative sample of 755 adults who use the Internet, 506 stated that they have paid to download music. Let p represent the true proportion of all Internet-using adults who have paid to download music.

a. Compute a point estimate of p. $\hat{p} = \frac{506}{755} = 0.67$

b. Set up the null and alternative hypotheses for testing whether the true proportion of all Internet-using adults who have paid to download music exceeds .7. $H_0: p \leq 0.7$, $H_1: p > 0.7$

c. Compute the test statistic for part b.

d. Find the rejection region for the test if $\alpha = .01$.

f. Make the appropriate conclusion using the rejection region.

g. Make the appropriate conclusion using the p-value obtained in the following R output:

```
prop.test(506,755,p=0.7,alternative="greater",correct=FALSE)

        1-sample proportions test without continuity correction

data:  506 out of 755, null probability 0.7
X-squared = 3.193, df = 1, p-value = 0.963
alternative hypothesis: true p is greater than 0.7
95 percent confidence interval:
 0.6414909 1.0000000
sample estimates:
        p
0.6701987
```

c. Test statistic $z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{0.67 - 0.7}{\sqrt{\frac{0.7\ 0.3}{755}}} = -1.80$

d. Rejection region for $\alpha = .01$

$R = \{z > z_{0.01} = 2.33\}$

f. $z = -1.80 \not> 2.33 \Rightarrow$ There is no sample evidence (at the 1% significance level) to conclude that $p > 0.7$.

g. We would only reject H_0 for $\alpha > 0.963$, which does not include any of the usual significance levels $(0.01, 0.05, 0.1)$. So the sample does not support rejecting H_0.