Section 8.3

46. $n = 500$

$\hat{p} = \frac{15}{500} = 0.03$

$\alpha = 0.01$

$\begin{cases} H_0 : p = 0.035 \\ H_a : p < 0.035 \end{cases}$

Test Stat: $z = \dfrac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$

RR: $z \leq -z_\alpha$

we find:

Test Stat: $z = \dfrac{0.03 - 0.035}{\sqrt{\frac{0.035(0.965)}{500}}} = -0.6084$

RR: $z \leq -z_{0.01}$
$= -2.33$.

Since $-0.6084 \not\leq -2.33$ we do not have sufficient evidence to say that the proportion of defective cables in robots is lower than humans.

48. $p \leq \alpha$ reject
$p > \alpha$ fail to reject

a) fail to reject
b) fail to reject
c) fail to reject
d) reject
e) fail to reject
f) fail to reject

54. $n = 855$

$\hat{p} = \frac{346}{855} = 0.4047$

By randomly guessing, the tasters have a $\frac{1}{3}$ chance of identifying the "different" wine. Thus we state

$$\begin{cases} H_0 : p = 0.\overline{3} \\ H_a : p > 0.\overline{3} \end{cases}$$

Then our test statistic is $z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = 4.43$, making the corresponding p-value $P(Z \geq z) = 4.716E{-6} \doteq 0$. Thus we reject the null at any (reasonable) signifance.

strongly!

$\therefore$ We conclude that there is ... sufficient evidence that the proportion of wine tasters have the ability to distinguish the "different" wine out of three more than $1/3$ of the time.

58. $n = 30$

$\bar{x} = 2.481$

$s = 1.616$

Since $n \leq 30$ and σ is unknown, we must use the t-distribution!

$$\begin{cases} H_0 : \mu = 3 \\ H_a : \mu \neq 3 \end{cases}$$

Test Stat: $\hat{t} = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$, P-value $= 2[P(t > |\hat{t}|)]$

We find:

T.S.: $\hat{t} = \frac{2.481 - 3}{1.616/\sqrt{30}} = -1.759$

P-value $= 2P(t > -1.759) = 2(0.04) = 0.089$

At significance level $\alpha = 0.1$ we would reject Ho since $0.089 < 0.1$. At significance of $\alpha = 0.05$, however, we would not reject Ho since $0.089 \not< 0.05$.

70. $n = 8$

Calculate manually that $\bar{x} = 30.7875$

$s = 6.5300$

$\alpha = 0.05$

$$\begin{cases} H_0: \mu = 29.0 \\ H_a: \mu > 29.0 \end{cases}$$

Test · Stat $= t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}}$

P-Value: $P(t_7 \geq t)$

We find: T.S.: $t = \dfrac{30.7875 - 29}{6.5300/\sqrt{8}} = 0.7742$

P-Value: $P(t_7 \geq 0.7742) = 0.240$

Since $0.240 > 0.05$ we $\boxed{\text{fail to reject}}$ Ho. Thus, there is not sufficient evidence that coal increases the mean heat flux flow over grass for pots.

74. $n = 20$

Calculate manually that $\bar{x} = 9.8525$

$s = 0.09646$

$$\begin{cases} H_0: \mu = 9.75 \\ H_a: \mu > 9.75 \end{cases}$$

Test · Stat: $t = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}} = \dfrac{9.85 - 9.75}{0.096/\sqrt{20}}$

$t = 4.75$

P-Value $= P(t_{19} \geq t) = P(t_{19} \geq 4.75)$

$= 6.964E-5$

$\therefore$ we strongly reject the null hypothesis for any reasonable significance. The condition is not met.

Presidential Approval

$n = 1500$
$\hat{p}_1 = 0.51$, $\hat{p}_2 = 0.86$
$\alpha = 0.05$.

For each $\hat{p}$, we seek to test $\begin{cases} H_0 : p = 0.5 \\ H_a : p > 0.5 \end{cases}$.

For $\hat{p}_1 = 0.51$:

Test-Stat: $z = \dfrac{\hat{p}_1 - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \dfrac{0.51 - 0.5}{\sqrt{\frac{0.5(0.5)}{1500}}} = 0.7746$

P-Value $= 1 - \phi(z) = 0.2193$

$\therefore$ for Sept 7-10, 2001, we fail to reject the null. Thus there is not evidence that the pop. prop. of adults who approved of the President's performance was greater than 50%.

For $\hat{p}_2 = 0.86$:

Test-Stat: $z = \dfrac{\hat{p}_2 - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = 27.885$

P-Value: $1 - \phi(z) = 0.^*$

$\therefore$ for Sept 14-15, 2001, we strongly reject the null. There is significant evidence that the total prop. of the pop who approved was greater that 50%.

For $\hat{p}_1$, the p-value was about 4 times too large to be considered.
For $\hat{p}_2$, the p-value was far, far too small to be able to accurately calculate!

* For fun, this is about 2×10^{-171} via W.A.