6.43

a. $H_0 : \mu_{\text{Narrow}} = \mu_{\text{Wide}}$ versus $H_a : \mu_{\text{Narrow}} \neq \mu_{\text{Wide}}$; $t = \dfrac{118.37 - 110.20}{\sqrt{(7.87)^2/12 + (4.71)^2/15}} = 3.17$,

$df \approx 17 \Rightarrow 0.002 <$ p-value $< 0.010 \Rightarrow$ Reject H_0 and conclude that there is sufficient evidence in the data that the two types of jets have different average noise levels.

b. A 95% CI on $\mu_{\text{Narrow}} - \mu_{\text{Wide}}$ is (2.73, 13.60)

c. Because maintenance could affect noise levels, jets of both types from several different airlines and manufacturers should be selected. They should be of approximately the same age, etc. This study could possibly be improved by pairing Narrow and Wide body airplanes based on factors that may affect noise level.

6.55

a.

i. H_0: Mean campaign expenditures for women is at least that of the mean campaign expenditures for men. H_a: Mean campaign expenditures for women is less than that of the mean campaign expenditures for men.

ii. $H_0 : \mu_F \geq \mu_M$ versus $H_a : \mu_F < \mu_M$

b. A 95% CI on $\mu_F - \mu_M$ is (−142.3, −69.1) thousands of dollars.

c. Since $s_1 \approx s_2$, use the pooled t-test: $t = \dfrac{245.3 - 350.1}{57.2\sqrt{1/20 + 1/20}} = -5.85$ with df = 38, p-value $< 0.0001 \Rightarrow$ Reject H_0 and conclude that there is significant evidence that the mean campaign expenditures for females is less than the mean campaign expenditures for males.

d. Yes, the difference could be as much as $142,300.

6.56 The required conditions are that the two samples are independently selected from populations having normal distributions with equal variances. The boxplots do not reveal any indication that the population distributions were not normal. The sample variances have a ratio of 1.4 to 1.0, thus there is very little indication that the population variances were unequal.

hw # 6 solutions

3. a. $H_o : \mu_{Old} \geq \mu_{New}$ versus $H_a : \mu_{Old} < \mu_{New}$;
Since $s_1 \approx s_2$, use pooled t-test: $t = \frac{15.68-20.71}{9.72\sqrt{\frac{1}{28}+\frac{1}{28}}} = -1.94$ with $df = 54$, $p\text{-}value \approx 0.029 \Rightarrow$
Reject H_o and conclude the data provides sufficient evidence that the new therapy appears to have a longer mean survival time.

b. 95% C.I. on μ_{New}: (16.91, 24.52) months

c. 95% C.I. on $\mu_{Old} - \mu_{New}$: $(15.68 - 20.71) \pm (2.005)(9.72)\sqrt{\frac{1}{28} + \frac{1}{28}} \Rightarrow (-10.24, 0.18)$ months.
This C.I. appears to yield inconsistent results since the C.I. contains 0. However, the C.I. is equivalent to a *two-sided* level $\alpha = 0.05$ test, whereas in a. a one-sided test was conducted.

d. The population distributions appear to be normally distributed with equal variances. With the stipulation that the samples are independently selected random samples, the conditions required for the pooled t-test have been satisfied.

4. a. $H_o : \mu_1 = \mu_2$ versus $H_a : \mu_1 \neq \mu_2$
Since $s_1 \approx s_2$, use pooled t-test:
$t = \frac{8.375-14.54}{1.00\sqrt{\frac{1}{8}+\frac{1}{8}}} = -12.28$, With df $= 14 \Rightarrow p - value < 0.0005$
Reject H_o and conclude there is significant evidence that the mean hay consumption is different for the two groups.

b. 95% C.I. on the mean difference in hay consumption, $\mu_1 - \mu_2$: (-7.24, -5.09).